Appendix B
Northern Impoundment
Geotechnical Engineering Report



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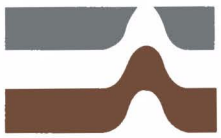
Appendix B

NORTHERN IMPOUNDMENT GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY 30% REMEDIAL DESIGN – NORTHERN IMPOUNDMENT
SAN JACINTO RIVER WASTE PITS

HARRIS COUNTY, TEXAS



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May 28, 2020
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GHD Services, Inc.
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Attention: Mr. Charles Munce, P.E.
Project Manager

Re: Northern Impoundment Geotechnical Engineering Report
Preliminary 30% Remedial Design
San Jacinto River Waste Pits
Northern Impoundment
Harris County, Texas

We have completed our study and preliminary analyses based on the existing and available data to date for the San Jacinto Waste Pits Superfund Site's Northern Impoundment Preliminary 30% Remedial Design. A summary of the methods of analysis and results are provided in the attached Geotechnical Engineering Report. The analyses were based on the information made available to Ardaman to date and may be subject to change in the future.

Sincerely,
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EXECUTIVE SUMMARY

This Geotechnical Engineering Report summarizes the results of the geotechnical investigation performed to better understand the soil characteristics and strengths of the underlying soil layers associated with the Northern Impoundment at the San Jacinto River Waste Pits Superfund Site. The geotechnical investigation was performed to support removal activities and design of best management practices (BMPs) to be used to isolate areas at the Northern Impoundment during excavation of waste materials.

Previous investigations of the Northern Impoundment had identified that, based on the limited information available at the time, the top of a sand formation occurs at an elevation between -50 and -60 feet North American Vertical Datum (NAVD88) to at least an elevation of approximately -80 feet NAVD88. After review of the boring log data from the Second Phase Pre-Design Investigation (PDI-2), it was concluded that these sands, although encountered in the PDI-2 borings, were not found to be as consistent at these elevations throughout the Northern Impoundment as originally believed. The occurrence of the sand is an important design consideration for the BMPs as the deeper occurrence of the top of the sand layer requires a deeper embedment of the BMPs.

The analyses for the BMPs considered the Q-Case (short-term loading condition), where the cohesive (clay) soils behave in an undrained manner. The analysis also considered the S-case (long-term loading condition) where the cohesive (clay) soils behave in a drained manner, as the BMP structures will be left in place for a minimum period of several months to a year during the remedial action (RA). In addition, a series of stability analyses were performed to estimate the minimum required embedment of the BMPs. For all cases considered, the top of BMP elevation was set to +9 feet NAVD88. The water levels inside and outside the BMP were set at variable levels and the ground surface was also varied to account for potential approaches that would be implemented during the RA. As the soil behavior changes from an undrained to the drained state, the drained state (the S-Case) governs the embedment depth, which on average, requires that the BMP be driven in excess of -80 feet NAVD88.

Results of the slope stability analysis indicate there is potential that during the installation of the BMP, the vibrations caused by pile driving could induce localized instability of the near-surface soils on the Northern Impoundment slope. This instability of the slope would cause soils containing waste to slide down and release waste to the San Jacinto River. At this stage of the design, there is significant uncertainty associated with the slope stability due to the heterogeneity in soil conditions across the Northern Impoundment and the uncertainty in the magnitude of the energy from the vibrations. For the ongoing remedial design, it would be prudent to consider, as a very likely possibility, a shallow instability occurring from vibrations due to driving the BMPs.

Additional consideration should also be given to other potential effects from the pile driving and vibrations including soil remolding, static liquefaction/cyclic mobility, densification and the potential impacts to the I-10 bridge, underground utilities and other surrounding structures.

NORTHERN IMPOUNDMENT GEOTECHNICAL ENGINEERING REPORT
PRELIMINARY 30% REMEDIAL DESIGN
SAN JACINTO RIVER WASTE PITS
NORTHERN IMPOUNDMENT
HARRIS COUNTY, TEXAS

This Geotechnical Engineering Report summarizes the results the preliminary analyses to better understand the soil characteristics and strengths of the underlying soil layers associated with the Northern Impoundment. Ardaman & Associates, Inc. (Ardaman) is working with GHD Services, Inc. (GHD), on behalf of the International Paper Company (IPC) and McGinnes Industrial Maintenance Corporation (MIMC), to develop a Preliminary 30% Remedial Design (30% RD) for the Northern Impoundment of the San Jacinto River Waste Pits Superfund Site located in Harris County, Texas. The geotechnical analyses were developed based on samples collected by Tolunay-Wong Engineers, Inc. (TWE) as part of the Second Phase Pre-Design Investigation (PDI-2) and other geotechnical data obtained from both the Remedial Investigation (RI) and the First Phase Pre-Design Investigation (PDI-1). The geotechnical investigation results from the RI and PDI-1 are provided in Attachment A. The geotechnical investigation results from PDI-2 are provided in Attachment B. The calculation package is provided in Attachment C.

SECTION 1. GENERAL PROJECT INFORMATION

1.1 Project Description

This geotechnical investigation was performed to support the removal activities and design of the BMPs for the 30 % RD.

1.2 Northern Impoundment Location and Description

The Northern Impoundment is located along the San Jacinto River and near I-10, as approximately shown in plan on Figure 1.

1.3 Geology

The geology in the vicinity of the Northern Impoundment is somewhat variable given the natural meander of the San Jacinto River over time. Based on the Geologic Atlas of Texas, Houston (1982), the near surface of the western bank of the San Jacinto River is comprised predominantly by Holocene Alluvium, which is comprised of clay, silt, sand, and can include organic matter. These alluvium deposits can be comprised of point-bar, natural levee, stream channel, back-swamp, and coastal marsh deposits. The near surface of the eastern bank of the San Jacinto River is comprised predominantly of the Pleistocene Beaumont Formation, which is made up of mostly clay, silt, and sand. A geologic profile of the area in the vicinity of the Northern Impoundment is provided for reference as Figure 2.

Historical topographic maps of the area from the U.S. Geological Survey (USGS), as shown on Figure 3, indicate that the near surface in the vicinity of the Northern Impoundment may have been comprised of backswamp and/or swamp deposits. It is unclear the extent to which these were scoured out and/or eroded over time, as well as how much was physically removed due to industrialization.

1.4 Groundwater

The Northern Impoundment is located on the San Jacinto River; therefore, the groundwater will fluctuate over time as the river rises and falls during periods of rain and drought. During the PDI-2, groundwater measurements were not able to be recorded at all the boring locations, as some of the soil borings were collected from a barge in open water, however, groundwater can be assumed to be near surface. The actual depth of the groundwater at the Northern Impoundment will fluctuate due to climatic conditions, local surface water control and drainage features, the San Jacinto River stage, and other factors.

1.5 Seismic Site Class

Seismicity can be addressed in accordance with the International Building Code (IBC), Latest Edition. Based on the furnished soil borings, the Northern Impoundment is classified as Site Class "E", according to the criterion given in Table 20.3-1 of the IBC. Some additional seismic design parameters are presented in Table 1, which were obtained from the USGS website.

TABLE 1 - SEISMIC DESIGN PARAMETERS

SEISMIC PARAMETERS (Per ASCE 7-16)	
PGA	0.034
S_s	0.069
S_1	0.04

The values in the aforementioned table are for use in seismic design, not to be confused with the pseudo-vibration analysis discussed further in this report.

SECTION 2. HISTORICAL GEOTECHNICAL INFORMATION

The following sections summarize the data Ardaman was provided that were obtained during the RI and the PDI-1. Only handwritten field logs were available. A summary of these borings is provided in Table 2. The furnished historical information is provided in Attachment A for reference.

TABLE 2 - HISTORICAL SOIL BORING DETAILS

Boring ID	Termination Depth (feet below ground surface)	Completion Date	Boring ID	Termination Depth (feet below ground surface)	Completion Date
SJGB001	60	10/27/10	SJGB019	57	12/03/18
SJGB002	60	5/9/10	SJGB020	62	12/02/18
SJGB003	120	5/8/10	SJGB021	56	12/01/18
SJGB004	59.5	5/11/10	SJGB022	47	11/30/18
SJGB005	61.5	5/6/10	SJGB023	60	12/04/18
SJGB006	30	10/29/10	SJSB028	37	11/19/18
SJGB007	119.5	5/7/10	SJSB029	40	11/16/18
SJGB008	59.5	5/6/10	SJSB030	40	11/18/18
SJGB009	29.5	10/26/10	SJSB031	40	11/18/18
SJGB010	15	10/28/10	SJSB032	42	11/17/18
SJGB011	20	10/29/10	SJSB033	40	11/14/18
SJGB012	20	10/28/10	SJSB034	42	11/10/18
SJGB013	10	5/11/10	SJSB035	42	11/11/18
SJGB014	12	5/10/10	SJSB036	35	11/17/18
SJGB015	10	5/10/10	SJSB036B	10	11/17/18
SJGB016	12	5/10/10	SJSB037	37	11/16/18
SJGB017	12	5/11/10	SJSB037B	10	11/16/18
SJGB018	52	12/13/18	SJSB038	36	12/09/18

SECTION 3. CURRENT FIELD EXPLORATION

The geotechnical scope of work for the PDI-2 for the Northern Impoundment included performing nine (9) soil borings within and around the perimeter of the Northern Impoundment. A plan map showing the locations of the soil borings is provided on Figure 4.

The soil borings were performed between November 7 and December 13, 2019 by TWE and logged by a representative of GHD. The borings were advanced using a 4-inch diameter bit and rotary wash methods to a maximum depth of 100 feet below the existing ground surface. Discrete samples were obtained continuously to 16 feet below ground surface (bgs), and generally on 5-ft. centers thereafter to the termination depth of the borehole.

The sampling procedure consisted of advancing the borehole to the desired depth, and then either a Shelby tube was lowered to the bottom of the boring and was then pushed into the soil in one continuous 24-inch stroke (ASTM D1587), or the Standard Penetration Test (SPT) (ASTM D1586) was performed. The SPT test consists of driving a two-inch diameter split-spoon sampler 1 foot (after first seating it 6 inches) with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler gives an indication of the consistency and density of the material.

Upon retrieval, the exposed soil surface at the bottom of each Shelby tube was visually classified, and field measurements of the strength of the material were obtained by means of a pocket penetrometer. Upon retrieval of the SPT samples, the split spoon was opened, the material was visually classified, and cuttings were removed from the sample. The sample was then placed in a labeled moisture proof bag for transportation to TWE's laboratory for testing. Table 3 provides a summary of the PDI-2 boring details.

TABLE 3 - PDI-2 SOIL BORING DETAILS

Boring ID	Termination Depth (feet below ground surface)	Termination Elevation (ft., NAVD88)	GPS Coordinate		Ground Surface Elevation (ft., NAVD88)
			Latitude	Longitude	
SJSB024	30	-27.36	29°47'36.74"N	95° 3'44.65"W	2.64
SJSB025	29.5	-24.52	29°47'38.65"N	95° 3'48.91"W	4.98
SJSB026	21.5	-16.16	29°47'39.24"N	95° 3'49.86"W	5.34
SJSB027	50	-46.08	29°47'41.34"N	95° 3'47.36"W	3.92
SJSB047	100	-103.40	29°47'38.50"N	95° 3'41.90"W	-3.40
SJSB050	20	-23.60	29°47'41.36"N	95° 3'40.53"W	-3.60
SJSB053	100	-109.70	29°47'43.62"N	95° 3'42.93"W	-9.70
SJSB057	100	-117.10	29°47'45.29"N	95° 3'46.74"W	-17.1
SJSB058	20	-19.38	29°47'42.79"N	95° 3'48.02"W	0.62

SECTION 4. LABORATORY TESTING

Once the field logs were made available to Ardaman, a lab testing program was developed and submitted to TWE for geotechnical laboratory testing. An overview of the scope of the laboratory testing phase in terms of the type of tests performed is presented in Table 4. Results of the laboratory tests are presented and discussed in the following sections of this report.

TABLE 4 - PDI-2 LABORATORY TESTING SUMMARY

Test Method	ASTM Reference
Moisture Content	D2216
Density (Unit Weight)	D7263
Unconsolidated-Undrained Compression Test (UU)	D2580
Atterberg Limit Determination	D4318
Grain Size (Sieve, Hydrometer, and/or #200 Wash)	D6913/D422/D1140
Organic Content	D2974
Consolidation	D2435

4.1 Classification and Index Testing

Subsurface conditions, in terms of soil classification, geotechnical index properties, effective stress history, and undrained shear strength profiles encountered at the various boring locations within the Northern Impoundment are somewhat variable. For a detailed description, refer to the individual boring logs provided in Attachment A. However, a general description of the subsurface conditions for the Northern Impoundment is provided below.

Down to an elevation of approximately -30 feet NAVD88, the Northern Impoundment is fairly heterogeneous consisting of highly interbedded alluvial deposits consisting of silty sands, sands, silts, lean clays, fat clays, and sandy clays. Below this reference elevation, the western and eastern side of the Northern Impoundment become more distinguishable. On the western side, sandy lean clays extend to an elevation of approximately -45 feet NAVD88 and are underlain by medium stiff to very stiff fat clay to an elevation of approximately -80 feet NAVD88. More granular medium dense to very dense clayey sands, silty sands and sandy lean clays extend to an elevation of approximately -108 feet NAVD88 and are underlain by stiff gray lean clay to at least an elevation of approximately -117 feet NAVD88, the maximum explored depth of boring

SJSB057. On the eastern side alternating layers of silts and clays extend below an elevation of approximately -30 feet NAVD88. These appear to be coarser towards the north and finer towards the south, with soil boring SJSGB053 (north) indicating more granular medium dense to very dense clayey sands at an elevation of approximately -68 feet NAVD88, and soil boring SJSB047 (south) indicating silty sands at an elevation of approximately -84 feet NAVD88. These more granular soils extend to an elevation of approximately -98 feet NAVD88 where stiff to very stiff fat clays and silts were encountered to at least an elevation of approximately -110 feet NAVD88, the maximum explored depth of the borings.

4.1.1 Visual Classification

Visual classifications include a description of soil color, consistency and type, and identification of structural conditions (layering, seams, etc.) and variations (e.g., organics). Visual classifications are included on the soil boring logs attached in Attachment B and are based on the descriptions provided in the field logs and in the laboratory analytical reports.

4.1.2 Moisture Content and Density and Unit Weight Determinations

Numerous moisture content determinations (ASTM D2216) and total unit weight determinations (ASTM D2937) were performed in conjunction with the preparation of test specimens. Total unit weights were computed based on sample volume and weight measurements during the test preparation. Moisture content and total density values for each sample are included on the soil boring logs attached in Attachment B.

4.1.3 Atterberg Limits

Atterberg limit determinations (ASTM D4318) were performed on selected samples to assist in soil classification and to enable correlations to pertinent clay behavior properties. The Atterberg limit data consists of measured liquid limit (LL) and plastic limit (PL) values from which the plasticity index (PI = LL – PL) is derived. The individual test data are included on the boring logs attached in Attachment B.

4.1.4 Grain Size Determinations

Grain Size Distributions Curves (ASTM D422) were performed on select samples, and fines content determinations (ASTM D 1140) were performed on selected granular samples. The test results, in terms of percent fines (i.e., percent by dry weight finer than the U.S. No. 200 sieve size, 0.074 mm, or combined silt and clay fraction) are shown on the boring logs attached in Attachment B, as well as the individual grain size distribution curves.

4.1.5 Unconsolidated-Undrained Compression Tests

Unconsolidated-Undrained (UU) Triaxial Compression tests (ASTM D2850) were performed on select specimens. Results of these strength tests are included on the soil boring logs attached in Attachment B. Individual UU test stress-strain curves are also included in Attachment B.

4.1.6 Consolidation Tests

One-Dimensional Incremental consolidation tests (ASTM D 2435) were included in the laboratory testing program to assess the stress history, one-dimensional stress-deformation, and time-rate of consolidation characteristics of the clay deposits. The tests were conducted using a load increment ratio (LIR) of one (LIR = 1.0) and generally included one unload-reload cycle to enable evaluation of recompression behavior.

During each load increment, the vertical displacement with time is measured. In general, each load increment was sustained for a period of 24 hours. The vertical displacement versus time data were evaluated using conventional log-time and square-root time curve fitting techniques to estimate the end of primary consolidation (i.e., the point in time at which dissipation of load-induced excess pore water pressures in the sample had dissipated and drained creep ensued for each load increment). The individual test results, in terms of vertical strain and void ratio versus effective vertical stress, are presented in Attachment B.

Typical laboratory consolidation test results, considered in terms of vertical strain, ε_v (%; at the end of primary consolidation) or void ratio, e_o, versus vertical effective stress, σ'_{vc} (tons/ft^2; log scale), may be simply characterized as being composed of recompression and virgin compression. The flatter recompression portion of the ε_v versus log σ'_{vc} curve occurs at vertical effective stresses lower than the pre-consolidation pressure, σ'_p to which the specimen had historically been subjected. The steeper virgin compression portion of the ε_v versus log σ'_{vc} response occurs at vertical effective stresses greater than the maximum past pressure, σ'_p.

SECTION 5. EVALUATION OF CURRENT & HISTORIC SUBSURFACE CONDITIONS

During the previous subsurface investigations, the Northern Impoundment subsurface stratigraphy was idealized as being comprised of interbedded Recent Alluvial Sediments (silts, sands, and clays) to an elevation of approximately -30 feet NAVD88, which was confirmed during the PDI-2 subsurface investigation. The previous investigations indicated that the Beaumont Clay formation extended below this reference elevation to a minimum elevation of approximately -60 feet NAVD88 on the western side and an elevation of approximately -50 feet NAVD88 on the eastern side. The PDI-2 investigation, which included boring SJSB057 (on the northwest side) encountered clays to a much deeper elevation of approximately -80 feet NAVD88, and on the eastern side clays were encountered between elevations of approximately -50 to -65 feet NAVD88.

The previous investigations, based on limited data, identified that the top of a sand formation occurs across the Northern Impoundment at an elevation between -50 and -60 feet NAVD88 to

at least an elevation of approximately -80 feet NAVD88. After review of the PDI-2 boring logs, it was determined these sand elevations, as encountered in PDI-2, were not found to be as consistent throughout the Northern Impoundment.

SECTION 6. ANALYSES

The following engineering analyses are based on the data obtained during the subsurface investigations for the Northern Impoundment and our interpretation of the existing data. If additional data are collected during subsequent phases of the work, the following recommendations may be subject to change. The following sections will discuss the methods of analyses, interpretation of the data, and the results of these analyses.

6.1 Methods of Analyses

The following sections describe the methodology employed in the analyses performed.

6.1.1 Methods of Analyses – Slope Stability

Two-dimensional limit equilibrium stability analyses were performed using the method of slices and Spencer's method (i.e. assuming a common inclination of inter-slice forces). The SLOPE/W (GeoStudio 2019 R2 Version 10.1.1.18972) computer program was used for calculating slope stability factors of safety for trial failure surfaces. This program incorporates search routines that, when properly managed, can systematically converge on kinematically admissible critical circular arc and sliding wedge type failure surfaces.

6.1.2 Methods of Analyses – BMPs (Cofferdams & Retaining Walls)

As part of the removal efforts, areas of the Northern Impoundment (cells) will need to be excavated to remove the waste material. Engineered barriers such as sheet pile coffer dams are planned to block the introduction of water from the San Jacinto River into the removal areas. These engineered barriers are referred to herein as BMPs.

As the areas within the Northern Impoundment are excavated, any soils or water on the outside of the BMP will produce a lateral pressure that needs to be counteracted by the soils and water on the inside. Therefore, the depth of the BMP system will be highly dependent on the methods and sequence of construction.

The analyses for the BMPs considered the Q-Case, or short-term, loading condition, where the cohesive (clay) soils behave in an undrained manner. Additionally, consideration was given to the S-Case, or long-term, loading condition, where the cohesive (clay) soils behave in a drained manner. Given that these structures will be left in place for a minimum period of several months to a year during the RA, it is imperative to consider the soil behavior under both loading conditions in order to determine the loading condition that is most conservative with respect to the BMP embedment depth.

Analyses were performed using the U.S. Army Corps of Engineers' (USACE) X0031 "Computer Program for Design and Analysis of Sheet-Pile Walls by Classical Methods (CWLASHT)", and the Deep Excavation Software Program "DeepEx" 2019 Version. In general, the CWALSHT program was used as a design check.

CWALSHT:

This program can handle non-horizontal ground surface and soil layers, and will apply Coulomb's earth pressure coefficients on the wall. It can also apply additional surcharge loads both in front of and behind the retaining wall using Boussinesq's pressure distribution. For all cases involving a sloping of irregular soil surface and/or subsurface layer, the wedge method is used to determine the lateral pressures. It should be noted that this program was intended to analyze plane-strain conditions; therefore, it is most applicable to long sheet pile retaining walls.

DeepEx:

This program can perform the same calculations as CWALSHT. In addition, it can analyze braced excavations with conventional limit-equilibrium methods as well as non-linear beam on elastic foundations using the Winkler Method. It is also capable of analyzing non-plane strain conditions.

As mentioned above, these programs were used in order to verify and cross-check the results of the analyses. However, DeepEx was generally relied upon for the determination of the tip embedment, shear and bending stresses, and the deflections.

In accordance with EM 1110-2-2504, *Engineering and Design: Design of Sheet Pile Walls*, 5.2 d. factors of safety, it states: "a factor of safety may be applied for active pressures; however, it is considered sufficient to use a factor of safety on the active side equal to 1 in most cases unless deformations of the wall are restricted" (USACE 1994). The minimum recommended values of passive factors of safety used for this project are shown in Table 5.

TABLE 5 - FACTORS OF SAFETY FOR SHEET PILE WALLS

Load Combination	Factor of Safety for Sheet Pile Embedment
	Passive Pressure
Usual	1.50
Unusual	1.25
Extreme	1.10

Notes: Active and passive pressure safety factors shall be "1.00" for all load cases to be calculated for sheet pile bending moment, shear, and deflection. Passive pressure safety factors from above shall be used to determine sheet pile embedment only.

For the Northern Impoundment 30% RD, a water level elevation for outside of the Northern Impoundment (i.e. San Jacinto River) up to +5 feet NAVD88 is to be considered a usual occurrence. Additionally, water elevations greater than this and up to an elevation of +9 feet NAVD88 are to be considered unusual events. Consideration was not given to the "extreme" event case factor of safety, as per the EM 1110-2-2504 guidance, the extreme condition allows the design to accept possible major damage which could result in a failure of the BMP wall.

6.2 Results of Analyses

6.2.1 Design Assumptions

Ardaman performed a sensitivity analysis on the design water surface elevations on the inside and outside of the proposed BMP as shown in Table 6. The following design assumptions were made regarding the Northern Impoundment for this phase of work. The analyses were based on the following cases:

TABLE 6 - DESIGN CASES CONSIDERED

Case[1]	Water Surface Outside of the BMP (ft, NAVD88)	Water Surface Inside the BMP (ft., NAVD88)[2]	Factor of Safety on the Passive Resistance
1	9	-8	1.25
2	9	-4	1.25
3	5	-8	1.50
4	5	-4	1.50

[1]Ground surface on inside/outside based on furnished cross sections.
[2]For cells that are to be completely dewatered, the inside water surface was taken to the excavation depth.

For all cases, it is assumed that the Top of Wall (TOW) would be set at an elevation of +9 feet NAVD88.

It should be noted that the water surface elevations selected on the inside of the BMP represent the expected working range during excavation activities. The inside water levels were fixed within a working range using elevations of -4 to -8 feet NAVD88.

6.2.2 Cross Sections

GHD provided Ardaman with a preliminary BMP alignment and a series of cross sections depicting the ground surface conditions in order for the geotechnical evaluation to be completed as part of the 30% RD. As a result, the BMP alignment used as the basis for this report slightly differs from the current BMP alignment shown in the *Preliminary 30% Remedial Design Report – Northern Impoundment*. The prior alignment and current alignment are both shown on Figure 5 (for the west cell) and Figure 8 (for the east cell). Cross sections from the prior alignment that were used in the geotechnical evaluation are provided in Figure 6 and Figure 7 (for the west cell) and Figure 9 and Figure 10 (for the east cell). For the purposes of this geotechnical evaluation, the difference between the preliminary and current alignment is not a concern as the BMP changes were primarily with respect to the locations of the interior walls, whereas the outer alignment for the BMPs remained relatively unchanged. The adjustment of the alignment does not change the conclusions of the geotechnical evaluation of the BMP.

6.2.3 Design Strength Parameters

The analyses were based on the design soil strength parameters developed from the soil borings located in the vicinity of the proposed alignment for the individual cells. The soil properties used for preliminary RD are summarized on Table 7 through Table 11.

TABLE 7 - DESIGN STRENGTH PARAMETERS (CELL 1)

Elev. (ft., NAVD88)	Soil Type	Density (pcf)	Q-Case		S-Case	
			Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
G.S[1]. to -10	Cohesive	112	800	--	--	23
-10 to -17	Granular	112	--	30	--	30
-17 to -27	Granular	115	--	30	--	33
-27 to -30	Granular	115	--	30	--	33
-30 to -34	Cohesive	126	2,290	--	--	26
-34 to -44	Cohesive	134	2,290	--	--	26
-44 to -57	Cohesive	126	2,290	--	--	26
-57 to -80	Cohesive	127	1,650	--	--	26
-80 to -89	Granular	122	--	30	--	33
-89 to -94	Cohesive	115	1,200	--	--	26
-94 to -103	Cohesive	120	4,000	--	--	26
-103 to -109	Granular	120	--	30	--	33
-109 to EOP[2]	Cohesive	115	1,670	--	--	26

[1]G.S. = Ground Surface, [2]EOP = End of Profile

TABLE 8 - DESIGN STRENGTH PARAMETERS (CELL 2)

Elev. (ft., NAVD88)	Soil Type	Density (pcf)	Q-Case		S-Case	
			Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
G.S.[1] to +0	Granular	120	--	25	--	25
+0 to -11	Cohesive	112	500	--	--	23
-11 to -23	Cohesive	112	1,000	--	--	23
-23 to -27	Granular	120	--	25	--	25
-27 to -41	Cohesive	120	3,300	--	--	23
-41 to -50	Cohesive	116	1,400	--	--	23
-50 to -58	Cohesive	116	1,850	--	--	23
-58 to -67	Cohesive	116	1,900	--	--	26
-67 to -74	Granular	130	--	30	--	30
-74 to -80	Cohesive	116	2,000	--	--	26
-80 to EOP[2]	Granular	130	--	32	--	32

[1]G.S. = Ground Surface, [2]EOP = End of Profile

TABLE 9 - DESIGN STRENGTH PARAMETERS (CELL 3)

Elev. (ft., NAVD88)	Soil Type	Density (pcf)	Q-Case		S-Case	
			Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
G.S.[1] to -6	Cohesive	115	500	--	--	23
-6 to -15	Cohesive	110	250	--	--	23
-15 to -26	Cohesive	110	350	--	--	23
-26 to -32	Cohesive	124	1,250	--	--	26
-32 to -40	Cohesive	120	1,000	--	--	26
-40 to -45	Cohesive	125	1,730	--	--	26
-45 to -54	Cohesive	125	3,300	--	--	26
-54 to -58	Cohesive	117	200	15	--	28
-58 to -62	Granular	130	--	30	--	30
-62 to -68	Cohesive	117	200	15	--	28
-68 to -71	Granular	130	--	30	--	30
-71 to -83	Cohesive	117	200	15	--	28
-83 to -93	Granular	130	--	30	--	30
-93 to -102	Cohesive	125	3,500	--	--	26
-102 to EOP[2]	Cohesive	125	4,000	--	--	26

[1]G.S. = Ground Surface, [2]EOP = End of Profile

TABLE 10 - DESIGN STRENGTH PARAMETERS (CELL 4)

Elev. (ft., NAVD88)	Soil Type	Density (pcf)	Q-Case		S-Case	
			Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
G.S.[1] to -1	Cohesive	118	1,000	--	--	26
-1 to -7	Cohesive	116	350	--	--	23
-7 to -14	Cohesive	116	500	--	--	23
-14 to -20	Cohesive	123	940	--	--	23
-20 to -26	Cohesive	115	350	--	--	23
-26 to -38	Granular	125	--	30	--	30
-38 to -43	Cohesive	100	2,500	--	--	26
-43 to -49	Cohesive	100	3,000	--	--	26
-49 to -56	Cohesive	100	3,500	--	--	26
-56 to EOP[2]	Granular	128	--	32	--	32

TABLE 11 - DESIGN STRENGTH PARAMETERS (CELL 5)

Elev. (ft., NAVD88)	Soil Type	Density (pcf)	Q-Case		S-Case	
			Cohesion (psf)	Friction Angle (deg)	Cohesion (psf)	Friction Angle (deg)
G.S.[1] to +3	Cohesive	117	200	15	--	28
+3 to +2	Cohesive	128	1,000	--	--	23
+2 to +0	Cohesive	117	200	15	--	28
+0 to -5	Cohesive	127	750	--	--	23
-5 to -13	Cohesive	130	1,700	--	--	23
-13 to -22	Granular	130	--	31	--	31
-22 to -33	Granular	130	--	32	--	32
-33 to -41	Cohesive	128	1,800	--	--	23
-41 to -46	Cohesive	130	1,950	--	--	23
-46 to -56	Cohesive	130	2,200	--	--	23
-56 to EOP[2]	Cohesive	130	2,500	--	--	23

[1]G.S. = Ground Surface, [2]EOP = End of Profile

6.2.4 BMPs (Cofferdams & Retaining Walls)

A series of stability analyses were performed for the Northern Impoundment assuming various water loads, as detailed above. The analyses were performed to estimate the minimum required embedment of the BMPs. The BMP tip elevations were determined using the factors of safety listed in Table 6 on the passive resistance afforded by the soils; however, the reported shear forces, and bending moments are based on a factor of safety 1.0. For all cases considered in Table 6, the TOW elevation is assumed to be +9 feet NAVD88; the water inside and outside the BMPs were varied, and the ground surface was also varied across the design cases considered. No additional surcharge loading from pile driving equipment, wave loads, or impact loads were considered in the analyses. The results of the analyses are given in Attachment C of this report for the various design cases from Table 6 that are considered.

The tables presented in Attachment C indicate the minimum tip elevations and the recommended tip elevations to provide an appropriate factor of safety against a toe failure. As can be seen, the different water level conditions and the different factors of safety applied do not result in significantly different embedment depths. Rather, as the soil behavior changes from an undrained to the drained state, the drained state governs the embedment depth, which, on average, requires that the BMP be driven in excess of -80 feet NAVD88.

Also given are the maximum bending moments and shear forces for the cases analyzed. These are ultimate values, and a structural factor of safety should be incorporated into the design for any BMP. The computed deflections are based on utilizing a PAZ66/AZ38-700N combi-wall section. However, at this time, the design section(s) has not been finalized, and therefore the results of the deflection calculations may not be representative for all the individual cases analyzed.

6.2.5 Pile Drivability Analysis

Analyses were performed based on the two (2) deeper soil borings (SJGB053 and SJGB057) to evaluate the drivability of a 66-inch pipe pile with a wall thickness of 1-inch to depth. The analyses assumed a conventional diesel hammer Delmag D100-42 and the D80-42. The results of the drivability analyses for both hammers are attached in Attachment C. It should be noted that a gain/loss factor of 1.0 was used in order to model the driving condition of no soil strength loss during driving. The drivability analysis indicates both hammers are capable driving the piles to depth. However, these analyses should be updated during the subsequent phases of the design and especially once information regarding the specific equipment to be used for the pile driving becomes available. Results of the analysis indicate that blow counts on the order of 80 to 120 blows per foot would be required past the 80-foot depth for both soil borings. The energy required to be imparted on the piles in order to drive them was estimated to range between 75 and 130 kip-ft.

6.2.6 Slope Stability

Given the depth of embedment required for stability of the proposed BMPs, a deep-seated failure extending beneath the BMP is unlikely. Instead, there is a possibility that during the installation

of the BMP, the vibrations caused by pile driving could induce localized instability of the near surface soils on the Northern Impoundment slope causing soils containing waste material to slide down and release waste material to the San Jacinto River. Therefore, this is a critical case for consideration. A series of parametric studies were performed on a select number of cross sections having been identified by GHD as having the steepest existing slope, and therefore having the highest likelihood of instability. The analyses incorporated an incremental horizontal acceleration (g-force) of 0.0-g, 0.1-g, 0.2-g, and 0.3-g as a way to approximate the additional horizontal forces that could be generated as a result of pile driving activities.

It should be mentioned that vibrations induced by pile driving activities attenuate with distance away from the "epicenter", and therefore, so do the horizontal acceleration forces. Based on our experience with pile driving activities in stiff clays and dense sands, a g-force equal to about a 0.1-g could be assumed as a representative value; however, these measurements are typically obtained some distance away from the pile/pile-driving equipment. Therefore, the possibility of higher horizontal acceleration forces being generated at distances much closer to the pile/pile-driving equipment should be considered.

GHD provided Ardaman with a plan map indicating the stationing around the perimeter of the Northern Impoundment as well as cross sections located along the Northern Impoundment for use in these analyses. The analyses focused on Station 5+00 and Station 22+00. The locations of these stations are shown on Figure 11. Consideration was given to the field logs furnished from the previous subsurface investigations, which indicated that very soft sediment was encountered in the near surface at these locations. The results of the analyses are summarized in Table 12.

TABLE 12 - SUMMARY OF SLOPE STBAILITY ANALYSIS (HORIZONTAL ACCELERATION)

Station	Minimum Factor of Safety				Figure No
	0.0-g	0.1-g	0.2-g	0.3-g	
5+00	2.82	1.67	1.17	0.87	13 – 16
22+00	5.37	2.02	1.11	0.78	17 - 20

The foregoing table provides the minimum factors of safety against developing a slope stability failure given different horizontal acceleration forces. As can be seen, the existing slopes, if assumed to be stable, may become unstable as a result of additional horizontal forces that may be caused by pile driving activities. It is recommended that additional efforts be performed to evaluate the correlation between pile driving energy, peak particle velocity, and horizontal acceleration forces at this location.

These are preliminary analyses and therefore do not represent all the soil conditions that may be encountered across the alignment of the BMPs. Analyses were conducted on a very limited number of cross sections and soil types. For conditions where loose sand is encountered at the near surface rather than soft clays, these additional horizontal forces are more prone to result in

a shallow and localized instability. Furthermore, there is significant uncertainty associated with these analyses due to the heterogeneity in soil conditions across the Northern Impoundment and uncertainty in the magnitude of the vibrations. For the RD, pending further evaluation, it would be prudent to consider the likely possibility of a shallow instability occurring from vibrations due to driving the BMPs.

SECTION 7. ADDITIONAL CONSIDERATIONS

Additional consideration should be given to the following potentialities:

- **Soil Remolding:** As the BMPs get driven to depth, the piles are shearing the soils located at the soil-pile interface, and to a lesser extent, soils located at some distance away from the pile (typically assumed as 1 to 2 pile diameters). When clay soils are sheared, or remolded, they tend to exhibit a "peak strength" lower than that of an undisturbed clay, or un-sheared clay. A lower peak strength therefore means that once the BMP is installed, the soils in and around the soil-pile interface is now weaker, and more likely to undergo significant deformation.

- **Static Liquefaction / Cyclic Mobility:** As the BMPs are driven to depth, the vibrations induced by pile driving are capable of generating excess pore pressures (an increase in the pore pressure from the normal in-situ condition). Static liquefaction is the sudden loss of strength when loose granular soils (sands, silty sands, etc.) experience a rapid increase in pore pressures. Given that the strength of granular soils is dependent on the effective stress of the soil, as the pore pressure increases, the effective stress decreases. As the pore pressure approximates the in-situ effective stress, there is a possibility for the soils to lose all strength, and "liquefy", or flow, resulting in a failure. This typically occurs if the pore pressures are not able to dissipate quickly, either because of the amount of clay within the soil matrix, or because of the boundary conditions around the granular soil.

- **Densification:** As the BMPs are driven to depth, the vibrations induced by pile driving activities are capable of causing loosely packed granular material to rearrange itself into a dense packing order. Should these loose granular (sands) soils densify, the volume of voids would decrease, meaning that the water/air within the void space would be displaced. The movement of this "pore-water" could occur vertically into the water column or laterally into the San Jacinto River depending on the local boundary conditions and impedance afforded by adjacent soils. Should any waste material be located within this "pore-water", then the potential of a release should be considered.

In addition to the potentialities listed above, there are adjacent structures in the vicinity of the project site that also should be considered.

- **I-10 Bridge Structure:** The southern boundary of the Northern Impoundment is located within 100 feet of the existing Interstate 10 (I-10) bridge, which appears to be pile-founded. Should the pile supporting this bridge include batter piles, consideration would need to be given to the BMP's alignment for the Northern Impoundment to ensure that the footprint of the BMP, such as individual sheet piles and/or king piles, are not laid over any existing piles. Should the sheet piles or king piles be driven into an existing bridge pile, they could damage the bridge's pile foundations.

- **Underground Utilities:** It is understood that there are a series of underground utilities located at depth which run parallel to the I-10 bridge. Consideration would need to be given to the BMP's alignment for the Northern Impoundment relative to the underground utilities to ensure that the BMPs do not impact the underground utilities. Similarly, consideration should be given to the effects of pile driving (vibrations) on the existing utilities.

As the design progresses from Preliminary (30%) to Pre-Final (90%), these additional considerations will need to be further developed and incorporated into the RD.

SECTION 8. REFERENCES:

Bowles, J. E. (1977). Foundation analysis and design 5th Edition. New York: McGraw-Hill.

Naval Facilities Engineering Command. Design Manual 7.02. (1986) "Foundations & Earth Structures"

U.S. Army Corps of Engineers. EM 1110-2-1902. (2003) "Engineering Design: Slope Stability".

U.S. Army Corps of Engineers. EM 1110-2-2504. (1994) "Engineering and Design: Design of Sheet Pile Walls".

SECTION 9. FIGURES

FIGURE 1 – SITE PLAN

FIGURE 2 – REGIONAL GEOLOGY

FIGURE 3 – HISTORICAL TOPOGRAPHIC SURVEYS

FIGURE 4 – SOIL BORING LOCATION PLAN (NORTHERN IMPOUNDMENT)

FIGURE 5 – NORTHERN IMPOUNDMENT WEST CELLS PLAN MAP

FIGURE 6 – WEST CELLS PROFILES (INDEX 1 / 2)

FIGURE 7 – WEST CELLS PROFILES (INDEX 2 / 2)

FIGURE 8 – NORTHERN IMPOUNDMENT EAST CELLS PLAN MAP

FIGURE 9 – EAST CELLS PROFILES (INDEX 1 / 2)

FIGURE 10 – EAST CELLS PROFILES (INDEX 2 / 2)

FIGURE 11 – NORTHERN IMPOUNDMENT VIBRATION ANALYSIS STATIONING

FIGURE 12 – NORTHERN IMPOUNDMENT VIBRATION ANALYSIS CROSS SECTIONS

FIGURE 13 – STATION 5+00 SLOPE STABILITY – STATIC CONDITION

FIGURE 14 – STATION 5+00 SLOPE STABILITY – 0.1-G HORIZONTAL ACCELERATION

FIGURE 15 – STATION 5+00 SLOPE STABILITY – 0.2-G HORIZONTAL ACCELERATION

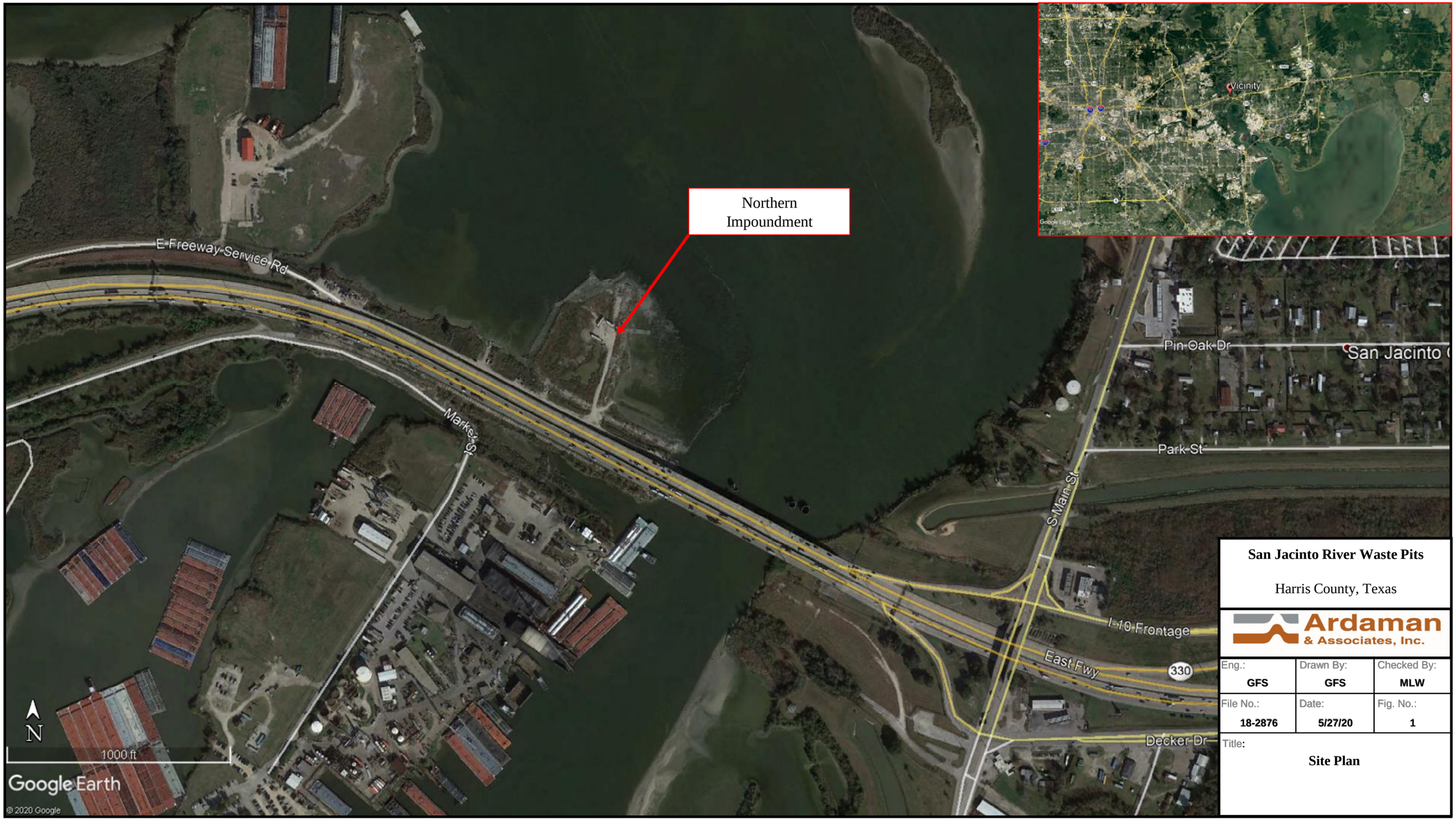
FIGURE 16 – STATION 5+00 SLOPE STABILITY – 0.3-G HORIZONTAL ACCELERATION

FIGURE 17 – STATION 22+00 SLOPE STABILITY – STATIC CONDITION

FIGURE 18 – STATION 22+00 SLOPE STABILITY – 0.1-G HORIZONTAL ACCELERATION

FIGURE 19 – STATION 22+00 SLOPE STABILITY – 0.2-G HORIZONTAL ACCELERATION

FIGURE 20 – STATION 22+00 SLOPE STABILITY – 0.3-G HORIZONTAL ACCELERATION



San Jacinto River Waste Pits

Harris County, Texas

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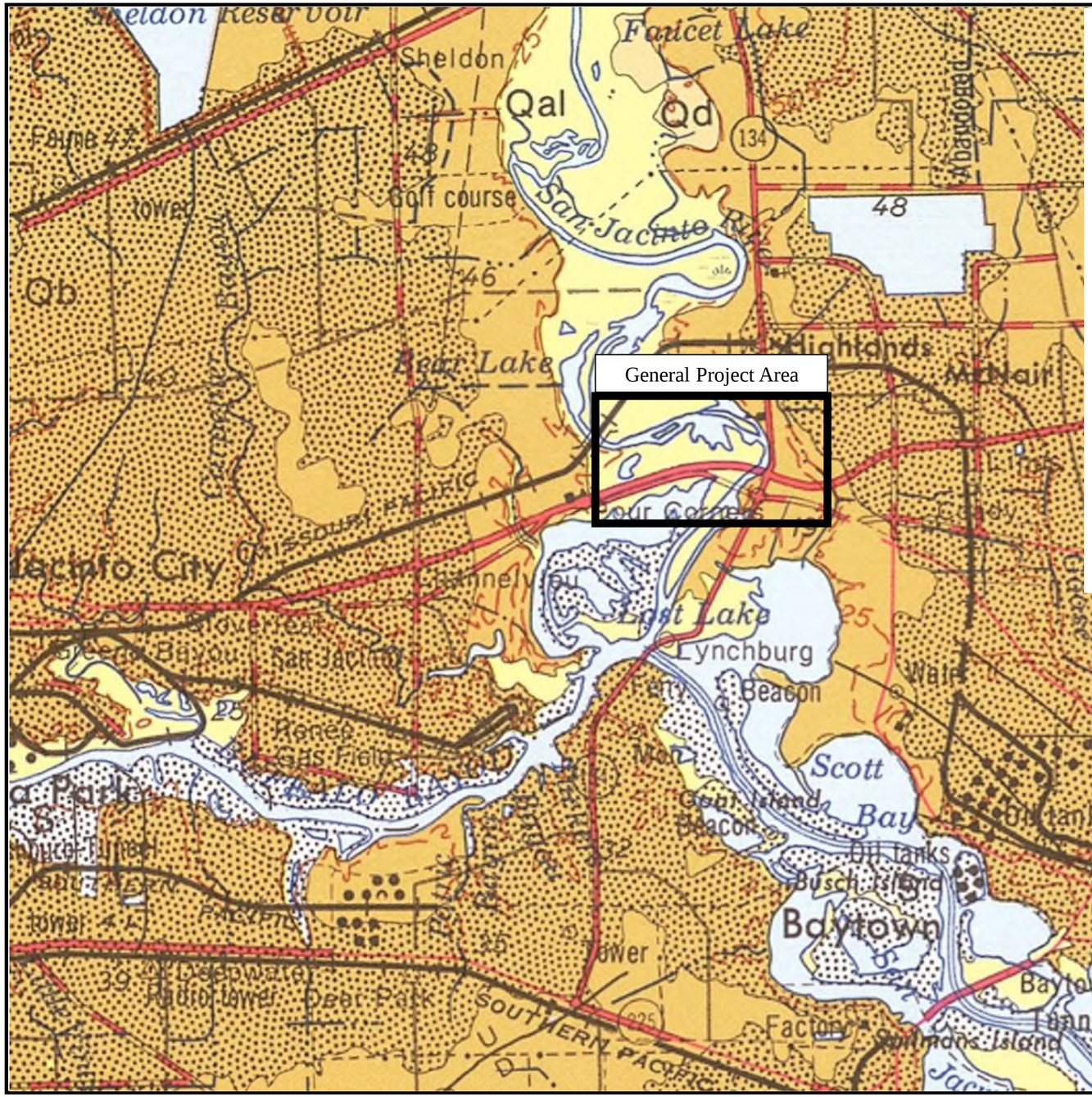
Site Plan



EXPLANATION

Fill and spoil (FS)

Fill, F, material dredged for raising land surface above alluvium and barrier-island deposits and for creating land. Spoil, S, dredged material along waterways

Alluvium (Qal)

Clay, silt, and sand, organic matter abundant locally; includes point-bar, natural levee, stream channel, backswamp, coastal marsh, mud-flat, and narrow beach deposits that are shown by line symbol

Barrier-island deposits (Qb)

Sand, silt, and clay; mostly sand, well-sorted, fine-grained, abundant shells and shell fragments; interfingers with clay and silt in landward direction; includes beach ridge, spit, tidal channel, tidal-delta, and sand dune deposits

Deweyville Formation (Qd, Qd')

Sand, silt, and clay, some gravel; includes point-bar, natural levee, stream channel, and backswamp deposits at a level only slightly above that of the present floodplain; sand coarser than that in alluvium; surface characterized by relict meanders of much larger radius of curvature than those of present streams, some scattered pimple mounds; thickness locally more than 50 feet. High-level Deweyville, Qd', surfaces cut into the Beaumont Formation, and high-level Deweyville deposits along Trinity River are intermediate in position between the surface of the Beaumont and the level of most Deweyville deposits

Beaumont Formation (Qbb, Qb, Qb)

Beaumont Formation, Qb, with barrier-island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, and sand; includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits, concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; thickness ± 100 feet. The stippled overprint (source shown in Index to Geologic Mapping) shows areas that are "Dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity; geologic units include interdistributary muds, abandoned channel-fill muds, and overbank fluvial muds." The nonstippled areas are "Dominantly clayey sand and silt of moderate permeability and drainage, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands"

Lissie Formation (Ql)

Upper part, clay, silt, sand, and very minor siliceous gravel of granule and small pebble size, gravel more abundant northwestward, locally calcareous, concretions of calcium carbonate, iron oxide, and iron-manganese oxides common in zone of weathering; fluviatile; surface fairly flat and featureless except for numerous rounded shallow depressions and pimple mounds. Lower part, clay, silt, sand, and minor amount of gravel; gravel slightly coarser than in upper part, noncalcareous, iron oxide concretions more abundant than in upper part; fluviatile; very gently rolling; thickness ± 200 feet

Willis Formation (Qw)

Clay, silt, sand, and minor siliceous gravel of granule to pebble size including some petrified wood; sand coarser than in younger units. Deeply weathered and lateritic, indurated by clay and cemented by iron oxide locally, concretions of iron oxide numerous, noncalcareous; fluviatile; maximum thickness 75 feet

Tertiary rocks on Hockley salt dome (T)

Sandstone, very fine grained, hard, abundant porcelaneous to opaline cement, poorly bedded, jointed, grayish white; possibly Catahoula Formation (Stenzel, 1946) (See Index of Geologic Mapping for reference.)

Holocene; Holocene or late (?) Pleistocene; Pleistocene; QUATERNARY

Pleistocene; Miocene; QUATERNARY; TERTIARY

CR

Outcrop of caprock reported on Damon Mound

Not found. Reportedly used for building stone (Bevier, 1925)

U / D

Fault

U, upthrown; D, downthrown side

10,000-meter Universal Transverse Mercator grid ticks, shown in blue

Partially funded by Texas Department of Water Resources

San Jacinto River Waste Pits

Harris County, Texas

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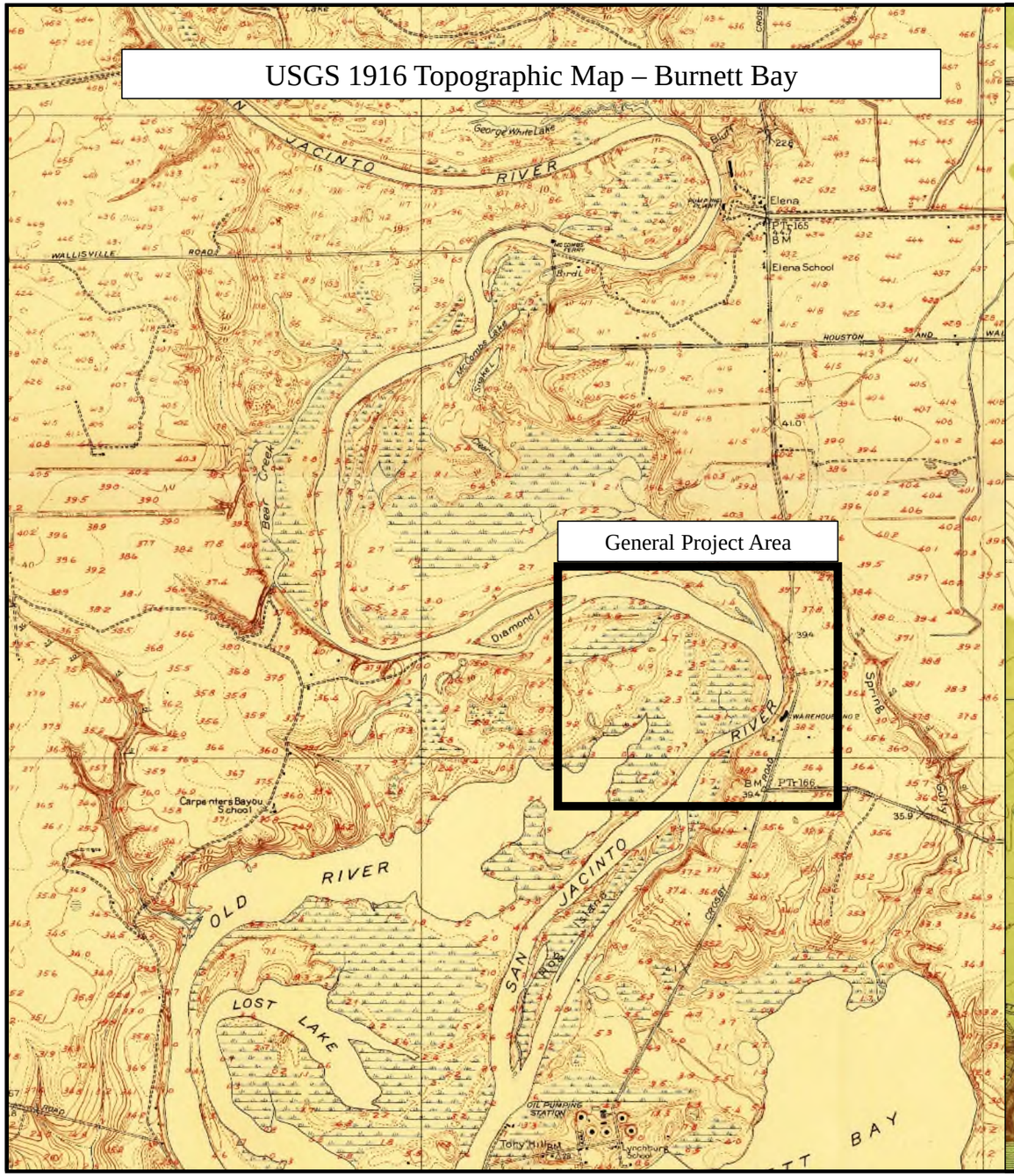
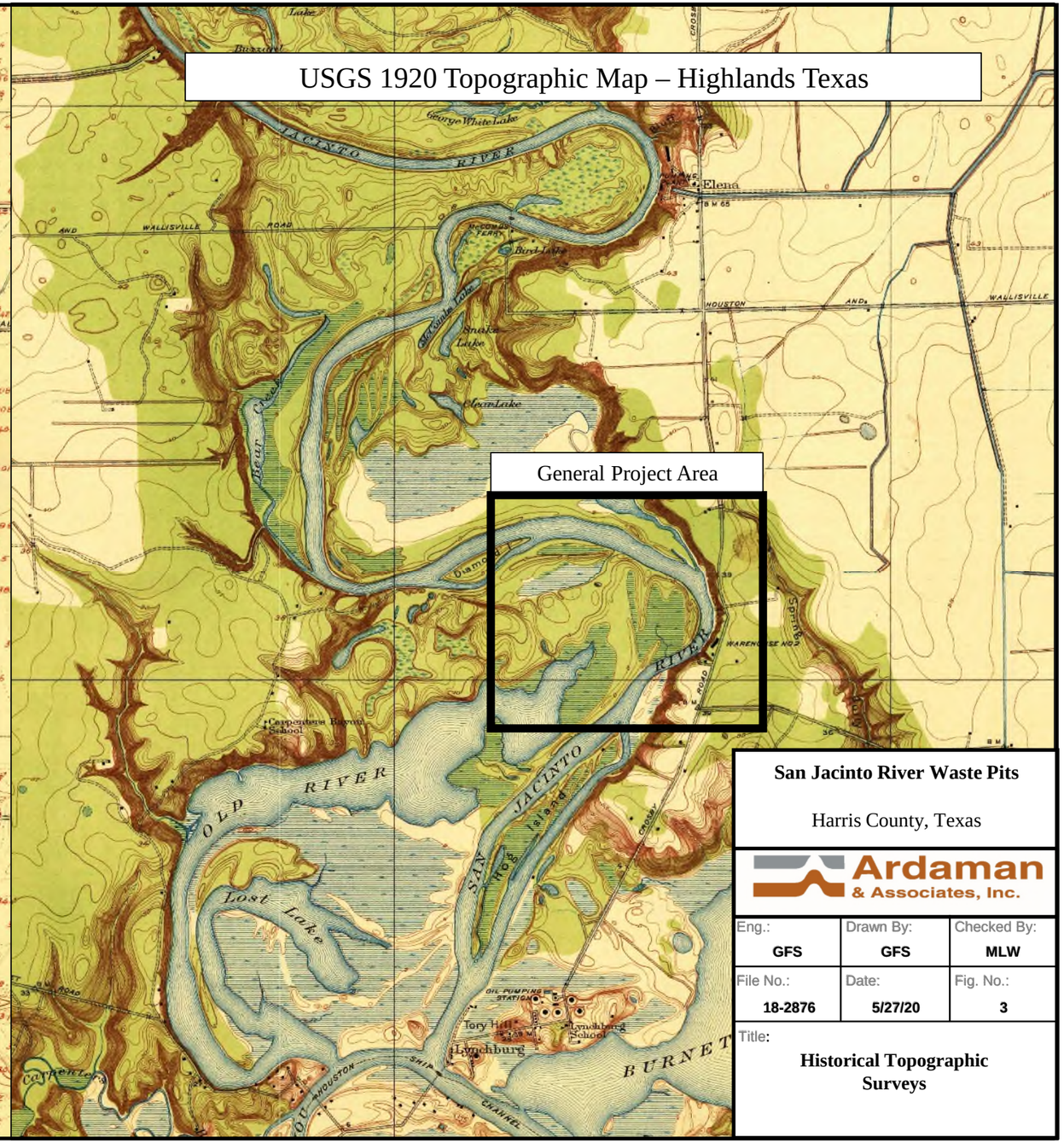
Regional Geology

USGS 1916 Topographic Map – Burnett Bay



General Project Area

USGS 1920 Topographic Map – Highlands Texas



General Project Area

San Jacinto River Waste Pits

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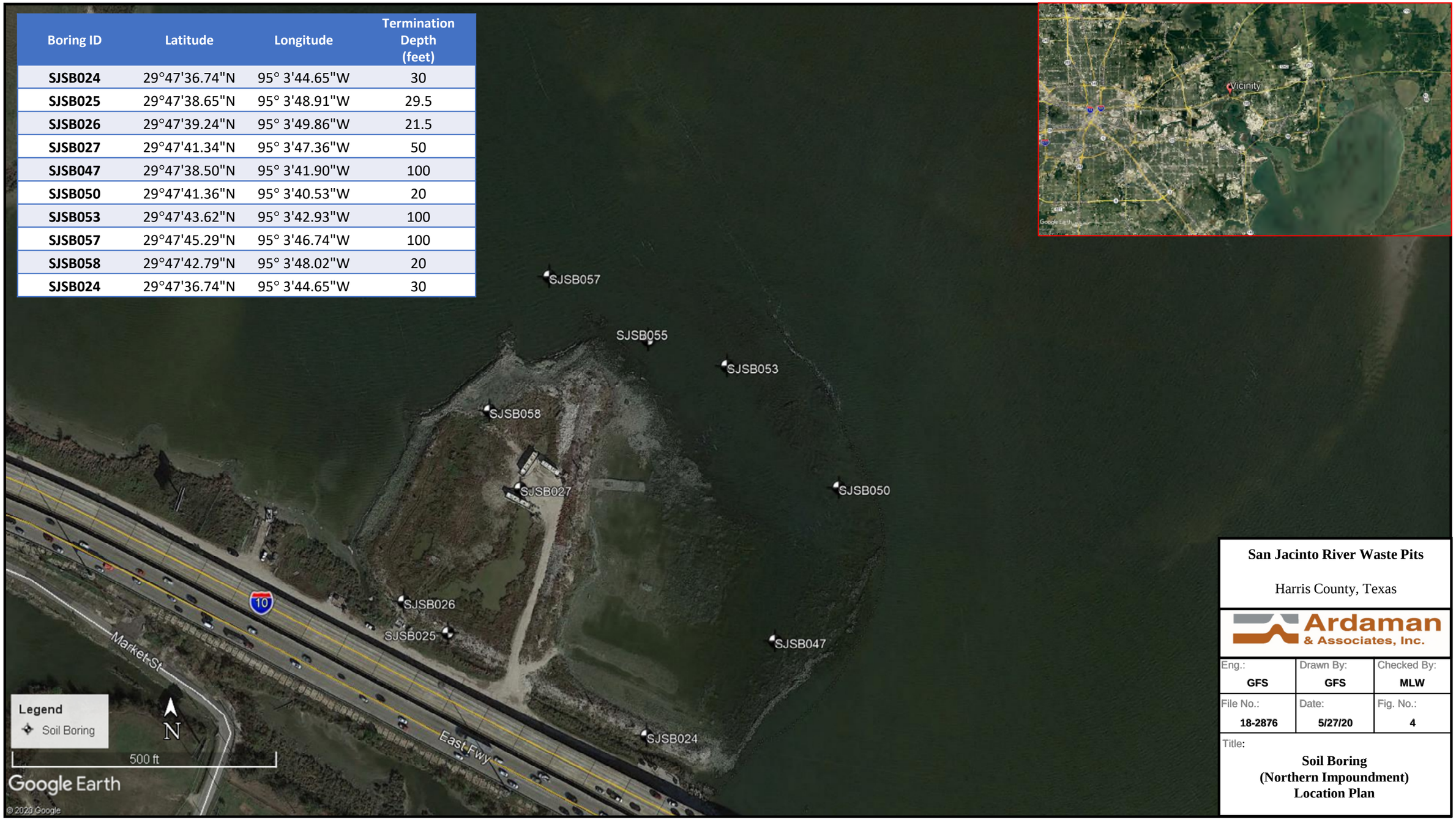
Title:

Historical Topographic Surveys

Boring ID	Latitude	Longitude	Termination Depth (feet)
SJSB024	29°47'36.74"N	95° 3'44.65"W	30
SJSB025	29°47'38.65"N	95° 3'48.91"W	29.5
SJSB026	29°47'39.24"N	95° 3'49.86"W	21.5
SJSB027	29°47'41.34"N	95° 3'47.36"W	50
SJSB047	29°47'38.50"N	95° 3'41.90"W	100
SJSB050	29°47'41.36"N	95° 3'40.53"W	20
SJSB053	29°47'43.62"N	95° 3'42.93"W	100
SJSB057	29°47'45.29"N	95° 3'46.74"W	100
SJSB058	29°47'42.79"N	95° 3'48.02"W	20
SJSB024	29°47'36.74"N	95° 3'44.65"W	30



San Jacinto River Waste Pits

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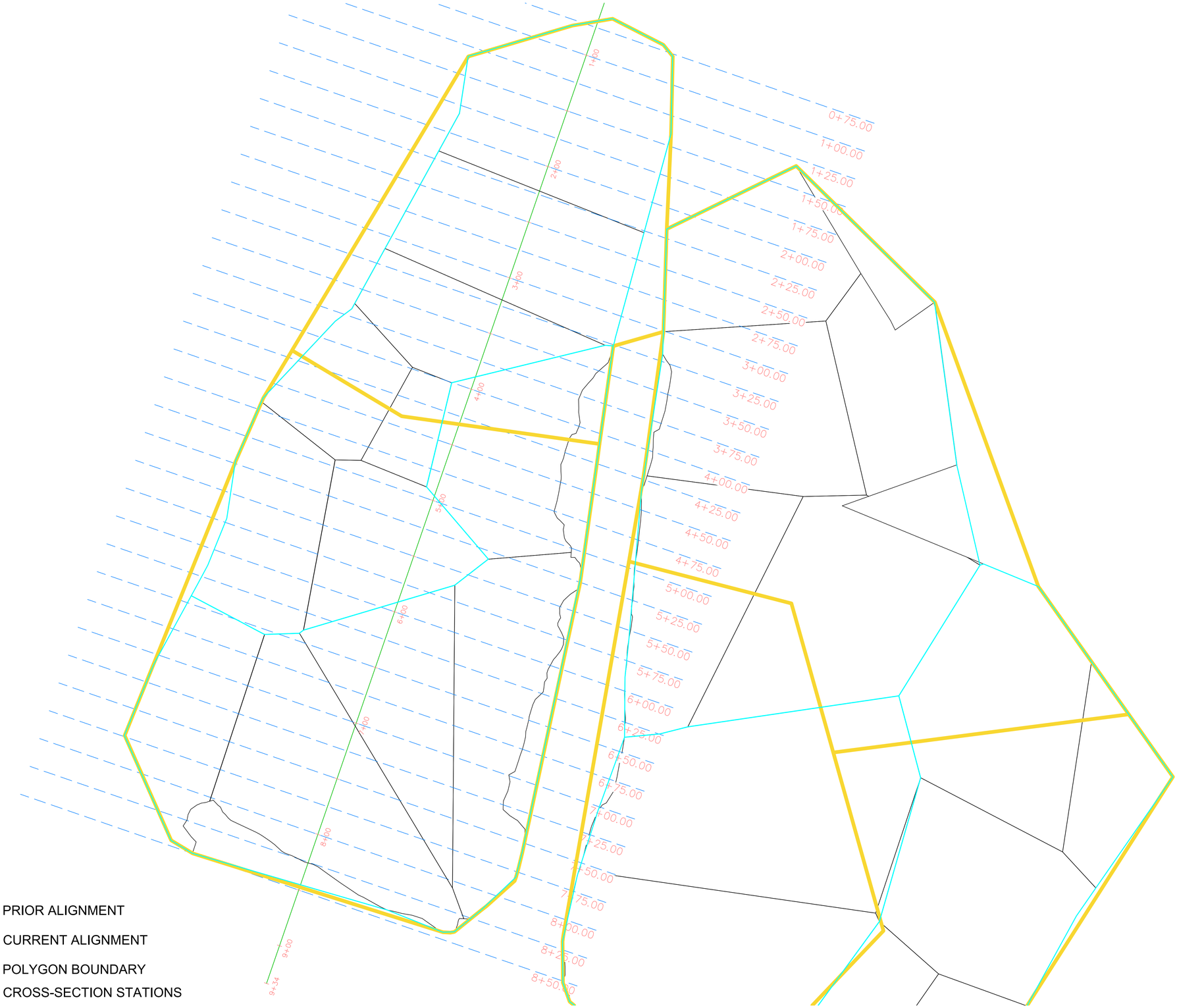
Soil Boring (Northern Impoundment) Location Plan



LEGEND:

- PRIOR ALIGNMENT
- CURRENT ALIGNMENT
- POLYGON BOUNDARY
- CROSS-SECTION STATIONS

San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

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File No.: 18-2876	Date: 05/27/20	FIG No. 5

Title: N.I. West Cells & Alignment

0 40'

N

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT

WEST CELLS CROSS-SECTION INDEX PLAN MAP

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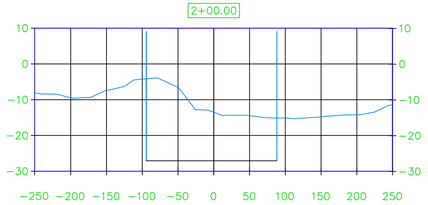

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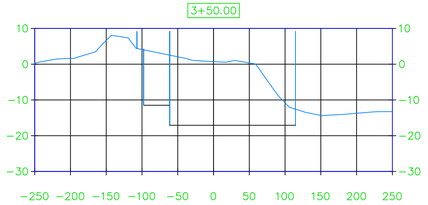

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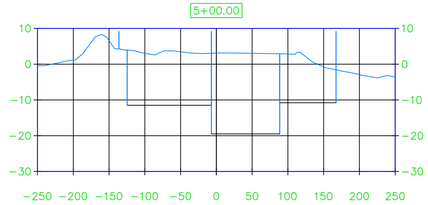

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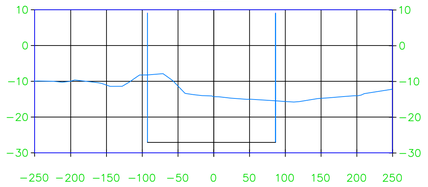

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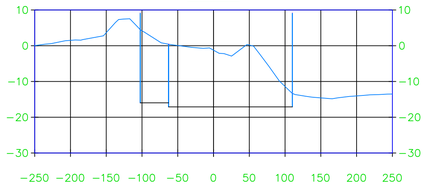

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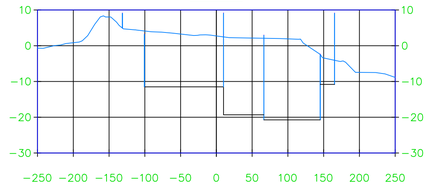

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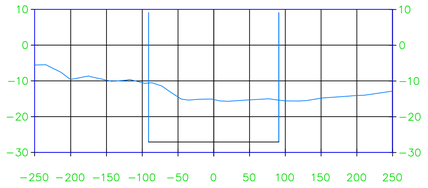

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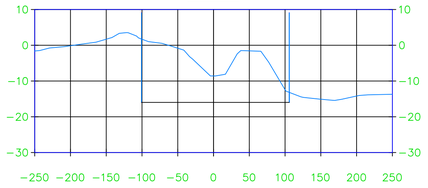

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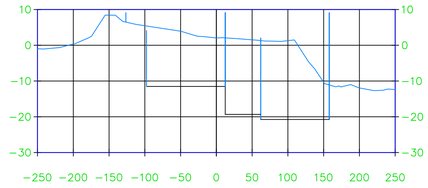

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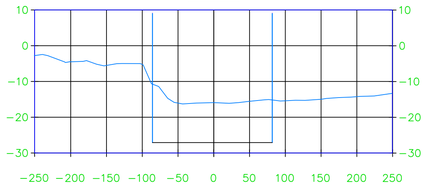

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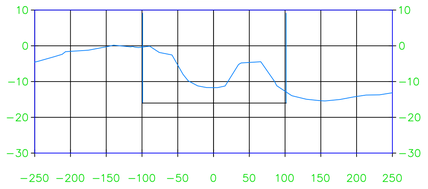

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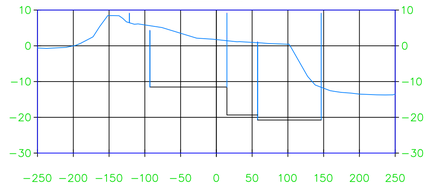

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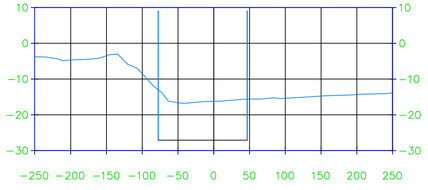

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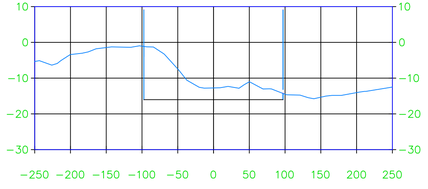

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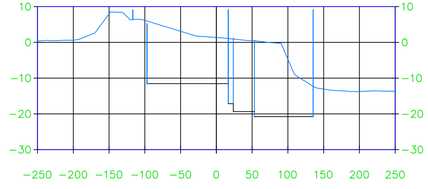

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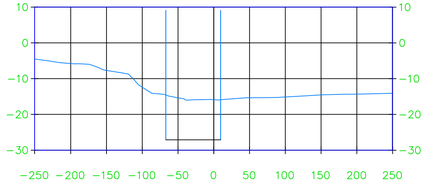

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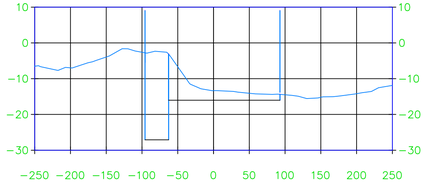

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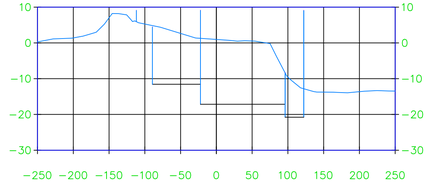


San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG: GFS	Drawn by: AC	Checked by: MLW
File No.: 18-2876	Date: 05/27/20	FIG No. 6

Title: N.I. West Cells & Alignment

HORIZONTAL
0 100'

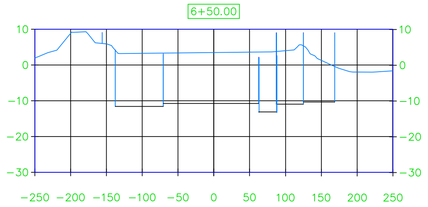
VERTICAL
0 20'

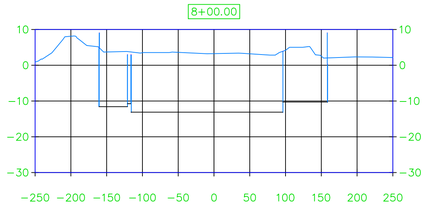
SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

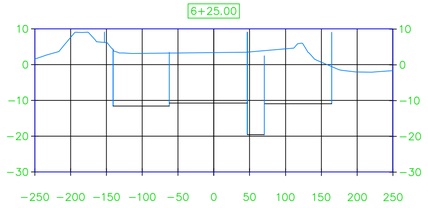
NORTHERN IMPOUNDMENT

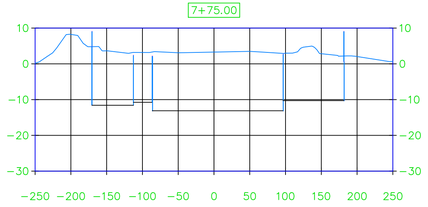
WEST CELLS CROSS-SECTIONS STA 0+75 TO 5+00 (SHEET 1 OF 2)

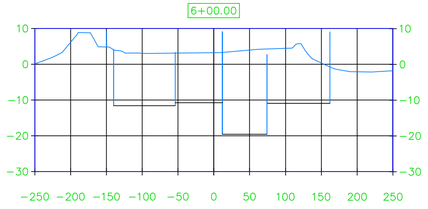
CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_eg_tif_new_poly_-_Standard1\North Impoundment eg tif new poly.dwg

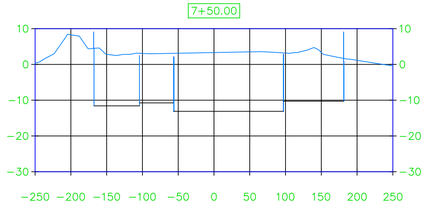


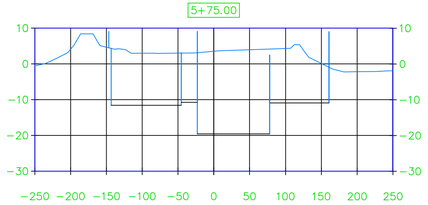


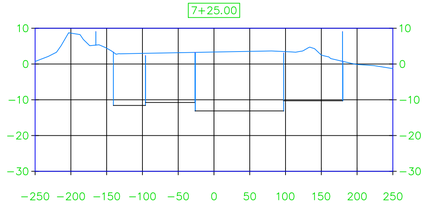


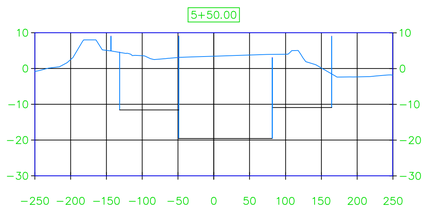


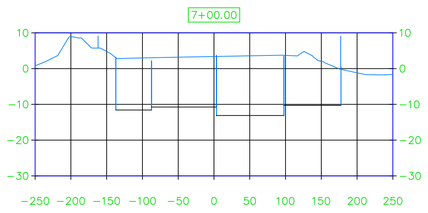


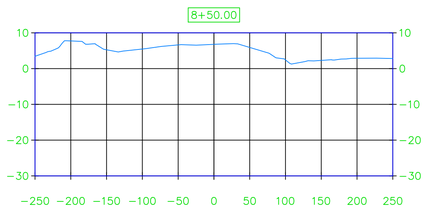


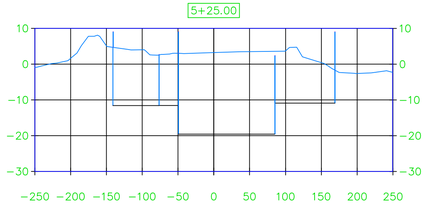


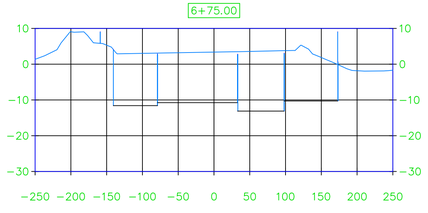


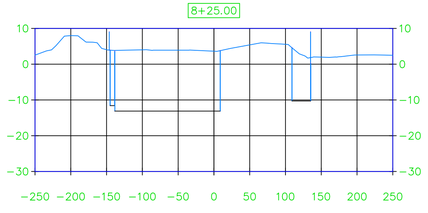












San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.: 18-2876	Date: 05/27/20	FIG No. 7

Title: N.I. West Cells & Alignment

HORIZONTAL
0 100'

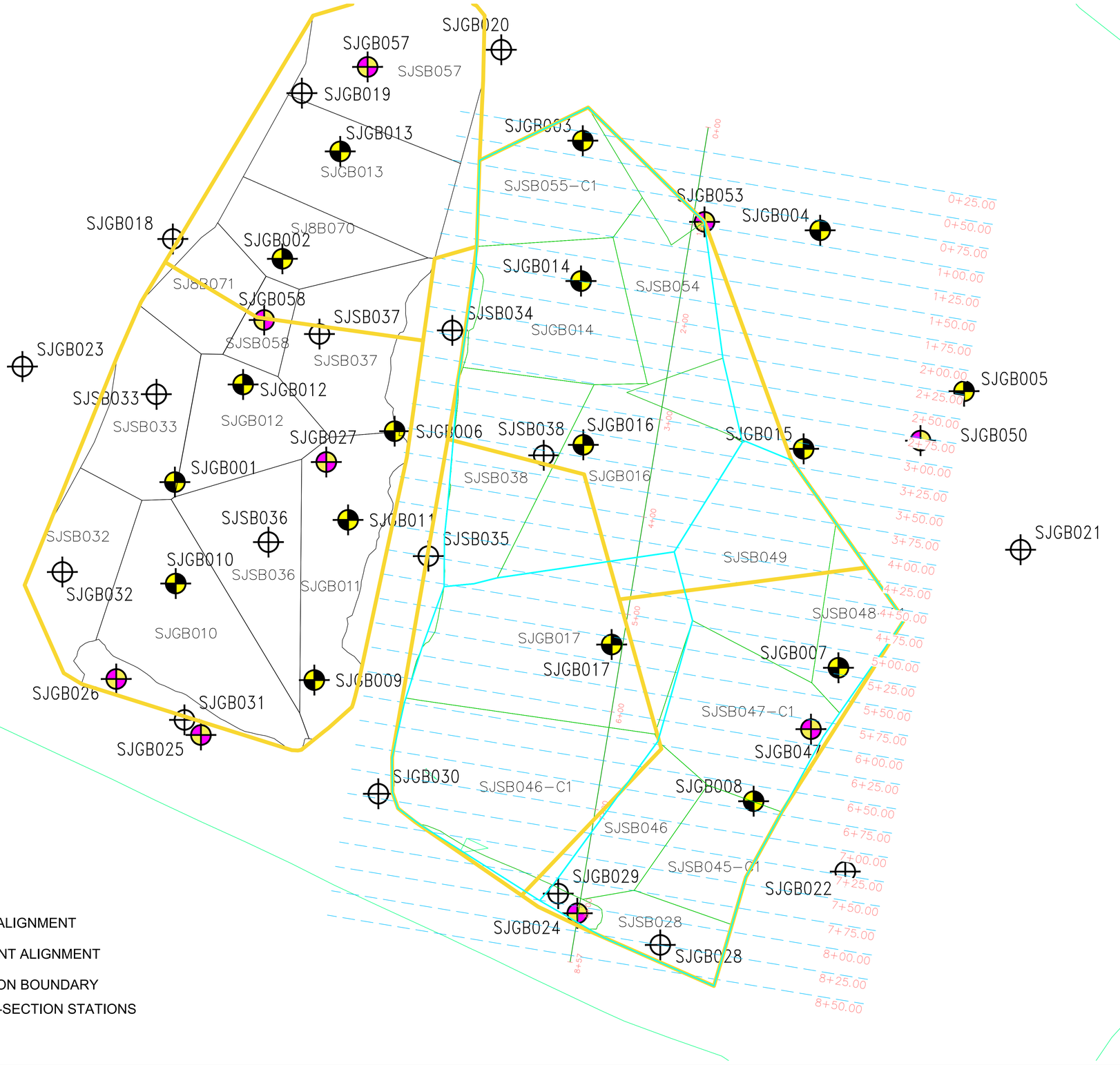
VERTICAL
0 20'

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_eg_tif_new_poly_-_Standard1\North Impoundment eg tif new poly.dwg

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT

WEST CELLS CROSS-SECTIONS STA 5+25 TO 8+50 (SHEET 2 OF 2)



LEGEND:

- PRIOR ALIGNMENT
- CURRENT ALIGNMENT
- POLYGON BOUNDARY
- CROSS-SECTION STATIONS

San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.:	Date:	FIG
18-2876	05/27/20	No. 8

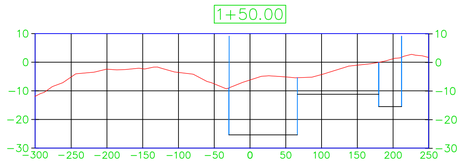
Title: N.I. East Cells & Alignment

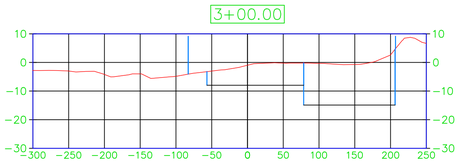
0 40'

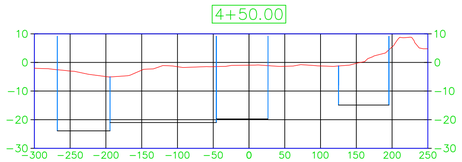
N

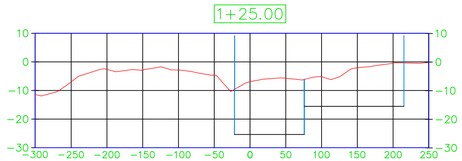
SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS
NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTION INDEX PLAN MAP

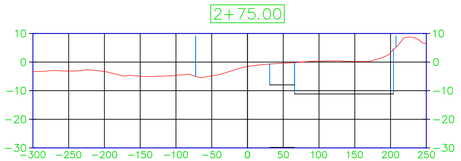
CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard1\North Impoundment East Cells Alignment and Sections-1.dwg

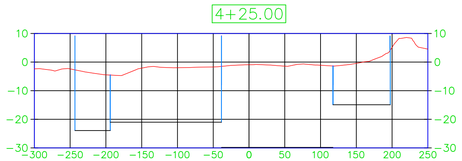


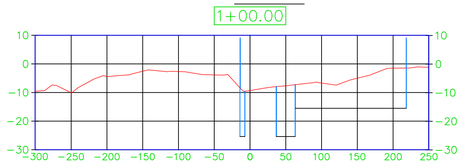


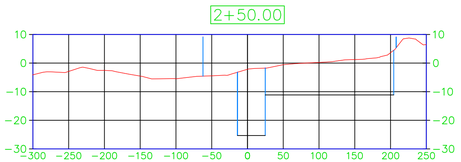


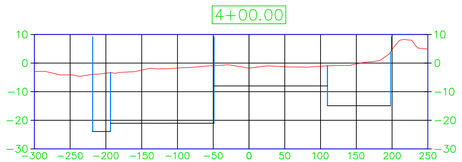


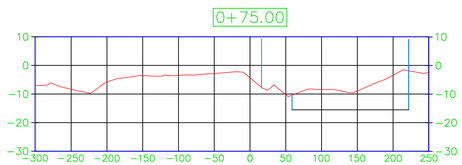


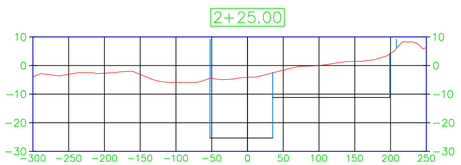


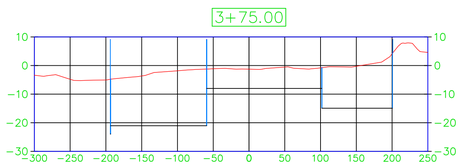


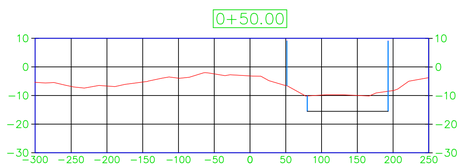


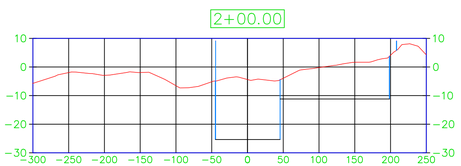


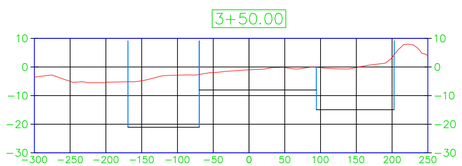


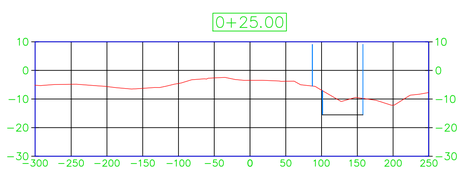


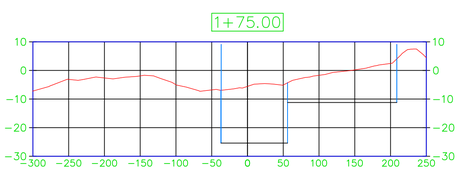


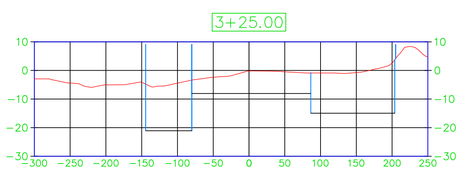












San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.: 18-2876	Date: 05/27/20	FIG No. 9

Title: N.I. East Cells & Alignment

HORIZONTAL
0 100'

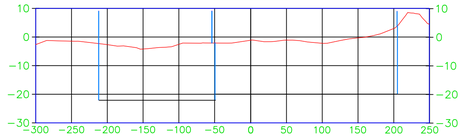
VERTICAL
0 20'

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTIONS STA 0+25 TO 4+50 (SHEET 1 OF 2)

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard1\North Impoundment East Cells Alignment and Sections-1.dwg

6+00.00



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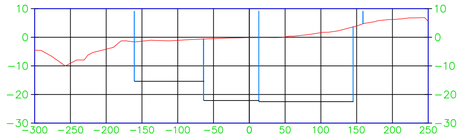

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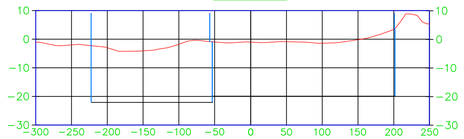

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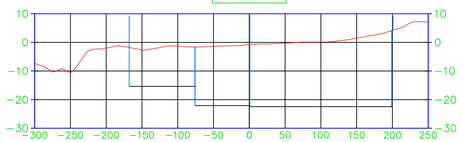

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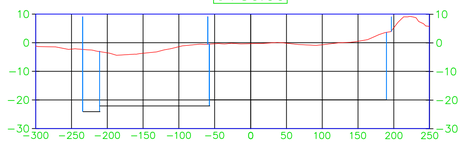

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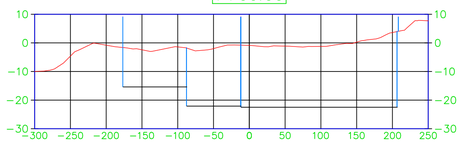

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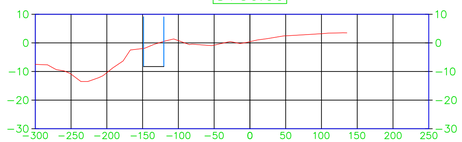

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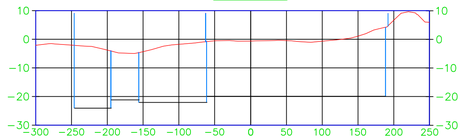

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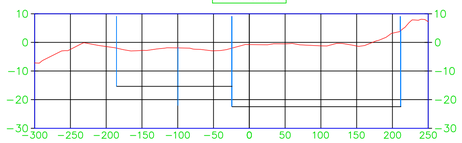

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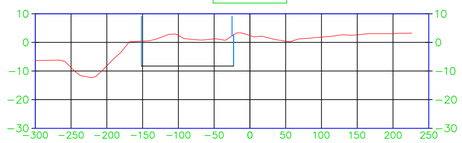

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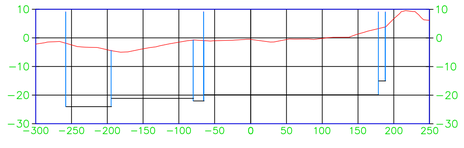

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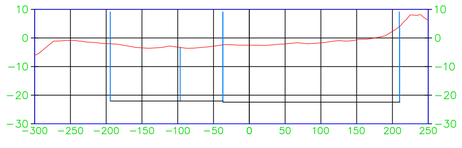

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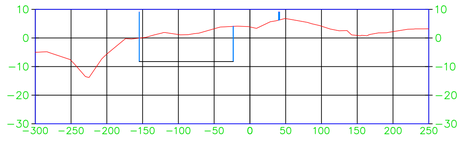

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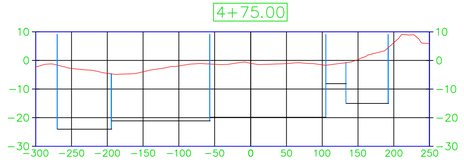

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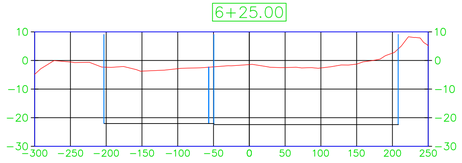

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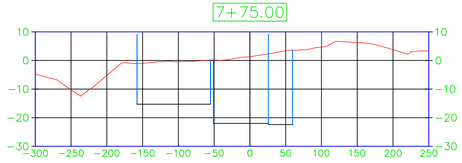


San Jacinto River Waste Pits

Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.: 18-2876	Date: 05/27/20	FIG No. 10

Title: N.I. East Cells & Alignment

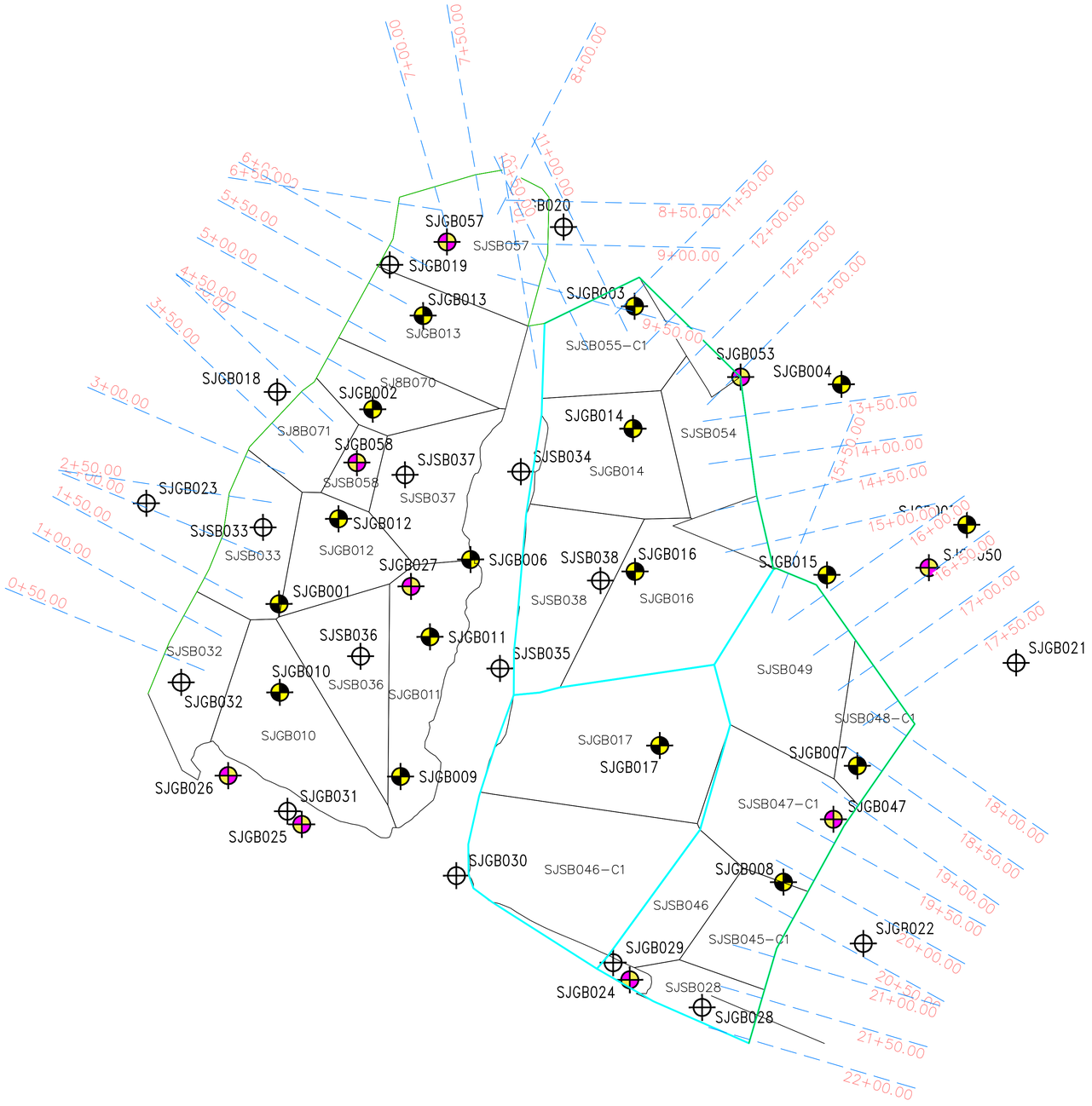
HORIZONTAL
0 100'

VERTICAL
0 20'

SAN JACINTO RIVER WASTE PITS
HARRIS COUNTY, TEXAS

NORTHERN IMPOUNDMENT
EAST CELLS CROSS-SECTIONS STA 4+75 TO 8+50 (SHEET 2 OF 2)

CAD File: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Furnished Information\Northern Impoundment\Report Figures from GHD\North_Impoundment_East_Cells_Standard Fl\North Impoundment East Cells Alignment and Sections-1.dwg



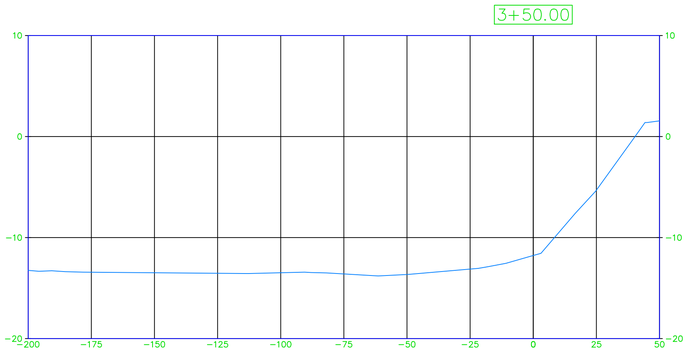
San Jacinto River Waste Pits

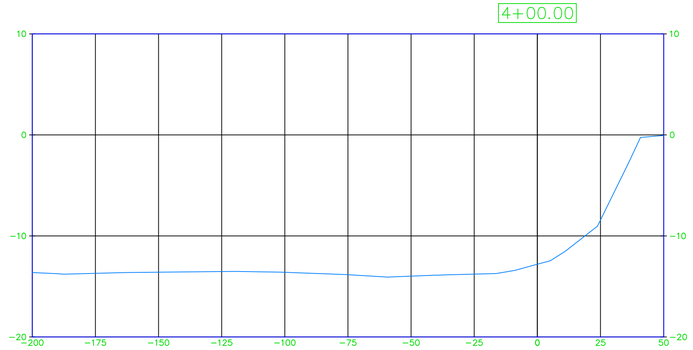
Harris County, Texas

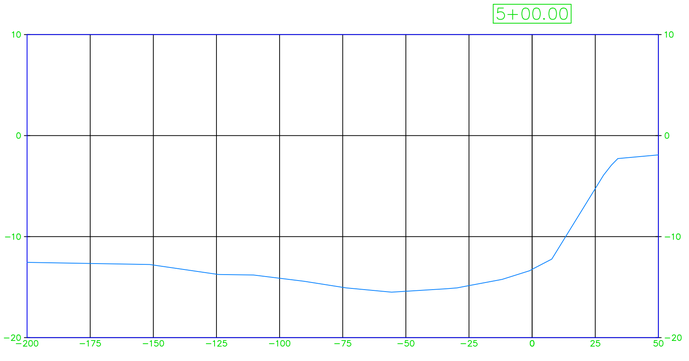
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

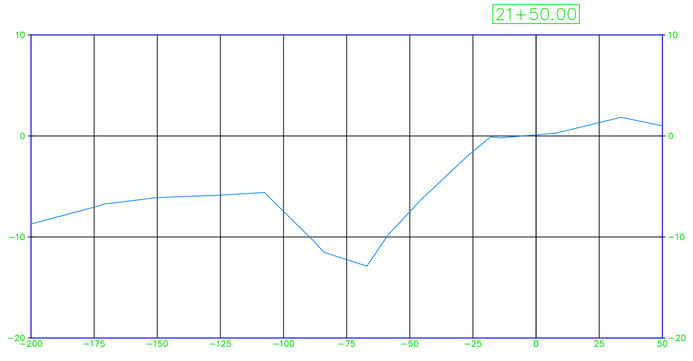
ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.:	Date:	FIG
18-2876	05/18/20	No. 11

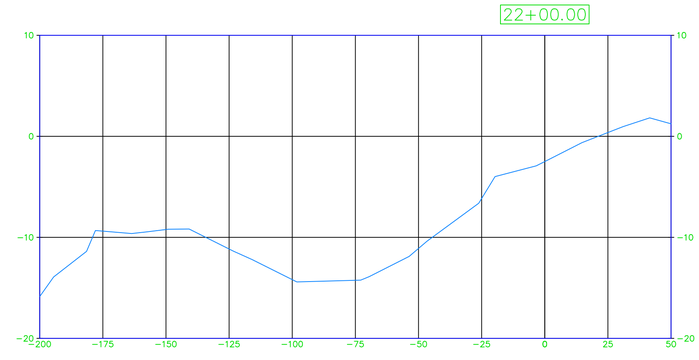
Title: N.I. Vibration Analysis Stationing











San Jacinto River Waste Pits

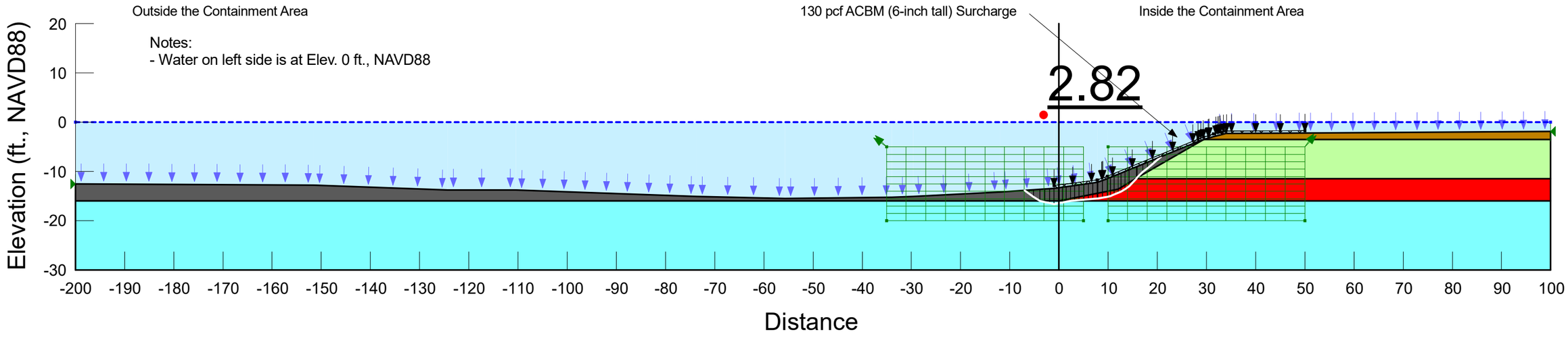
Harris County, Texas

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

ENG	Drawn by:	Checked by:
GFS	AC	MLW
File No.	Date:	FIG
18-2876	05/18/20	No. 12

Title: **N.I. Vibration Analysis X-Sections**

Method: Spencer
Slip Surface Option: Block
Factor of Safety: 2.82
Horz Seismic Coef.:



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	2- CLs (-1.6 to -3.4)	Mohr-Coulomb	117	200	0	0	1
	3- CL (-3.4 to -11.5)	Mohr-Coulomb	95	900	0	0	1
	4- SM (-11.5 to -16)	Mohr-Coulomb	120	0	25	0	1
	4- SM (-16 to -???)	Mohr-Coulomb	120	0	33	0	1
	Soft Soil	Mohr-Coulomb	90	100	0	0	1

Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 0g

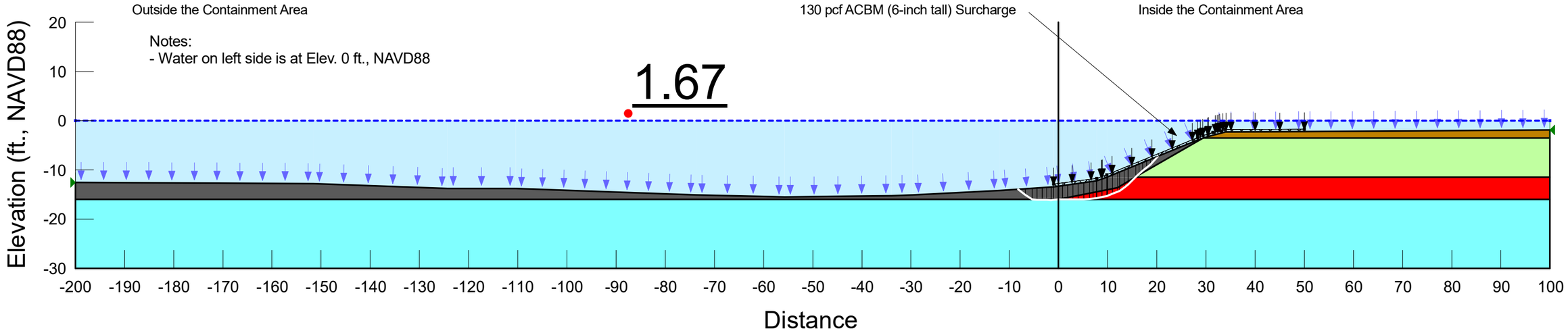
Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block	
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz	
Date: 04/21/2020	Scale: 1:250

Figure No. 13

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 1.67
Horz Seismic Coef.: 0.1



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	2- CLs (-1.6 to -3.4)	Mohr-Coulomb	117	200	0	0	1
	3- CL (-3.4 to -11.5)	Mohr-Coulomb	95	900	0	0	1
	4- SM (-11.5 to -16)	Mohr-Coulomb	120	0	25	0	1
	4- SM (-16 to -???)	Mohr-Coulomb	120	0	33	0	1
	Soft Soil	Mohr-Coulomb	90	100	0	0	1

Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.1g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.10)

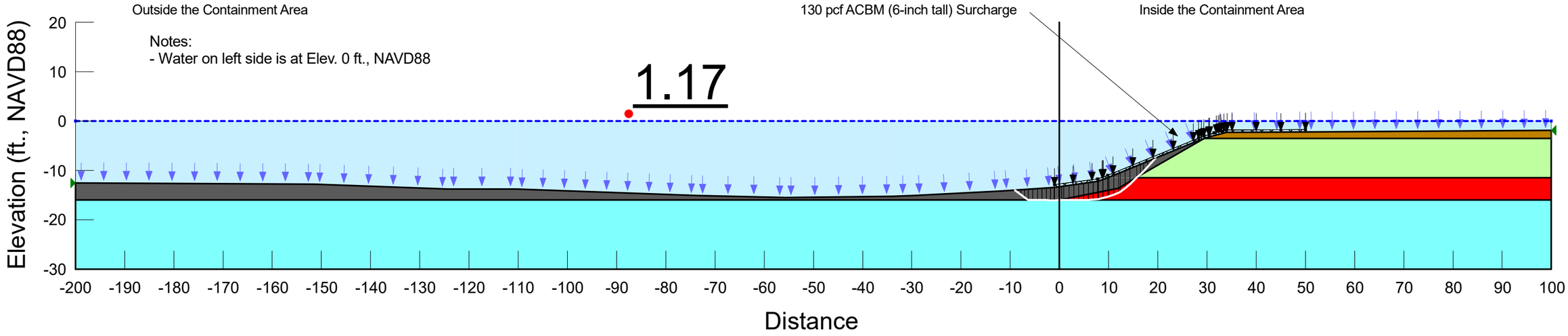
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 14

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 1.17
Horz Seismic Coef.: 0.2



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	2- CLs (-1.6 to -3.4)	Mohr-Coulomb	117	200	0	0	1
	3- CL (-3.4 to -11.5)	Mohr-Coulomb	95	900	0	0	1
	4- SM (-11.5 to -16)	Mohr-Coulomb	120	0	25	0	1
	4- SM (-16 to -???)	Mohr-Coulomb	120	0	33	0	1
	Soft Soil	Mohr-Coulomb	90	100	0	0	1

Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.2g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.20)

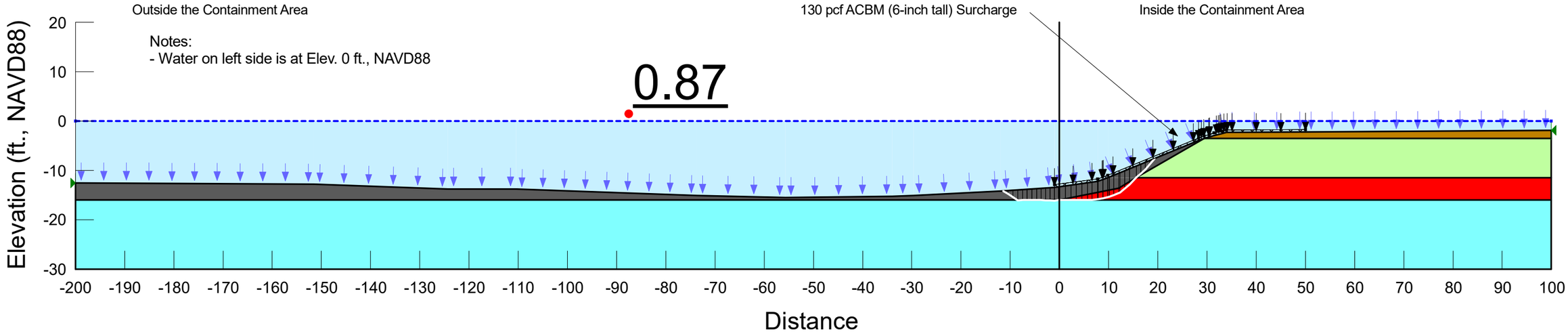
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 15

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Critical Slip Surfaces from Other
Factor of Safety: 0.87
Horz Seismic Coef.: 0.3



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	2- CLs (-1.6 to -3.4)	Mohr-Coulomb	117	200	0	0	1
	3- CL (-3.4 to -11.5)	Mohr-Coulomb	95	900	0	0	1
	4- SM (-11.5 to -16)	Mohr-Coulomb	120	0	25	0	1
	4- SM (-16 to -???)	Mohr-Coulomb	120	0	33	0	1
	Soft Soil	Mohr-Coulomb	90	100	0	0	1

Northern Impoundment - Sta 5+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.3g

Ardaman & Associates, Inc.

Analysis Name: Deep - Spencer Block (EQ=0.30)

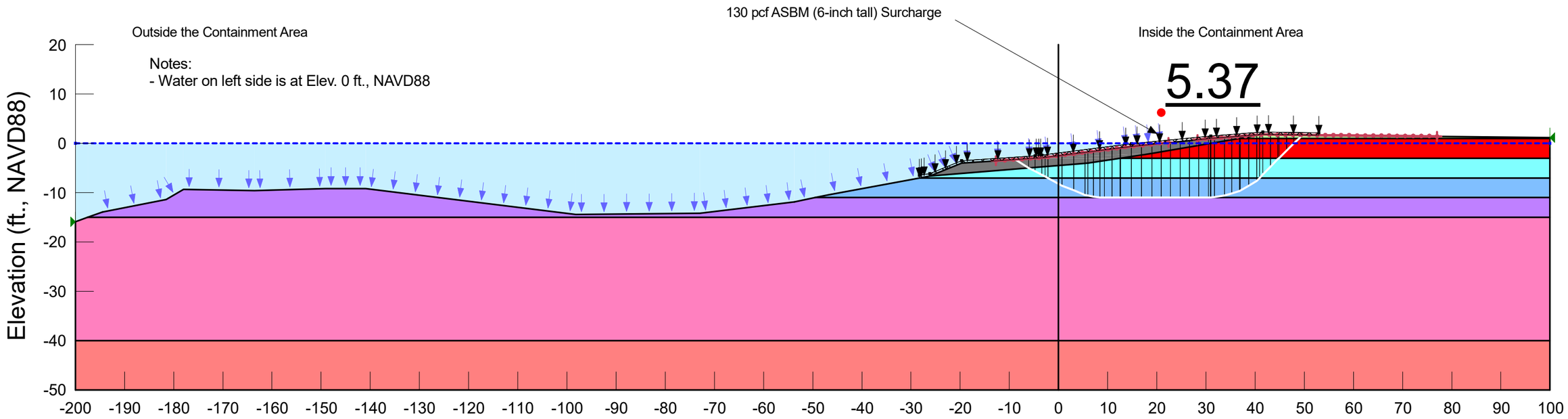
File Name: 18-2876 North Sta 5+00 Vibration (B058) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Figure No. 16

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\SlopeW\Northern Impoundment\

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 5.37
Horz Seismic Coef.:



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	3- CL (+3.3 to +1)	Mohr-Coulomb	131	800	0	0	1
	4- OH (+1 to -3)	Mohr-Coulomb	95	600	0	0	1
	5- SC (-3 to -7)	Mohr-Coulomb	115	0	28	0	1
	6- CL (-7 to -11)	Mohr-Coulomb	115	200	0	0	1
	7- CLs (-11 to -15)	Mohr-Coulomb	121	700	0	0	1
	8- SM/SP-SC (-15 to -40)	Mohr-Coulomb	130	0	30	0	1
	9- CH (-40 to -50)	Mohr-Coulomb	122	1,500	0	0	1
	Soft Soil	Mohr-Coulomb	95	100	0	0	1

Northern Impoundment - Sta 22+00 (Vibration Analysis)

Horizontal Seismic Coef.: 0g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE

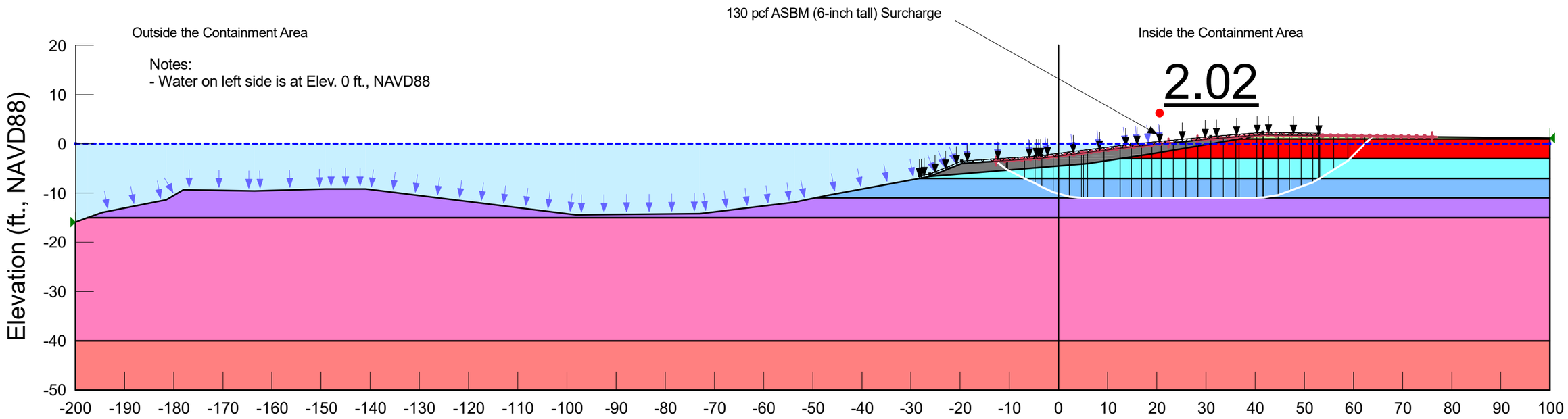
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 17

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 2.02
Horz Seismic Coef.: 0.1



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	3- CL (+3.3 to +1)	Mohr-Coulomb	131	800	0	0	1
	4- OH (+1 to -3)	Mohr-Coulomb	95	600	0	0	1
	5- SC (-3 to -7)	Mohr-Coulomb	115	0	28	0	1
	6- CL (-7 to -11)	Mohr-Coulomb	115	200	0	0	1
	7- CLs (-11 to -15)	Mohr-Coulomb	121	700	0	0	1
	8- SM/SP-SC (-15 to -40)	Mohr-Coulomb	130	0	30	0	1
	9- CH (-40 to -50)	Mohr-Coulomb	122	1,500	0	0	1
	Soft Soil	Mohr-Coulomb	95	100	0	0	1

Northern Impoundment - Sta 22+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.1g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.10)

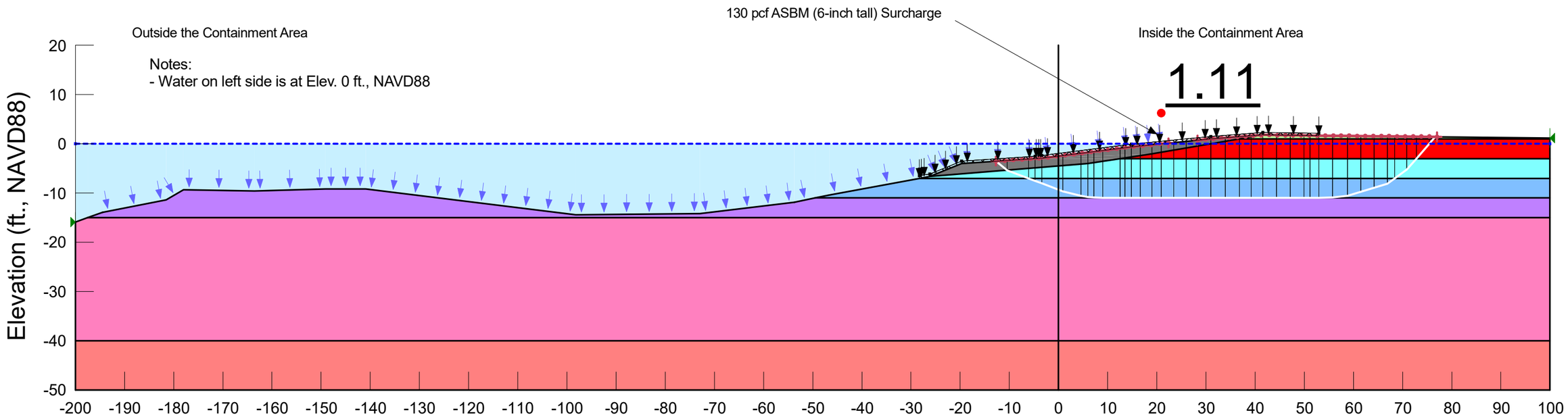
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 18

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 1.11
Horz Seismic Coef.: 0.2



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	3- CL (+3.3 to +1)	Mohr-Coulomb	131	800	0	0	1
	4- OH (+1 to -3)	Mohr-Coulomb	95	600	0	0	1
	5- SC (-3 to -7)	Mohr-Coulomb	115	0	28	0	1
	6- CL (-7 to -11)	Mohr-Coulomb	115	200	0	0	1
	7- CLs (-11 to -15)	Mohr-Coulomb	121	700	0	0	1
	8- SM/SP-SC (-15 to -40)	Mohr-Coulomb	130	0	30	0	1
	9- CH (-40 to -50)	Mohr-Coulomb	122	1,500	0	0	1
	Soft Soil	Mohr-Coulomb	95	100	0	0	1

Northern Impoundment - Sta 22+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.2g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.20)

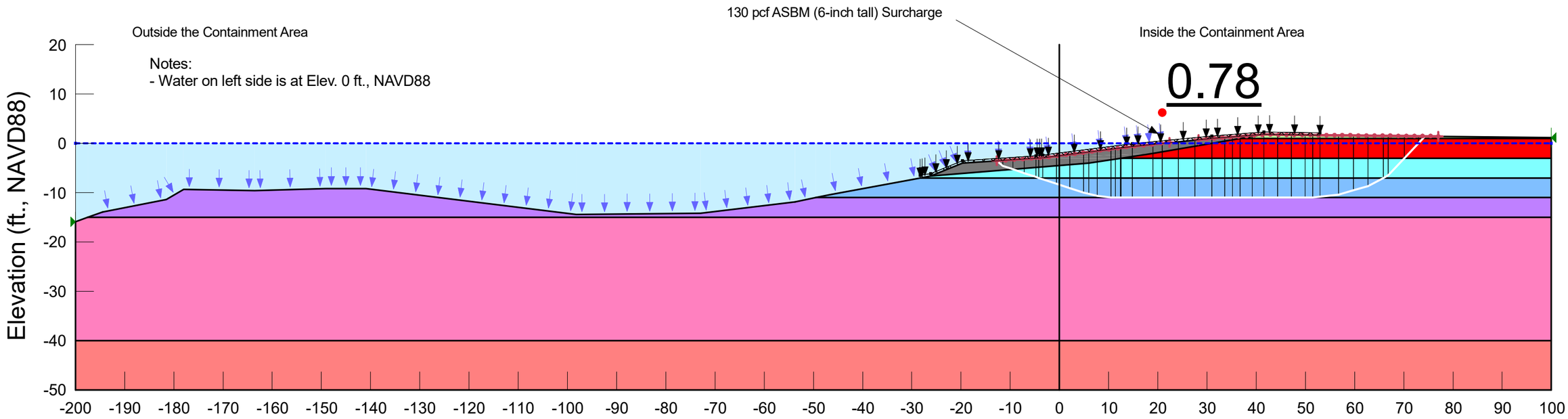
File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 19

Method: Spencer
Slip Surface Option: Entry and Exit
Factor of Safety: 0.78
Horz Seismic Coef.: 0.3



Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	3- CL (+3.3 to +1)	Mohr-Coulomb	131	800	0	0	1
	4- OH (+1 to -3)	Mohr-Coulomb	95	600	0	0	1
	5- SC (-3 to -7)	Mohr-Coulomb	115	0	28	0	1
	6- CL (-7 to -11)	Mohr-Coulomb	115	200	0	0	1
	7- CLs (-11 to -15)	Mohr-Coulomb	121	700	0	0	1
	8- SM/SP-SC (-15 to -40)	Mohr-Coulomb	130	0	30	0	1
	9- CH (-40 to -50)	Mohr-Coulomb	122	1,500	0	0	1
	Soft Soil	Mohr-Coulomb	95	100	0	0	1

Northern Impoundment - Sta 22+00 (Vibration Analysis)

Horizontal Seismic Coef.: 00.3g

Ardaman & Associates, Inc.

Analysis Name: Shallow - Spencer EE (EQ=0.30)

File Name: 18-2876 North Sta 22+00 Vibration (B028) - Soft Soil ACBM.gsz

Date: 04/21/2020 Scale: 1:250

Directory: G:\Projects\2018\18-2876 (San Jacinto Waste Pits)\Analyses\Slope\W\Northern Impoundment\

Figure No. 20

Attachment A. FURNISHED BORING LOGS AND GEOTECHNICAL TESTING RESULTS FROM PREVIOUS INVESTIGATIONS

This Attachment contains the following:
(Digital Copies Only)

A.1 Field Logs – Anchor (SJGB001 to SJGB017)

A.2 Field Logs – Anchor (SJSB018 to SJSB023)

A.3 Field Logs – Anchor (SJSB028 to SJSB038)

A.4 GeoTesting Express Lab data Sheets

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 3.5 FT FROM DECK TO MUDLINE; 5.5 FT FROM MUDLINE TO Measuring spot. ch	Boring SJGB001 Date 10/27 Sheet 1 of 3
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather P. SUNNY
	Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 60 ft Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	10	90	930 935 940	0	2	ST	CR1-A CR1-B S1	0 2.2' 1		(Very soft), moist ~~bro~~ grayish brown, sl. sandy SILT w/ ~~tr.~~ abund. organics (roots) @ 0.6 to 0.7' brown peaty silty Peat (OL) @ 0.7' to 1' moist gray ~~silty sandy~~ Sandy SILT w/ roots/organics no plasticity		OL
–	–	–	1000	2	4	ST	S2	2 2' 3		1 to 1.8' moist lt gray sandy-like silt particle. H2S ODOR from 0 to 1.8' Chemical-like odor @ 1.8		Black Muck
<5	<5	95	1010	4	6	SPT	S3	4 2' 5	0 0 0	1.8' V. SOFT wet dk gray to black clay w/ ~~chem-like~~ odor Methane? Sulfur? 0-2' unknown odor	Not rotten egg H2S	
<5	10	90	1020	6	8	SPT	S4	6 2' 7	0 0 0	2-4' ST FOR GEOTECH STRENGTH/CONSOL 4-6' WOR V. SOFT, wet, dk gray w/ gray patches tr. sand + gravel CLAY (Muck/mud) w/ tr. ~~chem-like~~ odor (Sulfur, Methane, muck)		
–	80	20	1040	8	10	SPT	S5	8 9 ~1.1' 10	6 6 14	6-8' @ V. SOFT. SAME AS ABOVE @ sampler shoe ~0.1' lt gray moist clayey SAND	unknown odor unknown odor @ 8'	SC
								1 2		8-10' (20) Md. dense, moist to wet, lt gray, clayey w/ layer Med grained SAND w/ layers (0.1)	hammer not falling 30"	tr. odor 8-10' in sand
–	65	35	1050	13	15	SPT	S6	3 1.6' 4 5	6 7 13	(20) Md. dense, moist, lt gray clayey SAND w/ layer of ~~cla~~ sandy CLAY ~0.4 Alternating layers ~0.2-0.4' thick of SP, SC + CL	of clay (SP) gravel sized unknown particles in slough	
–	85	15	1100	18	20	SPT	S7	8 1.1 9 20	5 5 12	(17) Md. dense, same as above seams of CLAY tr. shells		SP

Attachment Figure A.1-1

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SSGB001 Date 10/27/10 Sheet 2 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 90°F

Drilled By TRIANGLE RESOURCES (DSI) JOE/CHARLES

Drill Type/ Method ROTARY

Sampling Method 2' SPT / 2' ST ATD Water

Bottom of Boring 60' Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	70	30	1140	23	25	SPT	S8	1.4'	7, 6, 10	(16) Md. dense, wet, lt gray clayey SAND (SC), ALTERNATING LAYERS/SEAMS upto 0.1' of silty gray CLAY + lt gray Medium grained SAND tr. shells	Digging trench for drilling water	SC/SP
15	35	50	1125	28	30	SPT	S9	1.6	5, 4, 6	(10) Soft, moist, gray sl. sandy CLAY to 0.8' (CH) reddish brown 0.8 to sampler shoe (soft) clay and gravel - sand (transition) to shells sampler shoe medium stiff lt bluish gray CLAY (Beaumont)		CH, transition, Beaumont
5	45	95	1130	33	35	ST NR SPT	S10	1'	12, 20, 23	ST NR. USE SPT (43) V. HARD, damp, reddish brown CLAY w/ tr. gravel	TRY w/ ST Rig could only push 1FT NR. clean out hole, add mud, + resample w/SPT	
10	–	90	1145	38	40	SPT	S11	1.2'	5, 10, 12	(22) Hard, damp, reddish brown, CLAY w/ seam of gravel @ 0.5'	Rough Drilling	

Attachment Figure A.1-2

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB001 Date 10/27/10 Sheet 3 of 3
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY 92°F
	Drilled By TRIANGLE RESOURCES PSI
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method 2'SPT / ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 60FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								40			Rough Drilling bit is stopped occassionally Rig Shaking	
								1				Benamed
								2				
–	–	100	1220	43	45	SPT	S12	3	7	(20) Stiff, damp, reddish brown w/ tr. lt blue gray mottling CLAY		
								4	10			
									10			
								5			Unable to drive ST	color change
								6				
								7				CL
–	25	75	1240	48	50	SPT	S13	8 1.1'	10	(47) Very hard, damp, lt bluish gray, sandy silty CLAY.	G.S.	
								9	23	grades to very sandy to clayey SAND. At bottom		
									24			
								50				
								1		F.g. Sand.		
								2				
–	5	95	1330	53	55	SPT	S14	3	23	(42) V. Hard, dry, lt. bluish gray clayey SILT (MH)		MH
								4	24			
									18	tr. fine grained SAND		
								5				
								6				
								7				
–	5	95	1345	58	60	SPT	S15	8 1'	4	(54) V. hard dry to damp, lt bluish gray		
								9	27			
									27	SAME AS ABOVE		
								60		BOTTOM OF BORING @ 60'		

1400 10/27/10

Attachment Figure A.1-3

Soil Boring Processing Log

ANCHOR QEA

Boring Location:
2.6' FROM WATER TO MUDLINE
3.2' FROM DECK TO MUDLINE

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB002 Date 5/9/10 Sheet 1 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By WES MACDONALD Weather CLOUDY 65°F
Drilled By TRIANGLE RESOURCES (3)
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 59.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	10	90	0840	0	2	ST/SPT	S1	0	NR	1st ATTEMPTS w/ SHELBY TUBE. NR. TRY WITH SPT. STRONG CHEMICAL-LIKE ODOR		
								1		NO RECOVERY IN ST OR SPT IN UPPER 4 FT.		
				2	4	ST/SPT		2	NR	S1 is taken from shovel sample off of surface		
								3		S1 is V. SOFT, WET DK OLIVE GRAY ORGANIC SILT w/STRONG CHEM LIKE ODOR. TRACE SAND.		
–	10	90	0830	4	5.5	SPT	S2	4	0	WOH V. SOFT, wet, DK olive gray mod the organic silt OL @ 0.2 ft gray, like odor	OL	
								0.9 5		soft, laminated, sandy SILT. w/ black layer separating	ML	
								6	5	(7) MS stiff, damp, lt gray w/lt brown		
–	15	55	0835	6	7.5	SPT	S3	0.8 7	4	+ greenish gray mottling sand, CLAY (CL)	CL	
									3			
								8				
			0840	8	10	ST	S4	2' 9				
								10				
								11				
								12				
								13	4	(2) Loose, wet, gray, silty, clayey SAND (SM) w/ slight chem-like odor		
–	85	15	0850	13	14.5	SPT	S5	0.4 14	1			
									2			
								15				
								16				
								17				
								18	3	(14) MS dense, wet, lt gray SAND trace silt fine grained sand		
–	95	5	0900	18	19.5	SPT	S6	1.3 19	5	pocket of dk gray clay w/ chem-like odor (possible slough) @ ~ 1.1 ft		
									9	(not in sample)		
								20				

Attachment Figure A.1-4

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB0052 Date 5/9/10 Sheet 2 of 3
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT / ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 59.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								20				
								21				
								22				
–	80	20	0910	23	24.5	SPT	S7	23	4	(19) Md. dense, wet, lt gray w/ black specs, SAND w/ gray clay interbeds	SP	
								24	6			
									13			
								25				
								26				
								27				
–	85	15	915	28	29.5	SPT	S8	28	3	(19) Md. dense, wet, lt gray w/ black red, + some shell grains, SAND w interbeds of gray CLAY LAYER OF Gray clay in bottom 0.2'	SP - SC	
								2'	4			
								29	15			
								30				
								31				
								32			SP	
–	35	65	925	33	34.5	SPT	S9	33	10	(39) Md. dense, wet, lt gray sand to ABUNDANT SHELLS IN between layers Hard, lt bluish gray, sl. sandy CLAY (CH) @ 0.9' (beaumont Form) (sample taken is only clay)	CH	
								1.4	15			
								34	24			
								35				
								36				
								37				
5	5	90	935	38	39.5	SPT	S10	38	12	(45) HARD, damp, lt bluish gray + lt reddish brown, CLAY w trace gravel + sand (beaumont)		
								2'	17			
								39	28			
								40				

Attachment Figure A.1-5

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB002 Date 5/9/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather CLOUDY 70°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 59.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			945	43	45	ST	S11					
—	—	100	1000	48	49.5	SPT	S12	1.4	10 19 20	(45) HARD, damp, lt reddish-brown w/ gray + black mottling, CLAY w/ occassional chert		(CH)
—	—	100	1015	53	54.5	SPT	S13	1.7	14 18 22	(40) HARD, damp, lt bluish-gray w/ lt reddish brown throughout CLAY (CH)		(CH)
—	—		1030	58	59.5	SPT	S14	2'	28 50/4"	(50/4") Bottom 0.9' collected HARD, damp, lt bluish-gray CLAY F to M grained gray SAND in sample head BOTTOM OF BORING AT 59.5 FT	BORING COMPLETED	CH SP

Attachment Figure A.1-6

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 10.7' DEPTH TO MUDLINE FROM WATER; 11.4' " " DECK	Boring SJ GB003 Date 5/8/10 Sheet 1 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather CLOUDY 75°F
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT / ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			815	0	2	SPT ST	S1	0 2' 1		Appears to be soft gray sandy SILT w/ WOOD		
–	60	40	820	2	3.5	SPT	S2	2 3	0	WOH @ VERY LOOSE, WET GRAY v. silty SAND (SM)		
–	50	50	825	6	7.5	SPT	S3	6 2' 7	1 0 1	① Very loose wet gray silty SAND (SM) w/ shells + H2S odor. to grading to soft wet gray sandy SILT to sandy CLAY (MH-CH)		
			835	10	12	ST	S4	10 1.9 11 12				
–	30	70	900	13	14.5	SPT	S5	13 1.6 14	2 4 6	⑩ M. STIFF, wet to moist, gray CLAY W LAYERS of light gray SAND F-M grained @ 0.3 ft reddish-brown stiff clay. (BEAUMONT FORM)	(RECENT SED.) gray clay SILT/SAND RED CLAY	
–	5	95	925	18	19.5	SPT	S6	18 1.8 19	3 6 12	top 0.7' slough bottom ⑱ stiff, dump, reddish brown CLAY w/ layers + pockets of white CLAY		
								20		SLOUGH WAS LT GRAY, COARSE, SUB ROUND SAND (OTTAWA?)		

Attachment Figure A.1-7

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB003 Date 5/8/10 Sheet 2 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather CLOUDY 75°F
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								20				
								21				
								22				
–	<5	95	926	23	24.5	SPT	S7	23 1.7 24	8 14 20	(34) STIFF, MOIST, very LT gray to white CLAY (CH) w/ TRACE Lt yellowish brown fg. SAND	CH	
								25				
								26				
								27		~~overpushed? large amount of sand~~ mmm tube v. slightly damaged yellow + red CLAY		
			935	28	30	ST	S8	28 21 29				
								30				
								31				
								32			NT	
5	5	90	940	33	34.5	SPT	S9	33 34	8 10 11	(21) poor recovery poor sample (md. stiff, moist/damp, lt gray clay w trace of reddish brown clay (CL)		
								35				
								36				
								37				
–	–	100	945	38	39.5	SPT	S10	38 1.5 39	10 15 24	39 red clay STIFF, DAMP, lt reddish-brown, CLAY w/ pockets of lt gray CLAY (CH)		
								40				

Attachment Figure A.1-8

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SSGB023 Date 5/8/10 Sheet 3 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P. CLOUDY WINDY 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ ST ATD Water
Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								40				
								41				
								42		1.2 ft good sample, remainder slough		
–	–	100	1000	43 / 53	44.5 / 54.5	SPT	S11	43 / 2' / 44	12 / 21 / 35	(56) Vi, STIFF, DAMP, M. reddish brown to M blue gray CLAY (Beaumont)		
								45				
								46				
								47				
–	–	96 / 100	1000	48	49.5	SPT	S12	48 / 1.4 / 49	11 / 17 / 21	Good sample (38) STIFF, DAMP, M. blue gray CLAY (Beaumont)		
								50				
								51				
								52				
–	–	100	1020	53	54.5	SPT	S13	53 / 42 / 54	6 / 6 / 8	(19) SOFT, STIFF, DAMP, M gray CLAY more plastic - containing occasional wood fibers + debris w/ depth grades to darker (Beaumont) brown gray w/ wood content + depth		AL
								55				
								56				
								57				
–	10	90	1030	58	59.5	SPT	S14	58 / 1.5 / 59	8 / 12 / 20	(32) STIFF, DAMP, M gray sl. fine grained slightly CLAY w/ Trace wood fragments.		
								60				

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB003 Date 2/5/10 Sheet 4 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P.cloudy 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT/ST ATD Water
Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
—	5	95	1040	63	64.5	SPT	S15	1.5	5 8 15	(23) STIFF, damp, lt. gray CLAY w/ trace f. gravel SAND + trace wood fragments (Beaumont?)		
—	45	95	1055	68	69.5	SPT	S16	5	11 17 28	(45) sample overpenetrated (full of slough) slough is top 0.5'+ SAME AS ABOVE		
—	—	100	1105	73	74.5	SPT	S17	2'	6 11 15	top 0.5' was slough (26) STIFF, damp, dark gray CLAY w/ trace of wood fragments		
			1150	77	79	ST	S18	2'			switched drillers + cathead pullers	

Attachment Figure A.1-10

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGE003 Date 5/8/10 Sheet 5 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather CLOUDY 75° WINDY FROM N
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes / No	Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								80				
								81				
								82				
—	40	60	1200	83	84.5	SPT	S19	83 0.6 84	14 22 26	(48) ENTIRE sample appears to be slough; a mix of the layers above. red clay, gray sand etc.		NT
								85				
								86			SM	
								87				
—	15	85	~~1245~~ 1210	88	89.5	SPT	S20	88 89	14 22 26	WM 5/8 (48) 50/5" v. dense, MOIST, sl. silty to silty SAND (SM) F. grained sand		
								90				
								91				
								92				
			1230	93	94.5	SPT	S21	93 2' 94	11 17 25	top 0.1' slough (42) from 1.9 to 1.2 ft & Dense, Moist, lt gray f. to m. grained silty SAND SP w/ silt in pockets. From 0 to 1.2 ft: stiff, damp, dk gray CLAY w/ trace wood fragments + moderate pockets of lt. gray chert.	(sample from lower portion f.g.)	SP CL
								95				
								96				
								97				
—	—	100	1245	98	99.5	SPT	S22	98 2' 99	24 50/4"	50/4" Driven 10" but 2' of sample bottom 0.6' is stiff, damp, dark brown to black organic silt to pt.	OL/pt	
								100		material in upper sampler is gray mg sand w/ red gray clay		

Attachment Figure A.1-11

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB003 Date 5/8/10 Sheet 6 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather P. CLOUDY 75°F WIND FROM N
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes ~~No~~	Bottom of Boring 119.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								100				
								101				
								102				
								103		2' OF MAT. IN sample (32) stiff, damp, lt. bluish gray CLAY (CH)		
–	–	100	1305	103	104.5	SPT	S23	1.6	10 12 22			
								104				
								105				
								106				
								107				
								108		(39) SAME AS ABOVE		
–	–	100	1325	108	109.5	SPT	S24	2'	15 15 24			
								109				
								110				
								111				
								112				
								113		(50/4") v. DENSE (mo. dense), wet, lt bluish gray f. grained silty SAND (SM)		
–	70	30	1340	113	114.5	SPT	S25	1.1	30 50/4"	slough has sand clay + lard gravel	SM	
								114				
								115				
								116				
								117				
								118		0.7 good sample rest was slow		
–	80	20	1400	118	119.5	SPT	S26	0.7	15 30 45	(75) v. dense, gray f.g. silty SAND (SM)		
								119				
								120				

Attachment Figure A.1-12

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 5.6 FT TO MUDLINE	Boring SSGB004 Date ~~5/9/10~~ 5/11/10
	Sheet 1 of 3
	Job San Jacinto Waste Pits
	Job No. 090557-01
	Logged By WES MACDONALD
	Weather SUNNY WIND FROM S
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT - ST
	ATD Water Level Depth
Obs. Well Install. Yes (No)	Bottom of Boring 59.5

Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	20	80	1315	0	1.5	SPT	S1	0 / 0.4 / 1	6 / 2 / 2	poor recovery · catcher in backwards @ soft, wet, dk gray sl. sandy SILT w trace shells + organic debris (wood)		NT
–	15	80	1330	2	3.5	SPT	S2	2 / 3 / 0.1	1 / 1 / 1	poor recovery · catcher in backwards SAME AS ABOVE		NT
–	<5	100	1345	4	6	ST push	S3	4 / 2' / 5		SHELBY TUBE WAS EXTRUDED ON BOARD SOFT, WET, GRAY TO DK GRAY SILTY CLAY w/ thin sand lens		GS AL
–	<5	100	1350	6	7.5	SPT	S4	6 / 2' / 7	0 / 0 / 0	WOR V. SOFT, WET, DK GRAY CLAY w/ TR. SILT + sand	CH	
–	10	90	1355	8	9.5	SPT	S5	8 / 2' / 9	0 / 0 / 0	WOR V. SOFT, WET, DK GRAY CLAY w/ TR SAND LAYERS, gray		
			1400	10	12	ST push	S6	10 / 2' / 11 / 12				
–	35	65	1410	13	14.5	SPT	S7	13 / 2' / 14	0 / 0 / 0	WOH @ 14 ft change V. SOFT, WET, DK GRAY CLAY to Md. dense, wet, lt gray SAND w black specks Fine to med grained	CH / SP	
–	35	65	1420	18	19.5	SPT	S8	18 / 1.4 / 19 / 20	5 / 9 / 9	change at 19.1 ft ! (18) SOFT, wet DK gray CLAY to lt gray w/ black specks SAND	CH / SP	

Attachment Figure A.1-13

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB004 Date 5/11/10 Sheet 2 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 85° WINDY

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT / ST ATD Water

Bottom of Boring 59.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			1430	23	24.5	SPT	SJ9	23	8	(30) No Recovery shoe of sampler was lost in ground		
								24	15			
									15			
5	-	95	1440	28	29.5	SPT	SJ10	28	7	(38) V. HARD, damp, lt reddish brown & CLAY w/ fine gravel	CH	
								1.3	12			
								29	20			
-	-	100	1455	33	34.5	SPT	SJ11	33	10	Upper 1.4 of sample appears to be slough (CH gray sand w/ pockets of gray & red-brown silty clay)	CH	
								34	12	(27) HARD, damp to dry, lt reddish-brown w/ black & lt gray splotches CLAY		
									15			
										Upper 1.4 slough		
-	-	100	1505	38	39.5	SPT	SJ12	38	8	(26) HARD, damp & same as above fewer to no splotches & other color		
								8.6	11	trace gravel @ sample top (slough?)		
								39	17			

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB004 Date 5/11/10 Sheet 3 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Wes MacDonald Weather Sunny Winds SE

Drilled By Triangle Resources Heavy from SE

Drill Type/ Method Rotary

Sampling Method SPT/ST ATD Water

Bottom of Boring 59.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			1535	43	45	ST	S13	43 γ 44				
—	25	75	1550	48	49.5	SPT	S14	48 W3 49	12 50/6"	(50/6") V. Hard, moist, lt. bluish gray sl. f-g sandy CLAY. bottom 0.2 ft lt bluish gry, wet silty SAND	(CL)	
—	10	90	1550	53	54.5	SPT	S15	53 1.5 54	8 12 22	(34) V. HARD, wet to moist, lt. bluish-gray sl. sandy CLAY		
—	10	90	1605	58	59.5	SPT	S16	58 1.4 59	8 12 20	(32) V. Hard, moist, lt. bluish gray sl. sandy CLAY	(CL)	
								60		BOTTOM OF BORING 59.5' @ 5/11/10	1625	

Attachment Figure A.1-15

Soil Boring Processing Log

ANCHOR QEA

Boring Location:
Water level 5.4 ft to deck
1006 5-6-10

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 1 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante / MacDonald Weather Clear 85°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT & Push ATD Water
Bottom of Boring 61.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
-	-	100		0	2		SJGB005-S1	0		(Soft), wet, brown organic SILT with abundant wood fibers		
-	95	5						1				
								2				
								3		SILT, wet, gray, fine to medium SAND		
-	40	60	1040	4	5.5	SPT	S2	4	9	V. SOFT, WET, GRAY V. SANDY CLAY (CL) MOD. w/ ALTERNATING LAYERS OF CLAY & SAND		
								5				
								6				
								7				
								8				
								9				
-	20	80	1058	10	11.5	SPT	S3	10	0	WT. OF HAMMER V. SOFT, WET, GRAY, SANDY CLAY w/ # OCCASIONAL ALTERNATING LAYERS OF CLAY & SAND	OVER-PUSHED 6"	
								11	0			
								12	0			
								13				
								14				
-	40	60	1105	15	16.5	SPT	S4	15	4	(15) SOFT, WET. GRAY CLAY w LAYERS OF WT LT GRAY poorly graded rounded SAND LAYERS OF CLAY & SAND WERE 4-6" ea)		
								16'	3			
								16	12			
								17				
								18				
								19				
								20				

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 2 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By LAPLANTE / MACDONALD Weather Clear 85°
Drilled By TRIANGLE RESOURCES
Drill Type/ Method Rotary
Sampling Method SPT & Shelby ATD Water
Bottom of Boring 101.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
0	90	10	1120	20	21.5	X	S5	20	6	(10) Loose to M. dense, moist, lt. gray fine to coarse SAND		
								21	4			
									6			
								22				
								23				
								24				
0	90	10	1122	25	26.5	X	S6	25	11	(50) Dense to v. dense, moist lt. gray F-C SAND		
								26	20			
0	5	95							30	Hard, damp, brown and gray CLAY (Beaumont)		
								27				
								28				
								29				
								30	15	(51) Hard, damp gray transitioning to brown CLAY (Beaumont)		
0	5	95	1130	30	30.5	X	S7	31	20			
									31			
								32				
								33				
								34				
								35	6	(35) Hard, damp, red brown CLAY (Beaumont)		
0	10	90	1140	35	36.5	X	S8	36	8			
									27			
								37				
								38				
								39				
								40				

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB005 Date 5/6/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By LAPLANTE/MACDONALD Weather Clear 85°
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT & PUSH ATD Water
Bottom of Boring 61.5 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
0	10	90	1145	40	41.5	X	S-9	40	10	(41) Hard, damp, red brown CLAY (Beaumont) with lt. gray mottling		
								41	16			
									25			
								42				
								43				
								44				
0	15	85	1155	45	46.5	X	S-10	45	14	(40) Hard, damp, gray sl. sandy, silty CLAY		
								46	18			
									22			
								47				
								48				
								49				
								50	50	(50/5½") Dense to hard, gray, damp, silty, clayey SAND to sandy, silty CLAY	fine	
0	50	50	1205	50	51.5	X	S-11	50	50	/5½"		
								51				
								52				
								53				
								54				
								55	16	(48) Hard, damp, gray silty CLAY		
0	10	90	1220	55	56.5	X	S-12	56	16			
									32			
								57			DRILLER INDICATES CHANGE IN ACTION	
								58				
								59				
								60	15	(92/10") Very dense, moist, gray fine to coarse SAND		
0	90	10	1230	60	61.5	X	S-13	61	42			
									50/4			

BOTTOM OF HOLE AT 61.5 ft 1240 5/6/10

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB006 Date 10/29/10 Sheet 1 of 2
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY 65°F
	Drilled By TRIANGLE RESOURCES (PSI) Mash Buggy
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method 2' SPT ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 30 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
-	<5	100	1030	0-6"		ST	CR1-A	0		(Soft to mdr stiff) 0 to 0.4 Brown ~~moist to~~ damp SILT w/ abundant roots	2 STs TAKEN + COMPOSITED FOR 0-2'	Topsoil
			1035	6"-12"	0-2'		CR1-B	1.3'		0.4' to end ~~gray, moist~~ brownish gray moist w/ silt ~~gray~~ patches, blocky low plasticity w/ occassional roots SILT		Rolp waste
			1040	12"-24" 0'	2'		S1	2				
			1100			SPT		0.8'	0	(2) soft brown SILT		
(5)	—	100		2	4		S2	3	0 2 2	@ 0.3' dark gray v. soft, moist CLAY (muck) w/ small unknown gravel sized particles		muck (waste?)
-	-	-	1110	4	6	ST	S3	4 2' 5		shelby tube		
-	30	70	1120	6	8	SPT	S4	6 1.5' 7	11 7 8 9	(15) stiff, damp to moist, gray sandy CLAY (CL) ~~sandy~~ clayey sand in upper 0.3' tr. shells + yellow mottling.		CL
-	-	-	1130	8	10	ST	S5	8 1.5 9 10				
-	25	75	1140	13	15	SPT	S6	3 1.9' 4 5	0 0 0 0	(0) WOH v. soft, wet to moist, gray, sandy silty CLAY (CL) @ 0.9 v. soft moist gray clay (CH) w/ trace organics @ transition		
-	75	25	1150	18	20	SPT	S7	8 1.2' 9 20	3 7 14 14	(28) Md dense, ‖ gray, moist m to f grained clayey SAND sc w/ SP containing layers of gray soft clay.		SP-SC

Attachment Figure A.1-19

Soil Boring Processing Log

ANCHOR QEA

Boring Location: CATHEAD MINNOW POLL HAMMER

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB006 Date 10/29/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 65°F

Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY

Drill Type/ Method ROTARY 4 1/4" BIT

Sampling Method 2' SPT / 2' ST ATD Water

Bottom of Boring 30FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								20				
								1				
								2				
—	95	5	1200	23	25	SPT	S8	3	10	(53) V. Dense, moist, lt gray, med to fine grained SAND (SP) w/ tr. pockets of clay w/ gr		
								14 4	18			
									35			
								5	50/5"			
								6				
								7				
—	100	45	1210	28	30	SPT	S9	8	15	(45) M Dense, wet, lt gray, coarse grained SAND (SP) rounded to subrounded particles		
								2' 9	18			
									27	red/black gray white yellow grains		
								30	38			
								1		BOTTOM OF BORING, FILLING UP WITH MD. BENTONITE CHIPS		
								2				
								3				
								4				
								5				
								6				
								7				
								8				
								9				
								0				

Attachment Figure A.1-20

Soil Boring Processing Log

ANCHOR QEA

Boring Location: LL WATER DEPTH 5' 5.6' FROM DECK TO MUDLINE @ 0830	Boring SJGB007 Date 5/7/16 Sheet 1 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather P. SUNNY 70°F
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT + SHELBY ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 119.5FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			0830	0	~~0~~ 2	~~2~~ ST	S1	0–2		APPEARS TO BE SOFT, WET GRAY SANDY SILT		
–	~~40~~ 45	55	0835	2	~~2~~ 3.5	~~3.5~~ SPT	S2	2–3 (2')	0	WOH V. SOFT, GRAY, WET V. SANDY SILT (ML) w/ OCCASSIONAL WOOD DEBRIS		
–	55	45	0840	6	~~8~~ 7.5	SPT	S3	6–7 (2')	1, 1, 2	(3) LOOSE, WET, GRAY, V. SILTY SAND (SM) w/ OCCASSIONAL TO MOD. WOOD DEBRIS	ML/SM	
											CC	
–	15	85	0905	10	11.5	SPT	S4	10–11 (2')	1, 1, 1	(2) SOFT, WET, GRAY CLAY w OCCASIONAL INTERBEDS OF GRAY SAND		
			910	13	15	ST	S5	13–15 (2.2)				
–	100	~~0912~~ –	0912	18	19.5	ST	S6	18–19 (2.2')	1, 16, 14	(30) MD. DENSE, WET, GRAY LT GRAY w/ BLACK SPECS SAND (SP) w 2x 4"–6" Dk gray CLAY/SILT LAYERS SOFT (CH)	(Lower sample in double picture)	
–	–	100										

NOTE: - NO DRY ERASE MARKER, PICTURES OF SAMPLES ARE TAKEN IN ORDER SOME ST SAMPLE pictures are omitted.

- SPT samples have extra material in upper 0.5'. THIS MATERIAL IS CONSIDERED TO be fallen slough here.

Attachment Figure A.1-21

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB007 Date 5/7/10 Sheet 2 of 6
Job San Jacinto Waste Pits Job No. 090557-01
Logged By MACDONALD Weather P. SUNNY 75°F
Drilled By TRIANGLE RESOURCES
Drill Type/ Method ROTARY
Sampling Method SPT / ST ATD Water
Bottom of Boring 119.5FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								20				
								21				
								22			(BEAUMONT FORM)	
–	5	95	425	23	24.5	SPT	S7	23 2' 24	13 18 24	(40) HARD, DRY, LT bluish gray, SL. SANDY CLAY (CL)		
								25				
								26				
								27				
–	10	90	0945	28	29.5	SPT	S8	28 1.5 29	11 47 50	(97) V. HARD, DAMP, LT bluish gray w/ RED BROWN MOTTLING, SL. SANDY CLAY (CL-CH)	1ST PICTURE ON BOARD	
								30				
								31			COLOR CHANGE	
								32				
–	–	100	955	33	34.5	SPT	S9	33 2' 34	11 15 26	(41) HARD, MOIST, REDDISH BROWN w/ GRAY/WHITE VEINS & MOTTLING CLAY (CH) sand is overlying material		
								35				
								36				
								37				
–	–	100	1000	38	39.5	SPT	S10	38 2' 39	11 14 18	(32) HARD, MOIST to damp, REDDISH BROWN CLAY gray-brown clay in		
								40				

Attachment Figure A.1-22

Soil Boring Processing Log

ANCHOR QEA

Boring Location: PICTUR	Boring SJGB Date 5/7/10 Sheet 3 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 119.5 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								40				
								41				
								42				
			1010	43	45	ST	S11	43 2.2		Appears to be sl. sandy bluish lt gray CLAY		
								44			~~gr. transition~~	
								45				
								46				
								47				
								48		(51) HARD, MOIST, lt bluish gray F.G. sandy CLAY (CL) Low to No Plasticity		
–	20	80	1020	48	49.5	SPT	S12	2' 49	20 20 31			
								50			~~gr. transition~~ gr. transition	
								51				
								52				
–	90	5/10	1030	53	54.5	SPT	S13	53 1.2	18 26 32	(50) V. DENSE, moist to wet, lt gray fine to med.-grained SAND SP, sl. silty soft clay/SAND mix		
								54				
								55			~~gr. transition~~	
								56				
								57				
–	80	20	1040	58	59.5	SPT	S14	58 1.1	~~10~~ 15 ~~20~~ 26 ~~32~~ 31	~~(58)~~ (57) V. DENSE, wet, lt. gray silty F to M-grained SAND (SM)		
								59				
								60				

Attachment Figure A.1-23

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB007 Date 5/7/10 Sheet 4 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD W Weather P-SUNNY 75°F
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 119.5 FT Level Depth

162631

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
						S		60				
								61				
								62				
—	45	55	1050	63	64.5	SPT	S15	63 1.4 64	15 5 14	(19) MD. DENSE, WET, LT gray SILTY FG SAND TO (SM) STIFF, DAMP, Lt gray to Lt bluish gray f.g. sandy CLAY (CL)		
								65			color darkens + st. mat change	
								66				
								67				
			1100	68	69.5	SPT	S16	68 1.3 69	18 40 50/4"	90/10 V. DENSE, MOIST, GRAY, clayey SAND SC FG SAND		
								70				
								71				
								72				NT
~	50	50	1115	73	74.5	SPT	S17	73 0.7 74	26 40 36	(76) poor recovery sample missing from bottom. Recovery Mat. possibly slough, Des. of recov. lt gray sand to gray + red-brown clay	?	
								75				
								76				
								77				NT
			1130	78	79.5	SPT	S18	78 0.5 79	26 50/5"	(50/5") poor recovery Mat rec likely slough but sampled anyway. SAME AS ABOVE gray sand w/ clay		
								80				

Attachment Figure A.1-24

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB007 Date 5/7/10 Sheet 5 of 6

Job San Jacinto Waste Pits Job No. 090557-01

Logged By MACDONALD Weather SUNNY 85°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 119.5 ft Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
—	85	15	1328 not on COC	83	89.5	SPT	S19	80	83 1.8 84	(28) M. DENSE, WET LT GREY to Black grn (accessory) (approx mix of dirty sand - sub rounded f-m grained SAND w occasional pockets of clay. ↓ grey to red-brown mottled		
									36 47 32 36 46			
								85				
								86			color/texture change	
								87				
—	60	40	1335	88	89.5	SPT	S20	88 1.1'	40 50/5"	(50/5") MD. Dense, MOIST, grey fg - clayey SAND (SC) grades from clayey to fg SAND @ bottom		
								89				
								90				
								91				
								92				
-	-	100	1350	93	94.5	SPT	S21	93 2' 94	10 10 10	(20) STIFF, MOIST TO DAMP, GRAY CLAY (CH)		
								95				
								96				
								97				
-	-	100	1405	98	99.5	SPT	S22	98 2' 99	10 17 18	(35) STIFF, DAMP DARK GRAYISH BROWN silty CLAY w moderate wood fragments to ~0.7' ML. stiff, moist, gray CLAY w/ occasional wood fragments		
								100				

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB007 Date 5/7/10 Sheet 6 of 6
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather SUNNY 90°F
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 119.5 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								100				
								101				
								102				
-	-	100	1420	103	104.5	SPT	S23	103 1.3 104	15 24 26	(50) V. STIFF, MOIST, Lt bluish gray CLAY (CH) (MATERIAL was pulled back through outlet on retrieval)		
								105				
								106				
								107				
-	5	95	1425	108	109.5	SPT	S24	108 2' 109	13 50/5"	(50/5") TOP 1.2' Appeared to be slough V. STIFF, DAMP, lt bluish gray tan gray sl. sandy silty CLAY. (CL)		
								110				
								111				
								112				
65? -	30	70	1450	113	114.5	SPT	S25	113 1.9 114	16 18 28	(46) only 1.6 was sample 0.3 - slough "mid stiff" - stiff moist, gray F.g. sandy CLAY w/ LAYERS of clayey sand (CL)		
								115				
								116				
								117				
-	10	90	1510	118	119.5	SPT	S26	118 2' 119	50/4"	POOR RECOVERY MOST OF SAMPLE IS SLOUGH BOTTOM 0.4 SOFT, GRAY, MOIST ~~CLAY~~ CH ~~W SAND~~ sandy CLAY	(High blow counts + soft sample sample may not be indicative	
								120		BOTTOM OF BORING AT 119.5 FT 5/7/10		

Attachment Figure A.1-26

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

WATER DEPTH 5.0 Ft to Deck 1315 5/6/10

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB008 Date 5/6/10 Sheet 1 of 3

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Laplante / MacDonald Weather Clear 85°

Drilled By Triangle Resources - Joe Luder

Drill Type/ Method Rotary

Sampling Method SPT & Push ATD Water

Bottom of Boring Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
0	60	40	1320	0	1.5	X	S-1	0	0	(0) very loose, moist to wet, dark gray clayey silty SAND with organics		
								1	0			
									0			
								2				
								3				
0	75	25	1325	4	5.5	X	S-2	4	0	(0) v. loose, moist to wet, dark gray slightly clayey to clayey SAND.		
									0			
								5	0			
								6				
								7				
0	55	45	1330	8	9.5	X	S-3	8	1	(1) very loose, moist, dark gray clayey SAND		
								9	0			
									1			
								10				
								11				
								12				
0	40 60	60 40	1335	13	14.5	X	S-4	13	1	(3) Soft ~~very loose~~, moist to wet, dark gray ~~clayey~~ fine SANDY CLAY		
									1			
								14	2			
								15				
								16				
								17				
0	10	90	1340	18	19.5	X	S-5	18	1	(4) soft, moist to wet, dark gray CLAY		
									1			
								19	3			
								20				

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB008 Date 5/6/10 Sheet 2 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante/ MacDonald Weather Clear 90°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT ATD Water
Bottom of Boring Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
5	10	85	1345	23	24.5	X	S-6	20–40	9, 9, 13	(22) Very stiff, moist, blue gray CLAY with brown mottling. (Beaumont)		
0	5	95	1400	28	29.5	X	S-7	20–40	11, 12, 20	(32) Hard, damp to moist, blue gray and brown CLAY (Beaumont)	Gray – Brown	
0	5	95	1405	33	34.5	X	S-8	20–40	8, 17, 19	(33) Hard, damp, brown & red CLAY (Beaumont) with scattered black clasts		
0	5	95	1415	38	39.5	X	S-9	20–40	12, 14, 17	(31) Hard, damp, brown and red CLAY (Beaumont)		

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes No

Boring STGB008 Date 5/6/10 Sheet 3 of 3
Job San Jacinto Waste Pits Job No. 090557-01
Logged By Laplante / MacDonald Weather Clear 90°
Drilled By Triangle Resources
Drill Type/ Method Rotary
Sampling Method SPT-R ATD Water
Bottom of Boring Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								40				
								41				
								42				
								43	21	(68) Very dense, moist lt gray clayey fine SAND		
0	80	20	1425	43	44.5	X	S-10	44	32 36			
								45				
								46				
								47		— ? — ? — ? — ? — ? — ? —		
								48	15	(35) moist blue-gray, Hard, sl. sandy silty CLAY		
0	10	90	1430	48	49.5	X	S-11	49	15 20			
								50				
								51				
								52				
								53	16	(52) Hard, moist, blue-gray, sl. sandy silty CLAY		
0	10	90	1440	53	54.5	X	S-12	54	18 34			
								55				
								56				
								57				
								58	12	(60) Very dense, moist, blue gray clayey SAND		
0	80	20	1450	58	59.5	X	S-13	59	14 46			
								60		BOTTOM OF HOLE 59.5 FT		

1450 5/6/10

Soil Boring Processing Log

ANCHOR QEA

Boring Location: Pull Cathead Rope SPT MANUAL	Boring #SSCB009 Date 10/26/10 Sheet 1 of 2
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY
	Drilled By TRIANGLE RESOURCES Joe Kelly, Mark (PSI) Charles
	Drill Type/ Method ~~[illegible]~~ ROTARY
Elevation: Datum:	Sampling Method 2' SPT 2' ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 30 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	5	95	~~1115~~ 1120 1130 1130	0	2	ST	CR1-A CR1-B S1	0 1.8'		SOFT, MOIST, GRAY, PULP WASTE (soft) w/ H2S ODOR sl. sandy no plasticity, blocky @1.3 dk brownish gray, ~~silty~~ SILT (ML) w/ wet increased plasticity / w/ hair-like fibers w/ H2S ODOR tr organics (drugdown?)	#2 samples taken ~6" apart for chemchap	PULP WASTE (ML)
–	5	95	1150	2	4	SPT	S2	2'	0 0 0 0	WOR @ WOR, v. soft, gray to dk gray, wet silty CLAY tr. sand + @0.4' LARGE amount of organics (OL) @ bottom w/ strong chemical-like odor TR organics + ~~shells~~ (drugdown)		
–	5	95	1200	4	6	SPT	S3	1.5'	0 0 0 0			
–	~~7~~	95	1215	6	8	SPT	S4	1.6'	0 1 2	WOR ⓪ V. soft, wet, dk gray, silty CLAY w/ tr. sand w/ moderate chemical-like odor tr organics in the form of small wood chunks	S4 from bottom of sample	(CH)
–	15	85										
–	15	85	1230	8	10	SPT	S5	1.3	1 3 3	6-8 ② Soft, same as above @ 0.6' soft, moist, gray w/ black splotches, sandy (fine to md grained) CLAY	Shelby tube attempted @ 8' (No Recovery) Resample w/ SPT	SP
–	85	15				S(NR)						
			1245	10	12	SPT	S6					
		WMM								⑥ V. soft, moist gray w/ black splotches sl. sandy CLAY (CH)	sample S5 from lower portion (SP)	
–	~~30~~ 40	~~70~~ 60	1310	13	15	SPT	S6	1.1'	0 1 0	@ 0.7 loose, wet, lt gray SAND slightly clayey Md. grained SP to SC 13-15'	no sample @ 10' ST NR	SP
										① Soft, wet lt. gray, m.g. sandy CLAY w/ alternating layers of CLAY + SAND clayey SAND towards bottom	*problem w/ R16 SPT Hoist	CL
5	85	10	1430	18	20	SPT	S7	1.2'	10 13 25	(38) Dense, moist, lt gray coarse to M.G. sand w/ tr. fine gravel + occassional pockets of gray tr. fine shells	Rig hoist temp. fixed perhaps not 30" fall	

Attachment Figure A.1-30

Soil Boring Processing Log

ANCHOR QEA

Boring Location: SPT CATHEAD MANUAL PULL	Boring SJGB009 Date 10/26/10 Sheet 2 of 2
N	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather Mo. Sunny 90°F
	Drilled By TRIANGLE RESOURCES (PSI) Marsh Buggy
	Drill Type/ Method ROTARY (MUD) NO CIRCULATION
Elevation: Datum:	Sampling Method 2' SPT / 2' ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 30 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								20				
								1				
								2				
–	70	30	1500	23	24.5	SPT	S8	3 1.7'	9 18 23	(41) Dense, wet, lt gray, clayey SAND SC SAND w/ pockets/layers of Clay 0.6' FT LAYER OF Gray SOFT CLAY @ 0.3' subrounded wht, black + brown grains.	Sample had larger amount of Clay	(SC)
								4				
								5				
								6				
								7			blow counts may be overestimated due to manual pulling (not 30°) + hammer not pulling directly over rods consistently	(SP)
– 10	95 90	5 –	1520	28	29.5'	SPT	S9	8 1.7'	6 12 23	(35) Dense, moist, lt gray, fine to med grained SAND (SP) @ 0.3' grades to Coarse grained SAND w/ Fine gravel		
								9				
								30				
								1				
								2		BOTTOM OF BORING 29.5' 1530 10/26/10		
								3				
								4				
								5				
								6				
								7				
								8				
								9				
								0				

Attachment Figure A.1-31

Soil Boring Processing Log

ANCHOR QEA

Boring Location: drilling @ sl. angle	Boring SJGB010 Date 10/28/10 Sheet 1 of 1
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY WINDY 80°F
	Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY
	Drill Type/ Method ROTARY 4 1/4" BIT
Elevation: Datum:	Sampling Method 2' SPT / 2' ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 15 FT Level Depth

Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
-	15	85	1500 1505 1510	0	2	ST	CR1-A CR1-B S1	0 1.4' 1 2		0' to 0.2' (V. soft) brown, moist organic SILT w/ abundant roots tr. H2S odor 0.2' to bottom (V. soft), gray, pulp waste sandy material w/ abundant roots & large woody debris up to 3" long tr. black @ bottom		OL PULP WASTE
-	5	95	1540	2	4	SPT	S2	1.7 3 4	0 0 0 0	(6) V. soft, wet, black, SILTY CLAY tr. unknown odor (much) tr. sand in sampler shoe Md. dense moist. gray SAND		black MUCK
-	-	-	1600	4	6	SPT	S3	0' 5 6	4 6 8 10	(14) No RECOVERY		
-	70	30	1610 1630	6	8	SPT	S4	1.2' 7 8	7 8 8 10	(16) Md. dense, wet, lt. gray to gray SAND SP fine to medium grained 0.5' to 0.9' soft, wet, gray sandy clay tr. unknown odor @ top Layer of shell hash (0.1') @ 0.6' Shells throughout (fragments) top to 0.5'		SP
-	90	10	1615	8	10	SPT	S5	1.1' 9 10	3 4 4 5	(8) Loose, wet, lt gray to lt gray sl. silty f to m SAND (SP) layer of shells from 0.6 to 0.7'		
-	90	10	1620	10	12	SPT	S6	1.2' 1 2	3 4 5 7	(9) loose, wet, lt. gray, f to m SAND (SP) w/ tr. silt/clay pockets towards bottom layer of shells from 0.7 to 0.8'		
			1625	13	15	SPT	S7	13 1.3' 4 15	5 4 9 16	(15) Md. dense, wet to moist, lt gray (13) f to m gr. SAND (SP) w/ seams of gray clay w/ tr. shells in clay BOTTOM OF BORING 15', FILLING HOLE w/ MED. BENTONITE CHIPS <5' below "paper mill waste" DONE 1630 10/28/10		
								6 7 8 9 20				

Attachment Figure A.1-32

Soil Boring Processing Log

ANCHOR QEA

Boring Location: SJGB011

Boring SJGB011 Date 10/29/10 Sheet 1 of 1
Job San Jacinto Waste Pits Job No. 090557-01
Logged By WES MACDONALD Weather SUNNY 55°F
Drilled By TRIANGLE RESOURCES (PSI) MARSH BUGGY
Drill Type/ Method ROTARY 4¼" BIT
Sampling Method 2'SPT / 2'ST ATD Water
Bottom of Boring 20' Level Depth
Elevation: Datum:
Obs. Well Install. Yes (No)

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	5	95	830	0	6"	ST	CRU-A	0		(V. soft), moist, gray to lt gray, sl. sandy SILT, block texture, occassional root, plastic w/ trace organics + occassional small shells,	2 SHELBY TUBES TAKEN FROM 0-2' DIRECTLY NEXT TO EACH OTHER FOR SAMPLE VOLUME BOTH COMPOSITED	RUP WASTE
			835	0	2		CRU-B	2' 1				
							S1					
			840	1	2			2		@ 1.9' black, (v.s oft) moist clay.		
–	<5	100	850	2	4	SPT	S2	1.9' 3		lt gray to silver pockets moderate in upper 6" sl. H2S ODOR		MUCK
								2.4' 4		@ WOR, v. soft, wet, gray to dk gray silty CLAY (mud) w/ unknown odor		
–	–	–	900	4	6	ST	S3	1.6' 5				
–	<5	100				SPT		4-6		Shelby Tube No Recovery Sampling w/ SPT		
–	<5	100	910	6	8	SPT	S4	1.4' 7		@ WOR, v. soft, same as above black to gray w/ flat fibrous chunk ~½" w/ unknown odor		
60	60	40						6.8 8		@ v. s oft same as above w ~1.1' M. dense, moist, lt gray sand w/ layers (0.1') of grey w/ black patches, CLAY	054 large shell, hand chunks of debris in upper clay SAMPLE + sluff	CL
–	50	50	920	8	10	SPT	S5	1.9 9				SC
–	85	15	930	10	12	SPT	S6	8-10 10		(2) soft, moist, gray w/ patches of brown, V. sandy silty CLAY (CL) w alternating layers of Clay + Sand lt gray w/ 2 layers of wood @ 1+ 0.2' (each thick)		Sand w/ clay
								1.2' 1				SC/SP
								2				SP/SC
–	85	15	940	13	15	SPT	S7	1.0' 3		tr. organics throughout (?) (9) Loose, wet, lt gray, clayey SAND (SC) w/ layers of clay (0.1') in (SP) f to m. grained sand		
								1.4' 4				
								5				
								6		13-15 (12) M. dense same as above		
								7				
–	95	5	950	18	20	SPT	S8	8		(21) Md. dense, wet, lt gray, M-f grained sl clayey SAND (SP) tr. pockets of clay w/ tr. fine gravel		SP
								9				
								1.2' 14		@ 0.1 fine grained silty sand		
								20 13		BOTTOM OF BORING 20 FT		

BACKFILLED w/ 4 BAGS OF MED. BENTONITE CHIPS
10/29/10 1086

Soil Boring Processing Log

ANCHOR QEA

Boring Location:	Boring SJGB012 Date 10/28/10 Sheet 1 of 1
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY 70°F WINDY
	Drilled By TRIANGLE RESOURCES (PSI)
	Drill Type/ Method ROTARY MARSH BUGGY
Elevation: Datum:	Sampling Method 2' SPT 2' ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 20 FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	5	95	0930 935 940	0	2	ST	CRI-A CRI-B S1	0 2.2' 1 2		Soft, moist, gray to brown, Sandy SILT w/ abundant organics roots some silt like material consistency w/ H2S ODOR @ 0.8' LAYER OF ORGANICS @ sample bottom 2.2' wet (v. soft) black	2 BTS taken directly next to each other	PUCP WASTE/ PPSOIL
–	10	90	1245	2	4	SPT	S2	2' 3 4	0 0 0 0	@ WOR. v. soft, wet, Black or sl. sandy CLAY w/ (MUCH) w/ unknown odor	live fiddler crab at surface	MUCH BLACK CL
–	<5	100	1330	4	6	SPT	S3	1.5' 5 6	0 0 0 0	WOR @ SAME AS ABOVE w/ pocket of gray unknown round debris @ 0.3' tr. hairline fibers (unknown)	After S1 rig moved to assist w/ Vibecoring + haul Benchmarks pattern across site	
–	–	–	1345	6	8	ST	S4	2' 7	0 0	SHELBY TUBE		
–	35	65	1350	8	10	SPT	S5	8 1.4' 9	0 0 3	(3) Soft, wet, gray sandy CLAY w/ unknown particles (flat + rounded) (similar to OO1). w/ unknown odor @ 0.5 Md dense, wet, lt gray SAND m grained SP	resume on location	
–	100	<5						10	7		@ 1245 10/28/10	SP
–	80	20	1400	10	12	SPT	S6	1 1.9 2	7 6 9 13	(15) Md. dense, wet, lt gray, clayey silty SAND Fine to medium grained SAND (SM-SC) w/ pocket + ~~layers~~ seams up to 1cm w/ occasional organics (wood debris)		
–	95	5	1410	13	15	SPT	S7	3 1' 4 5	0 0 13 11	(13) Md. dense, moist, lt gray sl. silty SAND SP w/ tr. pockets of Clay. w/ flat metal shavings in sampler that appear to be flakes off of SPT split spoon sampler		
–	95	5	1420	18	20	SPT	S8	8 1.5' 9 20	6 16 28 32	(44) V. dense, moist to wet, lt gray SAND (SP) m-f grained sand w/ tr. seams of ~~clay~~ sandy CLAY		

BOTTOM OF BORING 20'. FILLING UP HOLE w/ MD. BENTONITE CHIPS (7 bags)
DONE 10/28/10 1450

Attachment Figure A.1-34

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 12.3' MUDLINE

Elevation: Datum:

Obs. Well Install. Yes No

Boring SJGB013 Date 5/11/10 Sheet 1 of 1

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 90°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 10 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
								0		0 to 2.0 Very soft, wet, dark gray w/ occasional gray pockets, sl sandy silty CLAY w/ trace organic fibers + shells, trace H2S/ch + chem-like odor when initially broken. Layer of whole shells near (0.2') surface		
–	5	95	1045	0	2	ST push	S1	2' 1			ML/OL	
								2		2.0 to 3.5 Very soft, wet, dk gray w/ pockets of gray, sl. sandy SILT + CLAY w occasional organic debris, decreasing moisture + increasing cons. w/ depth to moist + med. stiff.		
–	5	95	1100	2	4	ST push	S2	2' 3				
–	80	20								3.5 to 4 FT Loose, wet, gray SAND w occasional silt + clay pockets.	SP	
–	5	95	1150	4	6	ST PUSH	S3	4		SAMPLE was very disturbed upon extrusion		
								2' 5		4 to 5.6 Very soft, wet dark gray/tan pockets of gray, sl. sandy SILT, trace		
–	85	15								5.6 to 6 MD. dense, wet, gray sl silty SAND		
			1210			ST		6				
				6	8		S4	7				
–								8	5	0% recovery in ST. SPT sample		
–	95	5	1230			SPT		1.5	7	(14) MD. Dense, wet, gray sl silty fine to med grained SAND sub rounded		
				8	10		S5	9				
								10		BOTTOM OF BORING 10 ft COMPLETED 12:30 5/11/10		

Soil Boring Processing Log

ANCHOR QEA

Boring Location: depth to mudline 2.6 FT

Elevation: Datum:

Obs. Well Install. Yes / No

Boring SJGB014 Date 5/10/10 Sheet 1 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By ~~MM~~ WES MACDONNELL Weather P.SUNNY/WINDY 80°F

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 12 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			1000	0	2	ST	NR	0	2	1ST ATTEMPT W/ TUBE, NO RECOVERY TRY AGAIN WITH SPLIT SPOON		
				0	1.5	SS DPT		NR	1	No recovery w/ split spoon strong chemical-like odor (similar to CO2) from sampling equipment		
								1	3			
—	5	95	1015	2	4	ST	S2	2		SOFT, MOIST DARK GRAY TO OLIVE GRAY cl. SANDY SILT W/ TRACE ORGANICS 0 to 1.8 to 0.3 ft STRONG H2S ODOR		
								1.8'				
								3		0.4 0.3 ft, Gray, ST wet silty sand		
—	55	45										
								4		0' to 1.3' appears to be soft dk gray wet, sandy SILT (possible sloughs from drag down + fallen. CLAM SHELL observed at material boundary wood fibers		
—	85 15	15 85	1030	4	6	ST	S3	1.9		1.3 to 1.9' (loose) wet, gray sl. silty SAND		
—	5 95	5						5				
								6	1	0 to ② Loose, wet, gray, silty SAND w/ dark gray silt w/ some wood fragment in silt.		
—	70	30	1035	6 8	8	SPT	S4	0.8'	1			
								7	1			
								8		SHELBY TUBE FOR GEOTECH		
			1140	8	10	ST	S5					
								9				
								10				

Attachment Figure A.1-36

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB00 c/14 Date 5/10/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By MACDONALD Weather SUNNY 80°F WIND FROM SOUTH

Drilled By TRIANGLE

Drill Type/ Method Rotary

Sampling Method SPT / ST ATD Water

Bottom of Boring 12 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	40	60	1150	10	12	ST	S6	0 to 12		SOFT, WET, DK gray sandy SILT w/ trace shell fragments		
										BOTTOM OF BORING 12' COMPLETED 5/10/10 1150		

Soil Boring Processing Log

ANCHOR QEA

Boring Location: MUDLINE 7.4 FT

Elevation: Datum:

Obs. Well Install. Yes / No

Boring SJGB015 Date 5/10/10 Sheet 1 of 1

Job San Jacinto Waste Pits Job No. 090557-01

Logged By WES MACDONALD Weather SUNNY 85°F WIND 9 KTS SOUTH

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water Level Depth

Bottom of Boring 10 FT

Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
		15/5	1515			PUSH		0		SOFT, MOIST GRAY SANDY SILT		
—	20	80		0	2	PUSH ST	S1			w/ occasional layers of SAND (<0.1")		
								1		+ brown silty wood @ 1.1 TO 0.8 (<0.1")		
										sl. H2S odor.		
			1525			ST		2		SOFT, DAMP, gray to dk gray sandy		
—	15	85		2	4	PUSH	S2	1.8		SILT		
								3		w/ occasional pockets of CLAY		
								4		INITIAL TRY WITH ST resulted in NR		
			1540			SPT	S3		0	TRY W/ SPT		
—	15	85		4	6			1.5	0	WOH SAME AS ABOVE		
								5	0			
								6	0	NO RECOVERY INC ST. TRY SPT		
			1600			SPT			0	WOH SOFT, WET, GRAY TO DK GRAY		
—	10	90		6	8		S4	0.9		SANDY CLAY (CL)		
								7	0			
									0			
			1625			ST		8		Not extruded. Shelby tube for geotech		
								8'				
				8	10		S5	9				
								10		BOTTOM OF BORING 5/10/10 1625		

Attachment Figure A.1-38

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 3.5 Depth from water to mudline 12:10	Boring SJGB016 Date ~~5/9/10~~ 5/10/10 Sheet 1 of 2
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By MACDONALD Weather SUNNY 80°F wind from S
	Drilled By TRIANGLE RESOURCES
	Drill Type/ Method ROTARY
Elevation: Datum:	Sampling Method SPT + ST ATD Water
Obs. Well Install. Yes No	Bottom of Boring 12FT Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			1210	0	2	ST	S1	0		0 to 0.1 loose, wet, grave sl. silty SAND w/ trace wood debris	This sample was logged in reverse order from bottom to top	
–	5	95						2'		0.1 to 1.1 soft, moist, dk gray to black CLAY w/ trace wood debris (CH OH)		
								1		1.1 to 1.4 soft, moist dk brown to dk gray organic silt w/ moderate wood debris + mod. chem-like odor		
										1.4 to 2 soft, moist, gray clayey SILT w/ mod. chem-like odor		
–	30	70	1230	2	4	ST	S2	2		1.1 0.8 ~~1.7~~ to ~~1.9~~ dk gray, soft sandy silt, damp		
								1.1		0.8 0.6 ~~1.9~~ to ~~0.8~~ lt gray, wet, SAND loose		
								3		~~0.8~~ 0.6 to 0.4 dk brown, damp, SILT w/ wood debris		
										0.4 to 0.8 Md. dense, dk lt. gray SAND w/ occasional silt pockets		
			1350	4	6	ST	S3	4		NOT EXTRUDED (geotech)		
								2'				
								5				
–	20	80	1400	6	8	ST	S4	6		STIFF, MOIST, GRAY sandy SILT w/ occasional pockets + Layer of lt. gray SAND		
								2'				
								7				
			1410	8	10	ST	S5	8		SOFT, WET, GRAY SANDY SILT w/ LAYERS of sand		
								2'		occasional ~~Nut~~ shell AT 0.2FT intact trace shells throughout		
								9				
								10				

Attachment Figure A.1-39

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGB 016 Date 5/10/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By Wes MacDonald Weather SUNNY 85°F WIND FROM S

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water Level Depth

Bottom of Boring 12 FT

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
			1425	10	12	ST	S6	10 2' 11 12		Not extruded GEOTECH BORING BORING TERMINATED		

3 4 5 6 7 8 9 10

Attachment Figure A.1-40

Soil Boring Processing Log

ANCHOR QEA

Boring Location: 2.9' Depth from water to mudline; 3.7 " " deck " "	Boring SJGB017 Date 5/11/10 Sheet 1 of 2
	Job San Jacinto Waste Pits Job No. 090557-01
	Logged By WES MACDONALD Weather SUNNY 80°F
	Drilled By TRIANGLE RESOURCES (J)
	Drill Type/ Method Rotary
Elevation: Datum:	Sampling Method SPT/ST ATD Water
Obs. Well Install. Yes (No)	Bottom of Boring 12 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	DEPTH To	SAMPLE Type	SAMPLE Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
–	10	90	0830	0	2	ST push	S1	0		0 to 0.3 Loose, wet, gray silty SAND	Wood in sand wood on the border of two soils	
								2'		0.3 to 2 Soft, moist to damp, dk gray to black CLAY to SILT w/ trace organic fibers		
								1		Long, shinny clam at soil border horizon (intact)		
–	<5	100	0845	2	4	ST push	S2	2		0 to 1.7 soft to md. stiff, dk gray to blk, damp CLAY		
								2.2'		thin gray sand layer @ 1.7' 1.7' to 2.2' soft, dk brownish-gray CLAY w/ moderate organic fibers		
								3				
–	25	75	0900	4	6	SPT	S3	4	0	ATTEMPTS TO OBTAIN SAMPLE w/ PUSH TUBE FAILED. SAMPLE OBTAINED w/ SPT.		
								1.5	0	WOH SOFT, WET, GRAY, sandy SILT w/ occasional interbeds of black CLAY		
								5	0			
								6	0	ATTEMPTS OF ST FAILED. SPT used. WOH		
–	20	80	0915	6	8	SPT	S4	1.4	0	SAME AS ABOVE		
								7	0			
			0930	8	10		S5	8		Not extruded		
								2'		Geotech sample		
								9				
								10				

Attachment Figure A.1-41

Soil Boring Processing Log

ANCHOR QEA

Boring Location:

Elevation: Datum:

Obs. Well Install. Yes (No)

Boring SJGBB17 Date 5/11/10 Sheet 2 of 2

Job San Jacinto Waste Pits Job No. 090557-01

Logged By W. MACDONALD Weather SUNNY 85° 11. breeze SE

Drilled By TRIANGLE RESOURCES

Drill Type/ Method ROTARY

Sampling Method SPT/ST ATD Water

Bottom of Boring 12 Level Depth

Grain size (%) Gravel	Sand	Fines	Time/ PID	DEPTH From	To	SAMPLE Type	Number	DEPTH/ SAMPLE RECOVERY	Penetration Resistance	DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, NON-SOIL SUBSTANCES: Odor, staining, sheen, scrag, slag, etc.	REMARKS: Drill action, drill and sample procedures, water conditions, heave, etc.	SUMM. LOG (Water & Date)
—	90	10	1045	10	12	SPT	S6	10	0	ATTEMPTED SAMPLE w/ pust ST. NO Recovery sample obtained via SPT		
								11	0	for recovery. (WOH) (MD dense) wet, lt gray sl. silty SAND in sampler head.		
								0.3	0			
								12		BOTTOM OF BORING 12' 10:20 5/11/10		
								3				
								4				
								5				
								6				
								7				
								8				
								9				
								10				

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannalas
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB18
DATE BEGAN 12/3/18
DATE COMPLETED 12/3/18
TOTAL DEPTH 52'
PAGE 1 OF 3

Field location of boring
Water depth to MLLW: 20 ft

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	1	SJGB018-G01	.4	0-2'	1		very soft, wet, black slimy silt with small gravel	10		90
↓	WOH	SL0860								
↓	1050				2		Casing sunk in this material to a depth of 8'			
					3					
					4					
					5					
					6					
					7					
					8					
SS	4	SJGB018-G02	1.0	8'-10'			@ 8.8': black slime			
↓	2	SL0861			9		@ 9': very loose wet light grey fine SAND grades to silty SAND @ 9.6'	~~100~~ 93	~~50~~ 50	100 90
	WOH	1120								
↓	WOH				0					
SS	WOH	SJGB018-G03	1.9	10-12						
↓	WOH	SL0862		(30-32)	1		very soft light grey moist SILT with clay			100
↓	WOH	1135								
ST	PUSH	SJGB018-G04	2	12-14	2					
↓	↓	SL0863								
		1150			3					
					4					
					5					
SS	WOH	SJGB018-G05	1.4	~~14~~ 15-16			loose, wet, coarse SAND with	5	60	~~35~~
↓	2	SL0864			6		CLAY laminations, CLAY at 15.8'			
↓	7	1300								
	8				7					
SS	4	SJGB018-G06	1.7	16-18'		CL	stiff, damp to dry, bluish grey CLAY			100
↓	9	SL0865			8					
↓	13	1315								
	17				9					
					0					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-1

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Gimaker
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB018
DATE BEGAN 12/3
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	5	SJGB018-G07	1.8	~~38-20~~	1		SAA @ 16': Color changes to yellowish brown CLAY			100
	8	SL0866		(40-42)						
	14	1330			2		SAA to 21'			
	17									
SS	1	SJGB018-G08	2.0	20-22'	3		21': orangish brown damp CLAY with gravel	5		95
	3	SL0867								
	9	1345			4					
	17									
					25					
ST	PUSH	SJGB018-G09	2.0	25-27'	26		SAA @ 21'			
		SL0868		45-47						
		1405			27					
					28					
					29					
S		S			30					
SS	5	SJGB018-G10	2.0	30-32'	31	CL	V Stiff reddish brown dry CLAY			100
	13	SL0869		50-52			PP: 4.5 TSF			
	18	1435			32		VT: .6 ksf/cm²			
	25									
					33					
					34					
				~~40-42'~~	35	→	driller pushed to 40' from 30' skipping 35' by mistake.			
SS	20	SJGB018-G11		~~35-37'~~	36					
	44	SL0870		55-57						
	48	1510			37					
	50									
					38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-2

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
SAMPLING METHOD: in. by ft

BORING # SJGB018
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	20	SJGB018-G11	2.0	40-42	1		very dense dry light grey SILTY FINE SAND with clay lamination		60	40
↓	44	SL0870								
	48	1510			2					
↓	50				3					
					4					
					5					
ST	Push	SJGB018-G12	2.3	45-47'			SAA @ 40', wood fragment at 45'			
↓	↓	SL0871			6					
		1545			7					
					8					
					9					
					0					
SS	WOH	SJGB018-G13		50-52'	1		stiff, dry to damp, light grey SILTY CLAY.			100
↓	4	SL0872								
	11	16			2		Boring complete @1405			
	16				3					
					4					
					5					
					6					
					7					
					8					
					9					
					0					

narks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-3

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakis
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED 12/3/18
TOTAL DEPTH ~~57~~ 71
PAGE 1 OF 3

Field location of boring
Water depth to TOC: 20'
Water depth to MH: 16'

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	3	SJGB019-601 SL0847 1225	0.1	0-2' ~~(18-20)~~ (20-22)	1		rock in catcher, no sample recovered. Very loose sand (grey) with dark substance		58	58
	WOH				2					
	WOH				3					
					4					
SS	WOH	SJGB019-602 SL0848 1245	0.4	4-6' (24-26)	5		rock in catch, minimal recovery. Very soft dark grey CLAY w/ silt			102
SS	WOH	SJGB019-603 SL0849 ~~1255~~ 1300	.7	~~8'-10'~~ ~~6-8~~ SG ~~26-28~~ 28-30	6					
					7		casing fell under own weight to 10', sample depth actual 8'-10'			
					8		Very soft dark grey moist silty CLAY catcher forced inside of SS.			100
					9					
					10		Casing sunk under weight, 30' casing, 33' hole			
SS	WOH	SJGB019-604 SL0850 1325	2.0	~~10-12~~ SG 13-15 (33-35)	11		Very soft, moist, dark grey silty CLAY			102
	5				12		@13.6' grades to loose grey. medium Silty SAND with clay lamations		60	40
~~ST~~	~~PUSH~~	~~SJGB019-604 SL0851~~		~~SG 35-37~~	13					
					14					
					15					
ST	PUSH	SJGB019-604 ~~SL0851~~ SG 1345		15-17 (35-37)	16		No Sample recovered, hit rock or gravel? bent Shelby. Sheared off bolts			
					17					
					18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-4

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	WOH	SJGB-019-GO5	2.0	20-22	21		Stiff, dry to damp, yellowish brown CLAY			100
	4	SL0851		(40-42)			reddish brown layer @ 20.1'			
	8	1400			22		PP: 2.25, VT: 4.25			
	11				23					
					24					
					25					
ST	PUSH	SJGB019-GO6	1.0	25-27	26		SAA @ 20'			
		SL0852		(45-47)						
		1425			27					
					28					
					29					
					30					
SS	7	SJGB019-GO7	1.7	30-32			Sluss on top of sample.			
	13	SL0853			31		Hard, dry. reddish brown CLAY			100
	20	1450			32					
	26				33					
					34					
					35					
SS	WOH	SJGB019-GO8	2.0	35-37	36		Very soft, moist, orange brown			100
	~~WOH~~	SL0854					mottled with bluish grey clayey SILT			
	WOH	1530			37					
	3				38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-5

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: in. by ft

BORING # SJGB019
DATE BEGAN 12/2
DATE COMPLETED 12/3
TOTAL DEPTH ~~62~~ 57'
PAGE 3 OF 3

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	SAMPLING DATA: RECOVERY (ft recovered/ft driven)	SAMPLING DATA: DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
		Field location of boring								
SS	7	SJGB019-09	2.0	40'-42'						
↓	11	SL0855		(60-62)	41	CL	Hard, dry, reddish brown marbled with bluish grey CLAY			10
↓	17	1600								
↓	26				42					
					43					
					44					
SS	AUGH	SJGB019-G10	2.3	45-47'	45		SAA @ 40'			
↓		SL0856		(65-67)						
↓		1630			46					
					47					
					48					
					49					
SS	6	SJGB019-G11	2.0	50-52	50		Stiff, dry to damp, light bluish grey to dark grey CLAY. Woody fragments when broken apart			10
↓	7	SL0857			51					
↓	10	0840								
↓	14	↓		↓	52					
					53					
					54					
SS	4	SJGB019-G12		55-57'	55					
↓	8	SL0858			56		Stiff dark grey dry to damp CLAY grades to SILTY CLAY @ 56.5			10
↓	6	~~0920~~ 915								
↓	13				57					
					58					
SS		SJGB019-G13		~~60-62~~ 59'	59		Driller hit sand @ ~57', brought up drill head and slurry of WET sand spilled out			
↓		SL0859			60		Sample w/ approx depth taken, no SPT			
					61					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

light grey SAND w/ very little silt 80:20
end of boring @ 935

Attachment Figure A.2-6

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches

BORING # SJGB020
DATE BEGAN 12/1/2018
DATE COMPLETED 12/2/18
TOTAL DEPTH
PAGE 1 OF 3
SAMPLING METHOD 3 in. by 2 ft

Field location of boring
Water depth to TOD: 10'
Water depth to ML: 6' (WL to TOD: 4')

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	9 7 11 9	SJGB020-G01 ~~SL0832~~ SG 1245	0	0-2' (10-12')	1		NO Sample Recovered (rock in catcher) Shell Fragments inside + around spoon.			
					2					
					3					
					4					
SS	1 2 WOH WOH	SJGB020-G02 SL0832 1255	1.0	4-6' (14-16')	5		very loose, moist to wet, dark grey SAND with gravel (picture labeled G01)	5	90	5
SS	WOH WOH WOH WOH	SJGB020-G03 SL0833 1300	2.0	6'-8' (16-18)	7		very loose, wet dark silty Sand		80	20
SS	WOH WOH WOH WOH	SJGB020-G04 SL0834 1325	1.7	8'-10' (18-20')	9		very loos, moist, dark grey silty SAND with Clay	5	60	35
					0					
ST	PUSH	SJGB020-G05 1335	—	10'-12' (20-22')	1		NO Sample recovered			
					2					
ST	PUSH	SJGB020-G06 SL0835 1350	0.4	12-14 (22-24')	3		~~SAND~~ Clayey Silt recovered.			
					4					
SS	WOH WOH WOH	SJGB020-G07 SL0836 1415	2.0	15-17 (25-27')	5		very soft dark grey, damp silty CLAY grades to silty gravel @15.8'	5 60	~~10~~ 85 40	
					6					
ST	PUSH	SJGB020-G08 SL0837 1425	0.6	17-19	7					
					8					
~~SS~~		~~SJGB020-G10~~ SG ~~SL0838~~			9					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB020
DATE BEGAN 12/1/2018
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	SAMPLING DATA: RECOVERY (ft recovered/ft driven)	SAMPLING DATA: DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	5	SJGB020-G10	2.0	20-22	21		loose, damp to moist light grey, med to		100	
↓	6	SL0838		(30-32)			coarse SAND.			
↓	6	1435			22		@22'; Beaumont: reddish brown CLAY		10	90
↓	13				23					
					24					
SS					25					
SS	2	SJGB020-G11	1.9	25-27	26	CH	Stiff, damp, Orangish brown +			100
↓	4	SL0851		(35-37)			bluish grey CLAY			
↓	6	1505			27		laminations of fine wet SILT @ 26'			
↓	10				28					
					29					
					30		Stiff, damp, yellowish CLAY			100
SS	1	SJGB020-G12	2.0	30-32	31					
↓	6	SL0840		(40-42)						
↓	6	1520			32					
↓	8				33					
					34					
					35					
ST							SAA @ 30'			
↓	PUSH	SJGB020-G13	2.0	35-37	36					
↓	↓	SL0841		(45-47)						
↓		1540			37					
					38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-8

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB020
DATE BEGAN 12/11/2018
DATE COMPLETED 12/12/18
TOTAL DEPTH 62'
PAGE 3 OF 3

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	8	SJGB020-G14	2.0	40-42	41		Hard, dry, orangish brown CLAY			10
↓	16	SL0842					~~OS~~ VT: .7			
↓	22	1620			42		PP: 74.5 TSF			
	29				43					
					44					
					45					
ST	PUSH	SJGB020-G15	2.3	45-47	46		SAA @ 40'			100
↓	↓	SL0843		(55-57)						
		0820 (12/12)			47					
					48					
					49					
SS					50					
↓	WOH	SJGB020-G16	2.0	50-52	51		SAA @ 40'			
↓	⊥	SL0844		(60-62)						
↓	11	0840			52					100
					53					
					54					
					55					
SS	5	SJGB020-G17	2.0	55-57	56		very stiff, dry to damp, greenish gray CLAY			
↓	8	SL0845					@ 56.3' grades to Silty CLAY			
↓	12	0920			57					100
	23				~~58~~ 60					
SS		SSGB020-G18		(60'-62'	~~59~~		SAA @ 56'			
↓		SL0846			61					
		0950			~~60~~ 62		end of boring @ 1000			

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-9

ANCHOR QEA

SOIL BORING LOG

1130 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB021
DATE BEGAN 11/30/18
DATE COMPLETED 12/1
TOTAL DEPTH
PAGE 1 OF 3

Field location of boring
Water Depth = 11' to TOD
WL to ML = ~~8~~ 7.5' (WL to TOD = 3.5')

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	16	SJGB021-G01	0.4	0-2	1	SC	~~OH~~ 0-1': V. soft, wet, black SILT w/ substantial shell hash.	-	-	100
	2	SL0821		(11-13)	2		1-2': soft, wet, gray, clayey SAND (fine)	-	70	30
	3	1145			3					
	1				4					
SS	WOH	SJGB021-G02	0.7	4-6' ~~15-17~~		CL	SA 1-2' above. ~~V. Cly~~		~~60~~	~~40~~
		SL0822		15-17	5		Grades to V. silty, sandy CLAY	-	30	70
		1155								
SS	1	SJGB021-G03	~~0.5~~	6'-8' (17'-19')	6					
	3	SL0823	1.0		7		G-8: ~~SAA~~ Grades to slightly sandy CLAY		~~42~~	95
	WOH	1220								
	WOH				8		@ 8': Rock blocking shoe.			
ST	Push	SJGB021-G04	0	8-10						
		Tube Damaged		19-21	9					
		1330								
					10					
		Casing fell								
					11					
					12					
ST	Push	SJGB021-G05	0.9	12-14						
		SL0824		(23-25)	13		SA 6-8' above			
		1345								
					14					
SS	WOH	SJGB021-G06	2.0	14-16						
	3	SL0825		(25-27)	15		V soft, moist, dark grey CLAY to 14.9'		5	95
	3	1400					@ 14.9': ~~laminations of~~ 36 fine to med sand with laminations of CLAY		70	30
	5				16					
					17					
					18					
SS	2	SJGB021-G07	1.4'	50 19-21	19		very loose moist grey sand, clean SAND		~~100~~ 95	5
	1	SL0826		(30-32)						
	1	1415			20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # 021
DATE BEGAN 11/30
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	6	SL0826	1.4	19-21	21		See previous page			
					22					
					23					
					24					
SS	9	SJGB021-G08	—	24-26'	25		No sample recovered, Hammer fell 29'-31'			
	26	~~SL0827~~ SG		(35-37)						
	25	1435			26					
	21									
					27					
					28					
					29					
SS	7	SJGB021-G09	1.7'	29-31	30		very stiff, damp to dry, orangish to reddish brown CLAY			108
	12	SL0827		(40-42)						
	17	1455			31		PP: 74.5, 4.0 TSF			
	25						VT: 5.75			
					32					
					33					
					34					
SS	6	SJGB021-G010		34-36	35		SAA @ 29'			100
	9	SL0828		(45-47)						
	16	1530			36					
	20									
					37					
					38					
ST	PUSH	SJGB021-G011	2.3	39-41	39		@ Top SAA @ 29'			
		SL0829		(50-52)			graded to bluish grey CLAY at bottom			
		1550			40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: ~~Casey Janisch~~ Sam Giannakos
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB021
DATE BEGAN 11/30
DATE COMPLETED 12/1
TOTAL DEPTH 56'
PAGE 43 OF 43

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
ST	PUSH	SL0829			41					
					42					
					43					
					44					
SS	11	SJGB021-G12	2.0	44'-46'	45	MH	SG [redacted], Hard, damp, light grey SILT			10
↓	21	SL0830		(55-57)						
	37	1630								
	39				46					
					47					
					48					
~~SS~~		~~SJGB021-G13~~ SG	2.0	49-51'	49		SAA @ 44', grades to fine sandy grey SILT		10	90
SS	12	SL0831			50					
↓	21	SJGB021-G13								
	33	0830			51					
	32									
					52					
					53					
~~ST~~ SG										
ST	PUSH	SJGB021-G14		~~54-56'~~ 54-56'	54		No sample recovered			
↓	↓				55					
					56		---- end of bore @ 1000			
					57					
					58					
					59					
					60					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-12

ANCHOR QEA

SOIL BORING LOG

1300 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJGB022
DATE BEGAN 11/29/18
DATE COMPLETED 11/30/18
TOTAL DEPTH 21 BML
PAGE 1 OF 3

Field location of boring: Mudline @ −11 ft from WL @1200 & 14 ft TOD

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	1	SJGB022-G01	0	0-2	1	CL	No Recovery			
↓	4	~~SL0811~~ CT								
	10	1310								
↓	33				2		@1.5' → hammer bouncing →			
				CT 2-4						
					3					
					4					
					5		5-6.8			
SS	WOH	SJGB022-G02	1.6	5-7			V. Soft, wet, olive gray slightly silty CLAY	–	5	95
↓	↓	SL0811		19-21	6					
		1340					6.8-7: Lense			
ST	Push	SJGB022-G03	1,8	7-9'	7	SM	V loose, wet, olive gray, V. silty F. SAND	–	60	40
↓	↓	SL0812			8	CL	ST: Top + Bot: ~~½~~ soft, wet, grey CLAY			
		1400					as 5-6.8' above			
					9					
					10					
SS	WOH	SJGB022-G04	2.0	10-12						
↓	↓	SL0813		(24-26)	11		SAA CLAY. silty. No plasticity, Moist	–	–	100
		1420			12					
					13					
					14					
~~SS~~	~~WOH~~	~~Slough~~ CT					14.5-15 Slough			
SS	WOH	SJGB022-G05	2.0	15-16.5	15		15-16.5: SAA.			
	↓	SL0814		(29-31.5)	16					
		1455								
					17					
					18					
					19					
					20	CH	@19.5': Beaumont CLAY			

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-13

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches SAMPLING METHOD: in. by ft

BORING # SJGB022
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF 3

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	5	SJGB022-606	1.8	20-22	21	CH	V. Stiff, damp, bluish-gray Beaumont CLAY			
↓	10	SL0815					@21.1': grades to bluish-gray & L. brown mottling			
↓	17	1530			22		@21.9': grades to gravelly			
↓	29				23		@20.7': lense of silty f-m SAND. Gray			
							PP = 3.75 - 4.5+ TSF			
					24		VT = 1.25; 1.225, kg/cm²			
					25					
SS	9	SJGB022-607	1.9	25-27			Hard, damp to dry, orangish brown CLAY	-	-	100
↓	14	SL0816			26					
↓	21	1620			27		- @27' end day 11/29			
↓	27						resume 11/30			
					28					
					29					
					30					
ST	Push	SJGB022-608	2.3	30-32 (44-46)	31		SAA			
↓	↓	SL0817			32					
		0825			33					
					34					
SS	5	SJGB022-609	2.0	35-37 (49-51)	35	CH	Hard, damp to dry, orangish brown CLAY	-	-	100
↓	13	SL0818			36		SG PP: 3 to 3.5 TSF			
↓	18	0855			37		VT = .675 x 2.5			
					38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
SAMPLING METHOD: in. by ft

BORING # SJGB022
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	SAMPLING DATA: RECOVERY (ft recovered/ft driven)	SAMPLING DATA: DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
5 ← 55		SJGB022-G10	2.0	40-42	40	CH	very stiff, damp to dry, bluish gray CLAY	–	–	100
10 →		SL0819		(54-56)	41		PP: 3.25 TSF			
14 →		0930			42		VT: .275 x 2.5 =			
21 → 50/1					43					
					44					
SS	6	SJGB022-G11	2.0	45-47	45	SC	~~SILTY SAND~~ SC, damp, greenish gray	–	90	10
↓	9	SL0820		(59-61)			loose to med dense CLAYEY SAND			
	9	1000			46		Slightly more clayey sand grades to 90% sand 10% fns at 46'.			
	10				47					
					48		End @ 47' 11/30/18 @ 1015			
					49					
					50					
					51					
					2					
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					0					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.2-15

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN 12/4
GEOLOGIST/ENGINEER Sam Giannakos DATE COMPLETED 12/4
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD Sonic SHEET 1 OF 3
HOLE DIAMETER 6in Sample: 3" diam, 2' long

Field location of boring
depth to TOP: 7'
water: 3 ft

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
		SS	SJGB	023		WOH	0-2			black shiny grades to soft silty CLAY
				6-01		WOH	(7-9)	1		odorous damp to moist, @ .5'
			SL08	73		2				
				1000		3		2		
		SS	SJGB	23	1.6	WOH	2-4			SAA @ .5 ft
				602		3	(9-11)	3		
			SL08	74		3				
				1010		4		4		
		SS	SJGB	023	1.6	WOH	4-6			Soft, damp, light grey fine sandy SILT
				603		3	(11-13)	5		
			SL08	75		5				
				1020		7		6		
		SS	SJGB	023	2.0	WOH	6-8			SAA to 6.7'
				604		3	(13-15)	7		@ 7' grades to loose wet silty SAND
			SL08	76		1				light grey
				1030		WOH		8		
		SS	SJGB	023		WOH	8-10			loose, damp to moist, light grey silty SAND
				605	1.8	1	(15-17)	9		
			SL08	77		2				
				1040		4		10		
		ST	PUSH	SJGB02 606 SL08 78	1.7	/	10-12			fine light grey wet SAND
						/	(17-19)	11		
				1055		/				
						/		12		
		SS	SJGB	023	2.0	5	12-14			loose moist light grey fine to med SAND
				607		8	(19-21)	13		with pockets of clay
			SL08	79		5				
				1115		3		14		
								15		
		SS	SJGB	023	3	1, 4	18-20			loose, SAA @ 12'
				80	3		(25-27)	16		
			SL08	608	2					
				1130	5			17		
								18		
								19		
								20		

Remarks:

Attachment Figure A.2-16

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN
GEOLOGIST/ENGINEER DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD SHEET 2 OF 3
HOLE DIAMETER

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
		~~SS~~	~~SJGB~~	~~023~~	~~SG~~		~~2~~			
				~~609~~				21		
			SL08	81						
								22		
		SS						23		
			SJGB	023 609	1.0	8	23-25			med dense, wet, med grain clean SAND 100/
			SL08	81		10		24		
				1145		10				
						10		25		
								26		
								27		
								28		
		SS	SJGB	023	2.0	11	28-30'			med dense, moist, light grey coarse sand 100,
				610		15		29		layer above stiff bluish CLAY (dry) @29.6' 0, 10
			SL08	82 83		12				
				1200		13		30		SJGB023G10A: 28-29.6' (SL0882)
										SJGB023G10B: 29.6-30' (SL0883)
								31		
								32		
								33		
		ST	SJGB	023	1.8	Push	Push			SAA @ 29.6'
				611			33-35	34		
			SL08	84						
				1410				35		
								36		
								37		
								38		Stiff, dry, orangish brown CLAY 0,0,100
		SS	SJGB	023	2.0	6	38-40'			VT: 0.25
				612		10		39		PP: 4.25 TSF
			SL08	85		13				
				1425		20		40		

Remarks:

Attachment Figure A.2-17

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJGB023
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN
GEOLOGIST/ENGINEER DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD SHEET 3 OF 3
HOLE DIAMETER

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
		SS	SJGB023	023	2.0	2	43-45	41		V. stiff dry reddish orange grading to bluish grey CLAY (damp) 0 0 100
				618		9				
			SL08	86		12		42		
				1445		17				
								43		
								44		
								45		
								46		
								47		
								48		
		SS								
			SJGB	023	2.0	9	48-50	49		V stiff, dry, bluish grey silty CLAY 0,0,100
				G14		12				grades to higher silt content w/ depth
			SL08	87		18				
				1515		24		50		
								51		
								52		
								53		
		ST	SJGB	023	1.6	PUSH	53-55			SAA @ 49'
				G15				54		Full sample (2.0) ~4in crumbled off
			SL08	[illegible]						of bottom before recovery; silty
				1355				55		
								56		
								57		
								58		
		SS	SJGB	023	1.6	1	58-60			SAA, clayey dry SILT, grades to 0 0 100
				G16		14		59		wet fine light grey Sand @ 59.5' 0 100 0
			SL08	88+89		20				SJGB023 G16A, SL0588 @ 58-59.3
				1415		16		60		SJGB023 G16B, SL0589 @ 59.3-60

Remarks:

End of boring at 1615

Attachment Figure A.2-18

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB028
DATE BEGAN 11-19-18
DATE COMPLETED 11/19/18
TOTAL DEPTH 37
PAGE 1 OF 2

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
							Field location of boring			
SS	80	SJSB028-G01	1.0	0-2	1	Fill	0-0.8: brown, damp, v. dense sandy silty GRAVEL	70	10	20
↓	7	0850				ML	0.8-2: stiff, moist, dk brown slightly sandy SILT			
↓	16	SL0699			2					
↓	16 11									
SS	1	SJSB028-G02	1.6	2-4	3	CL	2-13.2: soft, moist, gray CLAY w/ trace organic matter + trace gravel, silty.	5	5	90
↓	2	1085								
↓	4	SL0800			4					
↓	26									
SS	1	SJSB028-G03	0.8	4-6	5		4-6 SAA			
↓	2	1015								
↓	1	SL0801			6					
↓	2									
SS	2	SJSB028-G04	2.0	6-8	7		6-8: SAA. Thin laminations of v. silty f. SAND and sandy CLAY. moist to wet			
↓	1	1030								
↓	3	SL0802			8		SAA			
↓	2						@ 8.6: ~~sub~~moderate organic fibers.			
SS	2	SJSB028-G05	2.0	8-10	9					
↓	1	1045								
↓	1	SL0803			10		Substantial organic fibers @ 10.3' + 10.6'			
↓	1	SG, GS, AL								
SS	2	SJSB028-G06	2.0	10-12	11		@ 11-11.5: 2 thin lam. of l. brn silty f. SAND			
↓	1	1100								
↓	WOR				12					
↓	1									
SS	2	SJSB028-G07	2.0	12-14	13					
↓	1	1115								
↓	1				14	ML	13.2-13.9: l. olive gray, v. soft, moist v. sandy SILT.	—	35	65
↓	1					CL	13.9-14.6: SA 2-13.2' above			
SS	1	SJSB028-G08	2.0	14-16	15	SM	14.6-16.9: l. gray, moist, v. loose, v. silty f. SAND. Trace lam. of gray CLAY	—	70	30
↓	1	1130								
↓	1	SL0804			16					
↓	1									
SS	WOH	SJSB028-G09	1.7	16-18	17	CL	16.9-20' v. soft, moist, gray, no plasticity CLAY.	—	—	100
↓	↓	1140								
↓	↓				18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: 1600 → Push ST 5-9' → driller over-pushed, Confirm as Clay is compact @ Top + Bottom. Try ST 9-11' instead.

1610 → Push ST 9-11' → Gray, Soft CLAY @ bottom. 1.5' recovery. ~~SL0804~~ CJ SL0810

Attachment Figure A.3-1

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB028
DATE BEGAN 11/19/18
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
ST	Push	SJSB028-G10 1335 SL0805	1.8	20-22	21	ML	Gray, moist, soft, v. sandy, clayey SILT	-	30	70
					22					
					23					
					24					
					25					
SS	WOH	SJSB028-G11 SL0806 1355 GS, SG, AL	2.0	25-27	26	CL	AOPP 16-20'			
					27					
					28					
					29					
					30					
SS	WOH	SJSB028-G12 1420 SL0807 ~~11~~	2.0	30-32	31		SAA			
					32					
					33					
					34					
					35		35-35.7' SAA			
SS	2 8 12 16	SJSB028-G13 1435 SL0808 SL0809	2.0	35-37	36	CH	35.7-37': Beaumont CLAY			
					37					
					38		End @ 37' @ 1445			
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-2

(TW014)

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING #: SB029
DATE BEGAN: 11/6/18
DATE COMPLETED: 11/6/18
TOTAL DEPTH: 40'
SHEET 1 OF 2

Field location of boring



OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
		SONIC	~~0505~~	0600						DK BRN - BL PEAT, ROOTS MOIST SILT SOME CLAY & VF SAND MOIST
		CRT						1		
		CRT						2		
			~~0507~~	0601						
								3		
		CRT								AHEAD ON 11/7/18 (moved over feet to shelby tube 5-7' SL 0612)
		~~0502~~	~~0502~~	0602				4	ST PULL	WET @ 5'
								5	SL 0612	SAND VF LIGHT GREY
		CRT						6		Some silt, little clay, clayer lense 5.5-6.0
			~~0503~~	0603						
								7		as 0-5 occ thin 1" sandier zones
		CRT						8		
			~~0504~~	0604						As ~~6-8~~ 5-6 CRT
								9		
		CRT						10		
			~~0505~~	0605						AS 0-5
								11		
								12		
								13		
										CRT
								14		
								15		SAND LIGHT GREY f-m little silt trace clay & rootlets 12.5-15
	GS, SG			0606						
								16		
								17		Same as 12.5-15
								18		Dk brn black clay & silt some vf sand & shells plastic
								19		
								20		

Remarks:

Attachment Figure A.3-3

TW014

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING # SB029
DATE BEGAN 11/6/18
DATE COMPLETED 11/6/18
TOTAL DEPTH 40'
SHEET 2 OF 2

Field location of boring: See pg 1

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	SG, AL		0607					21		as 17.5-20, 2" sand lenses @ 20.7 & 21.5
								22		
								23		
								24		heaving material fry 30-33
								25		
			0608					26		SHELBY TUBE
								27		
								28		saa 25-27.5 saa soupy
								29		
								30		
			0609					31		SHELBY TUBE 1450
								32		saa
								33		
								34		
								35		34.9-35 co light brn sand
	GS		0610	35-36.5				36		co sand & gravel shells
	AL							37		grey green v hard clay
								38		grading to tan-brn @ 39
								39		
			0611		39.5-40			40		BEAUMONT CLAY

NOTE: INTERGRAL TOOK PHOTOS OF 0-10 AQ 22' + 16'

Remarks:

Attachment Figure A.3-4

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB030
DATE BEGAN 11/18/18
DATE COMPLETED 11/18/18
TOTAL DEPTH 40
PAGE 1 OF 2

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	19	SJSB030-G01	2.0	0-2	1	Fill GM	0-1.8: damp, dense, brown, silty sandy GRAVEL	60	15	25
	24	1050								
	29	SL0688			2					
	21					ML	1.8-4.6: damp to dry, ~~hard~~ V. stiff, slightly sandy SILT	-	10	90
SS	2	SJSB030-G02	0.9	2-4	3					
	7	1055					@3.6: grades to intermixed w/ yellowish-brown, dry, v. silty F. SAND.			
	12	SL0689			4	ML/SM				
	15					ML	4.6-5.2: loose of damp, light olive brown, v. sandy SILT	-	30	70
SS	1	SJSB030-G03	2.0	4-6	5	CL	5.2-6 dk gray, moist, stiff, sandy silty, low plasticity CLAY.			
	4	1120				ML	6-6.4: SA 1.8-4.6' above, moist			
	8	SL0690			6	CL	6.4-7.1: dk olive gray, moist, m. stiff CLAY	-	-	100
	9					ML	7.1-11.4: dk brown, damp, stiff, sandy SILT	-	20	80
SS	2	SJSB030-G04	2.0	6-8	7					
	4	1125					8-10 SAA. grades to olive gray.			
	5	SL0691			8		@9.7-10': substantial shell hash.			
	8									
SS	WOH	SJSB030-G05	1.8	8-10	9					
	↓	1135								
	2	SL0692			10					
	6	AL, SG								
SS	3	SJSB030-G06	2.0	10-12	11					
	7	1150								
	8				12	SM	11.4-14.6: moist, m. dense, l. gray w/ l. brown mottling; v. silty SAND (v. fine SAND)	-	60	40
	9									
SS	WOH	SJSB030-G07	1.7	12-14	13		12-14: SAA			
	9	1200								
	10				14					
	10									
SS	WOH	SJSB030-G08	2.0	14-16	15	CL	14.6-15.1: lense of gray, moist soft, CLAY	-	-	100
	2	1215				SP/SM	15.1-16; wet, louse, l. gray v. fine silty Sand. occassional laminations of gray & dk gray CLAY throughout	-	80	20
	4	SL0693			16	SM				
	4	GS				CL	16-16.5: SA 11.4-14.6' above			
SS	WOH	SJSB030-G09	2.0	16-18	17					
	1	1225				AAA	16.5-20: dk gray grading to gray; v. soft, moist slightly sandy CLAY. Truce organic fibers.	-	5	95
	1	~~SL0694-CT~~			18					
	2									
					19					
					20					

marks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0698 → ST → 8-10', 11/18/18;

Attachment Figure A.3-5

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches

BORING #
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH: 40'
PAGE 2 OF 2
SAMPLING METHOD: 3 in. by 2 ft

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
ST	Push	SJSB030-G10 1340 SL0694	2.0	20-22	21	SM	Gray v. silty F. SAND in ST			
					22					
					23					
					24					
					25					
SS	12	SJSB030-G11 1400 SL0695	0.3	25-27	26	SM	Wet, m. dense, gray silty F. SAND Heaving sands → replaced catchers in SPTs	–	90	10
	15									
	13									
	13				27					
					28					
					29					
					30					
SS	10	SJSB030-G12 1415 SL0696 SG, AL, GS	0.5	30-32	31		SAA			
	15									
	15				32					
	13									
					33					
					34					
					35					
SS	10	SJSB030-G13 SL0697 1430		35-37	36					
	29									
	11				37					
	9									
					38		Beaumont CLAY (v. stiff, damp, l brown)			
					39					
					40		End @ 40' @ 1445.			

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

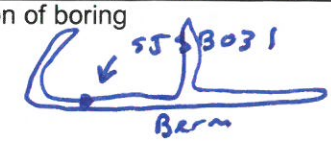
Notes:

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB031/TW01
PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN 11/8/18
GEOLOGIST/ENGINEER Torell DATE COMPLETED
DRILLING CONTRACTOR: Cascade TOTAL DEPTH
DRILLING METHOD 4x6 sonic + AUTO HAMMER SHEET 1 OF
HOLE DIAMETER 6"

Field location of boring



OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	910	SS	0613			12				TAN BRN f-m sand, some clean
						15		1		fill gravel little silt + clay
						16				grading to brn at 2'
						15		2		
	920		0614			9				as above integral
						13		3		has 0-18
						15				pics
						9		4		
	930	SS	0615			4			RRT	as above grading to grey
						4		5		5.5-6.0 black peat, roots
						4				~~Shelby tube 11/10/18 SL0627~~
						5		6		~~pull ahead~~
	945	SS	0616			7				as 4.0-5.5 occ rootlets, interbedded
						5		7		wet, bedding decreasing w/ depth
	955					4				ST T24, 5-7 poor recovery
						5		8		0800 SL0627
SG	300# hammer	SS	0617			5				as above
GS						5		9		
AL				HOLD		8				
						13		0		
	1015	SS	0618		WEIGHT OF HAMMER					as above
					3	~~WOH~~	CRT	1 1		
				HOLD		5				TAN BRN F-M SAND TRACE
	11/9/18					11		1 2		SILT, WET
	~~1025~~	SS	0619			?				saa, wet
	830					?		1 3		
						6				
						9		1 4		
	840	SS	0620			4				saa, dkbrn 14-15, tanbrn
						8		1 5		15-16
						13				
						9		1 6		
	905	SS	0621			WOH				saa tan brn dkbrn
						WOH		1 7		16.8-17.2 greying w/
						1				depth
						4		1 8		
		NS			NS					
								1 9		
								2 0		

Remarks:

Attachment Figure A.3-7

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Terell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 4x6 Sonic 300# auto hammer
HOLE DIAMETER: 6"
BORING #: SJSB031/MW01
DATE BEGAN: 11/8/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 2 OF

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
SG		SS	0622			2				SAND GREY med Some fine sand
GS						1		2 1		trace silt wet
AL						WOH				
						2		2 2		
								2 3		
								2 4		
								2 5		
		SS	0623			9				poor recovery (~8") saa
						18		2 6		
						19				
						15		2 7		
								2 8		
								2 9		
		SS						3 0		
	1140	SS	0624			3				saa
						5		3 1		
						7				
						4		3 2		
								3 3		
								3 4		
	1200	SS	0625					3 5		saa greyplastic clay large 2" thick @ 36'
						26				
						27		3 6		
						21				
						24		3 7		
	1345	ST	0626							Attempt shelby tube 37-39
								3 8		as above in top
								3 9		
								4 0		Beaumont in tip set well at 38'

Remarks:

have to overdrill to 40' to seal hole, backfill w/ pellets 40-38

ANCHOR QEA

SOIL BORING LOG

1400 Start

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB032
DATE BEGAN 11/17/18
DATE COMPLETED
TOTAL DEPTH
PAGE 1 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	3	SJSB032-G01	1.2	0-2	1	Fill GM	0-1.5': d moist, med. dense, brown, silty Sandy Gravel (Fill).	60	15	25
	8	1405								
	10	SL0675								
	7				2	ML	@ 1.5': grades to dk gray to black, damp, mod. stiff SILT.	–	5	95
SS	4	SJSB032-G02	1.7	2-4			@2.0': Liner (fabric, geotextile, fabric)			
	6	1410			3	SM	2-2.7 SAA			
	9	SL0676					2.7-4.3 brown, damp to dry, m. dense, very silty f. SAND. PP = 2.25 to 3.0 tsf	–	70	30
	10				4					
SS	5	SJSB032-G03	2.0	4-6		CL	4.3-~~5.0~~ 4.7': dk brown, damp, stiff sandy CLAY	–	30	70
	6	1420			5	SC	4.7-5.0': grades to clayey SAND	–	60	40
	12	SL0677				CL	5-5.3': m. dense, damp, gray silty SAND			
	21				6		5.3-5.9': v. stiff, gray, damp sandy CLAY			
SS	WOH	SJSB032-G04	2.0	6-8		CL/OL	@ 5.6 grades to dk. gray			
	4	1435			7	CH	5.9-6.9': dk gray, moist, CLAY w/ mod. organic fibers (Peat)	–	15	85
	5	SL0678					6.9-~~7.0~~': v. stiff, damp, gray sandy silty CLAY w/ ~~high~~ low plasticity (6.9-10.6)			
	7				8		~~9': light gray~~ CT			
SS	4	SJSB032-G05	2.0	8-10	9					
	7	1445								
	7	SL0679			10		10.6-			
	10	AL, SG								
SS	1	SJSB032-G06	2.0	10-12	11	SM	f. gray, damp, m. dense, v. silty f. SAND	–	70	30
	5	1505								
	6	~~SL0680~~ GS			12					
	8									
SS	2	SJSB032-G07	1.5	12-14			SAA, Grades to loose, moist.			
	2	1515			13		@ 13.5-13.8': lense of soft, moist, dk gray SILT			
	3									
	4				14					
SS	WOH	SJSB032-G08	1.1	14-16		SM	@ 14': grades to v. loose, wet, silty f. SAND (heaving)	–	90	10
	↓	1530			15					
	3	SL0680								
	3	GS			16					
SS	3	SJSB032-G09	2.0	16-18			16-18 SAA			
	1	1546			17					
	1									
	3				18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0686, 5-7', 11/18/18 0850, 2.3', sandy CLAY @ bottom.
SL0687 10-12' 11/18/18 0905, clayey, silty SAND @ bottom.

Attachment Figure A.3-9

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB032
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	4	SJSB032-G10	1.7	20-22	21	SM	AOPP. Shell fragments (trace)			
	4	1550								
	8	SL0681			22					
	7									
					23					
					24					
					25					
SS	10	SJSB032-G11	1.7	25-27			SAA			
	8	1610			26					
	5	SL0682			27					
	7									
					28					
					29					
					30					
SS	7	SJSB032-G12	1.	30-32			SAA.			
	12	1635			31					
	10	SL0683			32					
	8									
					33					
					34					
					35					
SS	4	SJSB032-G13	1.6	35-37			SAA. Shell fragments + halves (trace).			
	5	1650			36					
	6	SL0684			37					
	9	GS								
					38	?	Beaumont CLAY. Driller estimates interface @ 38' based on casing resistance.			
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-10

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SBSD032
DATE BEGAN 11/17/18
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	SAMPLING DATA: RECOVERY (ft recovered/ft driven)	SAMPLING DATA: DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	7	SJSB032-G14		40-42	41		Beaumont CLAY. V. Stiff, damp, orangish-brown, high plasticity CLAY.	-	-	100
↓	8	1705								
	14	SL0685			42					
↓	17	SG, AL								
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					0					
					1					
					2					
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					0					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-11

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 8 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB033
DATE BEGAN 11-12-18
DATE COMPLETED 11-14-18
TOTAL DEPTH 40
PAGE 1 OF 2

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	2	SJSB033-G01	0.6	0-2		SP	Damp, brown, m. dense f-c SAND. Trace silt ~~clay~~ cg.	-	80	20
	5	~~SL0640 No Sample~~			1		Trace organic roots/fibers			
	9	1540 SL0640								
	42	11-15-18 0820			2		2-2.5: moist, v. loose, brn f. SAND	-	95	5
SS	1	SJSB033-G02	2.0	2-4						
	1	SL0641			3	SC	2.5-4: moist, loose, gray clayey f. SAND	-	80	20
	2	1550								
	3				4		4-4.2: Rock, 4.2-4.5: dk gray, moist, soft CLAY			
SS	4	SJSB033-G03	1.3	4-6			4.5: m. stiff, moist, grays, sandy CLAY.			
	3	SL0642			5	CL	occasional organic material. Trace f. sand			
	2	1605					Laminations			
	2				6					
SS	6	SJSB033-G04	1.8	6-8	SL0649 0900		SAA			
	7	SL0643			7					
	3	1625								
	4	SG, AL			8					
SS	2	SJSB033-G05	1.9	8-10			SAA. Trace Org. mat.			
	2	SL0644			9					
	3	1635								
	3				10	SC	@9.5: grades to loose clayey SAND	-	60	40
SS	18	SJSB033-G06	1.7	10-12		~~SC~~	@10: grades to dk gray to brn-gray slightly sandy			
	15	1655			11	CL	CLAY.			
	10						@11.2: Gravel up to 0.2'			
	10				12	SM				
SS	4	SJSB033-G07		12-14			11.4-14.6: damp, m. dense, l. gray w/ brown mottling			
	4	1705			13		slightly silty f. SAND.	-	90	10
	4						12-14: SAA			
	8				14		14-14.6 SAA			
SS	15	SJSB033-G08	1.9	14-16			14.6-16 grades to light gray.			
	14	SL0645			15		Sandy CLAY laminations @ 14.7' & 15.6'			
	5	1035								
	5	SG AL GS			16					
SS	~~3~~ 5	SJSB033-G09	2.0	16-18			SAA light gray to gray, wet, loose sand, clayey/silty	-	90	10
	4	1045			17					
	3									
	2				18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes: SL0649, 5-7', 0900, 2.3/2, gray sandy CLAY @ bottom

SL0650, 10-12', 0920, 2.3/2, brown silty SAND @ bottom

Attachment Figure A.3-12

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER 8 inches
SAMPLING METHOD 3 in. by 2 ft

BORING # SJSB033
DATE BEGAN 11/12/18
DATE COMPLETED 11/14/18
TOTAL DEPTH 40.
PAGE 2 OF 2

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	25	SJSB033-G10	1.1	20-22	21	SM	Try ST @ 20' → no penetration. ST Dented AOPP. One 1½" x 2" gravel			
↓	10	SL0646								
	9	1135			22					
↓	13									
					23					
					24					
					25		Try ST @ 25-27' → cannot penetrate.			
SS	50/5"	SJSB033-G11	0	0.4	26					
		1200								
		No Recovery			27					
					28					
					29					
					30					
SS	5	SJSB033-G12	0.6	30-32	31	SM	wet, m.dense, gray, f-c, silty gravelly SAND, trace shells. 3"x2" gravel conglomerate of sand + f. gravel	15	70	15
↓	13	1320								
	17	SL0647			32					
↓	9	GS								
					33					
					34					
					35					
SS	1	SJSB033-G13		35-37	36		SAA. No gravel. Shell fragments			
↓	7									
	20 CT				37					
↓	32									
DP		~~SJS~~ CT			38					
						CH	Beaumont CLAY.			
					39		Bluish gray degrading to greenish brown			
		SL0648			40		PP = 2.0 tsf			

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-13

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # SJSB034/TW017
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 11/10/18
GEOLOGIST/ENGINEER TORELL | DATE COMPLETED
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH
DRILLING METHOD 8" sonic | SHEET 1 OF
HOLE DIAMETER 8"

Field location of boring: SJSB034/TW017

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING DATA: SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	1250	SS	0628			10		1	SP	sand f some m sand & silt occ roots brn, grey, dk brn mottled
						11				
						9		2		
						8				
	1300	SS	0629			5		3		as above, little clay
						6				
						5		4		
						5				
	1315	SS	0630			2		5		as above occ shell
						5				
						4		6		
						3				
	1330	SS	0631		2	4		7	SM ML	vf sand & silt little clay, roots, shells dk brn/black peaty wet
					1	7				
					2			8		loose
					7					
	1345	SS	0632			4		9		8-9 as above, shells layer
			0633			2			SP	9-10 grey m sand some f sand & little silt wet
						5		10		ST SL 0639 11/11/18 1015
						7			OL	10-11 peaty clay & silt some roots & shells plastic occ
	1400	SS				WOH		11	SM	11-12 as 9-10 above, shells
						2				
						4		12		
						15			OL	as 10-11, lower 3" grey med sand well, little f sand & silt
	1410	SS	0634			WOH		13		
						9		14		
	1420	SS	0634			9			SP	sand f-m red brn, little silt & clay tight
						12		15		
						15				
						16		16		
	1440	SS				4				as above, grey @ 17.5
						5		17		
						5				
						7		18		
		WS				WS				
								19		
								20		

Remarks:

Integral has pics 0-14

Attachment Figure A.3-14

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: TORELL
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING #: SJSB034/TW017
DATE BEGAN: 11/10/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 2 OF

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	1500	SS	0635			WOH			SP	grey f sand, little med sand & silt
								2 1		gray clay dense 1.5-1.7
						1				
						2		2		
		NS				NS				
								3		
								4		
								25		25-26.2
	1520	SS	0636			WOH			CL	~~35-36.2~~ clay & f sand
						WOH		6		interbeds, grey PP = 0.25 tsf
						4			SP	36.2-37 grey med sand
						3		7		
		NS				NS				try ST ~~27-29~~ 30-32 cont
								8		
								9		
								3 0		
	1550	ST	0637			ST				SHELBY TUBE
								1		
								2		
		NS				NS				
								3		
								4		
								3 5		
	1615	SS	~~0638~~ cont			1				NO Recovery, <1" Med-coarse gravel in spoon
						1		6		
						2				
						3		7		
								8		
								9		
								0		

Remarks:

casey has pics

Attachment Figure A.3-15

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1
PROJECT NUMBER: 180557-01.01 Task 03
GEOLOGIST/ENGINEER: Torell
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: 8" sonic
HOLE DIAMETER: 8"

BORING # SJSB034/TW017
DATE BEGAN: 11/10/18
DATE COMPLETED:
TOTAL DEPTH:
SHEET 3 OF

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	1705	SJ	0638			3		4	GP	40-40.8 f-m gravels & shells
						5		1		40.8-42 BEAUMONT CLAY
				gravel only		12			CH	GREY TO REDBND
						20		2		4.7 Tons/Ft²
								3		Set well @ 41' right on top of BEAUMONT
								4		
								5		
								6		
								7		
								8		
								9		
								0		
								1		
								2		
								3		
								4		
								5		
								6		
								7		
								8		
								9		
								0		

Remarks:

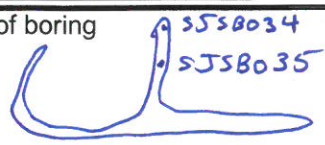
Attachment Figure A.3-16

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # SJSB035
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 11/1/18
GEOLOGIST/ENGINEER TOLL | DATE COMPLETED
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH
DRILLING METHOD 4"x6" SONIC | SHEET 1 OF
HOLE DIAMETER 6"

Field location of boring



OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	1305	SS	0640			17				dk brn S+G some silt + clay, rocks
		↓				15		1		full moist grading to grey f sand little silt
						14				
		↓				12		2		
	1315	SS	SLO640			3				dk brn clay + some silt, little
		↓				5		3		f sand coarsens w/ depth
						6				
		↓				9		4		
	1325	SS	0642			4				Tan brn f sand + silt some clay
		↓				4		5		
						4				
		↓				4		6		
	1340	SS	0643		1.3	1	2			SAA.
		↓				1		7		
						WOH				@ 7.5: 0.2 x 0.1' gravel
		↓				1		8		@ 7.8: grades to V. soft moist, ~~black~~ gray sandy
SG	1350	SS	0644		2	6	2			clay w/ shells
GS		↓				3		9		as 4-6 greying with depth
AL						5				
↓		↓				6		10		
		SS				1				10.0 - 11.5 saa
		↓				2		1		11.5 - 12 dk grey f sand + trace
						3				silt + clay
		↓				5		2		
	1410	SS				7				SAA to 12.5
		↓				7		3		12.5 - 14 tan brn f sand little silt
						13				+ mud sand
		↓				14		4		
	1420	SS	SLO645			4				SAA occ clayier lenses ≤ 1"
		↓				6		5		
						5				
		↓				3		6		
		SS				5				SAA, occ shells
		↓				7		7		
						4				
		↓				3		8		
		NS				NS				
		↓				↓		9		
		↓						20		

Remarks:

Interval was 0-18 pictures

Attachment Figure A.3-17

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB035

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET 2 OF

HOLE DIAMETER

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING DATA: SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION
	1445	SS	0646		WOH	3				SAA
		↓	↓		3	5	CM	2 1		@ 21.8 grey plastic clay
			21.8-23		1	→				
		↓	only		1	→		2		
		NS			NS					
		↓			↓			3		
								4		
		↓			↓			5		
	1500	SS	0647			4				SA upper above
		↓				2		6		
						6				
		↓				11		7		
		NS				NS				
		↓				↓		8		
								9		
		↓				↓		3 0		
	1545	SS	0648			3				occ f-m sand grey, silts
		↓				4		1		
						4				
		↓				4		2		
		NS				NS				
		↓				↓		3		
								4		
		↓				↓		5		
	1600	ST				ST				TRY SHELBY TUBE
		↓				↓		6		ST EMPTY 50 to 40'
		↓				↓		7		heaving sands
		NS				NS				
		↓				↓		8		
								9		
		↓				↓		4 0		

Remarks:

Attachment Figure A.3-18

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # SJSB035

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED 11/12/18

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET OF

HOLE DIAMETER

Field location of boring

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING DATA: SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
	1625	ss	0649			1		1		clean out from 37-40 had 39-40 green gray clay some mottled red brn v hard BEAUMONT check w/ split spoon 40-42
		↓	41-42			7				
						8		2		
						9				
								3		
										40-42
								4		green gray clay fradus to red brn clay
								5		2" gravel layers 40.4 41.0 coarse
								6		grout borings
								7		
								8		
								9		
								10		
								11		
								12		
								13		
								14		
								15		
								16		
								17		
								18		
								19		
								20		

Remarks:

Attachment Figure A.3-19

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB036-GAB
DATE BEGAN 11/16/18
DATE COMPLETED 11/17/18
TOTAL DEPTH 35'
PAGE 1 OF 3

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	3	SJSB036-G01	1.4	0-2.6		Waste	Overpenetrate by 7". V. soft	—	—	100
↓	WOH	SL0664			1		V. soft, moist, bluish-gray to blue, CLAY (waste).			
↓	↓	1430					@ 1.3: grades to dk brown. Hydrocarbon odor			
↓	WOH			~~2-4~~	2					
SS	WOH	SJSB036-G02	2.0	2.6-4	3		SAA. Trace gravel, Bluish-gray, dk brown, + black lenses.			
↓	↓	SL0665								
↓	↓	1435 GS, AL, SG			4		@ 3.6: Moderate organic fibers + yellow wood debris			
SS	5	SJSB036-G03	2.0	4-6						
↓	8	SL0666			5	CH	4-4.7: SAA (v. soft, moist to wet, gray to black silty CLAY) Strong hydroC odor.	—	—	100
↓	7	1445								
↓	~~8~~				6		4.7-11.3 Stiff, damp, ~~dk~~ brownish gray CLAY. ~~Strong odor, (hydroC)~~ Trace hydroC odor to 5.6 ft. Mod. organic fibers @ 4.9'			
SS	WOH	SJSB036-G04	1.7	6-8	7					
↓	1	SL0667								
↓	4	1540								
↓	4	SG, AL			8		@ 5.7 grades to light/med gray. High Plast.			
SS	2	SJSB036-G05	2.0	8-10			@ 6' grades to med. stiff			
↓	2	1600			9		8-10 SAA			
↓	4	SL0668								
↓	7				10		10-11.3 SAA			
SS	WOH	SJSB036-G06	2.0	10-12						
↓	3	1615			11					
↓	10	~~SL~~ CT								
↓	10				12	SC / CH	11.3- light gray, med dense, moist to damp clayey f. SAND.	—	80	20
SS	1	SJSB036-G07	2.0	12-14			12-13.2: dk gray, moist, v. soft CLAY	—	—	100
↓	1	1630			13					
↓	5	~~SL~~ CT				SP	13.2- ; moist, loose, gray f. SAND (silty)	—	75	25
↓	4				14					
					15		ST @ 15': No Recovery.			
ST	SS WOH	SJSB036-G08	1.5	15-17						
↓	2	1650			16		SAA			
↓	3	SL0669								
↓	↓ 5				17		END @ 17' on 11/16. Resume 11/17			
					18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-20

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # STSB036
DATE BEGAN 11/16/18
DATE COMPLETED
TOTAL DEPTH
PAGE 2 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	7	STSB036-G09	1.6	20-22	21	SM	AOPP. Thin laminations of gray silt + gray clay throughout.	–	85	15
↓	7	0815								
	7	SL0670								
↓	8	GS			22					
					23					
					24					
					25					
SS	4	STSB036-G10	1.7	25-27			SAA. Lense of dk gray silt @ 27' (1") thick			
↓	9	0830			26					
	13	SL0671								
↓	7				27					
					28					
					29					
					30					
SS	8	STSB036-G11	0	30-32			No recovery. Silty f-c Sand in shoe.			
↓	6	0845			31					
	7	~~SL0672~~ CJ								
↓	9				32					
					33	CH	clean-out casing 30-35': Beaumont CLAY observed from 32-35'. No sample			
					34		from 35-37' needed.			
					35					
~~SS~~	~~5~~	~~STSB036-G12CJ~~		~~35-37~~ CJ			END @ 35' 0905			
↓					36					
↓					37					
					38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-21

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches

BORING # SJSB036 B
DATE BEGAN
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF 3
SAMPLING METHOD: in. by ft

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
ST		SJSB036-G12 1035	0	0-2	1					
ST		SJSB036-G13 1050 SL0672	2.2	2-4	3					
ST	Push	SJSB036-G14 1100 SL0673	2.3	6-8	7					
	Push	SJSB036-G15 1110 SL0674	2.1	8-10	9					
					10		End @ 10' @ 1120			

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-22

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches
SAMPLING METHOD: 3 in. by 2 ft

BORING # SJSB037
DATE BEGAN 11-15-18
DATE COMPLETED 11-16-18
TOTAL DEPTH 37'
PAGE 1 OF

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
SS	3	SJSB037-G01	1.6	0-2	1	Fill	moist, dk brown, v. soft gravelly silt. Occasional organic material. (FILL)	15	20	65
	WOH	SL0651								
	WOH	1450			2	Waste	@1.2': grades to bluish silt (waste).	—	—	100
	WOH						@1.8 grades back to dk gray brown.			
SS	WOH	SJSB037-G02	2.0	2-4			2-4: laminations of dk brown, black, bluish, + dk gray waste. Hydrocarbon odor.			
		SL0652			3		@3.8: wood fibers (waste)			
		1455								
		SG, AL, GS			4		4-5: Waste, med stiff ~~stiff~~ CJ, moist, CLAY w/ odor			
SS	3	SJSB037-G03	2.0	4-6'			Munsell: 2.5Y (2.5/1) + 7.5YR (3/2)			
	6	CJ 1451D			5		@5.2': grades to stiff (0.75 to 1.25 tsf w/PP) CLAY w/ odor			
	7	SL0653								
	8				6		contact			
SS	4	SJSB037-G04	2.0	6-8	6.1					
	3	1535			7	CL	6.1- stiff, damp, bluish gray sandy CLAY			
	7	SL0654					Native. Black mottling throughout.			
	7				8		Munsell: GLEY 2 (6/10B and to 3/10B).			
SS	4	SJSB037-G05	1.4	8-10						
	5	1545			9		SAA. No black mottling			
	6	SL0655								
	6	AL, SG			10					
SS	WOH	SJSB037-G06		10-12						
		1640			11		SAA.			
		~~SL0656~~ CJ					11-12: laminations of black, v. soft SILT ~1/4" thick			
	2				12					
SS	1	SJSB037-G07					12-12.6 SAA SILT			
	2	1650			13		12.6: grades to dk gray laminations w/in bluish-gray sandy CLAY.			
	1	SL0656								
	2				14					
~~AS~~										
					15					
ST	Push	SJSB037-G08	2.1	15-17			ST: Gray, wet, soft sandy CLAY @ T+B.			
		1705			16					
		SL0657								
					17		End @ 17' 11-15-18.			
					18					
					19					
					20					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:
Contact potentially @ ~5.5' & stiff clay stained dk. brown + dk gray

Attachment Figure A.3-23

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD:
HOLE DIAMETER: inches
BORING #:
DATE BEGAN:
DATE COMPLETED:
TOTAL DEPTH:
PAGE ____ OF ____
SAMPLING METHOD: in. by ft

Field location of boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLING DATA: SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION: Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS
SS	6	SJSB037-G09	1.4	20-22	21	SM	Wet, loose, gray silty f-m. SAND	–	85	15
	3	0805								
	6	SL0658								
	10				22					
					23					
					24					
					25					
ST	4	SJSB037-G10	1.6	25-27		SP	ST: No Recovery. Do SS.	–	95	5
↓	8	0845			26		SAA			
	11	SL0659								
↓	12	GS			27					
					28					
					29					
					30					
SS	1	SJSB037-G11	0.7	30-32			SAA, Shell halves + pieces (trace).			
↓	2	0900			31					
	1	SL0660								
↓	2				32					
					33					
					34					
					35					
SS	2	SJSB037-G12			36					
↓	3	0915					36.5-37: Beaumont CLAY. Stiff, damp, L. brn.			
	6	SL0661			37	CH				
↓	6						End @ 37'. 0930			
					38					
					39					
					40					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-24

ANCHOR QEA

SOIL BORING LOG

CLIENT/PROJECT NAME: San Jacinto PDI Investigation
PROJECT NUMBER: 180557-01.01
GEOLOGIST/ENGINEER: Casey Janisch
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Sonic
HOLE DIAMETER: 6 inches

BORING # STSB037B
DATE BEGAN 11-16-18
DATE COMPLETED
TOTAL DEPTH
PAGE 3 OF
SAMPLING METHOD 3 in. by 2 ft

Field location of boring: 1 ft N of original boring

SAMPLING METHOD	BLOW COUNTS (140-Lb Hammer)	SAMPLE ID	RECOVERY (ft recovered/ft driven)	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION Den., moist., color, minor, MAJOR CONSTITUENT, Non-Soil	GRVL %	SND %	FNS %
ST	PUSH	No Recovery 1030 STSB037-G13	0	0-2	1					
ST	Push	1075 50 SL0662 STSB037-G14	1.8	2-4	2 3 4					
SS	WOH	1100 STSB037-G15 No Sample	1.6	4-6	5		Wet to moist, v. soft, dk brown CLAY (waste). Occassional to moderate wood debris.			
ST	Push	No Recovery STSB037-G16	0	6-8	6 7					
ST	Push	STSB037-G17 1120 SL0663	1.2	8-10	8 9 10		Bottom: Native, sandy CLAY, moist, dk greenish-gray End @ 10'	-	15	85
					1 2 3 4 5 6 7 8 9 0					

Remarks: No O = No Odor AOPP = As on Previous Page SAA = Same as above Δ = change

Notes:

Attachment Figure A.3-25

SJSB038

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 | BORING # ~~SJSB038~~
PROJECT NUMBER: 180557-01.01 Task 03 | DATE BEGAN 12/9/18
GEOLOGIST/ENGINEER Sam Giannakos | DATE COMPLETED 12/9
DRILLING CONTRACTOR: Cascade | TOTAL DEPTH @ 36'
DRILLING METHOD Sonic | SHEET 1 OF 2
HOLE DIAMETER 6", 2' by 3" Samples

Field location of boring: East cell

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	LITHOLOGIC DESCRIPTION
		SJGB	038		1.0	14	0-2'			Wet, black, gravels with medium sand.
			~~G015~~			33	(0-1)	1		geotextile fragments; 1'-2' below cap
		~~SJGB~~	~~890~~			18				
						12		2		
		SJGB	038		0.1	2	2-4'			gravel (large) with sand (no sample)
			~~G014~~			2	(1-3)	3		
		~~SJGB~~	~~891~~			3				
						WOH		4		
		SJGB	038		0	1	4-6			NO Sample recovered.
			~~G013~~ G034			WOH	(3-5)	5		
		~~SLO~~				1				
						WOH		6		
					0		6-8'			Soft → casing at 6', bailed at 8' - no sample
							(5'-7)	7		
								8		
		SJGB	~~038~~		0.6	WOH	8-10			Oily - hydrocarbon odor (Chem sample)
			G04			WOH	(7-9)	9		waste: black ooze
			1130			1				
						WOH		0		
		SJGB	038		1.0	1	10-12			grading out of waste:
			G05			1	(9-11)	1		light grey, moist to wet silt-like with
			1150			WOH				fine grains
						WOH		2		
		SJGB	038		2.0	WOH	12-14			damp, grey, V. soft SILT w/ pockets of
			G06					3		fine grey sand
		SLO8	890							
			1200					4		
		SJGB	038		2.0	WOH	14-16			SAA @ 12'
			G07				(13-15)	5		
		SLO8	891							
			1315					6		
		SJGB	G08		2.0	WOH	19'-21'			Very loose, grey, med. SILTY SAND 64&90
		SLO	892					7		
			1325							
								8		
								9		
								0		

Remarks: Sonic: 0-10' (1-9): recovered dark gray/black silty waste with gravel fragments and strong odor

Attachment Figure A.3-26

ANCHOR QEA

LOG OF EXPLORATORY BORING

CLIENT/PROJECT NAME: IPC/MIMC - SJRWP PDI-1 BORING # ST 38038

PROJECT NUMBER: 180557-01.01 Task 03 DATE BEGAN

GEOLOGIST/ENGINEER DATE COMPLETED

DRILLING CONTRACTOR: Cascade TOTAL DEPTH

DRILLING METHOD SHEET 2 OF 2

HOLE DIAMETER

OTHER*	WELL OR PIEZOMETER DETAILS	SAMPLING DATA: SAMPLING METHOD	SAMPLE NUMBER	FID / PID (ppm)	RECOVERY (feet)	BLOWS / 6 INCHES	DEPTH SAMPLED	DEPTH IN FEET	SOIL GROUP SYMBOL (USCS)	Field location of boring / LITHOLOGIC DESCRIPTION
								21		
								22		
								23		
								24		
SS		SGSB	038		2.0	4	24-26'			loose, grey, moist fine to coarse SAND 90%
			G09			3		25		laminations of clay in cap.
		SLOB	93			2				
			1335			2		26		
								27		
								28		
								29		wet
SS		SGSB	038		1.3	3	29-31			med. dense, moist, light grey coarse 100% SAND
			G10			7		30		
		SLO	894			12				
			1345			8		31		
								32		
								33		
								34		
ST		SJSB	038		2.3'	A/H	34-36			Beaumont
			G11					35		
		SLO	895					36		
								37		
								38		
								39		
								40		

Remarks: ST taken from 11-13' BML at additional note w/ 1.0 ft recovery

Attachment Figure A.3-27

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	486380		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB018	SL0860	0-2 ft	Moist, dark grayish brown clay	65.4
SJGB018	SL0861	8-10 ft	Moist, gray clay with sand	24.8
SJGB018	SL0862	10-12 ft	Moist, very dark gray clay	26.0
SJGB018	SL0864	14-16 ft	Moist, reddish brown silty sand	23.6
SJGB018	SL0865	16-18 ft	Moist, light yellowish brown clay	18.7
SJGB018	SL0866	18-20 ft	Moist, mottled light yellowish brown and gray clay	17.6
SJGB018	SL0867	20-22 ft	Moist, brownish yellow clay	17.0
SJGB018	SL0869	30-32 ft	Moist, mottled yellowish red and light gray clay	29.7
SJGB018	SL0870	40-42 ft	Moist, light brownish gray silty sand	19.1
SJGB018	SL0872	50-52 ft	Moist, gray clay	20.3

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	485090		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB019	SL0847	0-2'	Moist, dark yeollowish brown sand	36.4
SJGB019	SL0848	4-6'	Moist, dark olive brown sand with silt	37.1
SJGB019	SL0849	8-10'	Moist, dark gray clay	30.1
SJGB019	SL0850	13-15'	Moist dark grayish brown silty sand	27.3
SJGB019	SL0851	20-22'	Moist, light yellowish brown clay	20.9
SJGB019	SL0853	30-32'	Moist, mottled reddish yellow and light gray clay	28.1

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	486370		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB019	SL0854	35-37'	Moist, brownish yellow clayey sand	22.0
SJGB019	SL0855	40-42'	Moist, mottled reddish yellow and light gray clay	29.7
SJGB019	SL0857	50-52 ft	Moist, gray clay	28.2
SJGB019	SL0858	55-57 ft	Moist, very dark brown clay	29.8
SJGB019	SL0859	~59-60 ft	Moist, gray clay with sand	32.9

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	485079		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB020	SL0832	4-6'	Moist, brown sand with silt and gravel	22.3
SJGB020	SL0833	6-8'	Moist, dark olive brown sand	25.5
SJGB020	SL0834	8-10'	Moist, dark gray sand with silt	32.2
SJGB020	SL0836	15-17'	Moist, gray clay with gravel	34.1
SJGB020	SL0838	20-22'	Moist, dark grayish brown silty sand	18.0
SJGB020	SL0839	25-27'	Moist, mottled reddish yellow and gray clay	31.9

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	485084		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB020	SL0840	30-32'	Moist, light yellowish brown clay	21.6
SJGB020	SL0842	40-42'	Moist, yellowish red clay	27.1
SJGB020	SL0844	50-52'	Moist, yellowish red clay	30.4
SJGB020	SL0845	55-57'	Moist, light gray clay	23.4
SJGB020	SL0846	60-62'	Moist, grayish brown clay	26.8

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	485150		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB021	SL0821	0'-2'	Moist, reddish brown sand with silt	37.4
SJGB021	SL0822	4'-6'	Moist, dark grayish brown silty sand	39.9
SJGB021	SL0823	6'-8'	Wet, dark brown clay with sand	51.4
SJGB021	SL0825	14'-16'	Moist, reddish gray sand with clay	43.3
SJGB021	SL0826	19'-21'	Moist, light brown sand	19.2
SJGB021	SL0827	29'-31'	Moist, mottled reddish yellow and gray clay	45.1
SJGB021	SL0828	34'-36'	Moist, reddish yellow clay	30.5
SJGB021	SL0830	44'-46'	Moist, light brownish gray sandy silt	19.7
SJGB021	SL0831	49'-51'	Moist, light gray sand with silt	19.3

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	485141		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB022	SL0811	5'-7'	Moist, reddish brown sand with silt	47.6
SJGB022	SL0813	10'-12'	Moist, reddish brown sand with silt	50.2
SJGB022	SL0814	15'-17'	Moist, dark gray clay	56.6
SJGB022	SL0815	20'-22'	Moist, mottled pinkish gray and yellow clay	18.8
SJGB022	SL0816	25'-27'	Moist, yellowish red clay	25.2
SJGB022	SL0818	35'-37'	Moist, reddish brown clay	24.0
SJGB022	SL0819	40'-42'	Moist, light gray clay	21.0
SJGB022	SL0820	45'-47'	Moist, light brownish gray silty sand	21.8

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	486362		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB023G01	SL0873	0-2 ft	Moist, dark gray clay	29.8
SJGB023G02	SL0874	2-4 ft	Moist, dark brown clay	25.6
SJGB023G03	SL0875	4-6 ft	Moist, olive brown silty sand	23.0
SJGB023G04	SL0876	6-8 ft	Moist, gray clay	24.7
SJGB023G05	SL0877	8-10 ft	Moist, dark gray clay	27.6
SJGB023G07	SL0879	12-14 ft	Moist, dark gray clay	23.1
SJGB023G08	SL0880	18-20 ft	Moist, dark yellowish brown silty sand	21.7
SJGB023G09	SL0881	23-25 ft	Moist, dark grayish brown sand with silt	16.4
SJGB023G10A	SL0882	28-29.5 ft	Moist, light brown sand	15.8
SJGB023G10B	SL0883	29.5-30 ft	Moist, light gray clay	20.0

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	02/28/19	Checked By:	emm
Depth :	---	Test Id:	493238		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJGB023G12	SL0884	38-40 ft	Moist, yellowish red clay	30.5
SJGB023G13	SL0885	43-45 ft	Moist, mottled yellowish red and light gray clay	34.2
SJGB023G14	SL0886	48-50 ft	Moist, light gray clay	19.6
SJGB023G16A	SL0888	58-59.3 ft	Moist, very pale brown clay	22.3
SJGB023G16B	SL0889	59.3-60 ft	Moist, light brownish gray silty sand	16.9
SJGB038	SL0896	11-13 ft	Moist, dark gray clay	48.8

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482773		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB008-E1	SL1025	0-2 ft	Moist, mottled yellowish brown sand dark grayish brown clay	27.2
SJSB008-E1	SL1026	2-4 ft	Moist, dark yellowish brown clay with sand	25.9
SJSB008-E1	SL1027	4-6 ft	Moist, mottled dark grayish brown and yellowish brown clay	26.1
SJSB008-E1	SL1028	6-8 ft	Moist, mottled brown and dark gray clay	23.9
SJSB008-E1	SL1029	8-10 ft	Moist, very dark gray clay	63.7
SJSB008-E1	SL1030	14-16 ft	Moist, mottled very dark gray and gray clay	36.7
SJSB008-E1	SL1031	19-21 ft	Moist, mottled dark gray and light brownish gray clay	25.8
SJSB008-E1	SL1032	21-23 ft	Moist, dark gray clay	26.1
SJSB008-E1	SL1034	25-27 ft	Moist, light brownish gray silty sand	25.1
SJSB008-E1	SL1035	29-31 ft	Moist, grayish brown sand	24.3

Notes: Temperature of Drying : 110° Celsius

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/06/19	Checked By:	emm
Depth :	---	Test Id:	482959		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB012-W1	SL1046	0-2 ft	Moist, dark brownish gray clay with sand	30.9
SJSB012-W1	SL1047	2-4 ft	Moist, dark brown sand with gravel	21.4
SJSB012-W1	SL1048	10-12 ft	Moist, very dark gray clay	36.5
SJSB012-W1	SL1050	15-17 ft	Moist, grayish brown silty, clayey sand	23.9
SJSB012-W1	SL1051	20-22 ft	Moist, very dark gray clay	22.0
SJSB012-W1	SL1052	25-27 ft	Moist, dark gray clay with sand	31.5
SJSB012-W1	SL1053	30-32 ft	Moist, grayish brown sand with silt	19.5

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/06/18	Checked By:	emm
Depth :	---	Test Id:	482748		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB019-E1	SL1000	0-2 ft	Moist, dark grayish brown silty clay with gravel	27.1
SJSB019-E1	SL1001	2-4 ft	Moist, mottled grayish brown and yellowish brown clay	40.6
SJSB019-E1	SL1002	4-6 ft	Moist, mottled yellowish brown and dark grayish brown clay with gravel	43.5
SJSB019-E1	SL1003	6-8 ft	Moist, mottled light brownish gray and very dark gray clay	49.1
SJSB019-E1	SL1004	8-10 ft	Moist, very dark gray clay	47.2
SJSB019-E1	SL1005	14-15 ft	Moist, dark grayish brown silty sand	22.1

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/07/18	Checked By:	emm
Depth :	---	Test Id:	482753		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB019-E1	SL1006	15-16 ft	Moist, very dark gray clay	65.5
SJSB019-E1	SL1008	19-21 ft	Moist, very dark gray clay	30.3
SJSB019-E1	SL1009	24-26 ft	Moist, dark grayish brown sandy silt	32.2
SJSB019-E1	SL1010	29-31 ft	Moist, light brownish gray sand	22.0
SJSB019-E1	SL1011	34-36 ft	Moist, gray sand	23.4

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482763		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB023-E1	SL1013	0-2 ft	Moist, very dark gray sandy clay	14.5
SJSB023-E1	SL1014	2-4 ft	Moist, very dark gray silty clay	46.1
SJSB023-E1	SL1015	4-6 ft	Moist, very dark gray clay	70.2
SJSB023-E1	SL1016	6-8 ft	Moist, mottled dark grayish brown and very dark gray clay	52.9
SJSB023-E1	SL1017	10-12 ft	Moist, dark grayish brown silty sand	22.3
SJSB023-E1	SL1018	14-14.8 ft	Moist, gray sand	22.2
SJSB023-E1	SL1019	14.8-16 ft	Moist, mottled very dark gray and gray clay	46.2
SJSB023-E1	SL1020	19-21 ft	Moist, mottled gray and dark gray clay	26.8
SJSB023-E1	SL1022	24-26 ft	Moist, dark grayish brown clayey sand	28.2
SJSB023-E1	SL1023	29-31 ft	Moist, gray sand	22.6

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482780		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB025-1W	SL1037	2-4 ft	Moist, mottled very dark gray and brown clay	27.2
SJSB025-1W	SL1039	6-8 ft	Moist, mottled light brownish gray and dark grayish brown clay with sand	25.8
SJSB025-1W	SL1040	8-10 ft	Moist, very dark grayish brown sandy clay	34.7
SJSB025-1W	SL1041	14-16 ft	Moist, light brownish gray sand with silt	20.6
SJSB025-1W	SL1043	19-21 ft	Moist, gray clay	30.8
SJSB025-1W	SL1044	24-26 ft	Moist, gray silty sand	21.3
SJSB025-1W	SL1045	29-31 ft	Moist, grayish brown sand	23.8

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/11/19	Checked By:	emm
Depth :	---	Test Id:	483630		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB028	SL0699	0-2 ft	Moist, dark gray clay with gravel	25.1
SJSB028	SL0800	2-4 ft	Moist, dark brown clay	30.3
SJSB028	SL0801	4-6 ft	Moist, very dark gray clay	25.0
SJSB028	SL0802	6-8 ft	Moist, dark brown clay	26.9
SJSB028	SL0803	8-10 ft	Moist, very dark brown clay	41.1
SJSB028	SL0804	14-16 ft	Moist, grayish brown silty clay	32.5
SJSB028	SL0806	25-27 ft	Moist, very dark brown clay with sand	49.9
SJSB028	SL0807	30-32 ft	Moist, dark gray clay	55.3
SJSB028	SL0808	35-35.7 ft	Moist, dark gray clay	55.0
SJSB028	SL0809	35.7-37 ft	Moist, gray clay	18.2

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482786		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB029	SL0600	0-2 ft	Moist, very dark brown clay	32.2
SJSB029	SL0601	2-4 ft	Moist, very dark grayish brown clay	34.7
SJSB029	SL0602	4-6 ft	Moist, mottled very dark gray and grayish brown clay	41.9
SJSB029	SL0603	6-8 ft	Moist, very dark gray clay	63.6
SJSB029	SL0604	8-10 ft	Moist, very dark grayish brown clay with sand	35.3
SJSB029	SL0605	10-12 ft	Moist, very dark grayish brown clay	65.7

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482791		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB029	SL0606	15-17 ft	Moist, dark grayish brown silty sand	27.0
SJSB029	SL0607	20-22 ft	Moist, dark grayish brown clay	44.9
SJSB029	SL0608	25-27 ft	Moist, dark gray silt	45.1
SJSB029	SL0610	35-36.5 ft	Moist, very dark grayish brown sand with silt	19.7
SJSB029	SL0611	39.5-40 ft	Moist, mottled yellowish brown and very dark grayish brown clay	17.6

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/11/19	Checked By:	emm
Depth :	---	Test Id:	483620		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB030	SL0688	0-2 ft	Moist, dark brown silt with gravel	14.1
SJSB030	SL0689	2-4 ft	Moist, dark brown clay	16.0
SJSB030	SL0690	4-6 ft	Moist, dark grayish brown clay	21.4
SJSB030	SL0691	6-8 ft	Moist, dark grayish brown clay	26.1
SJSB030	SL0692	8-10 ft	Moist, dark brown silty clay with gravel	21.0
SJSB030	SL0693	14-16 ft	Moist, dark grayish brown clayey sand	26.9
SJSB030	SL0695	25-27 ft	Moist, dark gray silty sand	21.8
SJSB030	SL0696	30-32 ft	Moist, brownish gray sand with silt	21.8
SJSB030	SL0697	35-37 ft	Moist, dark gray sand	20.2

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	12/10/18	Checked By:	emm
Depth :	---	Test Id:	482801		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB031	SL0613	0-2 ft	Moist, olive brown silty sand with gravel	14.0
SJSB031	SL0614	2-4 ft	Moist, mottled olive brown and dark gray clay with sand	19.1
SJSB031	SL0615	4-6 ft	Moist, mottled dark grayish brown, gray, and yellowish brown clay	25.5
SJSB031	SL0616	6-8 ft	Moist, very dark grayish brown clay	21.9
SJSB031	SL0617	8-10 ft	Moist, very dark grayish brown clayey sand	20.7
SJSB031	SL0620	14-16 ft	Moist, mottled yellowish brown and grayish brown clay with sand	18.2
SJSB031	SL0622	20-22 ft	Moist, grayish brown sand	21.3
SJSB031	SL0623	25-27 ft	Moist, dark gray sand	23.5
SJSB031	SL0624	30-32 ft	Moist, grayish brown sand	20.0
SJSB031	SL0625	35-37 ft	Moist, grayish brown sandy silt	33.3

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	483606		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB032	SL0675	0-2 ft	Moist, light grayish brown and very dark gray clay with gravel	13.8
SJSB032	SL0676	2-4 ft	Moist, very dark gray and very dark grayish brown clay	40.7
SJSB032	SL0677	4-6 ft	Moist, very dark grayish brown clay with sand	18.8
SJSB032	SL0678	6-8 ft	Moist, very dark grayish brown clay	25.6
SJSB032	SL0679	8-10 ft	Moist, dark gray clay	27.8
SJSB032	SL0680	14-16 ft	Moist, dark grayish brown sand with silt	25.3

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	483611		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB032	SL0681	20-22 ft	Moist, dark gray sand	23.8
SJSB032	SL0682	25-27 ft	Moist, gray sand	18.5
SJSB032	SL0683	30-32 ft	Moist, dark grayish brown sand	20.4
SJSB032	SL0684	35-37 ft	Moist, grayish brown sand	20.5
SJSB032	SL0685	38-40 ft	Moist, yellowish brown clay	21.9

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/11/19	Checked By:	emm
Depth :	---	Test Id:	483582		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB033	SL0640	0-2 ft	Moist, light brownish gray sandy clay with gravel	15.2
SJSB033	SL0641	2-4 ft	Moist, very dark brown sand	25.0
SJSB033	SL0642	4-6 ft	Moist, very dark brown clay	24.9
SJSB033	SL0643	6-8 ft	Moist, dark grayish brown silty clay with sand	21.0
SJSB033	SL0644	8-10 ft	Moist, very dark gray clay	24.5
SJSB033	SL0645	14-16 ft	Moist, grayish brown silty sand	23.8
SJSB033	SL0646	20-22 ft	Moist, dark gray sand	21.0
SJSB033	SL0647	30-32 ft	Moist, grayish brown sand with gravel	15.2
SJSB033	SL0648	35-37 ft	Moist, dark gray sand	17.9
SJSB033	SL0649	38-40 ft	Moist, light olive brown clay	19.2

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/06/19	Checked By:	emm
Depth :	---	Test Id:	482952		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB034	SL0628	0-2 ft	Moist, dark olive brown silt with sand	14.6
SJSB034	SL0629	2-4 ft	Moist, dark grayish brown clay	18.7
SJSB034	SL0630	4-6 ft	Moist, dark gray clay	20.5
SJSB034	SL0631	6-8 ft	Moist, very dark brown sandy clay	25.2
SJSB034	SL0632	8-9 ft	Moist, very dark gray clay with gravel	25.7
SJSB034	SL0633	9-10 ft	Moist, pale brown sand	19.5
SJSB034	SL0634	14-16 ft	Moist, light yellowish brown silty sand	18.9
SJSB034	SL0635	20-22 ft	Moist, very dark gray clay with silt and sand	28.5
SJSB034	SL0636	25-27 ft	Moist, very dark gray clay with sand	35.4
SJSB034	SL0638	40-40.8 ft	Moist, dark grayish brown silty sand	12.1

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/03/19	Checked By:	emm
Depth :	---	Test Id:	482942		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB035	SL0640	0-2 ft	Moist, mottled dark gray and brown clay	15.0
SJSB035	SL0641	2-4 ft	Moist, grayish brown clay	18.6
SJSB035	SL0642	4-6 ft	Moist, mottled light yellowish brown and grayish brown clay	21.3
SJSB035	SL0643	6-8 ft	Moist, very dark gray clay with gravel	29.6
SJSB035	SL0644	8-10 ft	Moist, very dark grayish brown sandy clay	24.8
SJSB035	SL0645	14-16 ft	Moist, mottled grayish brown and light olive brown clay	25.6
SJSB035	SL0646	21.8-22 ft	Moist, very dark gray clay	42.8
SJSB035	SL0647	25-27 ft	Moist, dark gray silty sand	24.5
SJSB035	SL0648	30-32 ft	Moist, dark gray silty sand	16.9
SJSB035	SL0649	40-42 ft	Moist, yellowish brown clay	19.8

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/11/19	Checked By:	emm
Depth :	---	Test Id:	483600		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB036	SL0664	0-2.6 ft	Wet, black clay	82.4
SJSB036	SL0665	2.6-4 ft	Moist, very dark grayish brown sandy clay	77.5
SJSB036	SL0666	4-6 ft	Moist, very dark gray clay	30.0
SJSB036	SL0667	6-8 ft	Moist, very dark grayish brown clay	28.4
SJSB036	SL0668	8-10 ft	Moist, mottled very dark gray and gray clay	23.4
SJSB036	SL0669	15-17 ft	Moist, gray sandy clay	29.3
SJSB036	SL0670	20-22 ft	Moist, dark gray sand with silt	22.0
SJSB036	SL0671	25-27 ft	Moist, gray sand	19.9

Notes: Temperature of Drying : 110° Celsius

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/11/19	Checked By:	emm
Depth :	---	Test Id:	483592		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB037	SL0651	0-2 ft	Moist, dark gray and light brownish gray clay	48.4
SJSB037	SL0652	2-4 ft	Moist, very dark gray sandy clay	105.2
SJSB037	SL0653	4-6 ft	Wet, black clay	70.2
SJSB037	SL0654	6-8 ft	Moist, gray clay	21.1
SJSB037	SL0655	8-10 ft	Moist, dark grayish brown clay	28.5
SJSB037	SL0656	12-14 ft	Wet, very dark gray clay	39.8
SJSB037	SL0658	20-22 ft	Moist, very dark gray silty sand	24.6
SJSB037	SL0659	25-27 ft	Moist, grayish brown sand with silt	18.7
SJSB037	SL0660	30-32 ft	Moist, light brownish grey sand	16.5
SJSB037	SL0661	35-37 ft	Moist, light brownish gray clay	20.5

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	02/25/19	Checked By:	emm
Depth :	---	Test Id:	486506		

Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
SJSB038	SL0890	11-13 ft	Moist, very dark grayish brown clay	41.7
SJSB038	SL0891	13-15 ft	Moist, very dark grayish brown sandy clay	47.6
SJSB038	SL0892	19-21 ft	Moist, very dark brown silt with sand	25.2
SJSB038	SL0893	24-26 ft	Moist, dark brown sand with silt	22.3
SJSB038	SL0894	29-31 ft	Moist, light yellowish brown silt	13.9

Notes: Temperature of Drying : 110° Celsius

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	02/28/19	Checked By:	bfs
Depth :	---	Test Id:	493256		

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
SJGB022	SL0812	7-9 ft	Moist, grayish brown clay	102.5	39.69	73.40	(1)
SJGB038	SL0896	11-13 ft	Moist, dark gray clay	110.9	48.82	74.53	(2)

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

Notes: Moisture Content determined by ASTM D2216.

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GeoTesting EXPRESS

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	md
Sample ID:	---	Test Date:	02/28/19	Checked By:	bfs
Depth :	---	Test Id:	493254		

Laboratory Determination of Density (Unit Weight) of Soil Specimens by ASTM D7263

Boring ID	Sample ID	Depth	Visual Description	Bulk Density pcf	Moisture Content %	Dry Density pcf	*
JSB012-W	SL1054	8-10 ft	Moist, dark gray clay	108.4	34.90	80.38	(1)
SJSB019	SL1012	4-6 ft	Moist, brown clay with sand and gravel	125.3	18.56	105.7	(2)
SJSB023	SL1024	8-10 ft	Moist, gray clay with sand	114.3	36.57	83.72	(3)
SJSB025	SL1038	4-6'	Moist, grayish brown sandy clay	107.2	51.89	70.55	(4)
SJSB036	SL0672	2-4'	Moist, brown clay	81.85	80.10	45.45	(5)
SJSB037	SL0662	2-4'	Wet, gray silty clay	83.75	107.9	40.29	(6)

* Sample Comments

(1): Method B-Cylinder, Intact

(2): Method B-Cylinder, Intact

(3): Method B-Cylinder, Intact

(4): Method B-Cylinder, Intact

(5): Method B-Cylinder, Intact

(6): Method B-Cylinder, Intact

Notes: Moisture Content determined by ASTM D2216.

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	njf
Sample ID:	---	Test Date:	03/05/19	Checked By:	emm
Depth :	---	Test Id:	485156		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
SJGB018	SL0866	18-20 ft	Moist, mottled light yellowish brown and gray clay	2.64	
SJGB018	SL0870	40-42 ft	Moist, light brownish gray silty sand	2.66	
SJGB019	SL0851	20-22'	Moist, light yellowish brown clay	2.67	
SJGB019	SL0854	35-37'	Moist, brownish yellow clayey sand	2.68	
SJGB020	SL0840	30-32'	Moist, light yellowish brown clay	2.66	
SJGB020	SL0846	60-62'	Moist, grayish brown clay	2.68	
SJGB021	SL0823	6'-8'	Wet, dark brown clay with sand	2.64	
SJGB021	SL0830	44'-46'	Moist, light brownish gray sandy silt	2.69	
SJGB022	SL0818	35'-37'	Moist, reddish brown clay	2.65	
SJGB022	SL0820	45'-47'	Moist, light brownish gray silty sand	2.70	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	ckg
Sample ID:	---	Test Date:	01/10/19	Checked By:	emm
Depth :	---	Test Id:	482716		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
SJGB023G09	SL0881	23-25 ft	Moist, dark grayish brown sand with silt	2.67	
SJGB023G16B	SL0889	59.3-60 ft	Moist, light brownish gray silty sand	2.70	
SJSB008-E1	SL1026	2-4 ft	Moist, dark yellowish brown clay with sand	2.66	
SJSB008-E1	SL1029	8-10 ft	Moist, very dark gray clay	2.62	
SJSB019-E1	SL1004	8-10 ft	Moist, very dark gray clay	2.64	
SJSB019-E1	SL1008	19-21 ft	Moist, very dark gray clay	2.66	
SJSB023-E1	SL1015	4-6 ft	Moist, very dark gray clay	2.66	
SJSB023-E1	SL1022	24-26 ft	Moist, dark grayish brown clayey sand	2.69	
SJSB025-1W	SL1040	8-10 ft	Moist, very dark grayish brown sandy clay	2.65	
SJSB025-1W	SL1043	19-21 ft	Moist, gray clay	2.68	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	njf
Sample ID:	---	Test Date:	03/07/19	Checked By:	emm
Depth :	---	Test Id:	483648		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
SJSB028	SL0803	8-10 ft	Moist, very dark brown clay	2.63	
SJSB028	SL0806	25-27 ft	Moist, very dark brown clay with sand	2.67	
SJSB029	SL0606	15-17 ft	Moist, dark grayish brown silty sand	2.69	
SJSB029	SL0607	20-22 ft	Moist, dark grayish brown clay	2.64	
SJSB030	SL0692	8-10 ft	Moist, dark brown silty clay with gravel	2.66	
SJSB030	SL0696	30-32 ft	Moist, brownish gray sand with silt	2.69	
SJSB031	SL0617	8-10 ft	Moist, very dark grayish brown clayey sand	2.68	
SJSB031	SL0622	20-22 ft	Moist, grayish brown sand	2.71	
SJSB032	SL0679	8-10 ft	Moist, dark gray clay	2.67	
SJSB032	SL0685	38-40 ft	Moist, yellowish brown clay	2.68	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	njf
Sample ID:	---	Test Date:	03/05/19	Checked By:	emm
Depth :	---	Test Id:	483644		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
SJSB033	SL0643	6-8 ft	Moist, dark grayish brown silty clay with sand	2.70	
SJSB033	SL0645	14-16 ft	Moist, grayish brown silty sand	2.68	
SJSB034	SL0634	14-16 ft	Moist, light yellowish brown silty sand	2.70	
SJSB034	SL0638	40-40.8 ft	Moist, dark grayish brown silty sand	2.70	
SJSB035	SL0641	2-4 ft	Moist, grayish brown clay	2.69	
SJSB035	SL0644	8-10 ft	Moist, very dark grayish brown sandy clay	2.69	
SJSB036	SL0665	2.6-4 ft	Moist, very dark grayish brown sandy clay	2.61	
SJSB036	SL0667	6-8 ft	Moist, very dark grayish brown clay	2.66	
SJSB037	SL0652	2-4 ft	Moist, very dark gray sandy clay	2.67	
SJSB037	SL0655	8-10 ft	Moist, dark grayish brown clay	2.69	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	---	Sample Type:	---	Tested By:	njf
Sample ID:	---	Test Date:	03/05/19	Checked By:	emm
Depth :	---	Test Id:	486510		

Specific Gravity of Soils by ASTM D854

Boring ID	Sample ID	Depth	Visual Description	Specific Gravity	Comment
SJSB038	SL0891	13-15 ft	Moist, very dark grayish brown sandy clay	2.64	
SJSB038	SL0893	24-26 ft	Moist, dark brown sand with silt	2.68	

Notes: Specific Gravity performed by using method B (oven dried specimens) of ASTM D854
Moisture Content determined by ASTM D2216.

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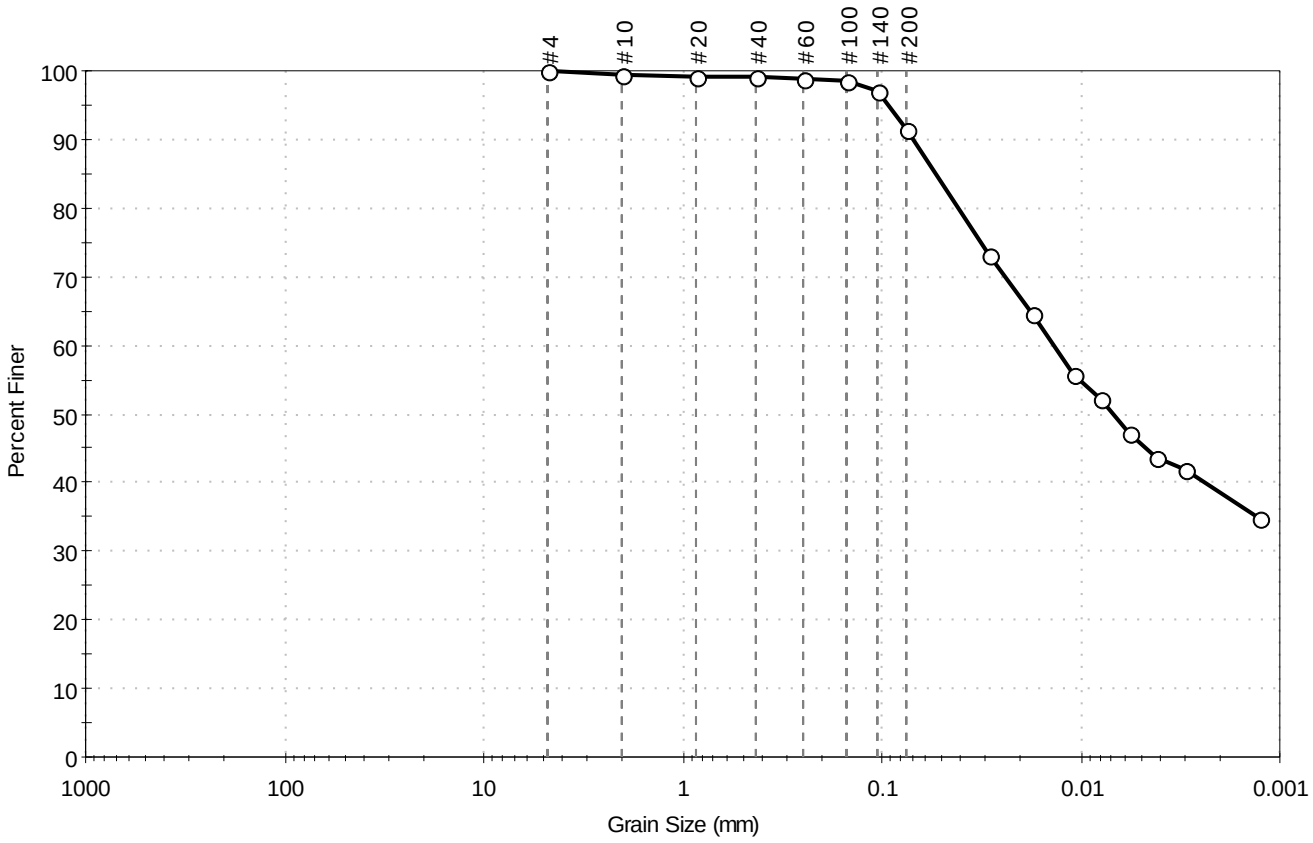
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB018	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0866	Test Date:	02/25/19	Checked By:	bfs
Depth :	18-20 ft	Test Id:	486394		
Test Comment:	---				
Visual Description:	Moist, mottled light yellowish brown and gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	8.5	91.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	99		
#100	0.15	99		
#140	0.11	97		
#200	0.075	91		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0287	73		
---	0.0177	65		
---	0.0108	56		
---	0.0079	52		
---	0.0057	47		
---	0.0042	44		
---	0.0030	42		
---	0.0013	35		

Coefficients

D_{85} = 0.0533 mm	D_{30} = N/A
D_{60} = 0.0138 mm	D_{15} = N/A
D_{50} = 0.0069 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (26))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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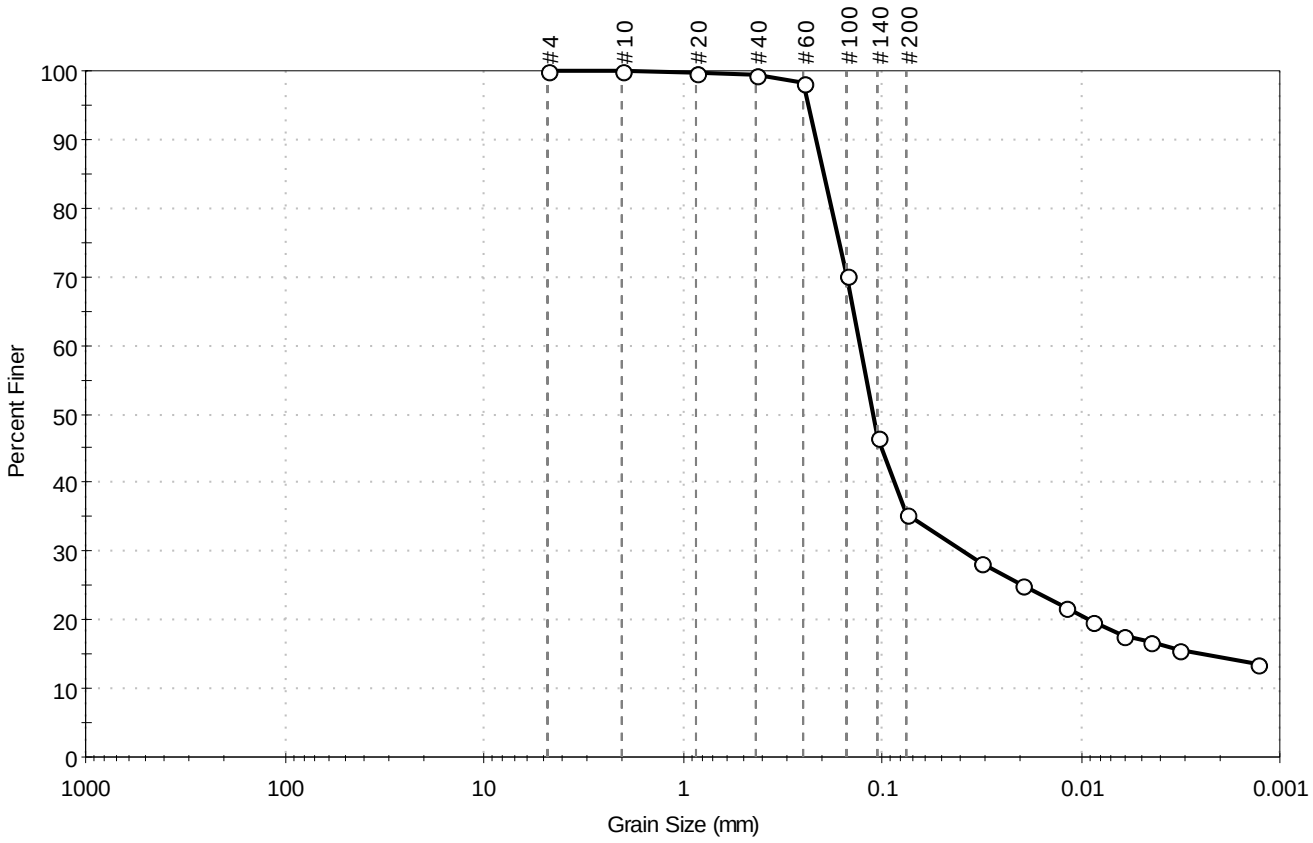
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB018	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0870	Test Date:	02/25/19	Checked By:	bfs
Depth :	40-42 ft	Test Id:	486395		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	64.7	35.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	70		
#140	0.11	47		
#200	0.075	35		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0319	28		
---	0.0199	25		
---	0.0120	22		
---	0.0088	20		
---	0.0062	18		
---	0.0045	17		
---	0.0032	16		
---	0.0013	14		

Coefficients

D_{85} = 0.1963 mm	D_{30} = 0.0395 mm
D_{60} = 0.1289 mm	D_{15} = 0.0024 mm
D_{50} = 0.1113 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Silty SAND (SM)

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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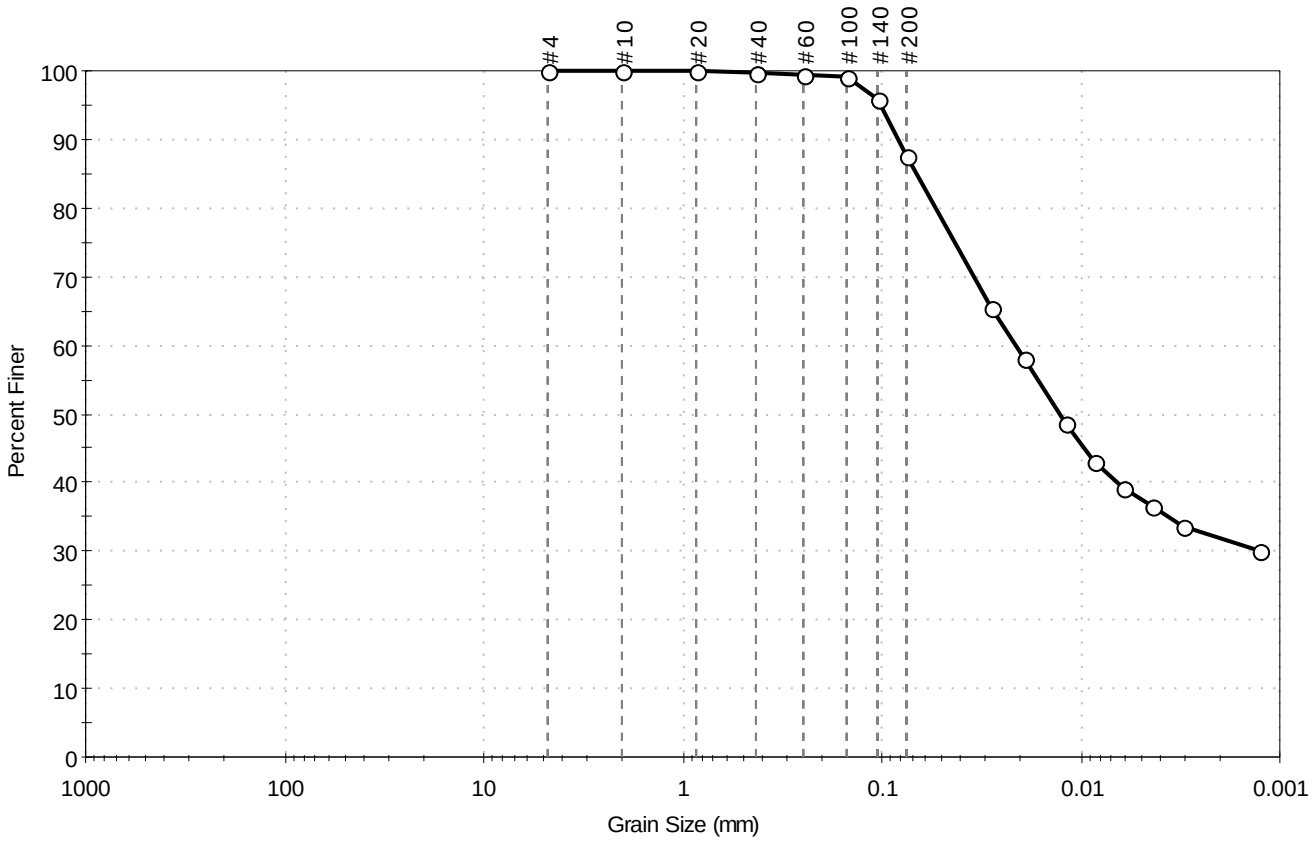
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB019	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0851	Test Date:	02/25/19	Checked By:	bfs
Depth :	20-22'	Test Id:	485119		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	12.3	87.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	99		
#140	0.11	96		
#200	0.075	88		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0284	66		
---	0.0194	58		
---	0.0119	49		
---	0.0086	43		
---	0.0061	39		
---	0.0044	37		
---	0.0030	34		
---	0.0013	30		

Coefficients

D_{85} = 0.0666 mm	D_{30} = 0.0013 mm
D_{60} = 0.0214 mm	D_{15} = N/A
D_{50} = 0.0128 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (21))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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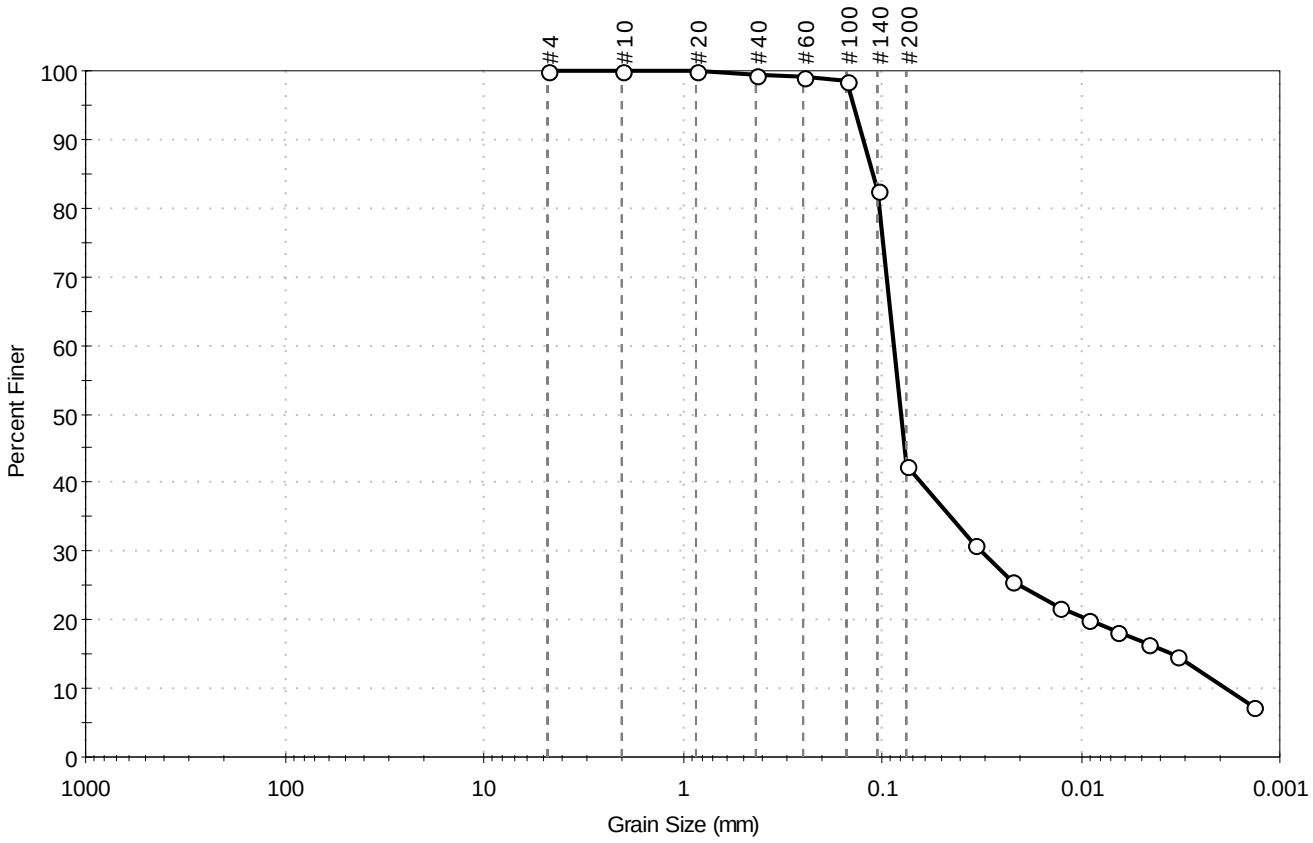
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB019	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0854	Test Date:	02/26/19	Checked By:	bfs
Depth :	35-37'	Test Id:	485120		
Test Comment:	---				
Visual Description:	Moist, brownish yellow clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.1	57.4	42.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	99		
#140	0.11	83		
#200	0.075	43		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0339	31		
---	0.0223	26		
---	0.0129	22		
---	0.0093	20		
---	0.0066	18		
---	0.0047	16		
---	0.0033	15		
---	0.0014	7		

Coefficients

D_{85} = 0.1118 mm	D_{30} = 0.0313 mm
D_{60} = 0.0872 mm	D_{15} = 0.0035 mm
D_{50} = 0.0800 mm	D_{10} = 0.0019 mm
C_u = 45.895	C_c = 5.913

Classification

ASTM Clayey SAND (SC)

AASHTO Silty Soils (A-4 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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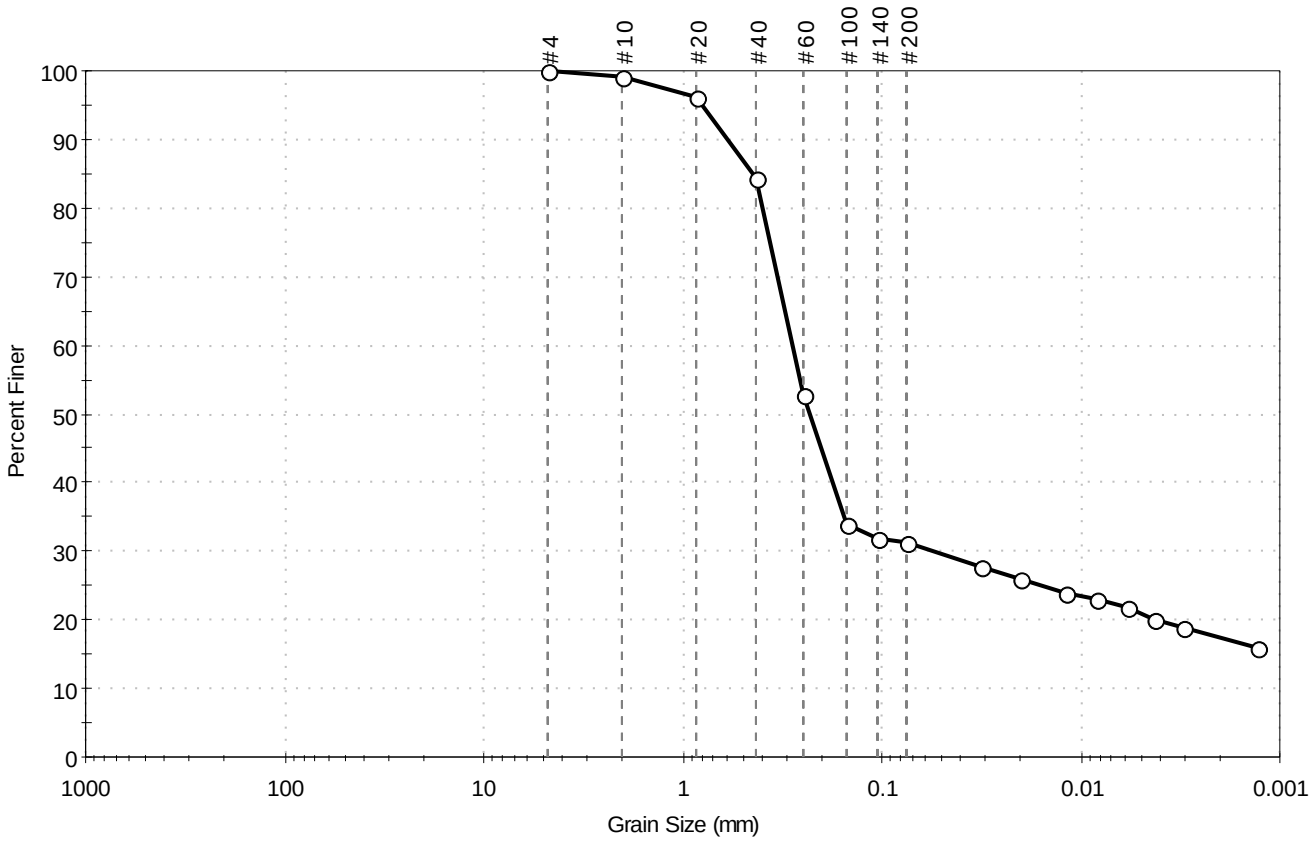
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB020	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0838	Test Date:	02/25/19	Checked By:	bfs
Depth :	20-22'	Test Id:	485117		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	68.7	31.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	96		
#40	0.42	84		
#60	0.25	53		
#100	0.15	34		
#140	0.11	32		
#200	0.075	31		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0317	28		
---	0.0204	26		
---	0.0119	24		
---	0.0083	23		
---	0.0059	22		
---	0.0043	20		
---	0.0031	19		
---	0.0013	16		

Coefficients

D_{85} = 0.4396 mm	D_{30} = 0.0542 mm
D_{60} = 0.2823 mm	D_{15} = N/A
D_{50} = 0.2321 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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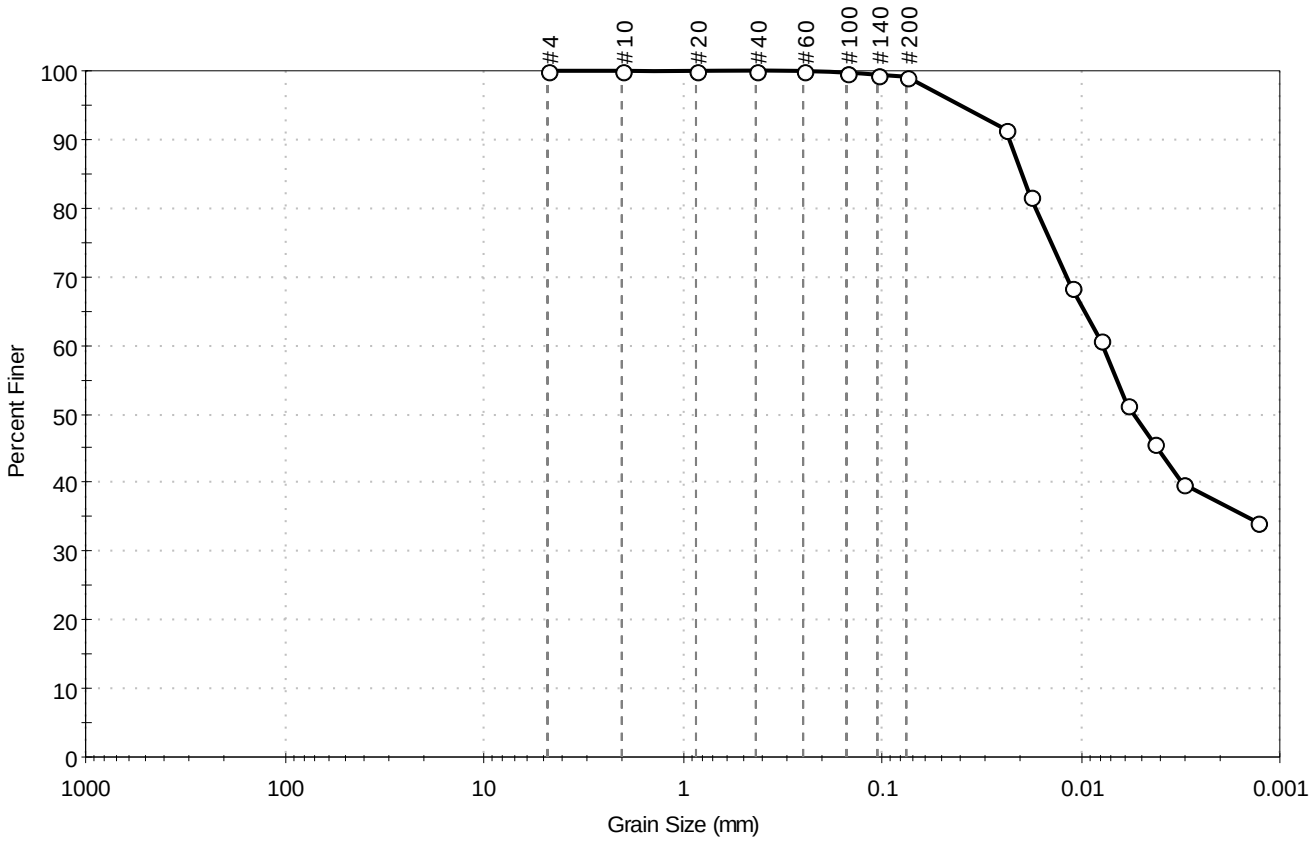
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB020	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0846	Test Date:	02/25/19	Checked By:	bfs
Depth :	60-62'	Test Id:	485118		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	0.9	99.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0241	91		
---	0.0180	82		
---	0.0111	68		
---	0.0080	61		
---	0.0058	51		
---	0.0043	46		
---	0.0031	40		
---	0.0013	34		

Coefficients

D_{85} = 0.0199 mm	D_{30} = N/A
D_{60} = 0.0078 mm	D_{15} = N/A
D_{50} = 0.0054 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (42))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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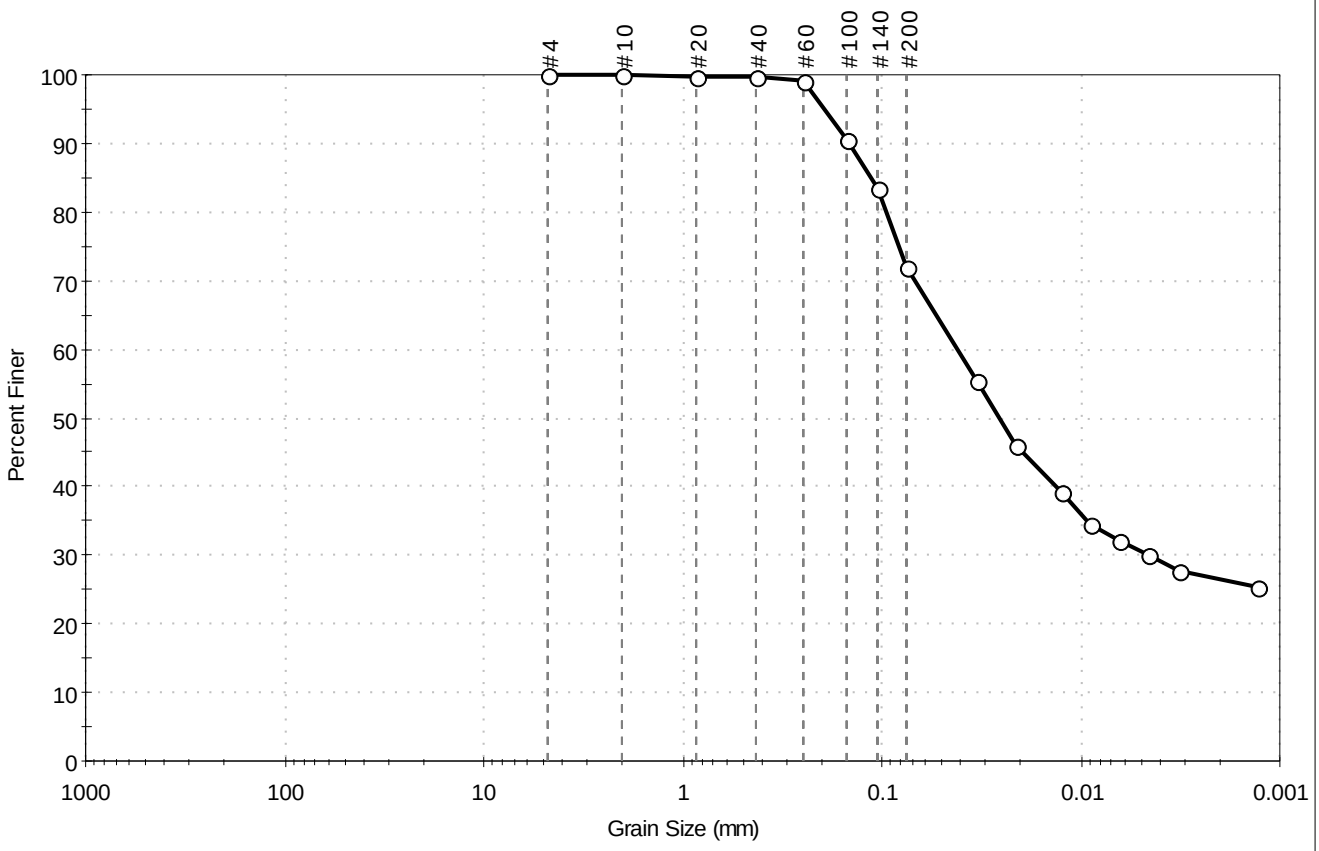
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB021	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0823	Test Date:	02/25/19	Checked By:	bfs
Depth :	6'-8'	Test Id:	485161		
Test Comment:	---				
Visual Description:	Wet, dark brown clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	27.9	72.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	91		
#140	0.11	83		
#200	0.075	72		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0331	55		
---	0.0210	46		
---	0.0126	39		
---	0.0091	35		
---	0.0064	32		
---	0.0046	30		
---	0.0032	28		
---	0.0013	25		

Coefficients

D_{85} = 0.1147 mm	D_{30} = 0.0046 mm
D_{60} = 0.0416 mm	D_{15} = N/A
D_{50} = 0.0255 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY with Sand (CL)

AASHTO Clayey Soils (A-7-6 (20))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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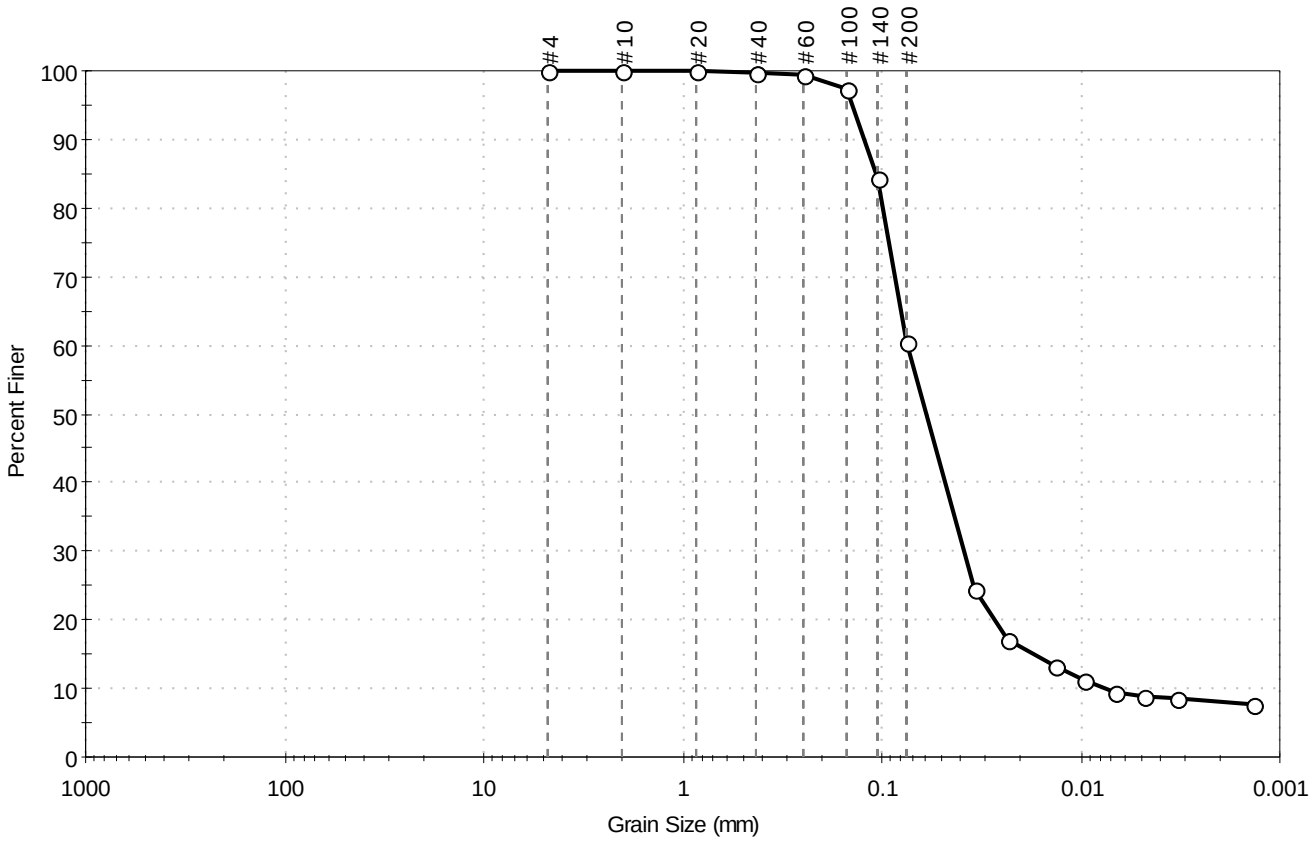
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB021	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0830	Test Date:	02/25/19	Checked By:	bfs
Depth :	44'-46'	Test Id:	485162		
Test Comment:	---				
Visual Description:	Moist, light brownish gray sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	39.6	60.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	97		
#140	0.11	84		
#200	0.075	60		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0342	25		
---	0.0231	17		
---	0.0135	13		
---	0.0096	11		
---	0.0068	9		
---	0.0048	9		
---	0.0033	9		
---	0.0014	8		

Coefficients

D_{85} = 0.1075 mm	D_{30} = 0.0385 mm
D_{60} = 0.0744 mm	D_{15} = 0.0174 mm
D_{50} = 0.0598 mm	D_{10} = 0.0075 mm
C_u = 9.920	C_c = 2.656

Classification

ASTM Sandy SILT (ML)

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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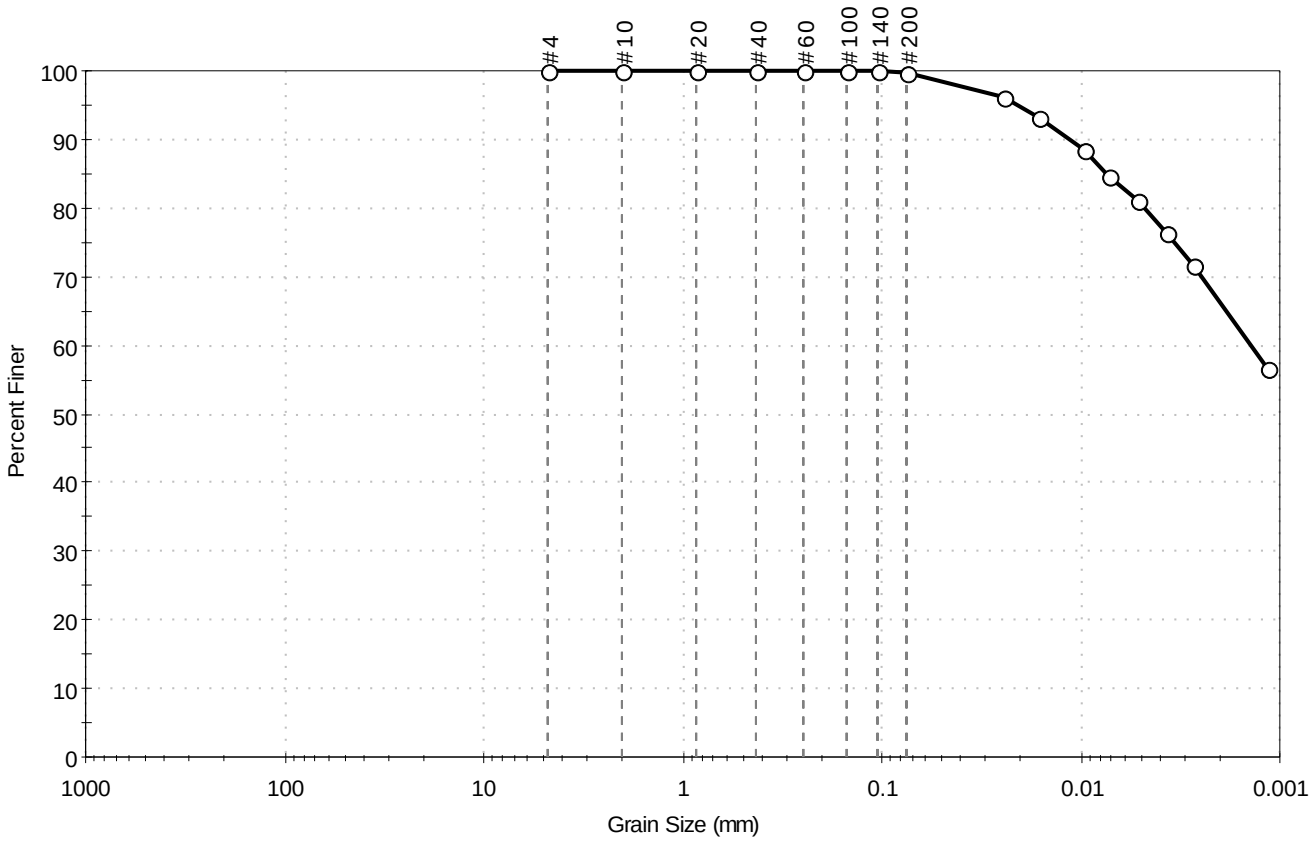
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB022	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0818	Test Date:	02/26/19	Checked By:	bfs
Depth :	35'-37'	Test Id:	485159		
Test Comment:	---				
Visual Description:	Moist, reddish brown clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0243	96		
---	0.0163	93		
---	0.0097	89		
---	0.0072	85		
---	0.0052	81		
---	0.0038	76		
---	0.0027	72		
---	0.0012	57		

Coefficients

D_{85} = 0.0073 mm	D_{30} = N/A
D_{60} = 0.0014 mm	D_{15} = N/A
D_{50} = N/A	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (50))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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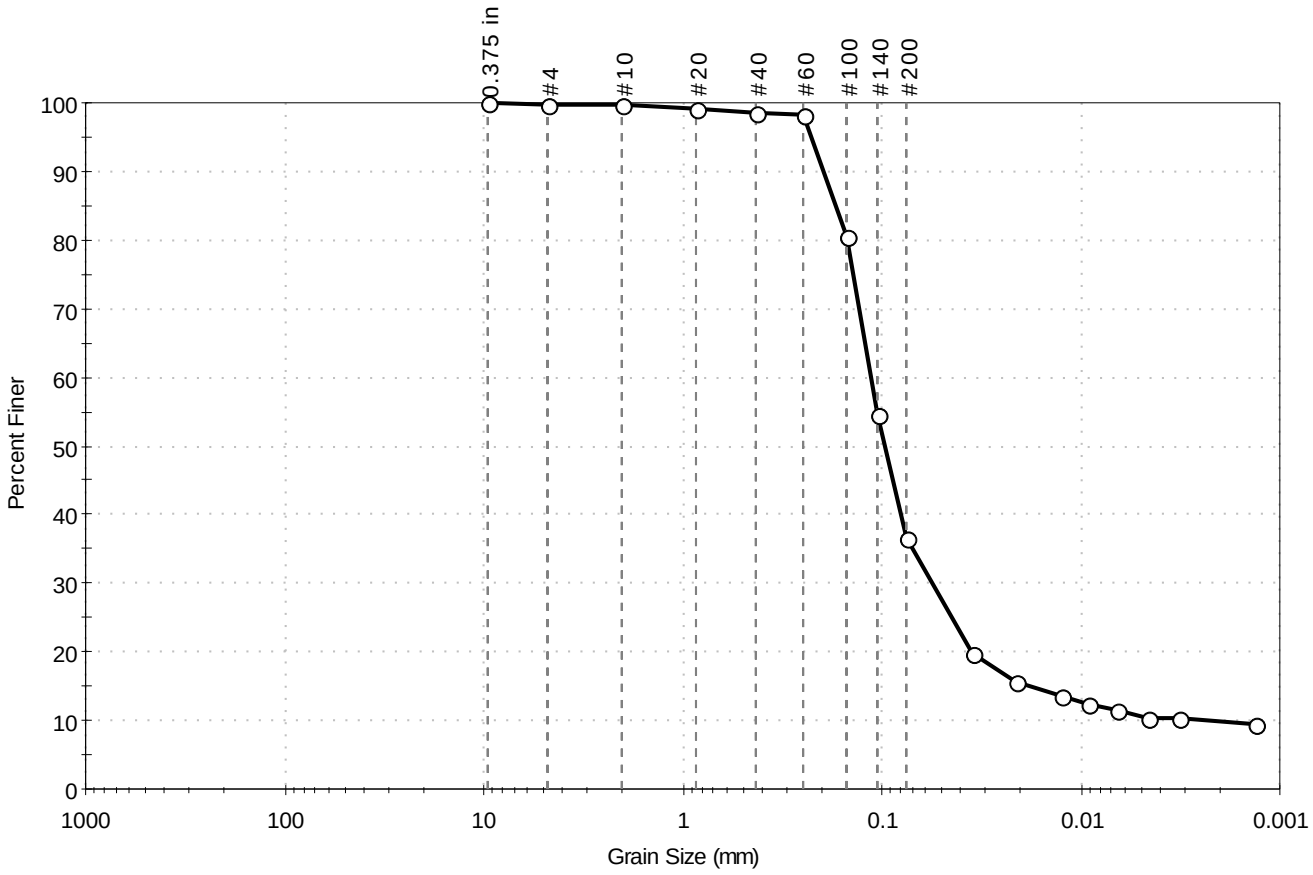
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB022	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0820	Test Date:	02/26/19	Checked By:	bfs
Depth :	45'-47'	Test Id:	485160		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.3	63.0	36.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	81		
#140	0.11	55		
#200	0.075	37		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0347	20		
---	0.0214	16		
---	0.0127	14		
---	0.0092	12		
---	0.0065	11		
---	0.0046	10		
---	0.0032	10		
---	0.0013	9		

Coefficients

D_{85} = 0.1708 mm	D_{30} = 0.0553 mm
D_{60} = 0.1140 mm	D_{15} = 0.0183 mm
D_{50} = 0.0970 mm	D_{10} = 0.0023 mm
C_u = 49.565	C_c = 11.663

Classification

ASTM Silty SAND (SM)

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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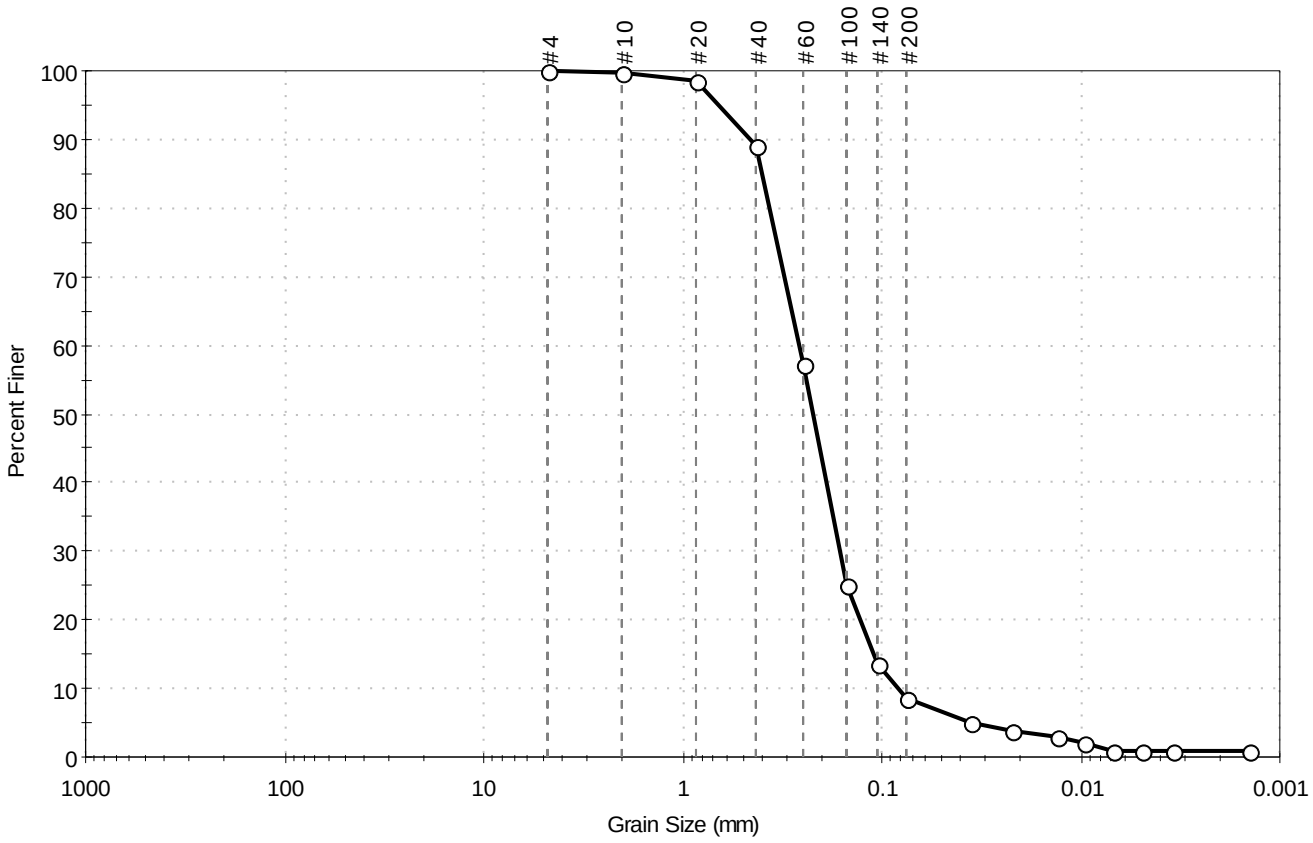
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB023G09	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0881	Test Date:	02/25/19	Checked By:	bfs
Depth :	23-25 ft	Test Id:	486391		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	91.5	8.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	89		
#60	0.25	57		
#100	0.15	25		
#140	0.11	13		
#200	0.075	8.5		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0359	5		
---	0.0225	4		
---	0.0133	3		
---	0.0097	2		
---	0.0069	1		
---	0.0049	1		
---	0.0035	1		
---	0.0014	1		

Coefficients

D_{85} = 0.3975 mm	D_{30} = 0.1621 mm
D_{60} = 0.2623 mm	D_{15} = 0.1109 mm
D_{50} = 0.2231 mm	D_{10} = 0.0831 mm
C_u = 3.156	C_c = 1.205

Classification

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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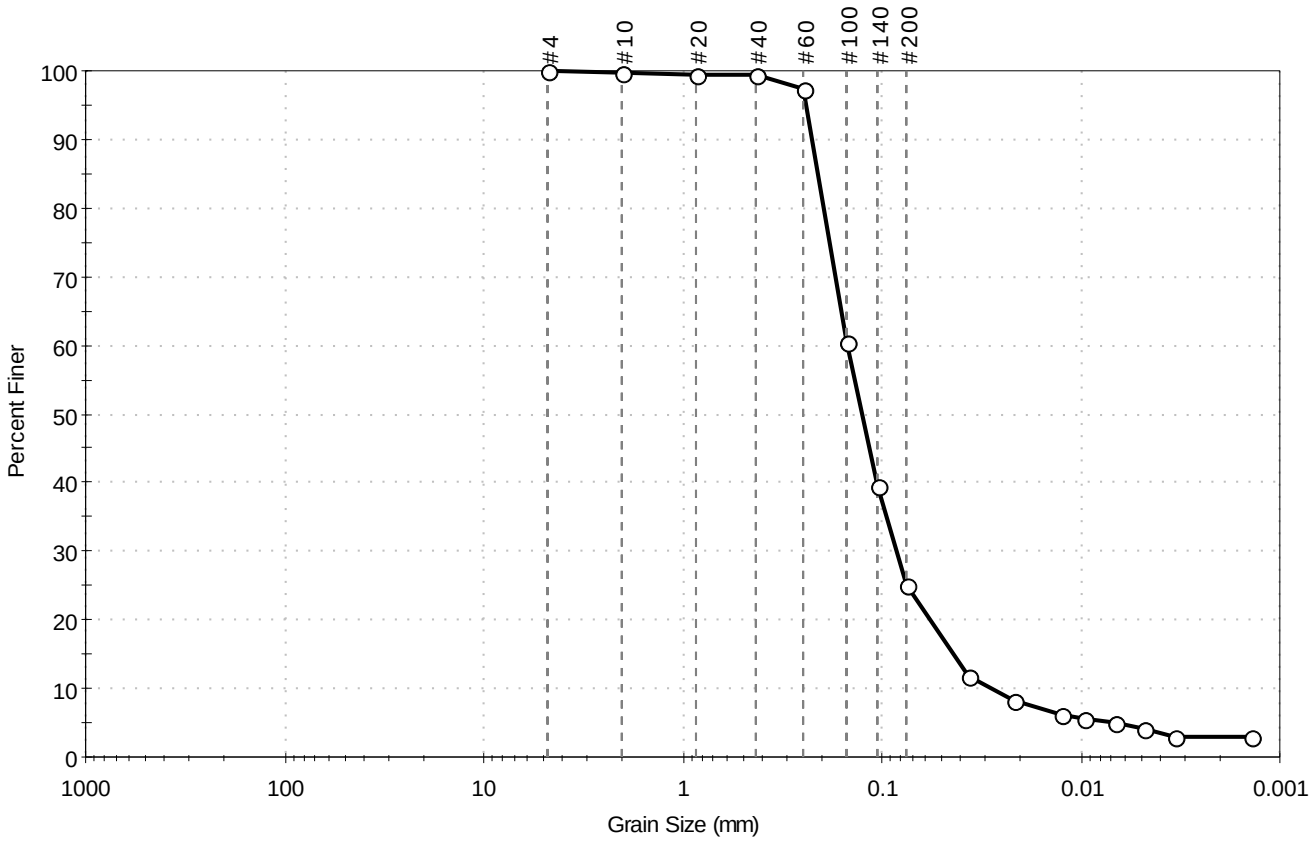
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB023G16B	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0889	Test Date:	02/25/19	Checked By:	bfs
Depth :	59.3-60 ft	Test Id:	486393		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	75.1	24.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	97		
#100	0.15	61		
#140	0.11	39		
#200	0.075	25		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0367	12		
---	0.0218	8		
---	0.0126	6		
---	0.0096	6		
---	0.0068	5		
---	0.0048	4		
---	0.0034	3		
---	0.0014	3		

Coefficients

D_{85} = 0.2106 mm	D_{30} = 0.0846 mm
D_{60} = 0.1487 mm	D_{15} = 0.0437 mm
D_{50} = 0.1261 mm	D_{10} = 0.0284 mm
C_u = 5.236	C_c = 1.695

Classification

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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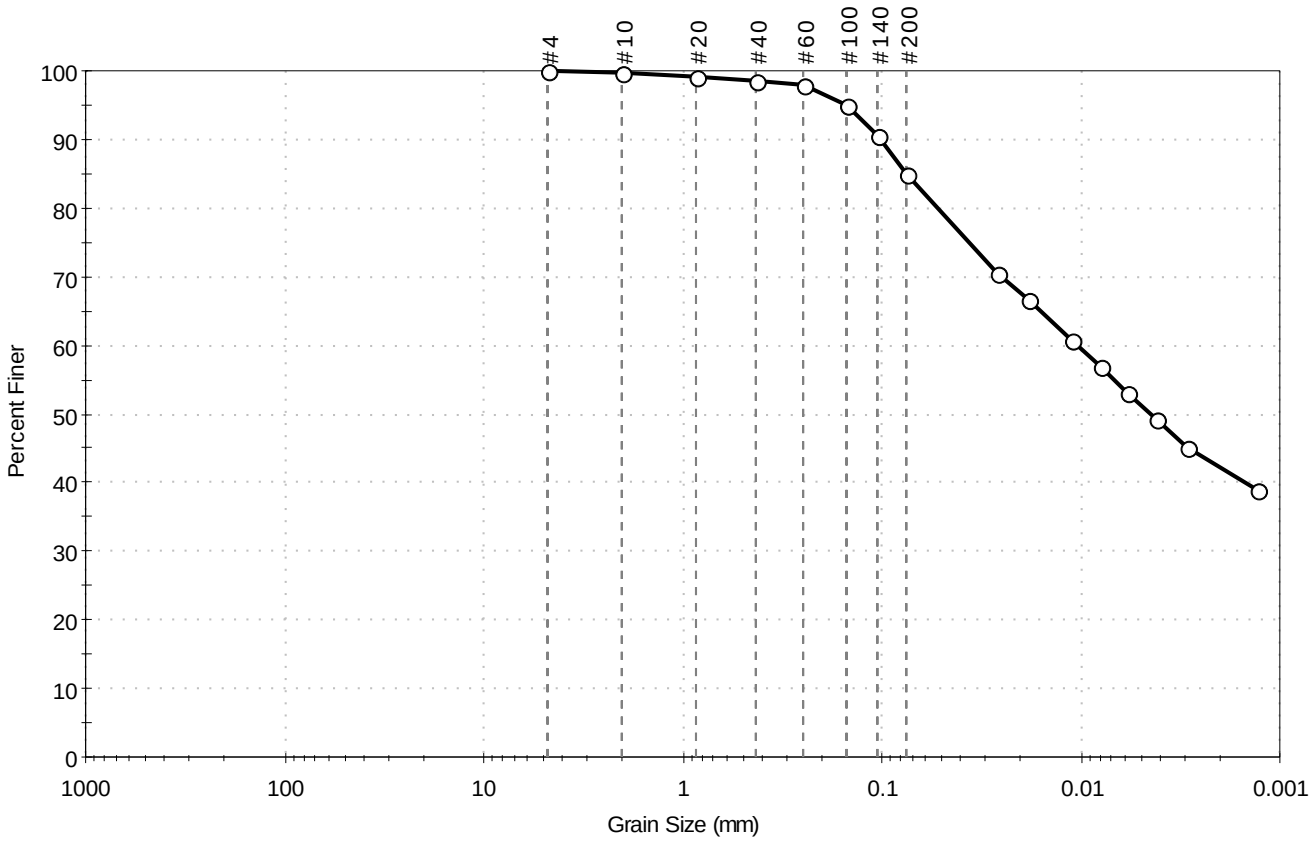
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB008-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1026	Test Date:	01/02/19	Checked By:	emm
Depth :	2-4 ft	Test Id:	482725		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	15.1	84.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	95		
#140	0.11	91		
#200	0.075	85		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0264	70		
---	0.0185	67		
---	0.0111	61		
---	0.0080	57		
---	0.0058	53		
---	0.0042	49		
---	0.0029	45		
---	0.0013	39		

Coefficients

D_{85} = 0.0753 mm	D_{30} = N/A
D_{60} = 0.0104 mm	D_{15} = N/A
D_{50} = 0.0045 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Lean CLAY with Sand (CL)

AASHTO Clayey Soils (A-7-6 (29))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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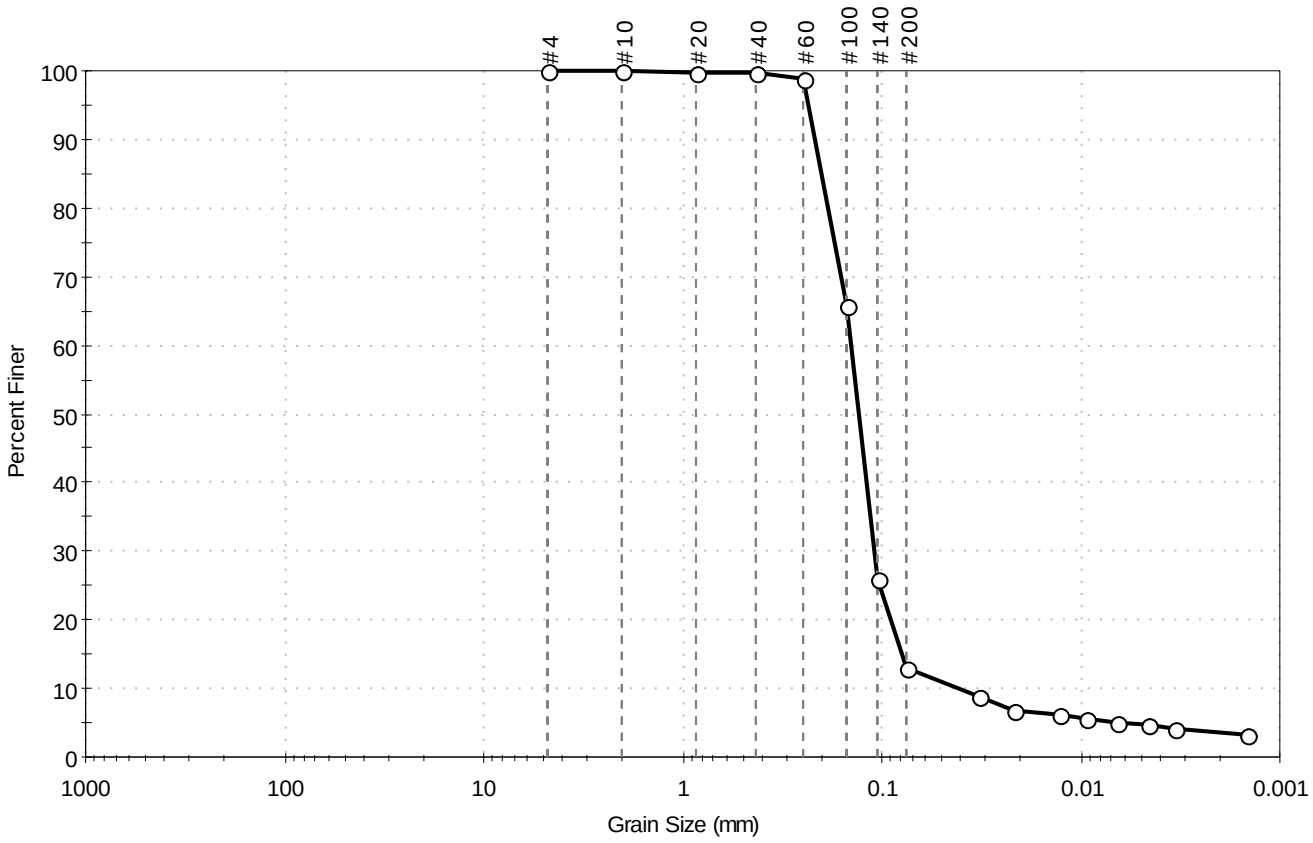
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB008-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1034	Test Date:	01/02/19	Checked By:	emm
Depth :	25-27 ft	Test Id:	482726		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	86.9	13.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	66		
#140	0.11	26		
#200	0.075	13		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0328	9		
---	0.0219	7		
---	0.0129	6		
---	0.0095	6		
---	0.0066	5		
---	0.0046	5		
---	0.0033	4		
---	0.0015	3		

Coefficients

D_{85} = 0.2019 mm D_{30} = 0.1098 mm
D_{60} = 0.1425 mm D_{15} = 0.0789 mm
D_{50} = 0.1306 mm D_{10} = 0.0408 mm
C_u = 3.493 C_c = 2.074

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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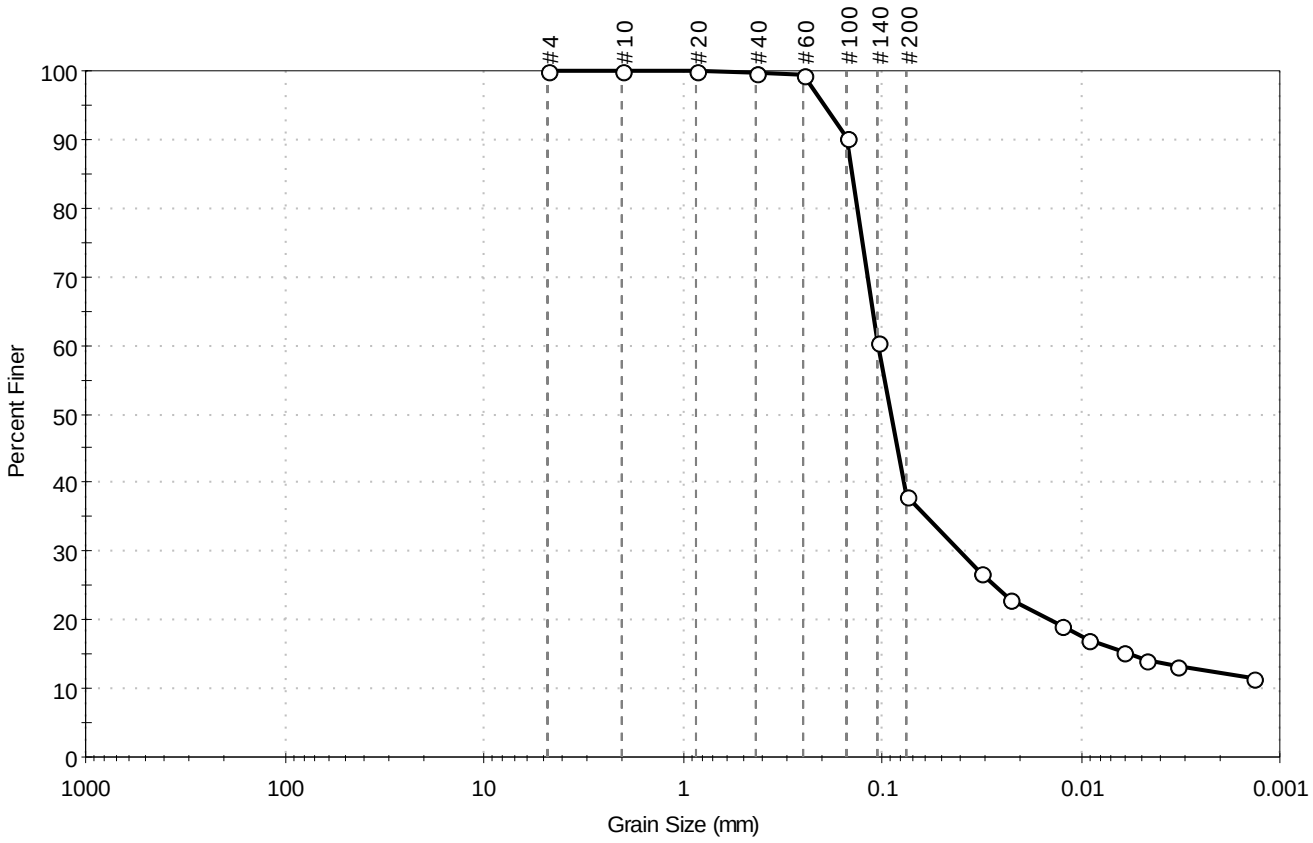
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB012-W1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1050	Test Date:	01/21/19	Checked By:	emm
Depth :	15-17 ft	Test Id:	482973		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty, clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	62.1	37.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	90		
#140	0.11	61		
#200	0.075	38		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0317	27		
---	0.0227	23		
---	0.0125	19		
---	0.0092	17		
---	0.0062	15		
---	0.0047	14		
---	0.0033	13		
---	0.0013	11		

Coefficients

D_{85} = 0.1412 mm	D_{30} = 0.0407 mm
D_{60} = 0.1052 mm	D_{15} = 0.0058 mm
D_{50} = 0.0902 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Silty, Clayey SAND (SC-SM)

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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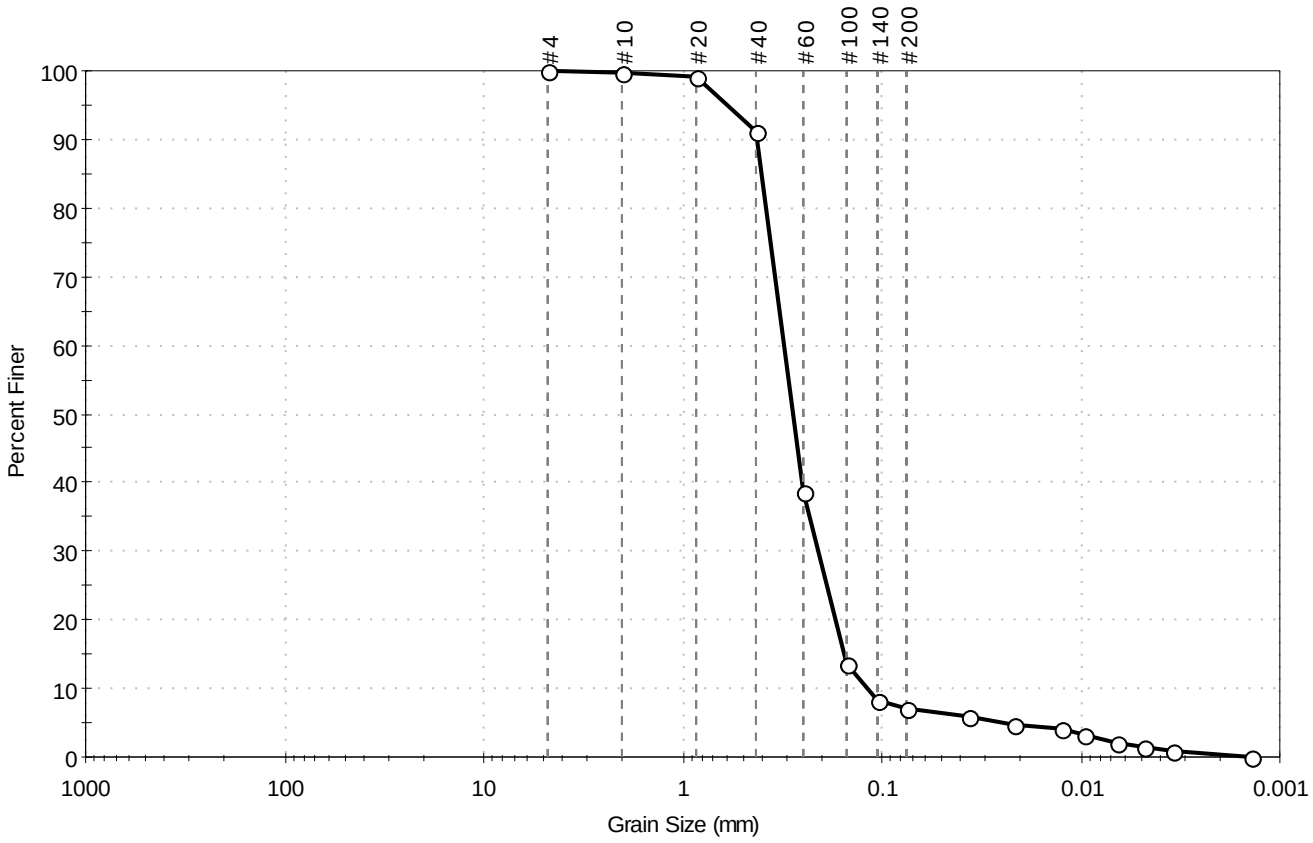
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB012-W1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1053	Test Date:	01/21/19	Checked By:	emm
Depth :	30-32 ft	Test Id:	482974		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	92.9	7.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	91		
#60	0.25	39		
#100	0.15	14		
#140	0.11	8		
#200	0.075	7.1		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0369	6		
---	0.0218	5		
---	0.0125	4		
---	0.0097	3		
---	0.0067	2		
---	0.0048	1		
---	0.0035	1		
---	0.0014	0		

Coefficients

D_{85} = 0.3995 mm	D_{30} = 0.2093 mm
D_{60} = 0.3100 mm	D_{15} = 0.1544 mm
D_{50} = 0.2802 mm	D_{10} = 0.1183 mm
C_u = 2.620	C_c = 1.195

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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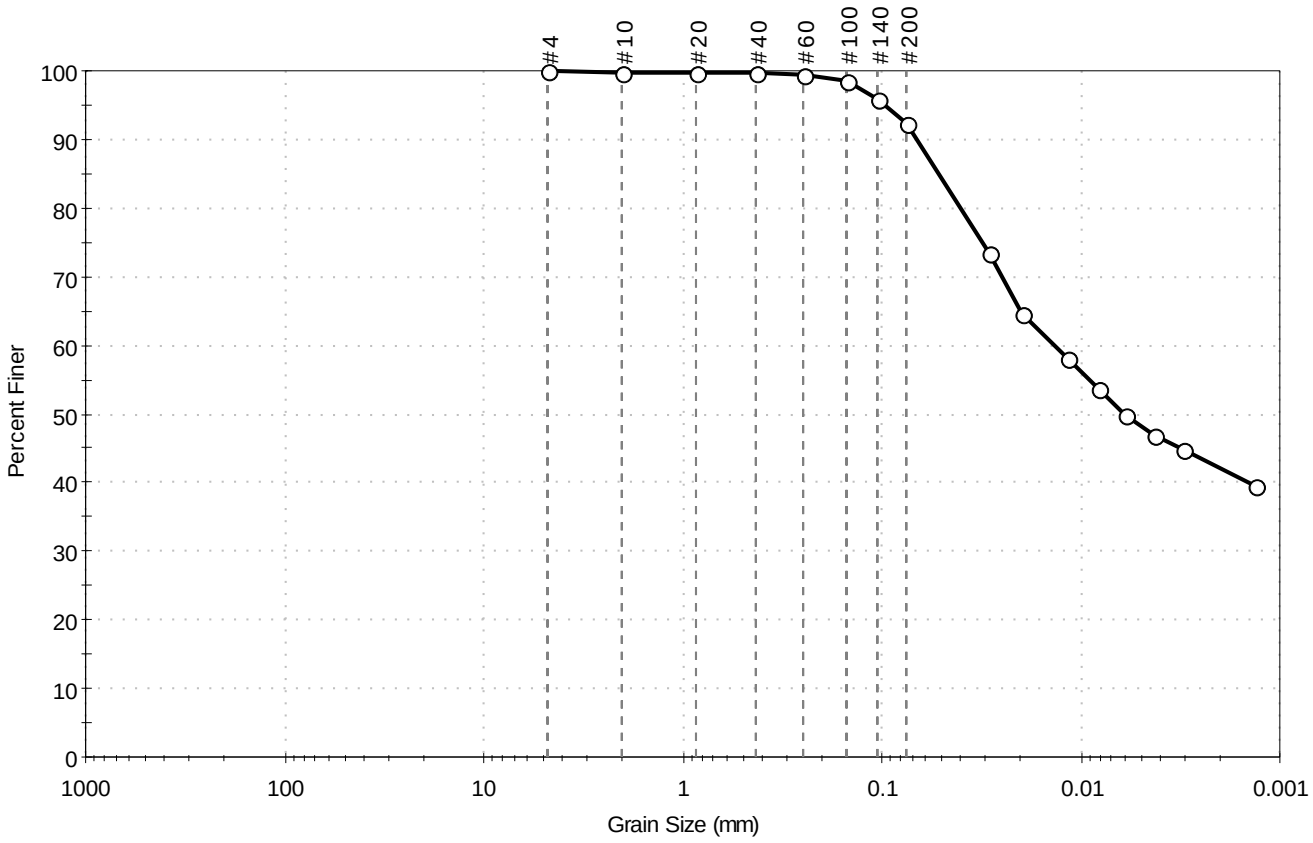
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB019-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1004	Test Date:	01/02/19	Checked By:	emm
Depth :	8-10 ft	Test Id:	482721		
Test Comment:	---				
Visual Description:	Moist, very dark gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	7.6	92.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	98		
#140	0.11	96		
#200	0.075	92		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0288	73		
---	0.0197	65		
---	0.0116	58		
---	0.0082	54		
---	0.0059	50		
---	0.0042	47		
---	0.0030	45		
---	0.0013	40		

Coefficients

D_{85} = 0.0517 mm	D_{30} = N/A
D_{60} = 0.0136 mm	D_{15} = N/A
D_{50} = 0.0061 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (69))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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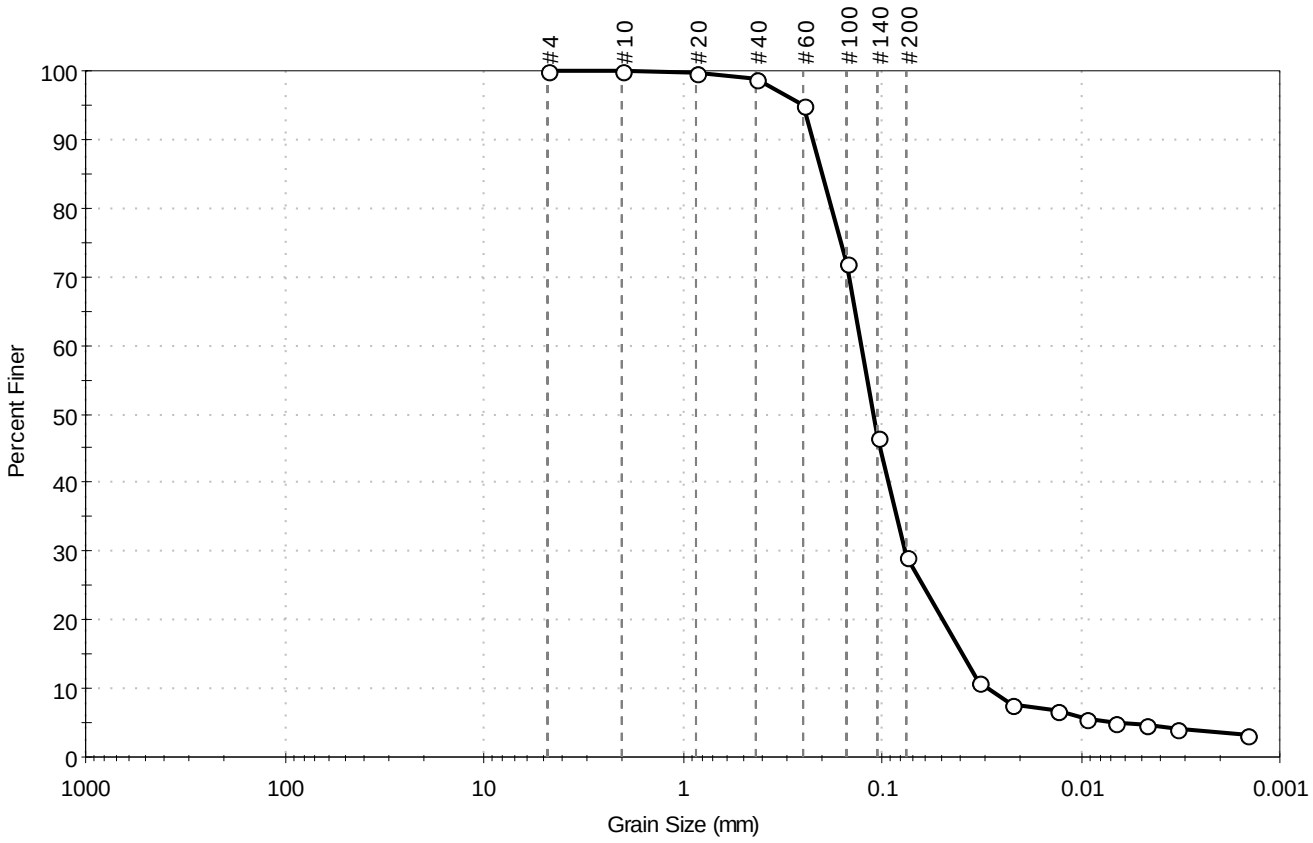
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB019-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1005	Test Date:	01/02/19	Checked By:	emm
Depth :	14-15 ft	Test Id:	482722		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	70.8	29.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	95		
#100	0.15	72		
#140	0.11	47		
#200	0.075	29		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0324	11		
---	0.0223	8		
---	0.0130	7		
---	0.0095	6		
---	0.0067	5		
---	0.0048	5		
---	0.0033	4		
---	0.0015	3		

Coefficients

D_{85} = 0.2005 mm	D_{30} = 0.0762 mm
D_{60} = 0.1274 mm	D_{15} = 0.0391 mm
D_{50} = 0.1111 mm	D_{10} = 0.0291 mm
C_u = 4.378	C_c = 1.566

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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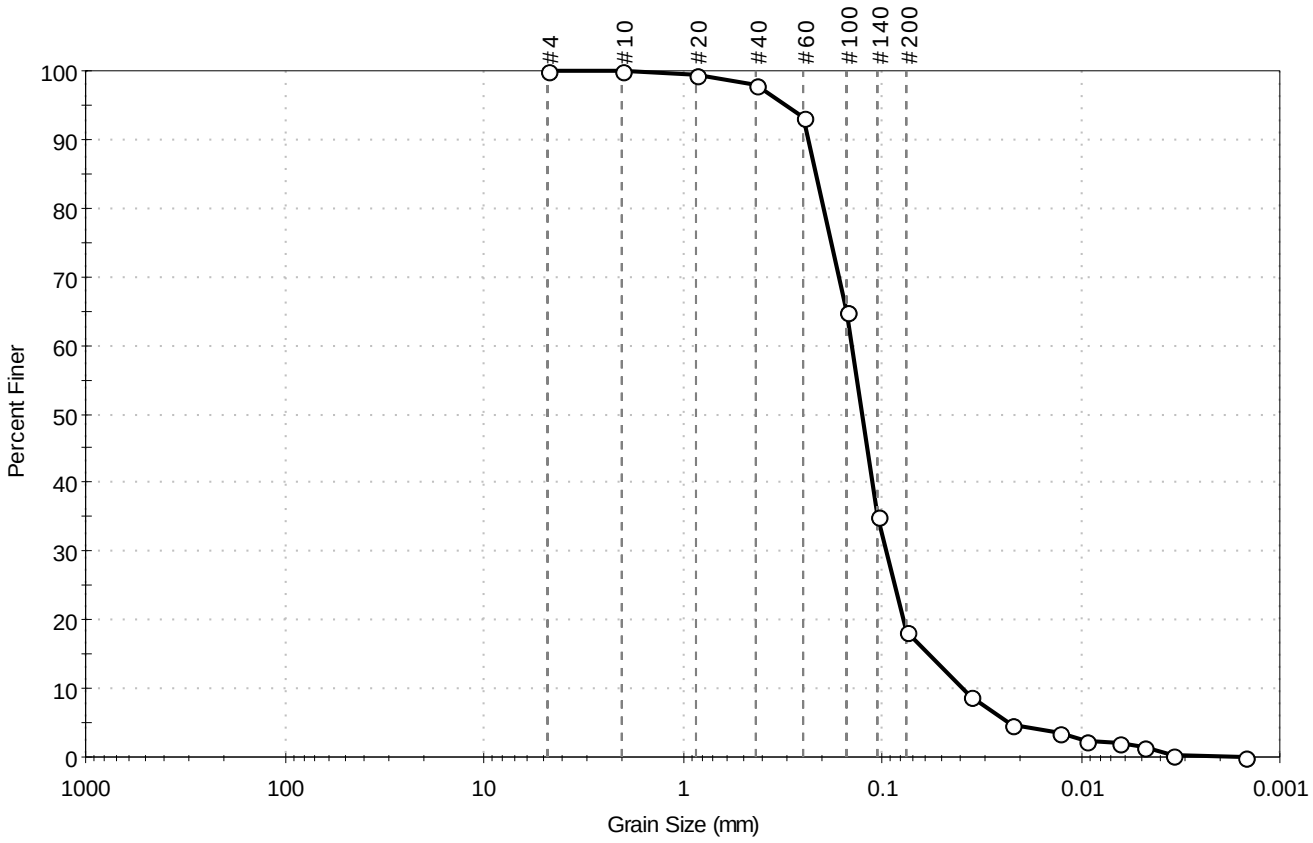
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB023-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1017	Test Date:	01/02/19	Checked By:	emm
Depth :	10-12 ft	Test Id:	482723		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	81.8	18.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	98		
#60	0.25	93		
#100	0.15	65		
#140	0.11	35		
#200	0.075	18		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0358	9		
---	0.0224	5		
---	0.0128	4		
---	0.0095	2		
---	0.0065	2		
---	0.0048	1		
---	0.0034	0		
---	0.0015	0		

Coefficients

D_{85} = 0.2152 mm	D_{30} = 0.0955 mm
D_{60} = 0.1416 mm	D_{15} = 0.0582 mm
D_{50} = 0.1260 mm	D_{10} = 0.0393 mm
C_u = 3.603	C_c = 1.639

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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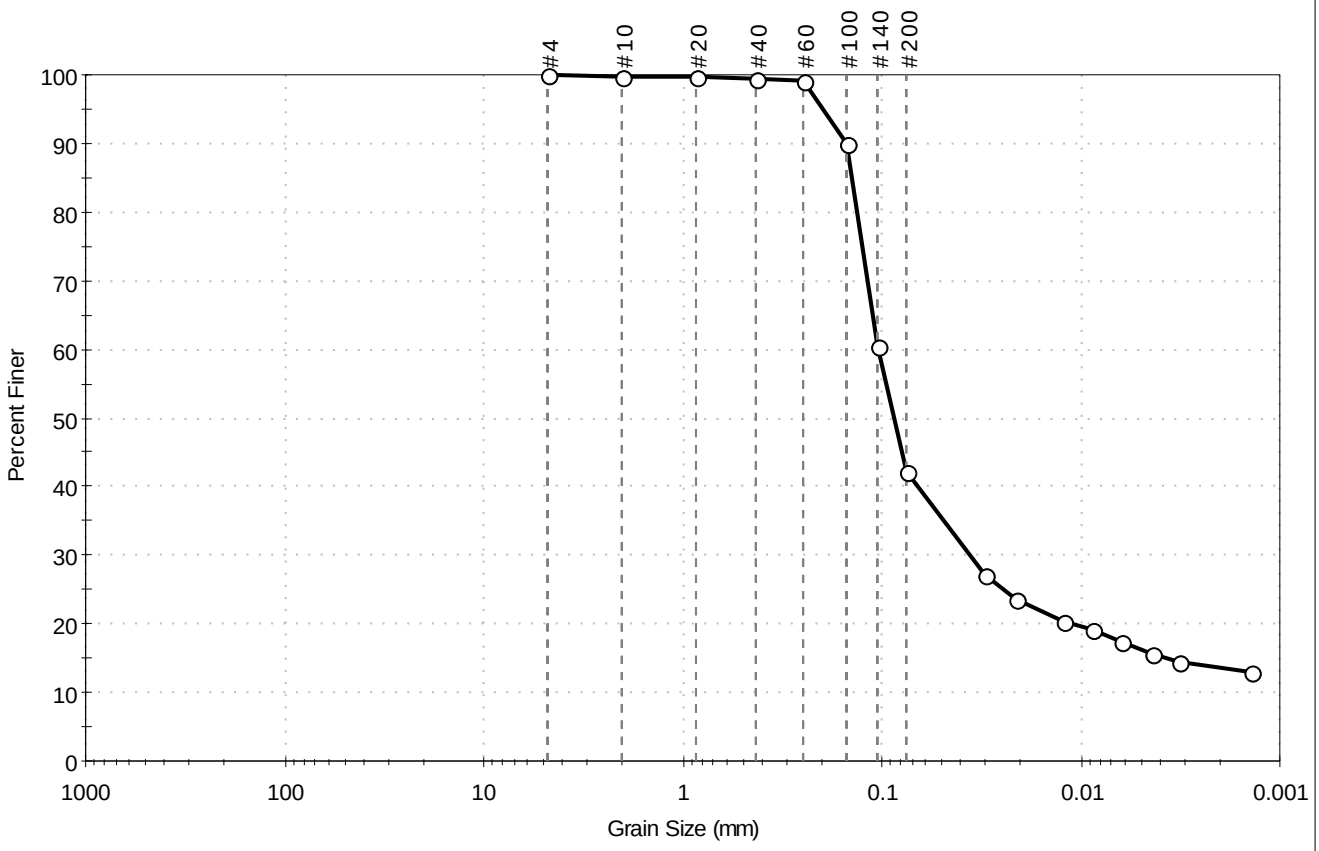
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB023-E1	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1022	Test Date:	01/02/19	Checked By:	emm
Depth :	24-26 ft	Test Id:	482724		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	57.9	42.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	90		
#140	0.11	60		
#200	0.075	42		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0301	27		
---	0.0210	24		
---	0.0123	20		
---	0.0087	19		
---	0.0062	17		
---	0.0044	16		
---	0.0032	14		
---	0.0014	13		

Coefficients

D_{85} = 0.1417 mm	D_{30} = 0.0357 mm
D_{60} = 0.1053 mm	D_{15} = 0.0038 mm
D_{50} = 0.0871 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Clayey SAND (SC)

AASHTO Silty Soils (A-4 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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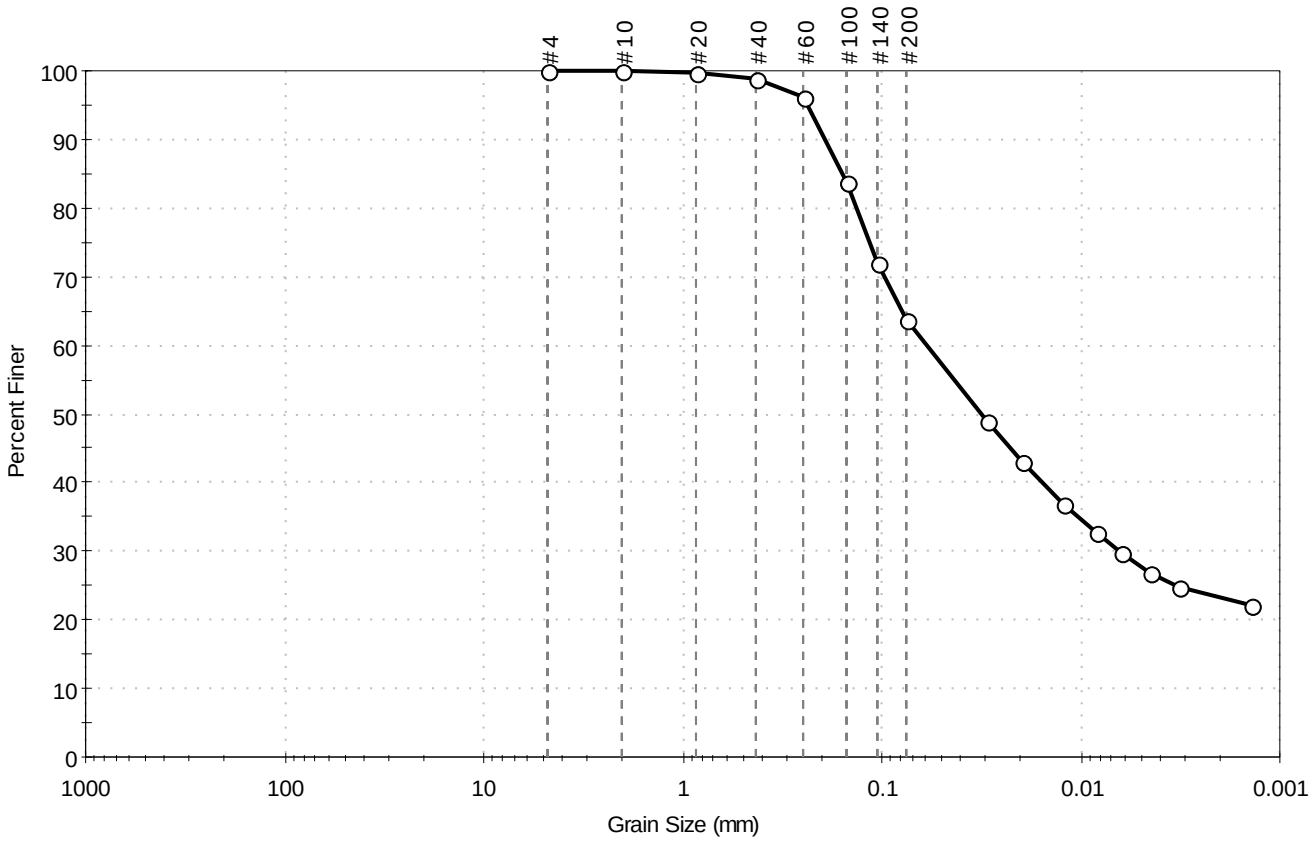
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB025-1W	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1040	Test Date:	01/02/19	Checked By:	emm
Depth :	8-10 ft	Test Id:	482727		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	36.3	63.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	96		
#100	0.15	84		
#140	0.11	72		
#200	0.075	64		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0293	49		
---	0.0197	43		
---	0.0123	37		
---	0.0084	33		
---	0.0063	30		
---	0.0045	27		
---	0.0032	25		
---	0.0014	22		

Coefficients

D_{85} = 0.1576 mm	D_{30} = 0.0064 mm
D_{60} = 0.0591 mm	D_{15} = N/A
D_{50} = 0.0313 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-7-6 (18))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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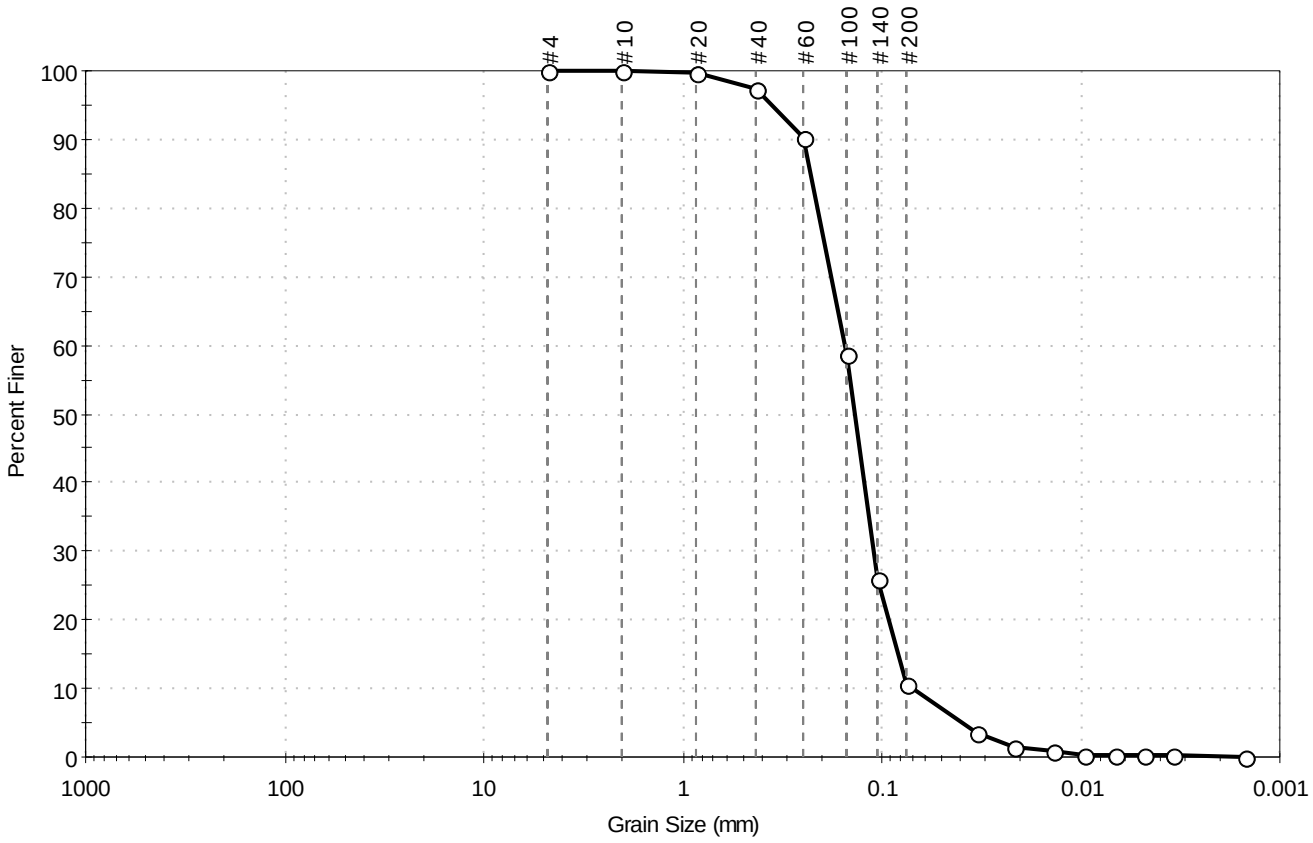
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB025-1W	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL1041	Test Date:	01/02/19	Checked By:	emm
Depth :	14-16 ft	Test Id:	482728		
Test Comment:	---				
Visual Description:	Moist, light brownish gray sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	89.5	10.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	97		
#60	0.25	90		
#100	0.15	59		
#140	0.11	26		
#200	0.075	10		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0330	4		
---	0.0215	1		
---	0.0138	1		
---	0.0096	0		
---	0.0068	0		
---	0.0048	0		
---	0.0034	0		
---	0.0015	0		

Coefficients

D_{85} = 0.2296 mm	D_{30} = 0.1106 mm
D_{60} = 0.1532 mm	D_{15} = 0.0829 mm
D_{50} = 0.1367 mm	D_{10} = 0.0707 mm
C_u = 2.167	C_c = 1.129

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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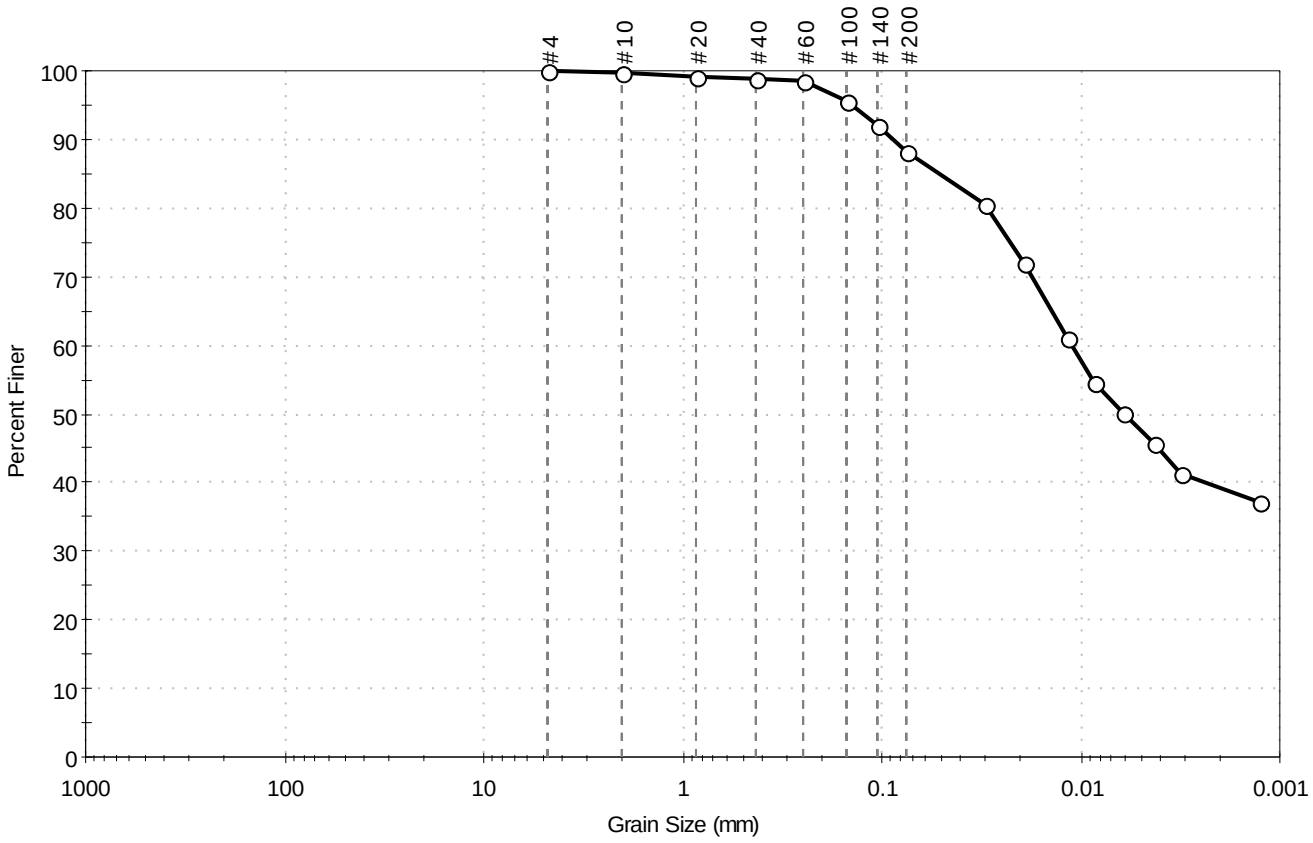
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB028	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0803	Test Date:	02/26/19	Checked By:	bfs
Depth :	8-10 ft	Test Id:	483656		
Test Comment:	---				
Visual Description:	Moist, very dark brown clay				
Sample Comment:	Sample contains organics				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.1	11.6	88.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	96		
#140	0.11	92		
#200	0.075	88		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0302	81		
---	0.0194	72		
---	0.0117	61		
---	0.0085	54		
---	0.0061	50		
---	0.0043	46		
---	0.0031	41		
---	0.0013	37		

Coefficients

D_{85} = 0.0506 mm	D_{30} = N/A
D_{60} = 0.0111 mm	D_{15} = N/A
D_{50} = 0.0060 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat CLAY (CH)

AASHTO Clayey Soils (A-7-6 (46))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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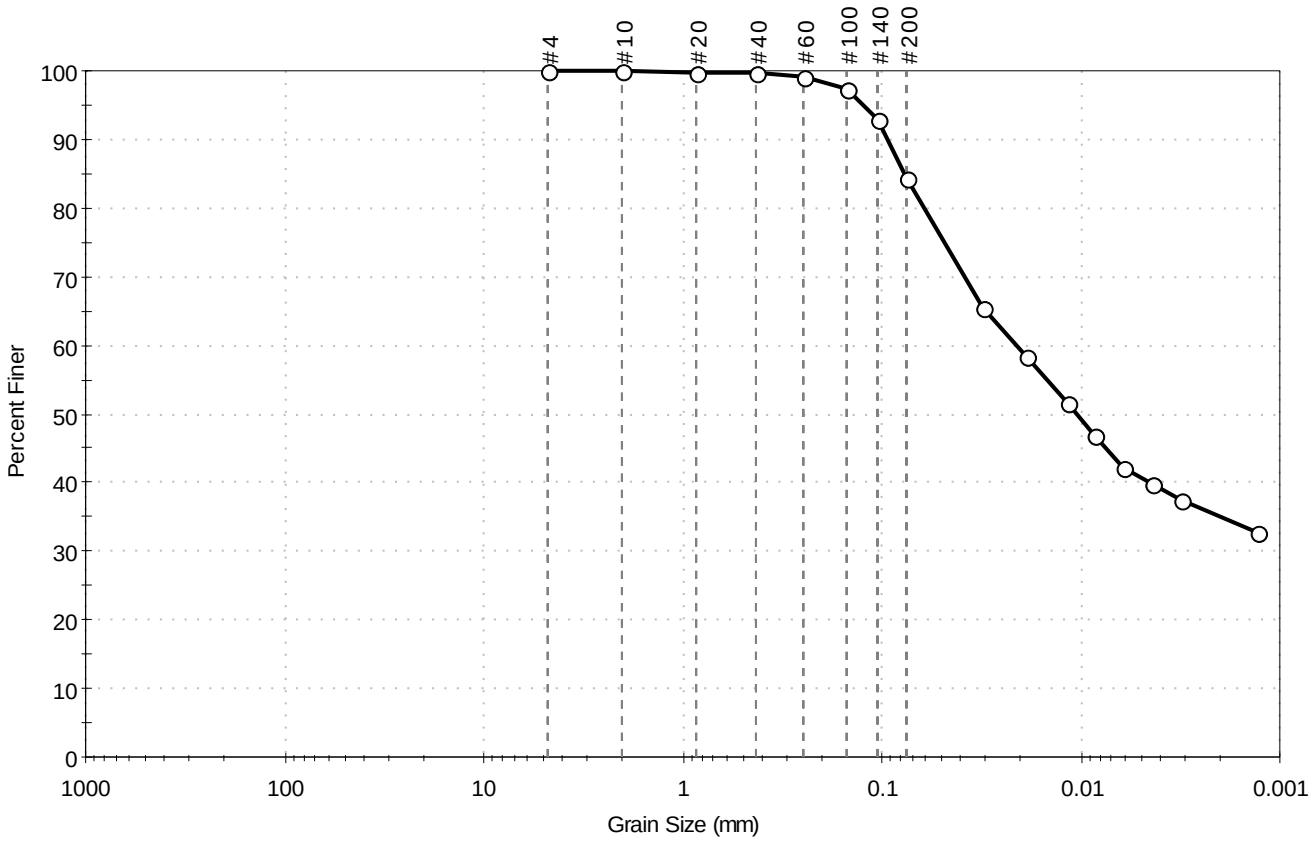
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB028	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0806	Test Date:	02/25/19	Checked By:	bfs
Depth :	25-27 ft	Test Id:	483657		
Test Comment:	---				
Visual Description:	Moist, very dark brown clay with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	15.6	84.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	99		
#100	0.15	97		
#140	0.11	93		
#200	0.075	84		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0314	66		
---	0.0189	58		
---	0.0116	51		
---	0.0086	47		
---	0.0061	42		
---	0.0044	40		
---	0.0031	37		
---	0.0013	33		

Coefficients

D_{85} = 0.0768 mm	D_{30} = N/A
D_{60} = 0.0211 mm	D_{15} = N/A
D_{50} = 0.0105 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Fat CLAY with Sand (CH)

AASHTO Clayey Soils (A-7-6 (44))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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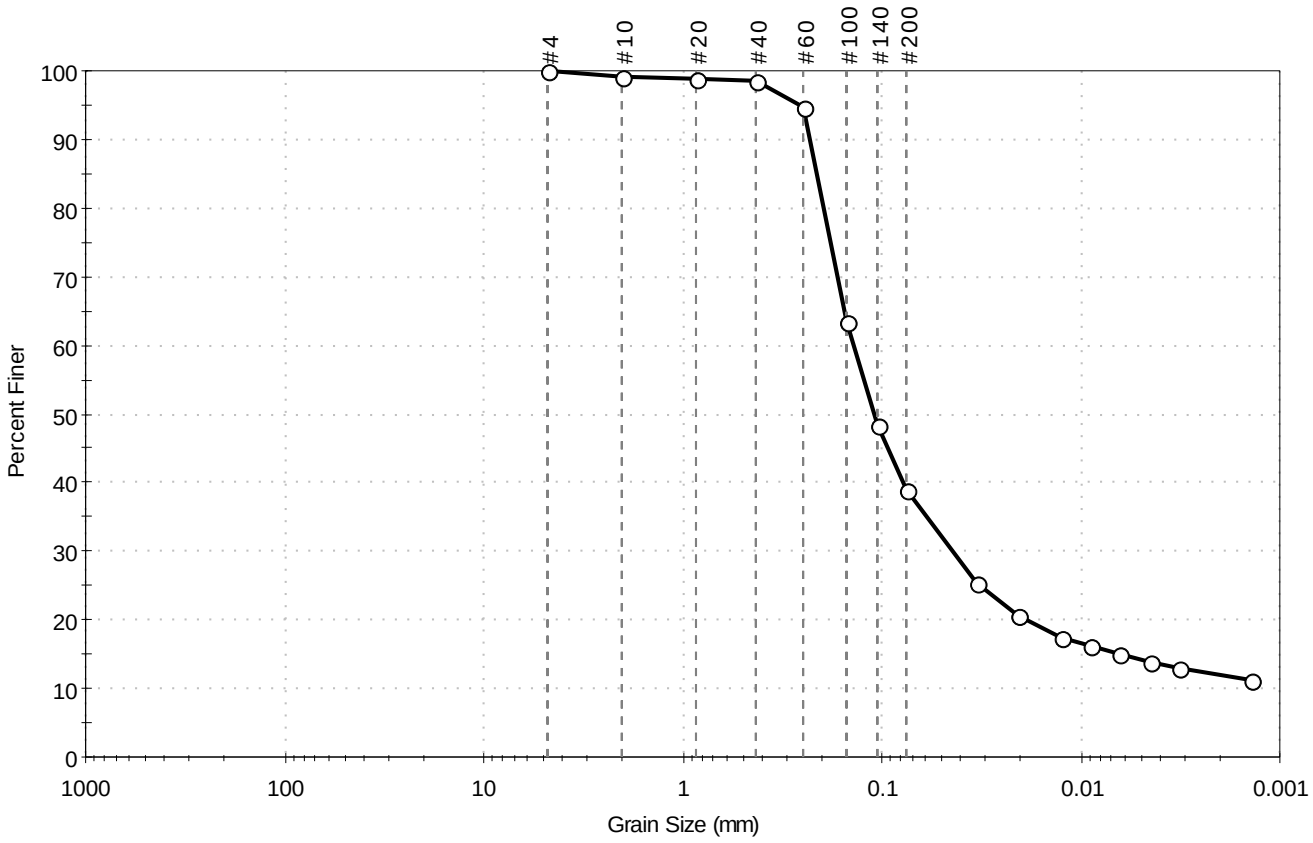
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB029	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0606	Test Date:	01/02/19	Checked By:	emm
Depth :	15-17 ft	Test Id:	482729		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	61.0	39.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	95		
#100	0.15	63		
#140	0.11	48		
#200	0.075	39		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0334	25		
---	0.0208	21		
---	0.0126	17		
---	0.0090	16		
---	0.0064	15		
---	0.0045	14		
---	0.0032	13		
---	0.0014	11		

Coefficients

D_{85} = 0.2137 mm	D_{30} = 0.0441 mm
D_{60} = 0.1385 mm	D_{15} = 0.0061 mm
D_{50} = 0.1098 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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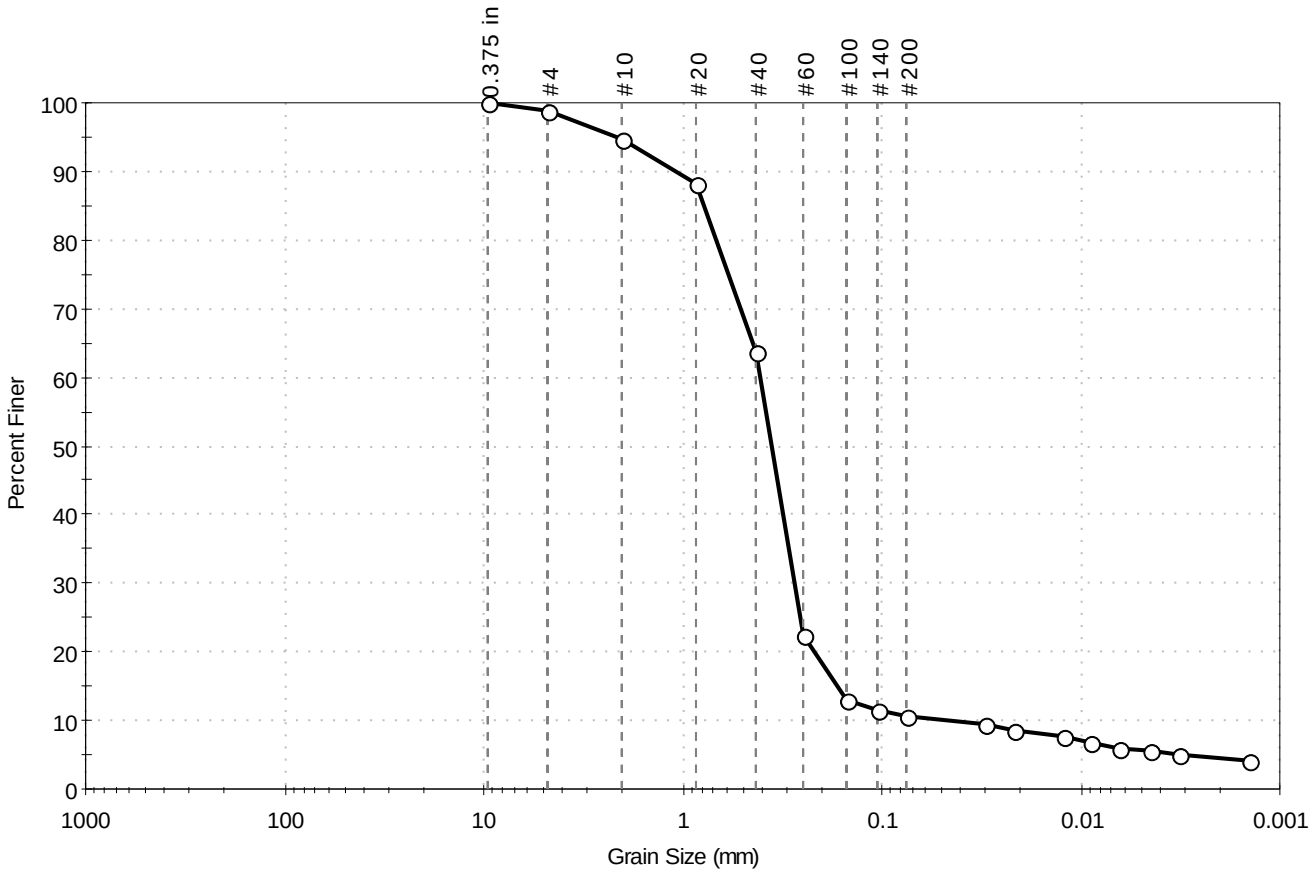
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB029	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0610	Test Date:	01/21/19	Checked By:	emm
Depth :	35-36.5 ft	Test Id:	482730		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sand with silt				
Sample Comment:	Sample contains shells				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	1.2	88.2	10.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	95		
#20	0.85	88		
#40	0.42	64		
#60	0.25	22		
#100	0.15	13		
#140	0.11	11		
#200	0.075	11		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0302	10		
---	0.0216	9		
---	0.0121	8		
---	0.0089	7		
---	0.0064	6		
---	0.0045	6		
---	0.0032	5		
---	0.0014	4		

Coefficients

D_{85} = 0.7778 mm	D_{30} = 0.2756 mm
D_{60} = 0.4049 mm	D_{15} = 0.1680 mm
D_{50} = 0.3562 mm	D_{10} = 0.0444 mm
C_u = 9.119	C_c = 4.225

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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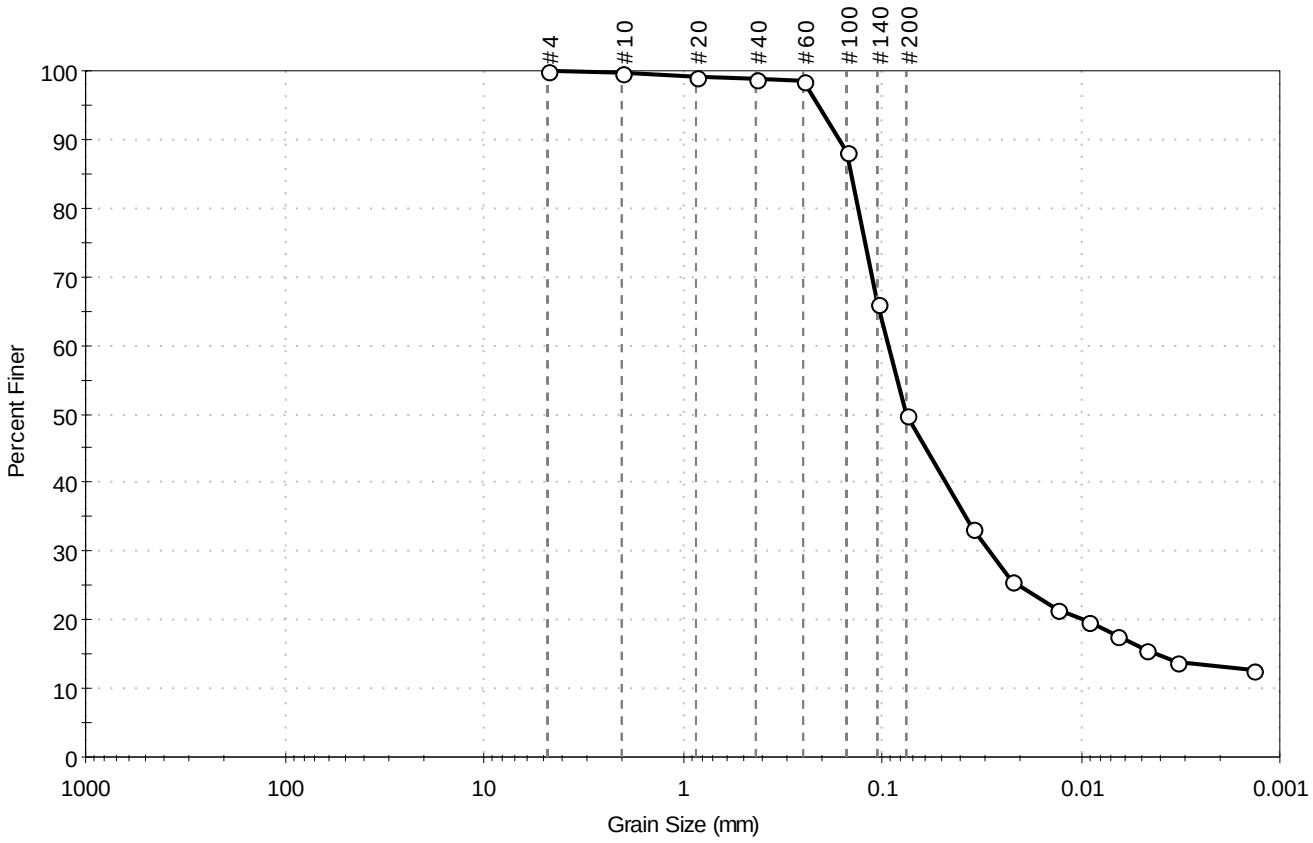
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB030	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0693	Test Date:	02/25/19	Checked By:	bfs
Depth :	14-16 ft	Test Id:	483654		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clayey sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	50.2	49.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	88		
#140	0.11	66		
#200	0.075	50		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0350	33		
---	0.0223	26		
---	0.0132	22		
---	0.0092	20		
---	0.0065	18		
---	0.0047	16		
---	0.0033	14		
---	0.0014	13		

Coefficients

D_{85} = 0.1426 mm
D_{30} = 0.0288 mm
D_{60} = 0.0931 mm
D_{15} = 0.0041 mm
D_{50} = 0.0753 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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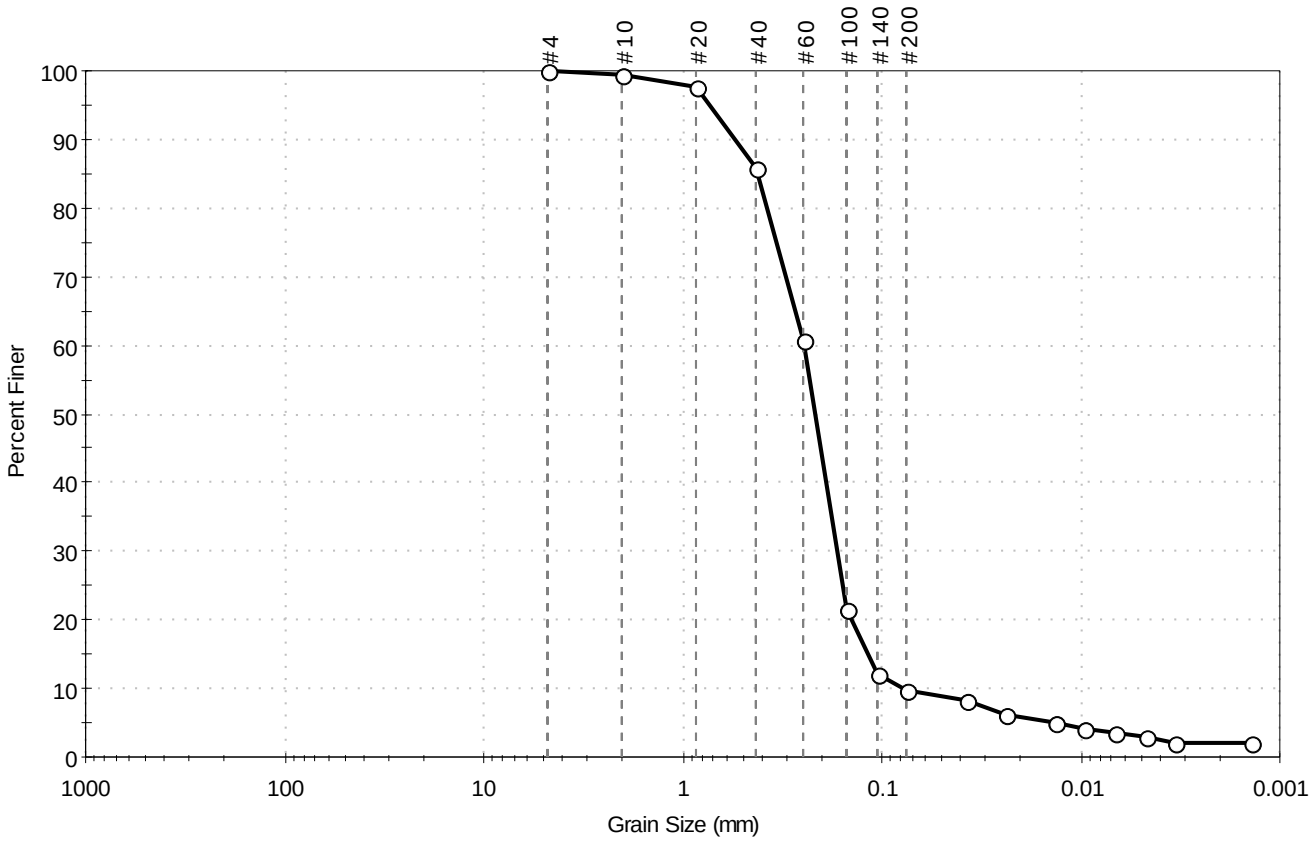
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB030	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0696	Test Date:	02/25/19	Checked By:	bfs
Depth :	30-32 ft	Test Id:	483655		
Test Comment:	---				
Visual Description:	Moist, brownish gray sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	90.3	9.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	98		
#40	0.42	86		
#60	0.25	61		
#100	0.15	21		
#140	0.11	12		
#200	0.075	9.7		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0372	8		
---	0.0237	6		
---	0.0134	5		
---	0.0095	4		
---	0.0068	4		
---	0.0047	3		
---	0.0034	2		
---	0.0014	2		

Coefficients

D_{85} = 0.4178 mm	D_{30} = 0.1677 mm
D_{60} = 0.2480 mm	D_{15} = 0.1184 mm
D_{50} = 0.2176 mm	D_{10} = 0.0781 mm
C_u = 3.175	C_c = 1.452

Classification

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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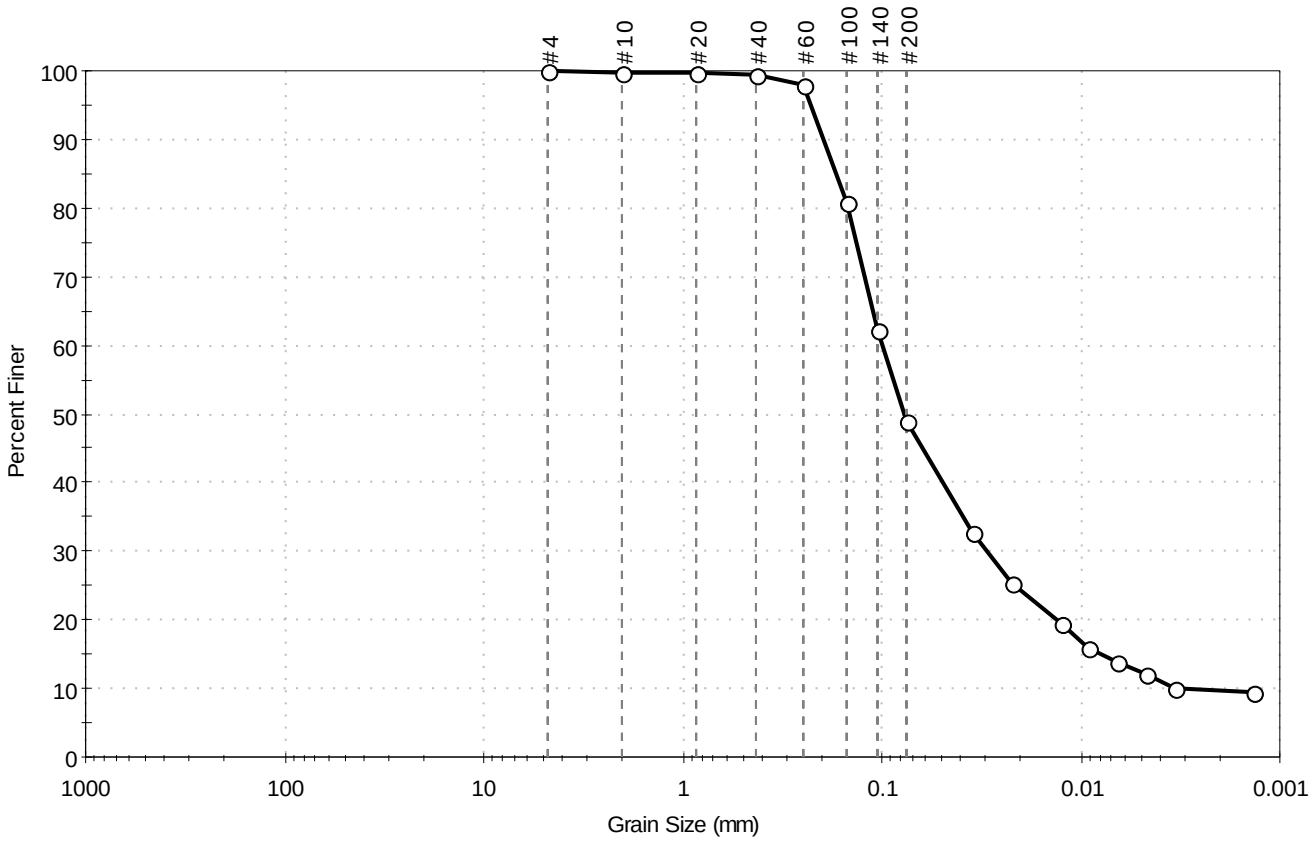
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB031	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0617	Test Date:	01/02/19	Checked By:	emm
Depth :	8-10 ft	Test Id:	482923		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown clayey sand				
Sample Comment:	Sample contains organics				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	51.2	48.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	98		
#100	0.15	81		
#140	0.11	62		
#200	0.075	49		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0349	33		
---	0.0224	25		
---	0.0126	20		
---	0.0092	16		
---	0.0066	14		
---	0.0047	12		
---	0.0033	10		
---	0.0014	9		

Coefficients

D_{85} = 0.1698 mm	D_{30} = 0.0296 mm
D_{60} = 0.1003 mm	D_{15} = 0.0080 mm
D_{50} = 0.0773 mm	D_{10} = 0.0029 mm
C_u = 34.586	C_c = 3.012

Classification

ASTM Clayey SAND (SC)

AASHTO Clayey Soils (A-6 (5))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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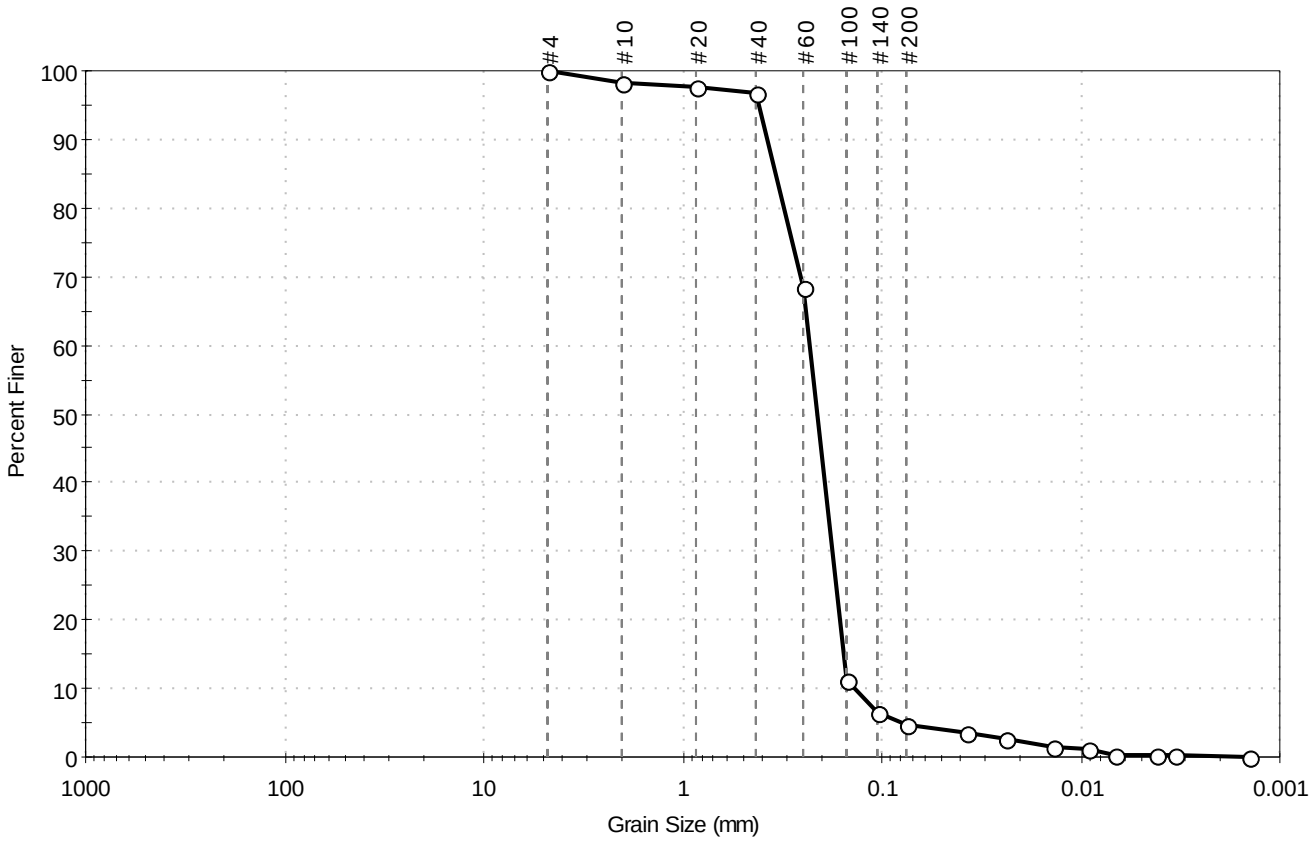
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB031	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0622	Test Date:	01/02/19	Checked By:	emm
Depth :	20-22 ft	Test Id:	482924		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	95.2	4.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	98		
#20	0.85	98		
#40	0.42	97		
#60	0.25	68		
#100	0.15	11		
#140	0.11	6		
#200	0.075	4.8		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0377	3		
---	0.0238	3		
---	0.0136	1		
---	0.0092	1		
---	0.0068	0		
---	0.0042	0		
---	0.0034	0		
---	0.0014	0		

Coefficients

D_{85} = 0.3406 mm	D_{30} = 0.1774 mm
D_{60} = 0.2318 mm	D_{15} = 0.1552 mm
D_{50} = 0.2120 mm	D_{10} = 0.1374 mm
C_u = 1.687	C_c = 0.988

Classification

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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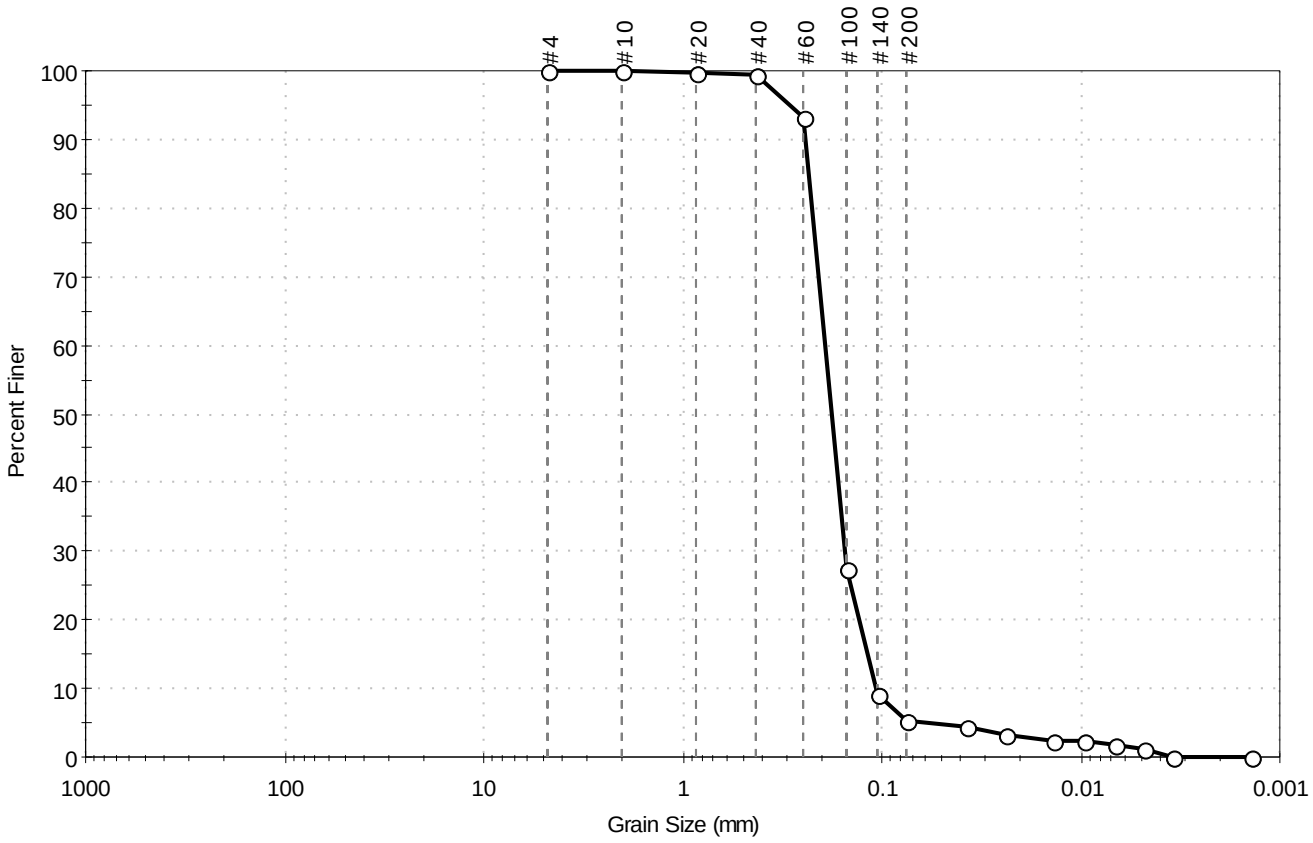
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB032	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0680	Test Date:	02/25/19	Checked By:	bfs
Depth :	14-16 ft	Test Id:	483684		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	94.7	5.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	93		
#100	0.15	27		
#140	0.11	9		
#200	0.075	5.3		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0376	4		
---	0.0238	3		
---	0.0138	2		
---	0.0097	2		
---	0.0067	2		
---	0.0049	1		
---	0.0035	0		
---	0.0014	0		

Coefficients

D_{85} = 0.2346 mm D_{30} = 0.1530 mm
D_{60} = 0.1932 mm D_{15} = 0.1186 mm
D_{50} = 0.1787 mm D_{10} = 0.1079 mm
C_u = 1.791 C_c = 1.123

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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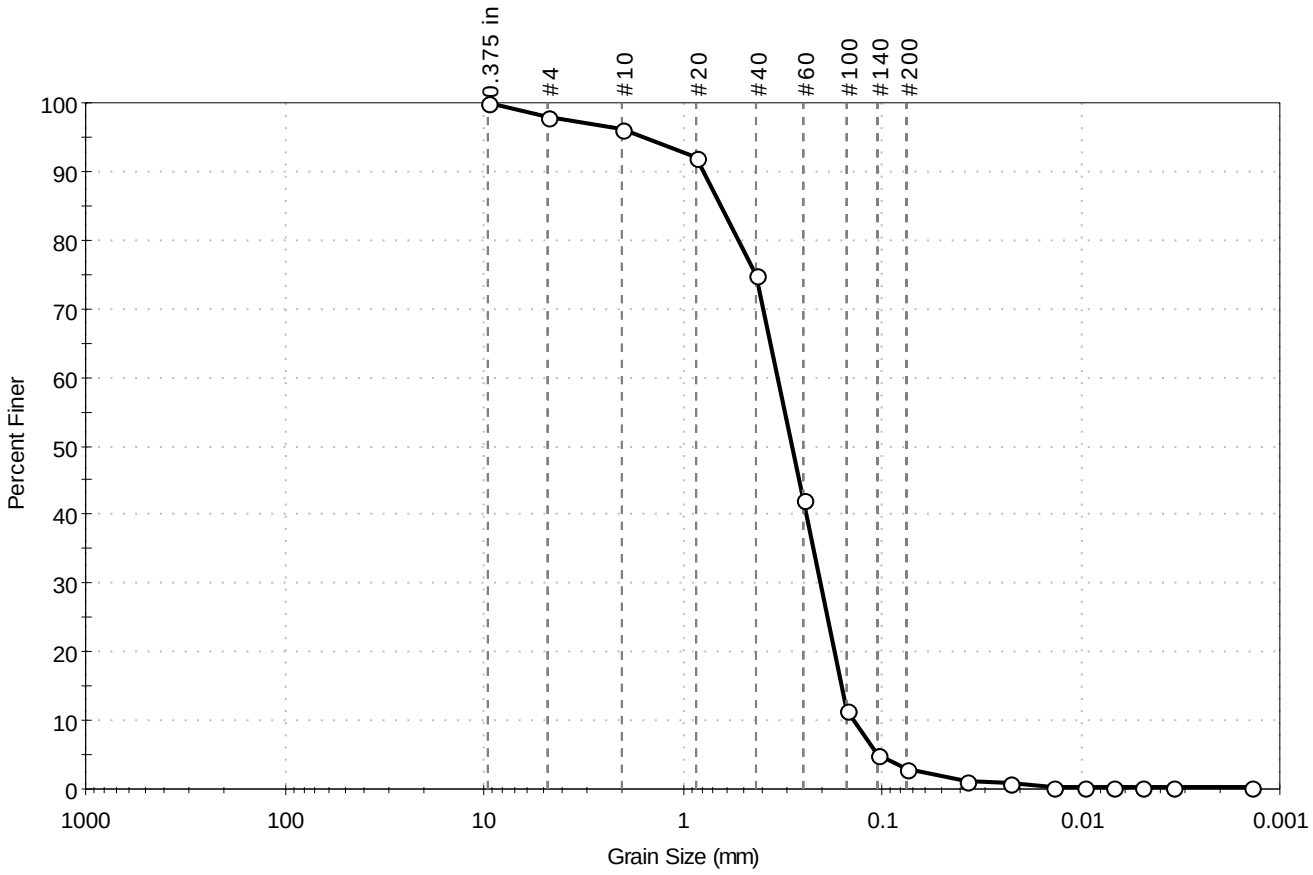
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB032	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0684	Test Date:	02/26/19	Checked By:	bfs
Depth :	35-37 ft	Test Id:	483653		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	2.1	95.0	2.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	96		
#20	0.85	92		
#40	0.42	75		
#60	0.25	42		
#100	0.15	11		
#140	0.11	5		
#200	0.075	2.9		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0376	1		
---	0.0229	1		
---	0.0139	0		
---	0.0098	0		
---	0.0070	0		
---	0.0049	0		
---	0.0034	0		
---	0.0014	0		

Coefficients

D_{85} = 0.6387 mm	D_{30} = 0.2039 mm
D_{60} = 0.3337 mm	D_{15} = 0.1591 mm
D_{50} = 0.2834 mm	D_{10} = 0.1386 mm
C_u = 2.408	C_c = 0.899

Classification

ASTM Poorly graded SAND (SP)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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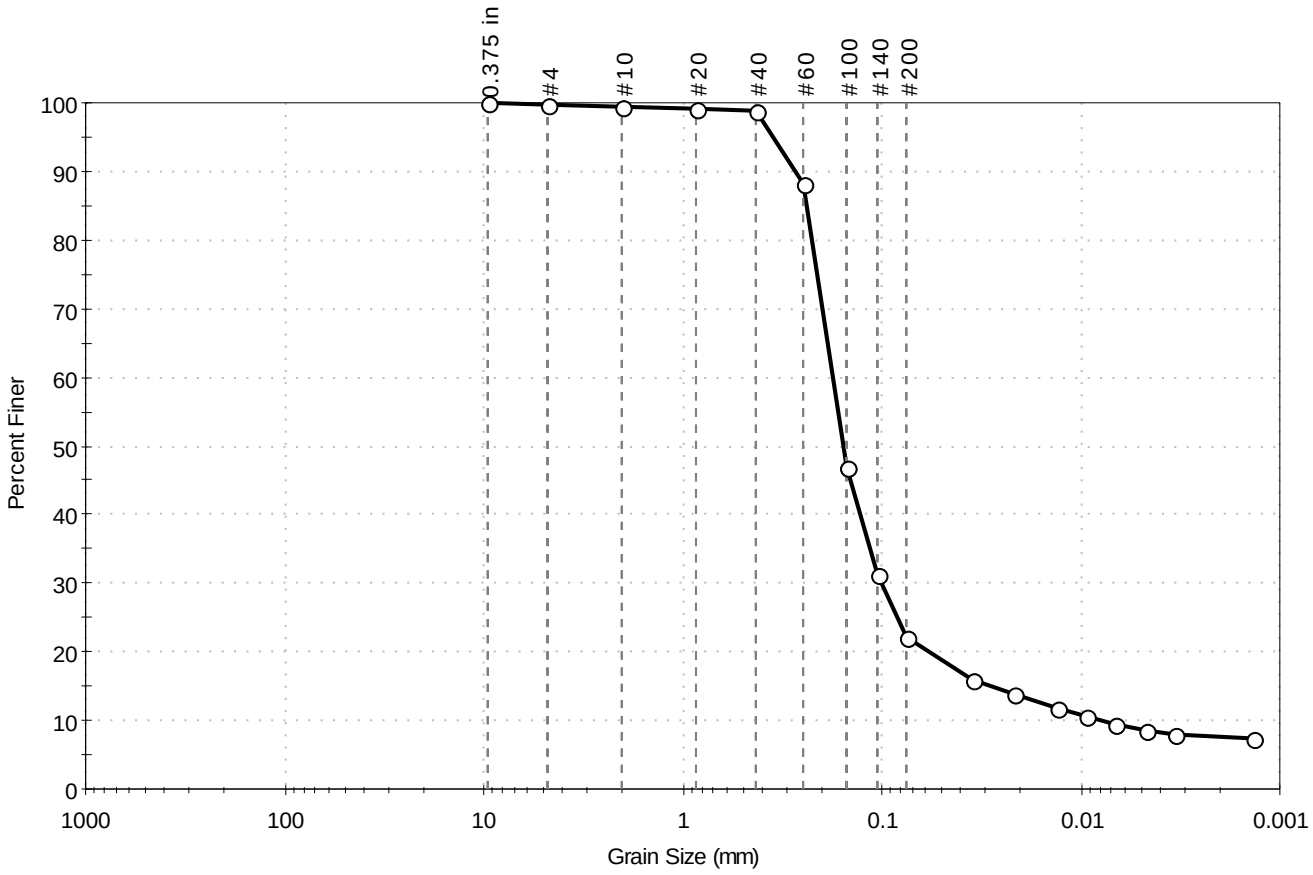
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB033	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0645	Test Date:	03/08/19	Checked By:	bfs
Depth :	14-16 ft	Test Id:	483678		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.3	77.6	22.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	88		
#100	0.15	47		
#140	0.11	31		
#200	0.075	22		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0351	16		
---	0.0219	14		
---	0.0130	12		
---	0.0094	11		
---	0.0067	10		
---	0.0047	8		
---	0.0034	8		
---	0.0013	7		

Coefficients

D_{85} = 0.2404 mm	D_{30} = 0.1006 mm
D_{60} = 0.1765 mm	D_{15} = 0.0285 mm
D_{50} = 0.1560 mm	D_{10} = 0.0077 mm
C_u = 22.922	C_c = 7.447

Classification

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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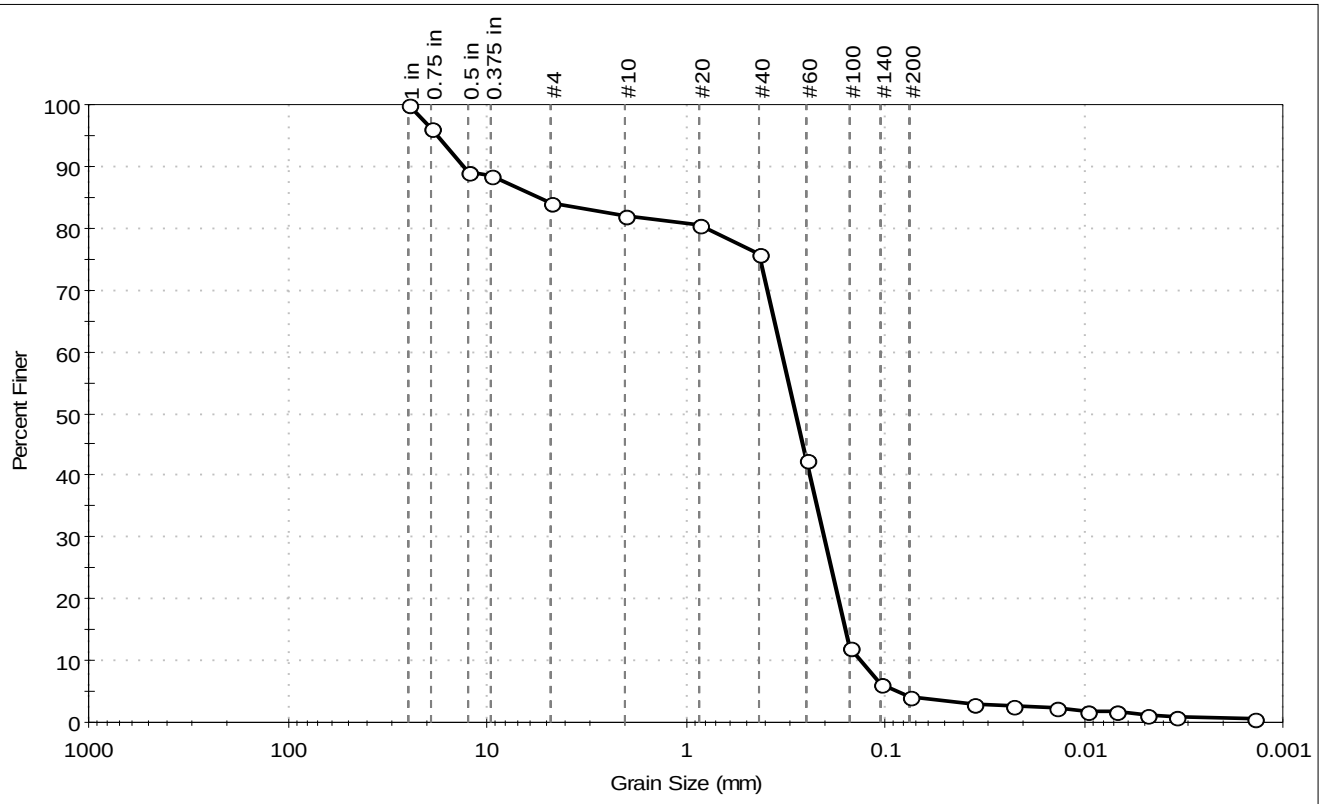
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB033	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0647	Test Date:	02/26/19	Checked By:	bfs
Depth :	30-32 ft	Test Id:	483679		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	16.0	79.8	4.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	96		
0.5 in	12.50	89		
0.375 in	9.50	88		
#4	4.75	84		
#10	2.00	82		
#20	0.85	81		
#40	0.42	76		
#60	0.25	42		
#100	0.15	12		
#140	0.11	6		
#200	0.075	4.2		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0358	3		
---	0.0228	3		
---	0.0138	2		
---	0.0097	2		
---	0.0069	2		
---	0.0048	1		
---	0.0035	1		
---	0.0014	1		

Coefficients

D_{85} = 5.5346 mm	D_{30} = 0.2028 mm
D_{60} = 0.3305 mm	D_{15} = 0.1576 mm
D_{50} = 0.2820 mm	D_{10} = 0.1329 mm
C_u = 2.487	C_c = 0.936

Classification

ASTM Poorly graded SAND with Gravel (SP)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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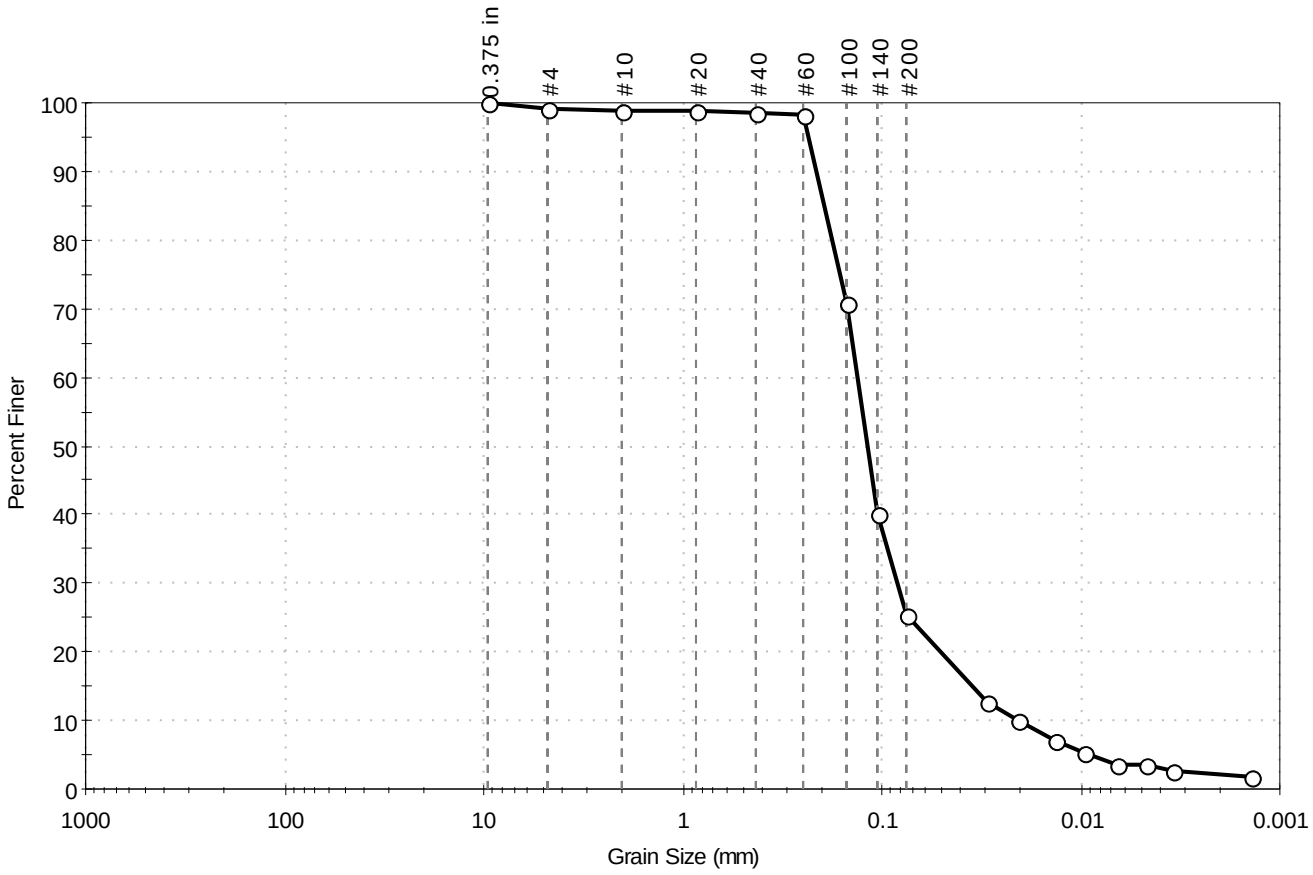
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB034	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0634	Test Date:	01/21/19	Checked By:	emm
Depth :	14-16 ft	Test Id:	482971		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	1.0	73.5	25.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	71		
#140	0.11	40		
#200	0.075	25		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0293	13		
---	0.0207	10		
---	0.0136	7		
---	0.0097	5		
---	0.0066	4		
---	0.0048	4		
---	0.0034	3		
---	0.0014	2		

Coefficients

D_{85} = 0.1956 mm	D_{30} = 0.0835 mm
D_{60} = 0.1329 mm	D_{15} = 0.0348 mm
D_{50} = 0.1186 mm	D_{10} = 0.0209 mm
C_u = 6.359	C_c = 2.510

Classification

ASTM Silty SAND (SM)

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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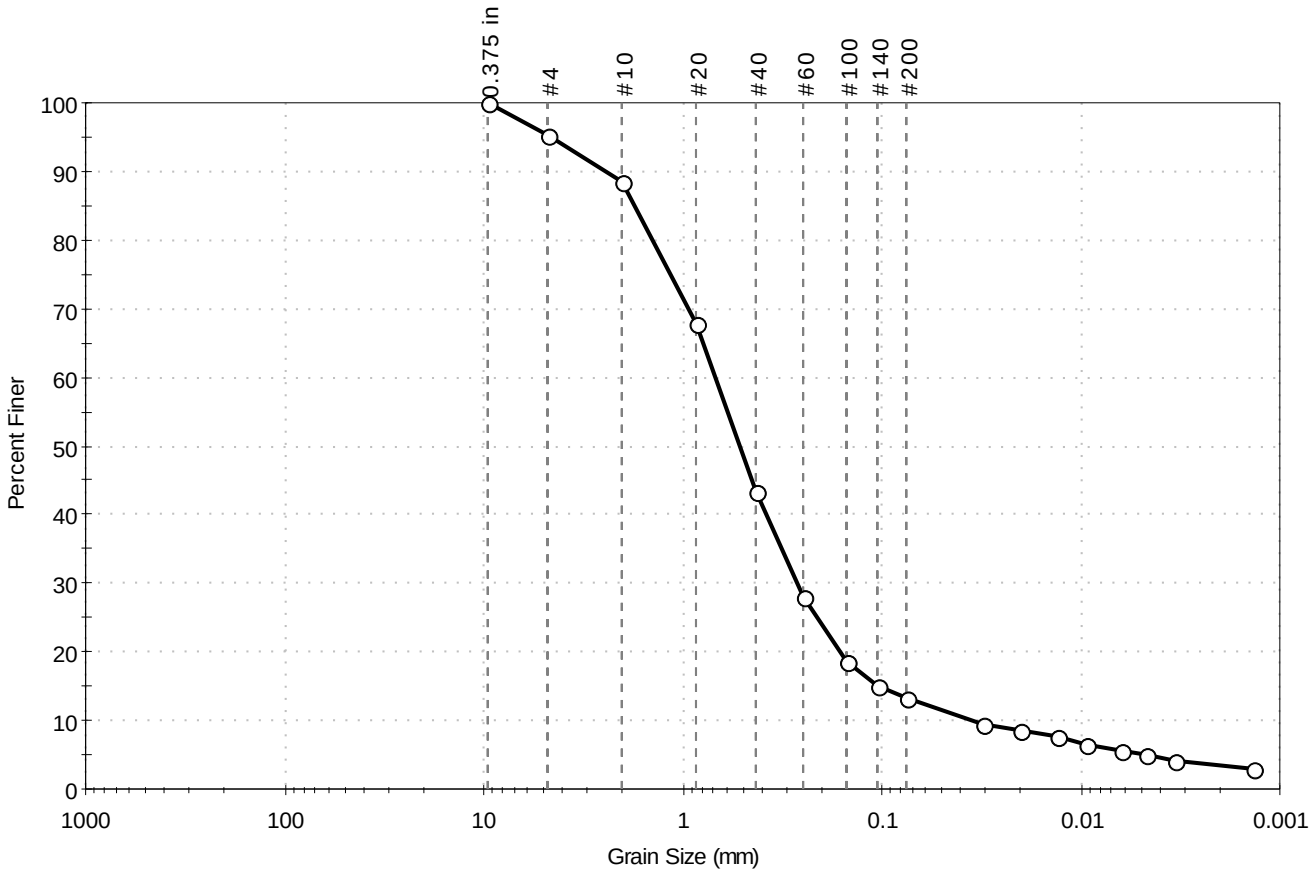
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB034	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0638	Test Date:	01/21/19	Checked By:	emm
Depth :	40-40.8 ft	Test Id:	482972		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty sand				
Sample Comment:	Sample contains shells				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	4.8	82.0	13.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	95		
#10	2.00	88		
#20	0.85	68		
#40	0.42	43		
#60	0.25	28		
#100	0.15	19		
#140	0.11	15		
#200	0.075	13		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	9		
---	0.0203	8		
---	0.0132	8		
---	0.0094	7		
---	0.0063	6		
---	0.0048	5		
---	0.0034	4		
---	0.0014	3		

Coefficients

D_{85} = 1.7309 mm	D_{30} = 0.2672 mm
D_{60} = 0.6806 mm	D_{15} = 0.1048 mm
D_{50} = 0.5123 mm	D_{10} = 0.0353 mm
C_u = 19.280	C_c = 2.972

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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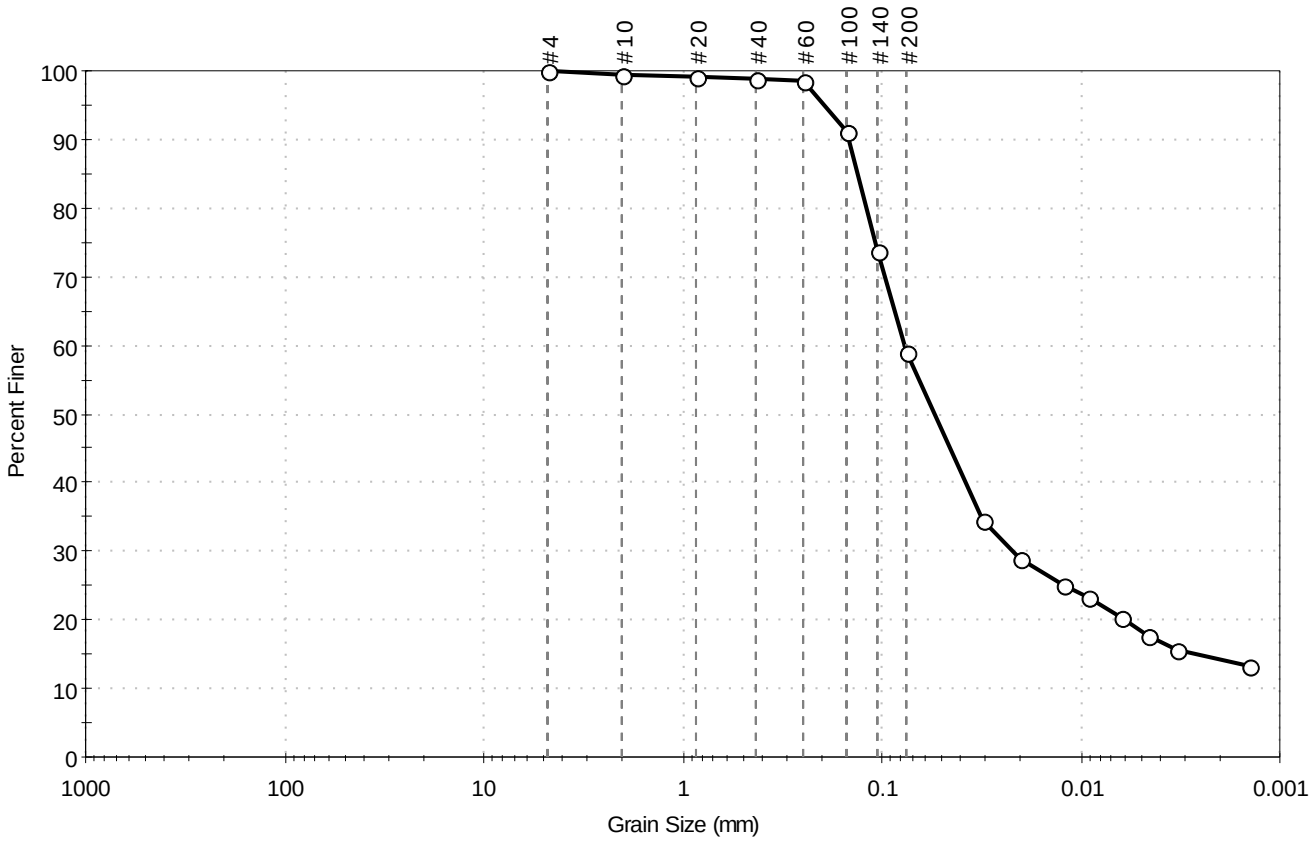
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB035	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0644	Test Date:	01/02/19	Checked By:	emm
Depth :	8-10 ft	Test Id:	482969		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	41.1	58.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	99		
#60	0.25	98		
#100	0.15	91		
#140	0.11	74		
#200	0.075	59		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	35		
---	0.0200	29		
---	0.0123	25		
---	0.0091	23		
---	0.0064	20		
---	0.0046	18		
---	0.0033	16		
---	0.0014	13		

Coefficients

D_{85} = 0.1324 mm	D_{30} = 0.0217 mm
D_{60} = 0.0770 mm	D_{15} = 0.0026 mm
D_{50} = 0.0542 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (5))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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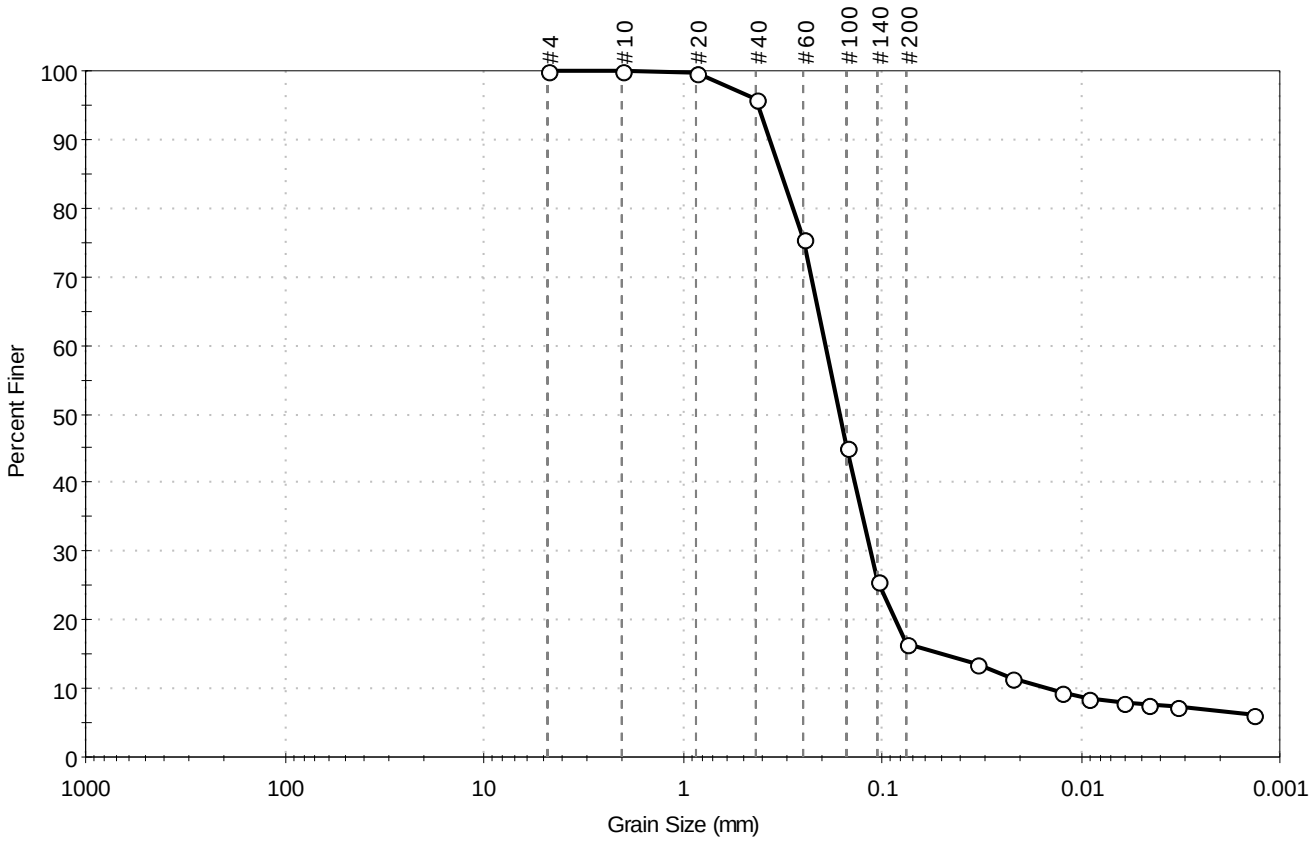
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB035	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0647	Test Date:	01/21/19	Checked By:	emm
Depth :	25-27 ft	Test Id:	482970		
Test Comment:	---				
Visual Description:	Moist, dark gray silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	83.4	16.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	96		
#60	0.25	75		
#100	0.15	45		
#140	0.11	26		
#200	0.075	17		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0332	14		
---	0.0221	12		
---	0.0126	9		
---	0.0092	8		
---	0.0061	8		
---	0.0046	8		
---	0.0033	7		
---	0.0014	6		

Coefficients

D_{85} = 0.3208 mm	D_{30} = 0.1146 mm
D_{60} = 0.1927 mm	D_{15} = 0.0477 mm
D_{50} = 0.1627 mm	D_{10} = 0.0145 mm
C_u = 13.290	C_c = 4.700

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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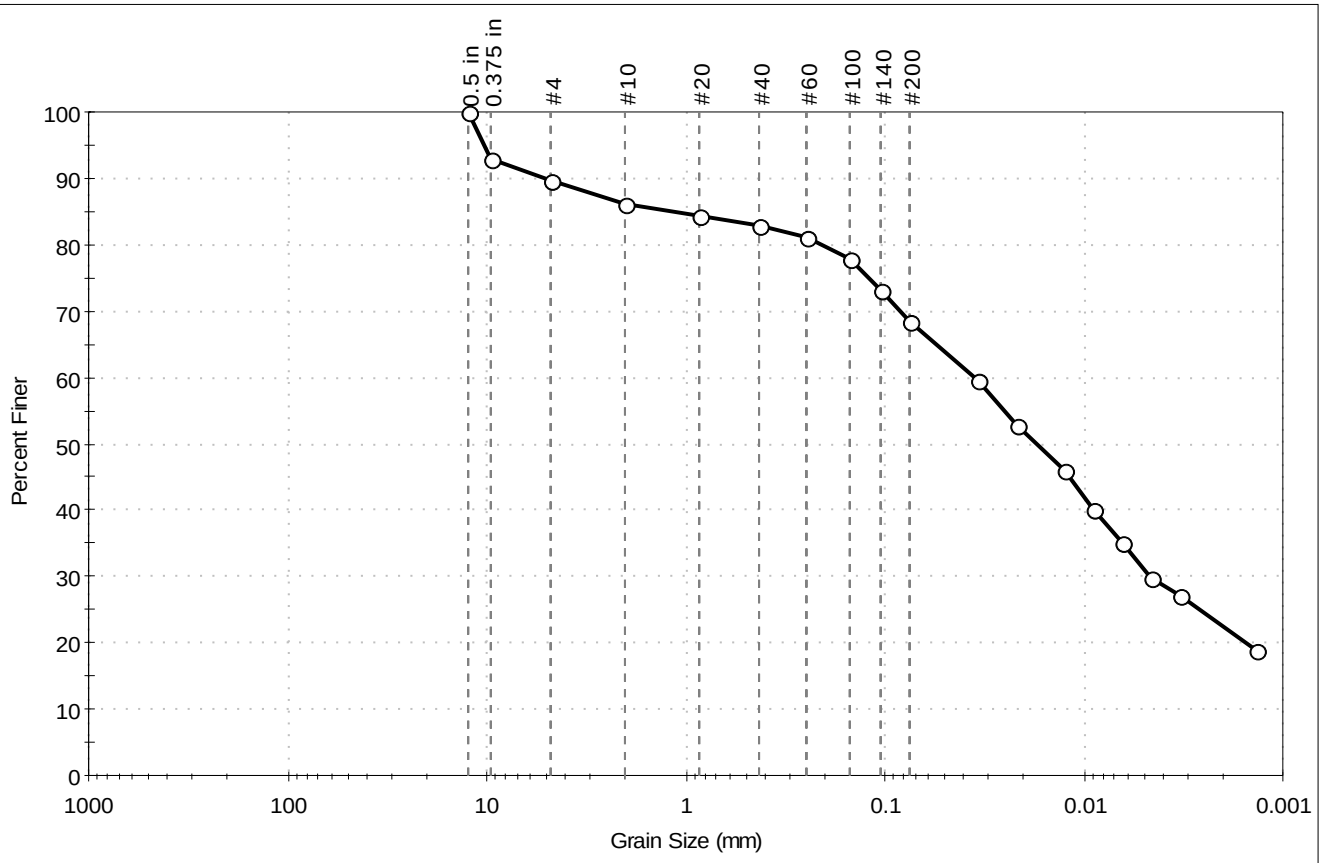
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB036	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0665	Test Date:	02/25/19	Checked By:	bfs
Depth :	2.6-4 ft	Test Id:	483682		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	10.2	21.3	68.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	93		
#4	4.75	90		
#10	2.00	86		
#20	0.85	84		
#40	0.42	83		
#60	0.25	81		
#100	0.15	78		
#140	0.11	73		
#200	0.075	68		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0343	60		
---	0.0216	53		
---	0.0127	46		
---	0.0090	40		
---	0.0064	35		
---	0.0046	30		
---	0.0033	27		
---	0.0014	19		

Coefficients

D_{85} = 1.1351 mm	D_{30} = 0.0046 mm
D_{60} = 0.0355 mm	D_{15} = N/A
D_{50} = 0.0172 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Fat CLAY (CH)

AASHTO Clayey Soils (A-7-5 (42))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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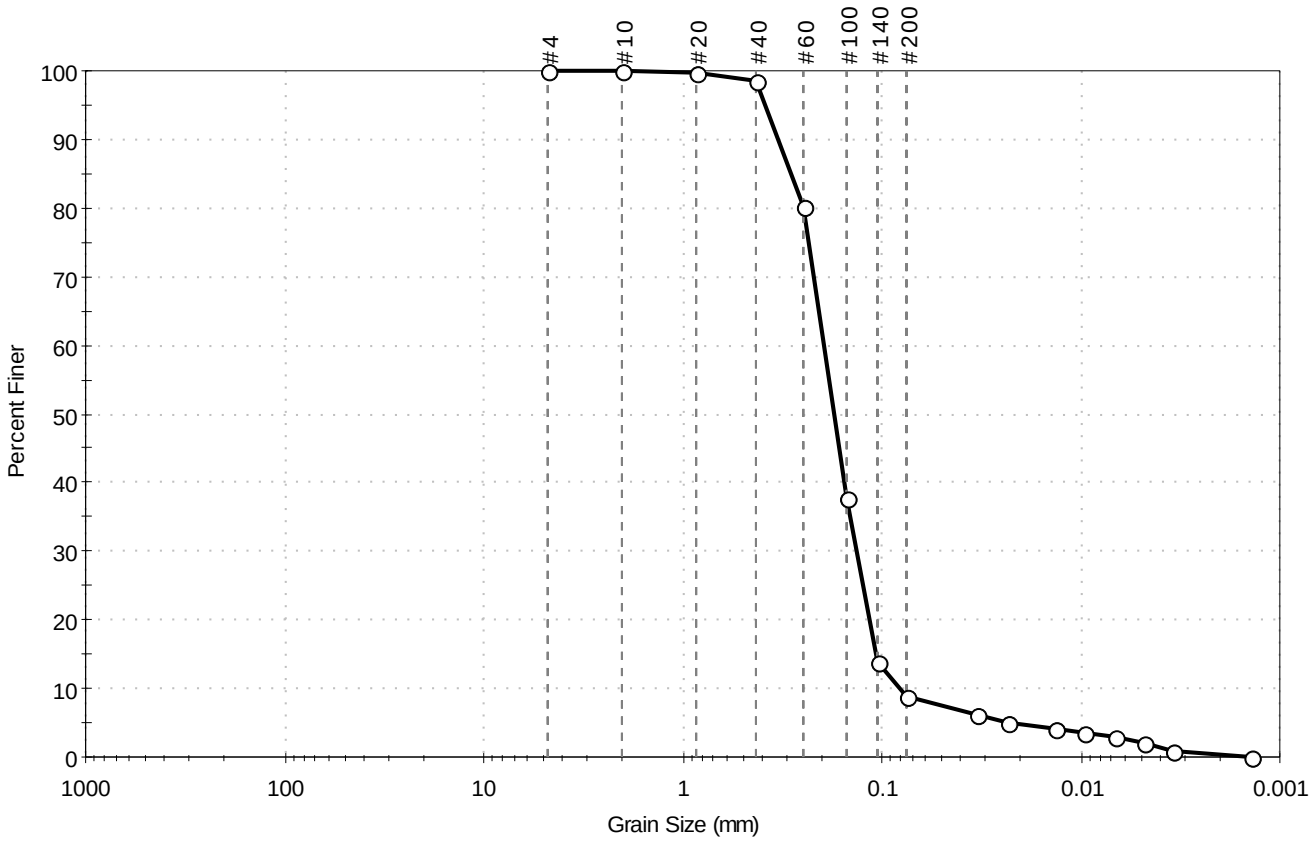
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB036	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0670	Test Date:	02/25/19	Checked By:	bfs
Depth :	20-22 ft	Test Id:	483683		
Test Comment:	---				
Visual Description:	Moist, dark gray sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	91.2	8.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	80		
#100	0.15	38		
#140	0.11	14		
#200	0.075	8.8		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0332	6		
---	0.0232	5		
---	0.0134	4		
---	0.0097	4		
---	0.0067	3		
---	0.0048	2		
---	0.0034	1		
---	0.0014	0		

Coefficients

D_{85} = 0.2878 mm	D_{30} = 0.1339 mm
D_{60} = 0.1962 mm	D_{15} = 0.1075 mm
D_{50} = 0.1739 mm	D_{10} = 0.0812 mm
C_u = 2.416	C_c = 1.125

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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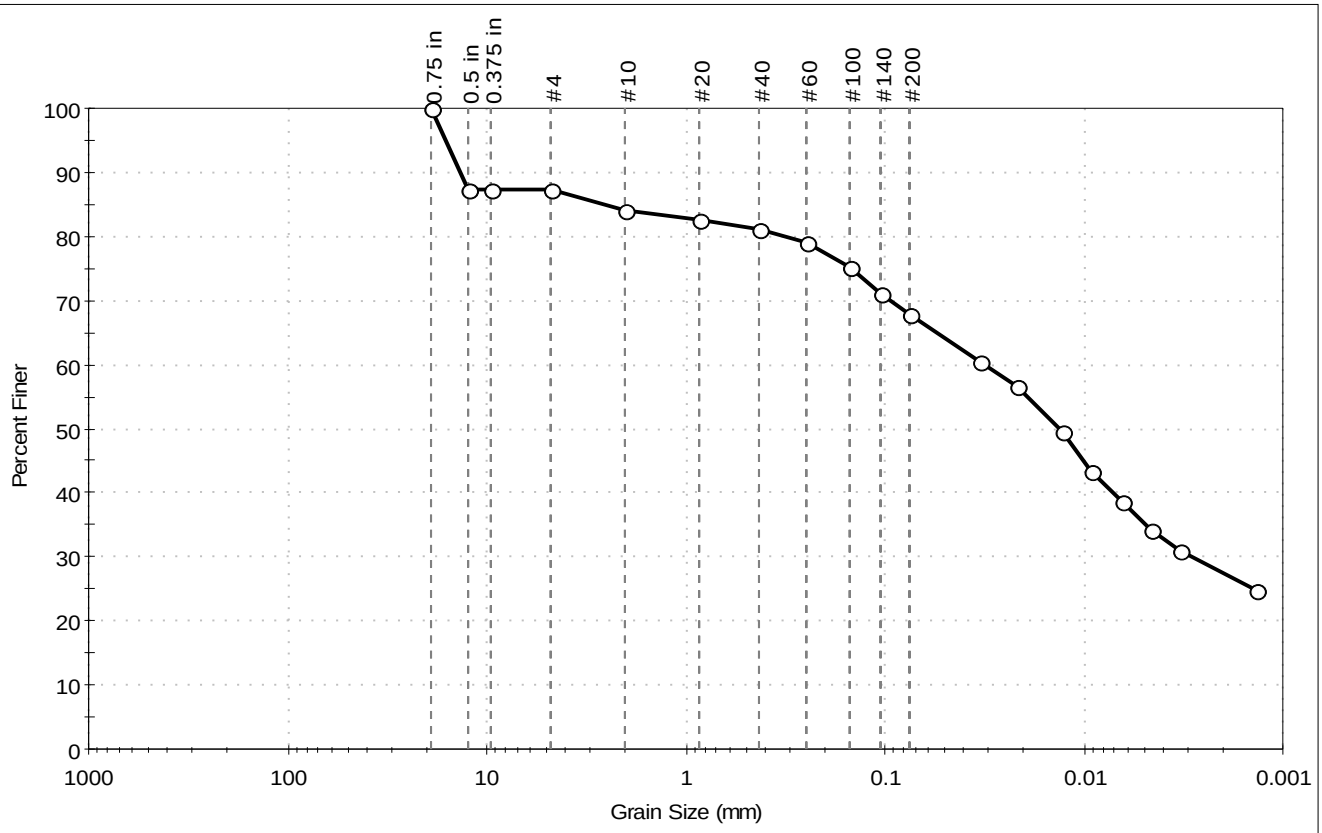
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB037	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0652	Test Date:	03/05/19	Checked By:	bfs
Depth :	2-4 ft	Test Id:	483680		
Test Comment:	---				
Visual Description:	Moist, very dark gray sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	12.8	19.4	67.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	87		
0.375 in	9.50	87		
#4	4.75	87		
#10	2.00	84		
#20	0.85	83		
#40	0.42	81		
#60	0.25	79		
#100	0.15	75		
#140	0.11	71		
#200	0.075	68		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0334	60		
---	0.0217	57		
---	0.0128	50		
---	0.0092	43		
---	0.0065	39		
---	0.0047	34		
---	0.0033	31		
---	0.0013	25		

Coefficients

D_{85} = 2.5542 mm	D_{30} = 0.0029 mm
D_{60} = 0.0319 mm	D_{15} = N/A
D_{50} = 0.0132 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Fat CLAY (CH)

AASHTO Clayey Soils (A-7-5 (54))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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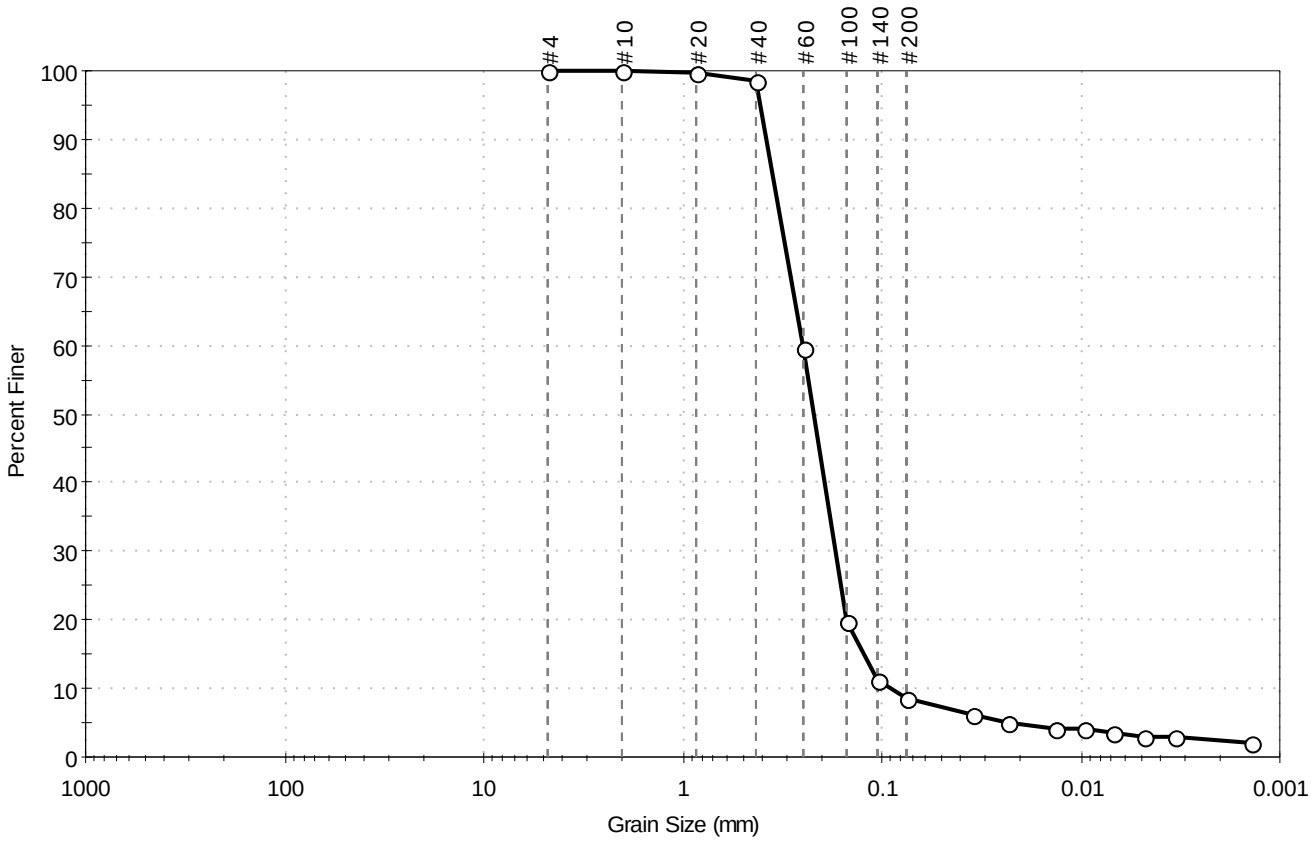
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB037	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0659	Test Date:	02/26/19	Checked By:	bfs
Depth :	25-27 ft	Test Id:	483681		
Test Comment:	---				
Visual Description:	Moist, grayish brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	91.4	8.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	98		
#60	0.25	60		
#100	0.15	20		
#140	0.11	11		
#200	0.075	8.6		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0351	6		
---	0.0234	5		
---	0.0135	4		
---	0.0097	4		
---	0.0069	4		
---	0.0048	3		
---	0.0034	3		
---	0.0014	2		

Coefficients

D_{85} = 0.3537 mm D_{30} = 0.1711 mm
D_{60} = 0.2514 mm D_{15} = 0.1237 mm
D_{50} = 0.2211 mm D_{10} = 0.0901 mm
C_u = 2.790 C_c = 1.292

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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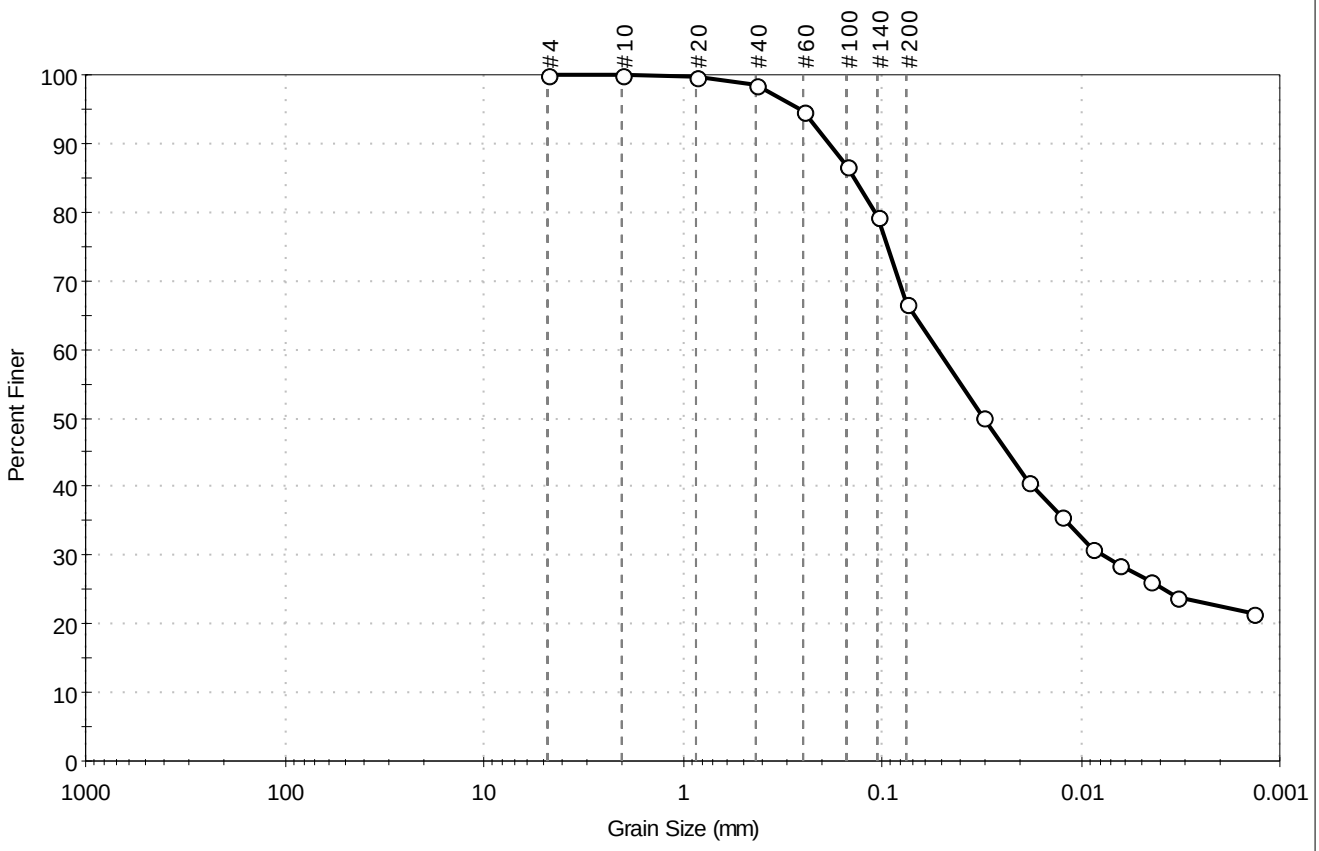
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB038	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0891	Test Date:	02/25/19	Checked By:	bfs
Depth :	13-15 ft	Test Id:	486511		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	33.4	66.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	95		
#100	0.15	87		
#140	0.11	79		
#200	0.075	67		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0308	50		
---	0.0183	41		
---	0.0127	36		
---	0.0087	31		
---	0.0065	29		
---	0.0045	26		
---	0.0033	24		
---	0.0014	21		

Coefficients

D_{85} = 0.1376 mm	D_{30} = 0.0077 mm
D_{60} = 0.0526 mm	D_{15} = N/A
D_{50} = 0.0306 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM Sandy Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (10))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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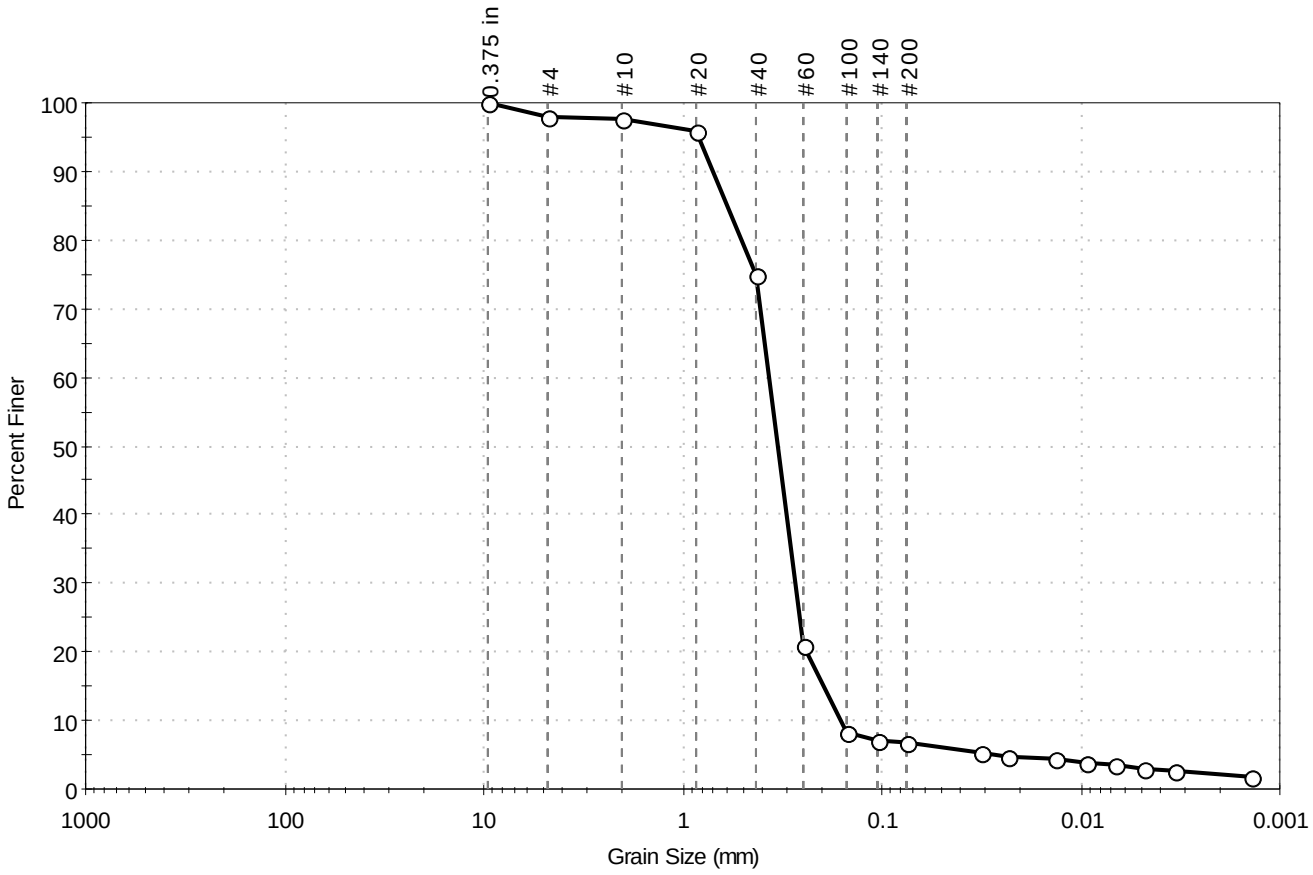
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB038	Sample Type:	bag	Tested By:	ckg
Sample ID:	SL0893	Test Date:	02/25/19	Checked By:	bfs
Depth :	24-26 ft	Test Id:	486512		
Test Comment:	---				
Visual Description:	Moist, dark brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	2.0	91.4	6.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	98		
#20	0.85	96		
#40	0.42	75		
#60	0.25	21		
#100	0.15	8		
#140	0.11	7		
#200	0.075	6.6		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0315	5		
---	0.0231	5		
---	0.0133	4		
---	0.0095	4		
---	0.0067	4		
---	0.0048	3		
---	0.0034	3		
---	0.0014	2		

Coefficients

D_{85} = 0.5909 mm	D_{30} = 0.2732 mm
D_{60} = 0.3667 mm	D_{15} = 0.1962 mm
D_{50} = 0.3324 mm	D_{10} = 0.1603 mm
C_u = 2.288	C_c = 1.270

Classification

ASTM Poorly graded SAND with Silt (SP-SM)

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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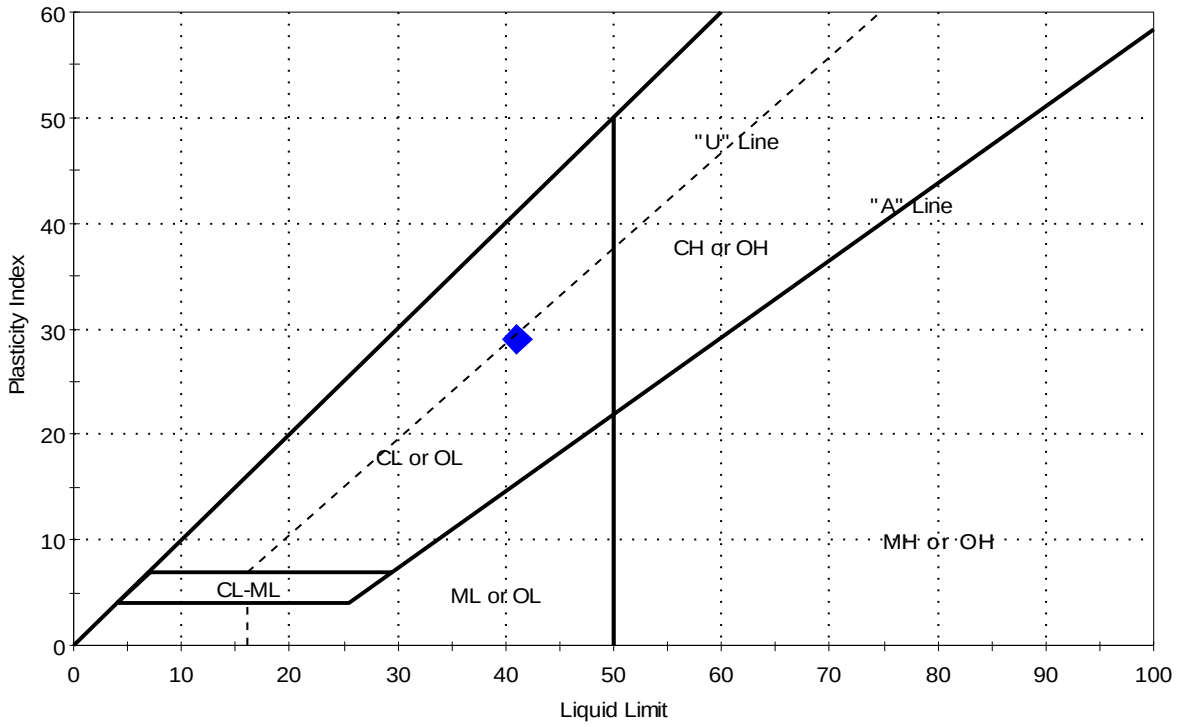
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB018	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0866	Test Date:	03/06/19	Checked By:	bfs
Depth :	18-20 ft	Test Id:	486384		
Test Comment:	---				
Visual Description:	Moist, mottled light yellowish brown and gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0866	SJGB018	18-20 ft	18	41	12	29	0.2	Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB018	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0870	Test Date:	03/05/19	Checked By:	bfs
Depth :	40-42 ft	Test Id:	486385		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0870	SJGB018	40-42 ft	19	n/a	n/a	n/a	n/a	Silty SAND (SM)

1% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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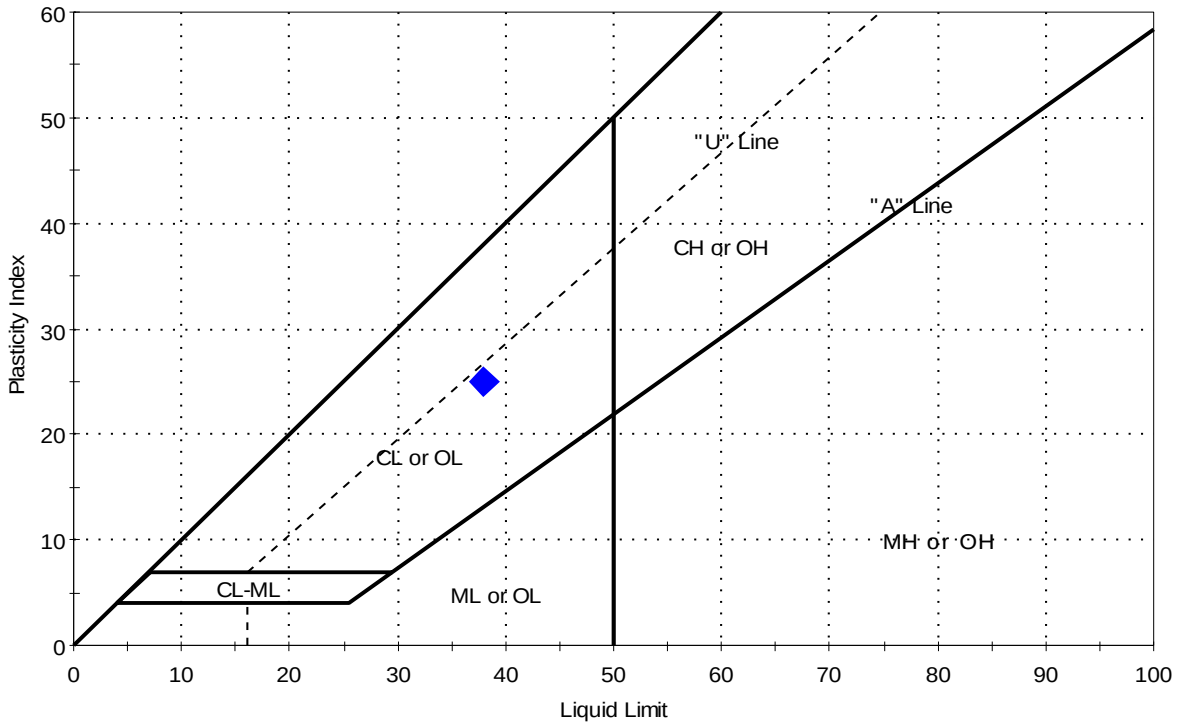
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB019	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0851	Test Date:	03/01/19	Checked By:	bfs
Depth :	20-22'	Test Id:	485095		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0851	SJGB019	20-22'	21	38	13	25	0.3	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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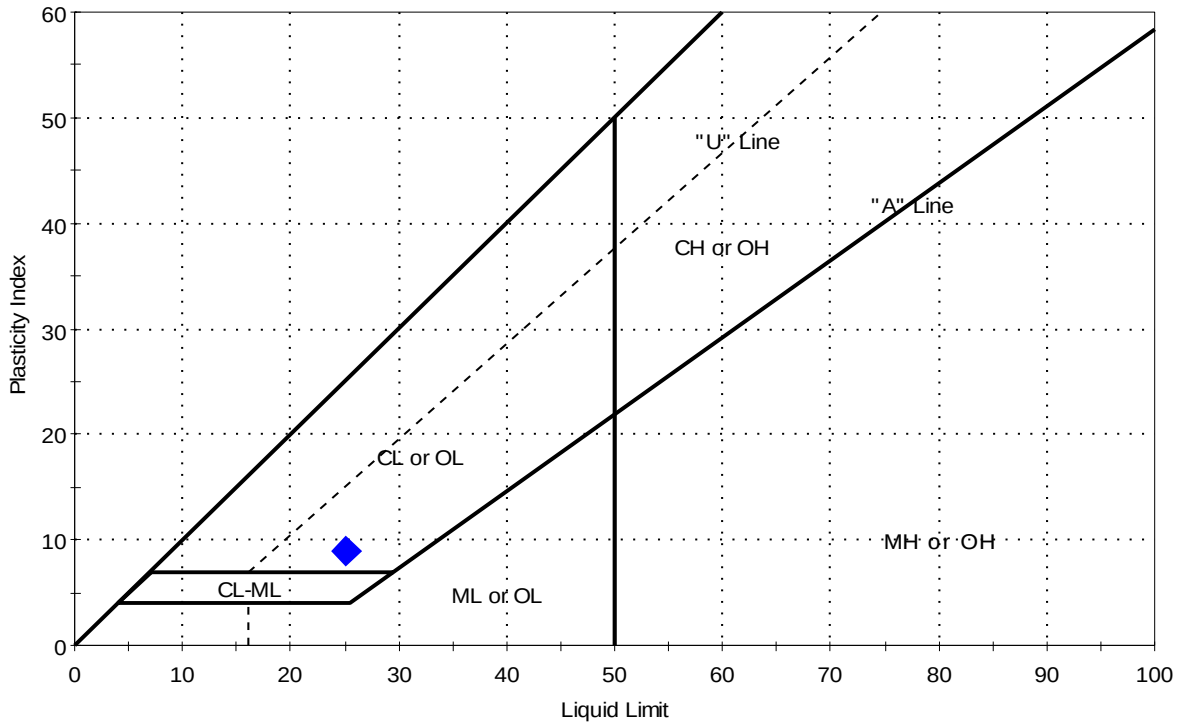
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB019	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0854	Test Date:	03/05/19	Checked By:	bfs
Depth :	35-37'	Test Id:	485096		
Test Comment:	---				
Visual Description:	Moist, brownish yellow clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0854	SJGB019	35-37'	22	25	16	9	0.7	Clayey SAND (SC)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

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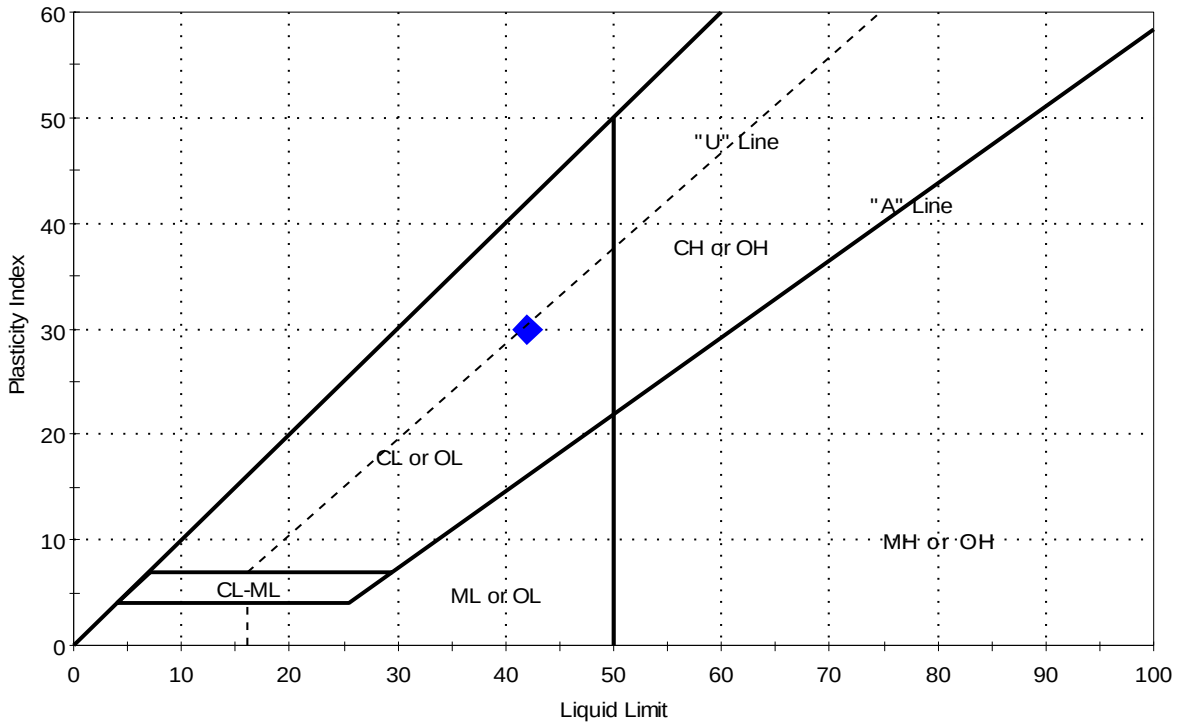
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB020	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0840	Test Date:	03/05/19	Checked By:	bfs
Depth :	30-32'	Test Id:	485093		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0840	SJGB020	30-32'	22	42	12	30	0.3	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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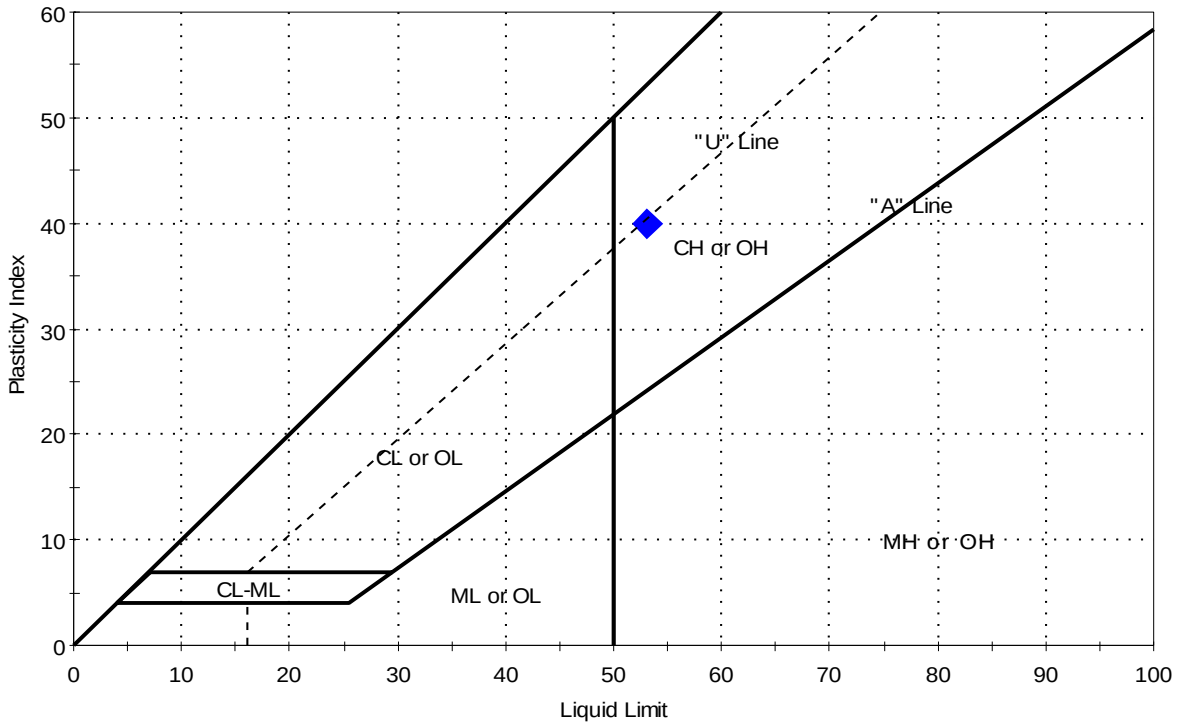
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB020	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0846	Test Date:	03/06/19	Checked By:	bfs
Depth :	60-62'	Test Id:	485094		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0846	SJGB020	60-62'	27	53	13	40	0.3	Fat CLAY (CH)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

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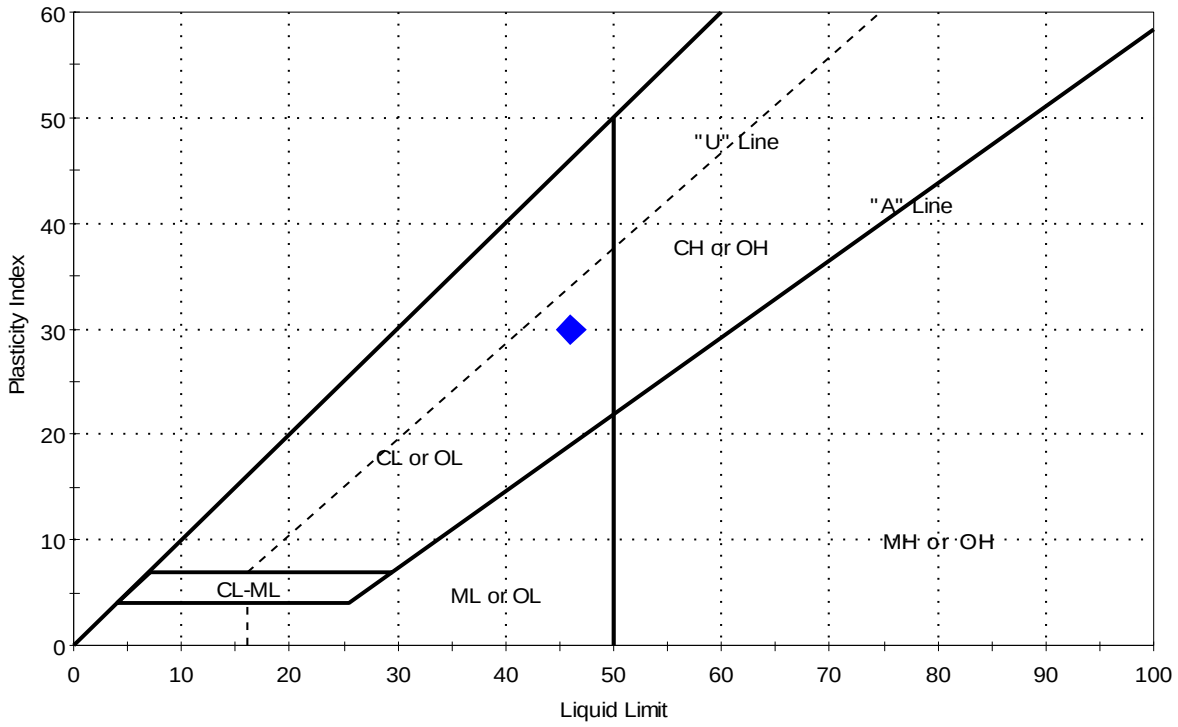
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB021	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0823	Test Date:	02/28/19	Checked By:	bfs
Depth :	6'-8'	Test Id:	485153		
Test Comment:	---				
Visual Description:	Wet, dark brown clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0823	SJGB021	6'-8'	51	46	16	30	1.2	Lean CLAY with Sand (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB021	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0830	Test Date:	02/27/19	Checked By:	bfs
Depth :	44'-46'	Test Id:	485154		
Test Comment:	---				
Visual Description:	Moist, light brownish gray sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0830	SJGB021	44'-46'	20	n/a	n/a	n/a	n/a	Sandy SILT (ML)

0% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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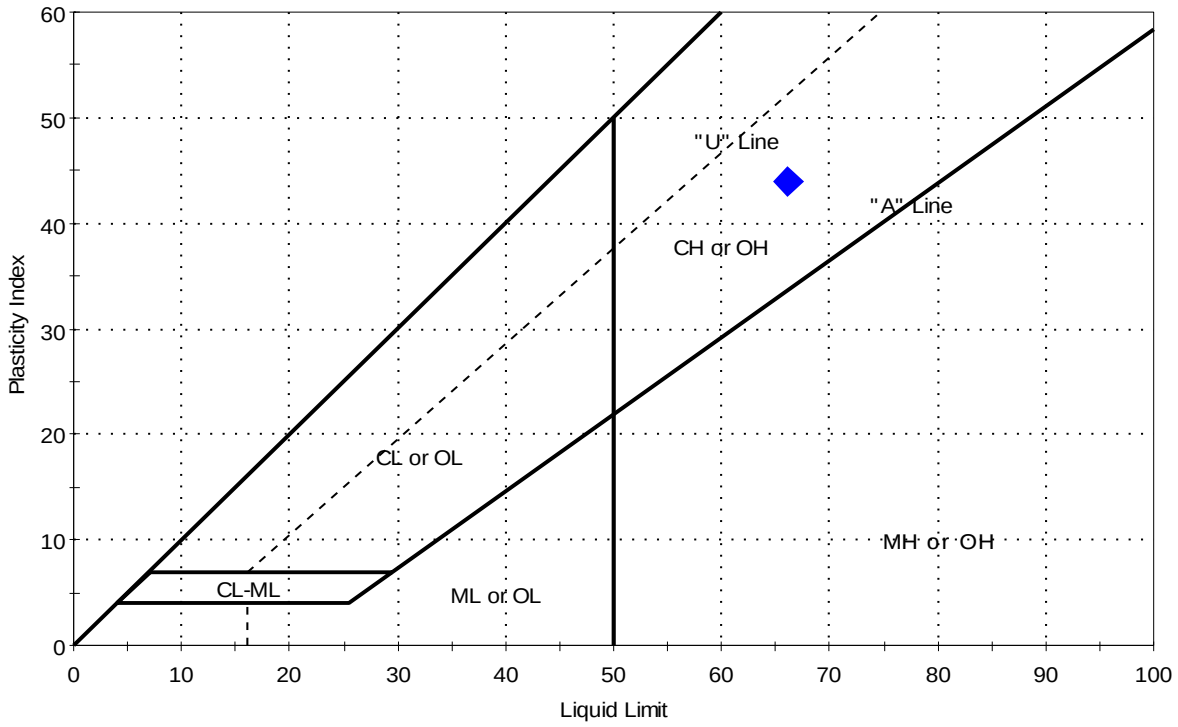
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB022	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0818	Test Date:	03/05/19	Checked By:	bfs
Depth :	35'-37'	Test Id:	485151		
Test Comment:	---				
Visual Description:	Moist, reddish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0818	SJGB022	35'-37'	24	66	22	44	0	Fat CLAY (CH)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB022	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0820	Test Date:	03/05/19	Checked By:	bfs
Depth :	45'-47'	Test Id:	485152		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0820	SJGB022	45'-47'	22	n/a	n/a	n/a	n/a	Silty SAND (SM)

1% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB023G09	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0881	Test Date:	02/26/19	Checked By:	bfs
Depth :	23-25 ft	Test Id:	486381		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown sand with silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0881	JGB023G0	23-25 ft	16	n/a	n/a	n/a	n/a	Poorly graded SAND with Silt (SP-SM)

11% Retained on #40 Sieve

Dry Strength: MEDIUM

Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJGB023G16B	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0889	Test Date:	03/05/19	Checked By:	bfs
Depth :	59.3-60 ft	Test Id:	486383		
Test Comment:	---				
Visual Description:	Moist, light brownish gray silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

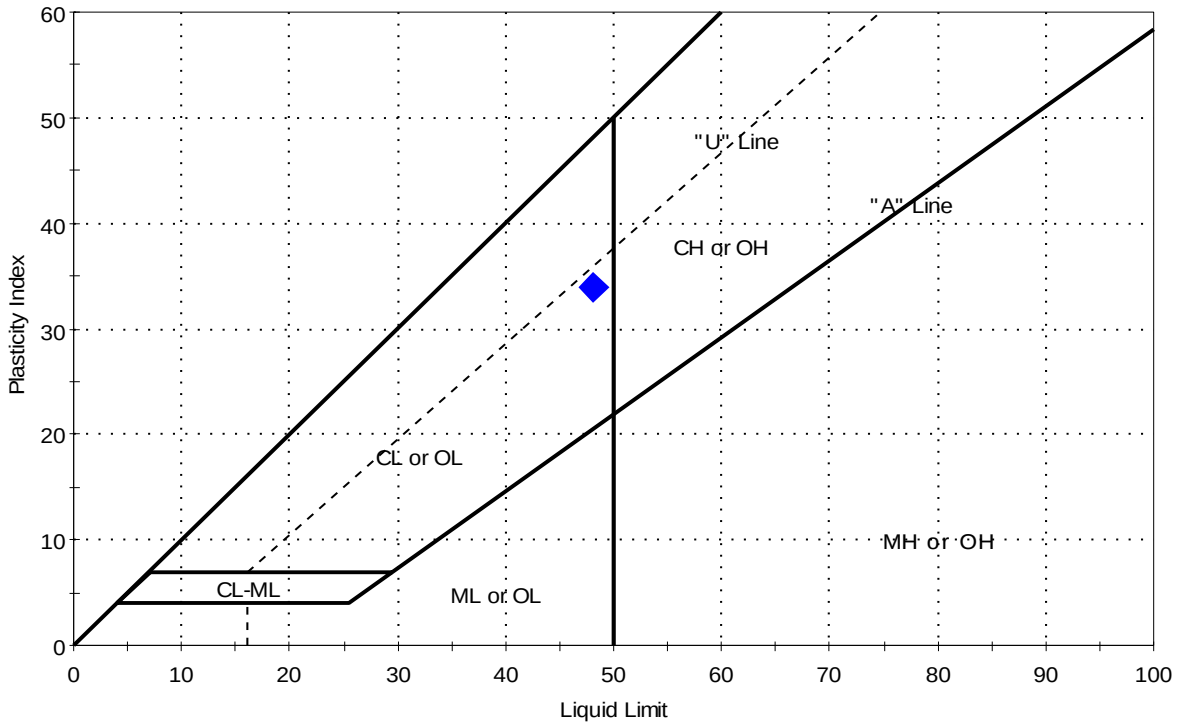
Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0889	GB023G1	59.3-60 ft	17	n/a	n/a	n/a	n/a	Silty SAND (SM)

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

printed 3/15/2019 12:35:21 PM

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB008-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1026	Test Date:	12/10/18	Checked By:	emm
Depth :	2-4 ft	Test Id:	482735		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1026	JSB008-E	2-4 ft	26	48	14	34	0.3	Lean CLAY with Sand (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

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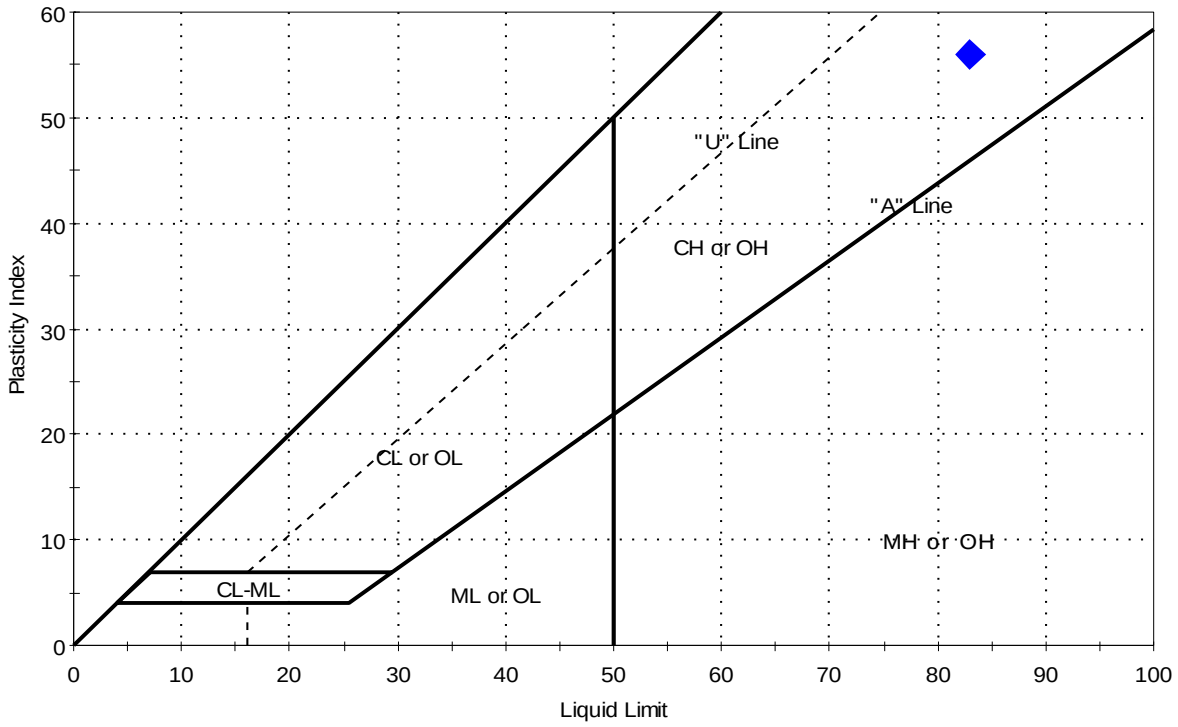
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB008-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1029	Test Date:	12/28/18	Checked By:	emm
Depth :	8-10 ft	Test Id:	482736		
Test Comment:	---				
Visual Description:	Moist, very dark gray clay				
Sample Comment:	Sample contains organics				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1029	JSB008-E	8-10 ft	64	83	27	56	0.7	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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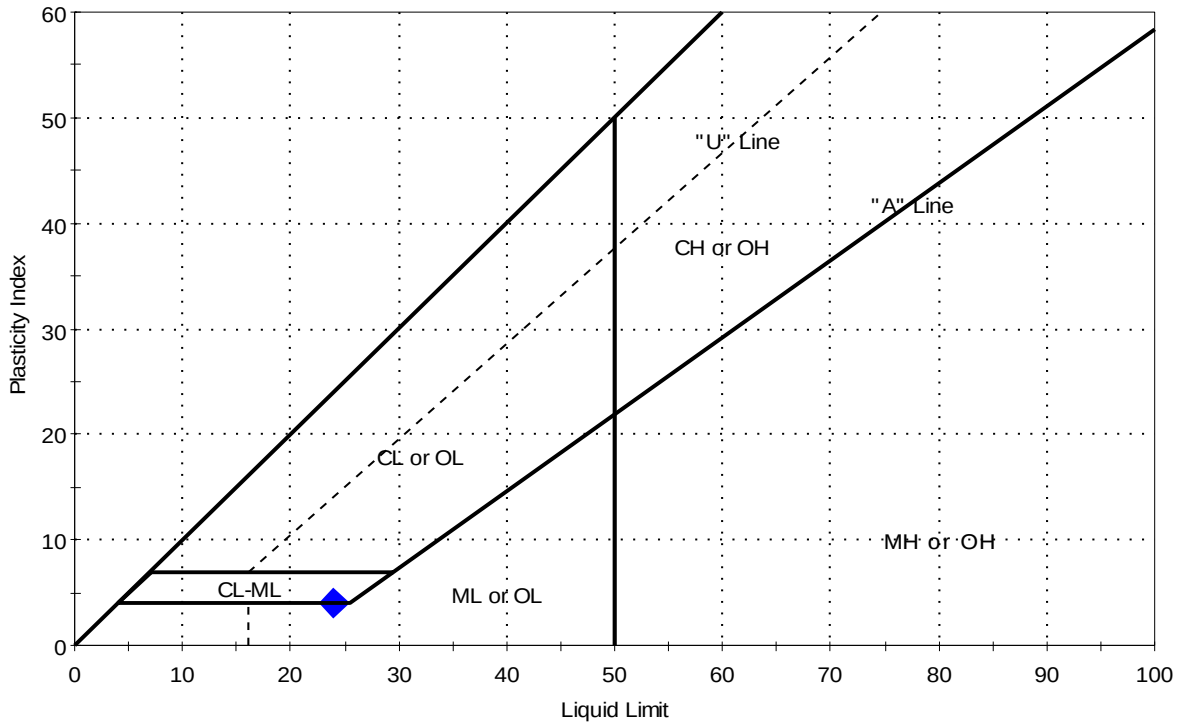
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB012-W1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1050	Test Date:	01/05/19	Checked By:	emm
Depth :	15-17 ft	Test Id:	482979		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty, clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1050	JSB012-W	15-17 ft	24	24	20	4	1	Silty, Clayey SAND (SC-SM)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

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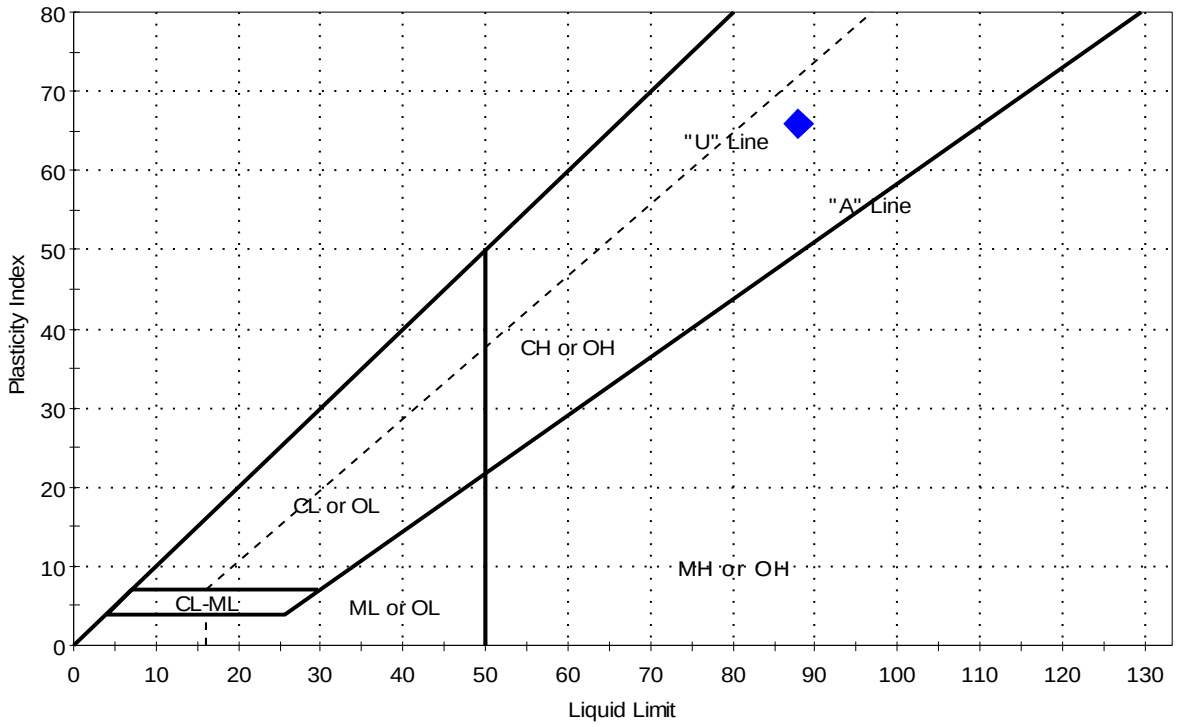
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB019-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1004	Test Date:	01/02/19	Checked By:	emm
Depth :	8-10 ft	Test Id:	482731		
Test Comment:	---				
Visual Description:	Moist, very dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Plasticity Chart



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1004	JSB019-E	8-10 ft	47	88	22	66	0.4	Fat CLAY (CH)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

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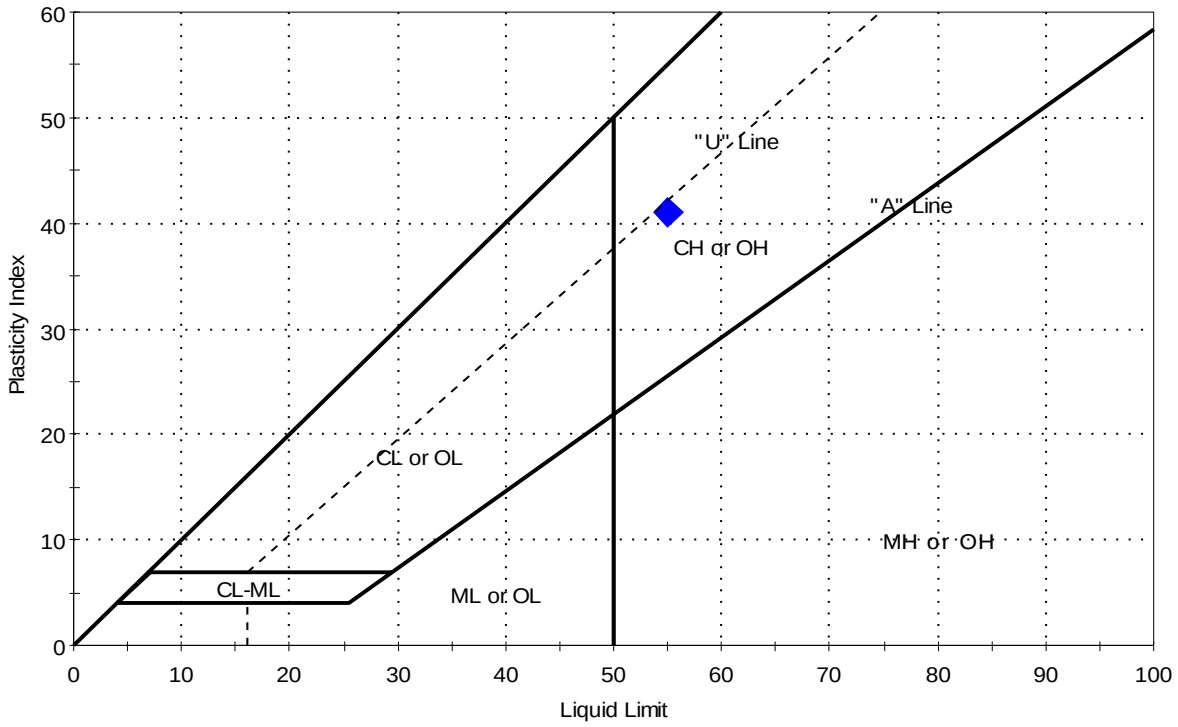
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB019-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1008	Test Date:	12/10/18	Checked By:	emm
Depth :	19-21 ft	Test Id:	482732		
Test Comment:	---				
Visual Description:	Moist, very dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1008	JSB019-E	19-21 ft	30	55	14	41	0.4	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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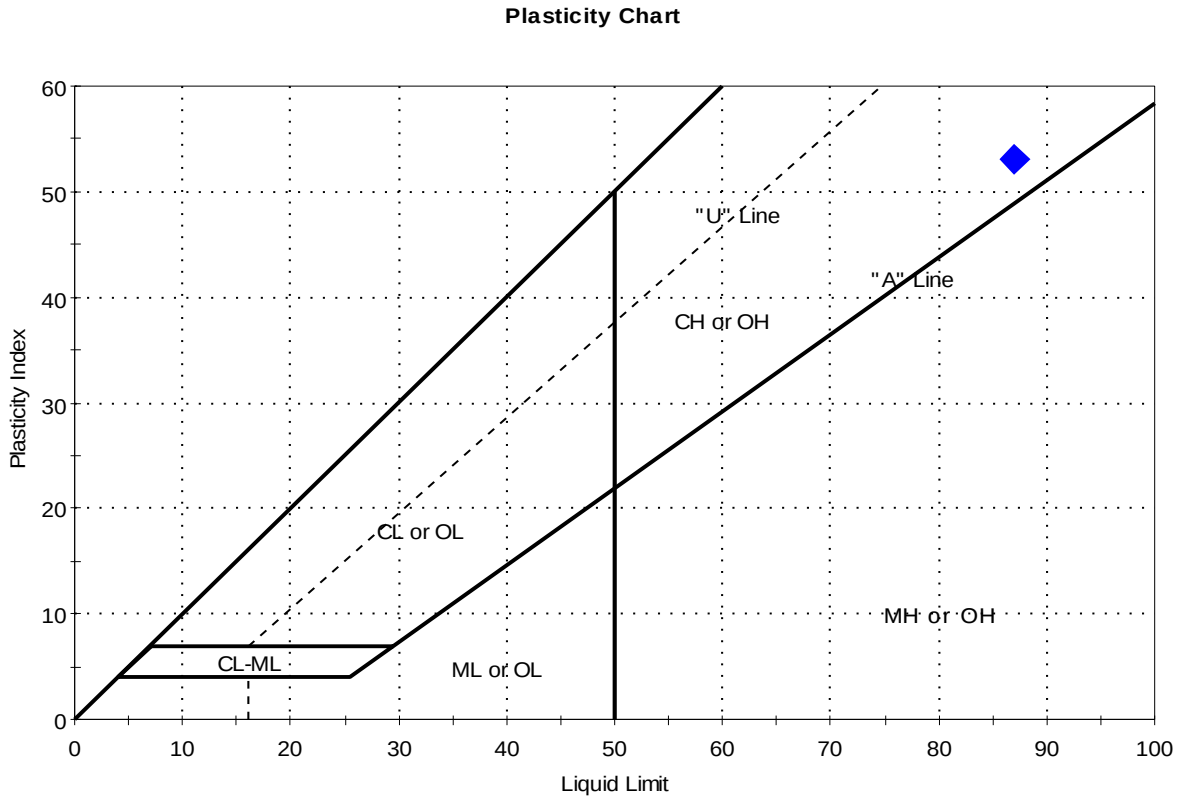
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB023-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1015	Test Date:	12/19/18	Checked By:	emm
Depth :	4-6 ft	Test Id:	482733		
Test Comment:	---				
Visual Description:	Moist, very dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1015	JSB023-E	4-6 ft	70	87	34	53	0.7	

Sample Prepared using the WET method

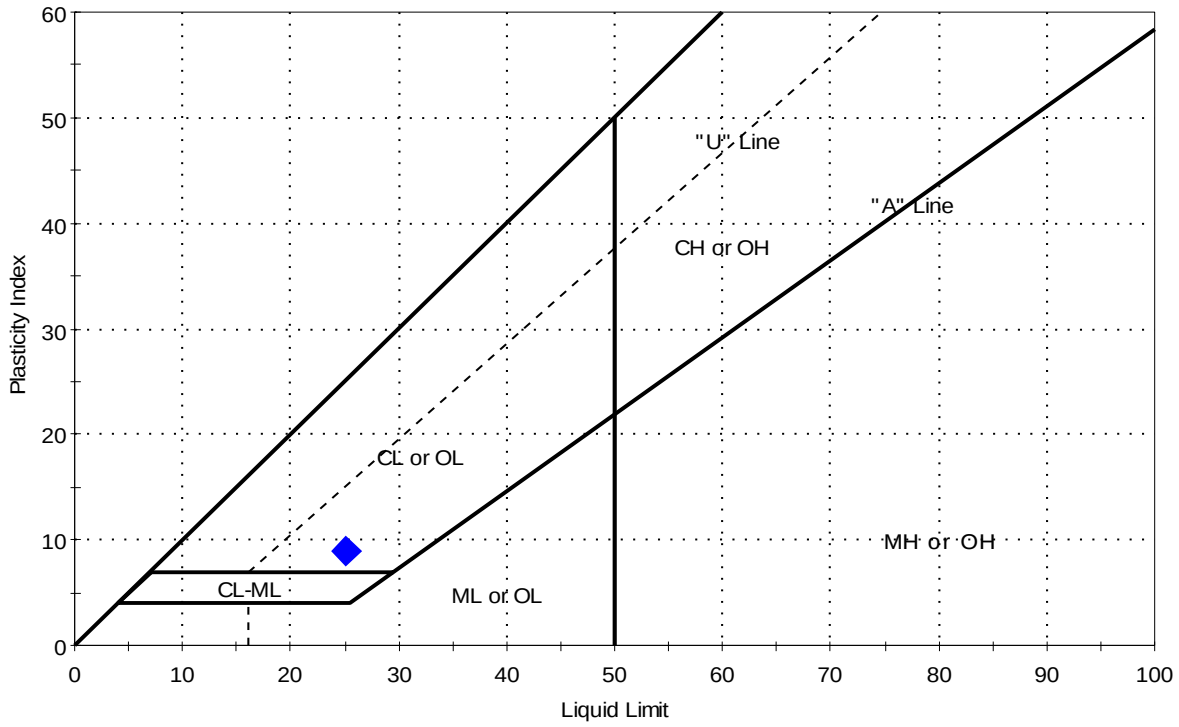
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: MEDIUM

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB023-E1	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1022	Test Date:	12/19/18	Checked By:	emm
Depth :	24-26 ft	Test Id:	482734		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1022	JSB023-E	24-26 ft	28	25	16	9	1.4	Clayey SAND (SC)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

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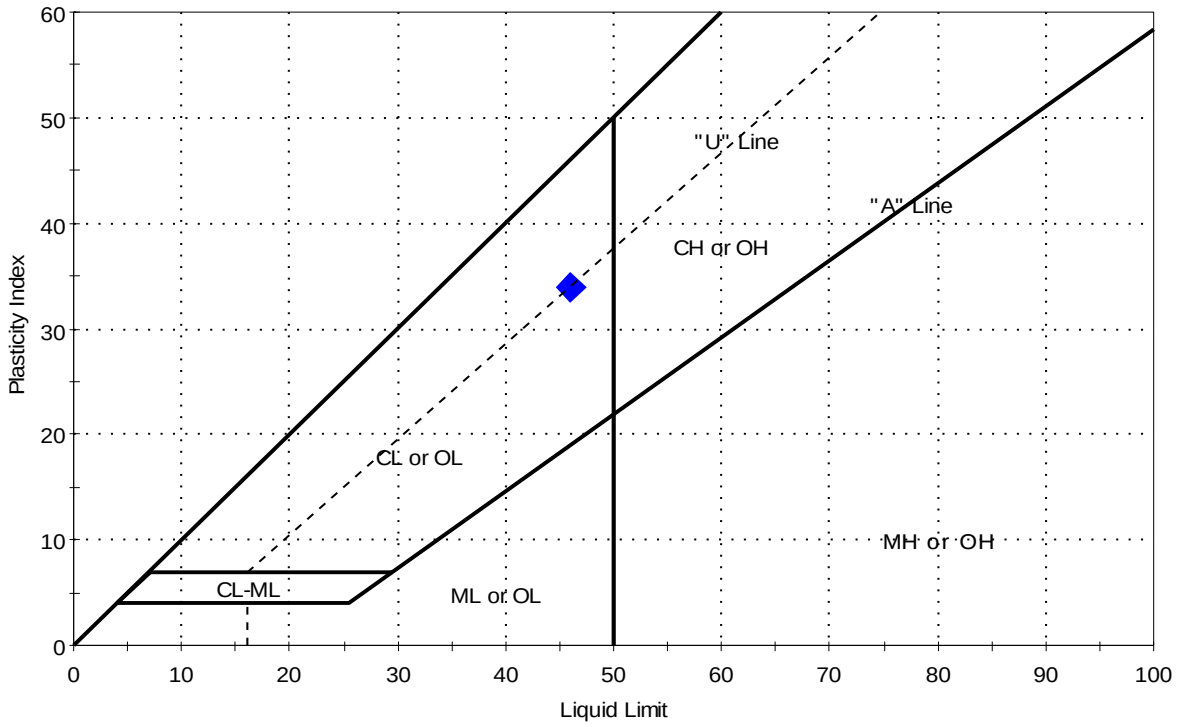
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB025-1W	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1040	Test Date:	12/19/18	Checked By:	emm
Depth :	8-10 ft	Test Id:	482737		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1040	JSB025-1	8-10 ft	35	46	12	34	0.7	Sandy Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: SLOW
Toughness: MEDIUM

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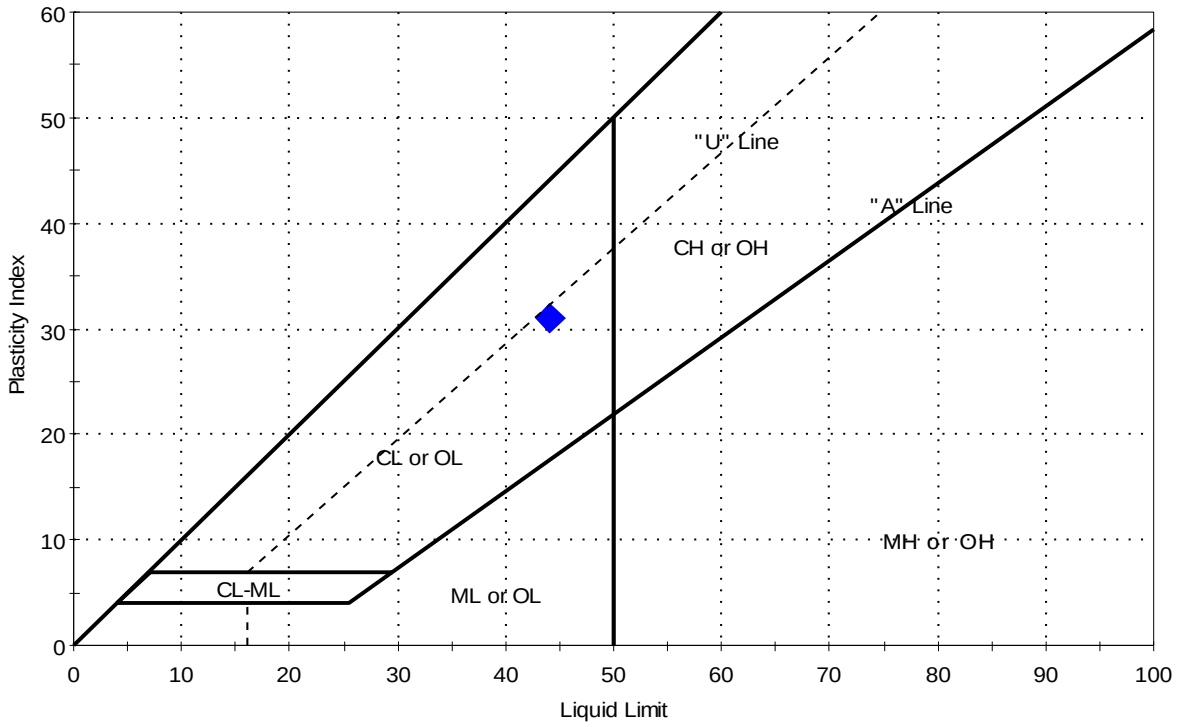
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB025-1W	Sample Type:	bag	Tested By:	cam
Sample ID:	SL1043	Test Date:	12/10/18	Checked By:	emm
Depth :	19-21 ft	Test Id:	482738		
Test Comment:	---				
Visual Description:	Moist, gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL1043	JSB025-1	19-21 ft	31	44	13	31	0.6	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: MEDIUM

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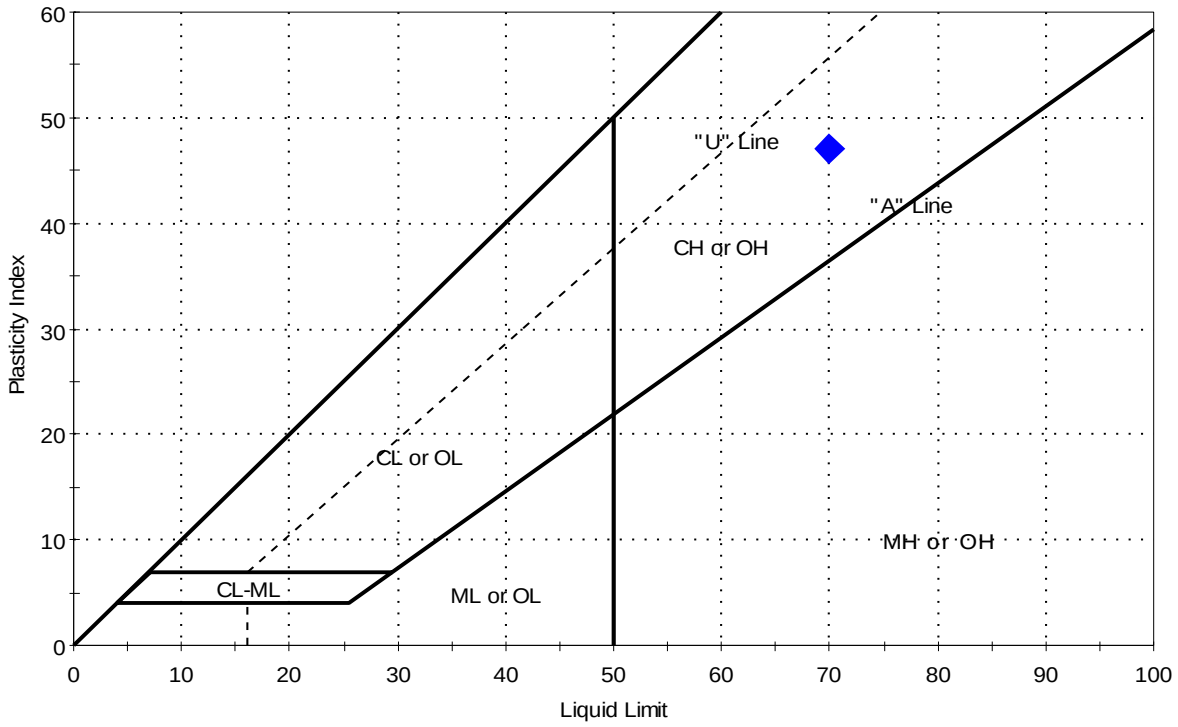
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB028	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0803	Test Date:	03/01/19	Checked By:	bfs
Depth :	8-10 ft	Test Id:	483640		
Test Comment:	---				
Visual Description:	Moist, very dark brown clay				
Sample Comment:	Sample contains organics				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0803	SJSB028	8-10 ft	41	70	23	47	0.4	Fat CLAY (CH)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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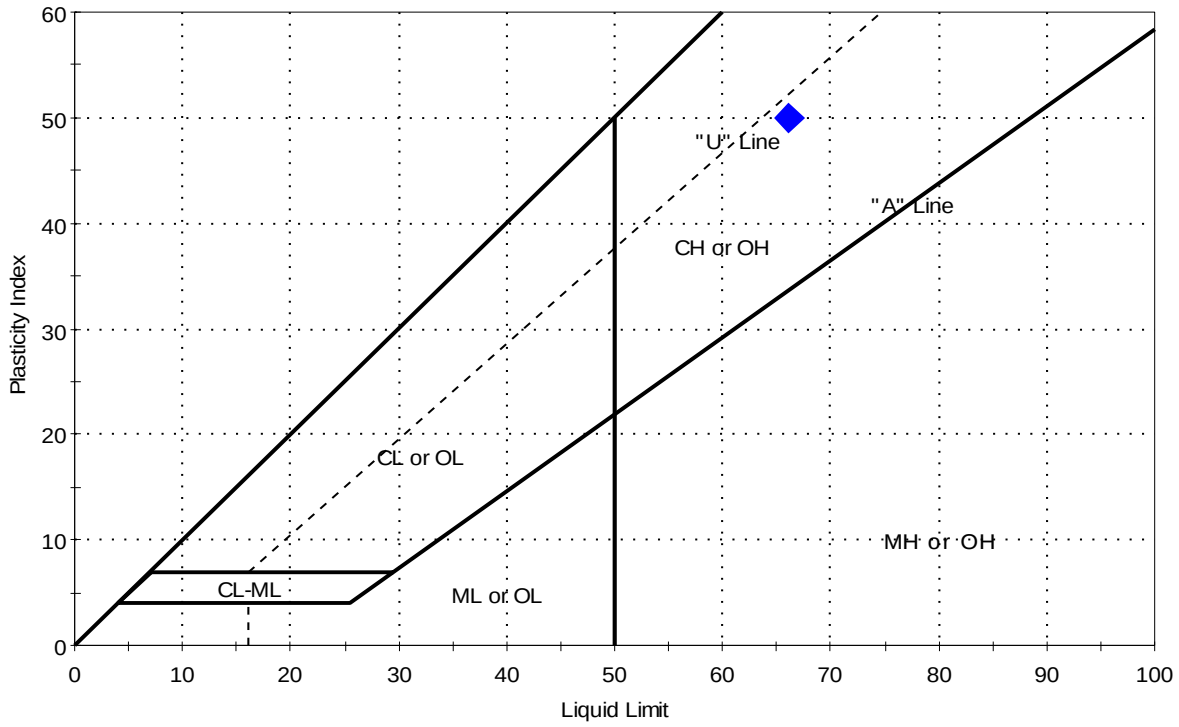
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB028	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0806	Test Date:	03/02/19	Checked By:	bfs
Depth :	25-27 ft	Test Id:	483641		
Test Comment:	---				
Visual Description:	Moist, very dark brown clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0806	SJSB028	25-27 ft	50	66	16	50	0.7	Fat CLAY with Sand (CH)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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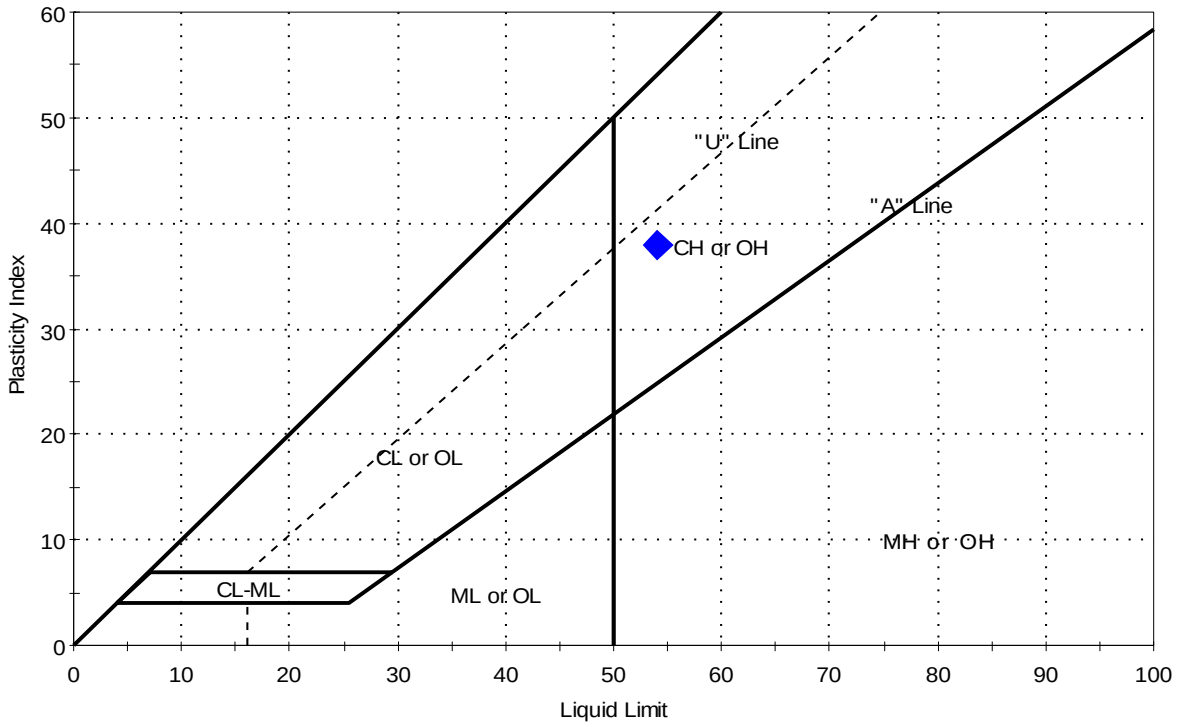
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB029	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0607	Test Date:	12/11/18	Checked By:	emm
Depth :	20-22 ft	Test Id:	482739		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0607	SJSB029	20-22 ft	45	54	16	38	0.8	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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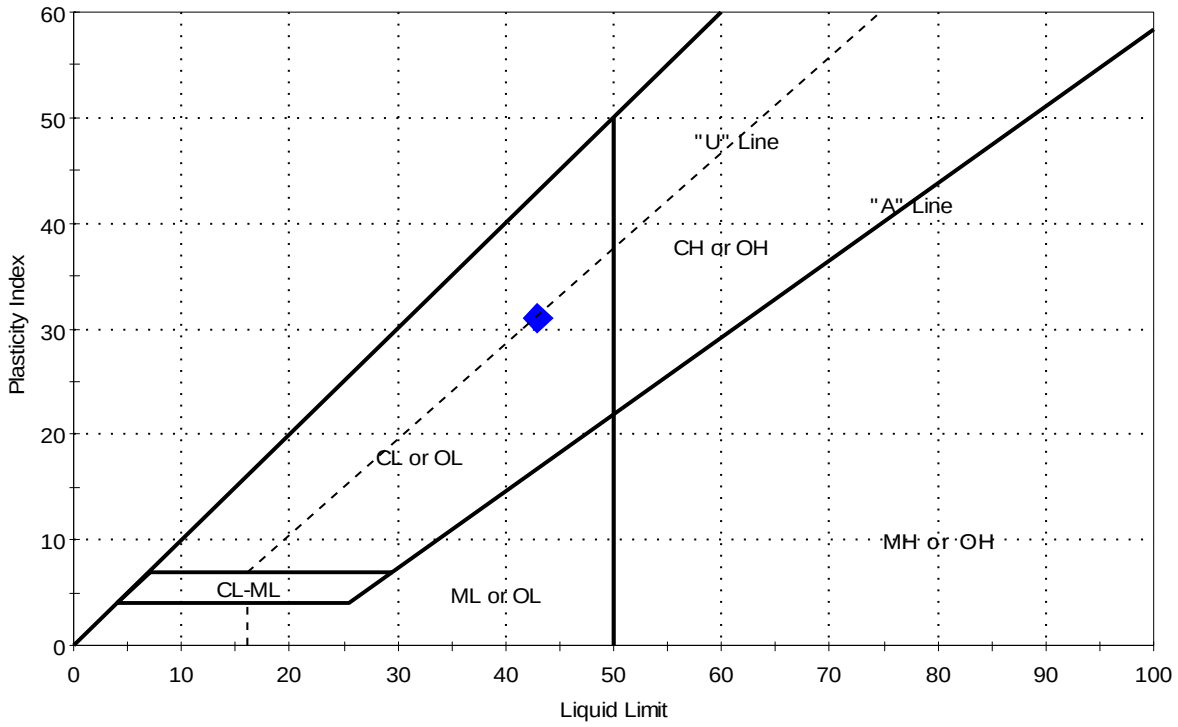
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB029	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0611	Test Date:	01/02/19	Checked By:	emm
Depth :	39.5-40 ft	Test Id:	482740		
Test Comment:	---				
Visual Description:	Moist, mottled yellowish brown and very dark grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0611	SJSB029	39.5-40 ft	18	43	12	31	0.2	

Sample Prepared using the WET method

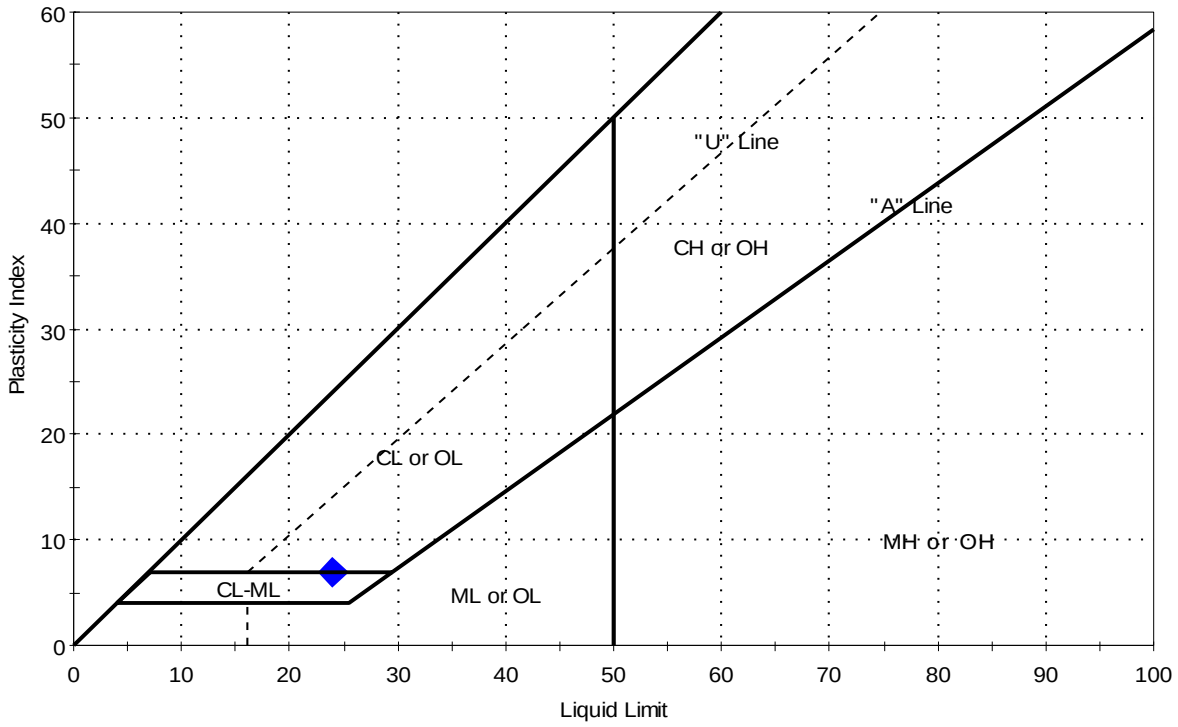
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB030	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0692	Test Date:	03/05/19	Checked By:	bfs
Depth :	8-10 ft	Test Id:	483638		
Test Comment:	---				
Visual Description:	Moist, dark brown silty clay with gravel				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0692	SJSB030	8-10 ft	21	24	17	7	0.6	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB030	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0696	Test Date:	02/26/19	Checked By:	bfs
Depth :	30-32 ft	Test Id:	483639		
Test Comment:	---				
Visual Description:	Moist, brownish gray sand with silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0696	SJSB030	30-32 ft	22	n/a	n/a	n/a	n/a	Poorly graded SAND with Silt (SP-SM)

14% Retained on #40 Sieve

Dry Strength: LOW

Dilatancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

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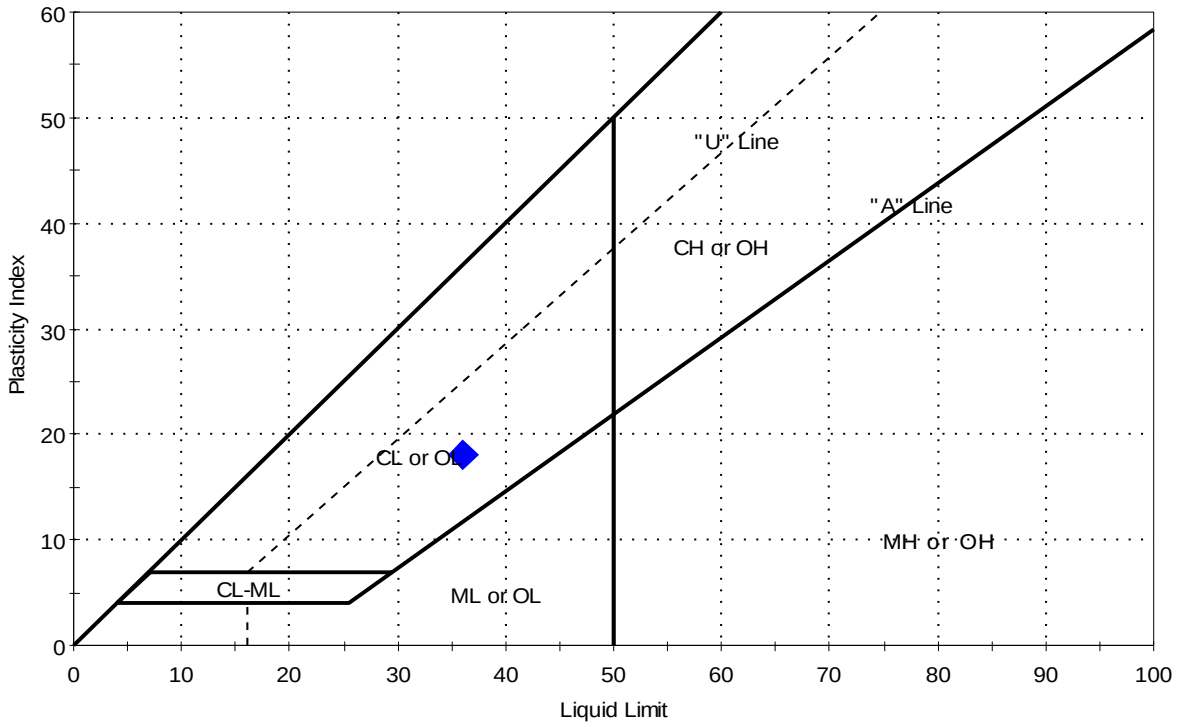
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB031	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0617	Test Date:	12/11/18	Checked By:	emm
Depth :	8-10 ft	Test Id:	482741		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown clayey sand				
Sample Comment:	Sample contains organics				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0617	SJSB031	8-10 ft	21	36	18	18	0.2	Clayey SAND (SC)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: HIGH
Dilatancy: RAPID
Toughness: LOW

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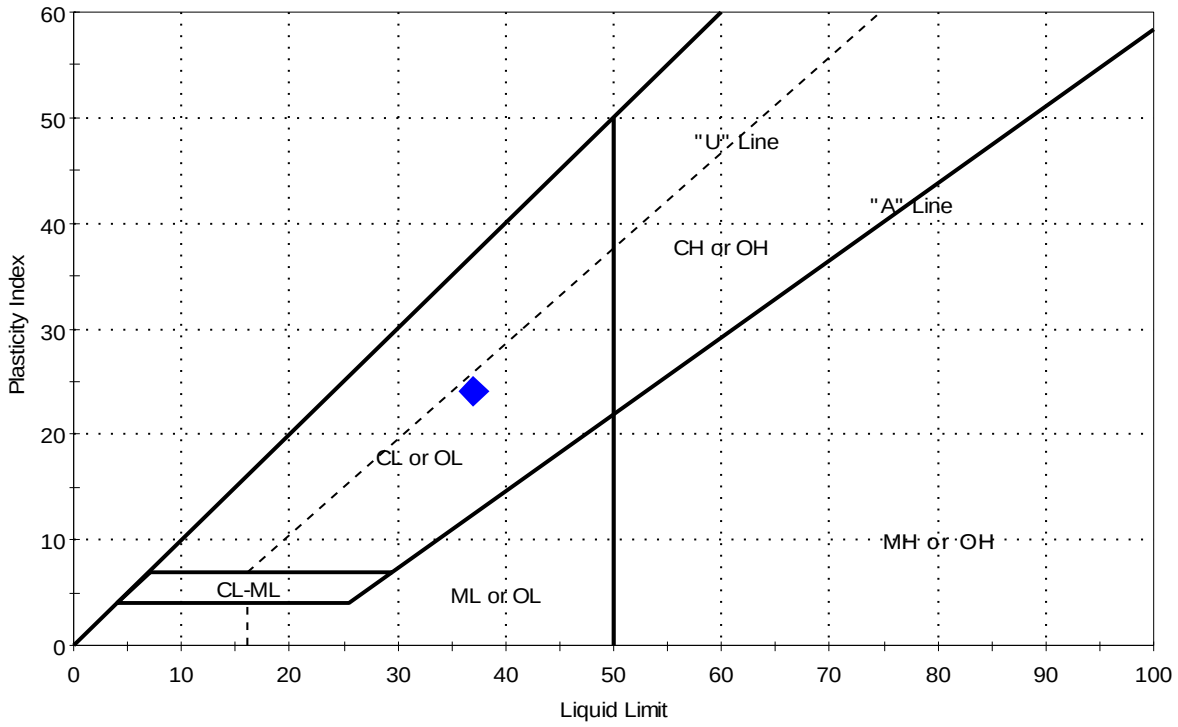
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB032	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0679	Test Date:	02/28/19	Checked By:	bfs
Depth :	8-10 ft	Test Id:	483636		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0679	SJSB032	8-10 ft	28	37	13	24	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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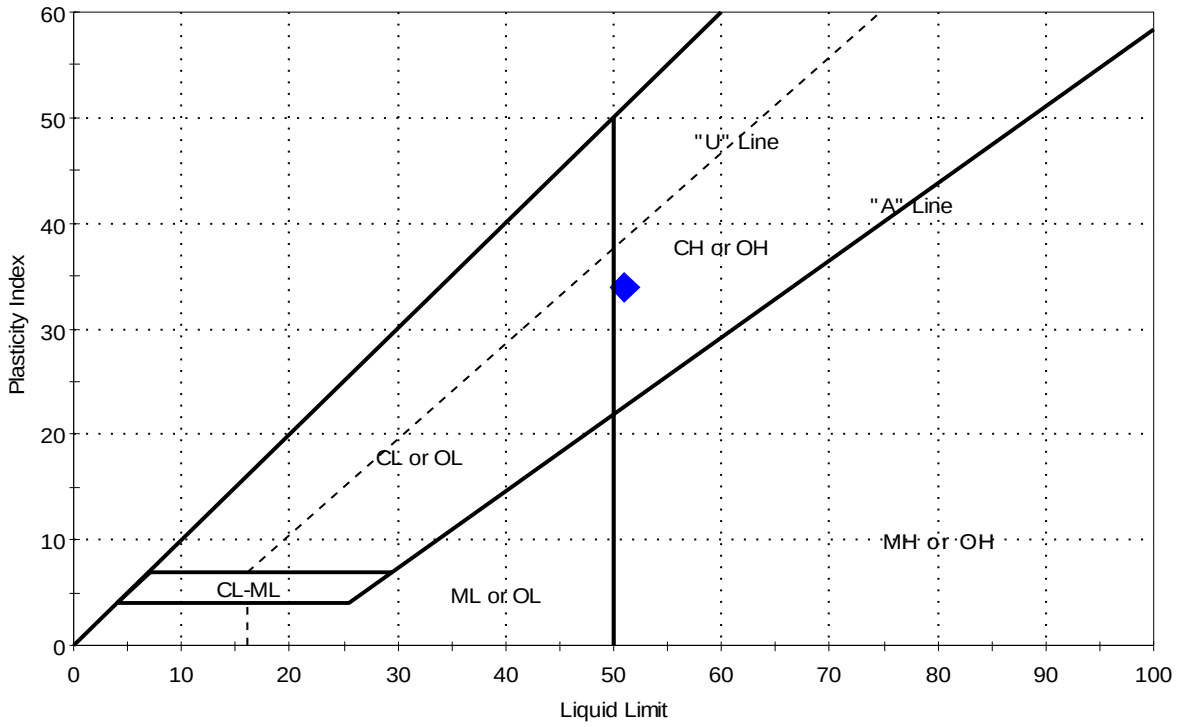
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB032	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0685	Test Date:	02/28/19	Checked By:	bfs
Depth :	38-40 ft	Test Id:	483637		
Test Comment:	---				
Visual Description:	Moist, yellowish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0685	SJSB032	38-40 ft	22	51	17	34	0.1	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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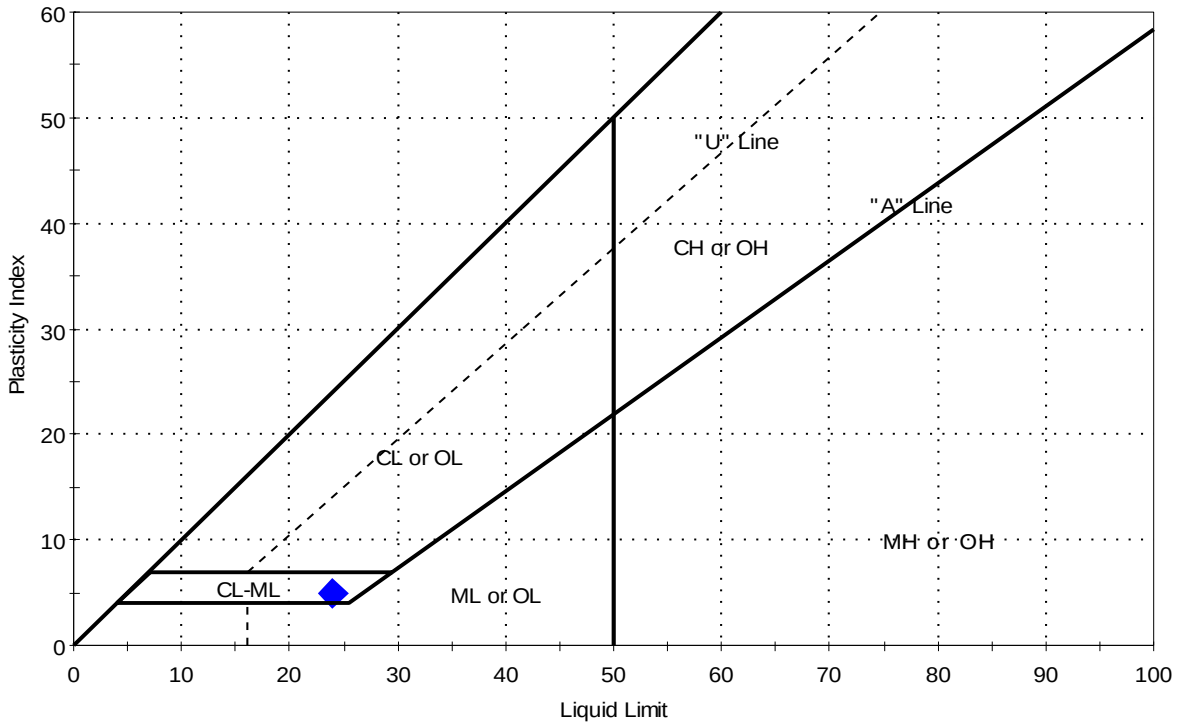
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB033	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0643	Test Date:	01/05/19	Checked By:	emm
Depth :	6-8 ft	Test Id:	482980		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown silty clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0643	SJSB033	6-8 ft	21	24	19	5	0.4	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: RAPID

Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB033	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0645	Test Date:	02/26/19	Checked By:	bfs
Depth :	14-16 ft	Test Id:	483631		
Test Comment:	---				
Visual Description:	Moist, grayish brown silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0645	SJSB033	14-16 ft	24	n/a	n/a	n/a	n/a	Silty SAND (SM)

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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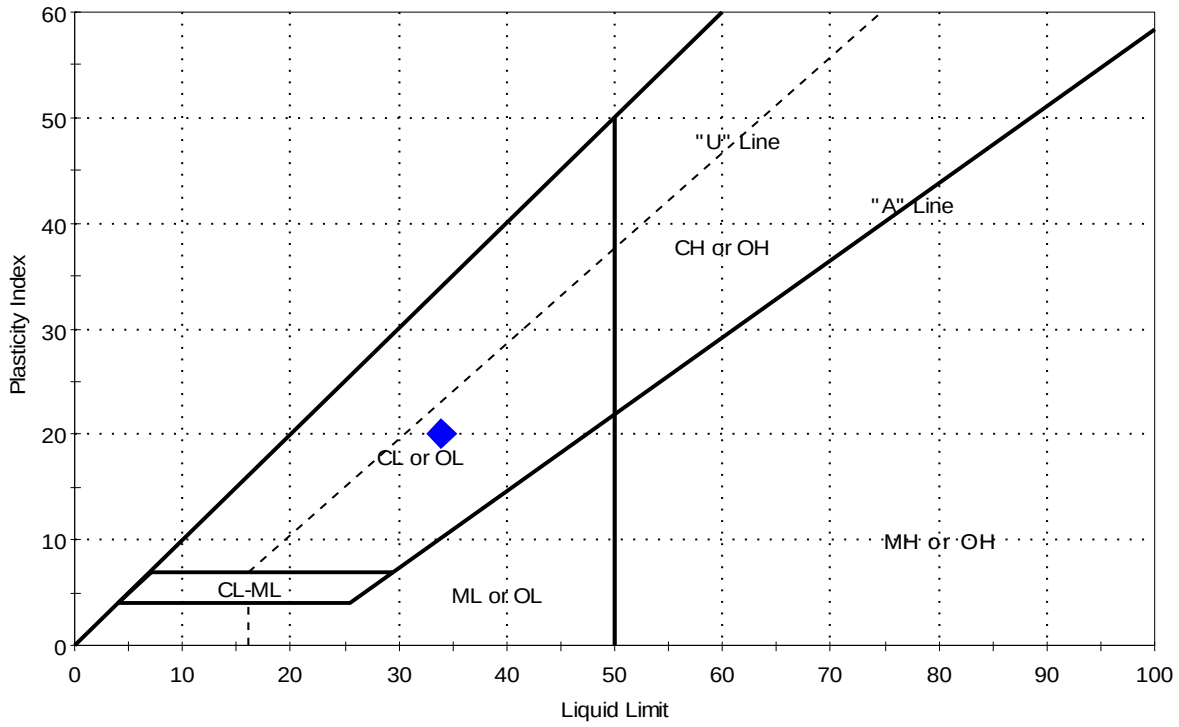
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB034	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0631	Test Date:	01/07/19	Checked By:	emm
Depth :	6-8 ft	Test Id:	482977		
Test Comment:	---				
Visual Description:	Moist, very dark brown sandy clay				
Sample Comment:	Sample contains organics				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0631	SJSB034	6-8 ft	25	34	14	20	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB034	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0634	Test Date:	01/04/19	Checked By:	emm
Depth :	14-16 ft	Test Id:	482978		
Test Comment:	---				
Visual Description:	Moist, light yellowish brown silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0634	SJSB034	14-16 ft	19	n/a	n/a	n/a	n/a	Silty SAND (SM)

1% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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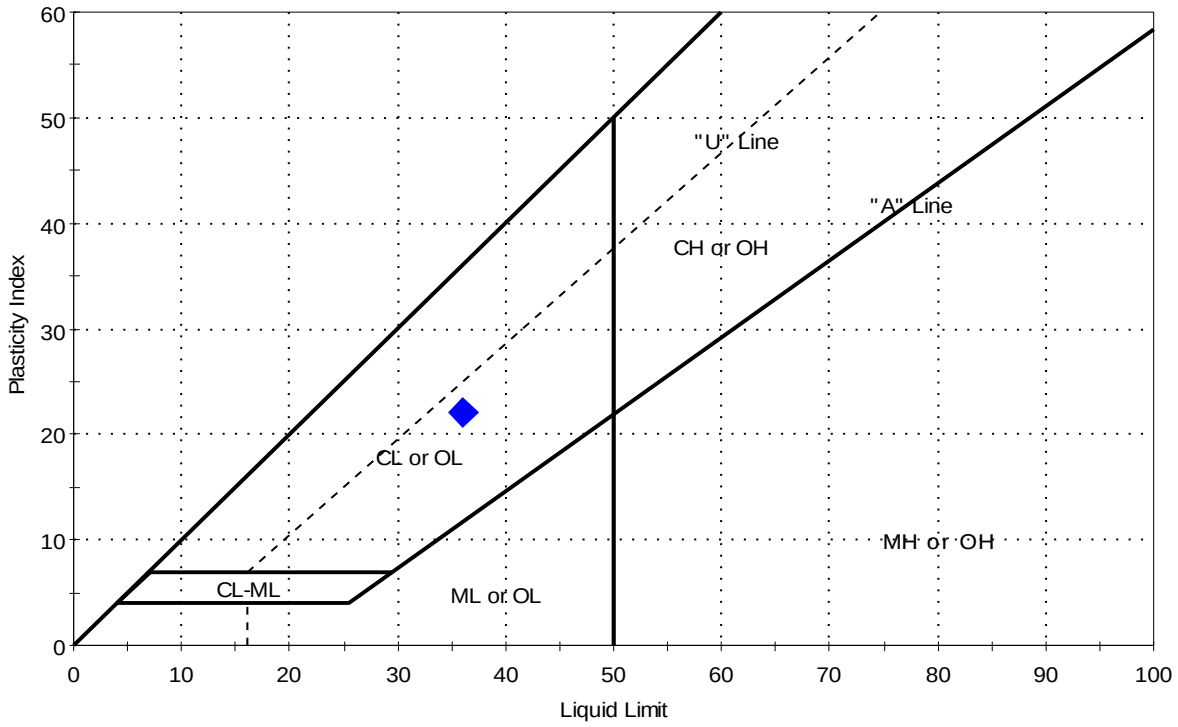
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB035	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0641	Test Date:	12/28/18	Checked By:	emm
Depth :	2-4 ft	Test Id:	482975		
Test Comment:	---				
Visual Description:	Moist, grayish brown clay				
Sample Comment:	Sample contains organics				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0641	SJSB035	2-4 ft	19	36	14	22	0.2	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: SLOW

Toughness: LOW

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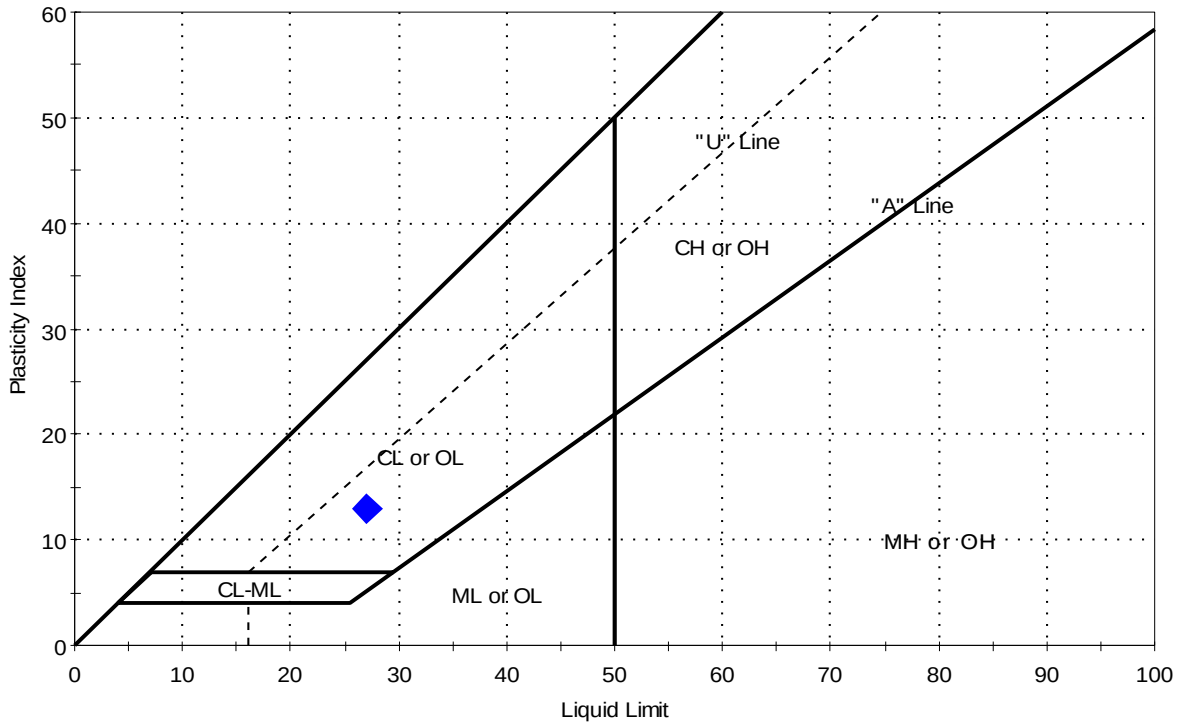
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB035	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0644	Test Date:	12/11/18	Checked By:	emm
Depth :	8-10 ft	Test Id:	482976		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0644	SJSB035	8-10 ft	25	27	14	13	0.8	Sandy Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: RAPID
Toughness: LOW

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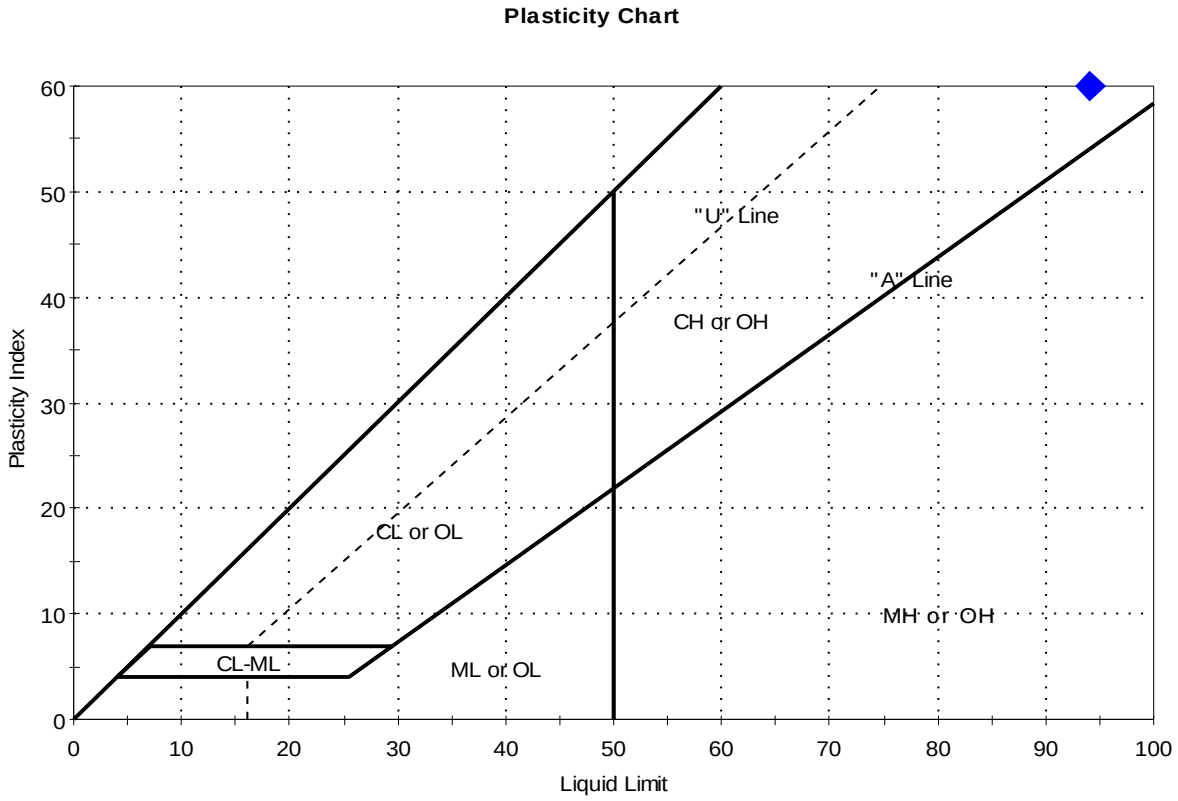
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB036	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0665	Test Date:	02/28/19	Checked By:	bfs
Depth :	2.6-4 ft	Test Id:	483634		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0665	SJSB036	2.6-4 ft	77	94	34	60	0.7	Sandy Fat CLAY (CH)

Sample Prepared using the WET method
17% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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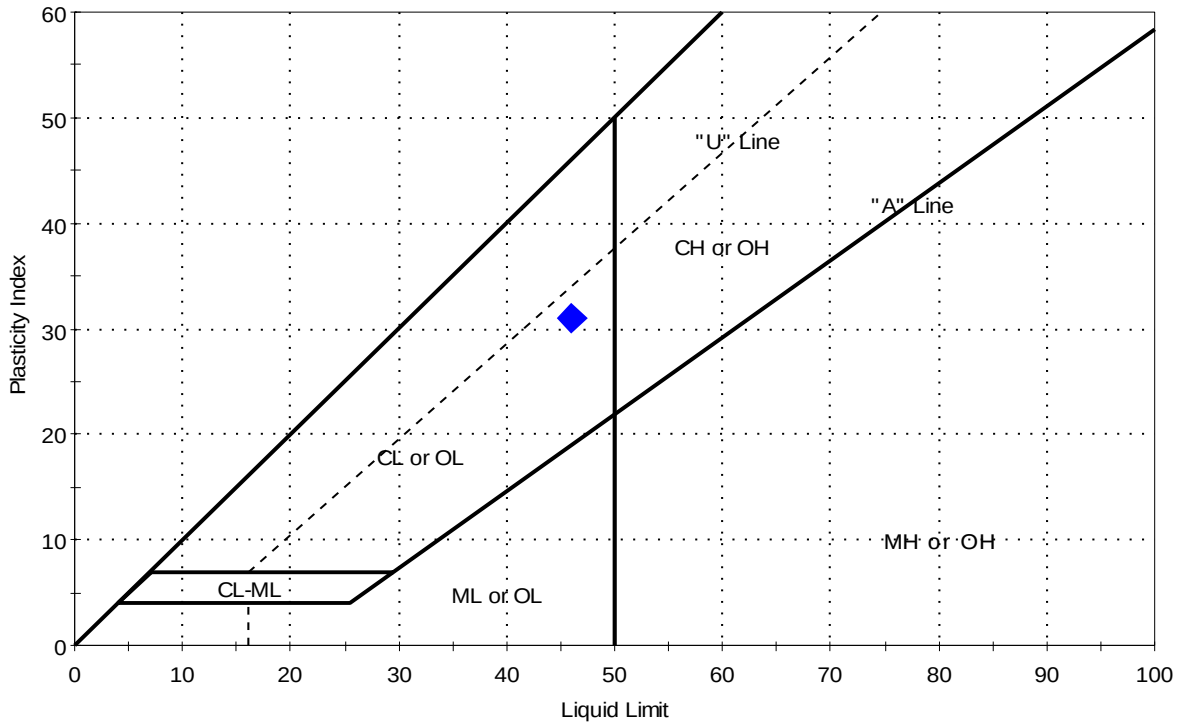
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB036	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0667	Test Date:	03/01/19	Checked By:	bfs
Depth :	6-8 ft	Test Id:	483635		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0667	SJSB036	6-8 ft	28	46	15	31	0.4	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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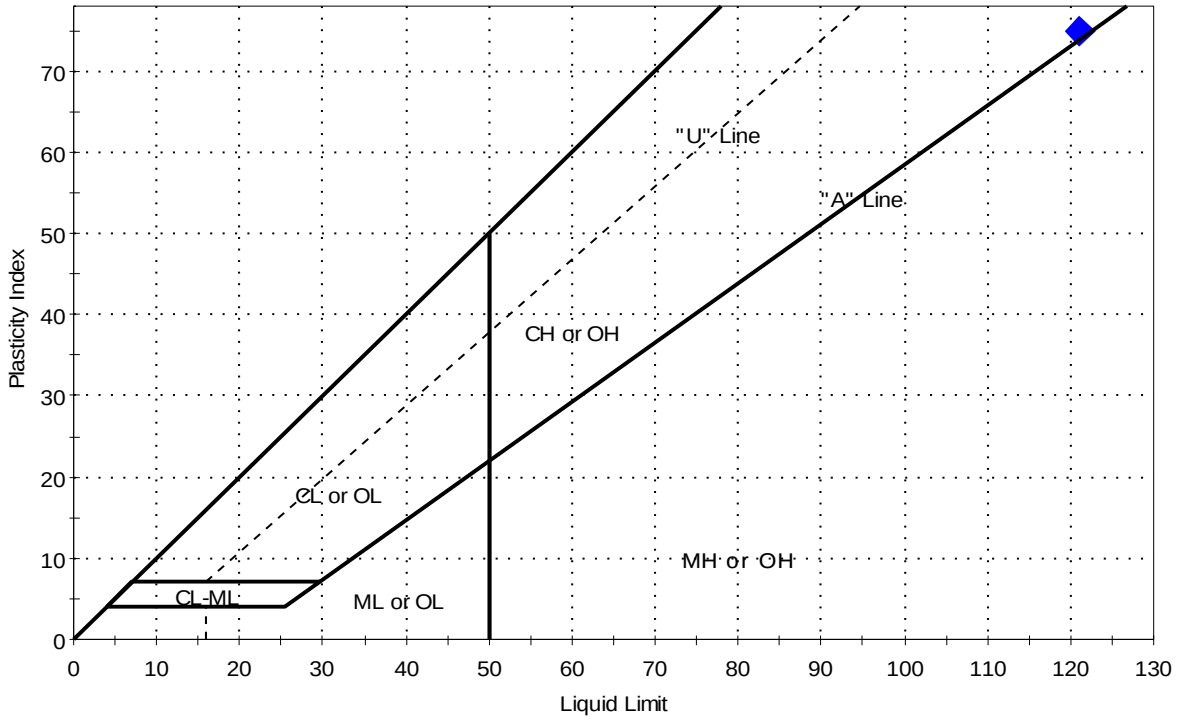
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB037	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0652	Test Date:	03/01/19	Checked By:	bfs
Depth :	2-4 ft	Test Id:	483632		
Test Comment:	---				
Visual Description:	Moist, very dark gray sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Plasticity Chart



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0652	SJSB037	2-4 ft	105	121	46	75	0.8	Sandy Fat CLAY (CH)

Sample Prepared using the WET method
19% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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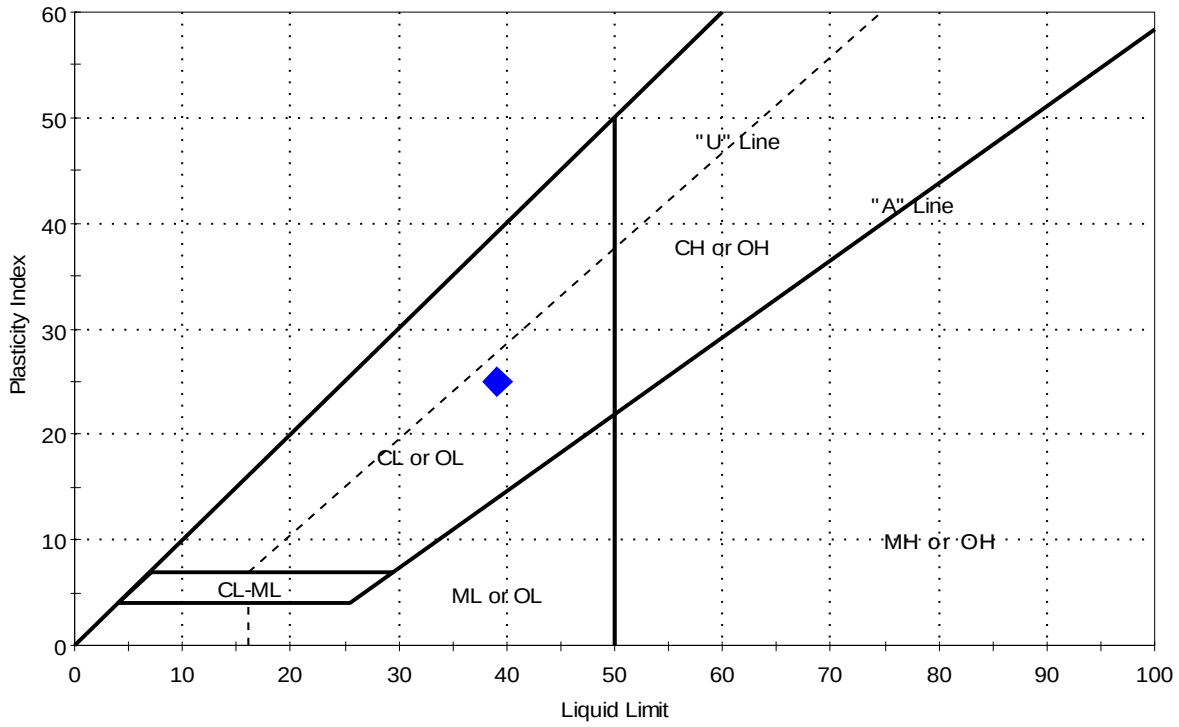
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB037	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0655	Test Date:	03/01/19	Checked By:	bfs
Depth :	8-10 ft	Test Id:	483633		
Test Comment:	---				
Visual Description:	Moist, dark grayish brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0655	SJSB037	8-10 ft	29	39	14	25	0.6	

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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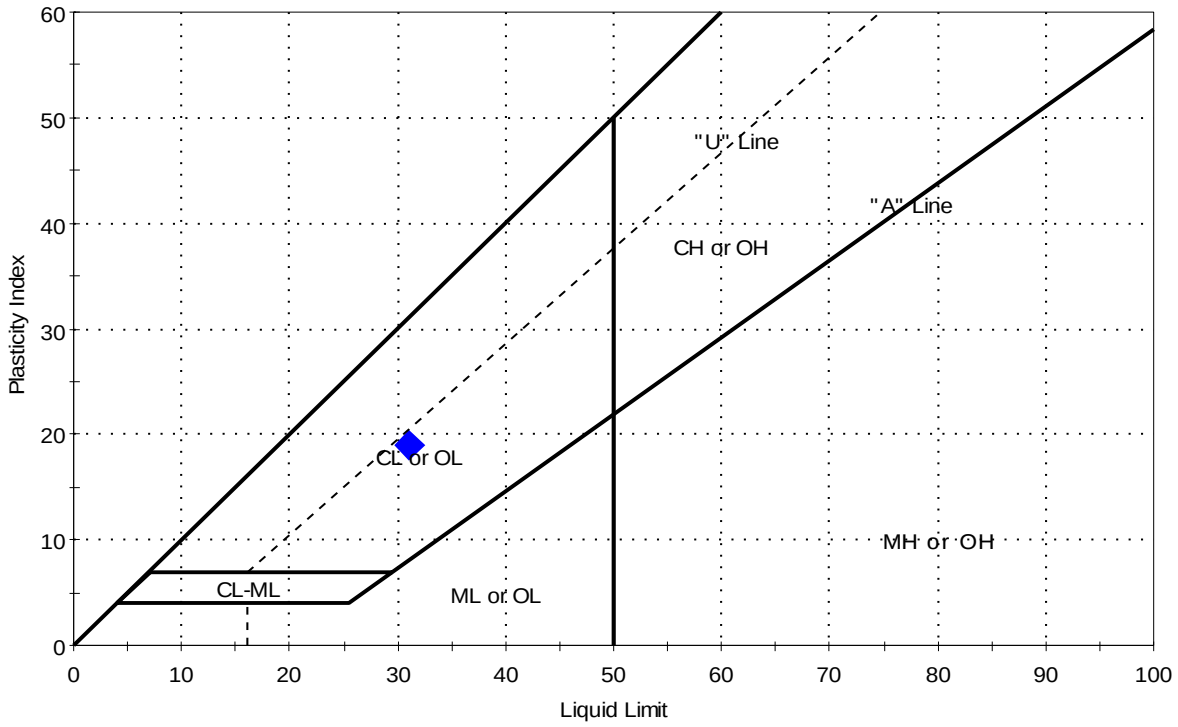
Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB038	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0891	Test Date:	03/02/19	Checked By:	bfs
Depth :	13-15 ft	Test Id:	486507		
Test Comment:	---				
Visual Description:	Moist, very dark grayish brown sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0891	SJSB038	13-15 ft	48	31	12	19	1.9	Sandy Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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Client:	Anchor QEA, LLC				
Project:	San Jacinto Pre-Design Investigation				
Location:				Project No:	GTX-309154
Boring ID:	SJSB038	Sample Type:	bag	Tested By:	cam
Sample ID:	SL0893	Test Date:	02/27/19	Checked By:	bfs
Depth :	24-26 ft	Test Id:	486508		
Test Comment:	---				
Visual Description:	Moist, dark brown sand with silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	SL0893	SJSB038	24-26 ft	22	n/a	n/a	n/a	n/a	Poorly graded SAND with Silt (SP-SM)

25% Retained on #40 Sieve
Dry Strength: LOW
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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Client:	Anchor QEA, LLC		
Project Name:	San Jacinto Pre-Design Investigation		
Project Location:	---		
GTX #:	309154		
Start Date:	2/15/2019	Tested By:	jlw
End Date:	2/27/2019	Checked By:	emm
Boring #:	SJSB037		
Sample #:	SLO657		
Depth:	15-17		
Visual Description:	Moist, dark gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Gradient

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 36.6%.

Assumed Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	2.62	2.56
Diameter, in	2.81	2.87
Area, in^2	6.21	6.45
Volume, in^3	16.3	16.5
Mass, g	497.4	496.0
Bulk Density, pcf	116.2	114.3
Moisture Content, %	36.2	35.8
Dry Density, pcf	85.3	84.1
Degree of Saturation, %	100	96

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.99	Increased Cell Pressure, psi:	94.98	Cell Pressure Increment, psi:	4.99
Sample Pressure, psi:	87.00	Corresponding Sample Pressure, psi:	91.70	Sample Pressure Increment, p	4.70
				B Coefficient:	0.94

B-value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Time, sec	Pressure, psi Cell	Inlet	Outlet	Gradient	Flow Volume, cc In	Out	Δ In	Δ Out	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
2/26	---	90.0	87.5	86.7	8.7	7.00	14.00	---	---	---	---	---
2/26	3545	90.0	87.5	86.7	8.7	7.30	13.90	0.30	0.10	19.5	1.013	1.6E-07
2/26	----	90.0	87.5	86.7	8.7	7.00	14.00	---	---	---	---	---
2/26	3901	90.0	87.5	86.7	8.7	7.30	13.70	0.30	0.30	19.5	1.013	2.2E-07
2/26	----	90.0	87.5	86.7	8.7	7.00	14.00	---	---	---	---	---
2/26	3604	90.0	87.5	86.7	8.7	7.20	13.80	0.20	0.20	19.5	1.013	1.6E-07
2/26	----	90.0	87.5	86.7	8.7	7.00	14.00	---	---	---	---	---
2/26	3634	90.0	87.5	86.7	8.7	7.30	13.80	0.30	0.20	19.5	1.013	1.9E-07

PERMEABILITY AT 20° C: 1.8 x 10^{-7} cm/sec (@ 3 psi effective stress)

Client:	Anchor QEA, LLC		
Project Name:	San Jacinto Pre-Design Investigation		
Project Location:	---		
GTX #:	309154		
Start Date:	2/15/2019	Tested By:	jlw
End Date:	2/28/2019	Checked By:	emm
Boring #:	SJSB036		
Sample #:	SLO674		
Depth:	8-10 ft		
Visual Description:	Moist, gray clay with sand		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Gradient

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 58.4%.

Assumed Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	2.41	2.35
Diameter, in	2.85	2.86
Area, in^2	6.36	6.41
Volume, in^3	15.3	15.0
Mass, g	394.7	395.4
Bulk Density, pcf	97.9	100.0
Moisture Content, %	58.9	59.1
Dry Density, pcf	61.6	62.9
Degree of Saturation, %	92	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.99	Increased Cell Pressure, psi:	95.02	Cell Pressure Increment, psi:	5.03
Sample Pressure, psi:	88.04	Corresponding Sample Pressure, psi:	92.12	Sample Pressure Increment, p	4.08
				B Coefficient:	0.81

B-value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Time, sec	Pressure, psi Cell	Inlet	Outlet	Gradient	Flow Volume, cc In	Out	Δ In	Δ Out	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
2/25	---	90.0	88.5	87.5	11.8	7.00	14.00	---	---	---	---	---
2/25	2488	90.0	88.5	87.5	11.8	7.30	13.80	0.30	0.20	19.5	1.013	2.1E-07
2/25	----	90.0	88.5	87.5	11.8	7.00	14.00	---	---	---	---	---
2/25	2804	90.0	88.5	87.5	11.8	7.30	13.80	0.30	0.20	19.5	1.013	1.9E-07
2/25	----	90.0	88.5	87.5	11.8	7.00	14.00	---	---	---	---	---
2/25	3007	90.0	88.5	87.5	11.8	7.30	13.80	0.30	0.20	19.5	1.013	1.7E-07
2/26	----	90.0	88.5	87.5	11.8	7.00	14.00	---	---	---	---	---
2/26	3209	90.0	88.5	87.5	11.8	7.30	13.80	0.30	0.20	19.5	1.013	1.6E-07

PERMEABILITY AT 20° C: 1.8 x 10^{-7} cm/sec (@ 2 psi effective stress)

Client:	Anchor QEA, LLC		
Project Name:	San Jacinto Pre-Design Investigation		
Project Location:	---		
GTX #:	309154		
Start Date:	2/12/2019	Tested By:	jlw
End Date:	2/27/2019	Checked By:	emm
Boring #:	SJGB022		
Sample #:	SLO817		
Depth:	30-32 ft		
Visual Description:	Moist, light red clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Gradient

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 28.5%.

Assumed Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	3.84	3.80
Diameter, in	2.79	2.85
Area, in^2	6.11	6.38
Volume, in^3	23.5	24.2
Mass, g	765.3	774.1
Bulk Density, pcf	123.9	121.4
Moisture Content, %	27.1	28.6
Dry Density, pcf	97.5	94.4
Degree of Saturation, %	100	98

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.99	Increased Cell Pressure, psi:	95.02	Cell Pressure Increment, psi:	5.03
Sample Pressure, psi:	85.00	Corresponding Sample Pressure, psi:	89.07	Sample Pressure Increment, p	4.07
				B Coefficient:	0.81

B-value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Time, sec	Pressure, psi Cell	Inlet	Outlet	Gradient	Flow Volume, cc In	Out	Δ In	Δ Out	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
2/19	---	90.0	85.5	84.5	7.3	0.00	25.00	---	---	---	---	---
2/19	10690	90.0	85.5	84.5	7.3	0.20	24.80	0.20	0.20	19.5	1.013	6.3E-08
2/19	----	90.0	85.5	84.5	7.3	0.00	25.00	---	---	---	---	---
2/19	11730	90.0	85.5	84.5	7.3	0.20	24.80	0.20	0.20	19.5	1.013	5.8E-08
2/20	----	90.0	85.5	84.5	7.3	0.00	25.00	---	---	---	---	---
2/20	11210	90.0	85.5	84.5	7.3	0.20	24.80	0.20	0.20	19.5	1.013	6.0E-08
2/20	----	90.0	85.5	84.5	7.3	0.00	25.00	---	---	---	---	---
2/20	9186	90.0	85.5	84.5	7.3	0.20	24.80	0.20	0.20	19.5	1.013	7.4E-08

PERMEABILITY AT 20° C: 6.4 x 10^{-8} cm/sec (@ 5 psi effective stress)

Client:	Anchor QEA, LLC		
Project Name:	San Jacinto Pre-Deisgn Investigation		
Project Location:	---		
GTX #:	309154		
Start Date:	3/5/2019	Tested By:	jlw
End Date:	3/11/2019	Checked By:	emm
Boring #:	SJGB019		
Sample #:	SLO852		
Depth:	25-27ft		
Visual Description:	Moist, pale brown clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084
Constant Gradient

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 20.5%.

Assumed Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	2.87	2.82
Diameter, in	2.82	2.80
Area, in^2	6.25	6.16
Volume, in^3	17.9	17.4
Mass, g	586.1	589.8
Bulk Density, pcf	124.3	129.1
Moisture Content, %	20.3	21.1
Dry Density, pcf	103.3	106.6
Degree of Saturation, %	87	98

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.00	Increased Cell Pressure, psi:	95.03	Cell Pressure Increment, psi:	5.03
Sample Pressure, psi:	85.96	Corresponding Sample Pressure, psi:	89.91	Sample Pressure Increment, p	3.95
				B Coefficient:	0.79

FLOW DATA

Date	Time, sec	Pressure, psi Cell	Inlet	Outlet	Gradient	Flow Volume, cc In	Out	Δ In	Δ Out	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
3/7	---	90.0	86.5	85.5	9.8	7.00	14.00	---	---	---	---	---
3/7	3600	90.0	86.5	85.5	9.8	7.30	13.50	0.30	0.50	19.5	1.013	2.9E-07
3/7	----	90.0	86.5	85.5	9.8	7.00	14.00	---	---	---	---	---
3/7	3600	90.0	86.5	85.5	9.8	7.30	13.50	0.30	0.50	19.5	1.013	2.9E-07
3/7	----	90.0	86.5	85.5	9.8	7.00	14.00	---	---	---	---	---
3/7	3660	90.0	86.5	85.5	9.8	7.30	13.60	0.30	0.40	19.5	1.013	2.5E-07
3/7	----	90.0	86.5	85.5	9.8	7.00	14.00	---	---	---	---	---
3/7	3600	90.0	86.5	85.5	9.8	7.30	13.50	0.30	0.50	19.5	1.013	2.9E-07

PERMEABILITY AT 20° C: 2.8 x 10^{-7} cm/sec (@ 4 psi effective stress)

Client:	Anchor QEA, LLC		
Project Name:	San Jacinto Pre-Design Investigation		
Project Location:	---		
GTX #:	309154		
Start Date:	2/15/2019	Tested By:	jlw
End Date:	2/26/2019	Checked By:	emm
Boring #:	SJGB038		
Sample #:	SL0896		
Depth:	11-13 ft		
Visual Description:	Moist, dark gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Gradient

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 48.8%.

Assumed Specific Gravity: 2.70

Parameter	Initial	Final
Height, in	2.66	2.59
Diameter, in	2.81	2.79
Area, in^2	6.20	6.11
Volume, in^3	16.5	15.8
Mass, g	480.3	471.2
Bulk Density, pcf	110.7	113.1
Moisture Content, %	43.6	40.9
Dry Density, pcf	77.1	80.3
Degree of Saturation, %	99	100

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	89.98	Increased Cell Pressure, psi:	95.04	Cell Pressure Increment, psi:	5.06
Sample Pressure, psi:	88.03	Corresponding Sample Pressure, psi:	92.75	Sample Pressure Increment, p	4.72
				B Coefficient:	0.93

B-value did not increase with increase in pressure. Final degree of saturation >95%.

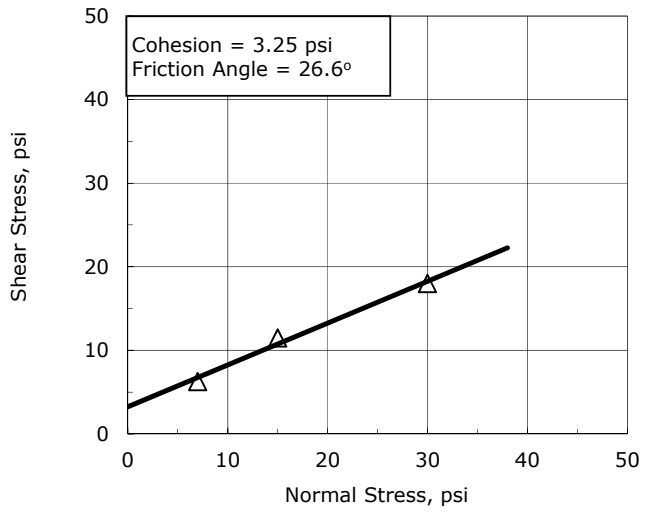
FLOW DATA

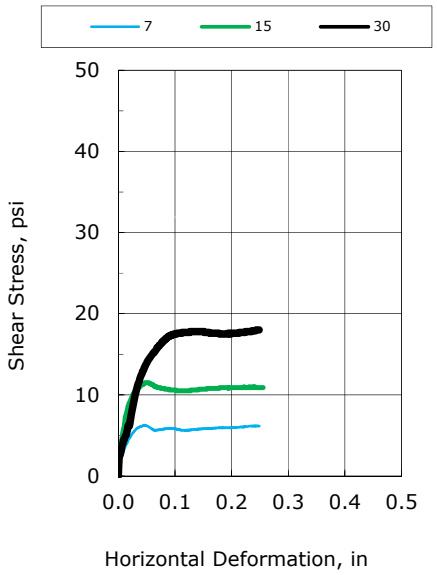
Date	Time, sec	Pressure, psi Cell	Inlet	Outlet	Gradient	Flow Volume, cc In	Out	Δ In	Δ Out	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
2/25	---	90.0	88.5	87.5	10.7	7.00	14.00	---	---	---	---	---
2/25	3708	90.0	88.5	87.5	10.7	7.60	13.50	0.60	0.50	19.5	1.013	3.6E-07
2/25	----	90.0	88.5	87.5	10.7	7.00	14.00	---	---	---	---	---
2/25	3967	90.0	88.5	87.5	10.7	7.50	13.60	0.50	0.40	19.5	1.013	2.7E-07
2/25	----	90.0	88.5	87.5	10.7	7.00	14.00	---	---	---	---	---
2/25	2900	90.0	88.5	87.5	10.7	7.40	13.60	0.40	0.40	19.5	1.013	3.3E-07
2/25	----	90.0	88.5	87.5	10.7	7.00	14.00	---	---	---	---	---
2/25	3062	90.0	88.5	87.5	10.7	7.40	13.60	0.40	0.40	19.5	1.013	3.1E-07

PERMEABILITY AT 20° C: 3.2 x 10^{-7} cm/sec (@ 2 psi effective stress)

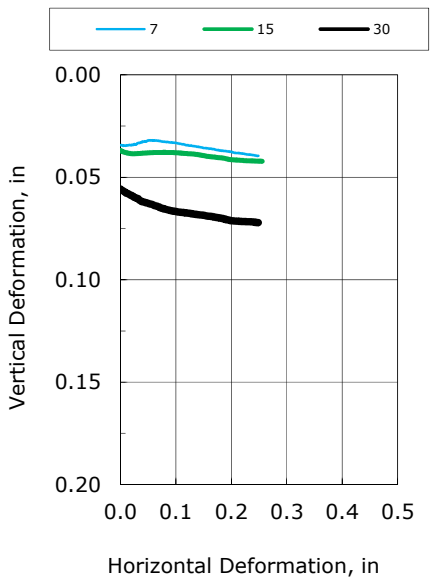
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	01/21/19
Tested By:	md
Checked By:	njh
Boring ID:	SJGB018
Sample ID:	SL0871
Depth, ft:	45-47
Visual Description:	Moist, blueish gray clay

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-16	DS-17	DS-18
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	159	161	159
Initial Dry Density, pcf:	102.2	102.8	101.4
Initial Moisture Content, %:	20.8	21.3	21.9
Initial Bulk Density, pcf:	123	125	124
Initial Degree of Saturation:	86.7	90.0	89.3
Initial Void Ratio:	0.65	0.64	0.66
Final Dry Density, pcf:	106.5	107.4	109.3
Final Moisture Content, %:	22.2	23.6	21.5
Final Bulk Density, pcf:	130	133	133
Normal Stress, psi:	7.0	15	30
Maximum Shear Stress, psi:	6.3	12	18
Shear Rate, in/min:	0.0003	0.0003	0.0003



Sample Type:	intact
Estimated Specific Gravity:	2.70
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

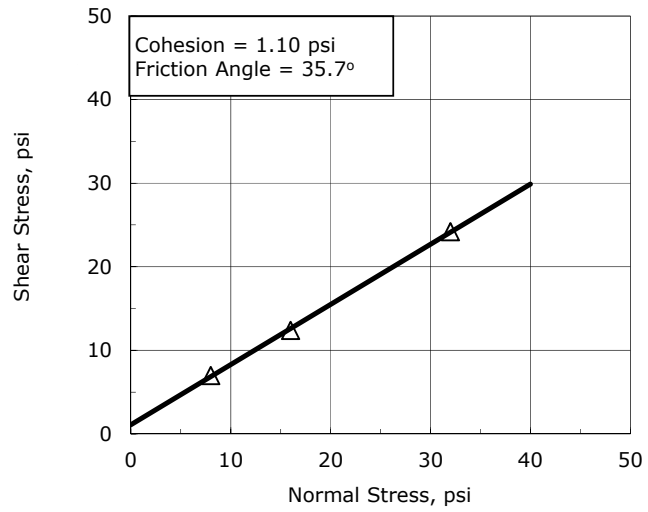
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

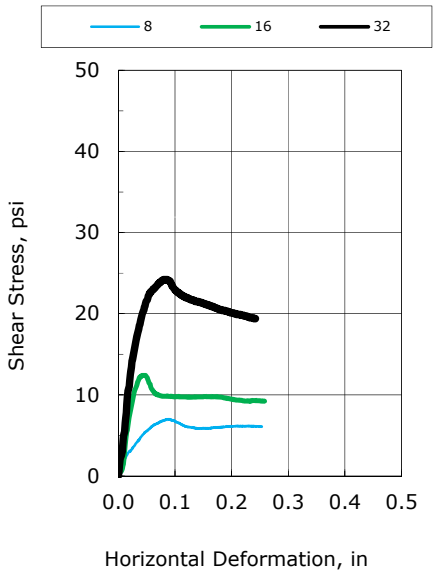
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

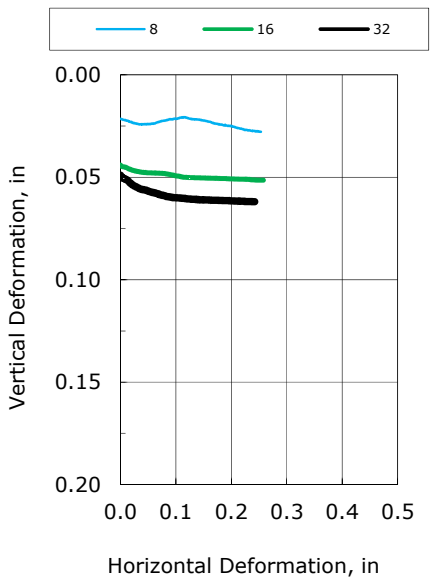
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	01/18/19
Tested By:	md
Checked By:	njh
Boring ID:	SJGB019
Sample ID:	SL0856
Depth, ft:	45-47
Visual Description:	Moist, light gray clay

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-13	DS-14	DS-15
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	154	157	155
Initial Dry Density, pcf:	99.0	100.4	96.9
Initial Moisture Content, %:	20.5	21.6	24.6
Initial Bulk Density, pcf:	119	122	121
Initial Degree of Saturation:	78.8	85.8	89.6
Initial Void Ratio:	0.70	0.68	0.74
Final Dry Density, pcf:	101.9	105.9	103.3
Final Moisture Content, %:	23.5	23.7	23.7
Final Bulk Density, pcf:	126	131	128
Normal Stress, psi:	8.0	16	32
Maximum Shear Stress, psi:	7.0	12	24
Shear Rate, in/min:	0.0003	0.0003	0.0003



Sample Type:	intact
Estimated Specific Gravity:	2.70
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

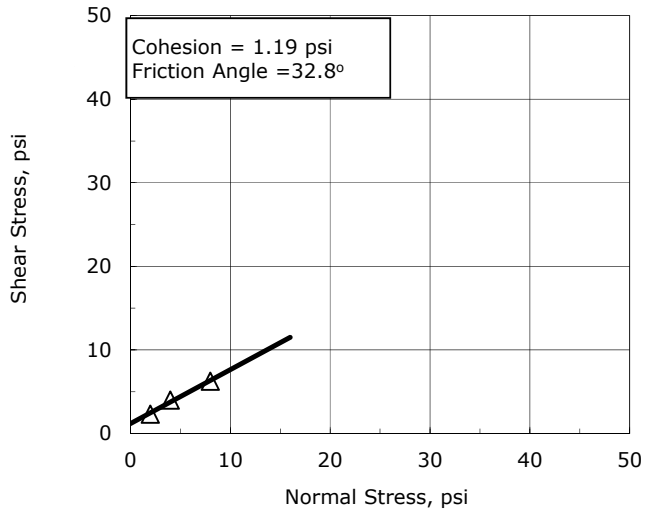
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

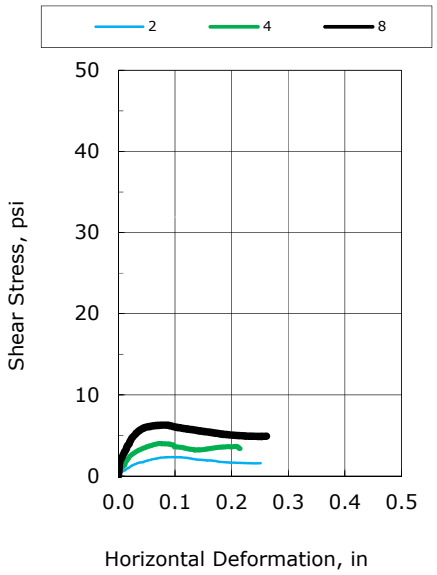
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

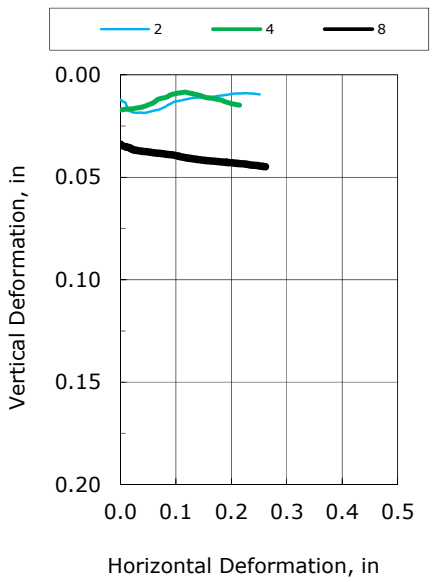
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	01/18/19
Tested By:	md
Checked By:	njh
Boring ID:	SJGB023
Sample ID:	SL0878
Depth, ft:	10-12
Visual Description:	Moist, gray sand with shells

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-10	DS-11	DS-12
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	153	153	152
Initial Dry Density, pcf:	96.9	99.7	96.9
Initial Moisture Content, %:	22.3	19.2	21.4
Initial Bulk Density, pcf:	118	119	118
Initial Degree of Saturation:	83.4	77.0	80.1
Initial Void Ratio:	0.71	0.66	0.71
Final Dry Density, pcf:	97.8	101.2	101.5
Final Moisture Content, %:	25.0	25.3	24.6
Final Bulk Density, pcf:	122	127	126
Normal Stress, psi:	2.0	4.0	8.0
Maximum Shear Stress, psi:	2.3	4.0	6.3
Shear Rate, in/min:	0.002	0.002	0.002



Sample Type:	intact
Estimated Specific Gravity:	2.65
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

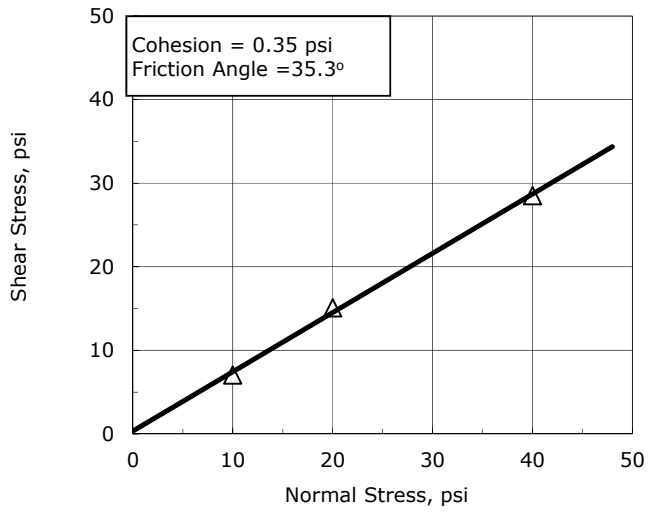
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

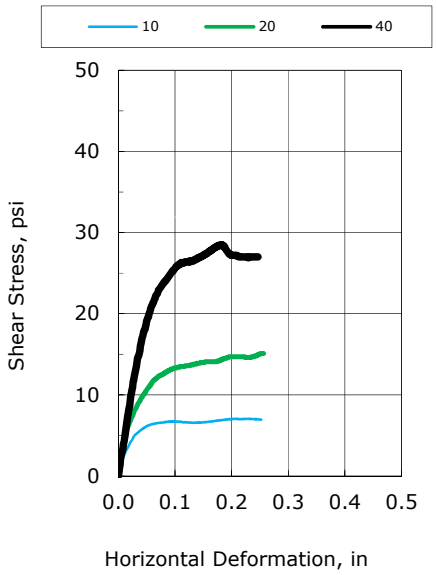
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

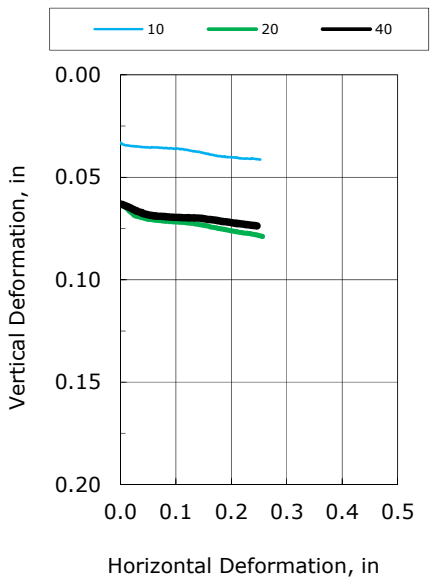
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	01/18/19
Tested By:	md
Checked By:	njh
Boring ID:	SJGB023
Sample ID:	SL0887
Depth, ft:	53-55
Visual Description:	Moist, light gray clay

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-7	DS-8	DS-9
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	155	158	159
Initial Dry Density, pcf:	99.6	102.0	103.0
Initial Moisture Content, %:	20.7	20.2	19.7
Initial Bulk Density, pcf:	120	123	123
Initial Degree of Saturation:	80.8	83.8	83.3
Initial Void Ratio:	0.69	0.65	0.64
Final Dry Density, pcf:	103.9	110.7	111.2
Final Moisture Content, %:	23.1	22.1	21.1
Final Bulk Density, pcf:	128	135	135
Normal Stress, psi:	10	20	40
Maximum Shear Stress, psi:	7.1	15	29
Shear Rate, in/min:	0.0004	0.0004	0.0004



Sample Type:	intact
Estimated Specific Gravity:	2.70
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

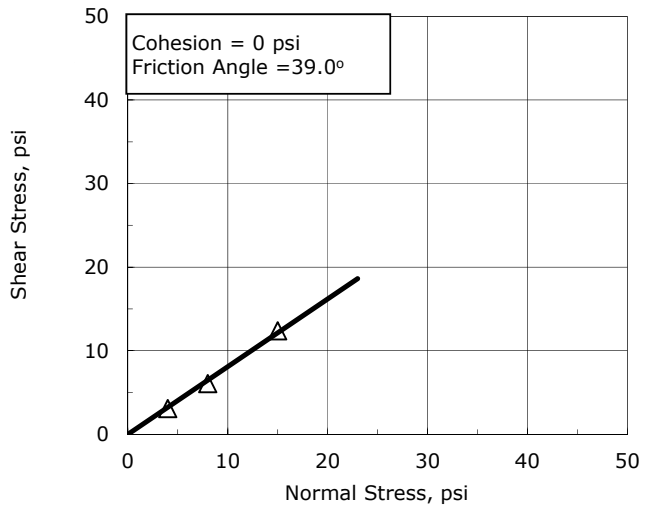
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

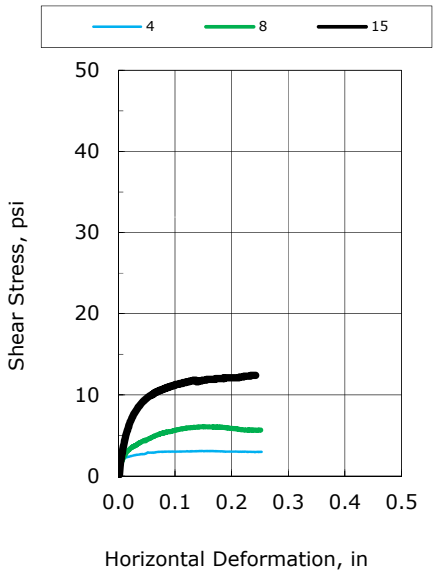
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

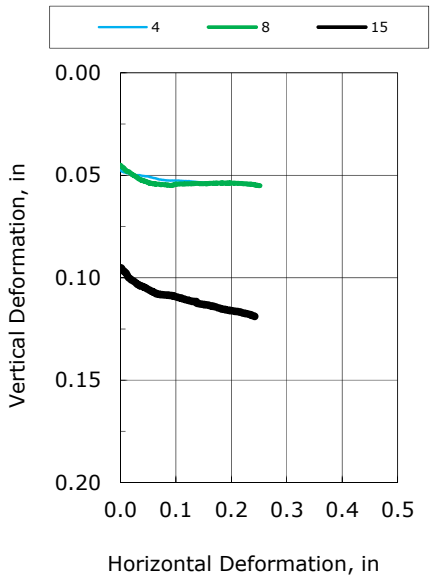
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	12/28/18
Tested By:	md
Checked By:	njh
Boring ID:	SJSB028
Sample ID:	SL0805
Depth, ft:	20-22
Visual Description:	Wet, gray sand with clay

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-1	DS-2	DS-3
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	146	151	144
Initial Dry Density, pcf:	85.1	91.9	88.3
Initial Moisture Content, %:	33.3	27.9	31.3
Initial Bulk Density, pcf:	113	118	116
Initial Degree of Saturation:	93.5	92.3	88.3
Initial Void Ratio:	0.94	0.80	0.94
Final Dry Density, pcf:	90.1	97.3	96.9
Final Moisture Content, %:	28.9	24.2	27.4
Final Bulk Density, pcf:	116	121	123
Normal Stress, psi:	4.0	8	15
Maximum Shear Stress, psi:	3.1	6	12
Shear Rate, in/min:	0.0004	0.0004	0.0004



Sample Type:	intact
Estimated Specific Gravity:	2.65
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

Moisture Content determined by ASTM D2216

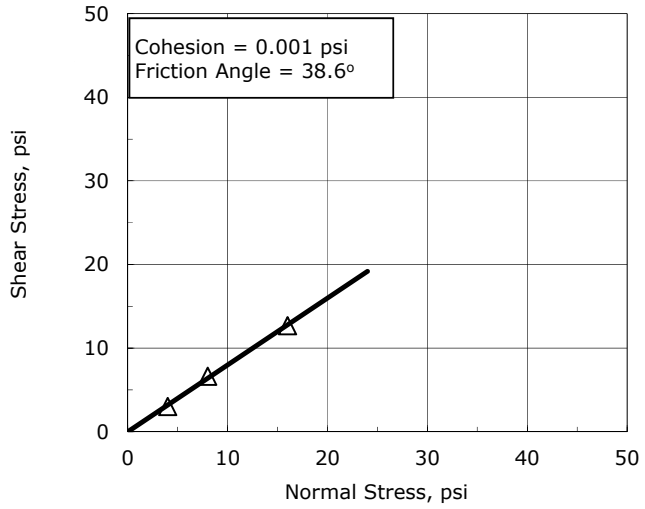
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

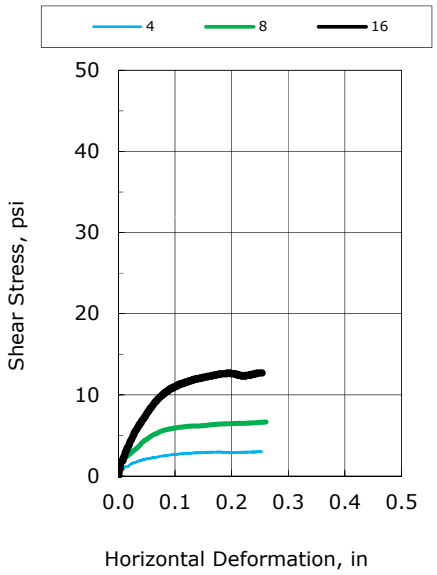
Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

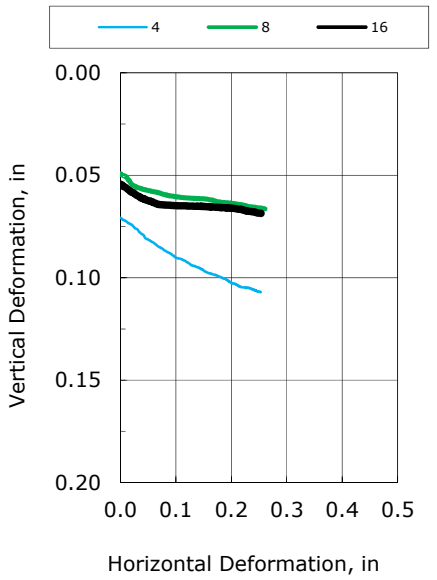
Client:	Anchor QEA, LLC
Project Name:	San Jacinto Pre-Design Investigation
Project Location:	---
GTX #:	309154
Test Date:	01/04/19
Tested By:	md
Checked By:	njh
Boring ID:	SJSB030
Sample ID:	SL00694
Depth, ft:	20-22
Visual Description:	Moist, gray sand with clay

Direct Shear Test of Soils Under Consolidated Drained Conditions by ASTM D3080





Test No.:	DS-4	DS-5	DS-6
Initial Diameter, in:	2.5	2.5	2.5
Initial Height, in:	1.0	1.0	1.0
Initial Mass, grams:	137	148	151
Initial Dry Density, pcf:	83.1	89.0	91.3
Initial Moisture Content, %:	28.0	29.4	28.6
Initial Bulk Density, pcf:	106	115	117
Initial Degree of Saturation:	74.8	90.7	93.2
Initial Void Ratio:	0.99	0.86	0.95
Final Dry Density, pcf:	93.1	95.4	98.0
Final Moisture Content, %:	38.5	26.1	25.7
Final Bulk Density, pcf:	129	120	123
Normal Stress, psi:	4.0	8.0	16
Maximum Shear Stress, psi:	3.0	6.7	13
Shear Rate, in/min:	0.0003	0.0003	0.0003



Sample Type:	intact
Estimated Specific Gravity:	2.65
Liquid Limit:	---
Plastic Limit:	---
Plasticity Index:	---
% Passing #200 sieve:	---
Soil Classification:	---
Group Symbol:	---

Notes:

Moisture content obtained before shear from sample trimmings

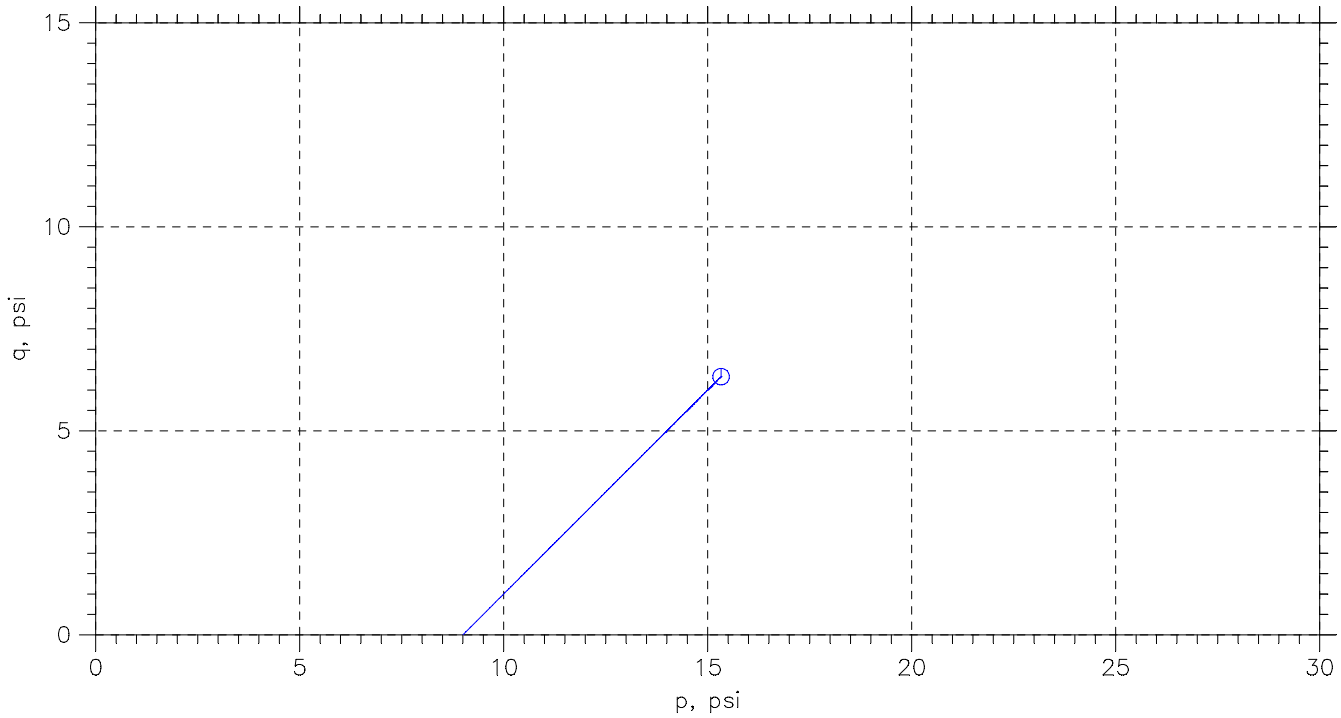
Moisture Content determined by ASTM D2216

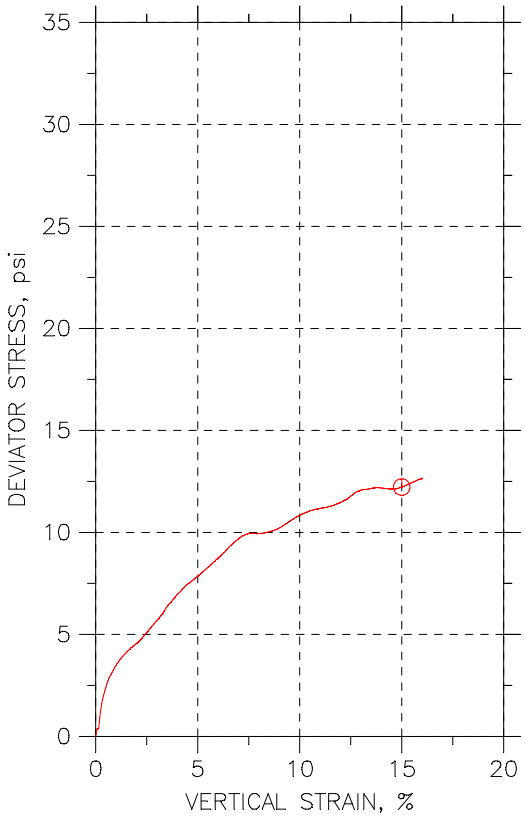
Extruded from tube, cut, trimmed and placed into apparatus at the as-received density and moisture content

Values for cohesion and friction angle determined from best-fit straight line to the data for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.

"---" indicates testing required to determine these values was not requested.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲			
Sample No.	SL0852			
Test No.	UU-21-1			
Depth	25-27 ft			
Tested by	trm			
Test Date	3/6/19			
Checked by	njh			
Check Date	3/14/19			
Diameter, in	2.86			
Height, in	6.45			
Water Content, %	23.3			
Dry Density, pcf	96.39			
Saturation, %	84.1			
Void Ratio	0.749			
Confining Stress, psi	9			
Undrained Strength, psi	6.113			
Max. Dev. Stress, psi	12.23			
Strain at Failure, %	15			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

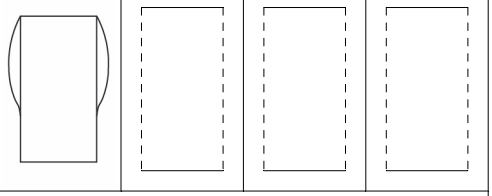
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB019

Sample Type: intact



Description: Moist, pale brown clay

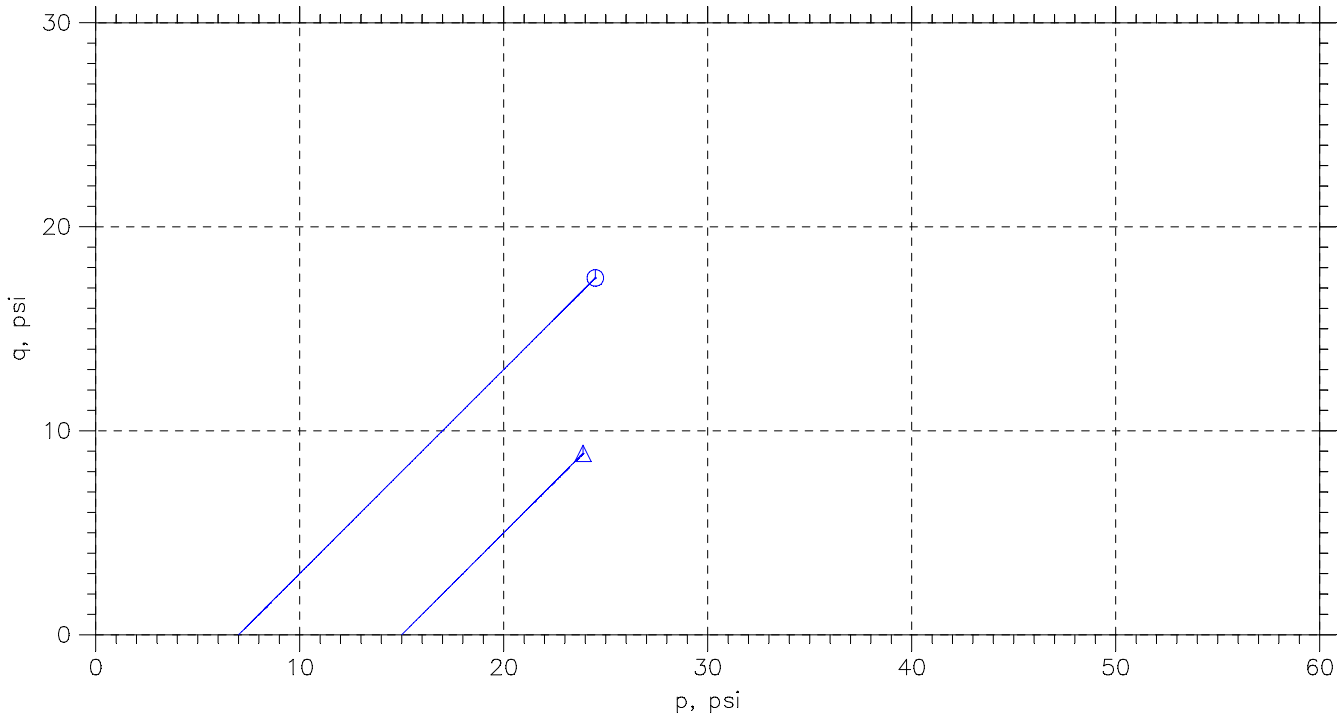
Remarks: System W

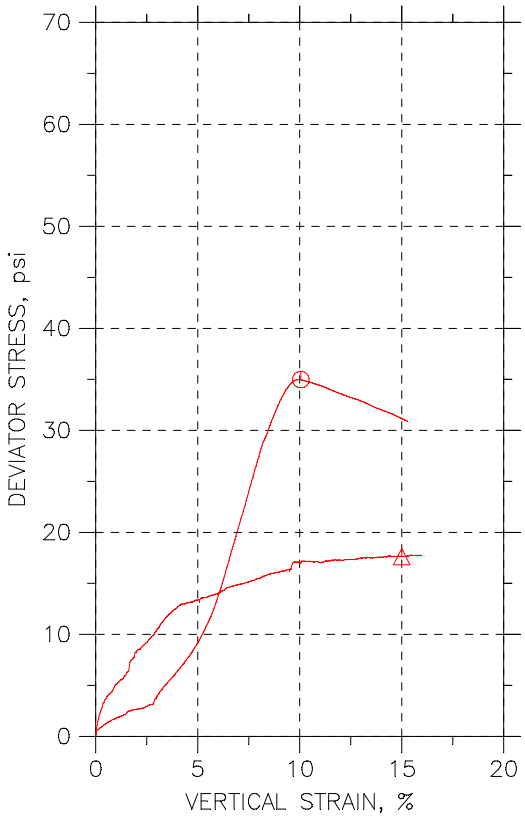
Phase calculations based on start and end of test.

Attachment Figure A.4-133

Thu, 14-MAR-2019 13:49:09

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0856	SL0856		
Test No.	UU-16-1	UU-16-2		
Depth	45-47 ft	45-47 ft		
Tested by	trm	trm		
Test Date	1/30/19	1/30/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	2.87	2.83		
Height, in	6.15	6.35		
Water Content, %	22.0	25.0		
Dry Density, pcf	95.45	95.23		
Saturation, %	77.5	87.6		
Void Ratio	0.766	0.77		
Confining Stress, psi	7	15		
Undrained Strength, psi	17.49	8.816		
Max. Dev. Stress, psi	34.98	17.63		
Strain at Failure, %	10.1	15		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

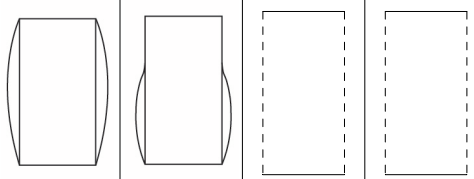
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB019

Sample Type: intact



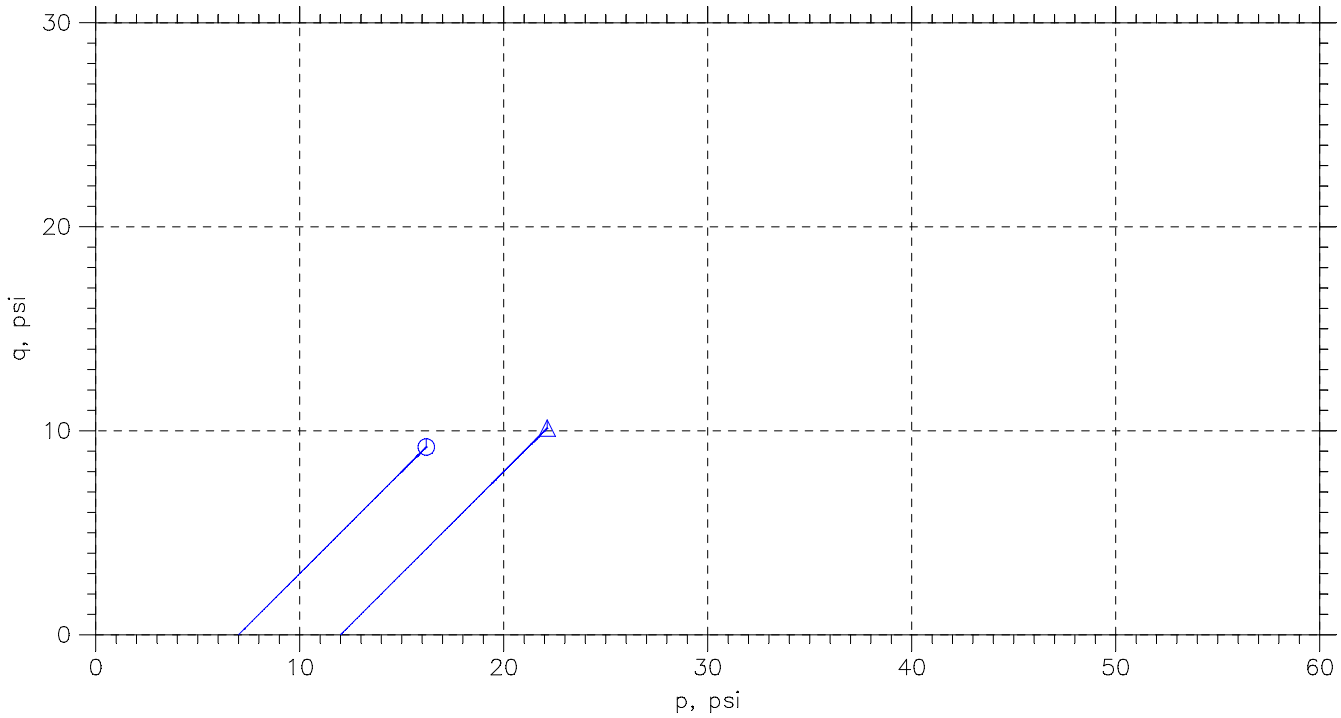
Description: Moist, light gray clay and silt

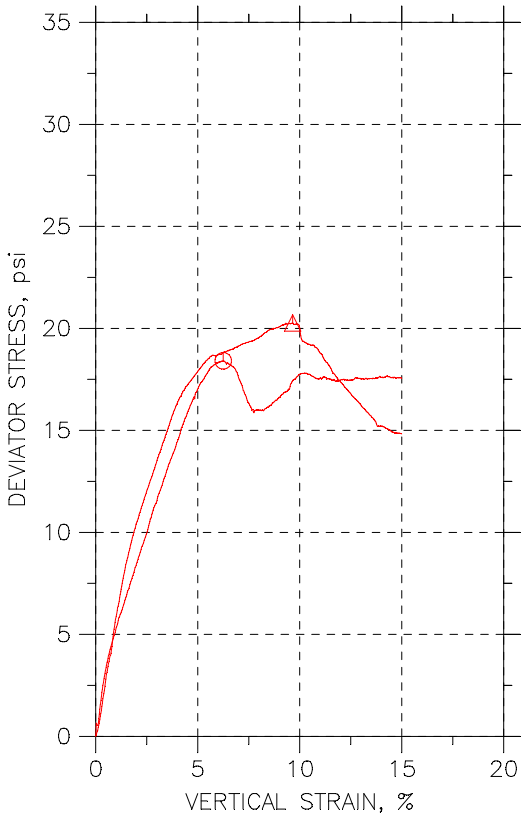
Remarks: System LL

Phase calculations based on start and end of test.

Attachment Figure A.4-134

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0841	SL0841		
Test No.	UU-11-1	UU-11-2		
Depth	35-37	35-37		
Tested by	trm	trm		
Test Date	1/25/19	1/25/19		
Checked by	njh	njh		
Check Date	3/13/19	3/13/19		
Diameter, in	2.85	2.85		
Height, in	6	5.95		
Water Content, %	21.3	18.7		
Dry Density, pcf	105.	103.8		
Saturation, %	94.8	81.1		
Void Ratio	0.606	0.624		
Confining Stress, psi	7	12		
Undrained Strength, psi	9.204	10.13		
Max. Dev. Stress, psi	18.41	20.26		
Strain at Failure, %	6.25	9.65		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

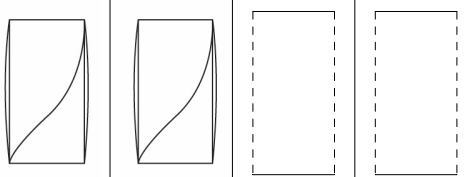
Project No.: GTX-309154

Boring No.: SJGB020

Sample Type: Intact

Description: Moist, light gray and light brown clay and silt

Remarks: System R

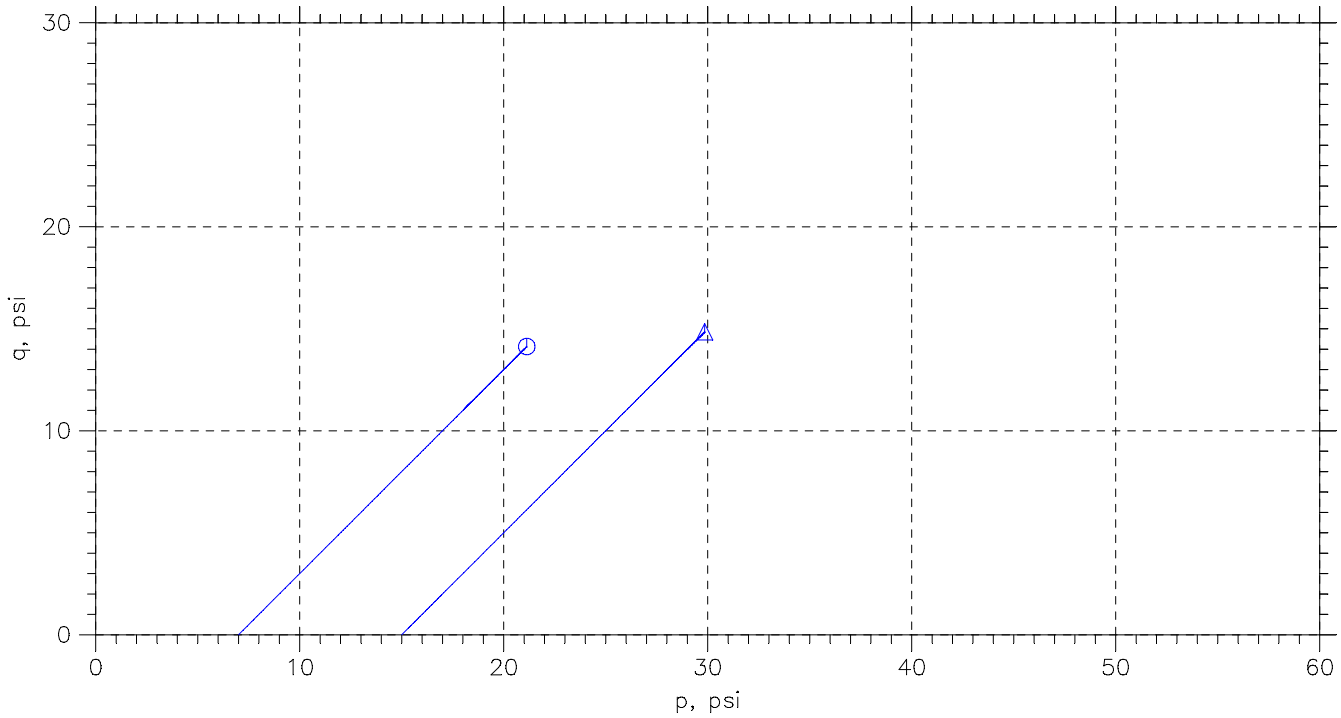


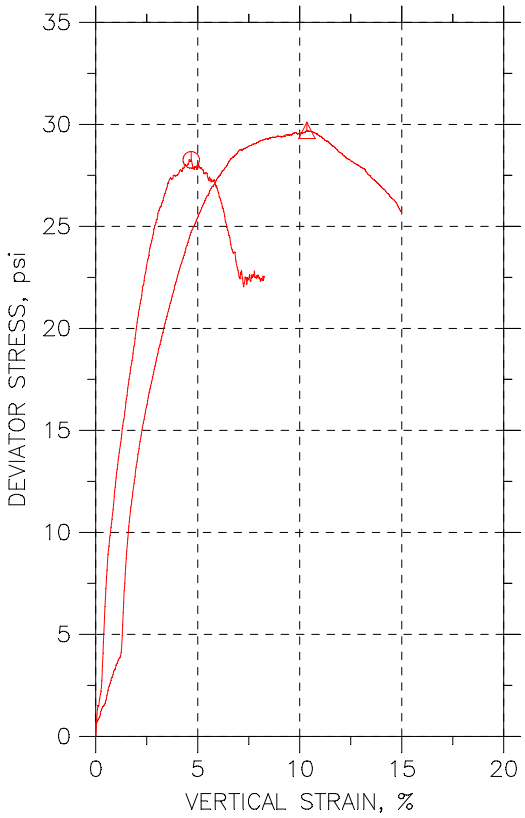
Phase calculations based on start and end of test.

Attachment Figure A.4-135

Wed, 13-MAR-2019 13:17:14

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0843	SL0843		
Test No.	UU-10-1	UU-10-2		
Depth	45-47	45-47		
Tested by	trm	trm		
Test Date	1/25/19	1/25/19		
Checked by	njh	njh		
Check Date	3/13/19	3/13/19		
Diameter, in	2.87	2.87		
Height, in	5.95	6.6		
Water Content, %	30.7	28.1		
Dry Density, pcf	90.69	95.86		
Saturation, %	96.7	99.9		
Void Ratio	0.859	0.758		
Confining Stress, psi	7	15		
Undrained Strength, psi	14.13	14.85		
Max. Dev. Stress, psi	28.26	29.71		
Strain at Failure, %	4.68	10.4		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

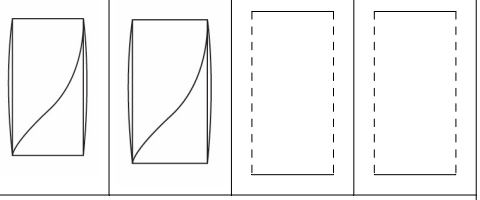
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB020

Sample Type: intact



Description: Moist, light brown clay

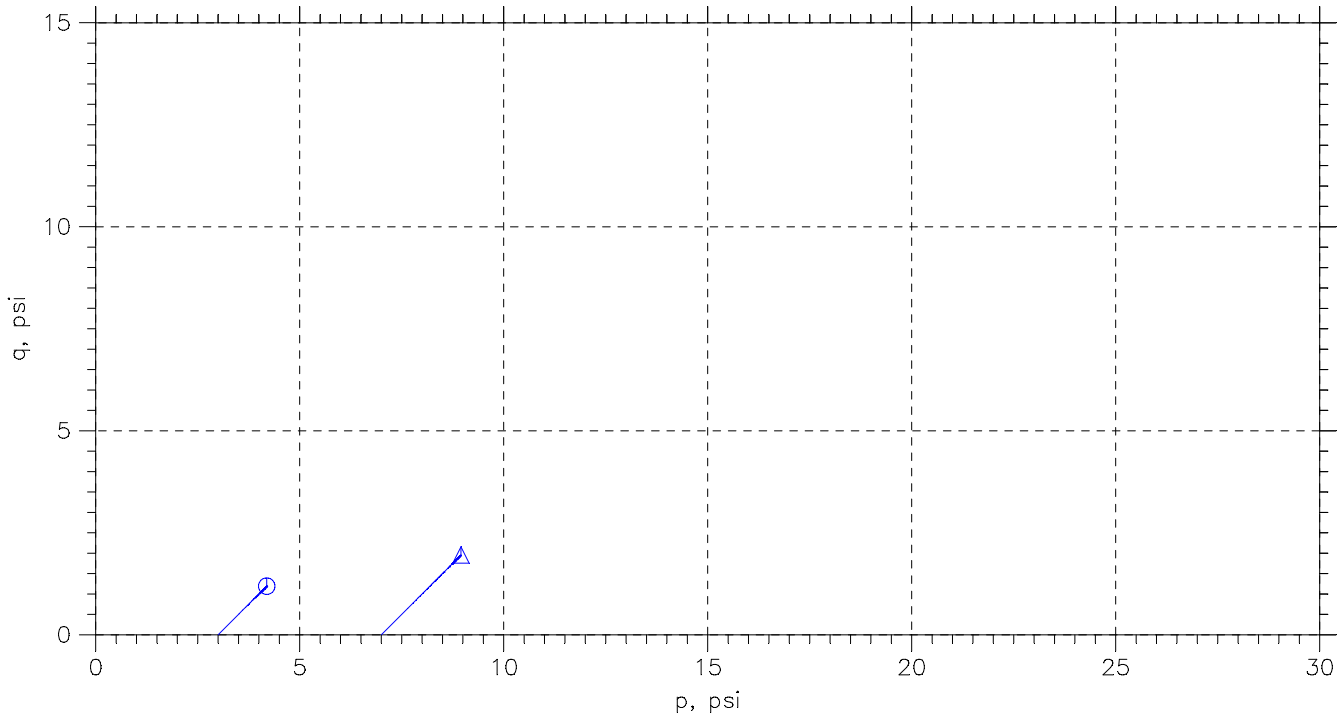
Remarks: System R

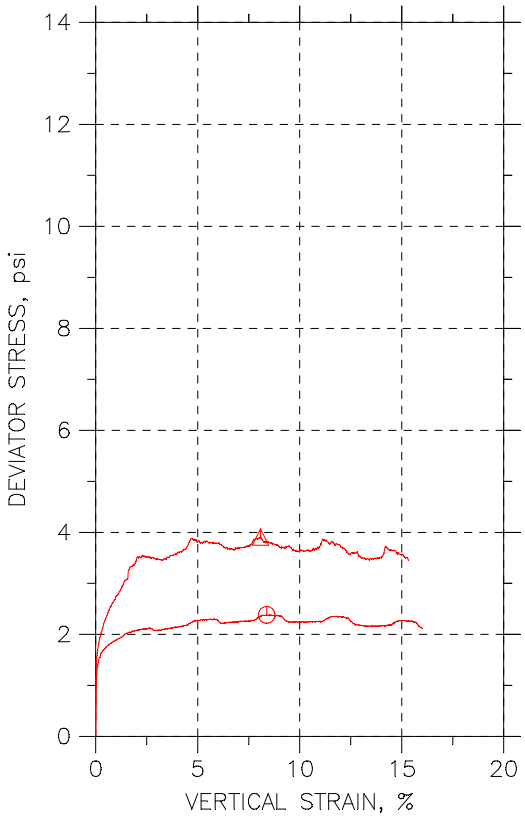
Phase calculations based on start and end of test.

Attachment Figure A.4-136

Wed, 13-MAR-2019 12:43:14

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0812	SL0812		
Test No.	UU-17-1	UU-17-2		
Depth	7-9 ft	7-9 ft		
Tested by	trm	trm		
Test Date	1/30/19	1/30/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	2.84	2.83		
Height, in	6	6.05		
Water Content, %	39.7	58.6		
Dry Density, pcf	73.4	65.08		
Saturation, %	82.7	99.5		
Void Ratio	1.3	1.59		
Confining Stress, psi	3	7		
Undrained Strength, psi	1.191	1.953		
Max. Dev. Stress, psi	2.382	3.907		
Strain at Failure, %	8.38	8.08		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

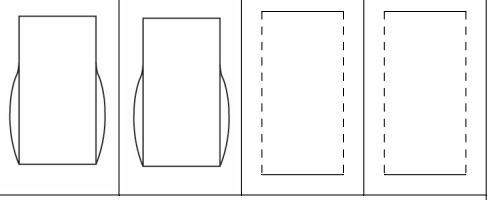
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB022

Sample Type: intact



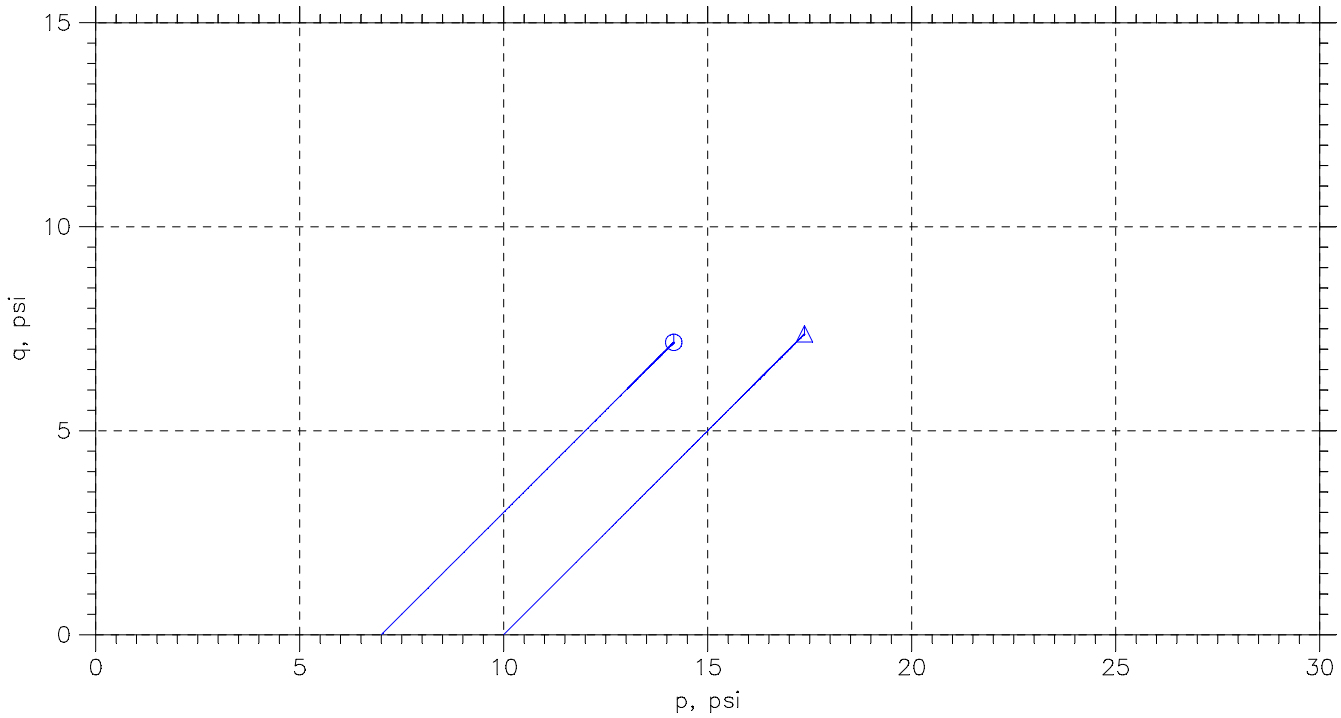
Description: Moist, grayish brown clay

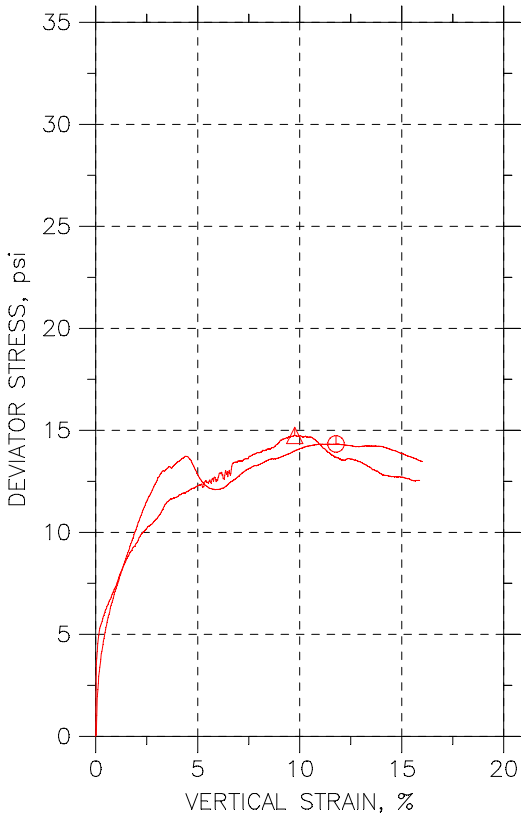
Remarks: System LL

Phase calculations based on start and end of test.

Attachment Figure A.4-137

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0817	SL0817		
Test No.	UU-15-1	UU-15-2		
Depth	30-32 ft	30-32 ft		
Tested by	trm	trm		
Test Date	1/30/19	1/30/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	2.85	2.85		
Height, in	6	6.1		
Water Content, %	28.3	33.2		
Dry Density, pcf	92.53	85.06		
Saturation, %	93.1	91.2		
Void Ratio	0.822	0.982		
Confining Stress, psi	7	10		
Undrained Strength, psi	7.167	7.373		
Max. Dev. Stress, psi	14.33	14.75		
Strain at Failure, %	11.8	9.75		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

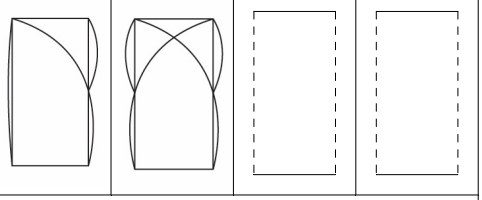
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB022

Sample Type: intact



Description: Moist, reddish brown clay

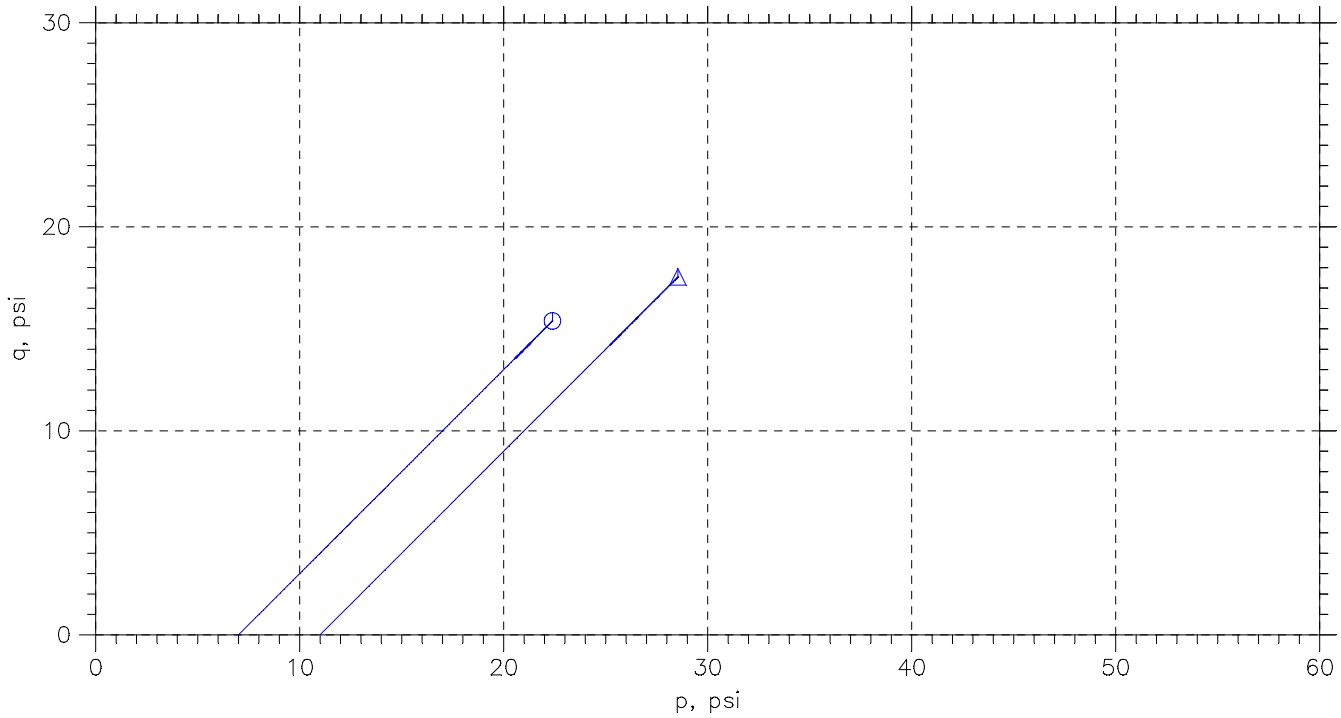
Remarks: System LL

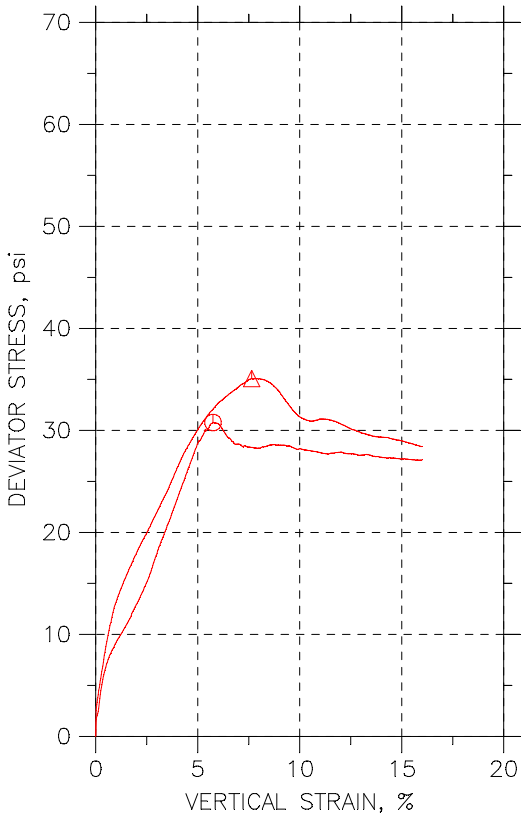
Phase calculations based on start and end of test.

Attachment Figure A.4-138

Thu, 14-MAR-2019 11:11:36

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0884	SL0884		
Test No.	UU-12-1	UU-12-2		
Depth	33-35 ft	33-35 ft		
Tested by	trm	trm		
Test Date	1/29/19	1/29/19		
Checked by	njh	njh		
Check Date	3/13/19	3/13/19		
Diameter, in	2.86	2.87		
Height, in	5.95	6		
Water Content, %	20.0	23.0		
Dry Density, pcf	102.8	100.		
Saturation, %	84.2	90.8		
Void Ratio	0.64	0.685		
Confining Stress, psi	7	11		
Undrained Strength, psi	15.39	17.54		
Max. Dev. Stress, psi	30.77	35.09		
Strain at Failure, %	5.75	7.65		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

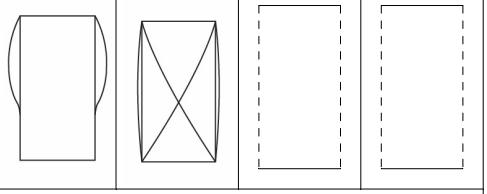
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB023

Sample Type: intact



Description: Moist, light brown and light gray clay

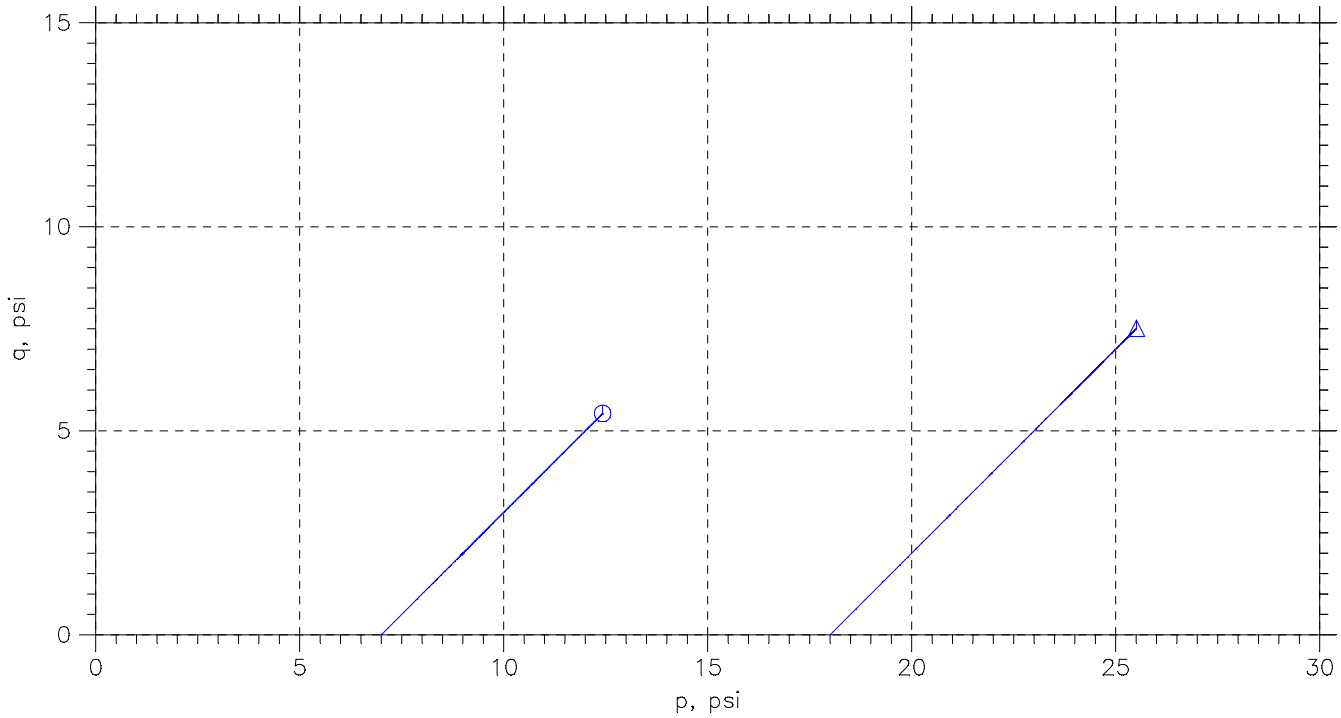
Remarks: System Q

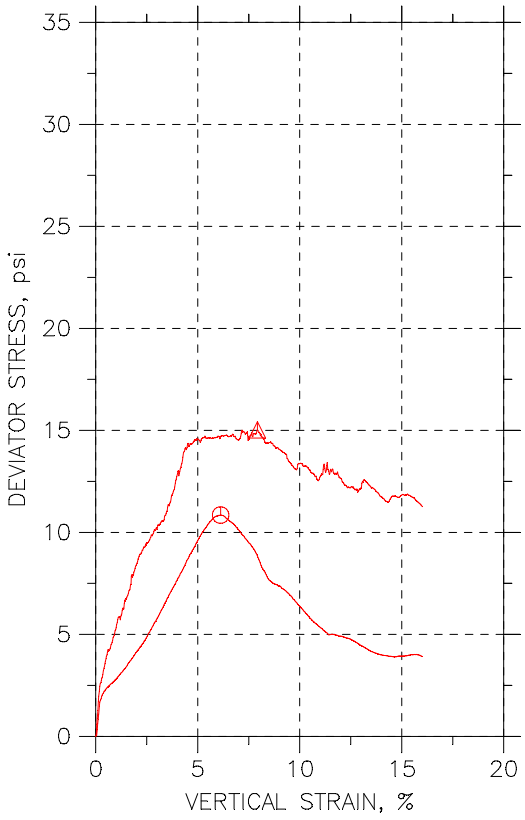
Phase calculations based on start and end of test.

Attachment Figure A.4-139

Wed, 13-MAR-2019 13:47:00

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0887	SL0887		
Test No.	UU-18-1	UU-18-2		
Depth	53-55 ft	53-55 ft		
Tested by	trm	trm		
Test Date	1/28/19	1/28/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	2.85	2.85		
Height, in	6.15	6.1		
Water Content, %	21.0	19.0		
Dry Density, pcf	105.6	103.		
Saturation, %	95.4	80.5		
Void Ratio	0.595	0.636		
Confining Stress, psi	7	18		
Undrained Strength, psi	5.424	7.511		
Max. Dev. Stress, psi	10.85	15.02		
Strain at Failure, %	6.12	7.93		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

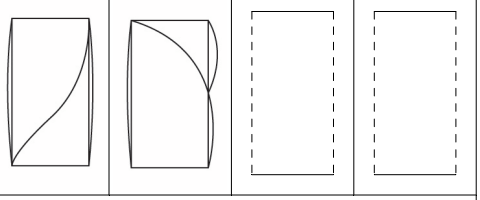
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJGB023

Sample Type: intact



Description: Moist, llight gray sand and clay

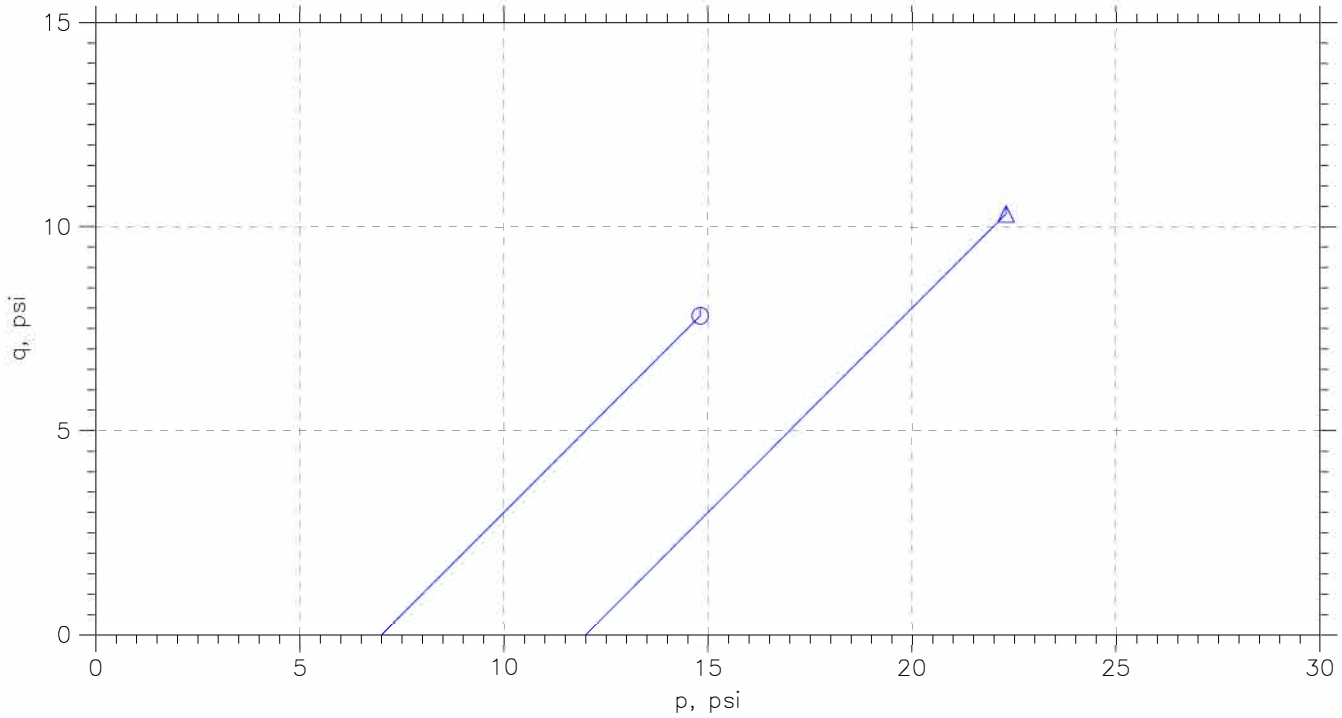
Remarks: System X

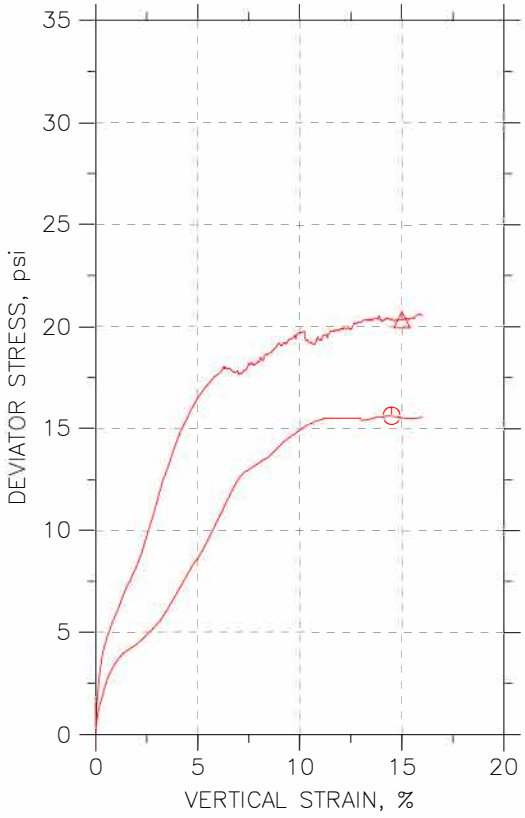
Phase calculations based on start and end of test.

Attachment Figure A.4-140

Thu, 14-MAR-2019 12:10:58

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0895	SL0895		
Test No.	UU-14-1	UU-14-2		
Depth	34-36 ft	34-36 ft		
Tested by	trm	trm		
Test Date	1/29/19	1/29/19		
Checked by	njh	njh		
Check Date	3/13/19	3/13/19		
Diameter, in	2.85	2.84		
Height, in	6	6		
Water Content, %	21.5	19.9		
Dry Density, pcf	100.3	105.1		
Saturation, %	85.5	88.9		
Void Ratio	0.68	0.604		
Confining Stress, psi	7	12		
Undrained Strength, psi	7.811	10.16		
Max. Dev. Stress, psi	15.62	20.33		
Strain at Failure, %	14.5	15		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

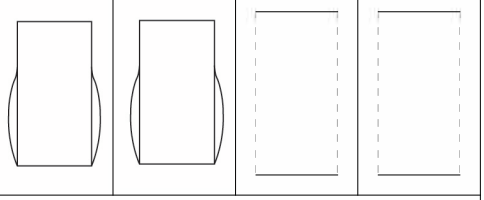
Project No.: GTX-309154

Boring No.: SJGB038

Sample Type: intact

Description: Moist, brown and reddish brown clay

Remarks: System Q

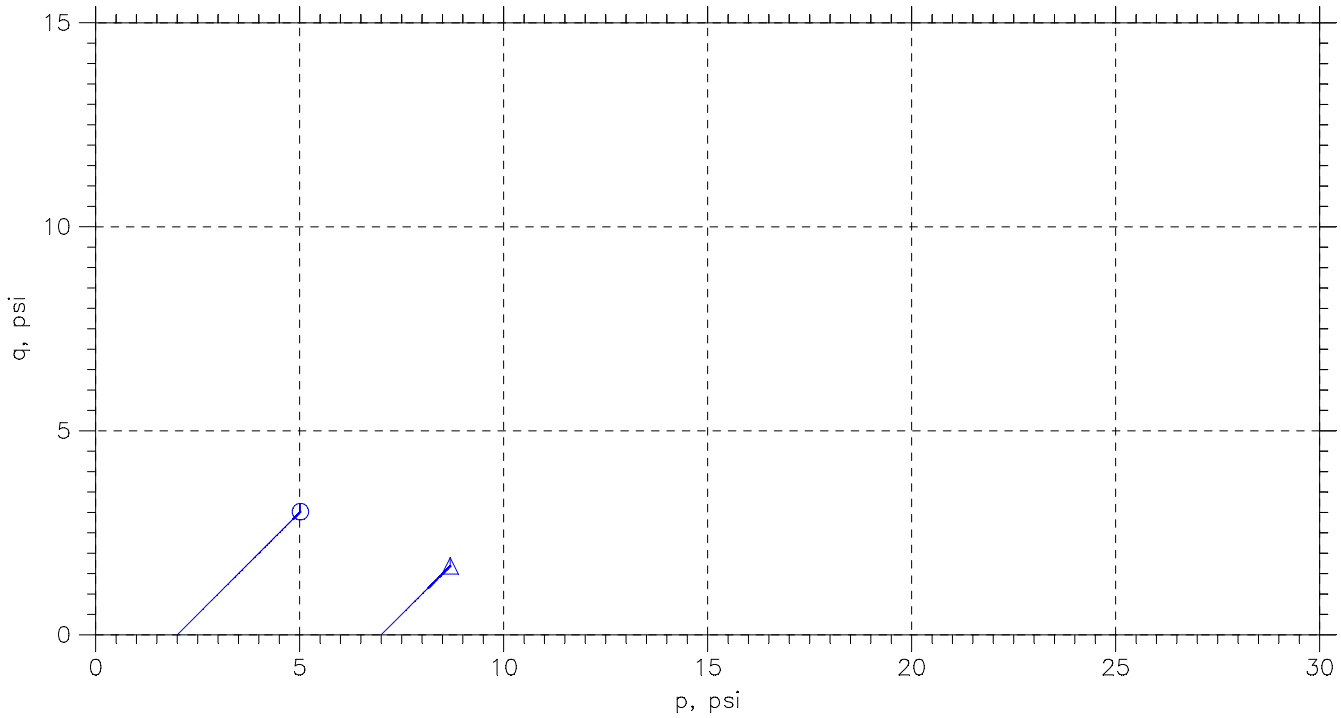


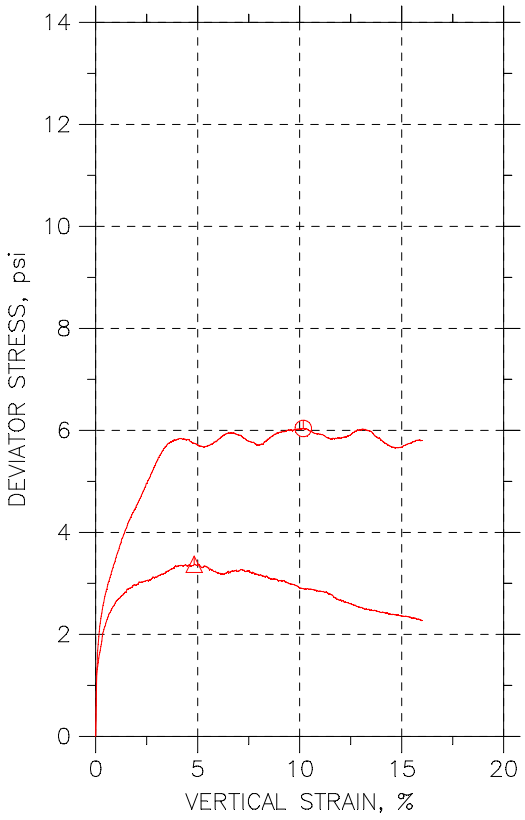
Phase calculations based on start and end of test.

Attachment Figure A.4-141

Wed, 13-MAR-2019 16:38:45

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL1038	SL1038		
Test No.	UU-4-1	UU-4-2		
Depth	4-6 ft	4-6 ft		
Tested by	trm	trm		
Test Date	12/26/18	12/26/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.86	2.83		
Height, in	6.25	5.85		
Water Content, %	29.4	20.9		
Dry Density, pcf	82.8	87.81		
Saturation, %	76.7	61.5		
Void Ratio	1.04	0.92		
Confining Stress, psi	2	7		
Undrained Strength, psi	3.018	1.688		
Max. Dev. Stress, psi	6.037	3.375		
Strain at Failure, %	10.2	4.83		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

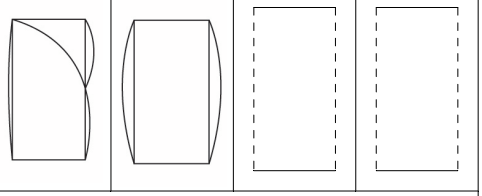
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB025

Sample Type: intact



Description: Moist, grayish brown sandy clay

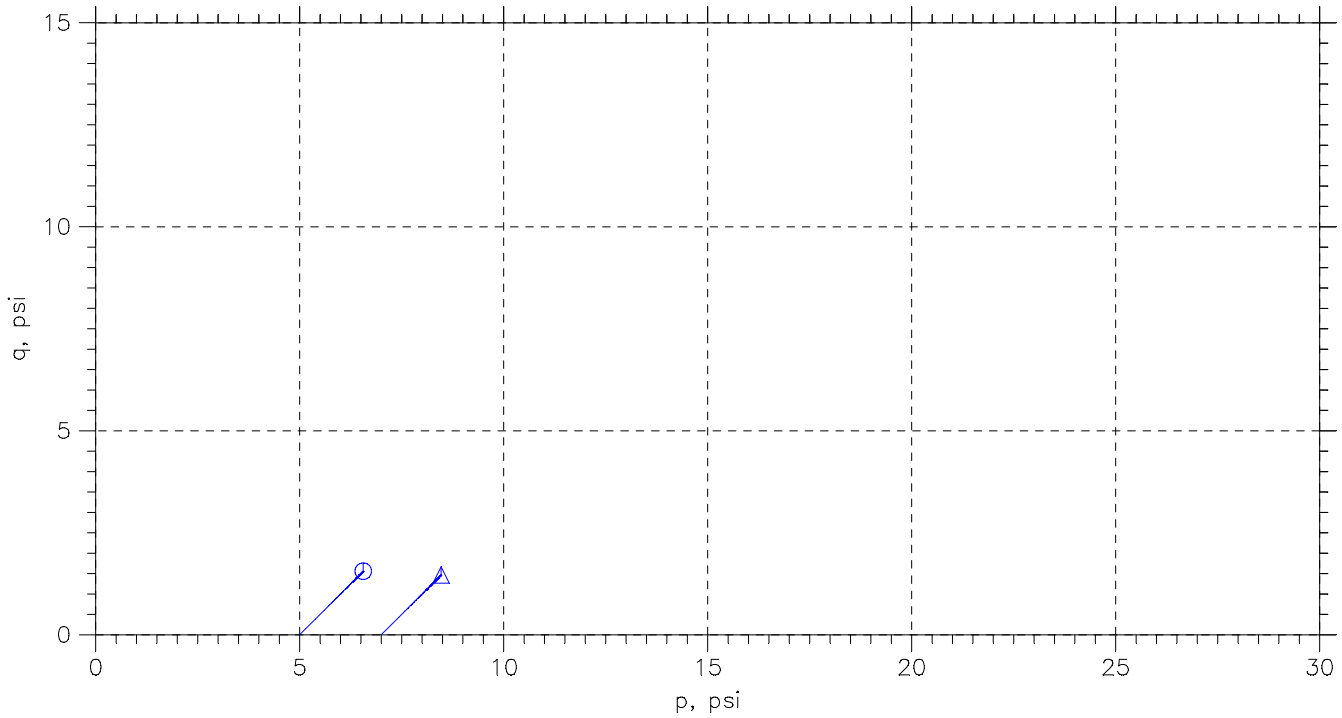
Remarks: System W

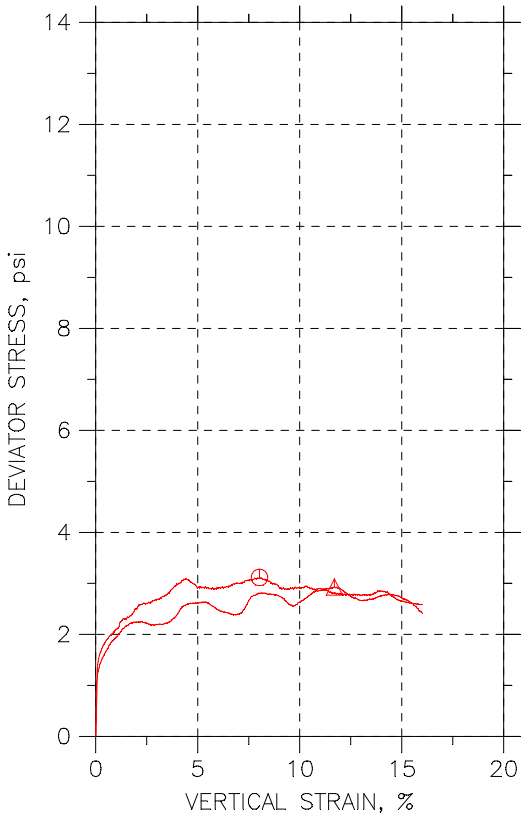
Phase calculations based on start and end of test.

Attachment Figure A.4-142

Thu, 28-FEB-2019 15:37:41

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0805	SL0805		
Test No.	UU-7-1	UU-7-2		
Depth	20-22 ft	20-22 ft		
Tested by	trm	trm		
Test Date	12/27/18	12/27/18		
Checked by	njh	njh		
Check Date	3/1/19	3/1/19		
Diameter, in	2.83	2.83		
Height, in	6.45	6.05		
Water Content, %	31.0	43.1		
Dry Density, pcf	81.79	77.78		
Saturation, %	78.9	99.8		
Void Ratio	1.06	1.17		
Confining Stress, psi	5	7		
Undrained Strength, psi	1.558	1.464		
Max. Dev. Stress, psi	3.116	2.929		
Strain at Failure, %	8.03	11.7		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

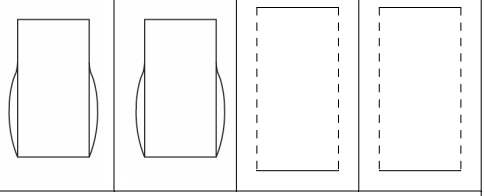
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB028

Sample Type: intact



Description: Moist, gray sandy clay

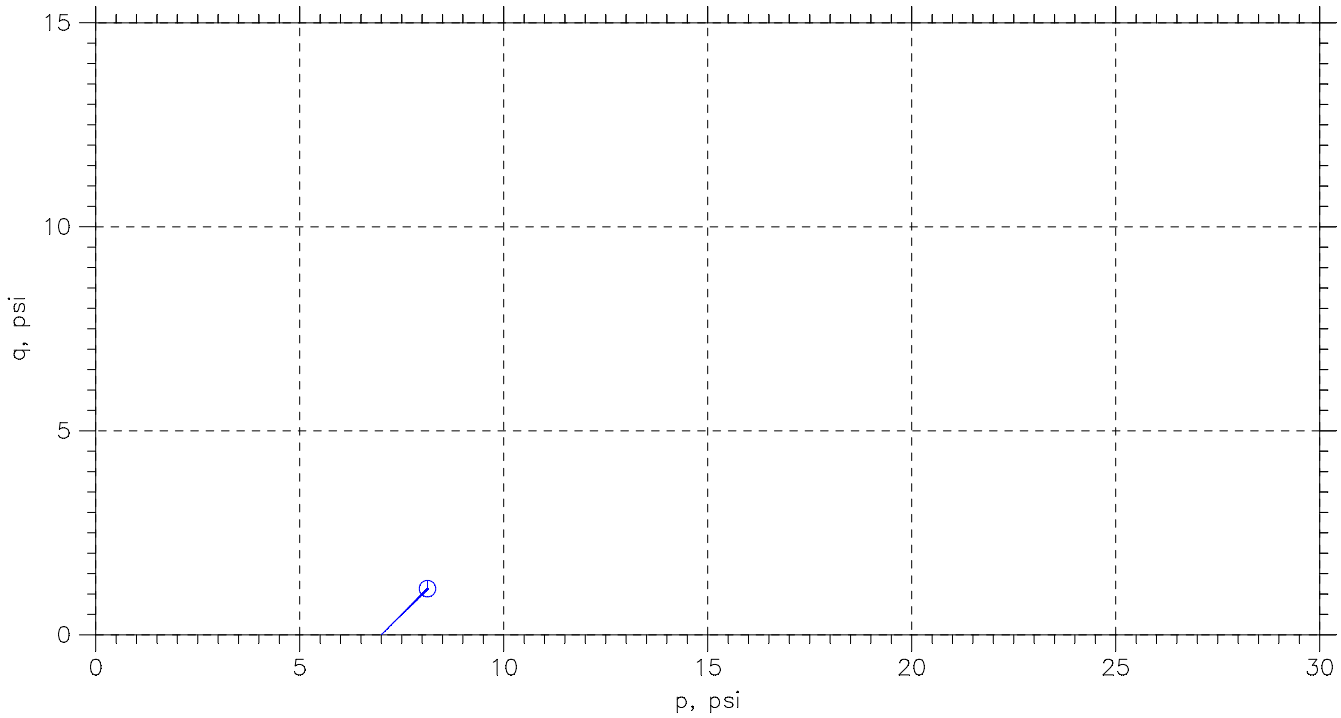
Remarks: System W

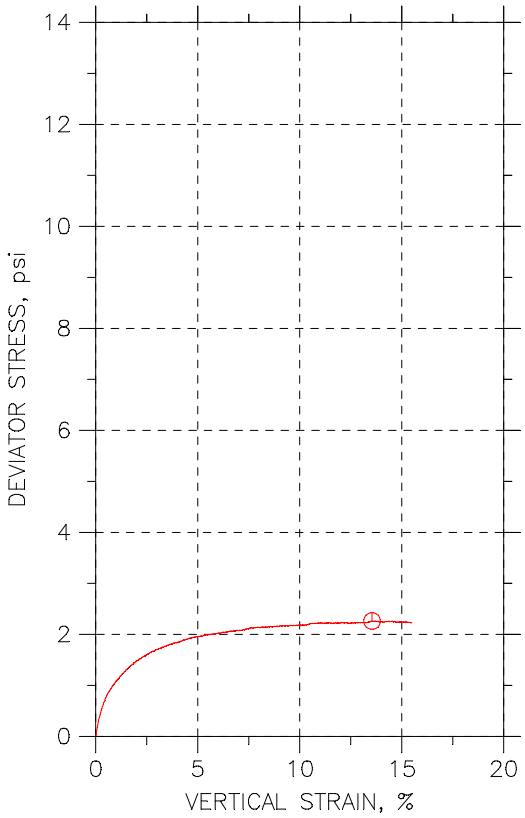
Phase calculations based on start and end of test.

Attachment Figure A.4-143

Fri, 01-MAR-2019 12:26:24

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲			
Sample No.	SL0612			
Test No.	UU-9			
Depth	5-7 ft			
Tested by	trm			
Test Date	1/2/19			
Checked by	njh			
Check Date	3/1/19			
Diameter, in	2.82			
Height, in	6.6			
Water Content, %	29.8			
Dry Density, pcf	86.92			
Saturation, %	85.7			
Void Ratio	0.939			
Confining Stress, psi	7			
Undrained Strength, psi	1.131			
Max. Dev. Stress, psi	2.262			
Strain at Failure, %	13.5			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

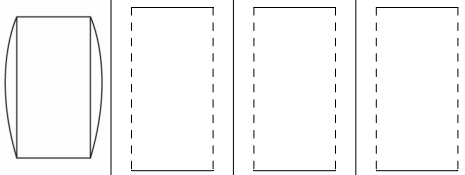
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB029

Sample Type: intact



Description: Moist, gray sandy clay

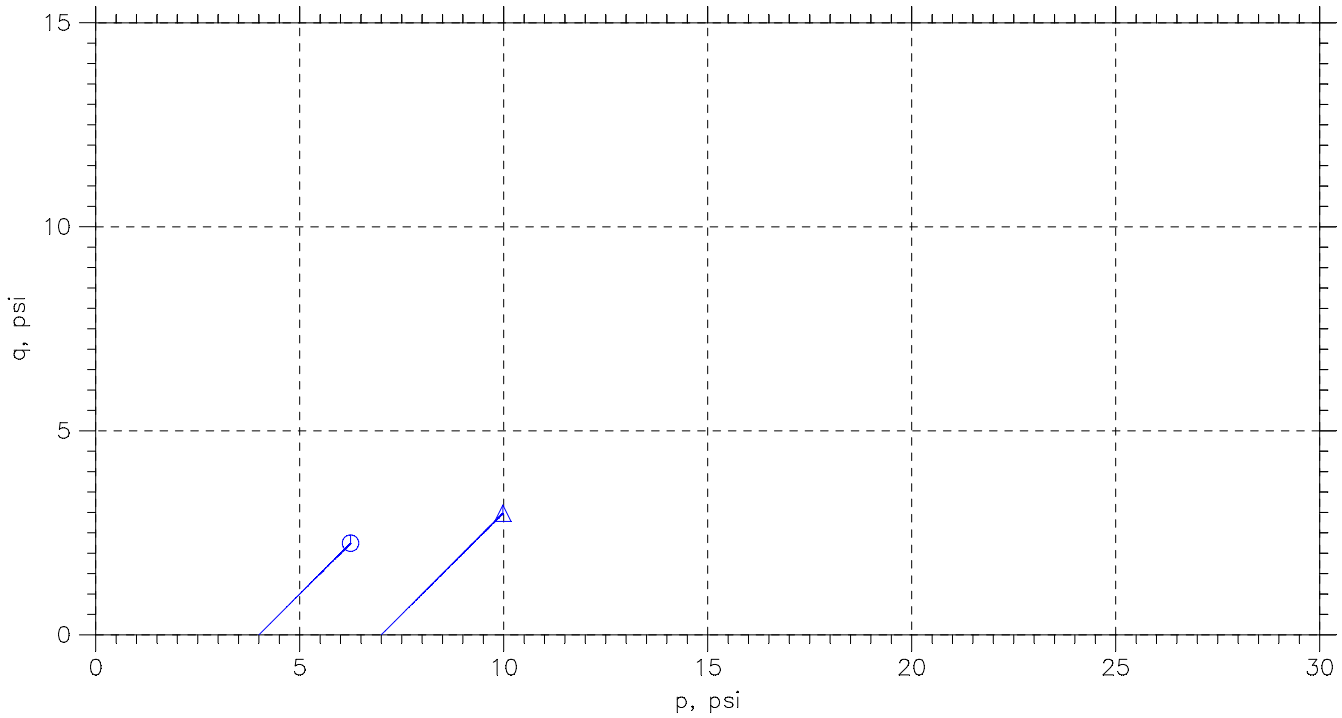
Remarks: System II

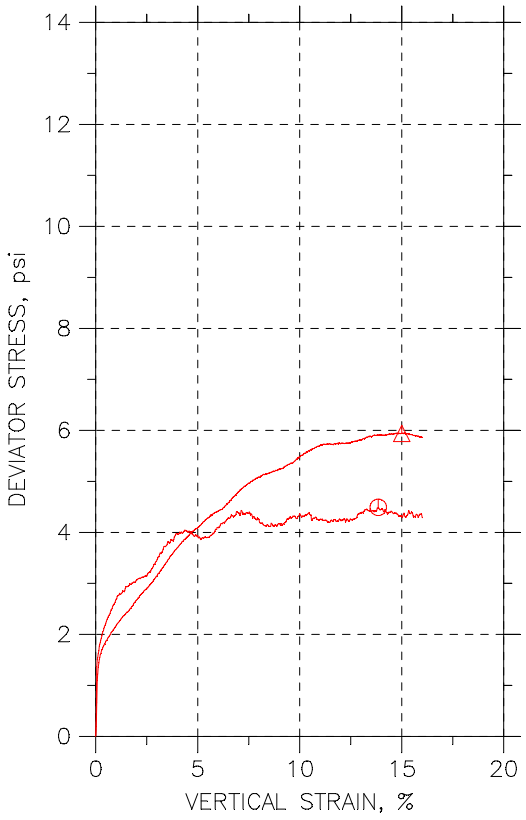
Phase calculations based on start and end of test.

Attachment Figure A.4-144

Fri, 01-MAR-2019 12:47:58

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0698	SL0698		
Test No.	UU-8-1	UU-8-2		
Depth	8-10 ft	8-10 ft		
Tested by	trm	trm		
Test Date	12/27/18	12/27/18		
Checked by	njh	njh		
Check Date	3/1/19	3/1/19		
Diameter, in	2.85	2.84		
Height, in	6.2	5.95		
Water Content, %	21.4	21.4		
Dry Density, pcf	92.42	101.7		
Saturation, %	70.2	88.1		
Void Ratio	0.824	0.657		
Confining Stress, psi	4	7		
Undrained Strength, psi	2.245	2.97		
Max. Dev. Stress, psi	4.491	5.941		
Strain at Failure, %	13.9	15		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

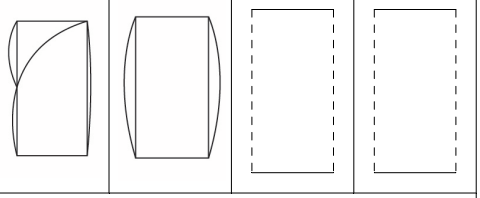
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB030

Sample Type: intact



Description: Moist, brownish gray sandy clay

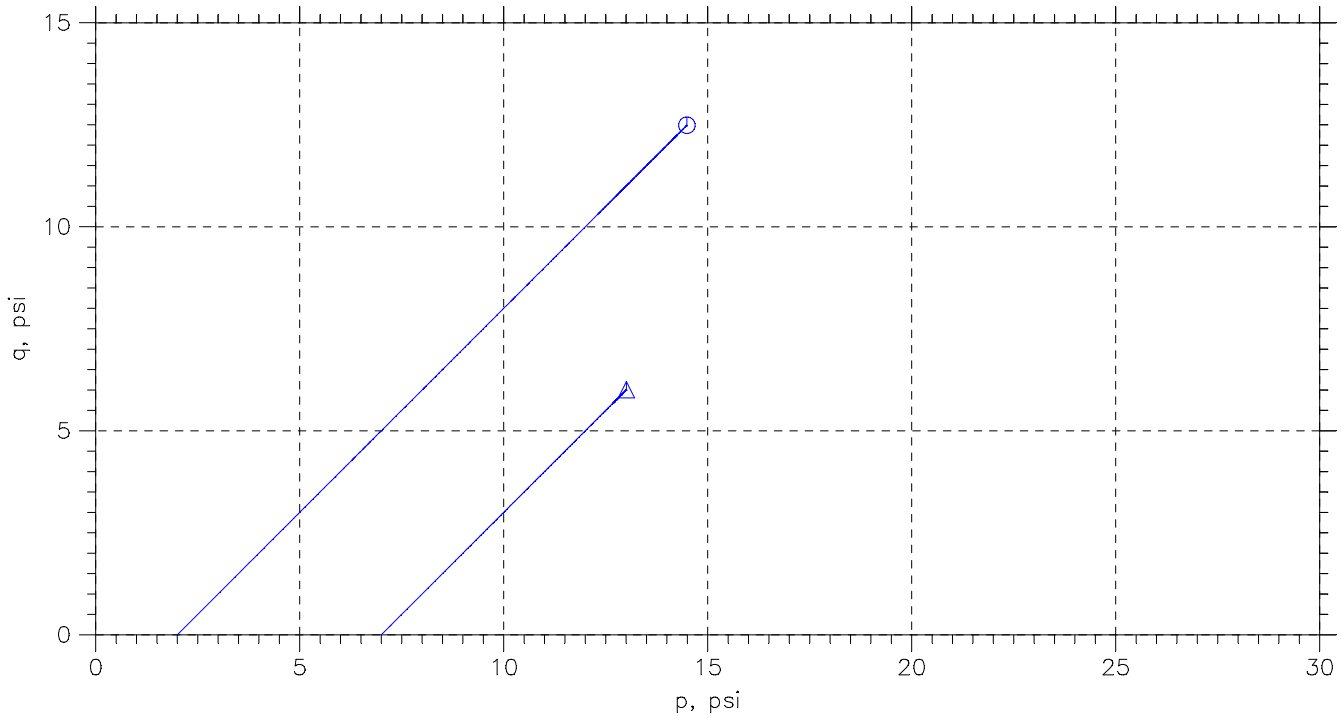
Remarks: System W

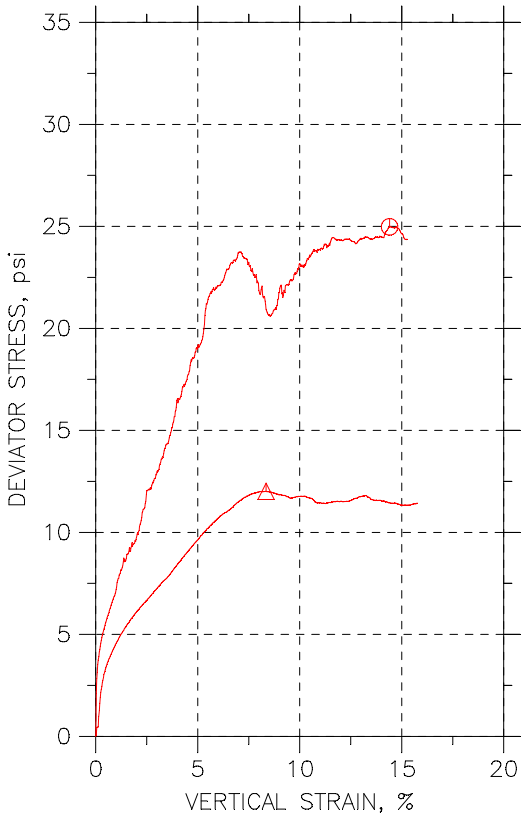
Phase calculations based on start and end of test.

Attachment Figure A.4-145

Fri, 01-MAR-2019 12:41:39

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0626	SL0626		
Test No.	UU-13-1	UU-13-2		
Depth	---	---		
Tested by	trm	trm		
Test Date	1/29/19	1/29/19		
Checked by	njh	njh		
Check Date	3/13/19	3/13/19		
Diameter, in	2.86	2.83		
Height, in	6	6.6		
Water Content, %	20.8	20.9		
Dry Density, pcf	101.6	100.8		
Saturation, %	85.3	84.2		
Void Ratio	0.659	0.672		
Confining Stress, psi	2	7		
Undrained Strength, psi	12.49	6.006		
Max. Dev. Stress, psi	24.98	12.01		
Strain at Failure, %	14.4	8.35		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

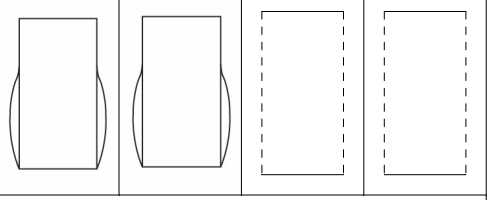
Project No.: GTX-309154

Boring No.: SJSB031

Sample Type: intact

Description: Moist, brown clay with sand

Remarks: System Q

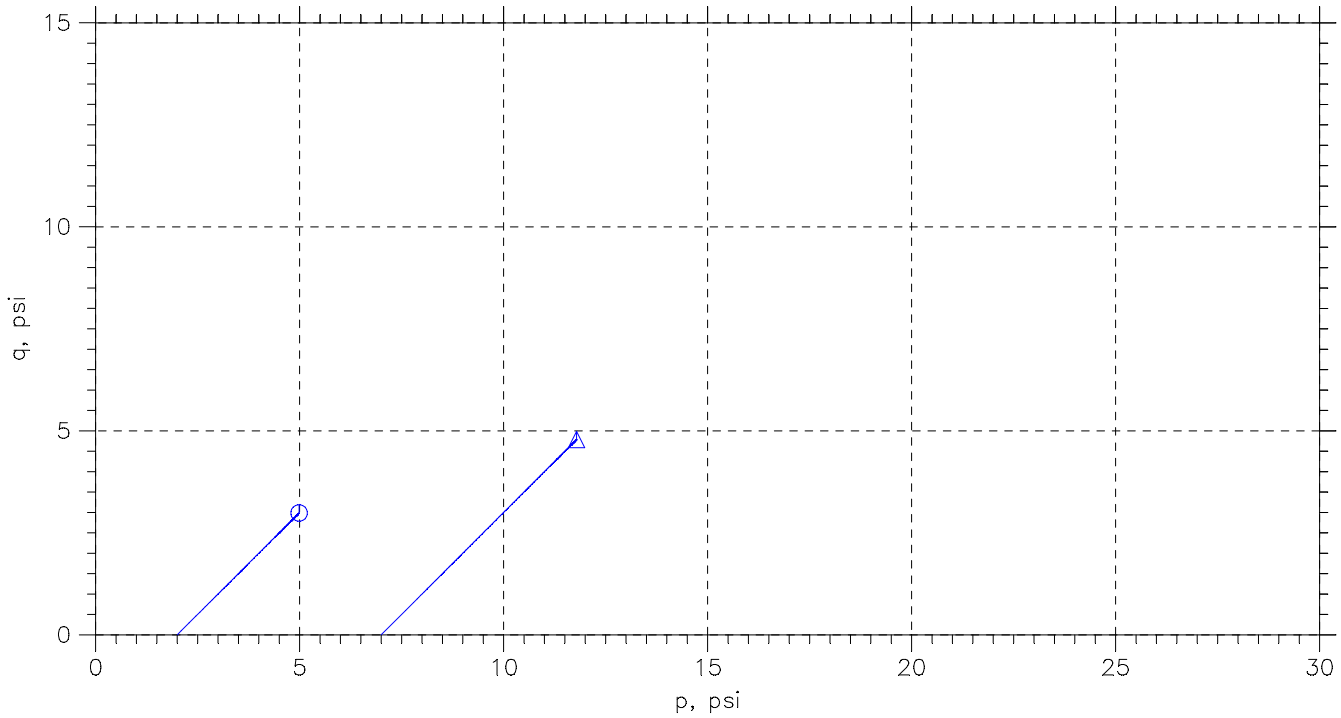


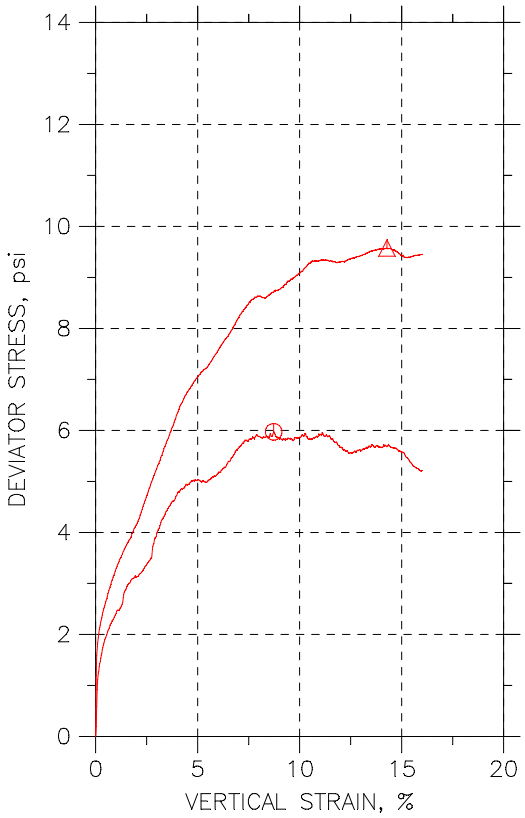
Phase calculations based on start and end of test.

Attachment Figure A.4-146

Wed, 13-MAR-2019 16:11:11

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0686	SL0686		
Test No.	UU-5-1	UU-5-2		
Depth	5-7 ft	5-7 ft		
Tested by	trm	trm		
Test Date	12/27/18	12/27/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.85	2.85		
Height, in	6.05	6.12		
Water Content, %	27.8	17.8		
Dry Density, pcf	82.18	109.2		
Saturation, %	71.4	88.6		
Void Ratio	1.05	0.543		
Confining Stress, psi	2	7		
Undrained Strength, psi	2.987	4.788		
Max. Dev. Stress, psi	5.973	9.576		
Strain at Failure, %	8.73	14.3		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

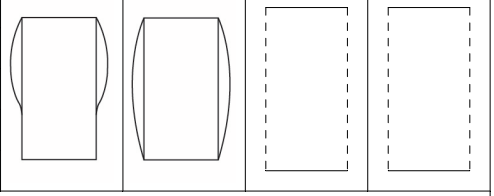
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB032

Sample Type: intact



Description: Moist, gray clay

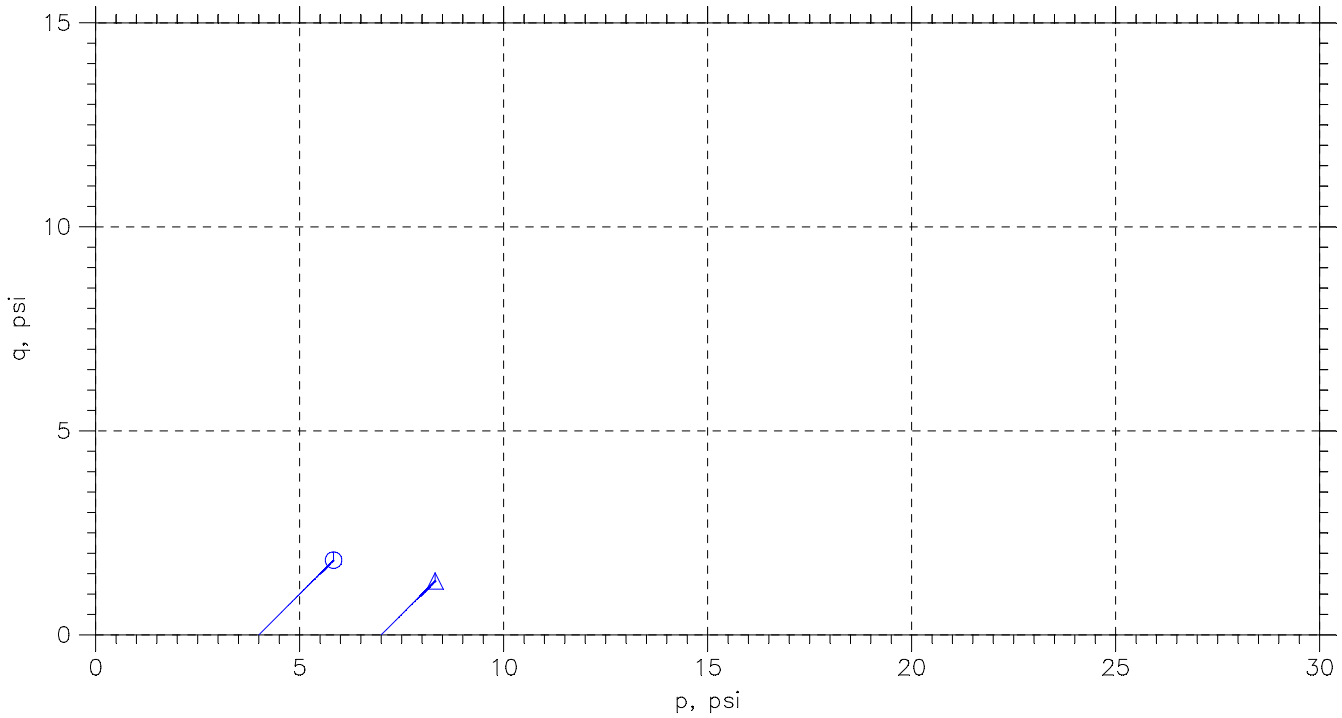
Remarks: System W

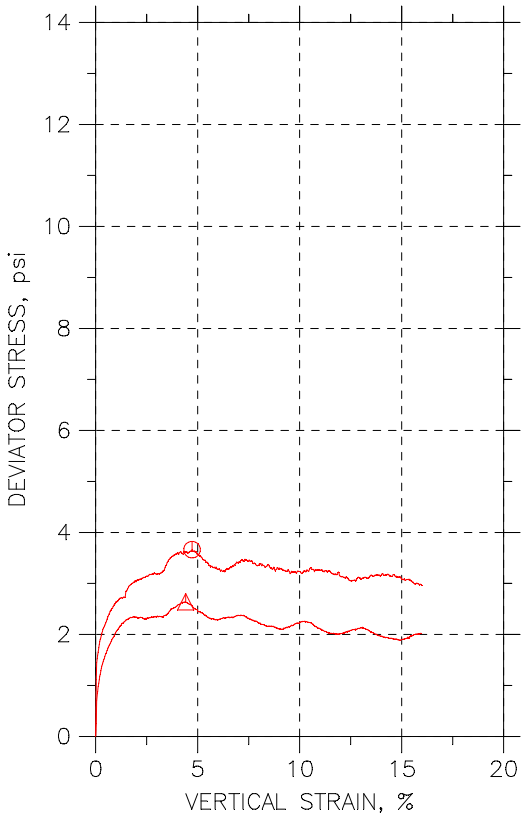
Phase calculations based on start and end of test.

Attachment Figure A.4-147

Thu, 28-FEB-2019 15:48:49

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0687	SL0687		
Test No.	UU-6-1	UU-6-2		
Depth	10-12 ft	10-12 ft		
Tested by	trm	trm		
Test Date	12/27/18	12/27/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.83	2.83		
Height, in	6.25	6.8		
Water Content, %	29.2	31.8		
Dry Density, pcf	91.86	90.61		
Saturation, %	94.5	99.9		
Void Ratio	0.835	0.86		
Confining Stress, psi	4	7		
Undrained Strength, psi	1.831	1.32		
Max. Dev. Stress, psi	3.662	2.64		
Strain at Failure, %	4.73	4.41		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

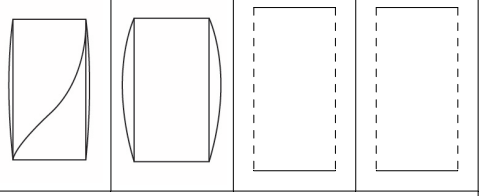
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB032

Sample Type: intact



Description: Moist, gray sandy clay

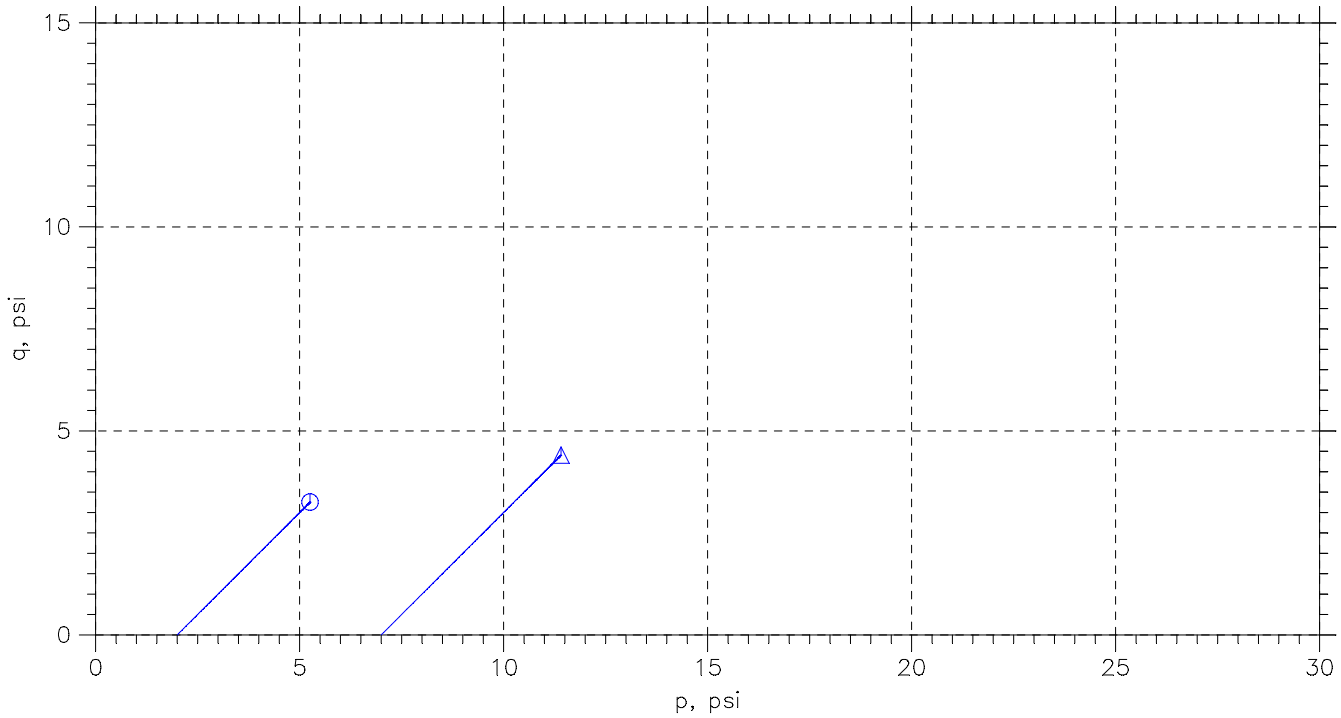
Remarks: System W

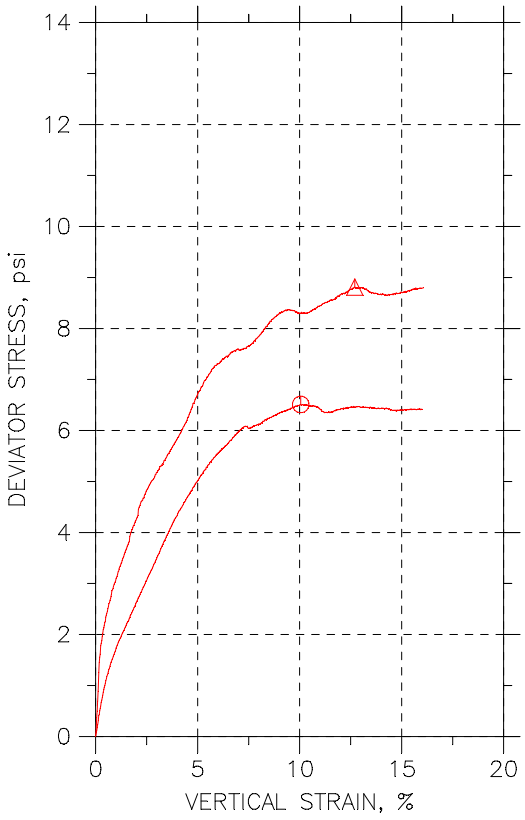
Phase calculations based on start and end of test.

Attachment Figure A.4-148

Thu, 28-FEB-2019 15:59:12

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0649	SL0649		
Test No.	UU-1-1	UU-1-2		
Depth	---	---		
Tested by	trm	trm		
Test Date	12/26/18	12/26/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.85	2.83		
Height, in	6	5.8		
Water Content, %	22.5	20.6		
Dry Density, pcf	103.3	106.4		
Saturation, %	96.0	95.0		
Void Ratio	0.632	0.585		
Confining Stress, psi	2	7		
Undrained Strength, psi	3.255	4.405		
Max. Dev. Stress, psi	6.511	8.81		
Strain at Failure, %	10.1	12.7		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

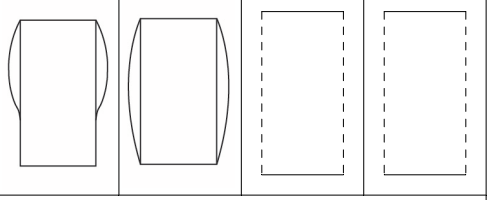
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB033

Sample Type: intact



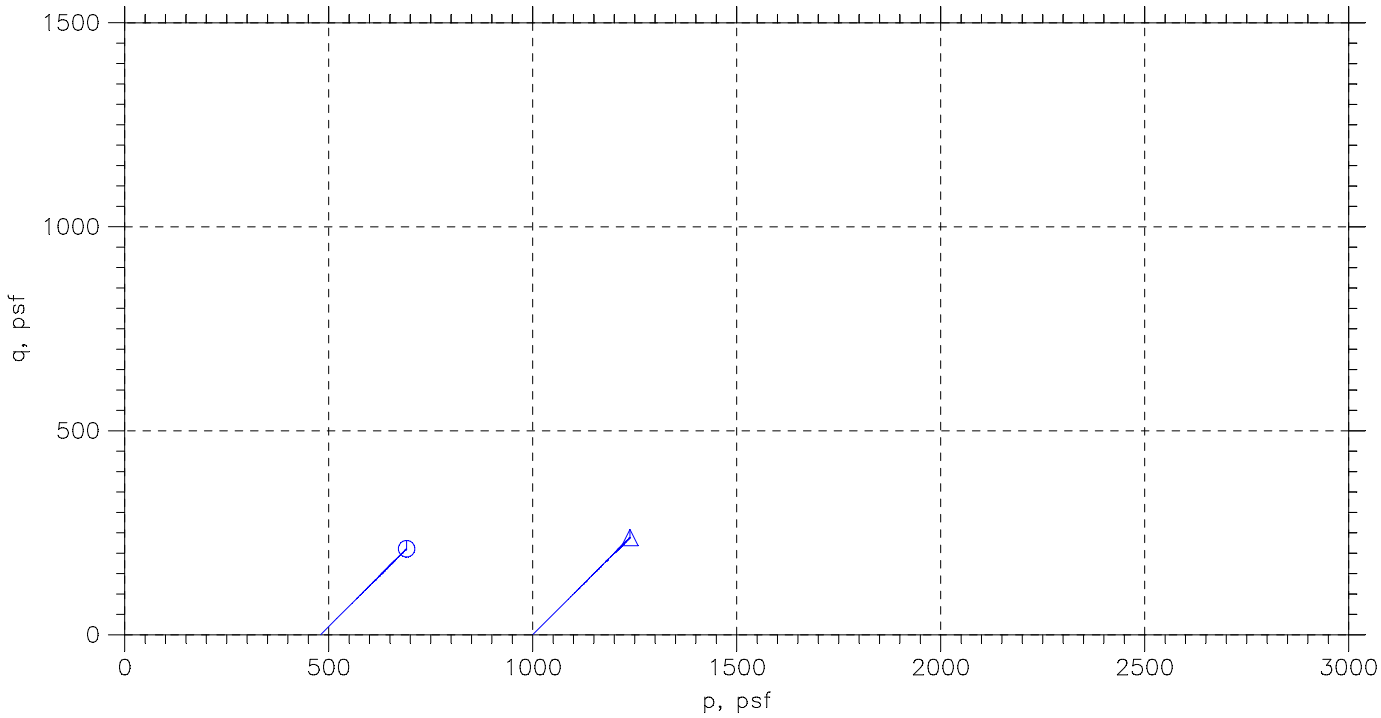
Description: Moist, gray sandy clay

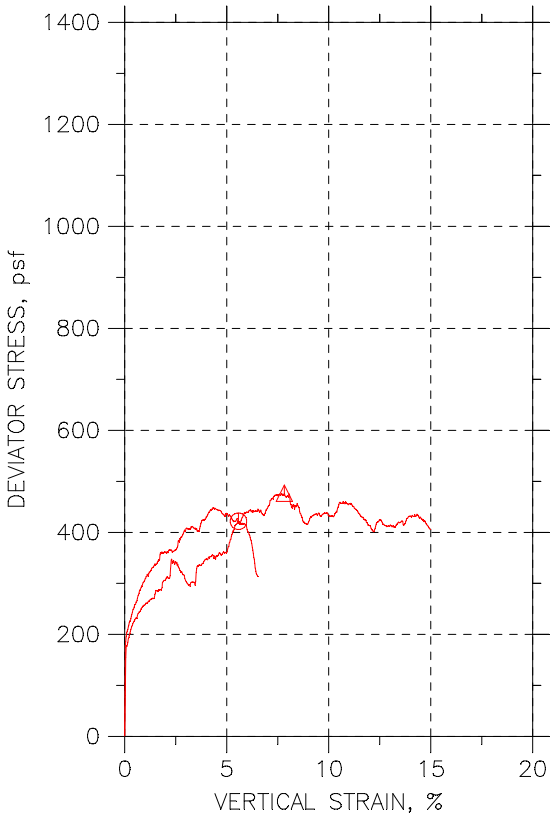
Remarks: System W

Phase calculations based on start and end of test.

Attachment Figure A.4-149

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0672	SL0672		
Test No.	UU-19-1	UU-19-2		
Depth	2-4 ft	2-4 ft		
Tested by	trm	trm		
Test Date	2/11/19	2/11/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	2.84	2.84		
Height, in	5.9	6		
Water Content, %	80.1	71.8		
Dry Density, pcf	45.45	53.38		
Saturation, %	79.8	89.9		
Void Ratio	2.71	2.16		
Confining Stress, psf	480	1000		
Undrained Strength, psf	210.9	238.3		
Max. Dev. Stress, psf	421.8	476.6		
Strain at Failure, %	5.58	7.83		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

Project: San Jacinto Pre-Design

Location: ---

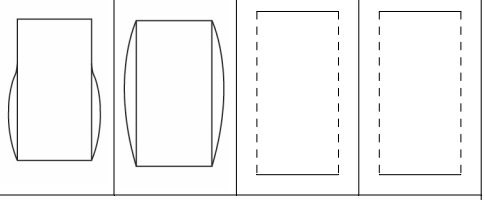
Project No.: GTX-309154

Boring No.: SJSB036

Sample Type: intact

Description: Moist, brown clay

Remarks: System II

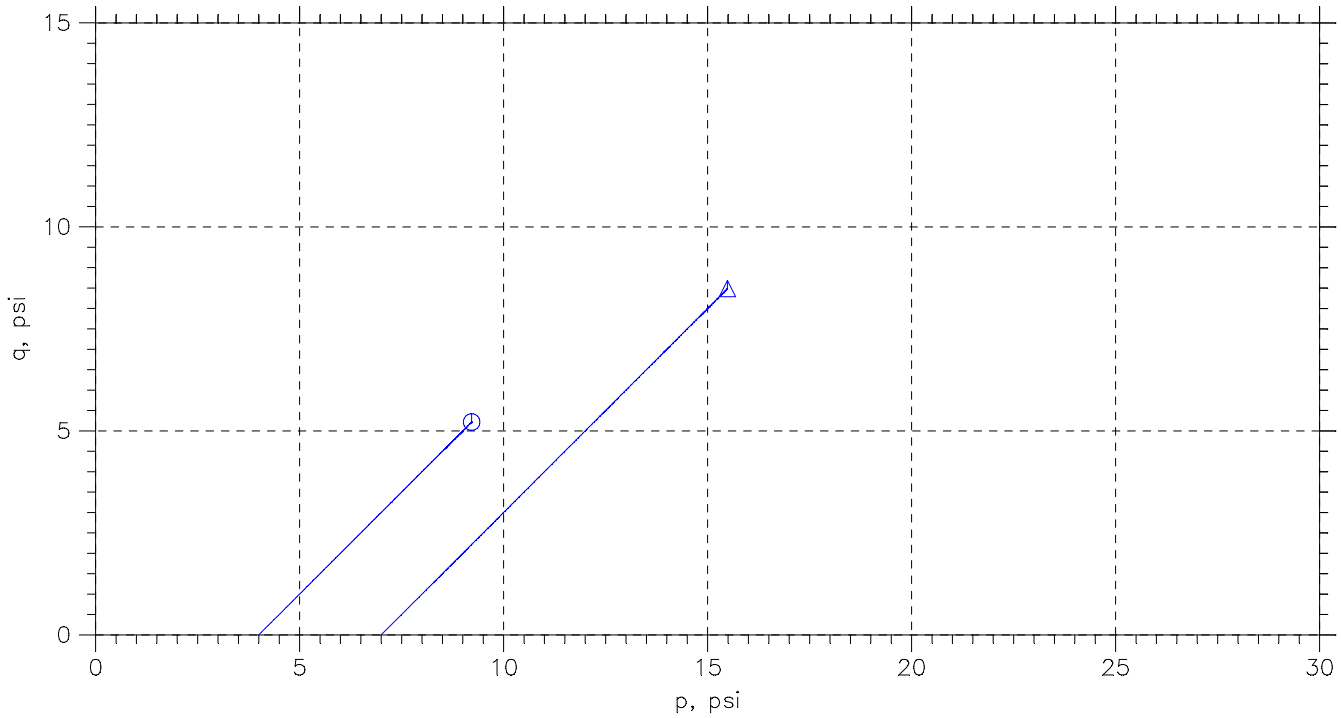


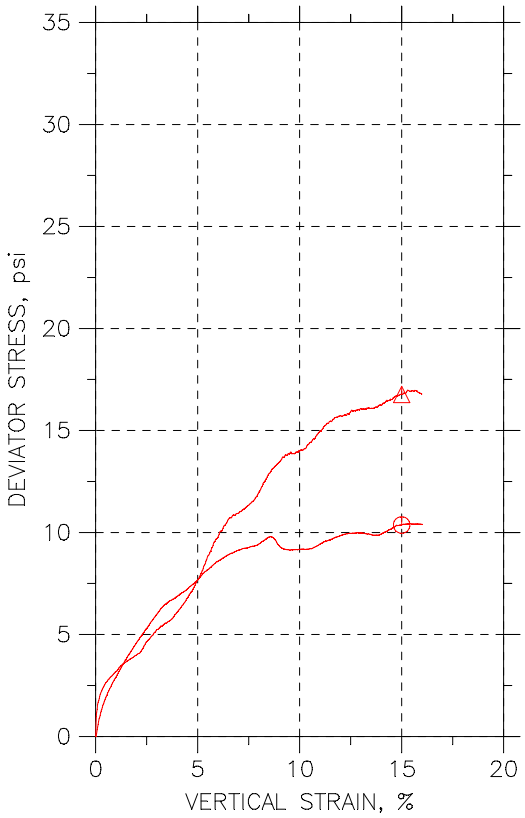
Phase calculations based on start and end of test.

Attachment Figure A.4-150

Thu, 14-MAR-2019 12:58:46

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0673	SL0673		
Test No.	UU-2-1	UU-2-2		
Depth	6-8 ft	6-8 ft		
Tested by	trm	trm		
Test Date	12/26/18	12/26/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.85	2.83		
Height, in	6.6	6.9		
Water Content, %	18.1	17.9		
Dry Density, pcf	106.3	102.7		
Saturation, %	83.6	75.5		
Void Ratio	0.586	0.641		
Confining Stress, psi	4	7		
Undrained Strength, psi	5.184	8.382		
Max. Dev. Stress, psi	10.37	16.76		
Strain at Failure, %	15	15		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

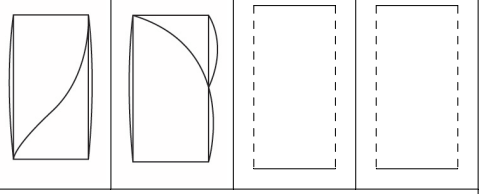
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB036

Sample Type: intact



Description: Moist, gray sandy clay

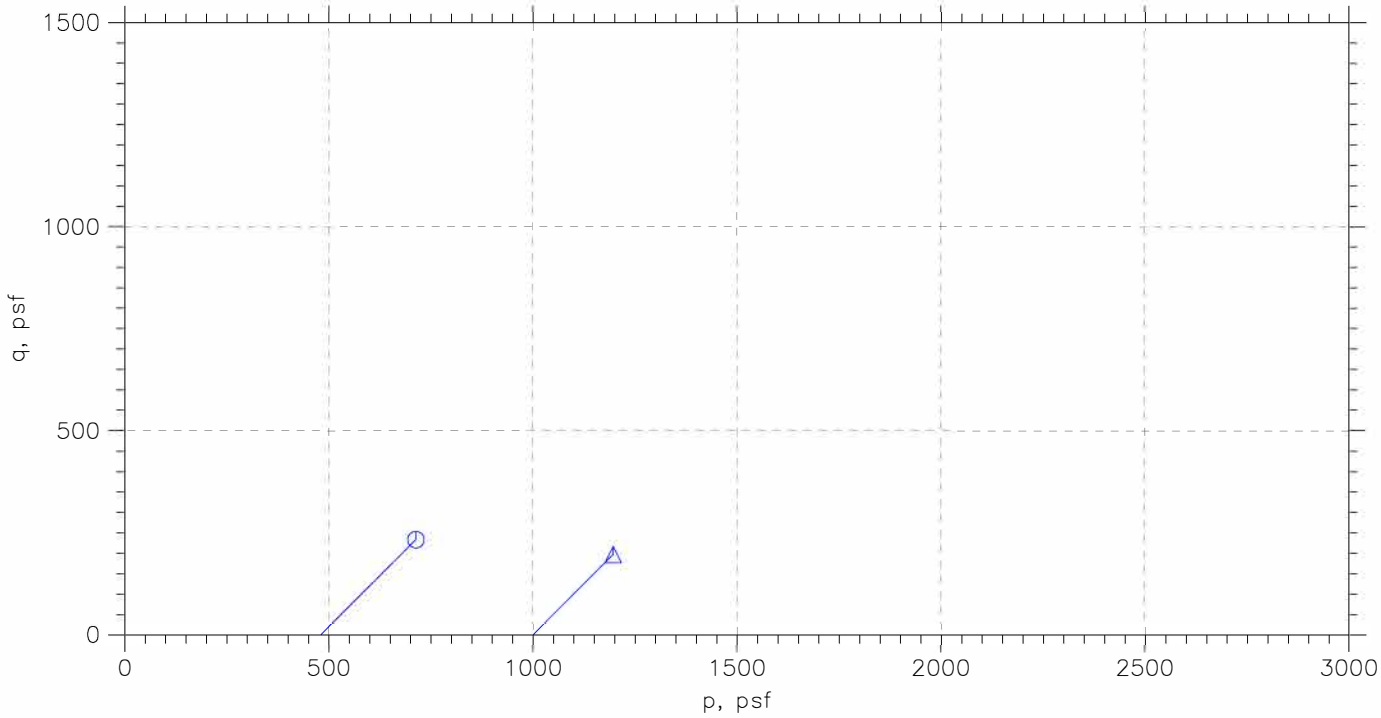
Remarks: System W

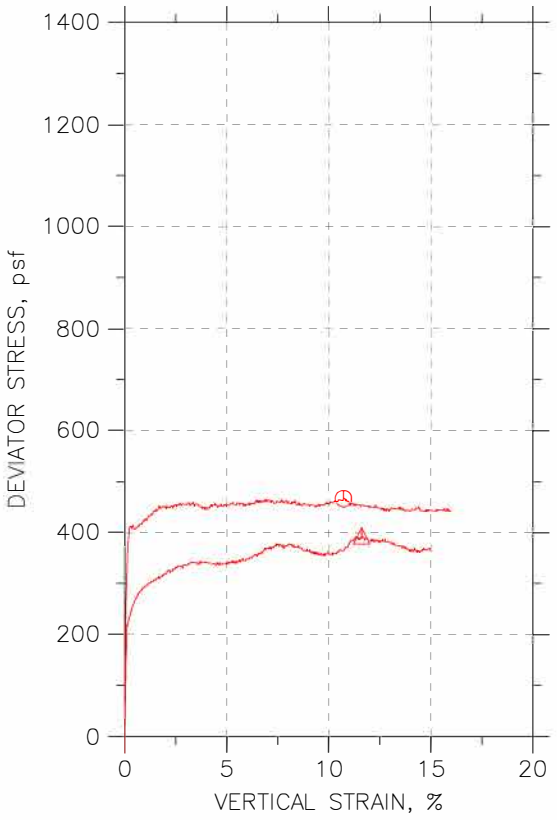
Phase calculations based on start and end of test.

Attachment Figure A.4-151

Thu, 28-FEB-2019 09:36:56

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0662	SL-0662		
Test No.	UU-20-1	UU-20-2		
Depth	2-4 ft	2-4 ft		
Tested by	trm	trm		
Test Date	2/11/19	2/11/19		
Checked by	njh	njh		
Check Date	3/14/19	3/14/19		
Diameter, in	1.93	1.93		
Height, in	4.4	4.52		
Water Content, %	107.9	119.0		
Dry Density, pcf	40.29	38.15		
Saturation, %	91.5	94.0		
Void Ratio	3.18	3.42		
Confining Stress, psf	480	1000		
Undrained Strength, psf	233.2	196.6		
Max. Dev. Stress, psf	466.4	393.1		
Strain at Failure, %	10.7	11.6		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

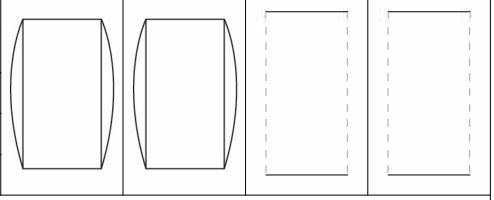
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB037

Sample Type: intact



Description: Wet, gray silty clay

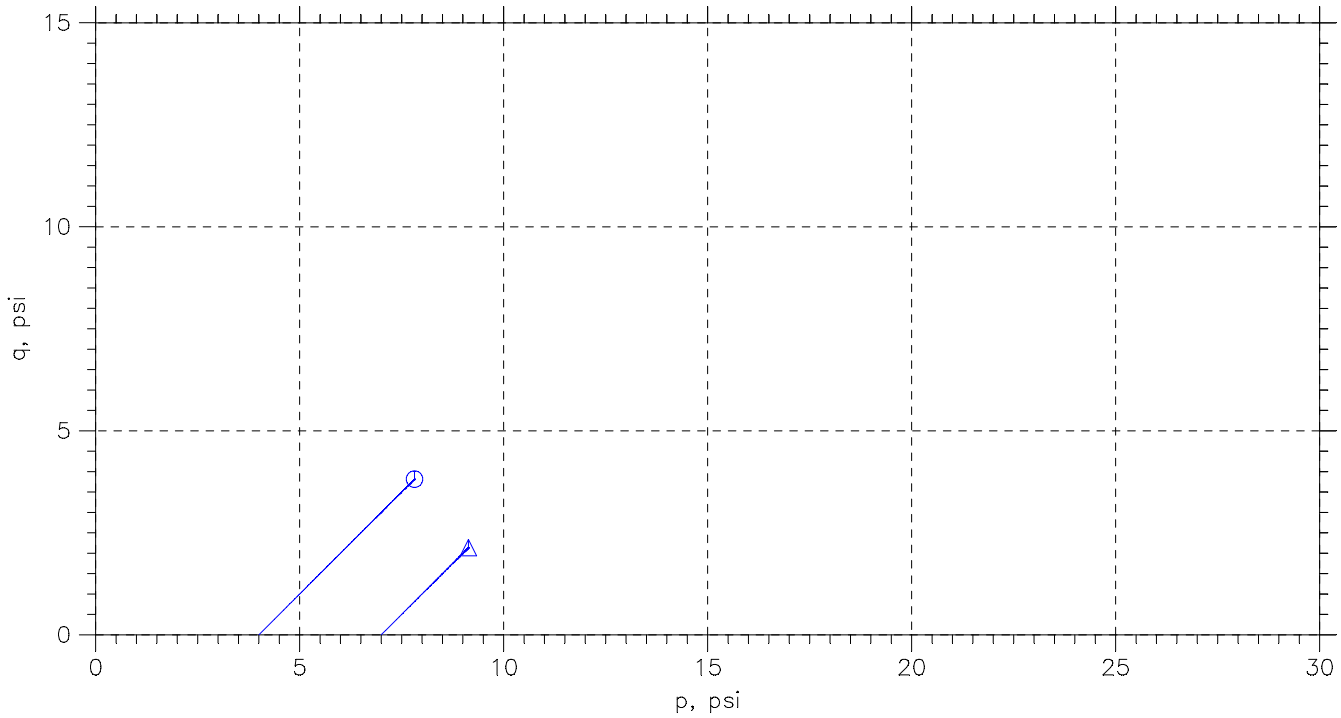
Remarks: System II

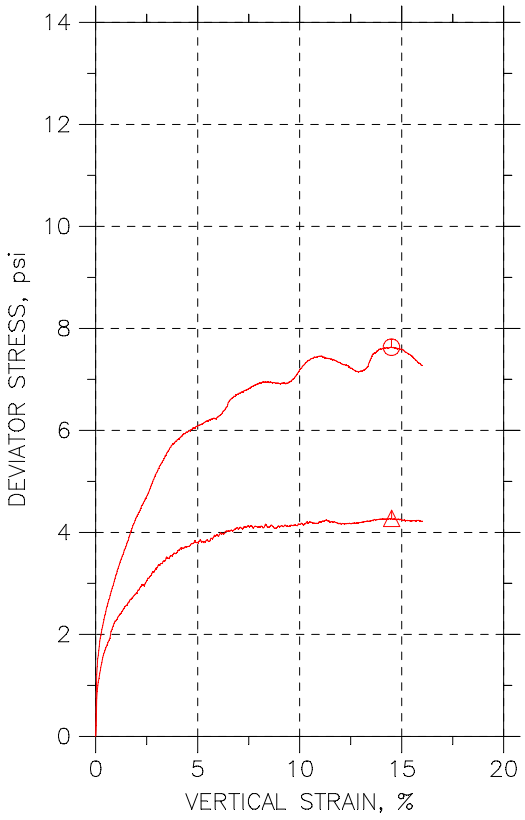
Phase calculations based on start and end of test.

Attachment Figure A.4-152

Thu, 14-MAR-2019 13:30:21

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏲	△		
Sample No.	SL0663	SL0663		
Test No.	UU-3-1	UU-3-2		
Depth	8-10 ft	8-10 ft		
Tested by	trm	trm		
Test Date	12/26/18	12/26/18		
Checked by	njh	njh		
Check Date	2/28/19	2/28/19		
Diameter, in	2.83	2.84		
Height, in	5.75	5.95		
Water Content, %	25.9	24.1		
Dry Density, pcf	94.44	94.21		
Saturation, %	89.0	82.6		
Void Ratio	0.785	0.789		
Confining Stress, psi	4	7		
Undrained Strength, psi	3.815	2.137		
Max. Dev. Stress, psi	7.63	4.273		
Strain at Failure, %	14.5	14.5		
Strain Rate, %/min	1	1		
Estimated Specific Gravity	2.7	2.7		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

GeoTesting EXPRESS

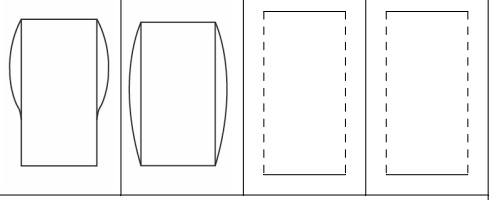
Project: San Jacinto Pre-Design

Location: ---

Project No.: GTX-309154

Boring No.: SJSB037

Sample Type: intact



Description: Moist, gray sandy clay

Remarks: System W

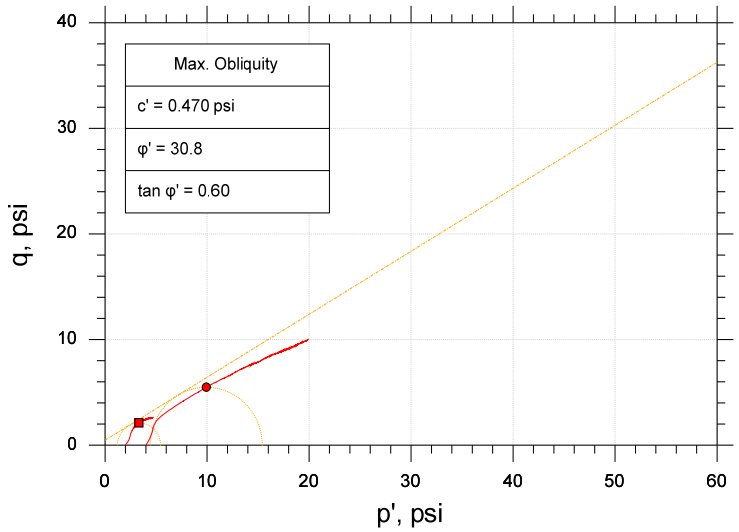
Phase calculations based on start and end of test.

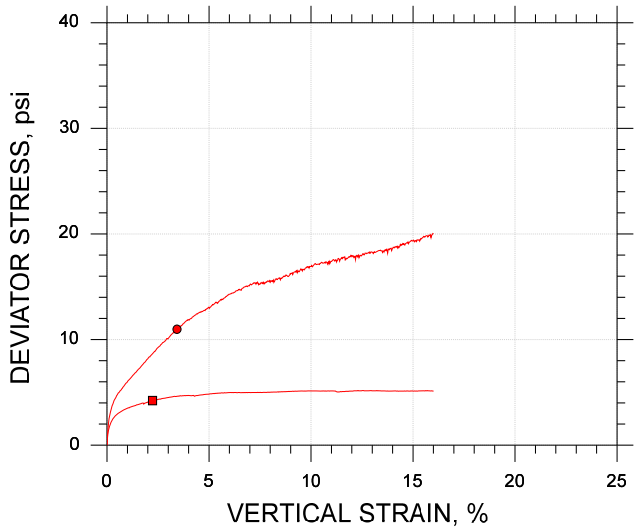
Attachment Figure A.4-153

Thu, 28-FEB-2019 11:05:41

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: trm	Checked By: njh
Boring ID: SJGB018	
Preparation: Intact	
Description: Moist, gray clay with sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

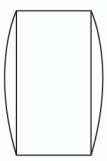


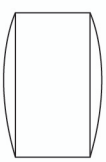


Symbol		■	●		
Sample ID		SL0863	SL0863		
Depth, ft		12-14	12-14		
Test Number		CU-7-1	CU-7-2		
Initial	Height, in	6.100	6.070		
	Diameter, in	2.870	2.880		
	Moisture Content (from Cuttings), %	13.6	10.6		
	Dry Density, pcf	104.	111.		
	Saturation (Wet Method), %	58.8	54.4		
	Void Ratio	0.623	0.524		
Before Shear	Moisture Content, %	23.0	19.3		
	Dry Density, pcf	104.	111.		
	Cross-sectional Area (Method A), in²	6.450	6.499		
	Saturation, %	100.0	100.0		
	Void Ratio	0.620	0.520		
	Back Pressure, psi	126.9	145.0		
Vertical Effective Consolidation Stress, psi		1.996	4.000		
Horizontal Effective Consolidation Stress, psi		1.994	3.997		
Vertical Strain after Consolidation, %		-0.002507	0.04992		
Volumetric Strain after Consolidation, %		0.4965	0.2225		
Time to 50% Consolidation, min		---	0.2500		
Shear Strength, psi		2.108	5.487		
Strain at Failure, %		2.23	3.43		
Strain Rate, %/min		0.01600	0.01600		
Deviator Stress at Failure, psi		4.217	10.97		
Effective Minor Principal Stress at Failure, psi		1.220	4.437		
Effective Major Principal Stress at Failure, psi		5.437	15.41		
B-Value		0.95	0.95		

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

Remarks:

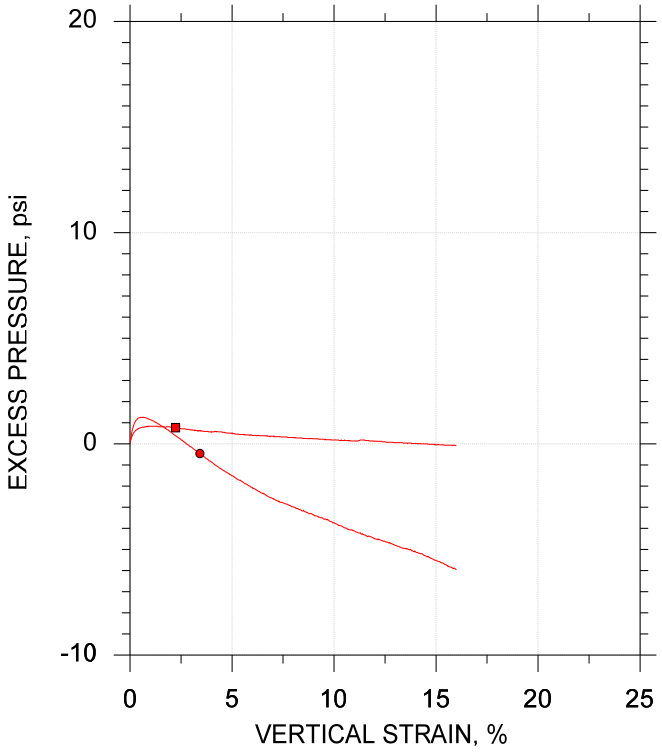


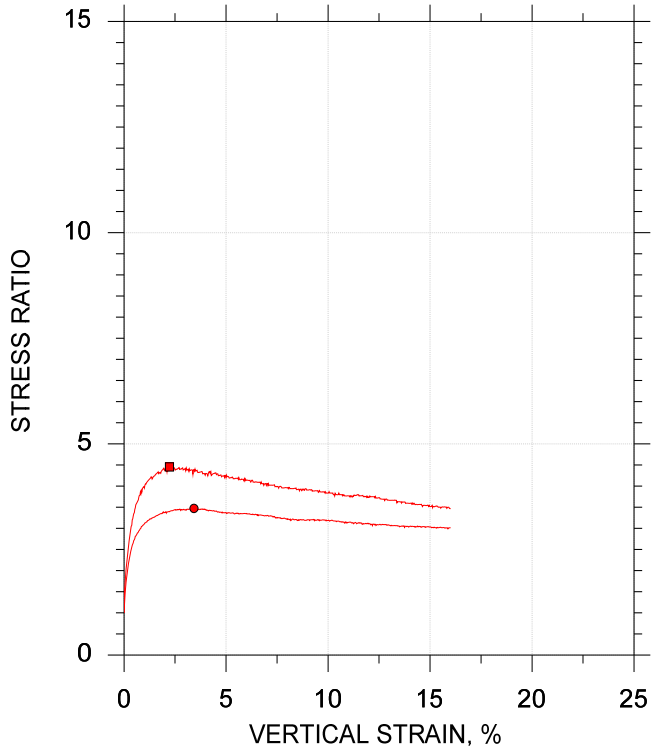


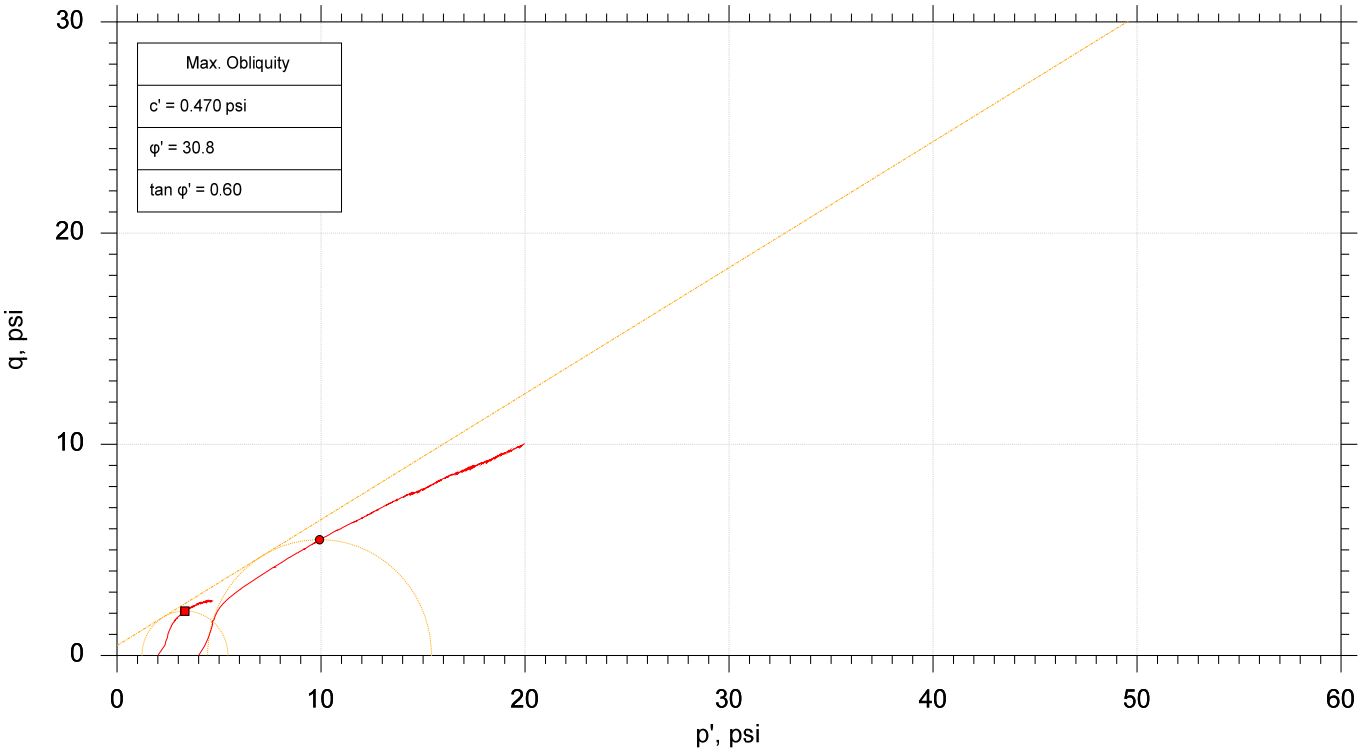
System T

Attachment Figure A.4-154

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL0863	CU-7-1	12-14	trm	3/7/19	njh	---	309154-CU-7-1n.dat
●	SL0863	CU-7-2	12-14	trm	3/7/19	njh	3/14/19	309154-CU-7-2n.dat

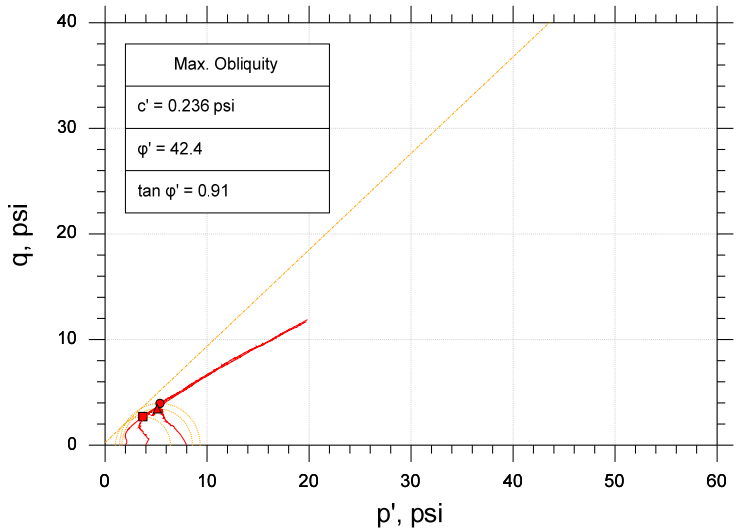
GeoTesting EXPRESS

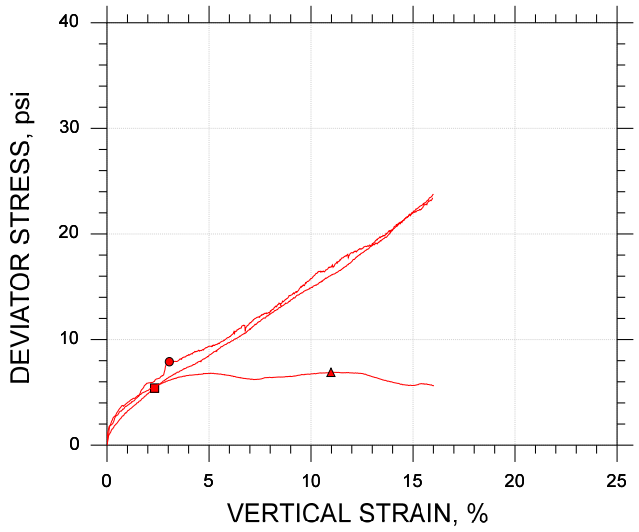
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Sample Type: Intact	
Description: Moist, gray clay with sand		
Remarks: System T		

Attachment Figure A.4-155

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: md	Checked By: njh
Boring ID: SJGB021	
Preparation: intact	
Description: Moist, gray clayey sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.65

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

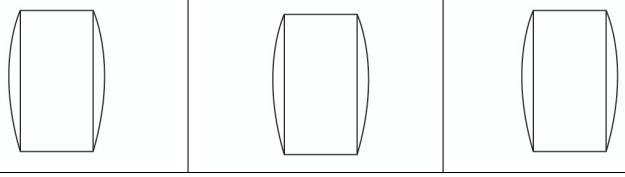




Symbol		■	●	▲	
Sample ID		SL0824	SL0824	SL0824	
Depth, ft		12-14	12-14	12-14	
Test Number		CU-6-1	CU-6-2	CU-6-3	
Initial	Height, in	3.000	3.310	2.820	
	Diameter, in	1.410	1.410	1.410	
	Moisture Content (from Cuttings), %	22.2	27.5	65.1	
	Dry Density, pcf	104.	95.0	60.7	
	Saturation (Wet Method), %	99.7	98.3	99.9	
	Void Ratio	0.590	0.741	1.73	
Before Shear	Moisture Content, %	21.6	21.5	57.2	
	Dry Density, pcf	105.	105.	65.8	
	Cross-sectional Area (Method A), in²	1.552	1.452	1.502	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.574	0.570	1.52	
	Back Pressure, psi	114.5	149.9	150.7	
Vertical Effective Consolidation Stress, psi		1.976	3.972	7.683	
Horizontal Effective Consolidation Stress, psi		1.993	3.968	7.965	
Vertical Strain after Consolidation, %		0.1773	0.007624	2.436	
Volumetric Strain after Consolidation, %		0.2409	0.7632	2.804	
Time to 50% Consolidation, min		---	---	90.00	
Shear Strength, psi		2.703	3.947	3.451	
Strain at Failure, %		2.33	3.05	11.0	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		5.405	7.895	6.902	
Effective Minor Principal Stress at Failure, psi		1.006	1.430	1.666	
Effective Major Principal Stress at Failure, psi		6.411	9.325	8.568	
B-Value		0.97	0.95	0.95	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

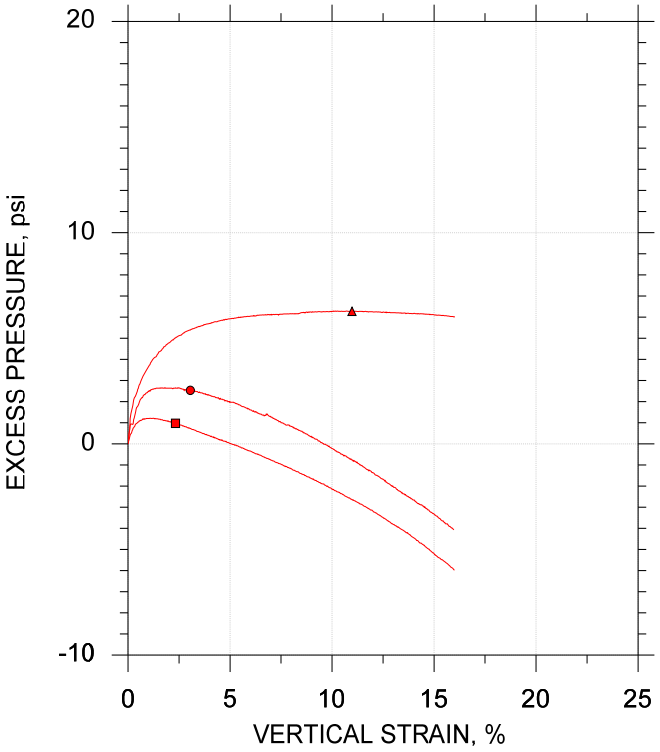
Remarks:

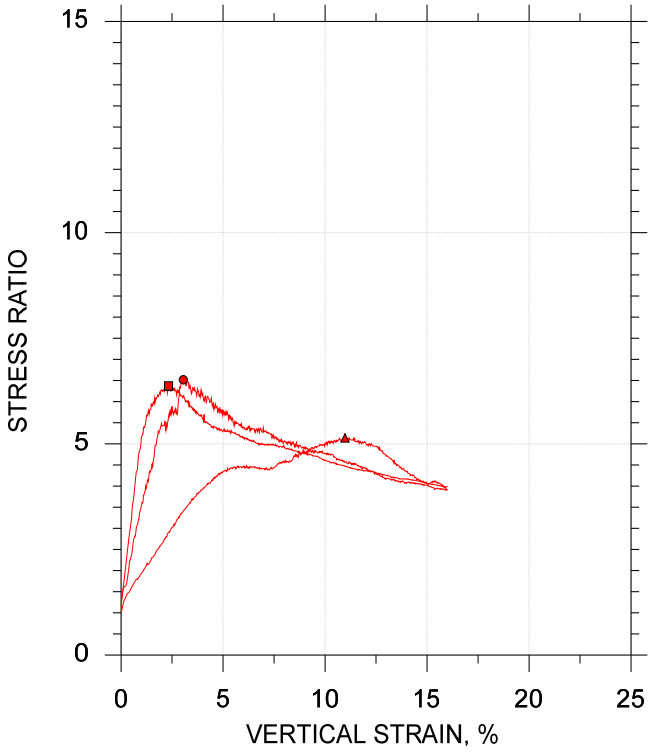


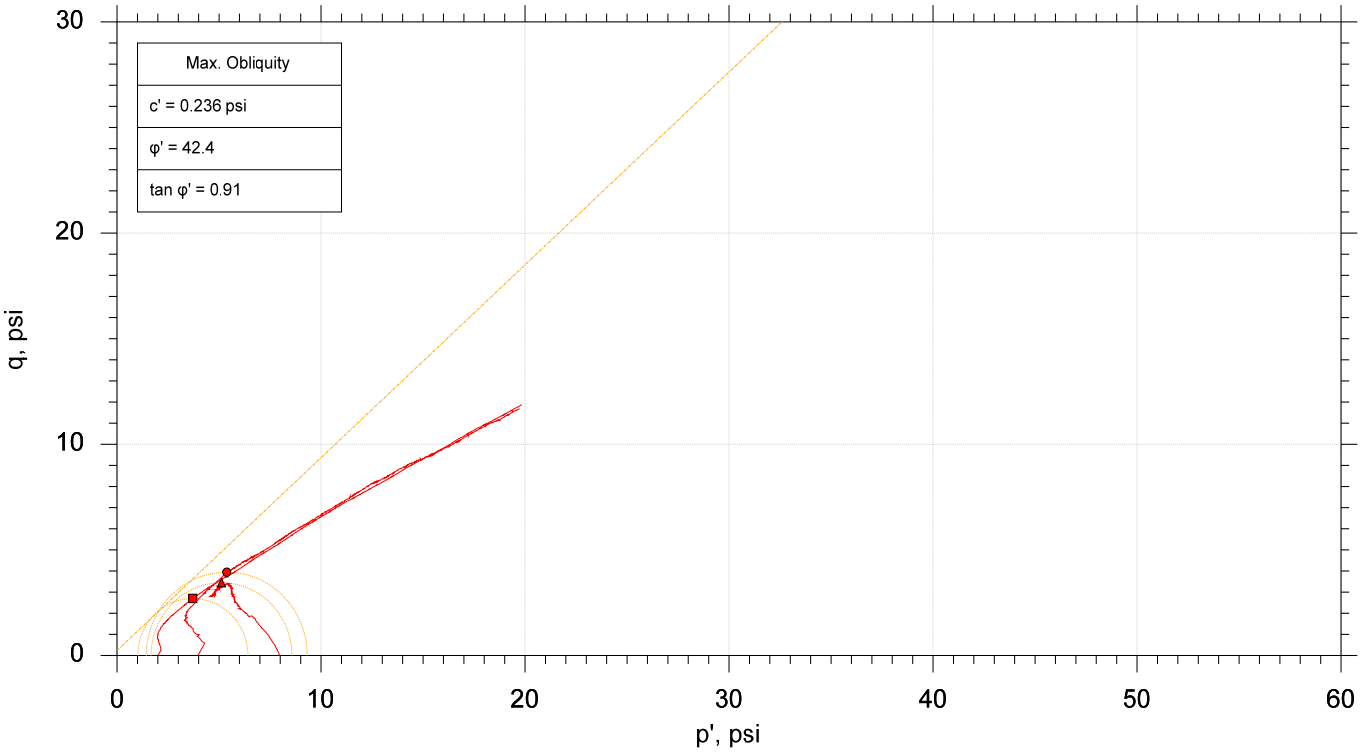
System E

Attachment Figure A.4-156

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL0824	CU-6-1	12-14	md	01/15/19	njh	2/5/19	309154-CU-6-1n.dat
●	SL0824	CU-6-2	12-14	md	01/15/19	njh	2/5/19	309154-CU-6-2n.dat
▲	SL0824	CU-6-3	12-14	md	01/15/19	njh	2/5/19	309154-CU-6-3n.dat

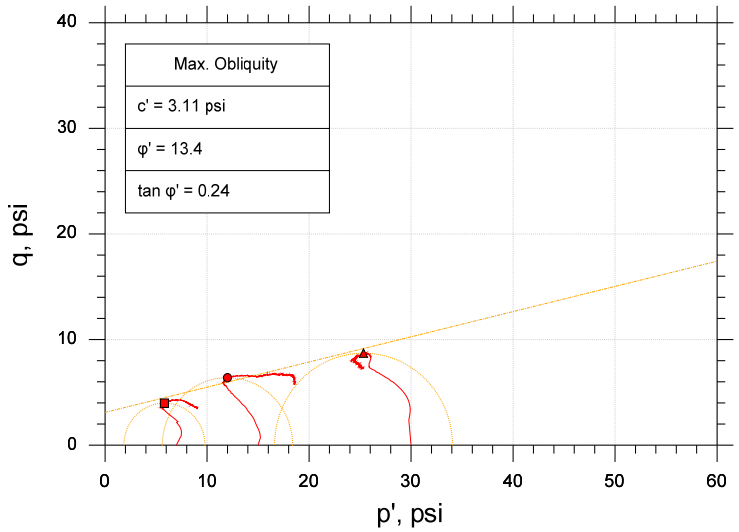
GeoTesting EXPRESS

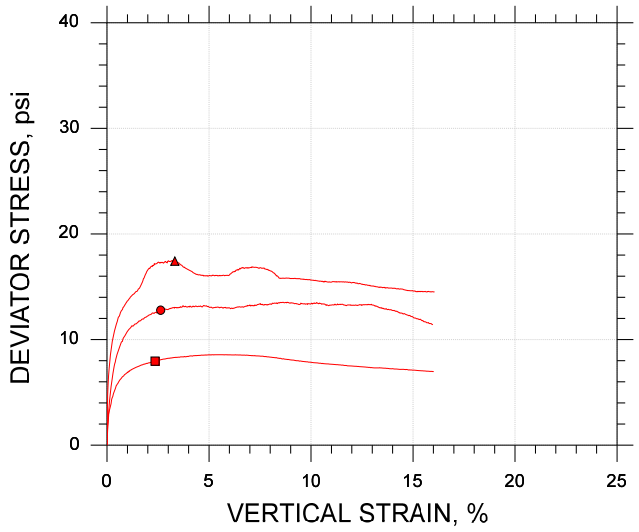
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Sample Type: intact	
Description: Moist, gray clayey sand		
Remarks: System E		

Attachment Figure A.4-157

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: md	Checked By: njh
Boring ID: SJGB-021	
Preparation: intact	
Description: Moist , reddish brown and gray clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.7

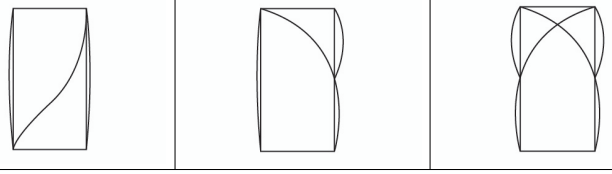
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲	
Sample ID		SL0829	SL0829	SL0829	
Depth, ft		39-41	39-41	39-41	
Test Number		CU-5-1	CU-5-2	CU-5-3	
Initial	Height, in	4.400	4.420	4.470	
	Diameter, in	2.030	2.020	1.990	
	Moisture Content (from Cuttings), %	36.7	35.0	36.0	
	Dry Density, pcf	84.1	81.2	80.2	
	Saturation (Wet Method), %	98.7	87.9	88.4	
	Void Ratio	1.00	1.07	1.10	
Before Shear	Moisture Content, %	37.1	37.7	39.0	
	Dry Density, pcf	84.2	83.5	82.1	
	Cross-sectional Area (Method A), in²	3.236	3.139	3.071	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	1.00	1.02	1.05	
	Back Pressure, psi	150.7	150.7	150.6	
Vertical Effective Consolidation Stress, psi		6.975	14.99	29.94	
Horizontal Effective Consolidation Stress, psi		6.991	14.99	30.00	
Vertical Strain after Consolidation, %		0.2258	0.03834	0.6596	
Volumetric Strain after Consolidation, %		0.3596	0.7104	1.078	
Time to 50% Consolidation, min		---	---	72.00	
Shear Strength, psi		3.976	6.388	8.717	
Strain at Failure, %		2.35	2.63	3.32	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		7.953	12.78	17.43	
Effective Minor Principal Stress at Failure, psi		1.840	5.616	16.62	
Effective Major Principal Stress at Failure, psi		9.793	18.39	34.05	
B-Value		0.95	0.95	0.94	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

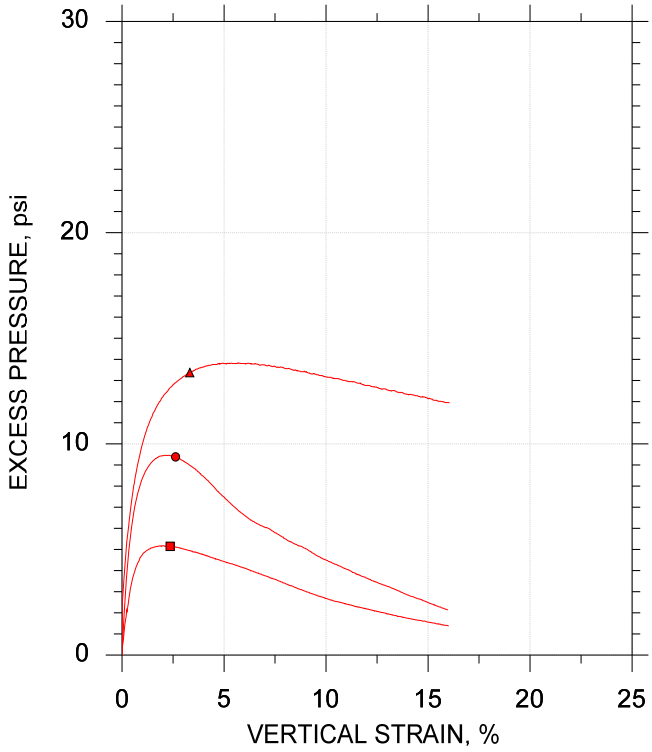


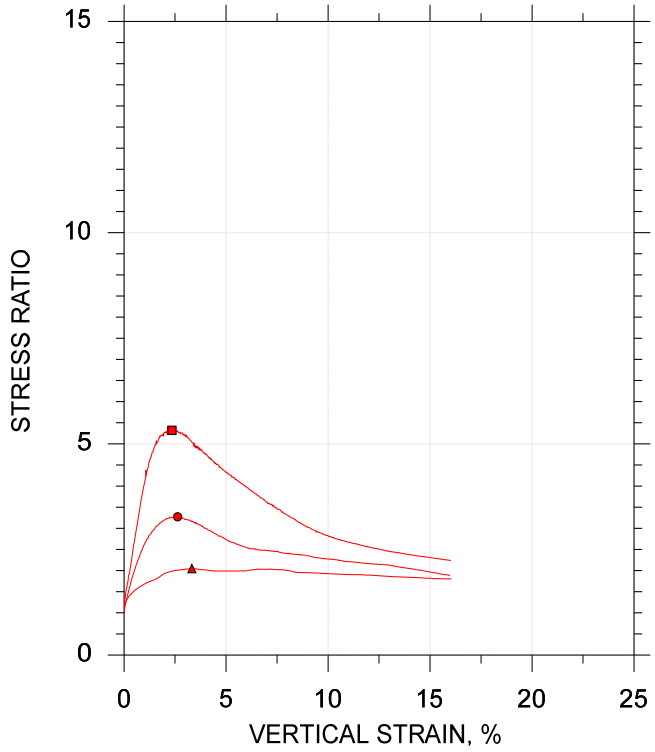
Remarks:

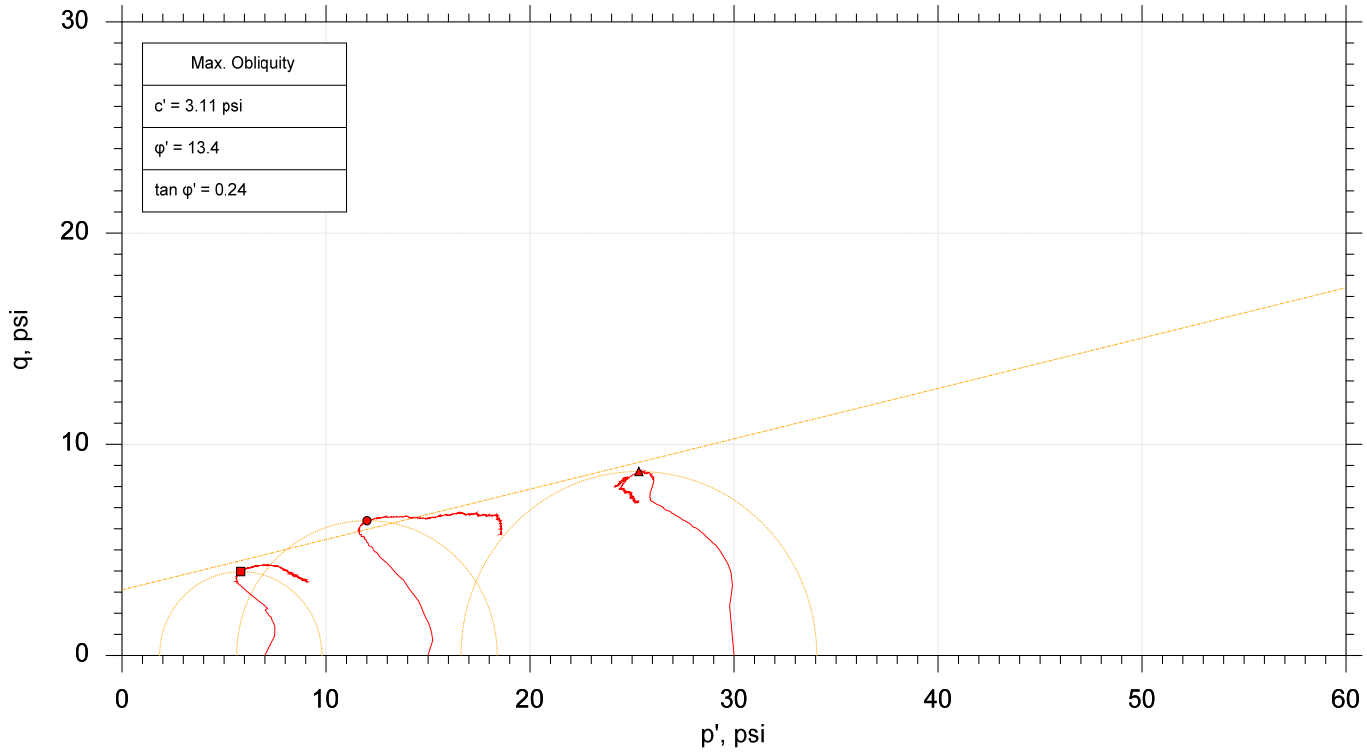
System Q

Attachment Figure A.4-158

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL0829	CU-5-1	39-41	md	01/15/19	njh	2/5/19	309154-CU-5-1n.dat
●	SL0829	CU-5-2	39-41	md	01/15/19	njh	2/5/19	309154-CU-5-2n.dat
▲	SL0829	CU-5-3	39-41	md	01/11/19	njh	2/5/19	309154-CU-5-3n.dat

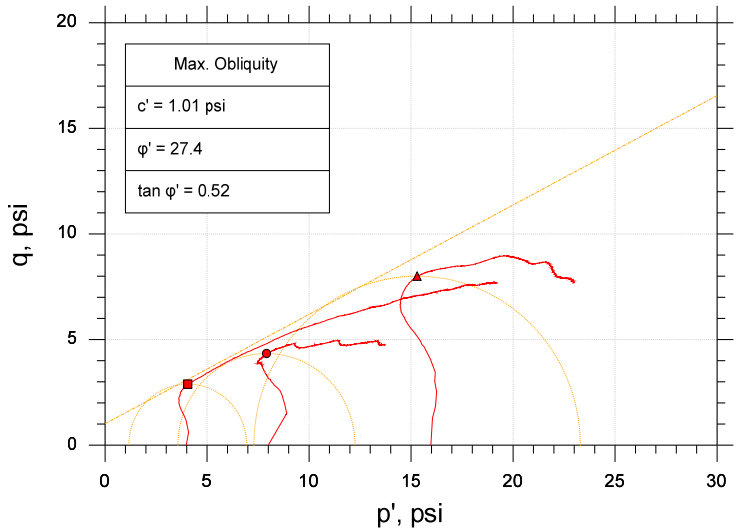
GeoTesting EXPRESS

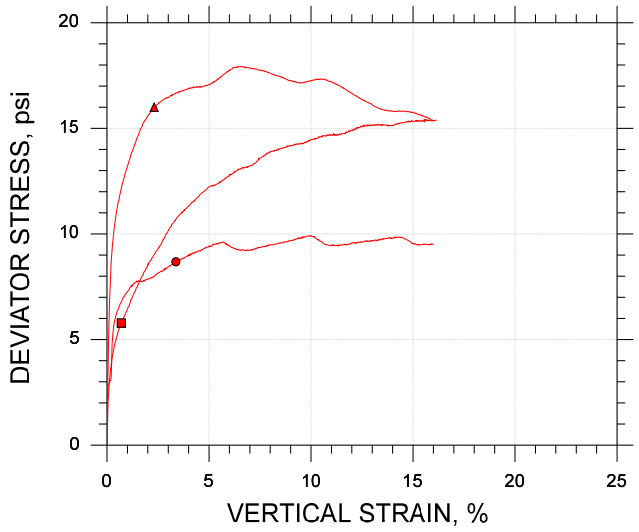
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB-021	Sample Type: intact	
Description: Moist , reddish brown and gray clay		
Remarks: System Q		

Attachment Figure A.4-159

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: md	Checked By: njh
Boring ID: SJGB018	
Preparation: intact	
Description: Moist, reddish brown clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





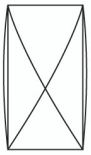
Symbol		■	●	▲
Sample ID		SL0868	SL0868	SL0868
Depth, ft		25-27	25-27	25-27
Test Number		CU-4-1	CU-4-2	CU-4-3
Initial	Height, in	4.500	4.520	4.600
	Diameter, in	2.020	2.030	2.030
	Moisture Content (from Cuttings), %	25.7	27.0	28.9
	Dry Density, pcf	97.5	92.1	90.4
	Saturation (Wet Method), %	95.0	87.7	90.2
	Void Ratio	0.729	0.831	0.865
Before Shear	Moisture Content, %	26.1	31.2	31.3
	Dry Density, pcf	98.8	91.6	91.4
	Cross-sectional Area (Method A), in²	3.176	3.243	3.215
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.705	0.841	0.845
	Back Pressure, psi	163.3	150.4	150.7
Vertical Effective Consolidation Stress, psi		3.976	8.020	15.96
Horizontal Effective Consolidation Stress, psi		3.980	7.998	15.96
Vertical Strain after Consolidation, %		0.09279	0.001025	0.3482
Volumetric Strain after Consolidation, %		0.2028	0.5529	0.7681
Time to 50% Consolidation, min		---	---	90.00
Shear Strength, psi		2.892	4.341	8.001
Strain at Failure, %		0.700	3.38	2.31
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		5.783	8.682	16.00
Effective Minor Principal Stress at Failure, psi		1.161	3.572	7.293
Effective Major Principal Stress at Failure, psi		6.944	12.25	23.29
B-Value		0.97	0.95	0.97

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

Remarks:



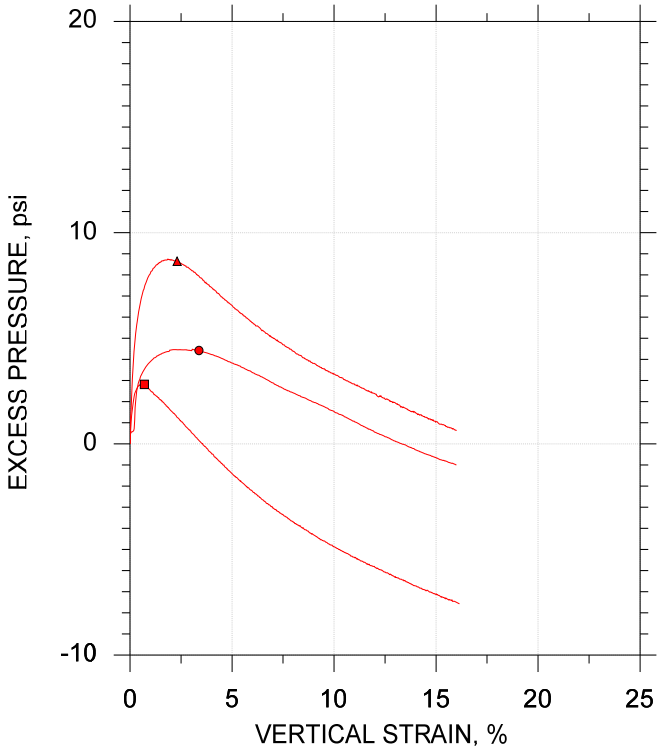


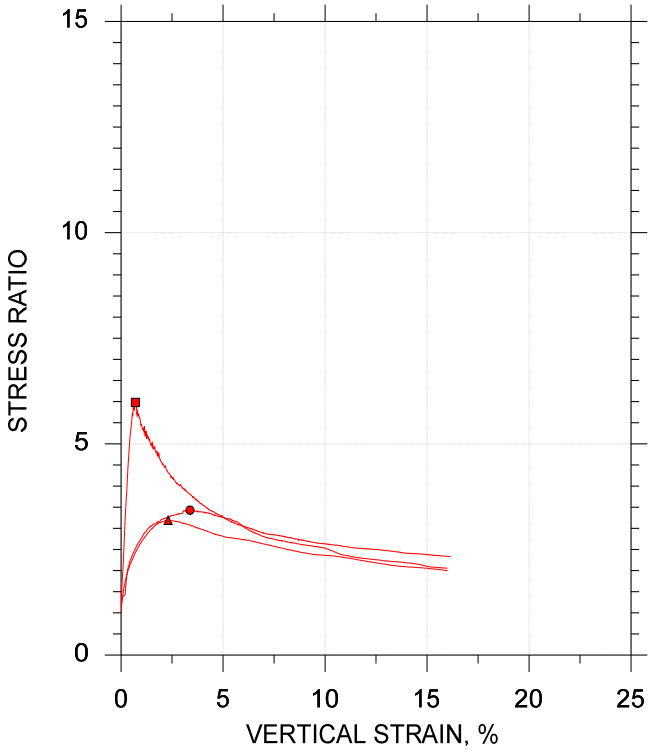


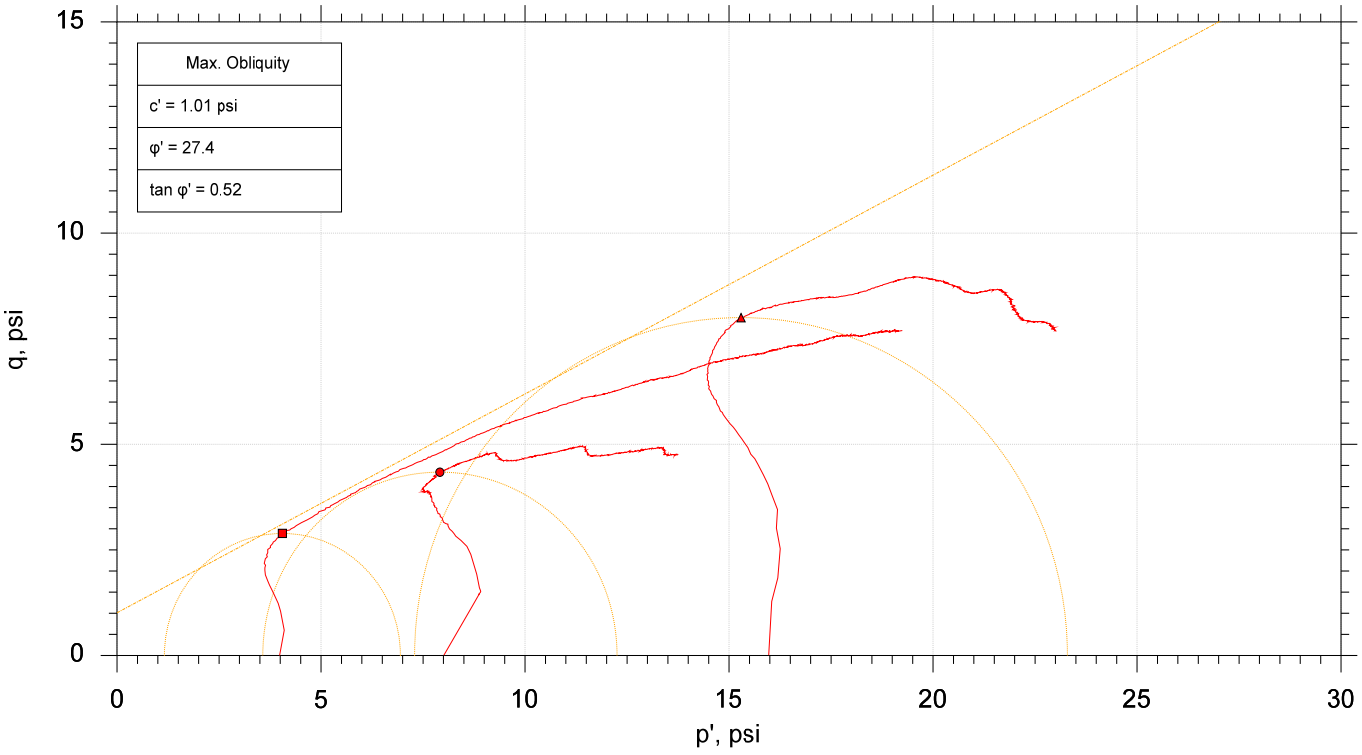
System LL

Attachment Figure A.4-160

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL0868	CU-4-1	25-27	md	01/11/19	njh	2/5/19	309154-CU-4-1n.dat
●	SL0868	CU-4-2	25-27	md	01/11/19	njh	2/5/19	309154-CU-4-2n.dat
▲	SL0868	CU-4-3	25-27	md	01/11/19	njh	2/5/19	309154-CU-4-3n.dat

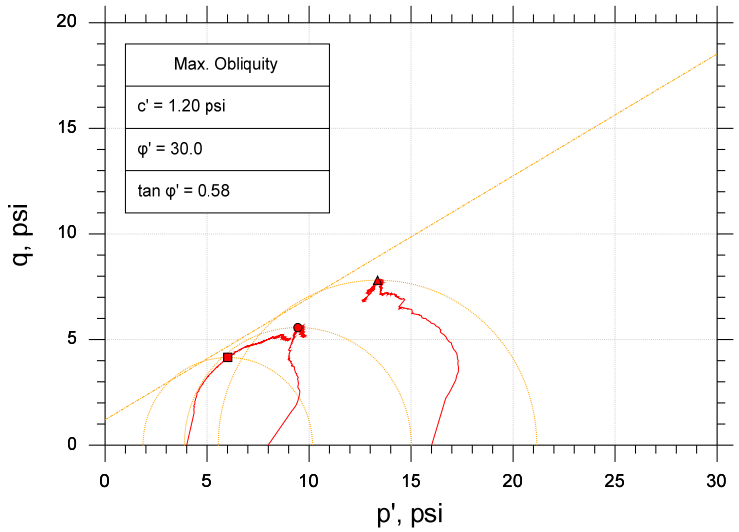
GeoTesting EXPRESS

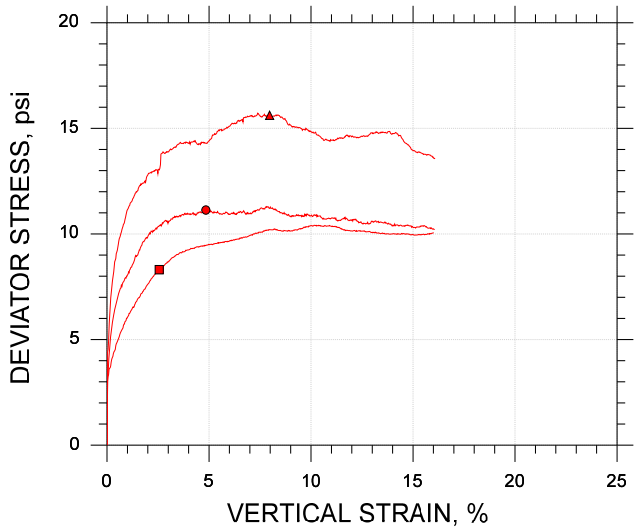
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Sample Type: intact	
Description: Moist, reddish brown clay		
Remarks: System LL		

Attachment Figure A.4-161

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: md	Checked By: njh
Boring ID: SJSB025	
Preparation: intact	
Description: Moist, black clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.8

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767

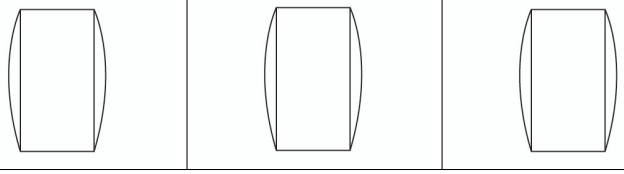




Symbol		■	●	▲	
Sample ID		SL1042	SL1042	SL1042	
Depth, ft		16-18	16-18	16-18	
Test Number		CU-3-1	CU-3-2	CU-3-3	
Initial	Height, in	3.080	3.250	3.240	
	Diameter, in	1.410	1.410	1.410	
	Moisture Content (from Cuttings), %	39.7	37.3	38.4	
	Dry Density, pcf	82.7	85.3	84.2	
	Saturation (Wet Method), %	99.9	99.6	99.8	
	Void Ratio	1.11	1.05	1.08	
Before Shear	Moisture Content, %	39.6	37.1	37.6	
	Dry Density, pcf	82.9	85.8	85.2	
	Cross-sectional Area (Method A), in²	1.560	1.560	1.552	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	1.11	1.04	1.05	
	Back Pressure, psi	149.8	150.7	150.4	
Vertical Effective Consolidation Stress, psi		3.972	7.956	15.96	
Horizontal Effective Consolidation Stress, psi		3.997	7.994	16.01	
Vertical Strain after Consolidation, %		0.2295	0.3525	0.4944	
Volumetric Strain after Consolidation, %		0.5639	0.2645	0.9214	
Time to 50% Consolidation, min		---	---	56.00	
Shear Strength, psi		4.153	5.566	7.810	
Strain at Failure, %		2.56	4.84	7.97	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		8.305	11.13	15.62	
Effective Minor Principal Stress at Failure, psi		1.863	3.882	5.546	
Effective Major Principal Stress at Failure, psi		10.17	15.01	21.17	
B-Value		0.95	0.95	0.94	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

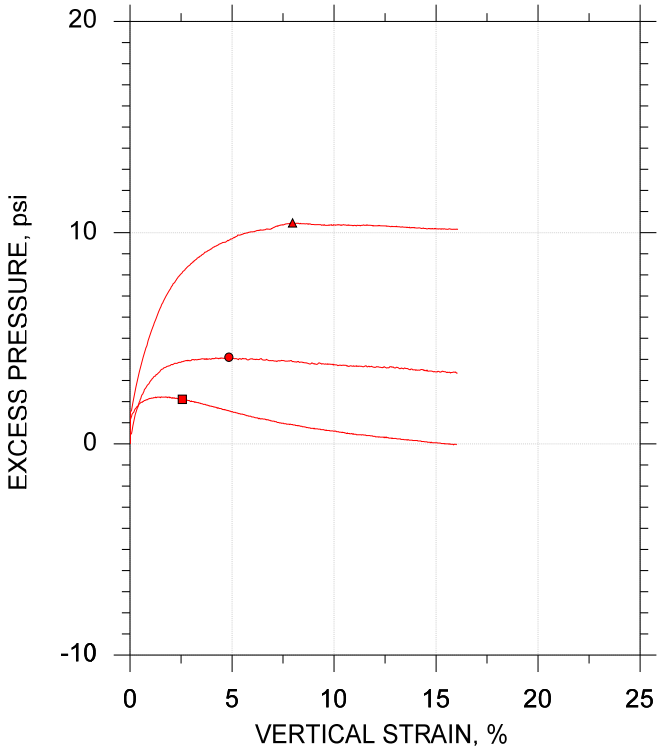
Remarks:

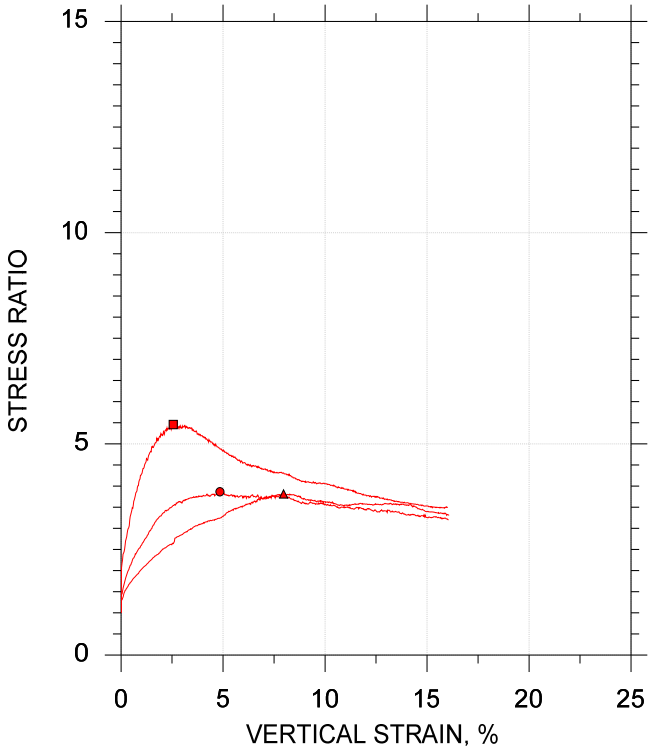


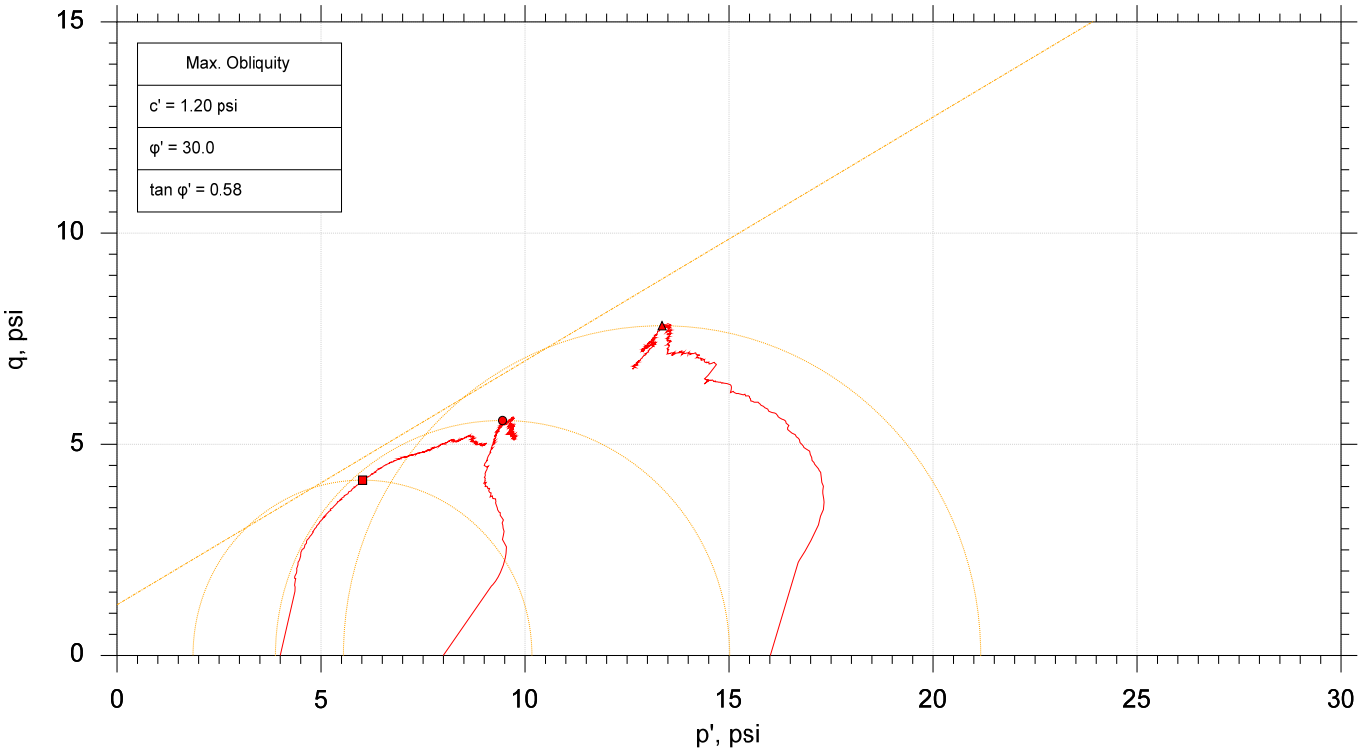
System K

Attachment Figure A.4-162

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL1042	CU-3-1	16-18	md	01/04/19	njh	2/5/19	309154-CU-3-1n.dat
●	SL1042	CU-3-2	16-18	md	01/04/19	njh	2/5/19	309154-CU-3-2n.dat
▲	SL1042	CU-3-3	16-18	md	01/04/19	njh	2/5/19	309154-CU-3-3n.dat

GeoTesting EXPRESS

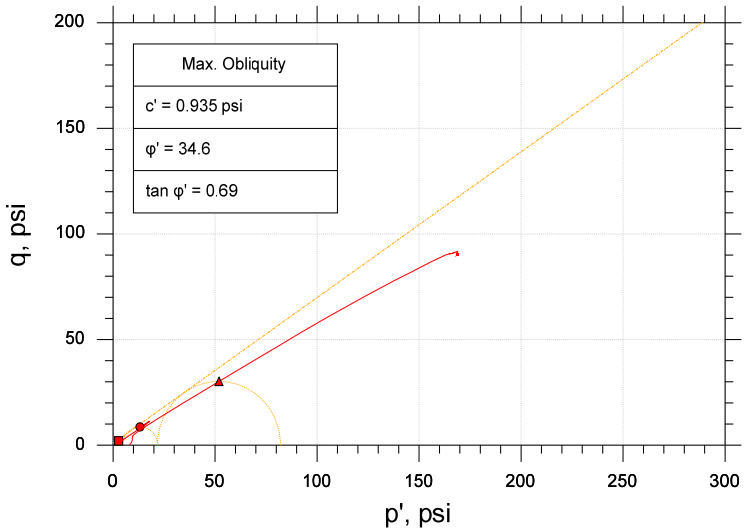
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB025	Sample Type: intact	
Description: Moist, black clay		
Remarks: System K		

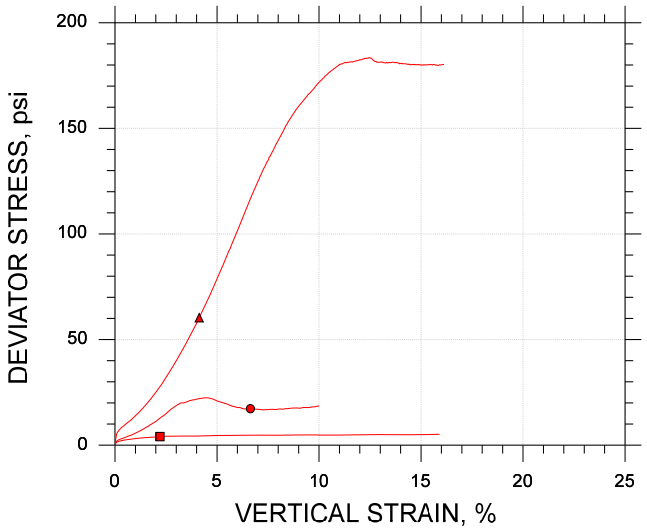
Attachment Figure A.4-163

GeoTesting EXPRESS

Client: Anchor QEA, LLC	
Project Name: San Jacinto Pre-Design	
Project Location: ---	
Project Number: GTX-309154	
Tested By: trm	Checked By: njh
Boring ID: SJSB034	
Preparation: intact	
Description: Moist, gray sand with clay and shells	
Classification: ---	
Group Symbol: ---	
Liquid Limit: ---	Plastic Limit: ---
Plasticity Index: ---	Estimated Specific Gravity: 2.7

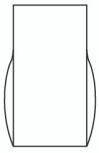
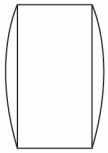
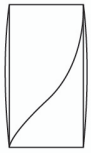
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲	
Sample ID		SL0639	SL0639	SL0639	
Depth, ft		10-12	10-12	10-12	
Test Number		CU-1-1	CU-1-2	CU-1-3	
Initial	Height, in	6.100	6.350	6.250	
	Diameter, in	2.860	2.870	2.860	
	Moisture Content (from Cuttings), %	19.1	13.5	23.7	
	Dry Density, pcf	98.8	108.	103.	
	Saturation (Wet Method), %	73.0	64.8	99.9	
	Void Ratio	0.707	0.561	0.642	
Before Shear	Moisture Content, %	25.7	23.0	23.5	
	Dry Density, pcf	99.5	104.	103.	
	Cross-sectional Area (Method A), in²	6.374	6.721	6.392	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.694	0.622	0.634	
	Back Pressure, psi	87.95	38.99	151.0	
Vertical Effective Consolidation Stress, psi		2.056	4.006	8.011	
Horizontal Effective Consolidation Stress, psi		2.052	4.005	8.003	
Vertical Strain after Consolidation, %		0.001646	0.02871	0.0007690	
Volumetric Strain after Consolidation, %		0.8510	-3.807	0.6056	
Time to 50% Consolidation, min		---	---	0.3600	
Shear Strength, psi		2.023	8.633	30.17	
Strain at Failure, %		2.20	6.63	4.13	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		4.046	17.27	60.35	
Effective Minor Principal Stress at Failure, psi		0.7033	4.555	21.75	
Effective Major Principal Stress at Failure, psi		4.750	21.82	82.09	
B-Value		0.95	0.95	0.96	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

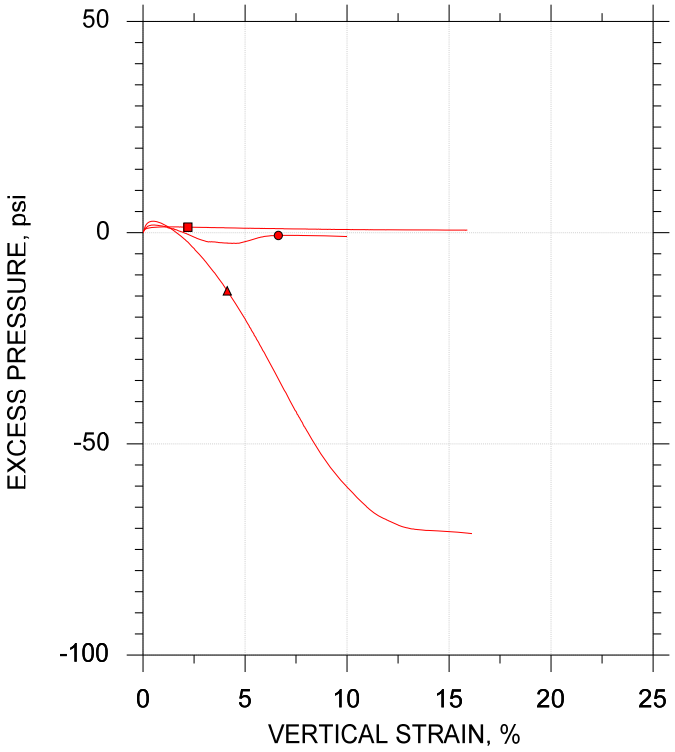




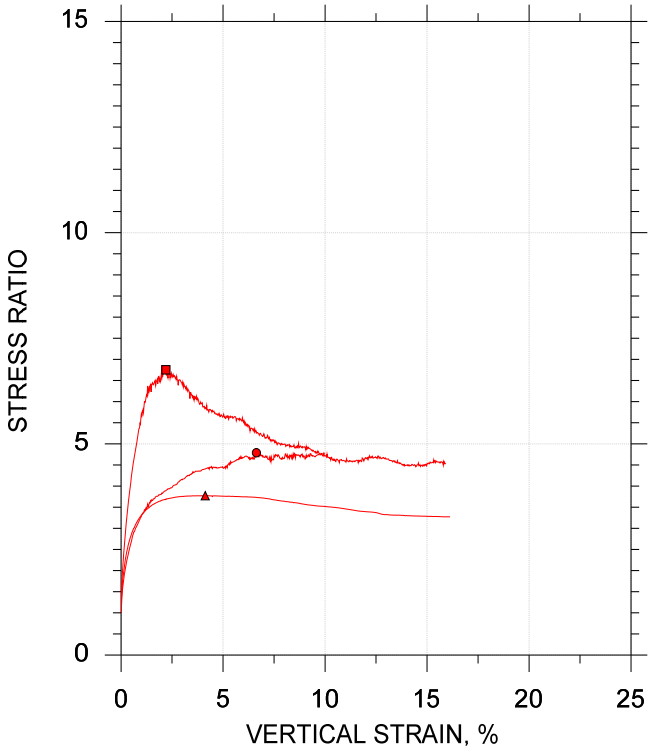
Remarks:

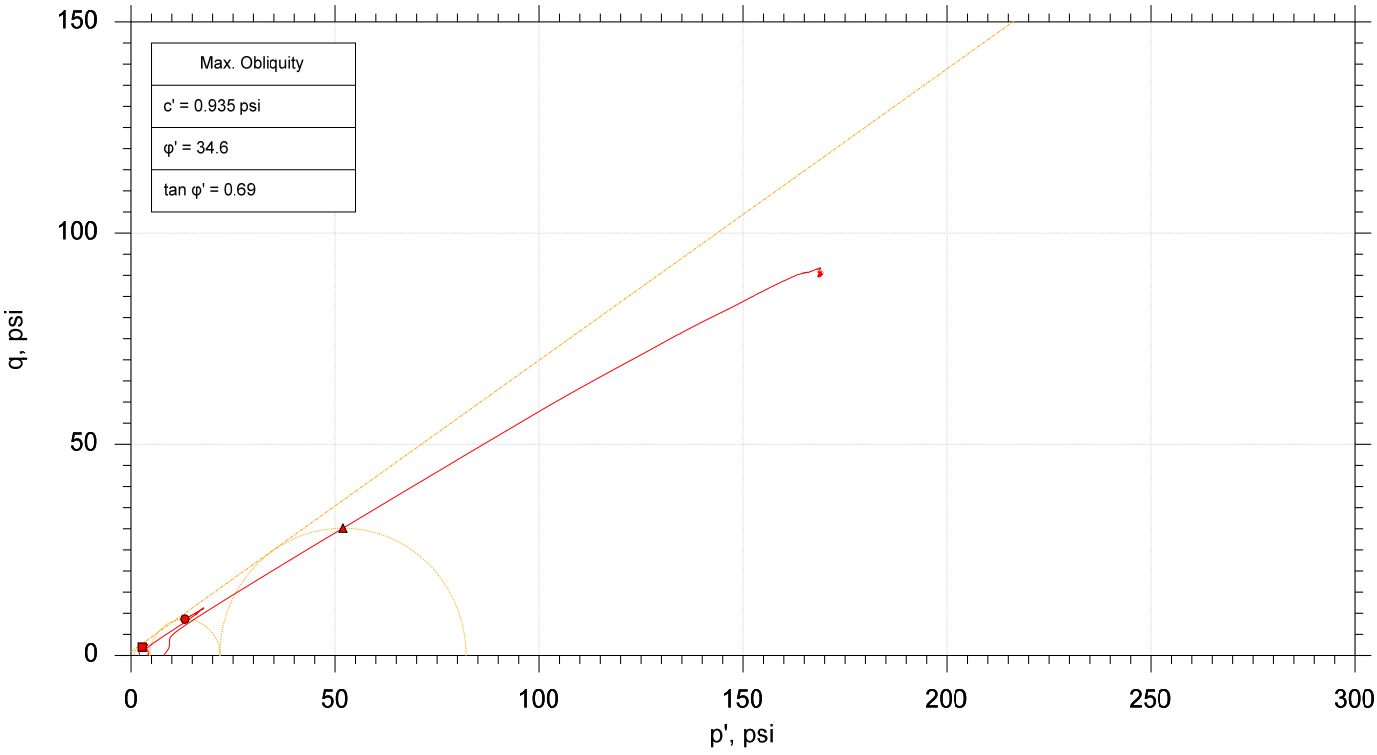
System Q

Attachment Figure A.4-164

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	SL0639	CU-1-1	10-12	trm	12/26/18	njh	2/5/19	309154-CU-1-1n.dat
●	SL0639	CU-1-2	10-12	trm	12/26/18	njh	2/5/19	309154-CU-1-2n.dat
▲	SL0639	CU-1-3	10-12	trm	12/26/18	njh	2/5/19	309154-CU-1-3n.dat

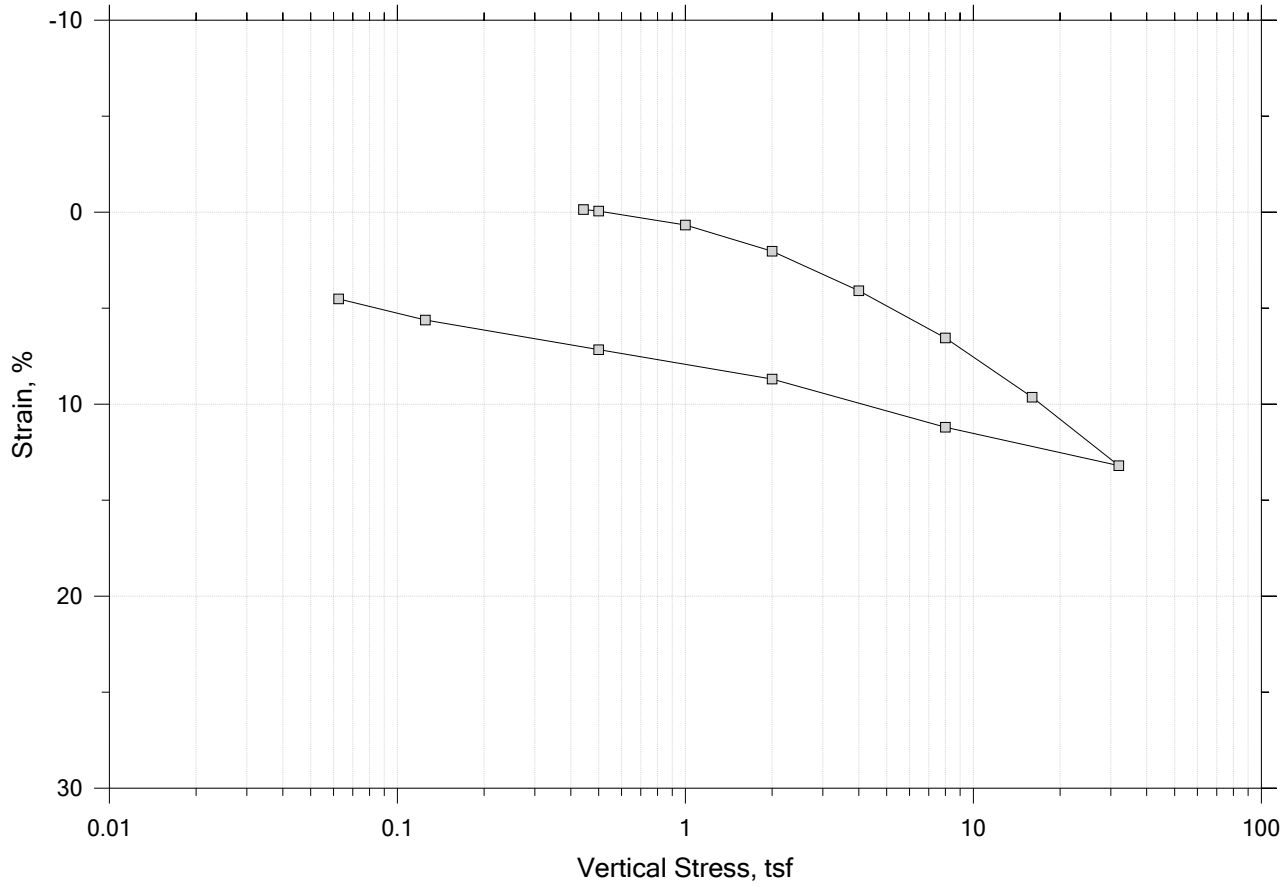
GeoTesting EXPRESS

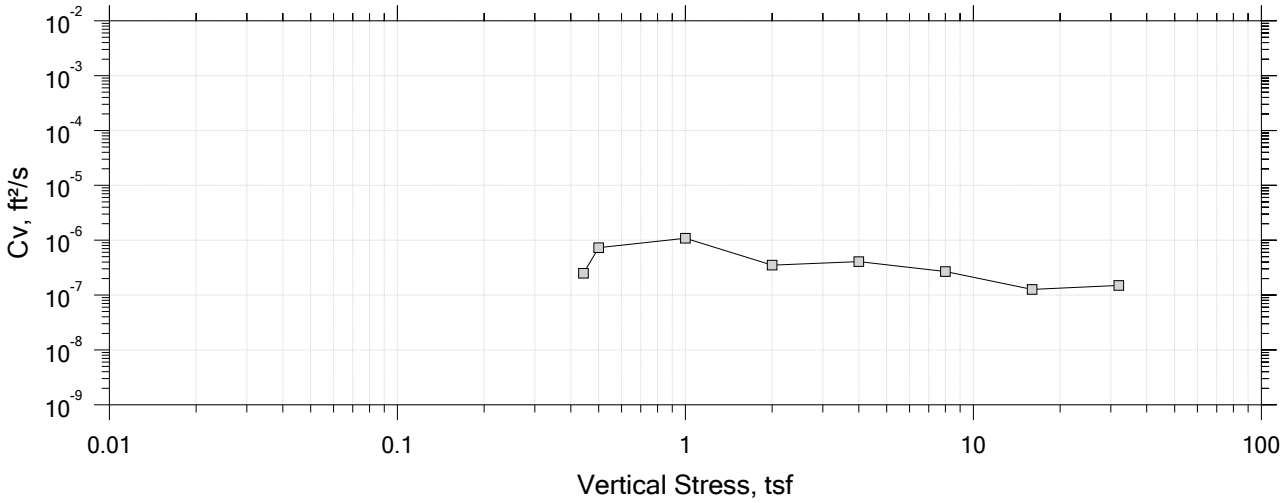
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB034	Sample Type: intact	
Description: Moist, gray sand with clay and shells		
Remarks: System Q		

Attachment Figure A.4-165

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





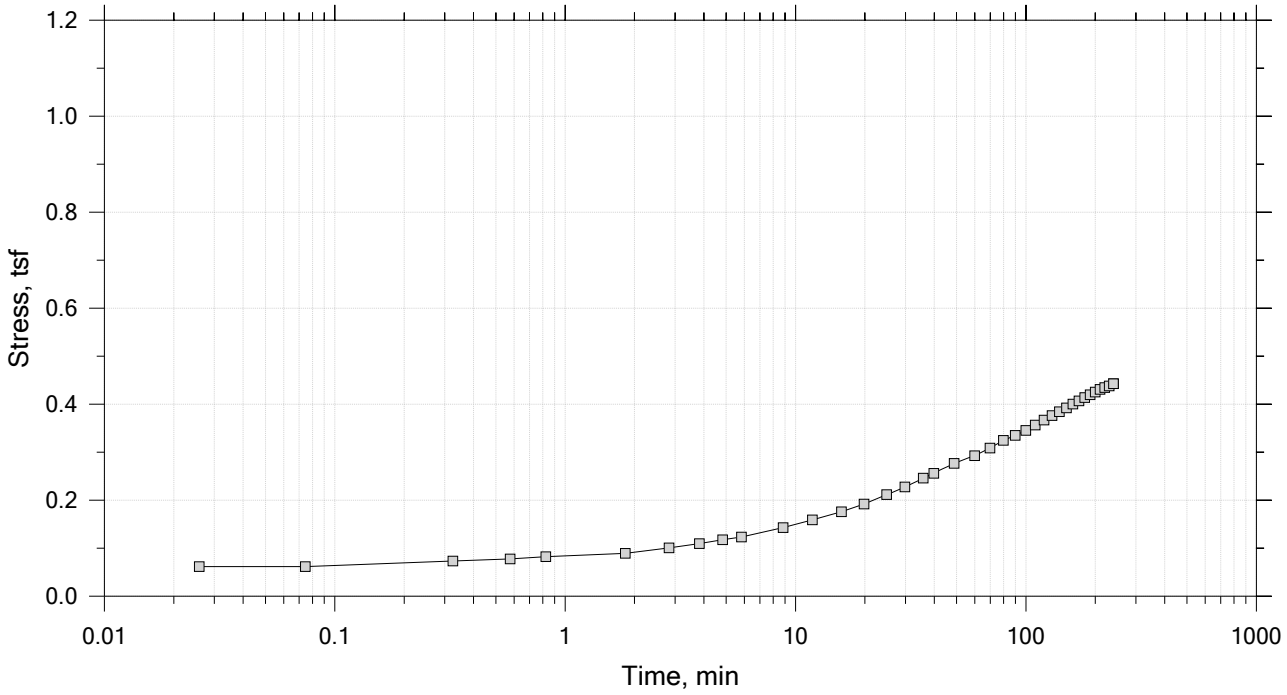
GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		
	Displacement at End of Increment		

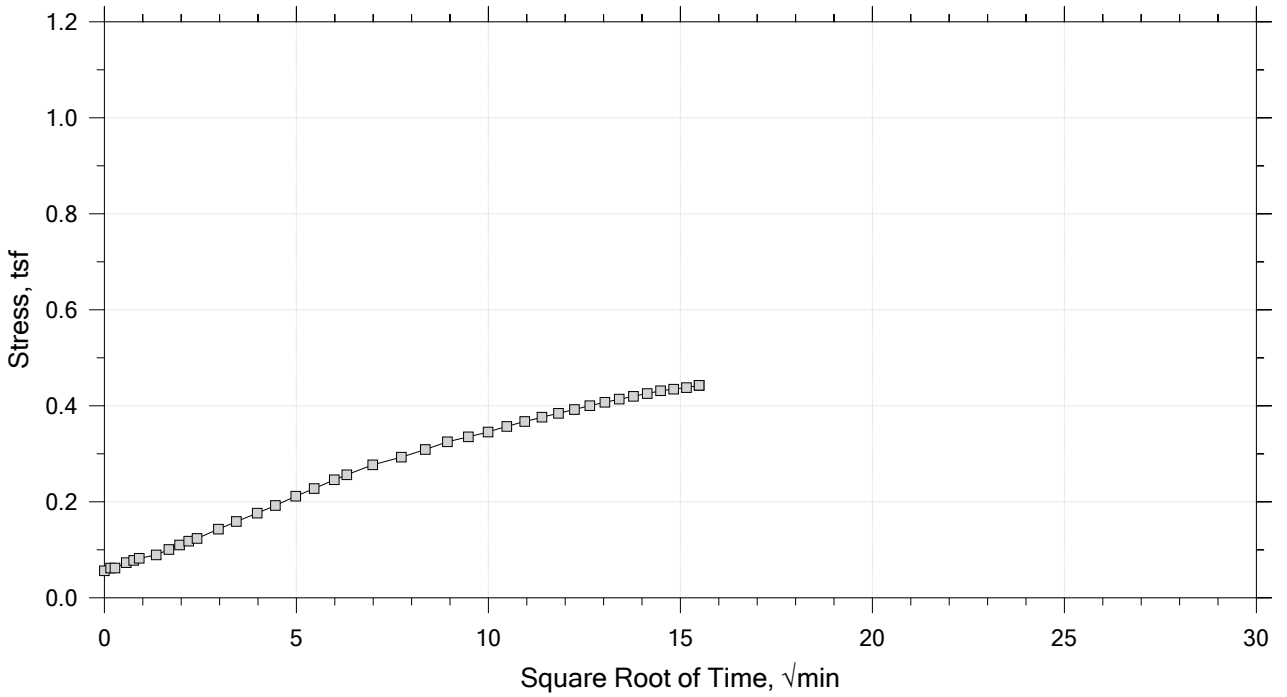
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 13

Constant Volume Step

Stress: 0.443 tsf





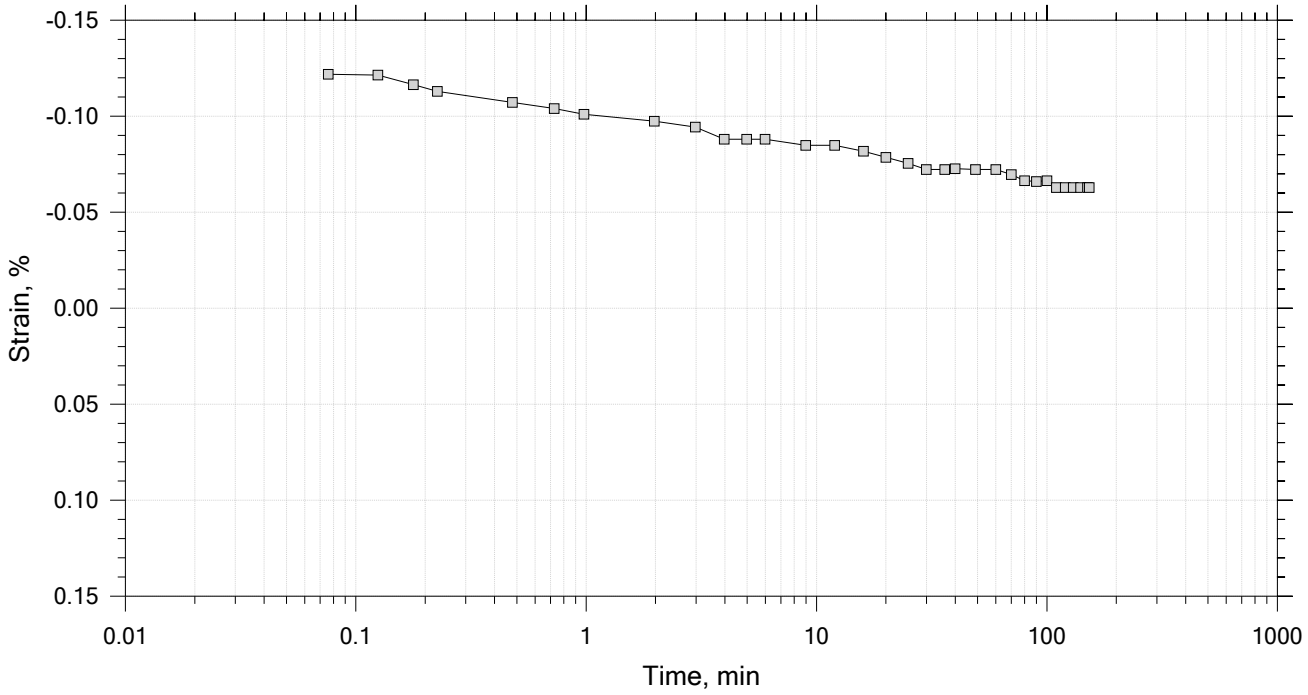
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

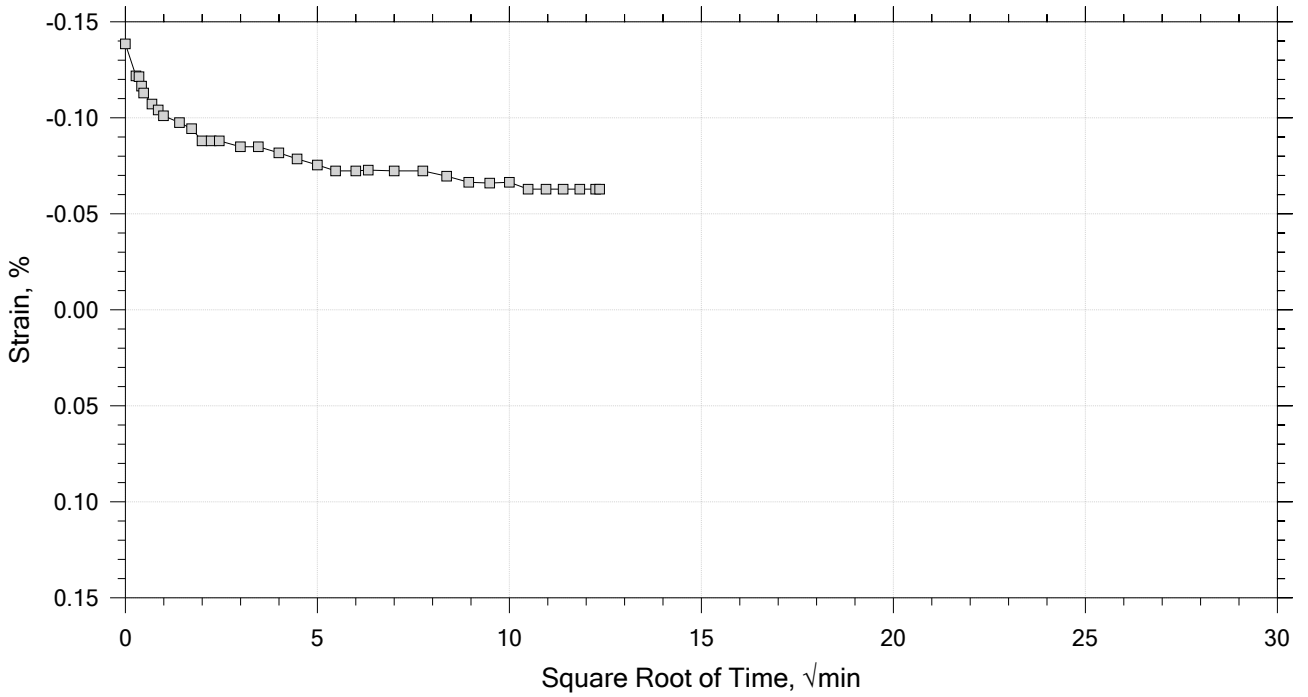
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 13

Constant Load Step

Stress: 0.5 tsf





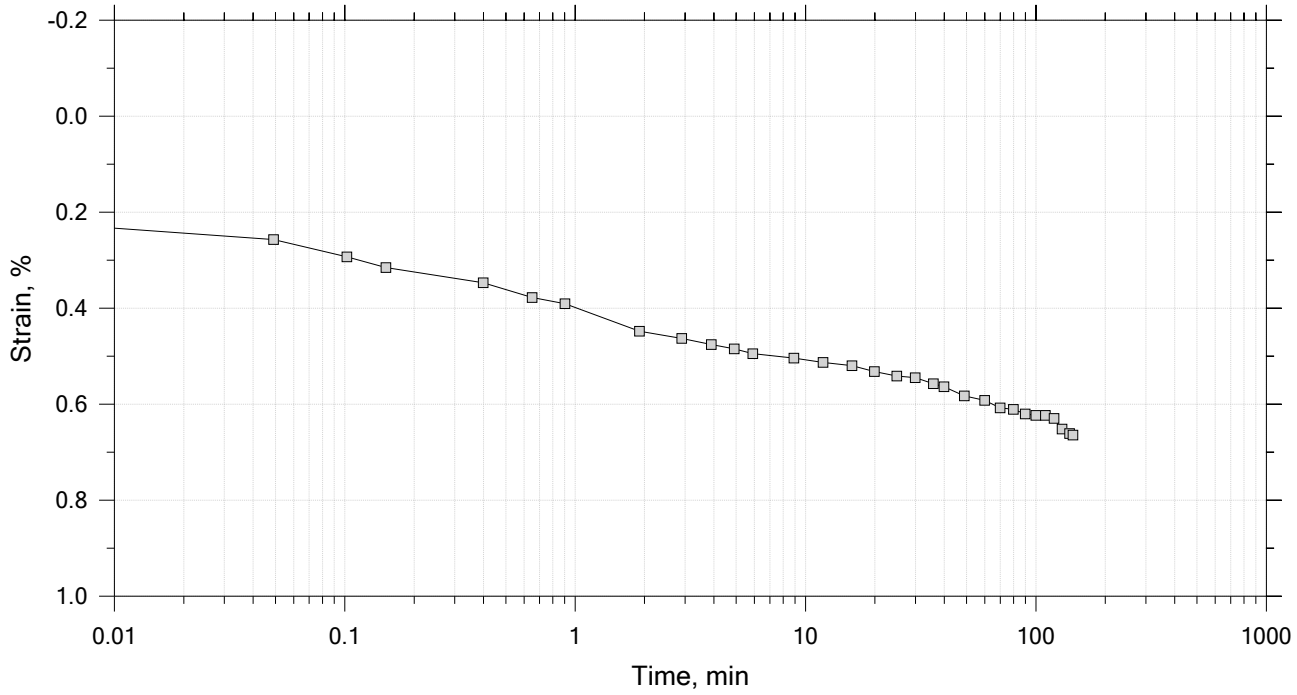
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

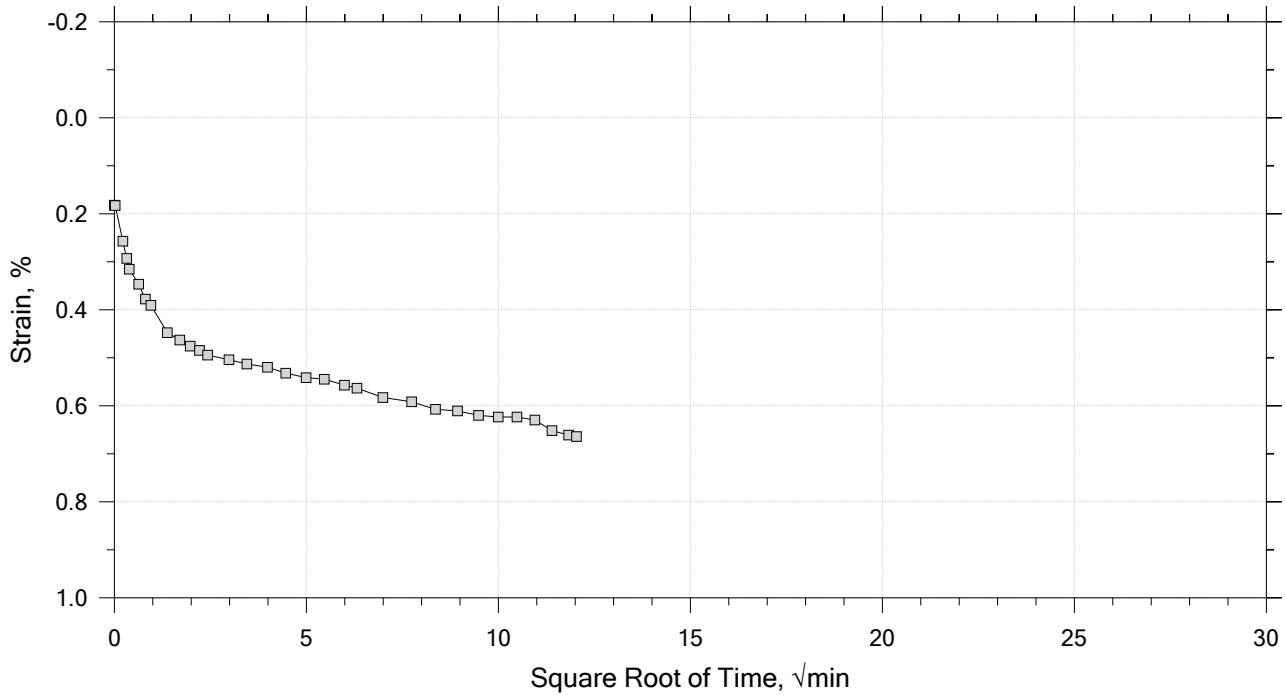
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 13

Constant Load Step

Stress: 1 tsf

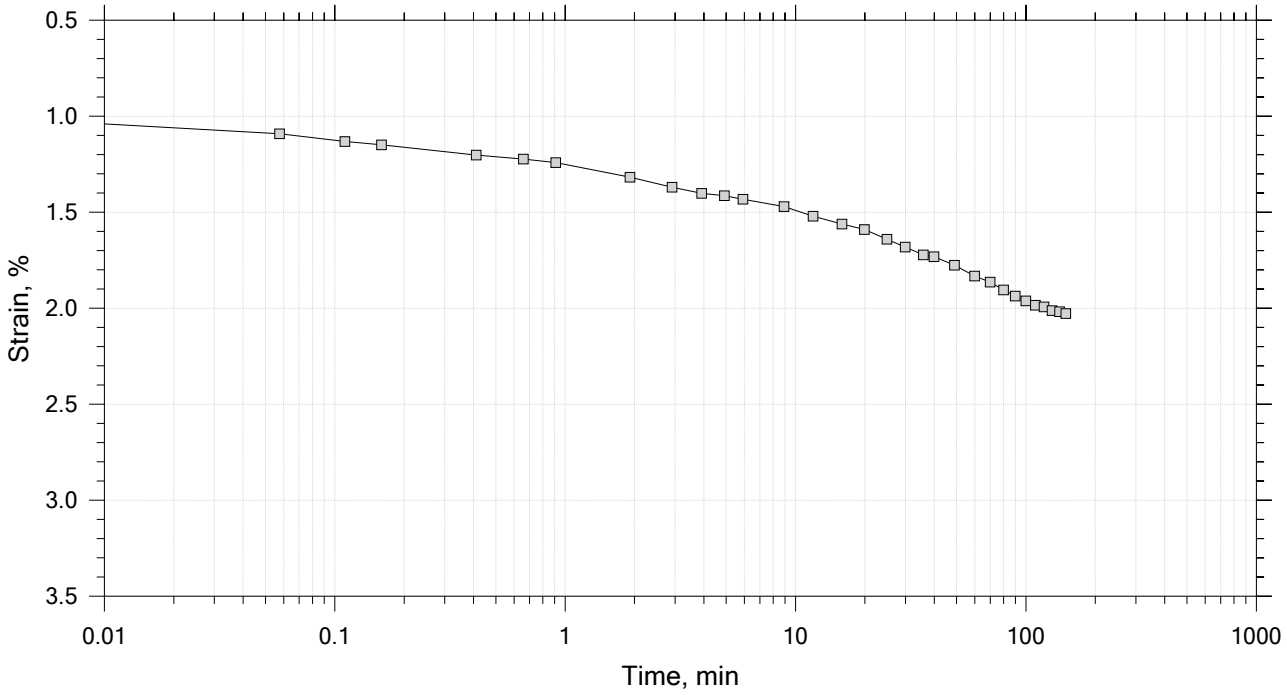


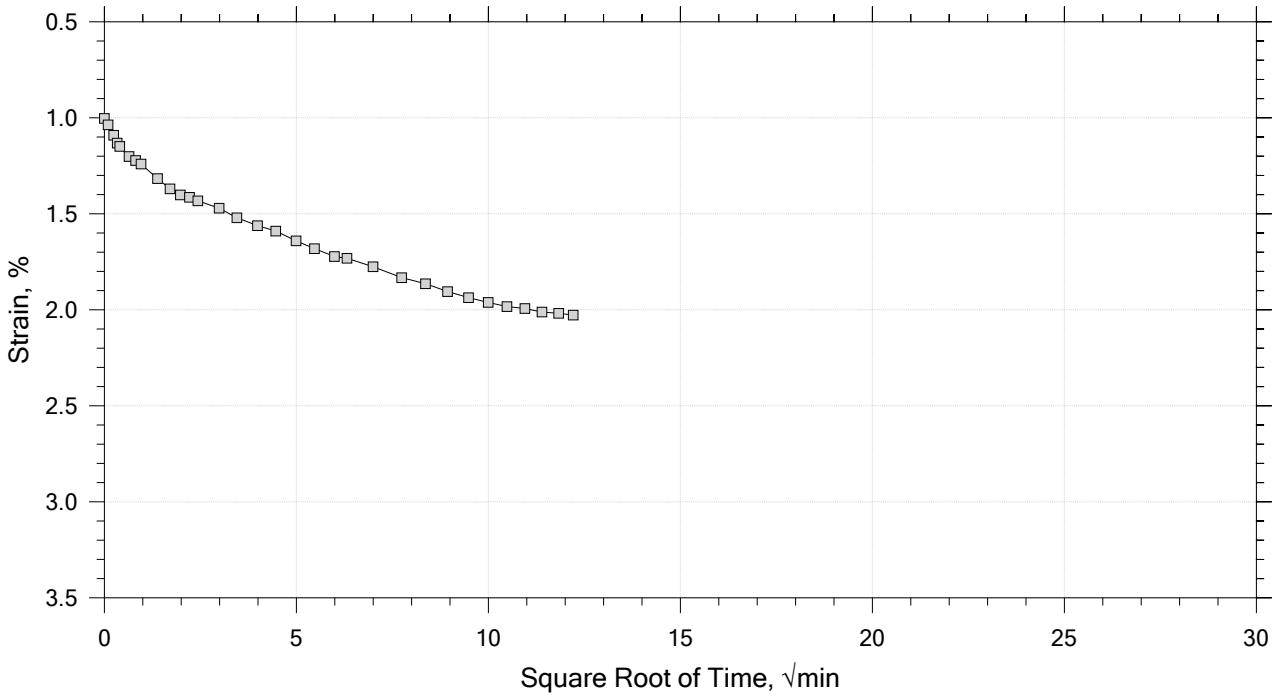


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 13
Constant Load Step
Stress: 2 tsf

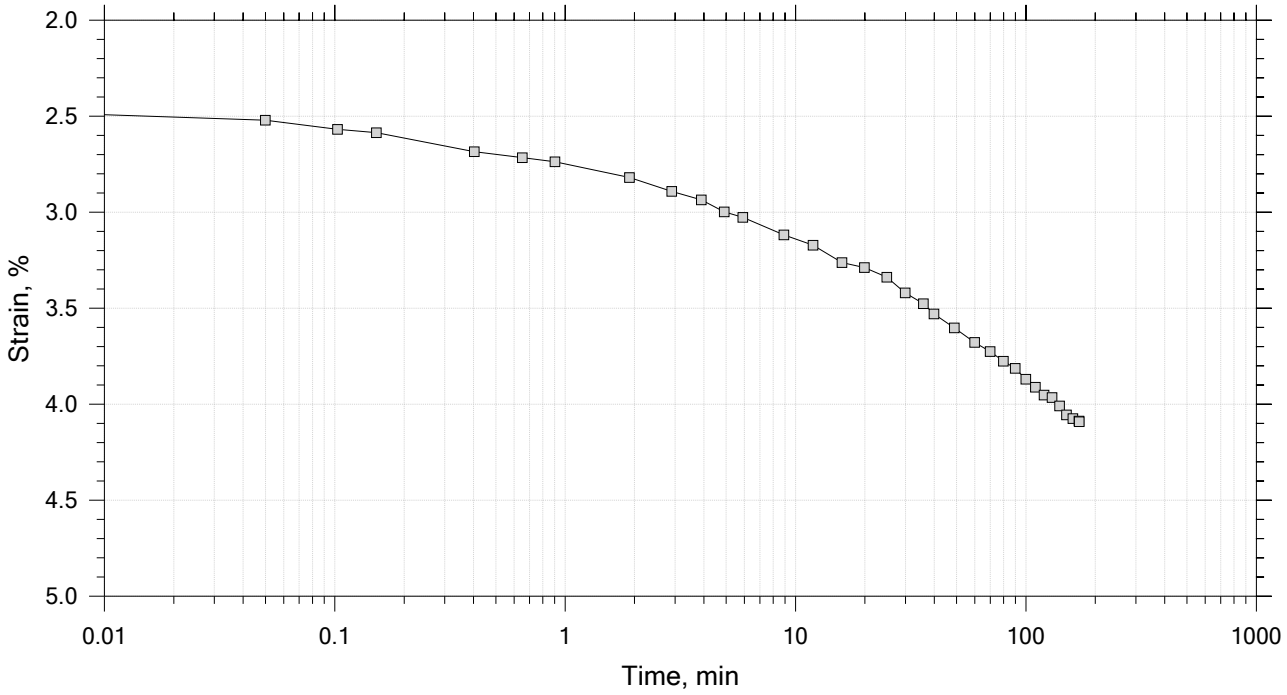


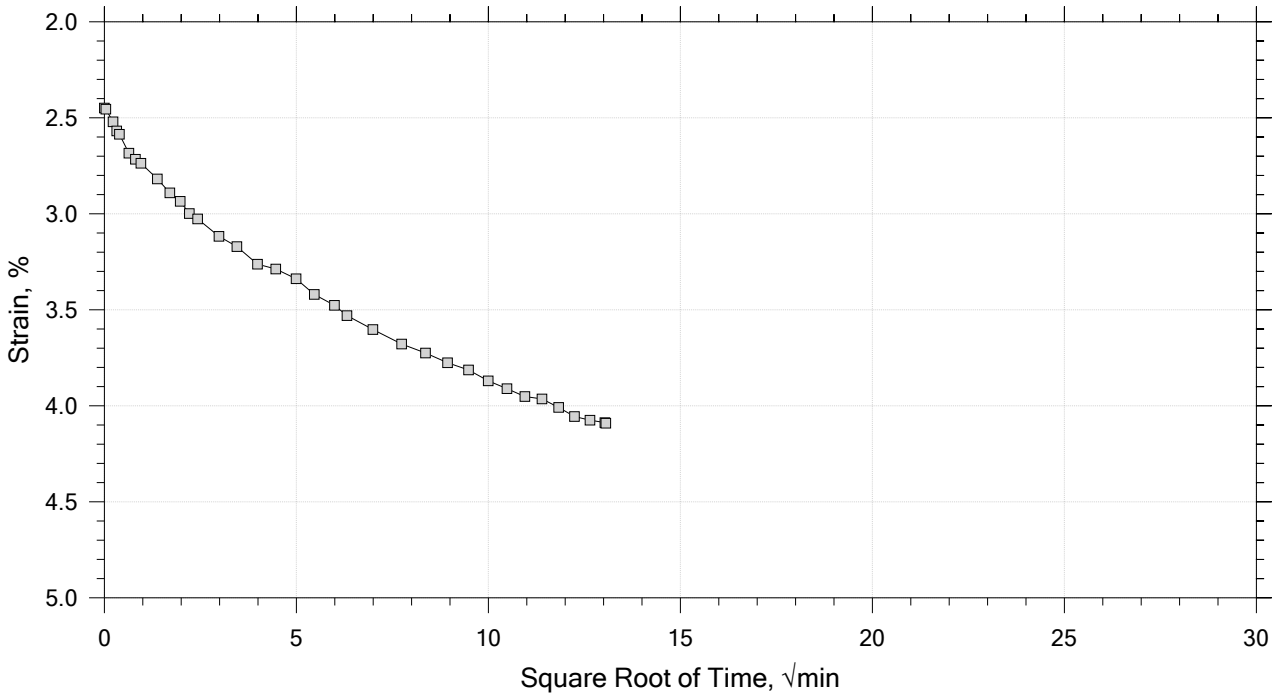


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 13
Constant Load Step
Stress: 4 tsf





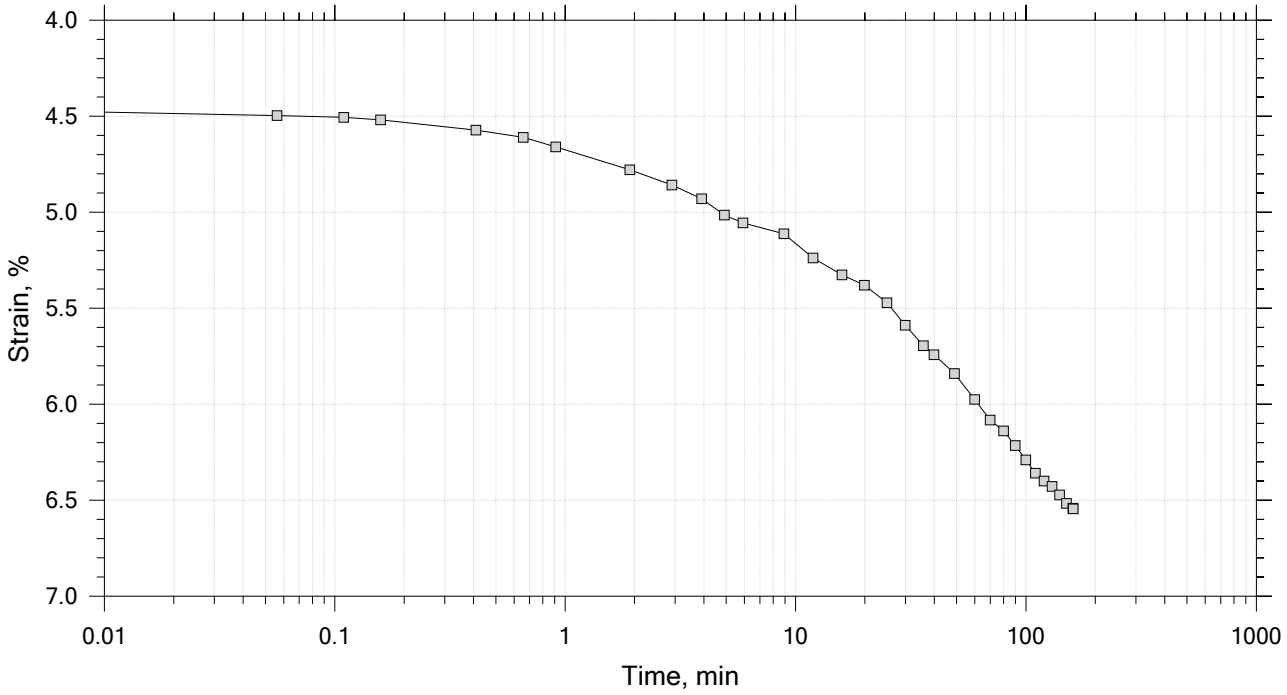
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

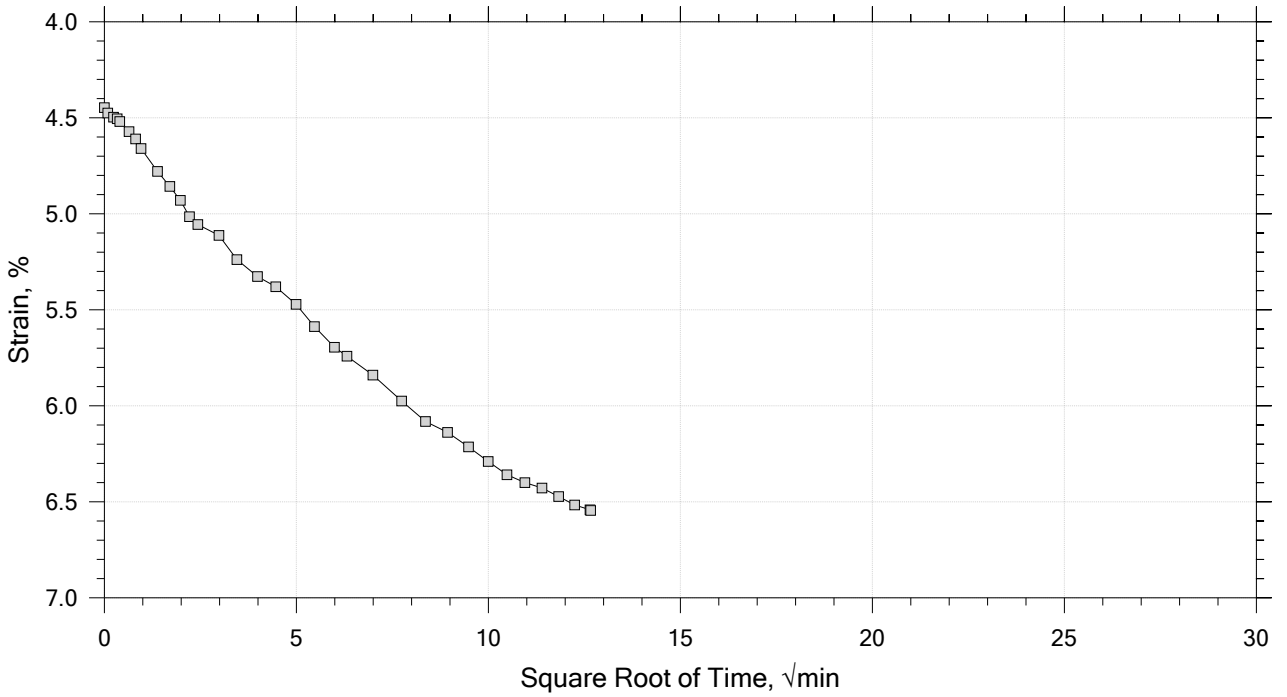
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 13

Constant Load Step

Stress: 8 tsf





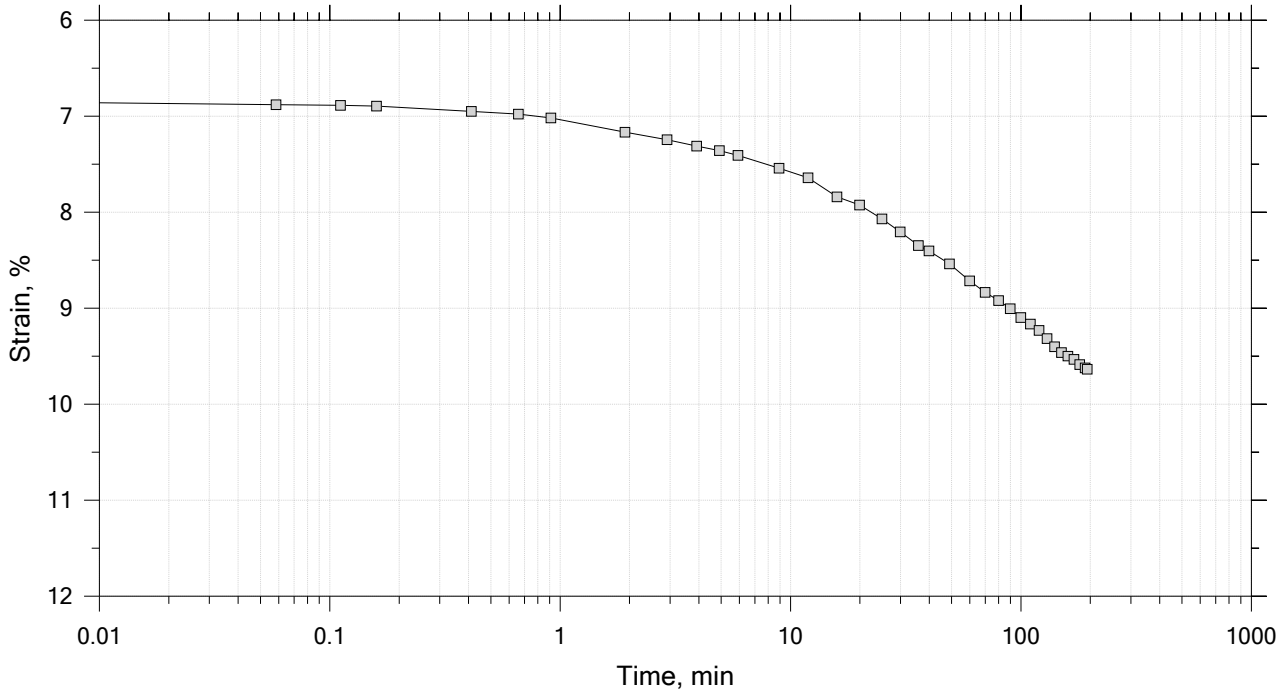
GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

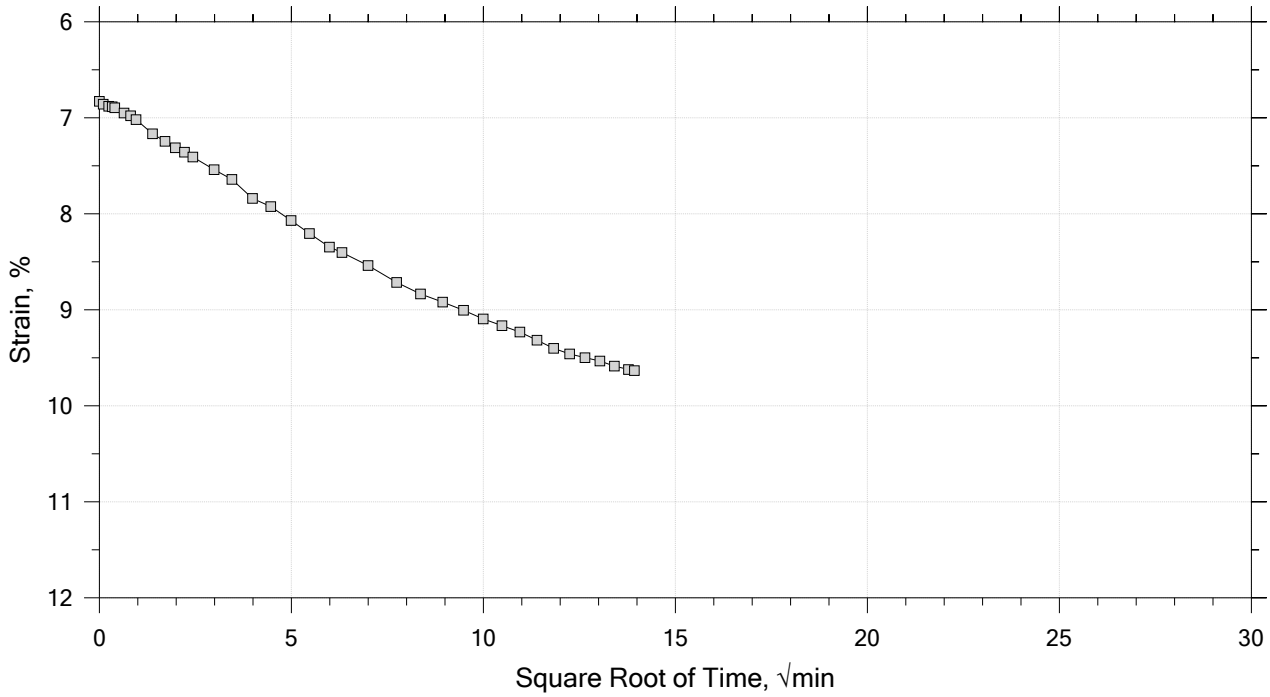
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 13

Constant Load Step

Stress: 16 tsf

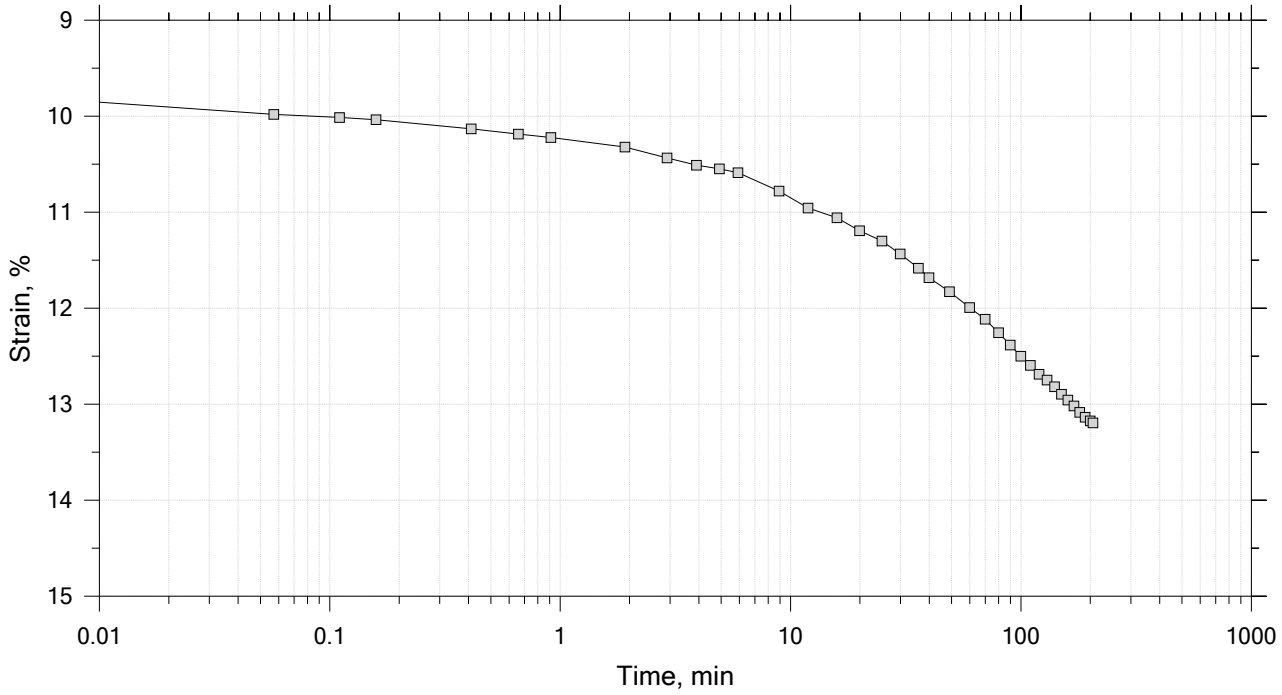


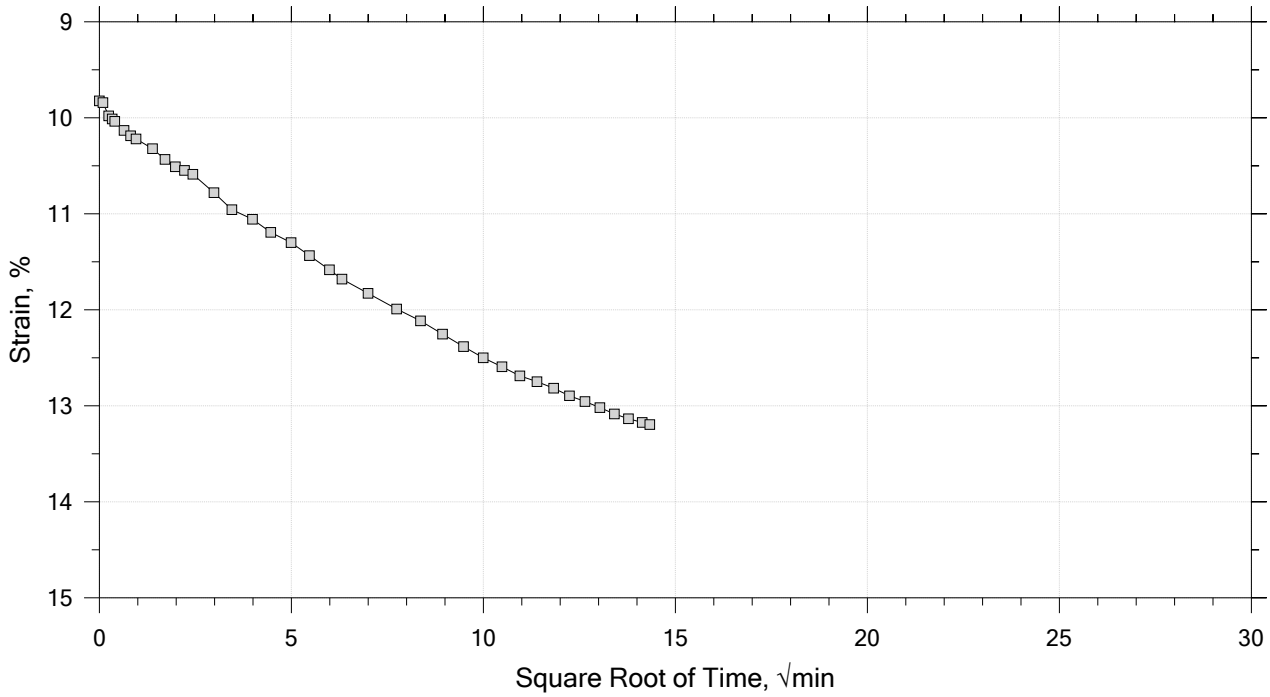


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 13
Constant Load Step
Stress: 32 tsf

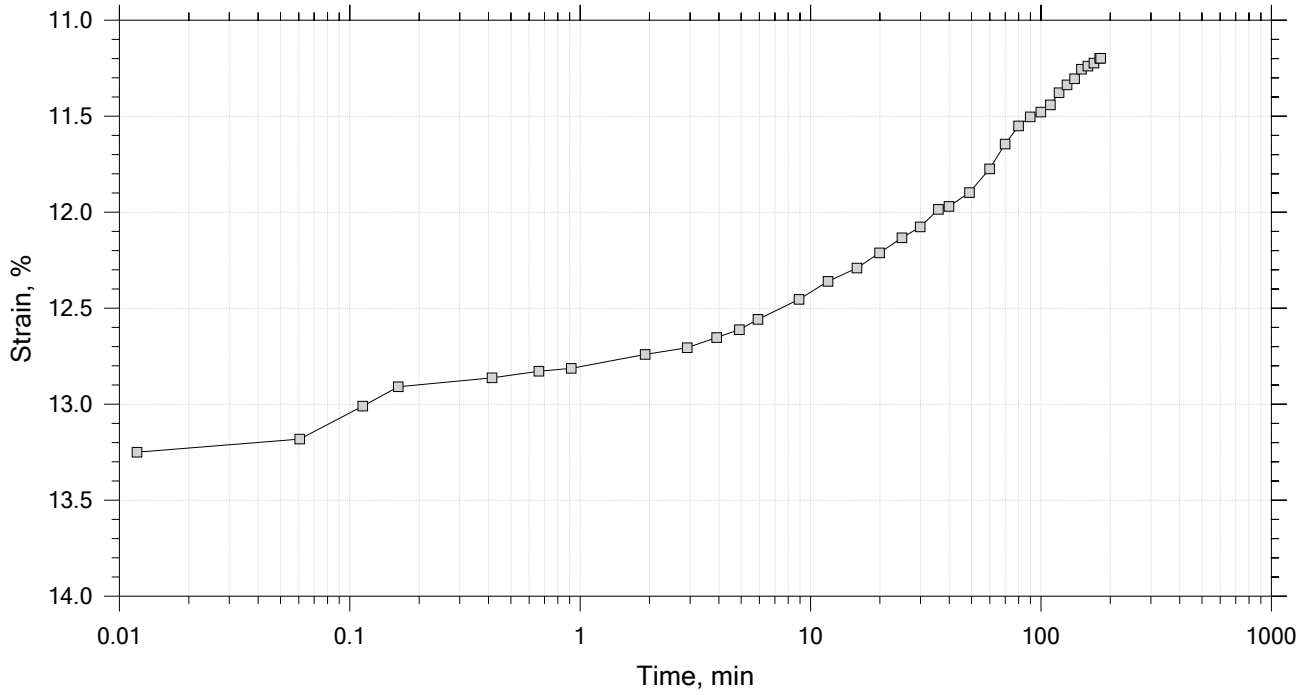


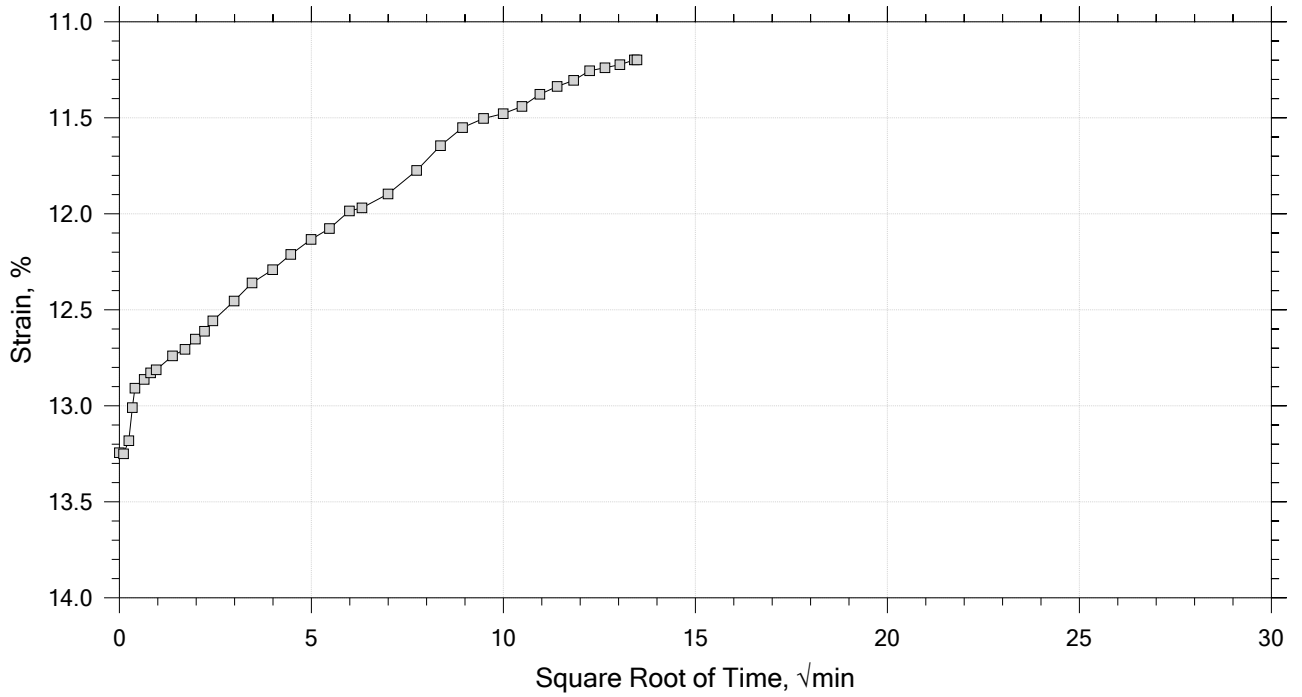


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 13
Constant Load Step
Stress: 8 tsf

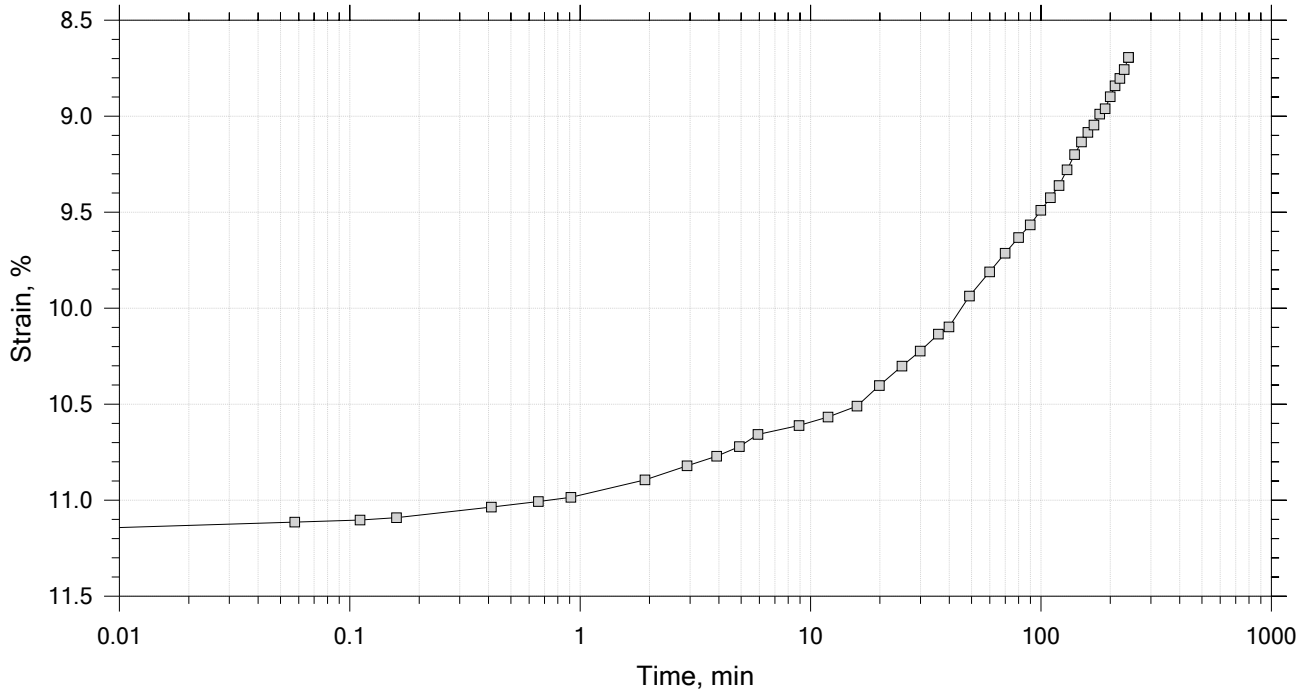


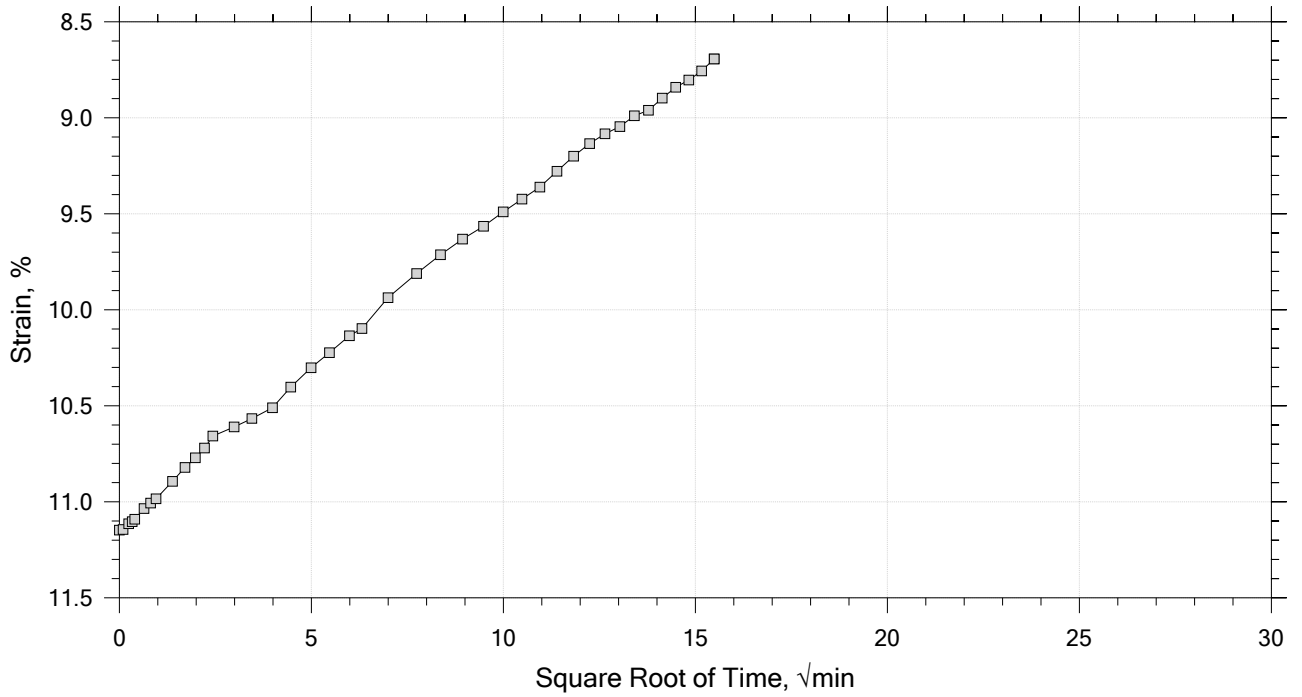


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 13
Constant Load Step
Stress: 2 tsf

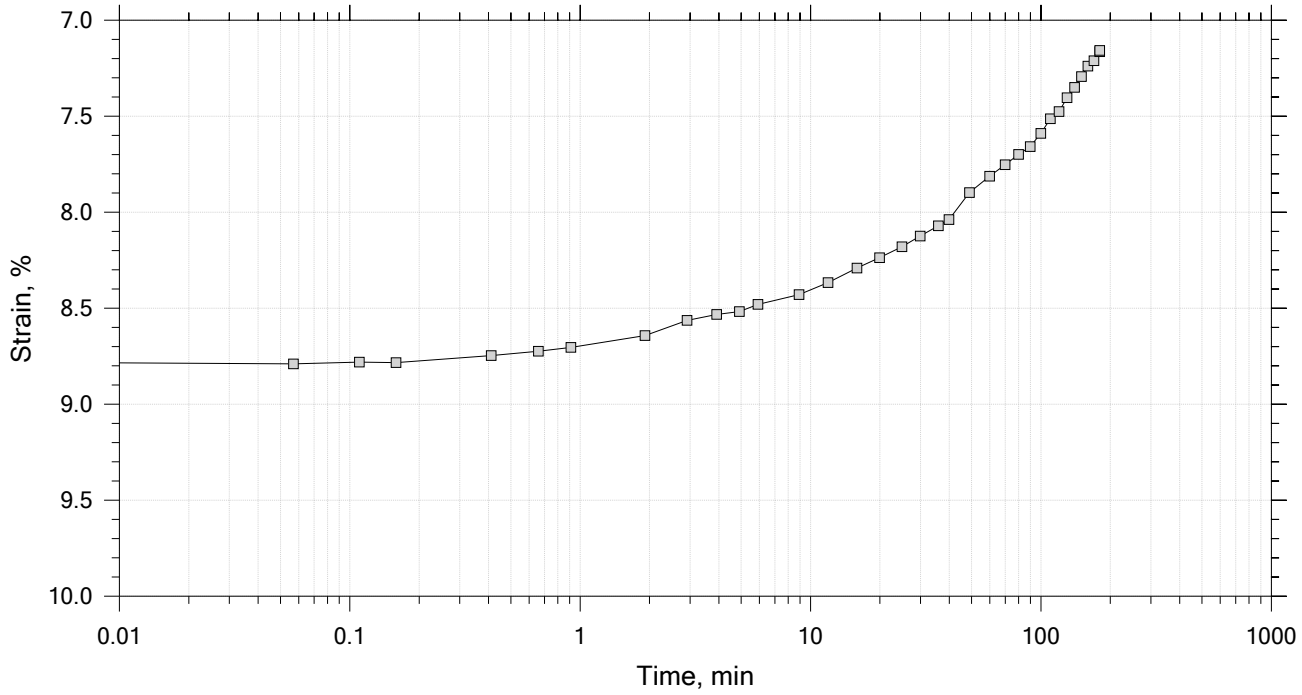


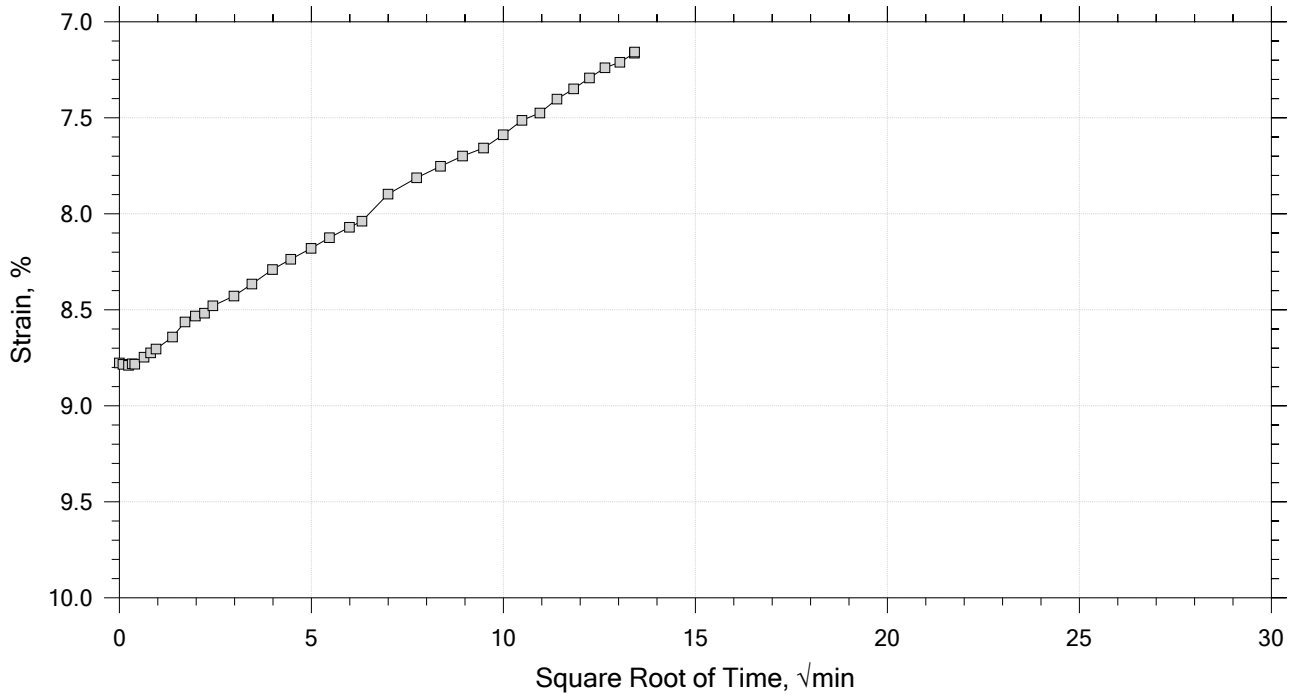


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 13
Constant Load Step
Stress: 0.5 tsf

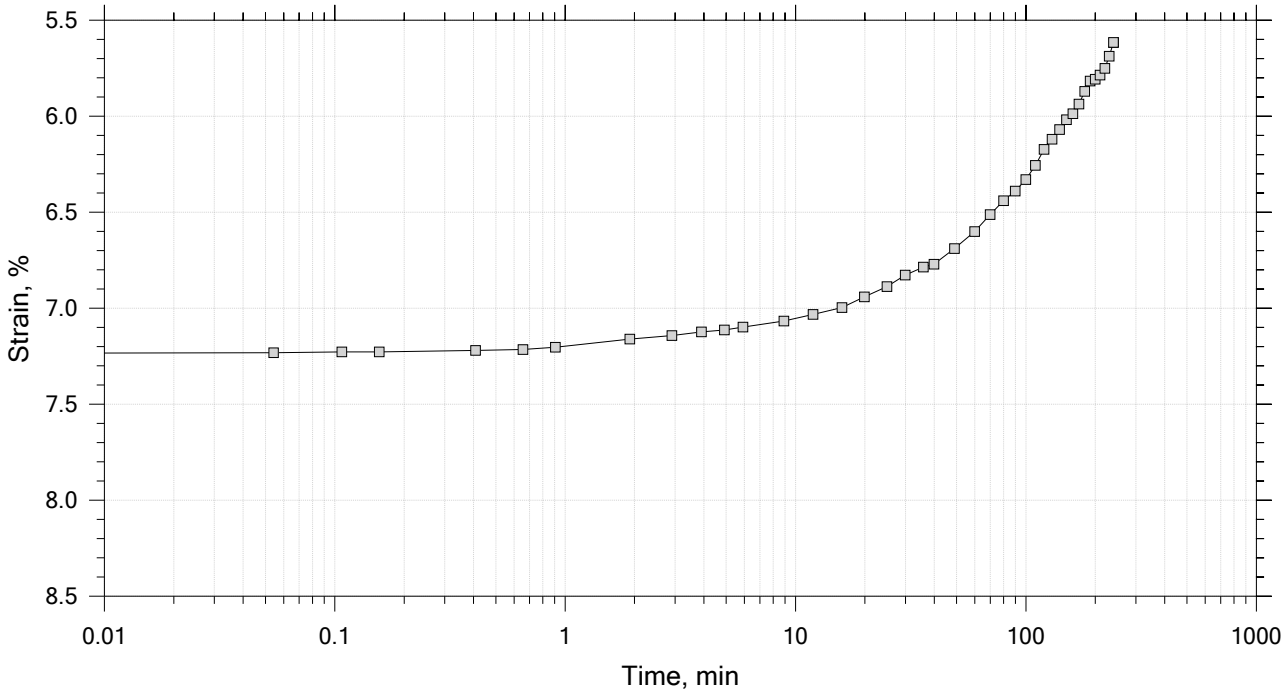


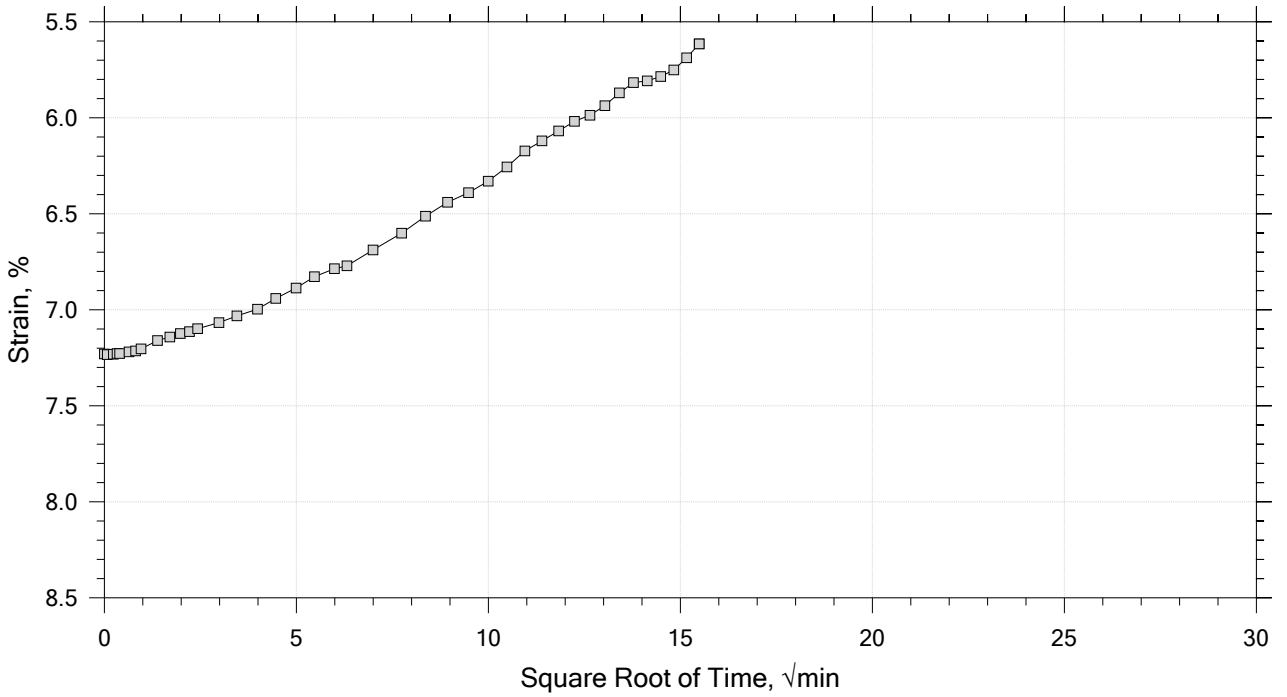


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 13
Constant Load Step
Stress: 0.125 tsf

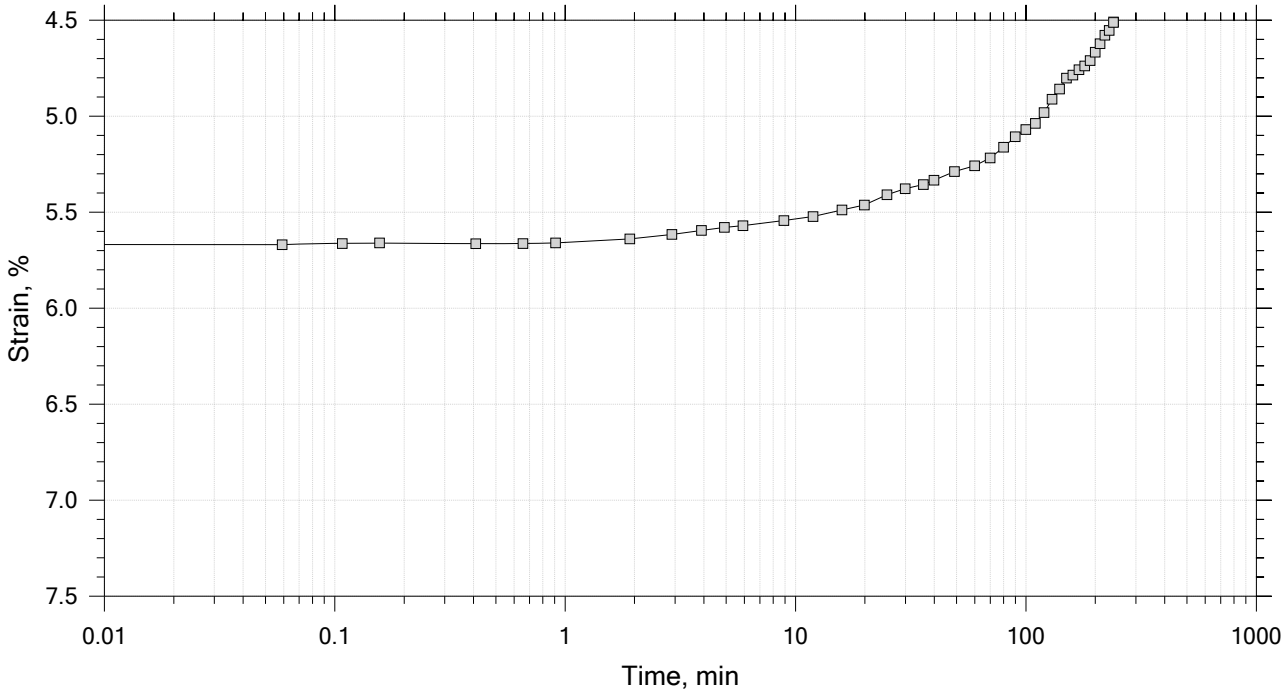


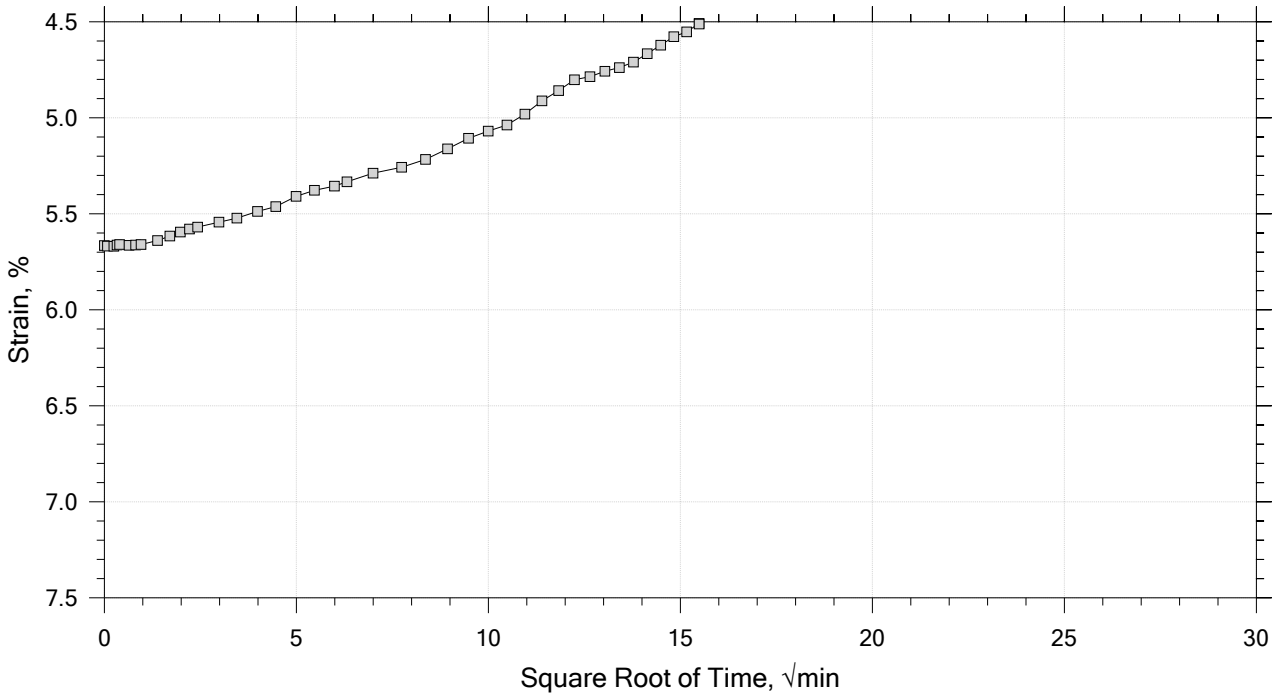


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 13
Constant Load Step
Stress: 0.0625 tsf





GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.81	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.918	Plastic Limit: ---
Final Height: 0.95 in	Final Void Ratio: 0.822	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-1367	RING		D2620
Mass Container, gm	8.21	107.89	107.89	8.28
Mass Container + Wet Soil, gm	195.96	263.43	260.38	162.37
Mass Container + Dry Soil, gm	153.75	225.9	225.9	127.53
Mass Dry Soil, gm	145.54	118.01	118.01	119.25
Water Content, %	29.00	31.80	29.22	29.22
Void Ratio	---	0.92	0.82	---
Degree of Saturation, %	---	97.48	100.00	---
Dry Unit Weight, pcf	---	91.587	96.407	---

Warning: The change in the sample wet weight during the test is not consistent with the change in the moisture content.

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.443	-0.001474	0.921	-0.147	0.000	0.00e+00	-3.33e-03	-0.00e+00	0.00e+00
2	0.500	-0.0006285	0.919	-0.0628	0.000	0.00e+00	1.47e-02	0.00e+00	0.00e+00
3	1.00	0.006642	0.905	0.664	0.000	0.00e+00	1.45e-02	0.00e+00	0.00e+00
4	2.00	0.02028	0.879	2.03	0.000	0.00e+00	1.36e-02	0.00e+00	0.00e+00
5	4.00	0.04091	0.840	4.09	0.000	0.00e+00	1.03e-02	0.00e+00	0.00e+00
6	8.00	0.06545	0.792	6.55	0.000	0.00e+00	6.14e-03	0.00e+00	0.00e+00
7	16.0	0.09634	0.733	9.63	0.000	0.00e+00	3.86e-03	0.00e+00	0.00e+00
8	32.0	0.1320	0.665	13.2	0.000	0.00e+00	2.23e-03	0.00e+00	0.00e+00
9	8.00	0.1120	0.703	11.2	0.000	0.00e+00	8.32e-04	0.00e+00	0.00e+00
10	2.00	0.08693	0.751	8.69	0.000	0.00e+00	4.17e-03	0.00e+00	0.00e+00
11	0.500	0.07157	0.781	7.16	0.000	0.00e+00	1.02e-02	0.00e+00	0.00e+00
12	0.125	0.05615	0.810	5.62	0.000	0.00e+00	4.11e-02	0.00e+00	0.00e+00
13	0.0625	0.04512	0.831	4.51	0.000	0.00e+00	1.77e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB018	Tested By: md	Checked By: njh
Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
Test No.: IP-4	Sample Type: intact	Elevation: ---
Description: Moist, reddish brown clay		
Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

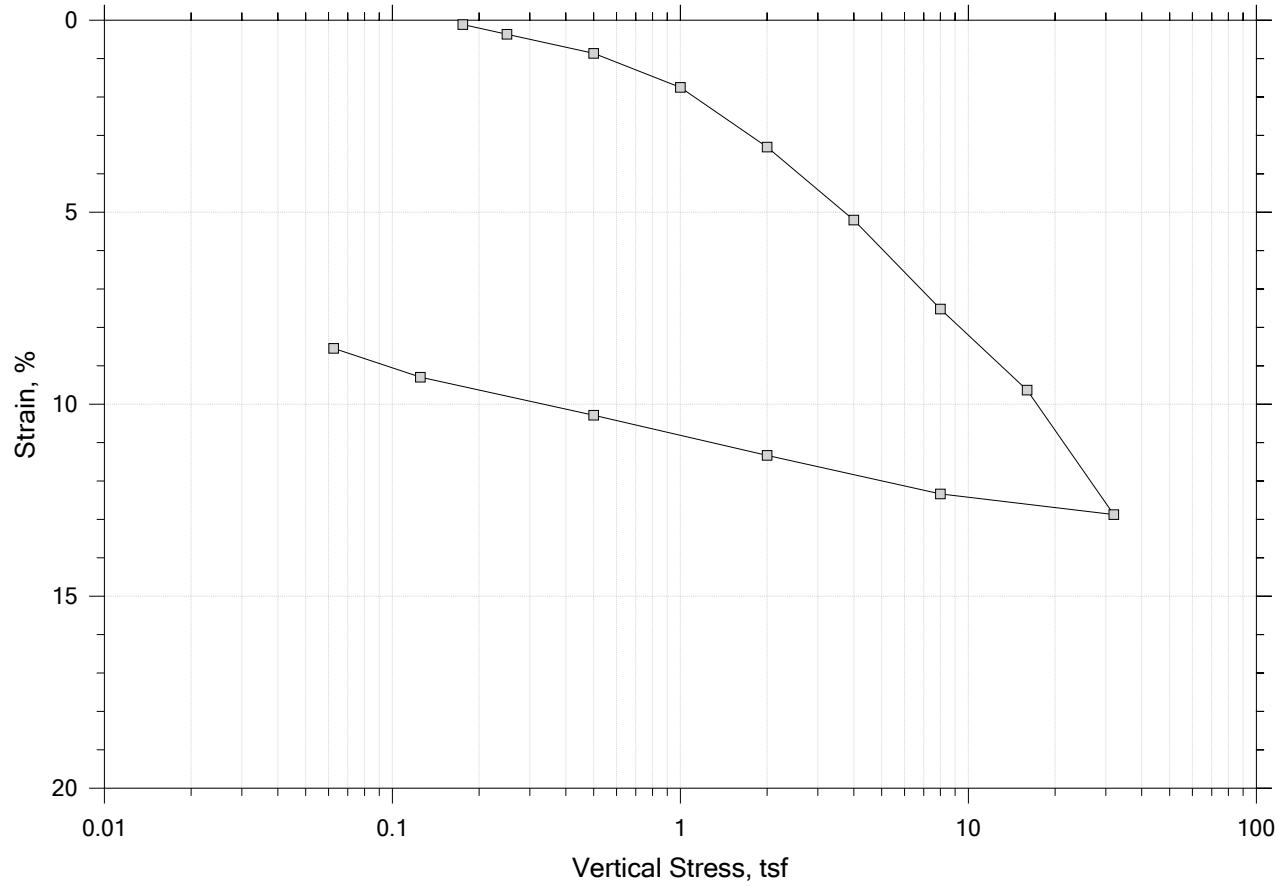
Square Root of Time Coefficients

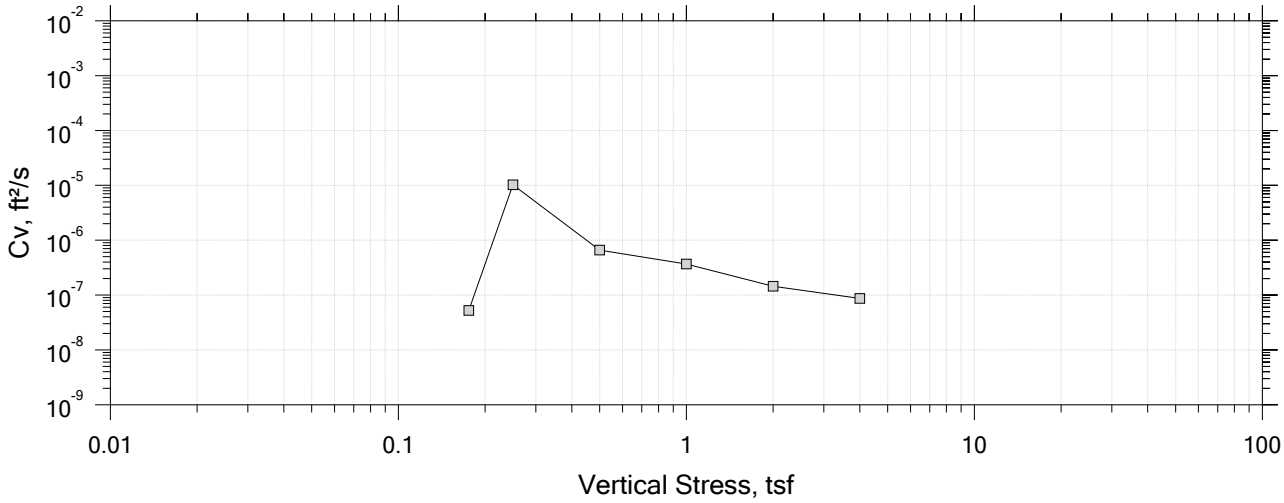
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.443	-0.001474	0.921	-0.147	89.042	2.76e-07	-3.33e-03	-2.48e-06
2	0.500	-0.0006285	0.919	-0.0628	29.471	8.34e-07	1.47e-02	3.31e-05
3	1.00	0.006642	0.905	0.664	25.071	9.73e-07	1.45e-02	3.82e-05
4	2.00	0.02028	0.879	2.03	63.686	3.75e-07	1.36e-02	1.38e-05
5	4.00	0.04091	0.840	4.09	54.943	4.20e-07	1.03e-02	1.17e-05
6	8.00	0.06545	0.792	6.55	68.357	3.22e-07	6.14e-03	5.33e-06
7	16.0	0.09634	0.733	9.63	167.241	1.24e-07	3.86e-03	1.29e-06
8	32.0	0.1320	0.665	13.2	117.365	1.64e-07	2.23e-03	9.85e-07
9	8.00	0.1120	0.703	11.2	86.170	2.20e-07	8.32e-04	4.93e-07
10	2.00	0.08693	0.751	8.69	205.876	9.67e-08	4.17e-03	1.09e-06
11	0.500	0.07157	0.781	7.16	136.653	1.52e-07	1.02e-02	4.20e-06
12	0.125	0.05615	0.810	5.62	0.000	0.00e+00	4.11e-02	0.00e+00
13	0.0625	0.04512	0.831	4.51	0.000	0.00e+00	1.77e-01	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB018	Tested By: md	Checked By: njh
	Sample No.: SL0868	Test Date: 01/09/19	Depth: 25-27 ft
	Test No.: IP-4	Sample Type: intact	Elevation: ---
	Description: Moist, reddish brown clay		
	Remarks: System LTIII-A, Swell Pressure = 0.443 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





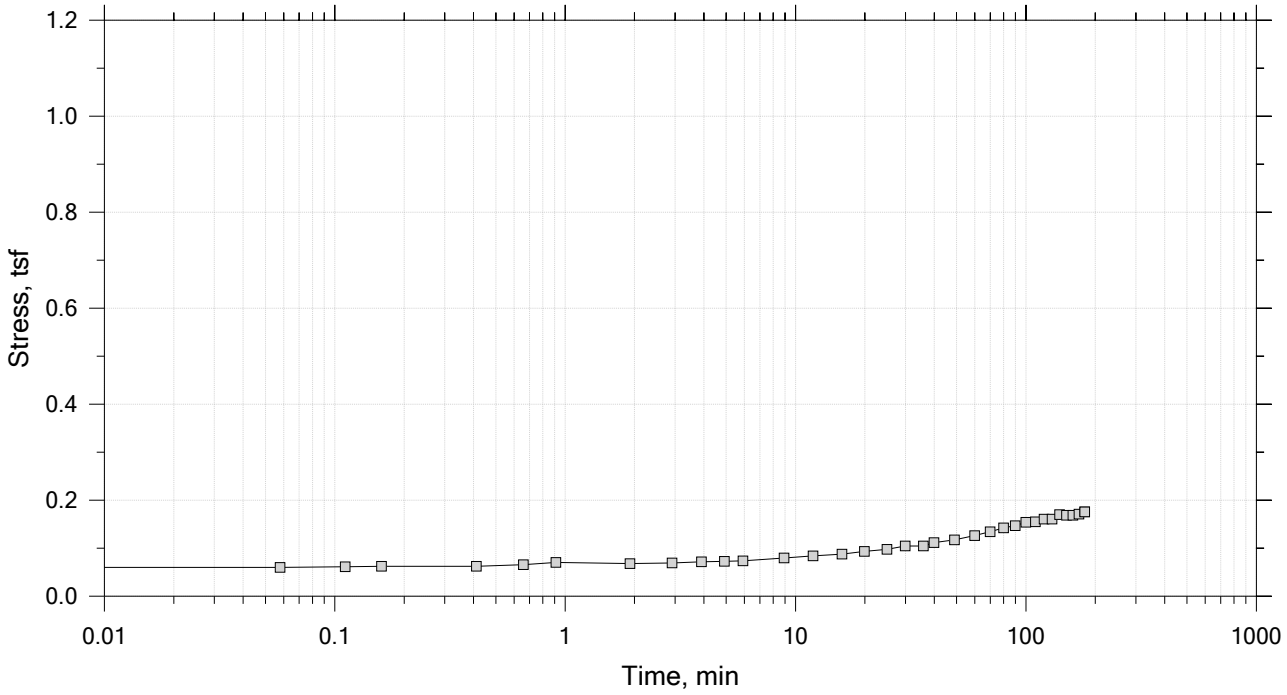
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		
	Displacement at End of Increment		

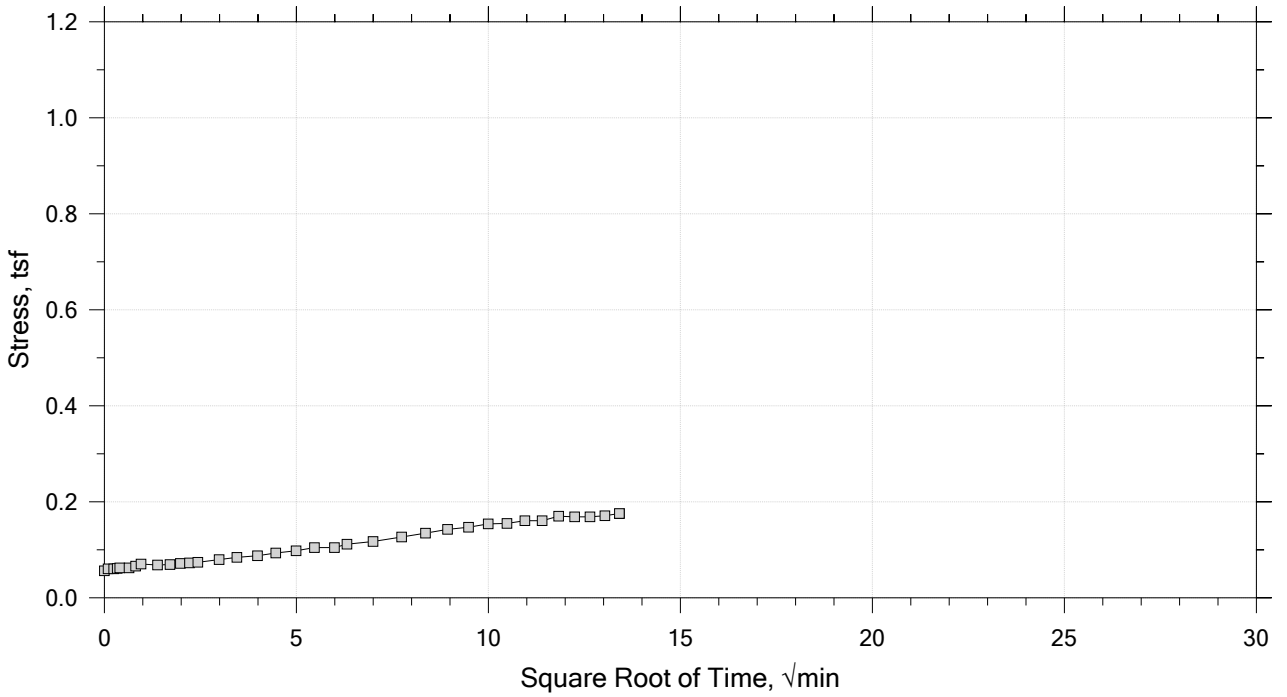
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 14

Constant Volume Step

Stress: 0.176 tsf

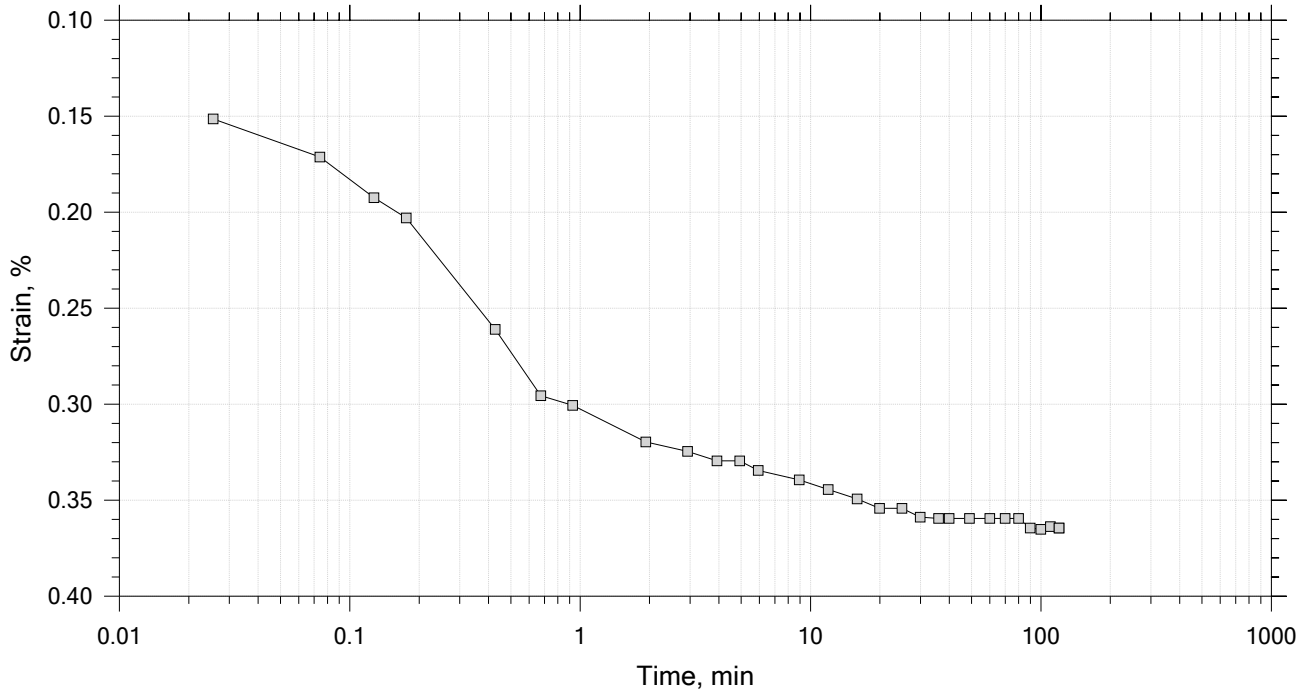


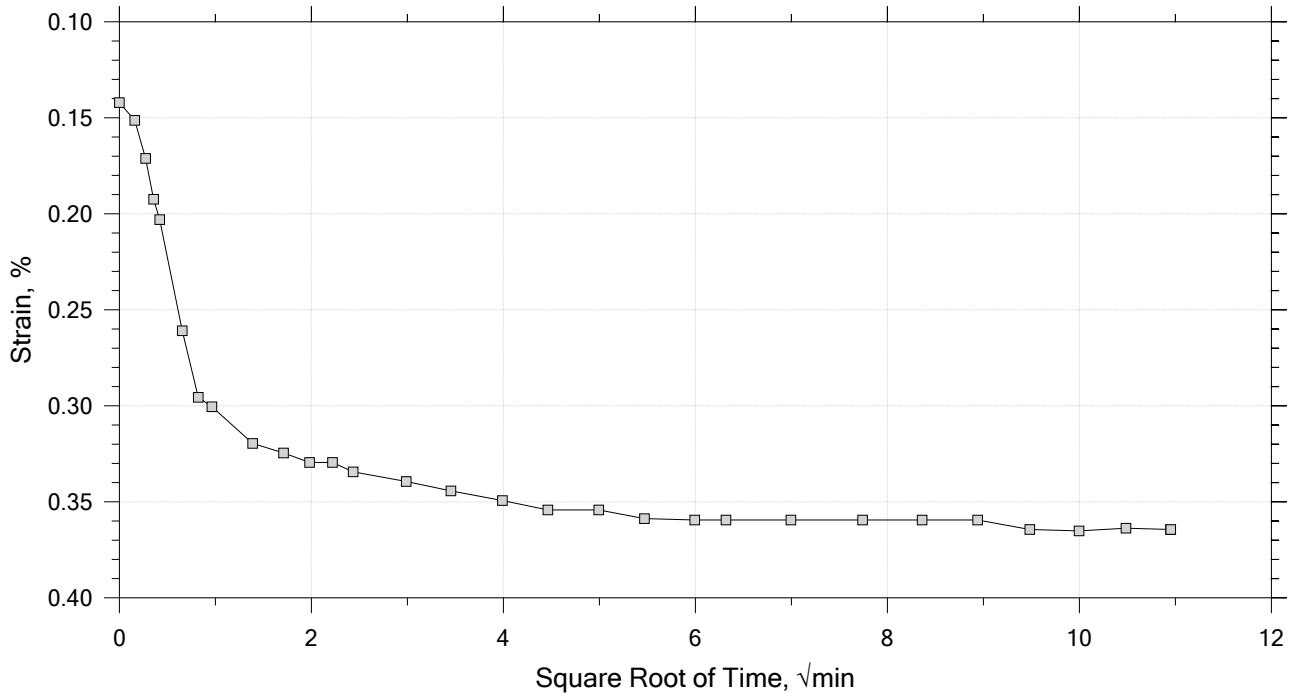


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 14
Constant Load Step
Stress: 0.25 tsf

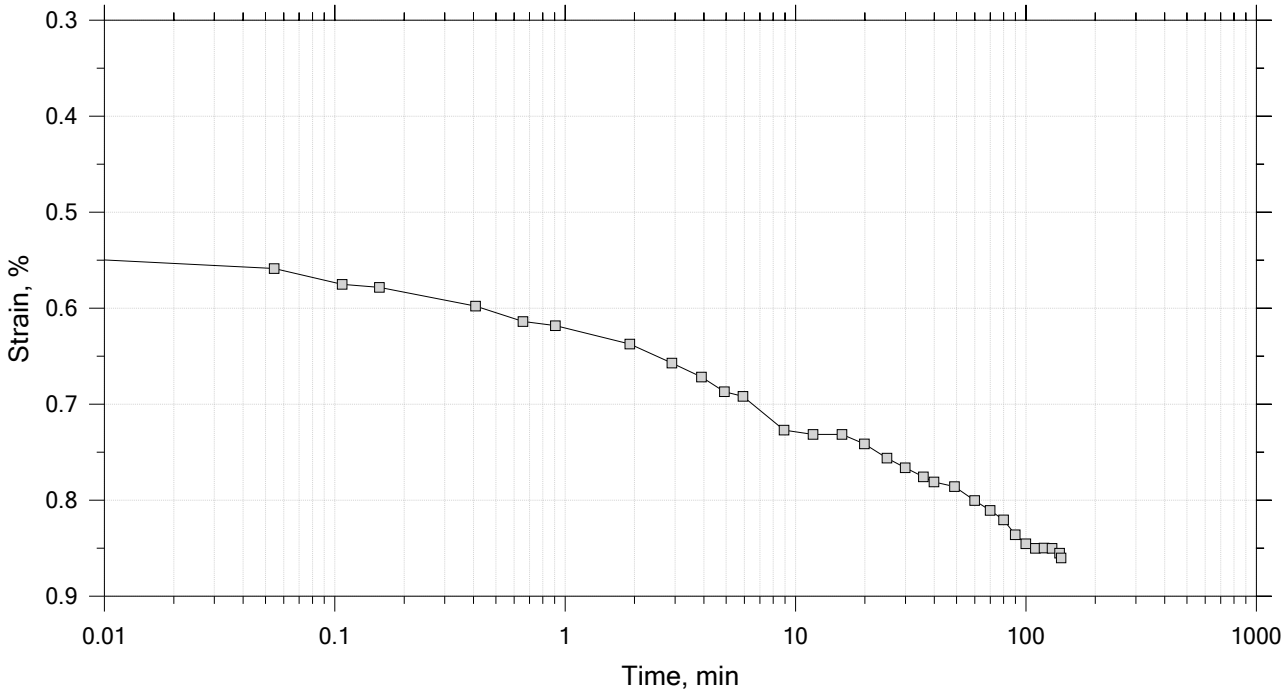


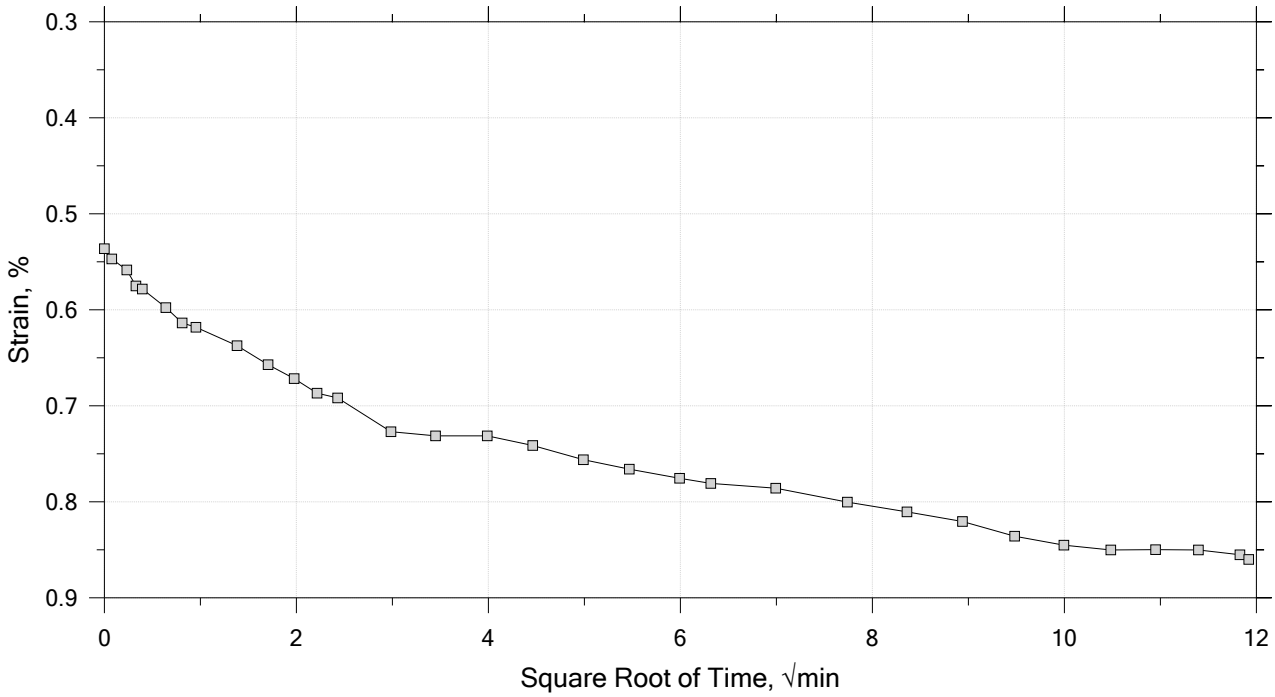


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 14
Constant Load Step
Stress: 0.5 tsf

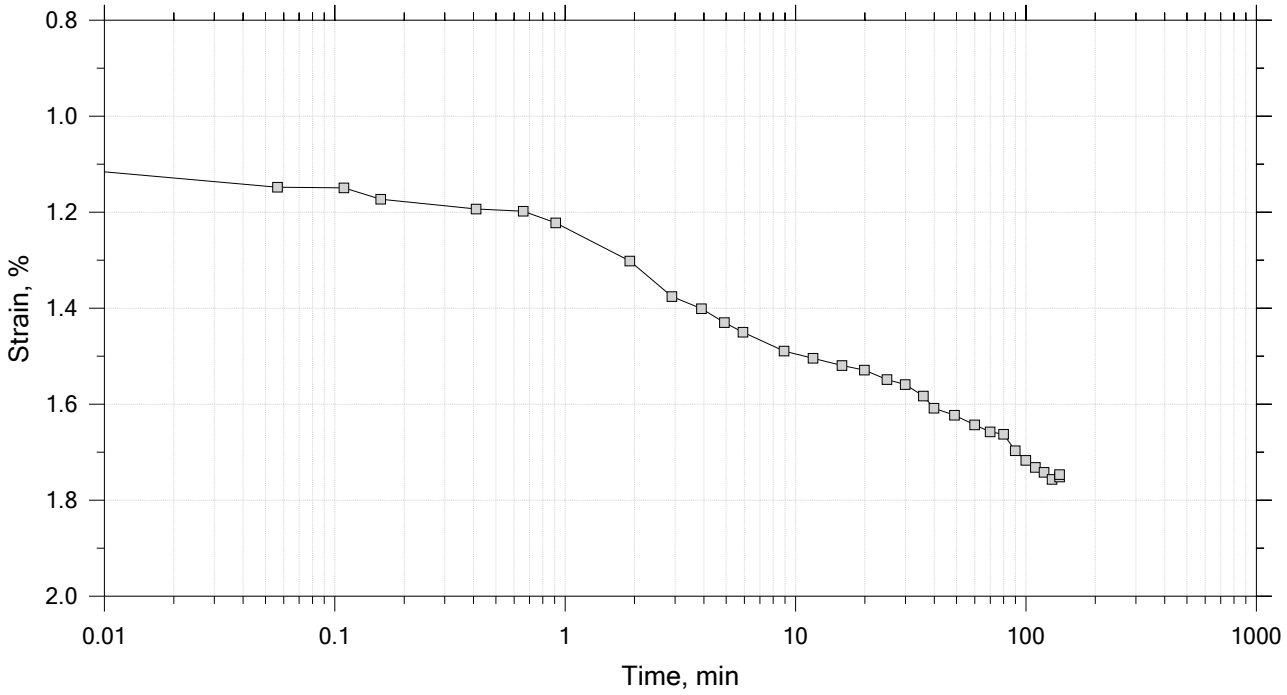


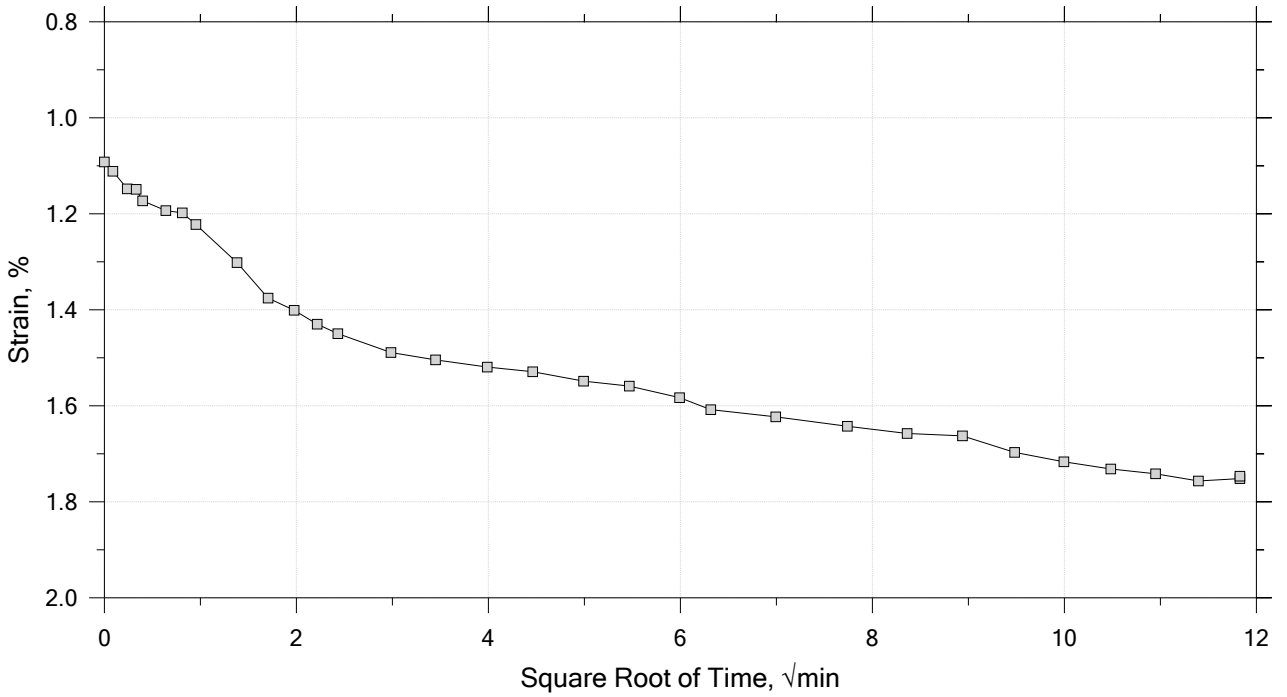


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 14
Constant Load Step
Stress: 1 tsf

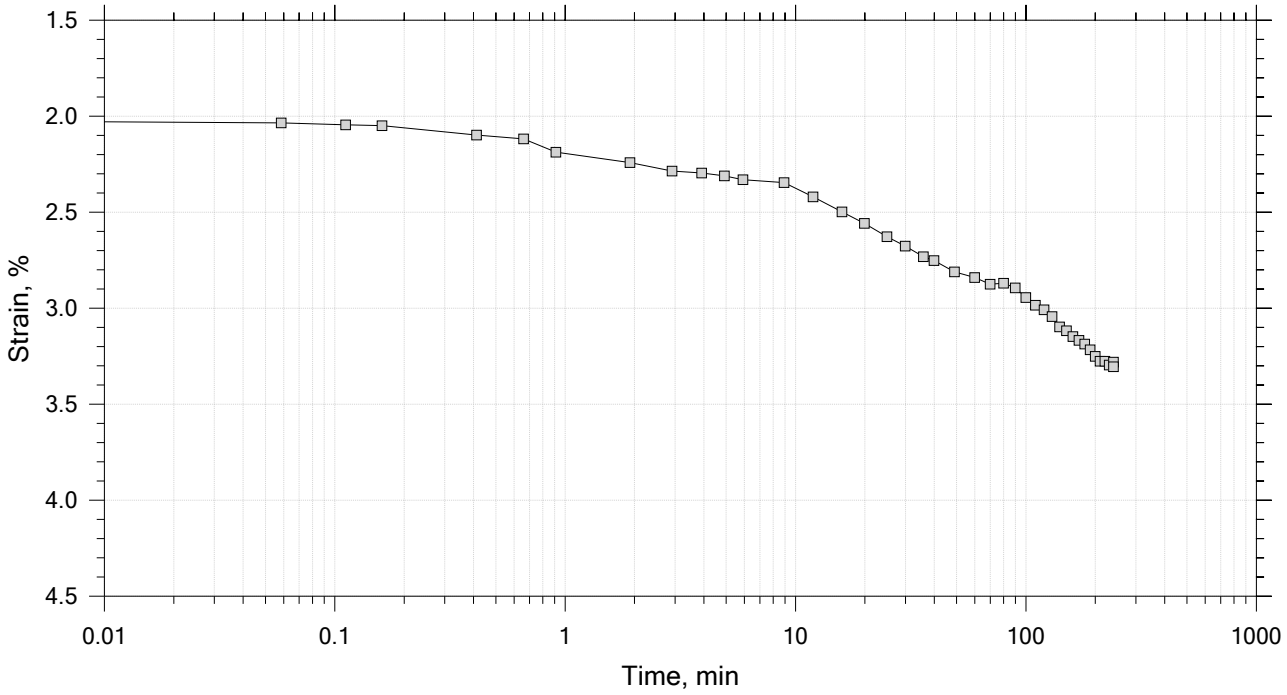


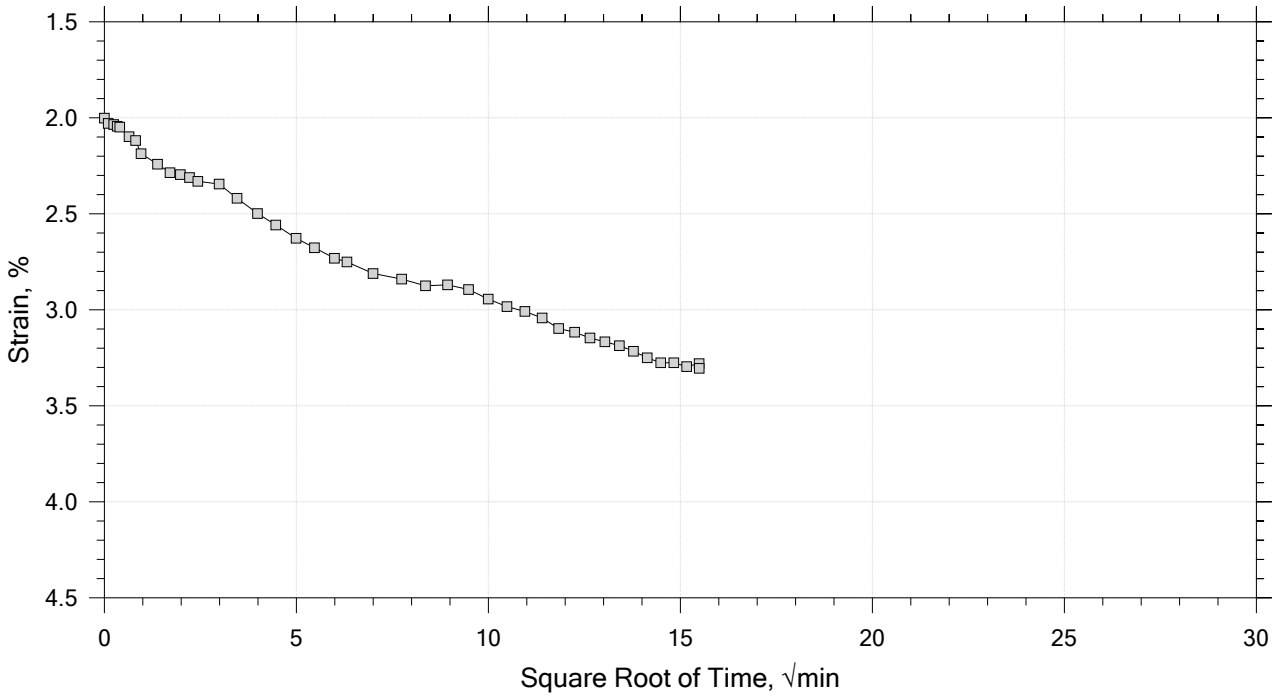


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 14
Constant Load Step
Stress: 2 tsf

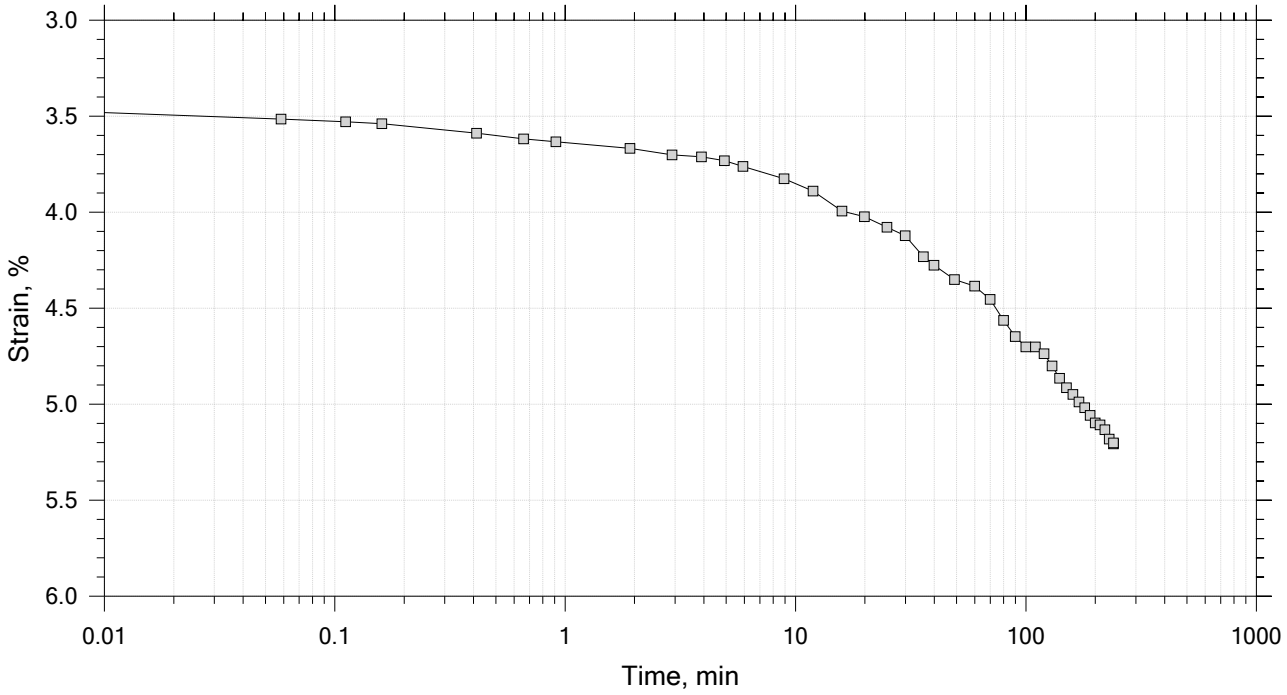


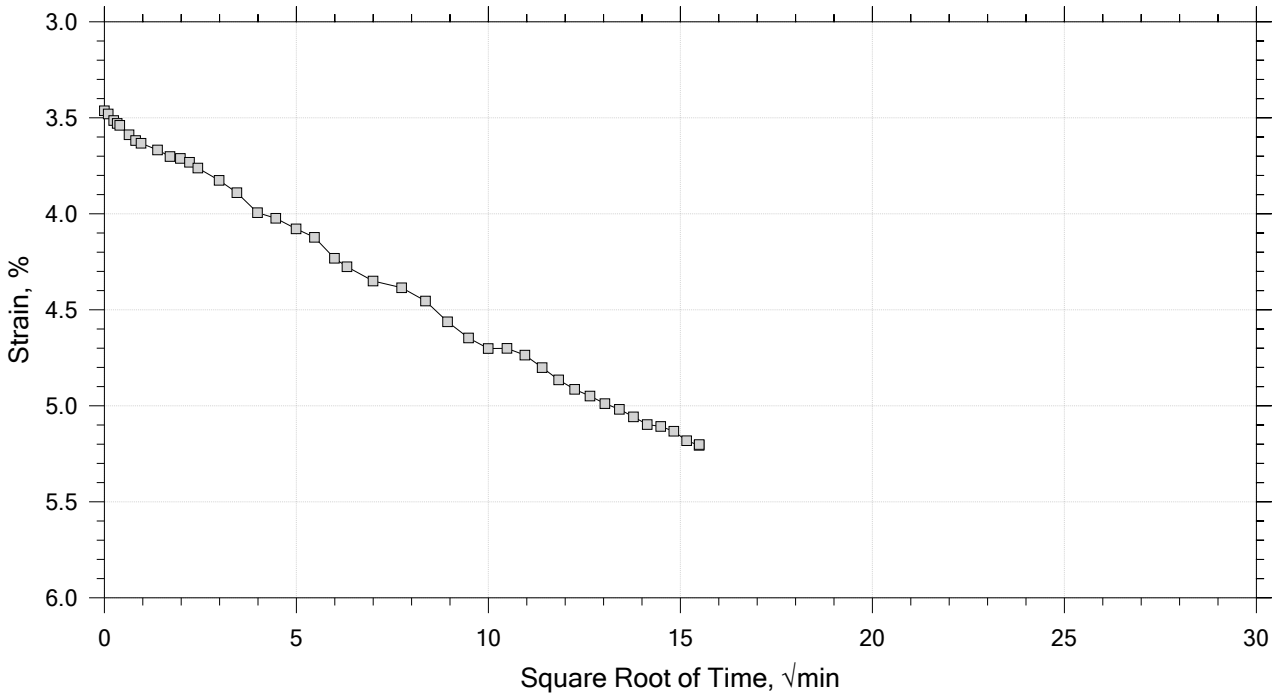


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 14
Constant Load Step
Stress: 4 tsf

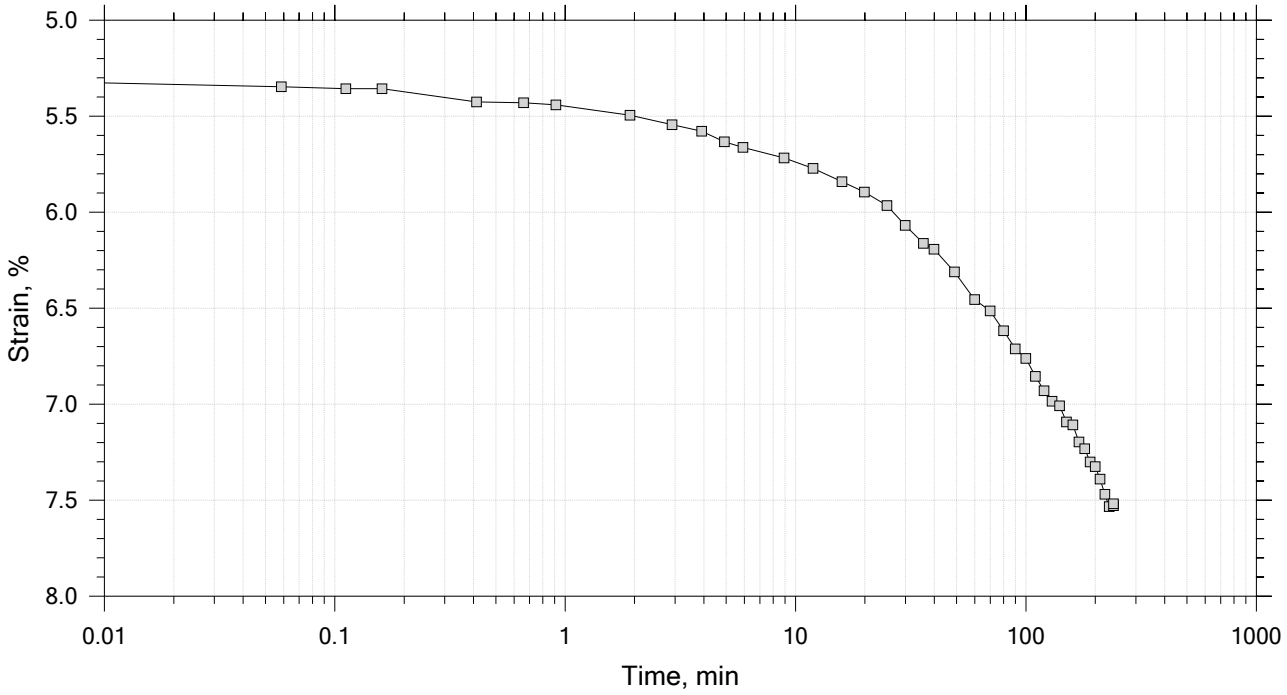


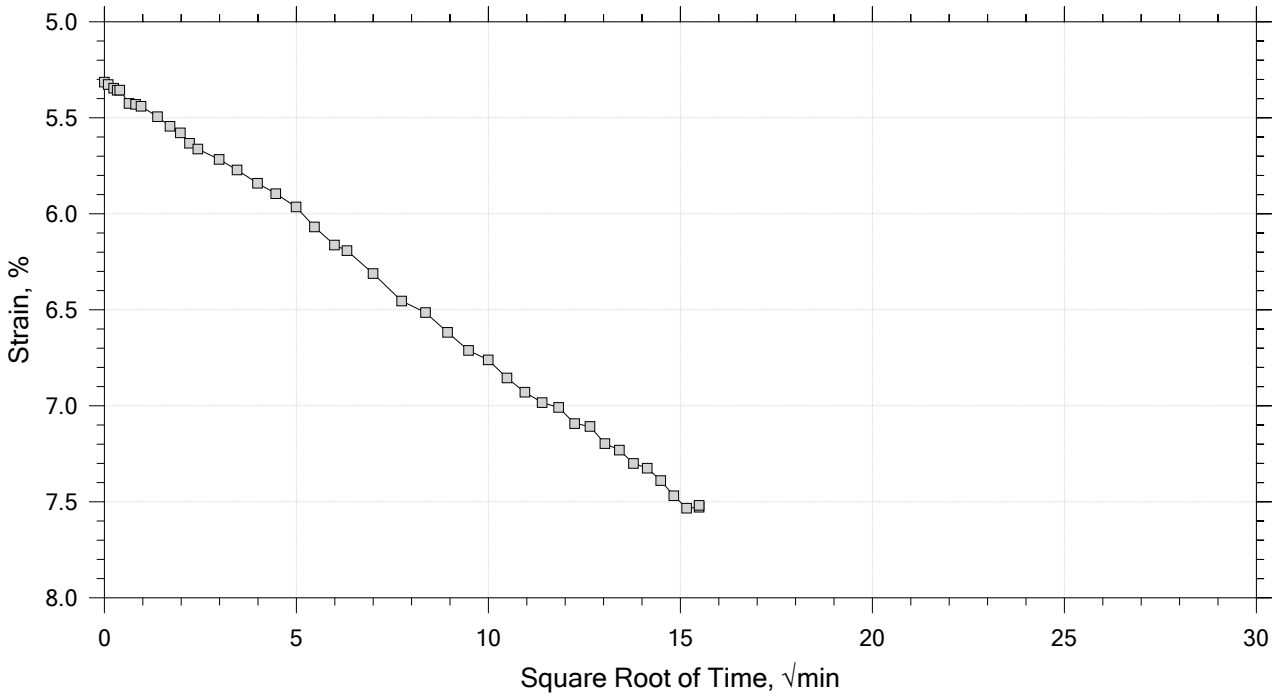


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 14
Constant Load Step
Stress: 8 tsf

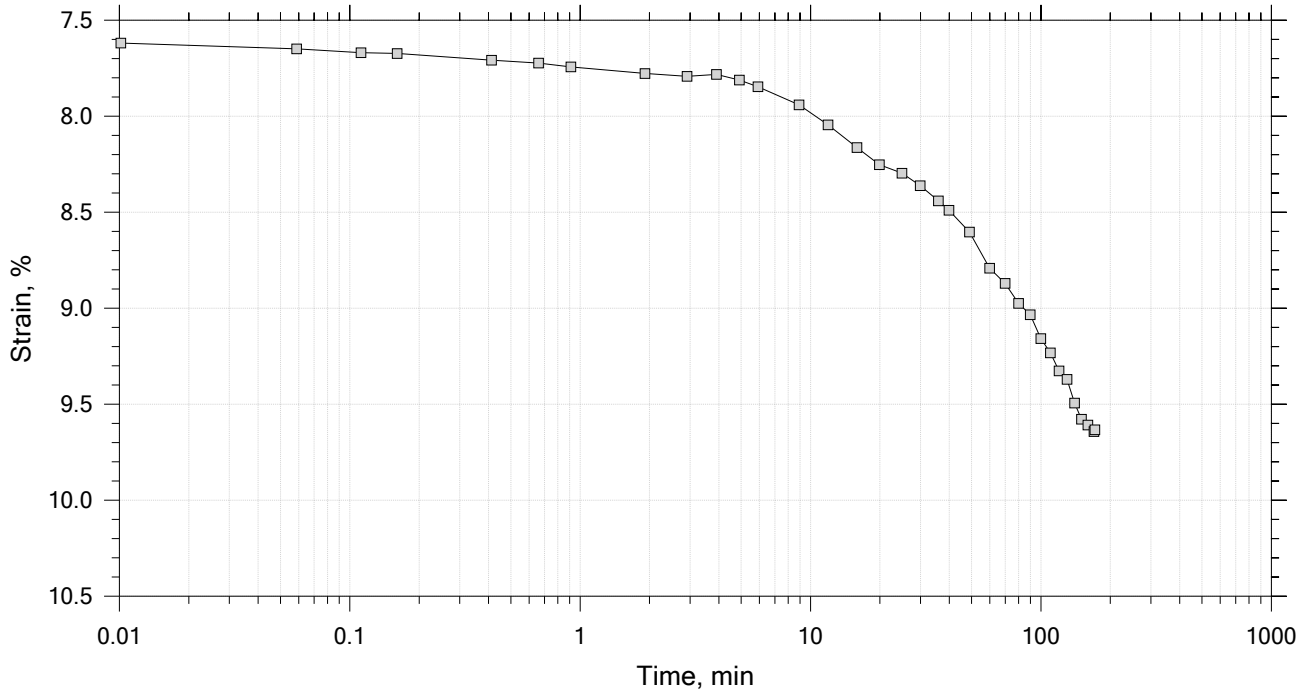


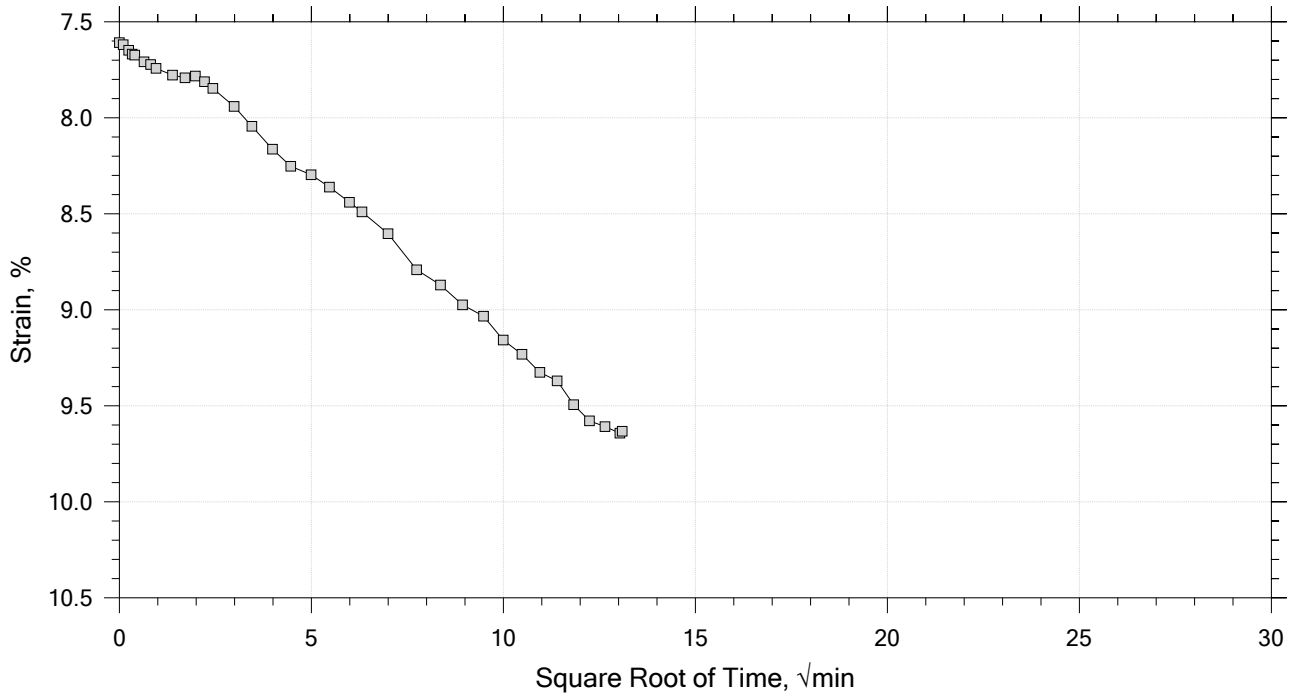


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 14
Constant Load Step
Stress: 16 tsf

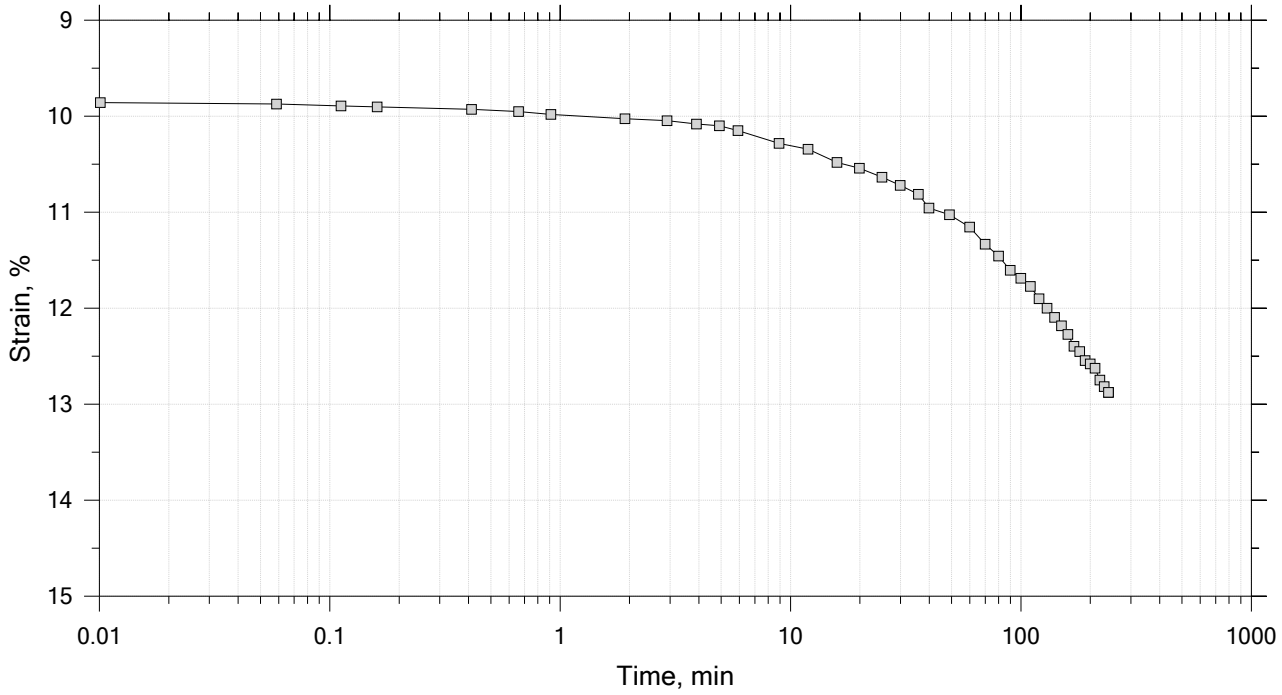


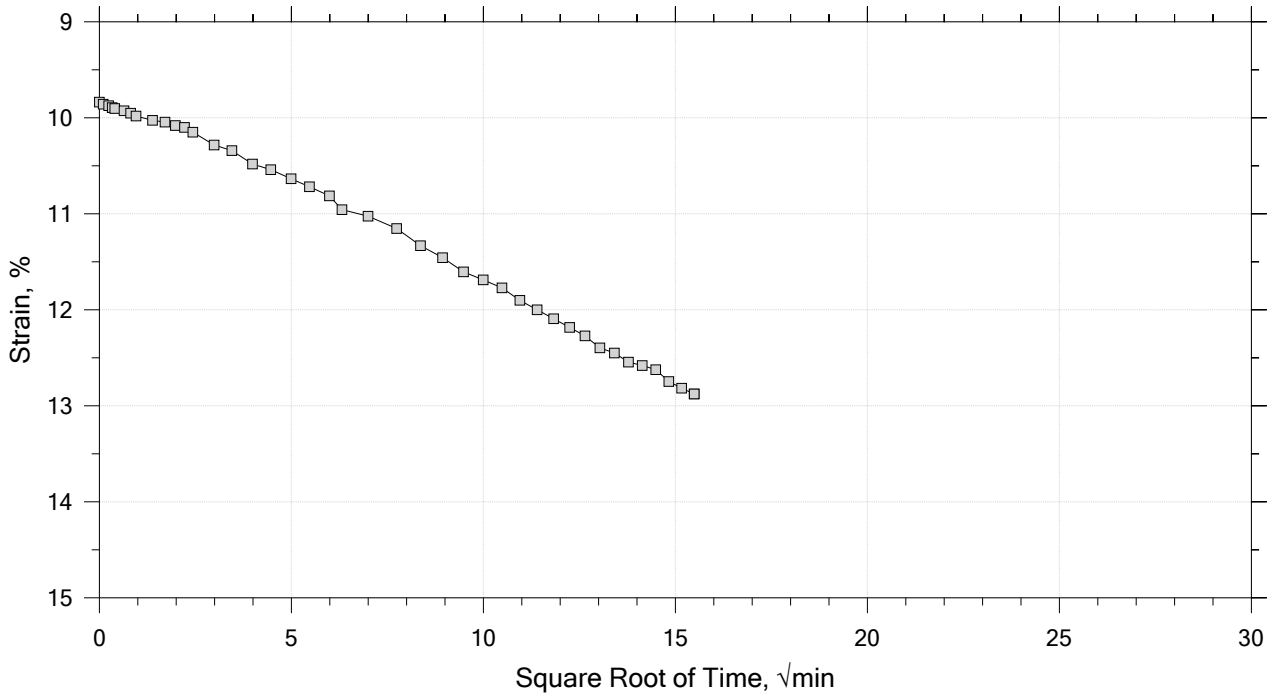


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 14
Constant Load Step
Stress: 32 tsf

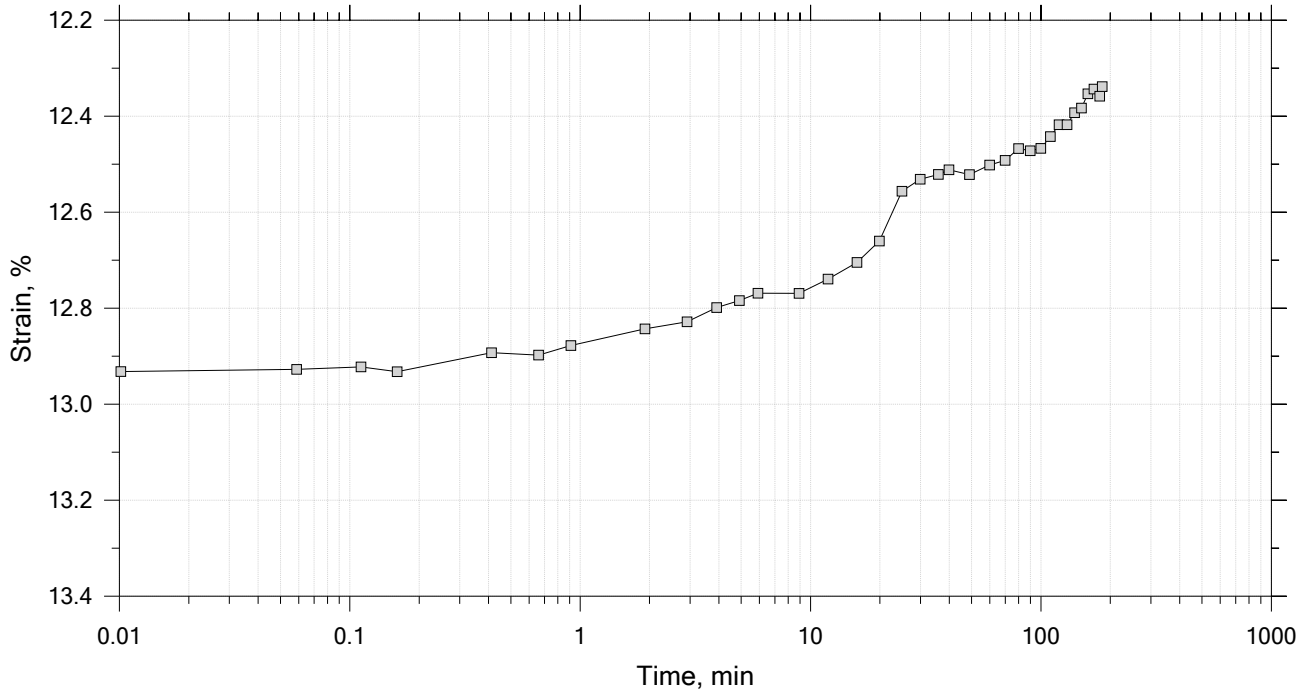


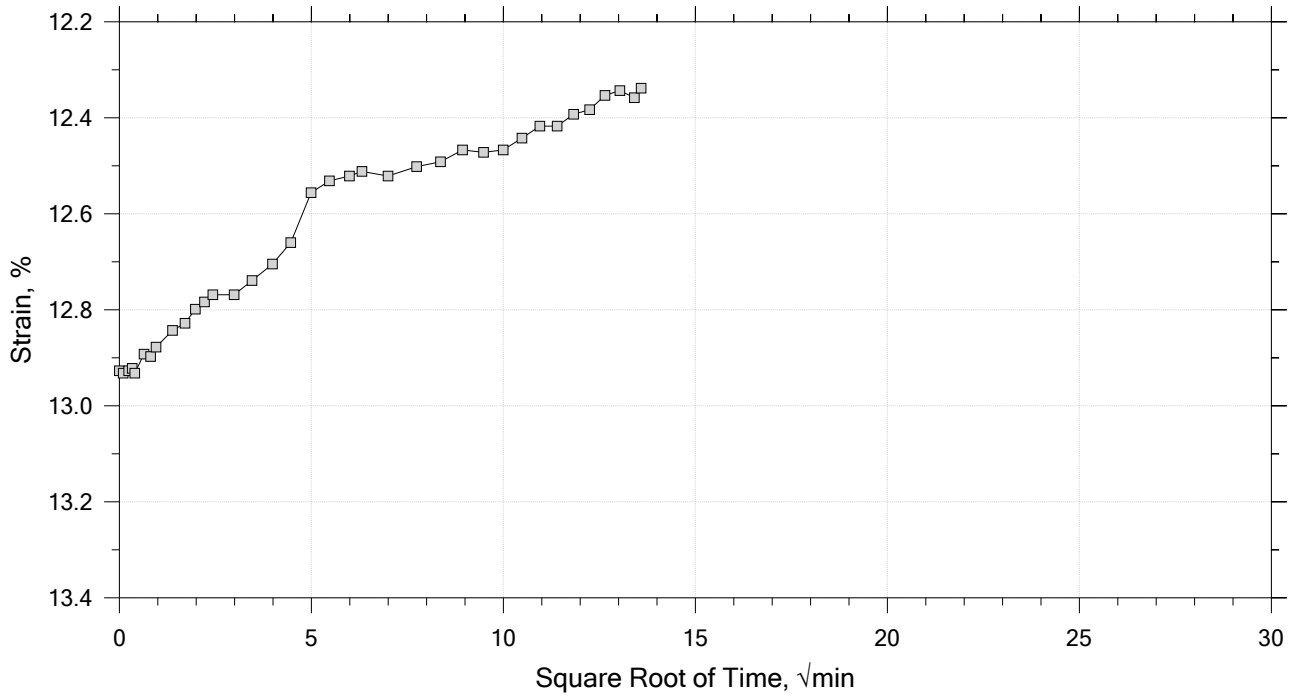


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 14
Constant Load Step
Stress: 8 tsf

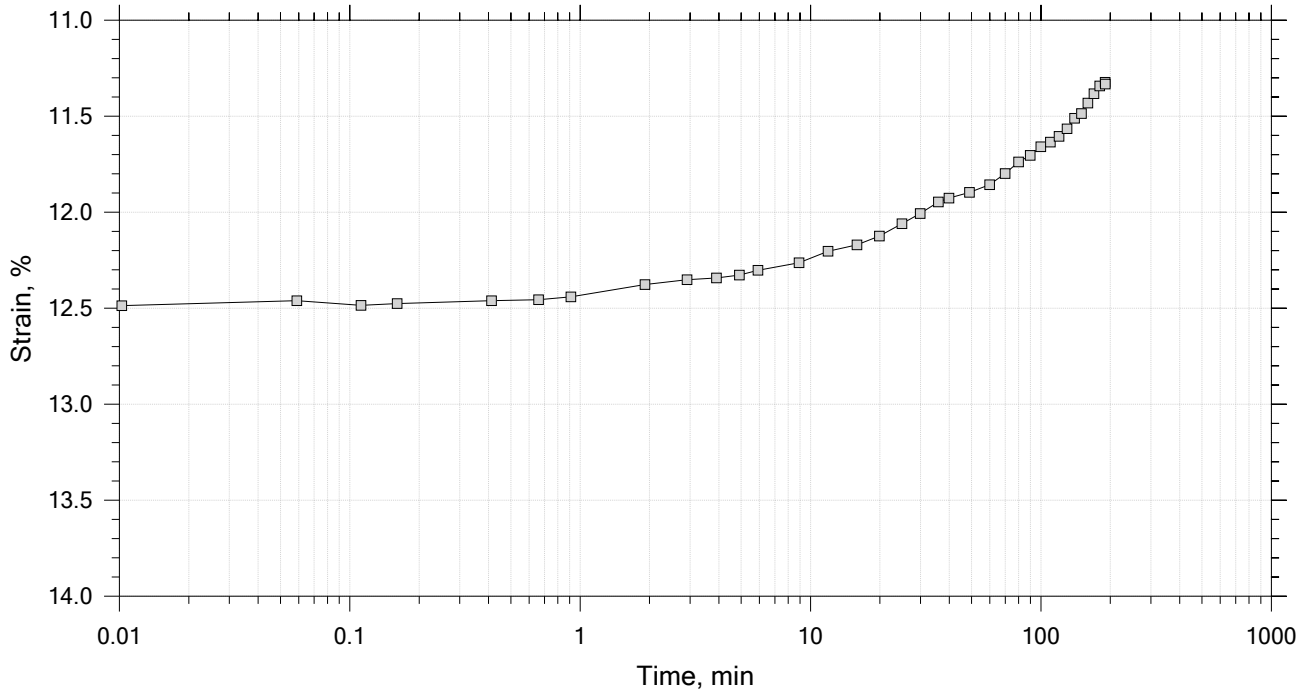


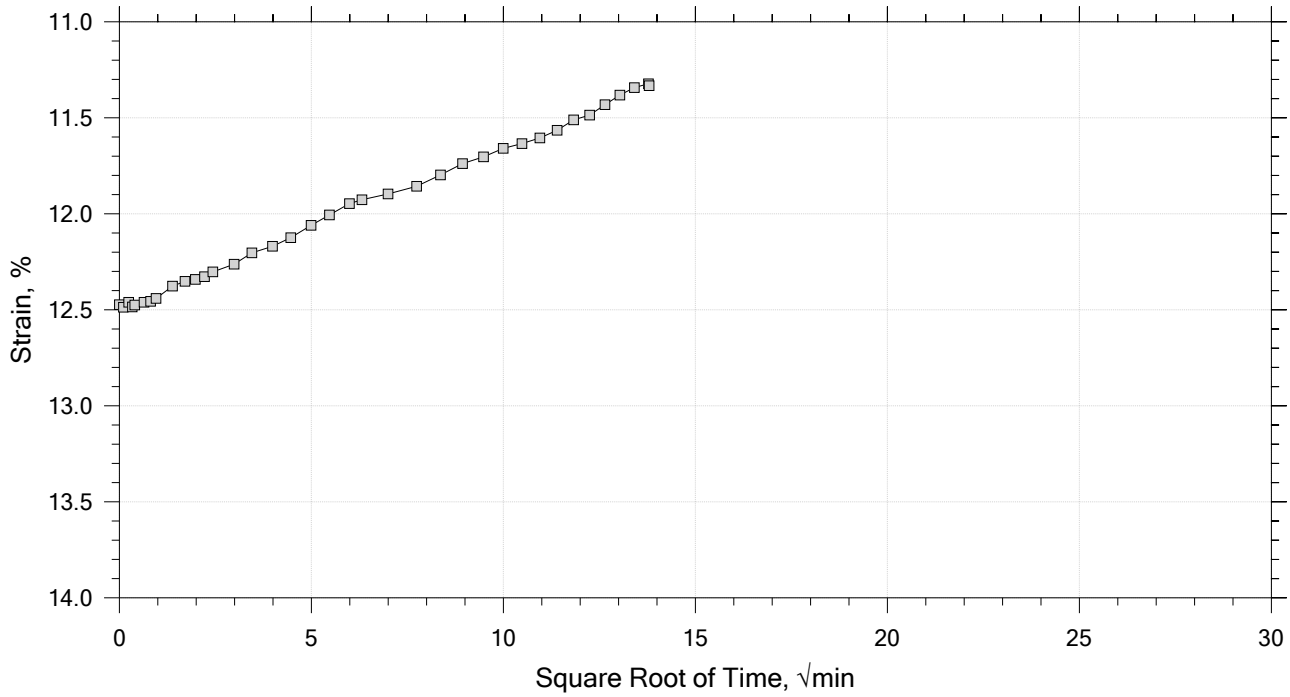


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 14
Constant Load Step
Stress: 2 tsf

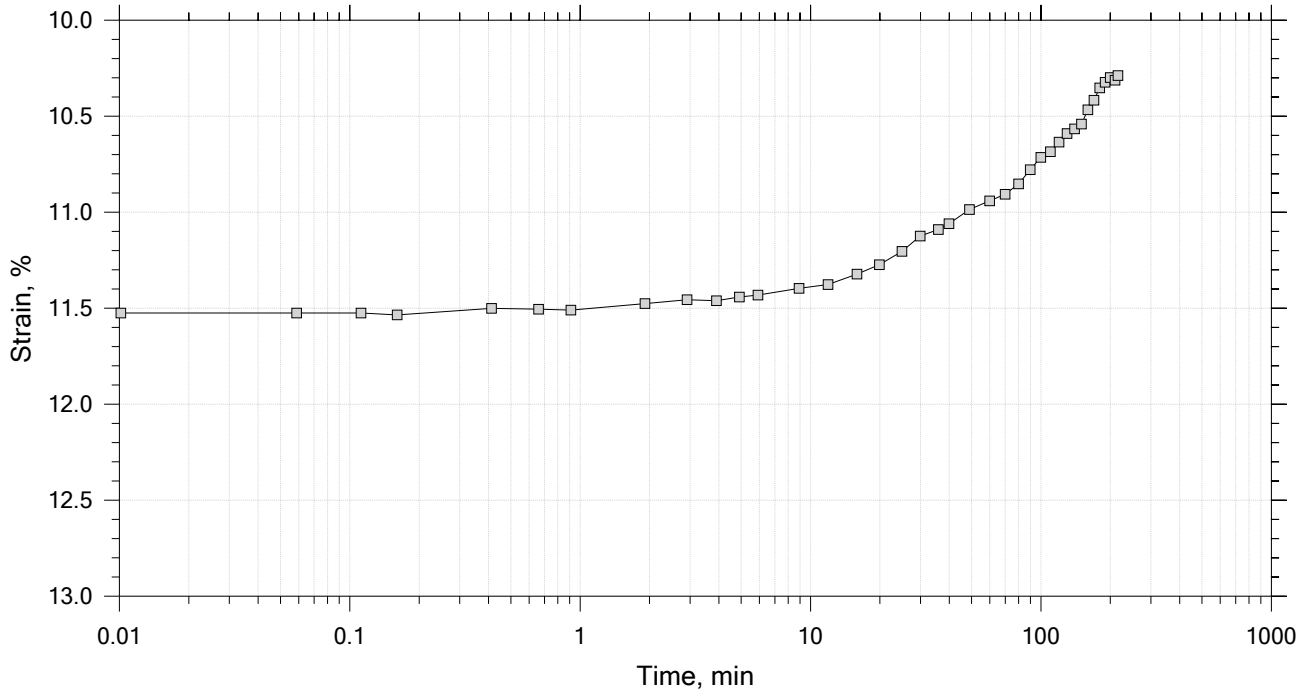


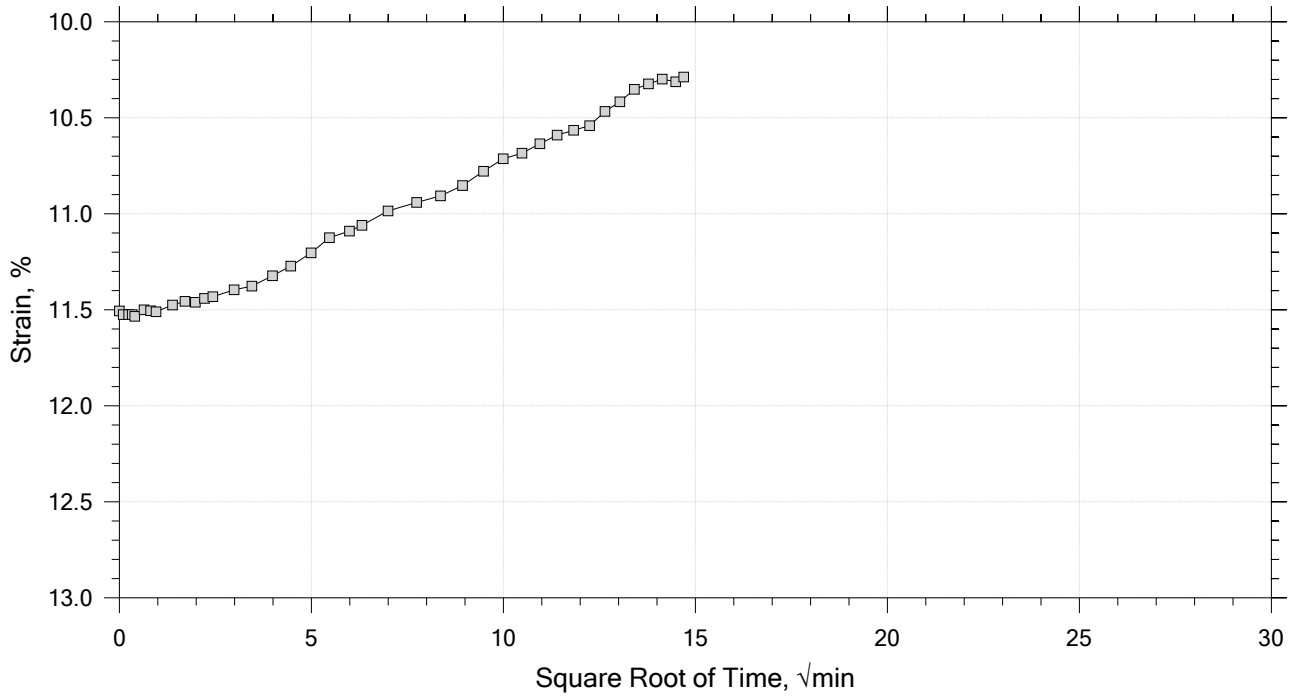


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 14
Constant Load Step
Stress: 0.5 tsf

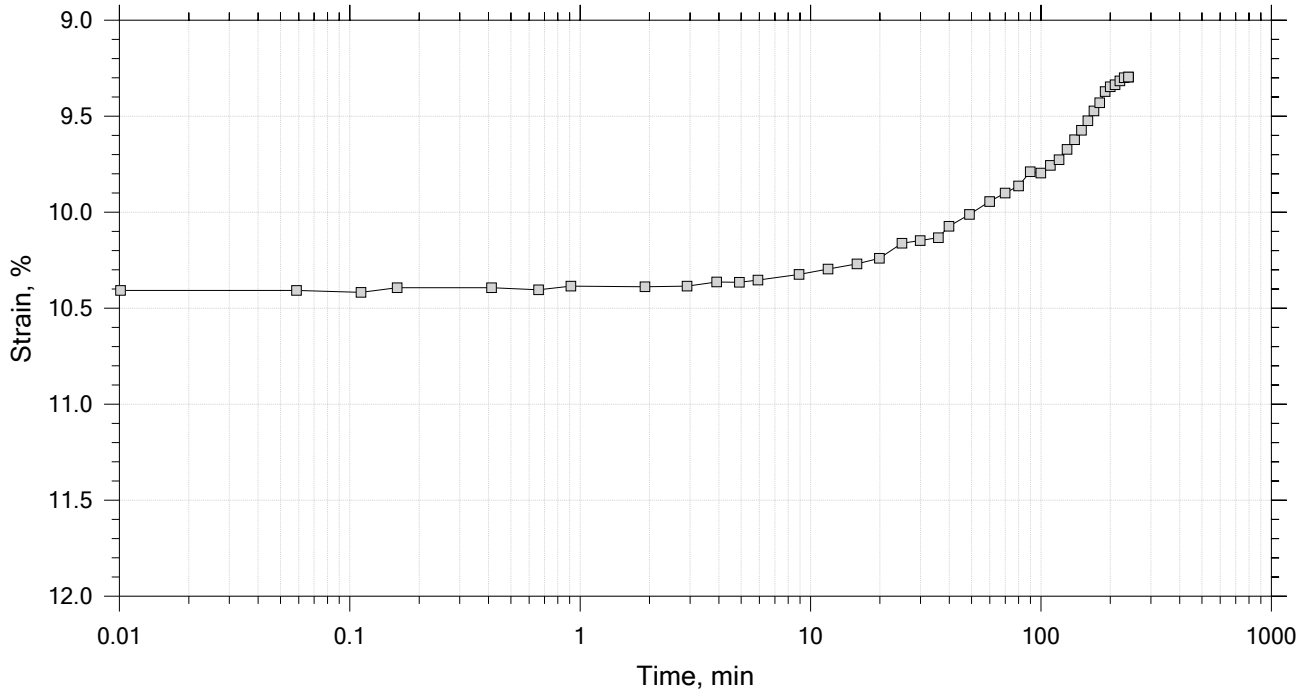


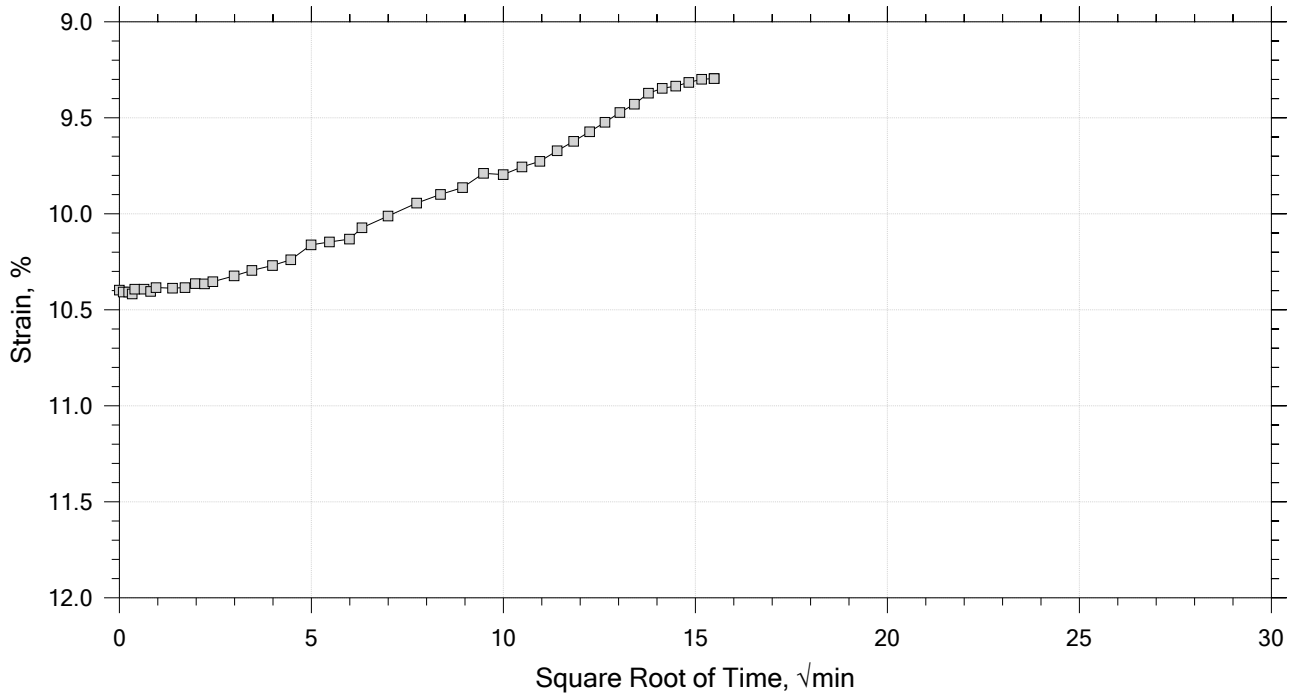


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 14
Constant Load Step
Stress: 0.125 tsf

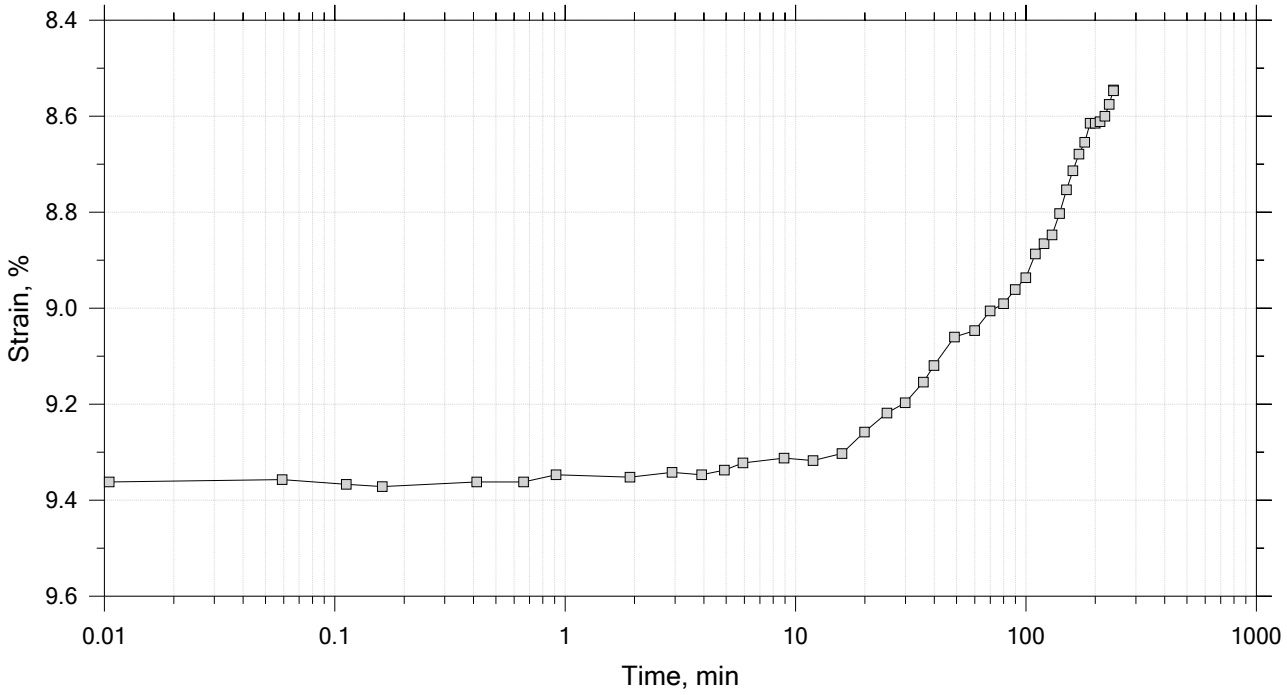


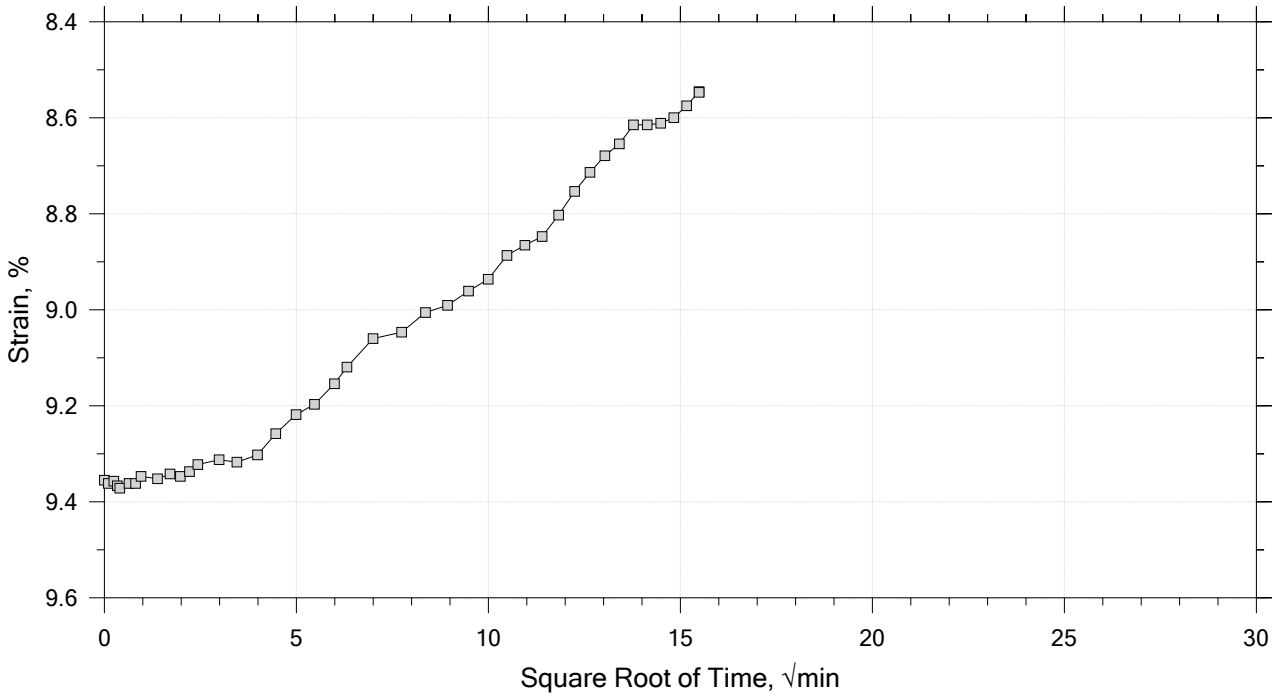


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 14
Constant Load Step
Stress: 0.0625 tsf





GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB021	Tested By: md	Checked By: njh
	Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
	Test No.: IP-5	Sample Type: intact	Elevation: ---
	Description: Moist, light blueish gray clay		
	Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.70	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.614	Plastic Limit: ---
Final Height: 0.95 in	Final Void Ratio: 0.533	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-2457	RING		Z-0213
Mass Container, gm	8.24	111.27	111.27	8.13
Mass Container + Wet Soil, gm	243.31	276.07	272.19	168.54
Mass Container + Dry Soil, gm	200.7	245.61	245.61	142.04
Mass Dry Soil, gm	192.46	134.34	134.34	133.91
Water Content, %	22.14	22.68	19.79	19.79
Void Ratio	---	0.61	0.53	---
Degree of Saturation, %	---	99.54	100.00	---
Dry Unit Weight, pcf	---	104.26	109.74	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.176	0.001093	0.612	0.109	86.786	6.56e-08	6.23e-03	1.10e-06	0.00e+00
2	0.250	0.003645	0.608	0.364	0.000	0.00e+00	3.43e-02	0.00e+00	0.00e+00
3	0.500	0.008601	0.600	0.860	0.000	0.00e+00	1.98e-02	0.00e+00	0.00e+00
4	1.00	0.01747	0.586	1.75	0.000	0.00e+00	1.77e-02	0.00e+00	0.00e+00
5	2.00	0.03305	0.561	3.31	0.000	0.00e+00	1.56e-02	0.00e+00	0.00e+00
6	4.00	0.05202	0.530	5.20	0.000	0.00e+00	9.48e-03	0.00e+00	0.00e+00
7	8.00	0.07518	0.493	7.52	0.000	0.00e+00	5.79e-03	0.00e+00	0.00e+00
8	16.0	0.09633	0.459	9.63	0.000	0.00e+00	2.64e-03	0.00e+00	0.00e+00
9	32.0	0.1288	0.406	12.9	0.000	0.00e+00	2.03e-03	0.00e+00	0.00e+00
10	8.00	0.1234	0.415	12.3	0.000	0.00e+00	2.24e-04	0.00e+00	0.00e+00
11	2.00	0.1133	0.431	11.3	0.000	0.00e+00	1.68e-03	0.00e+00	0.00e+00
12	0.500	0.1029	0.448	10.3	0.000	0.00e+00	6.96e-03	0.00e+00	0.00e+00
13	0.125	0.09296	0.464	9.30	0.000	0.00e+00	2.65e-02	0.00e+00	0.00e+00
14	0.0625	0.08547	0.476	8.55	0.000	0.00e+00	1.20e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

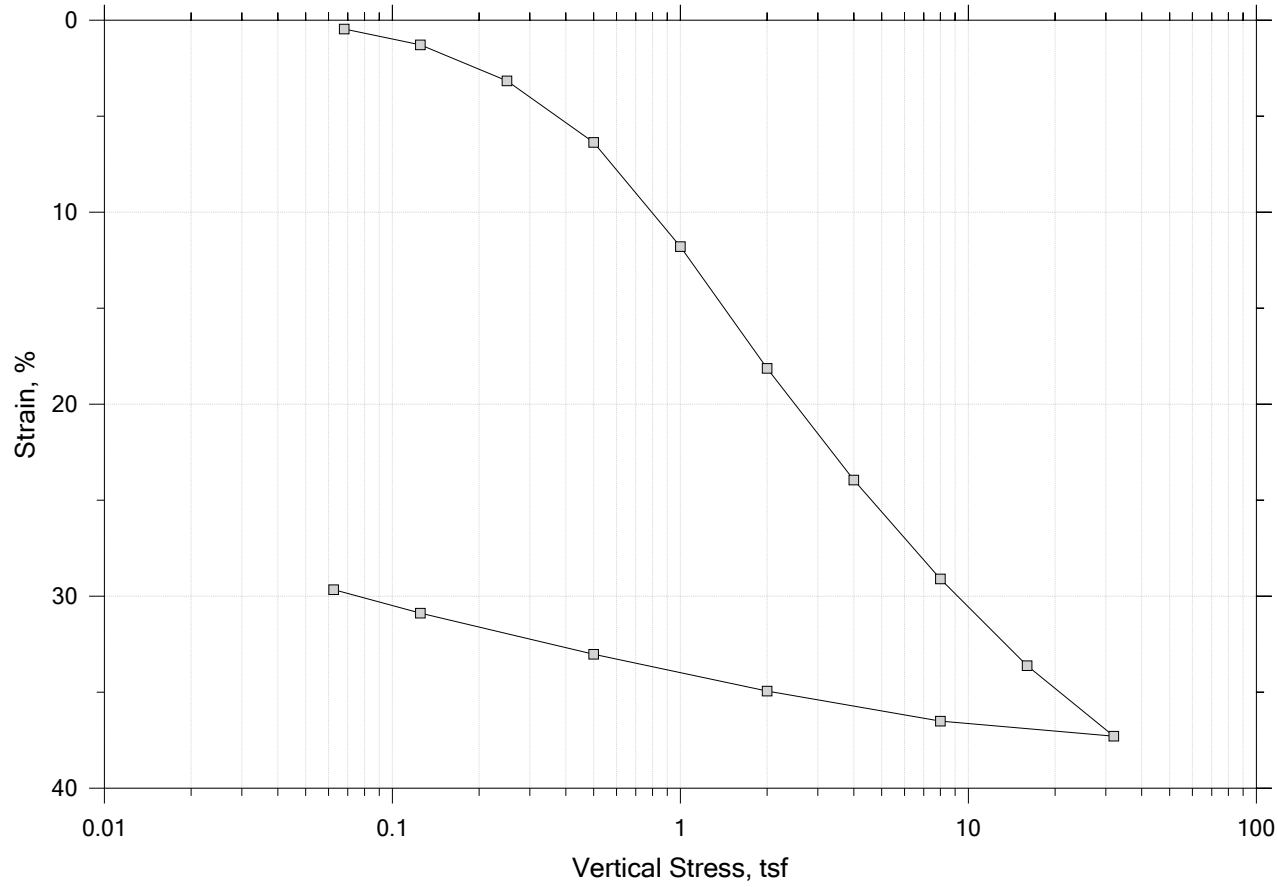
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.176	0.001093	0.612	0.109	134.307	1.82e-07	6.23e-03	3.06e-06
2	0.250	0.003645	0.608	0.364	2.424	1.01e-05	3.43e-02	9.32e-04
3	0.500	0.008601	0.600	0.860	51.117	4.74e-07	1.98e-02	2.54e-05
4	1.00	0.01747	0.586	1.75	66.429	3.60e-07	1.77e-02	1.72e-05
5	2.00	0.03305	0.561	3.31	189.697	1.23e-07	1.56e-02	5.16e-06
6	4.00	0.05202	0.530	5.20	198.474	1.13e-07	9.48e-03	2.90e-06
7	8.00	0.07518	0.493	7.52	0.000	0.00e+00	5.79e-03	0.00e+00
8	16.0	0.09633	0.459	9.63	0.000	0.00e+00	2.64e-03	0.00e+00
9	32.0	0.1288	0.406	12.9	0.000	0.00e+00	2.03e-03	0.00e+00
10	8.00	0.1234	0.415	12.3	140.239	1.34e-07	2.24e-04	8.08e-08
11	2.00	0.1133	0.431	11.3	0.000	0.00e+00	1.68e-03	0.00e+00
12	0.500	0.1029	0.448	10.3	0.000	0.00e+00	6.96e-03	0.00e+00
13	0.125	0.09296	0.464	9.30	182.122	1.10e-07	2.65e-02	7.82e-06
14	0.0625	0.08547	0.476	8.55	179.159	1.14e-07	1.20e-01	3.67e-05

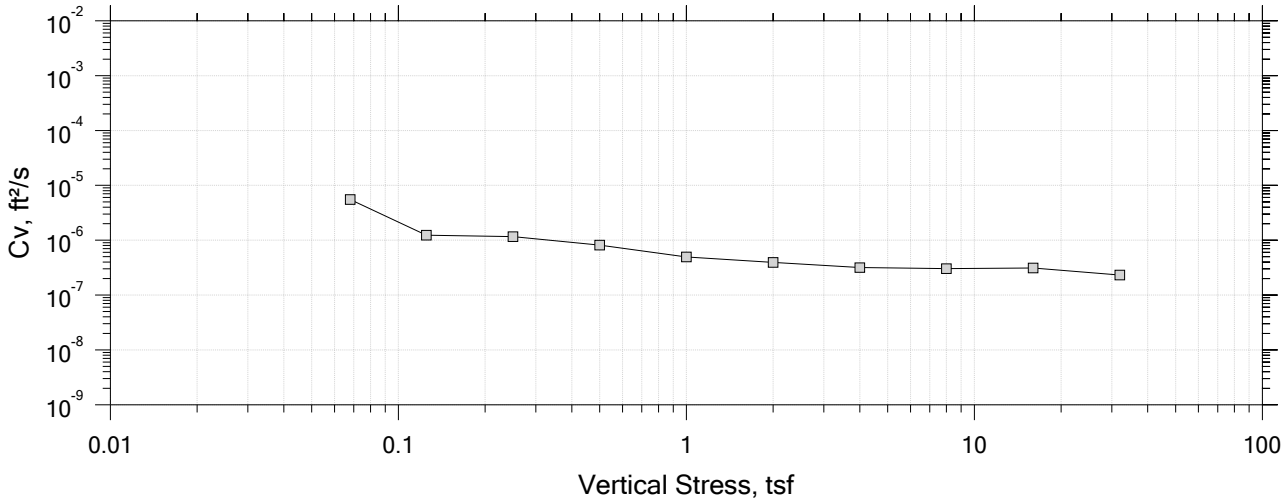
GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB021	Tested By: md	Checked By: njh
Sample No.: SL0829	Test Date: 01/10/19	Depth: 39-41 ft
Test No.: IP-5	Sample Type: intact	Elevation: ---
Description: Moist, light blueish gray clay		
Remarks: System X, Swell Pressure = 0.176 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





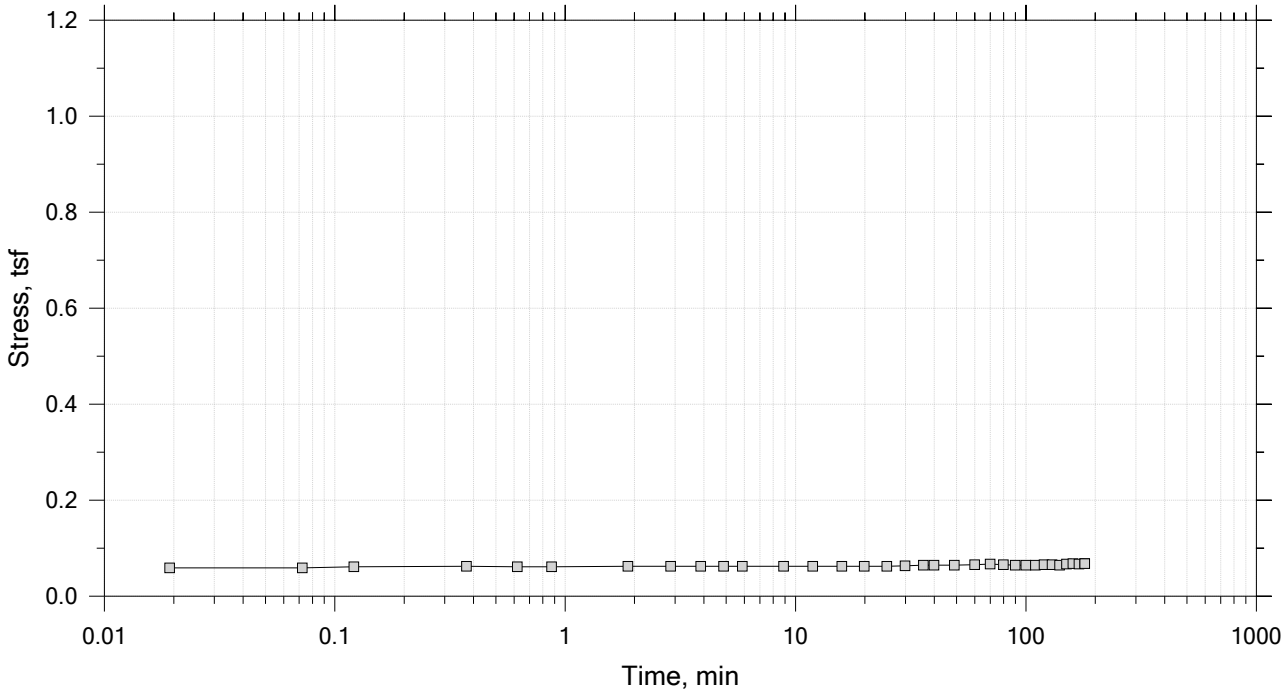
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		
	Displacement at End of Increment		

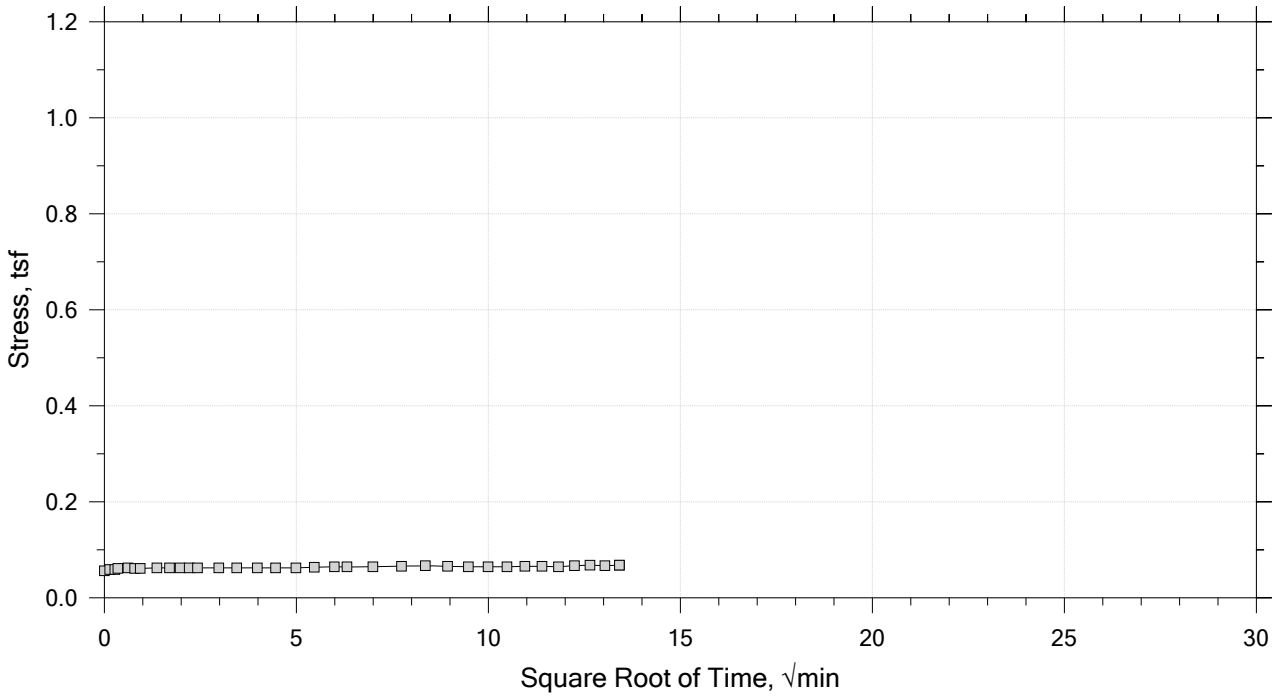
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.068 tsf

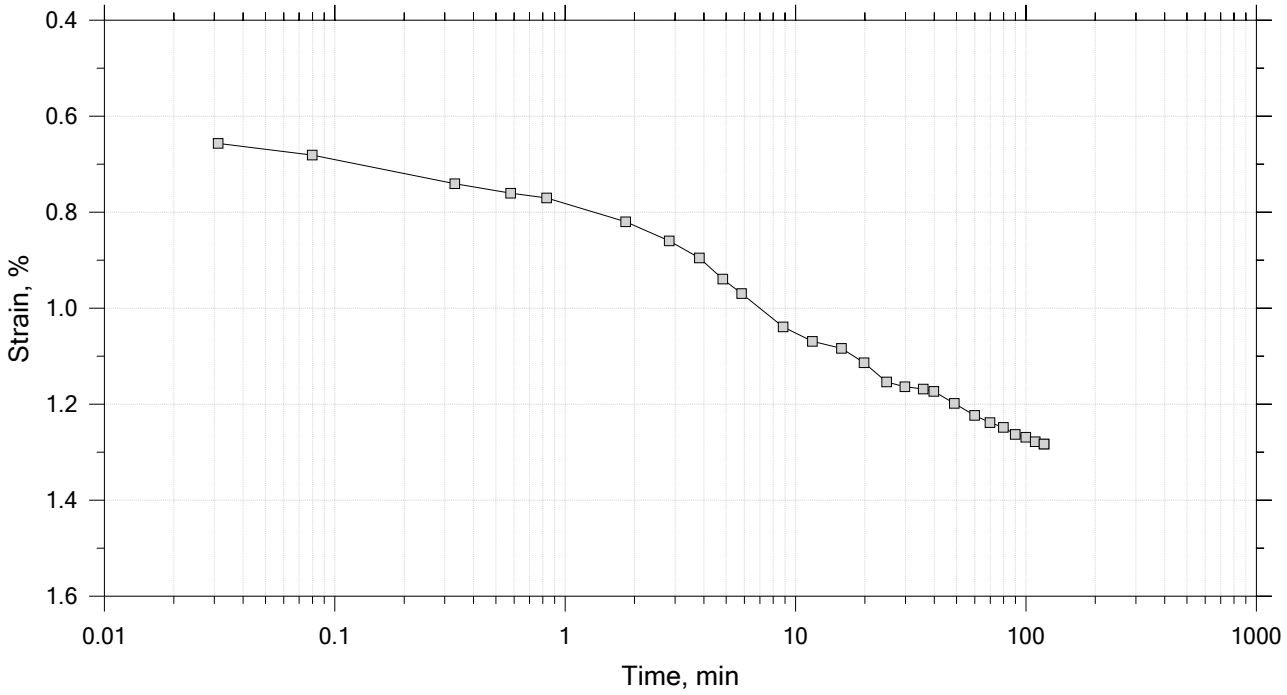


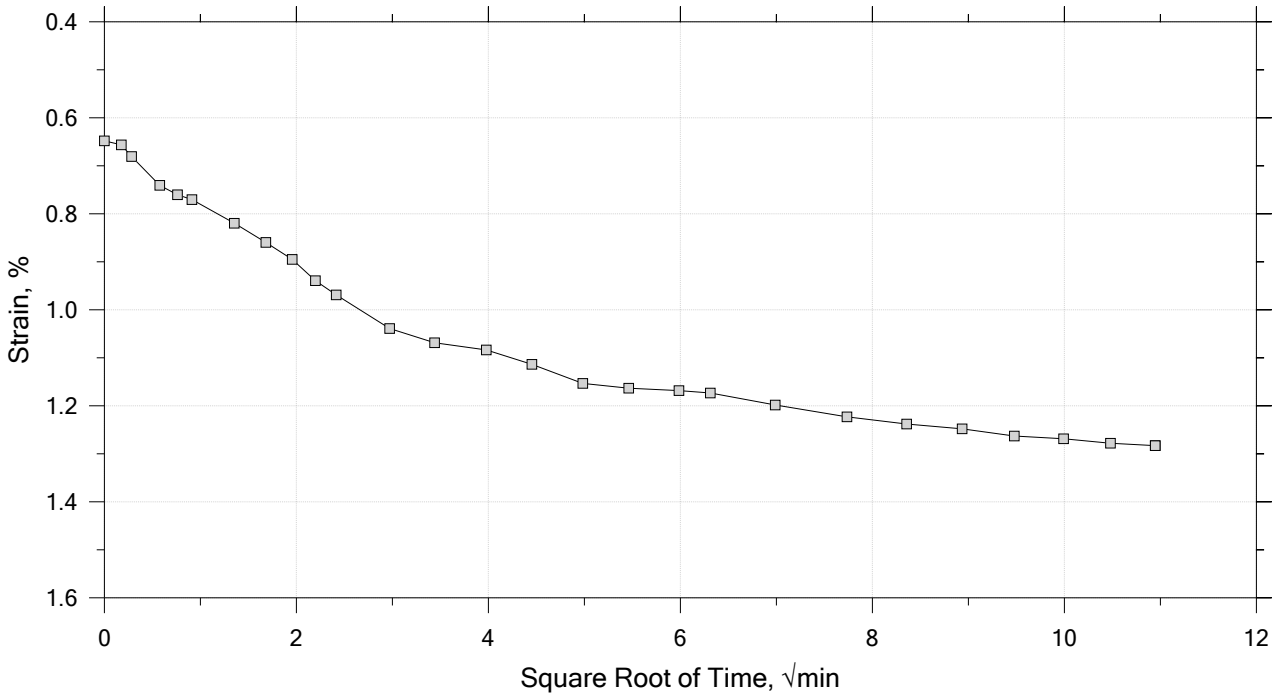


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

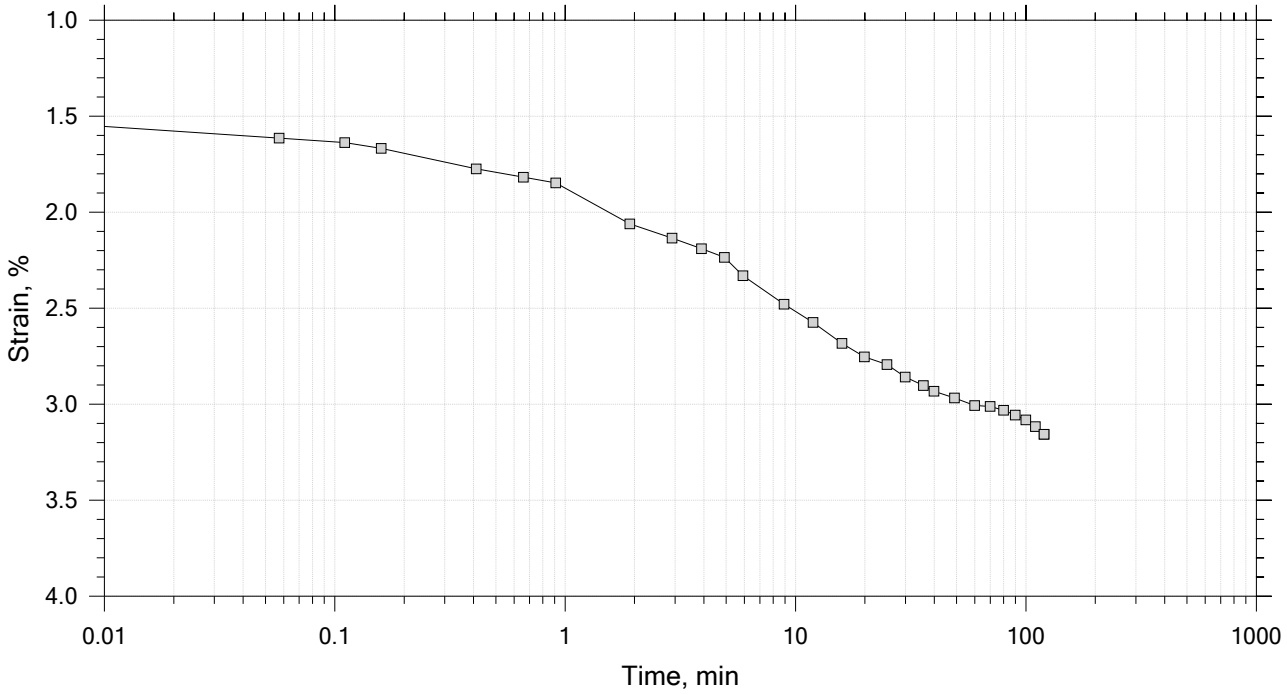


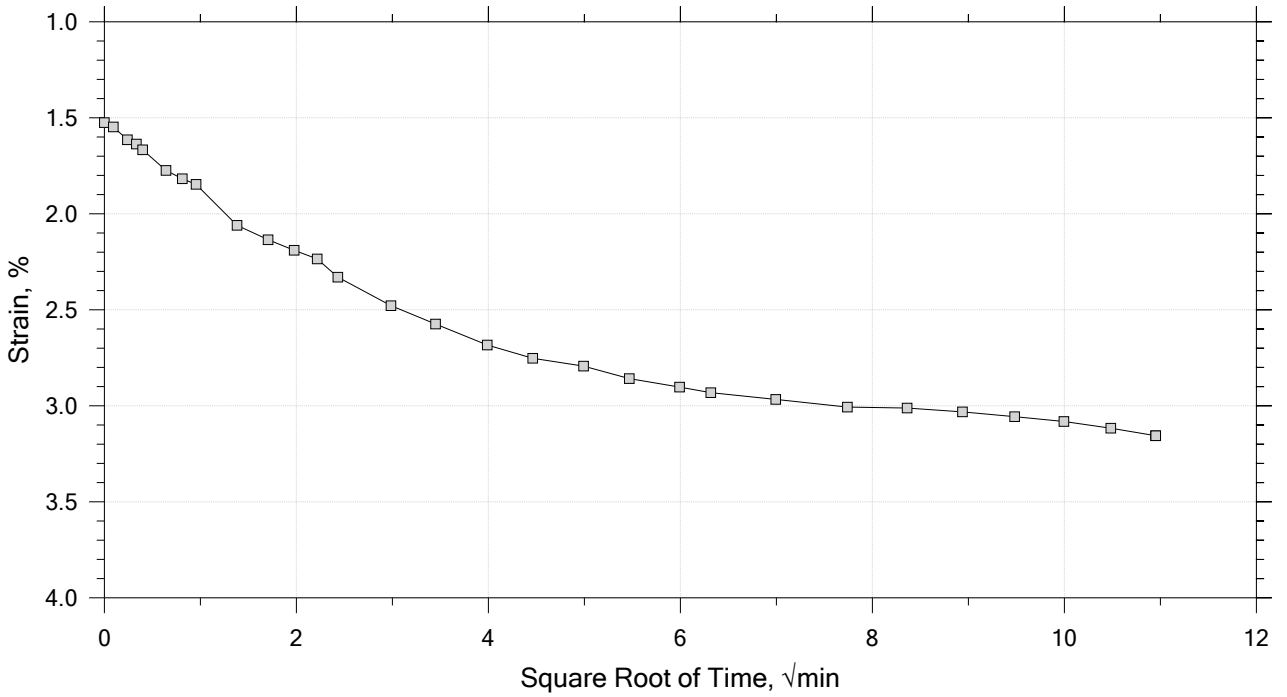


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf





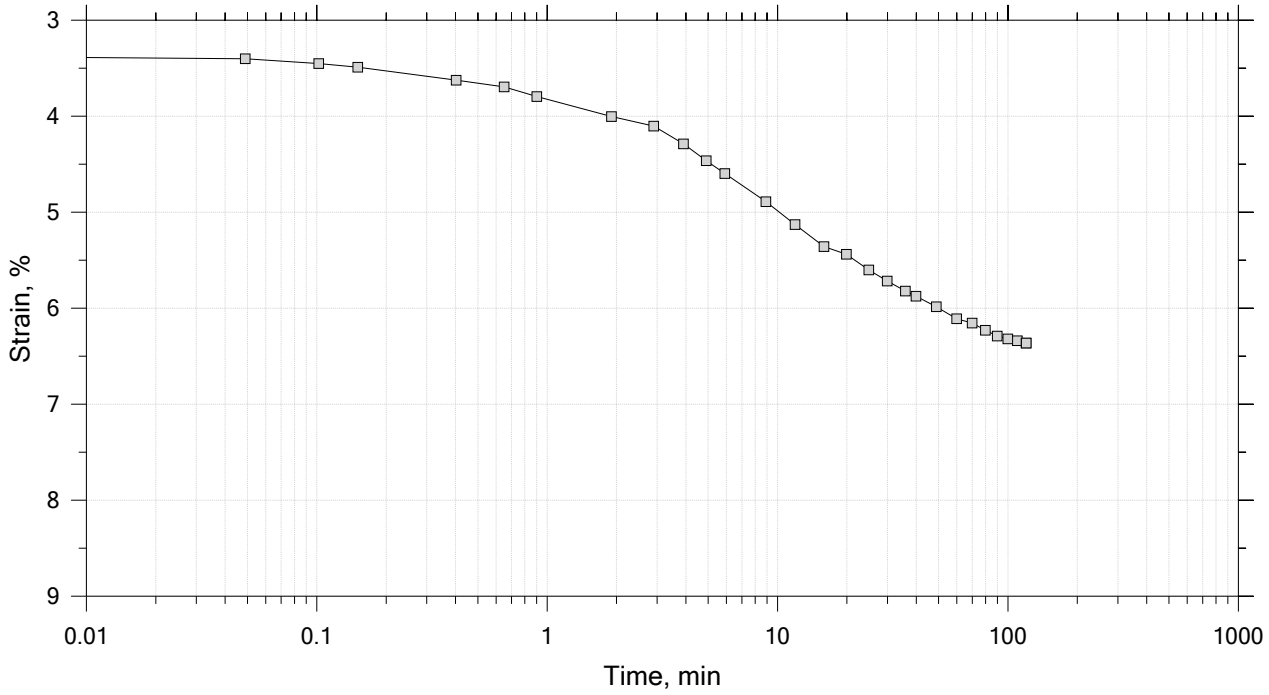
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		

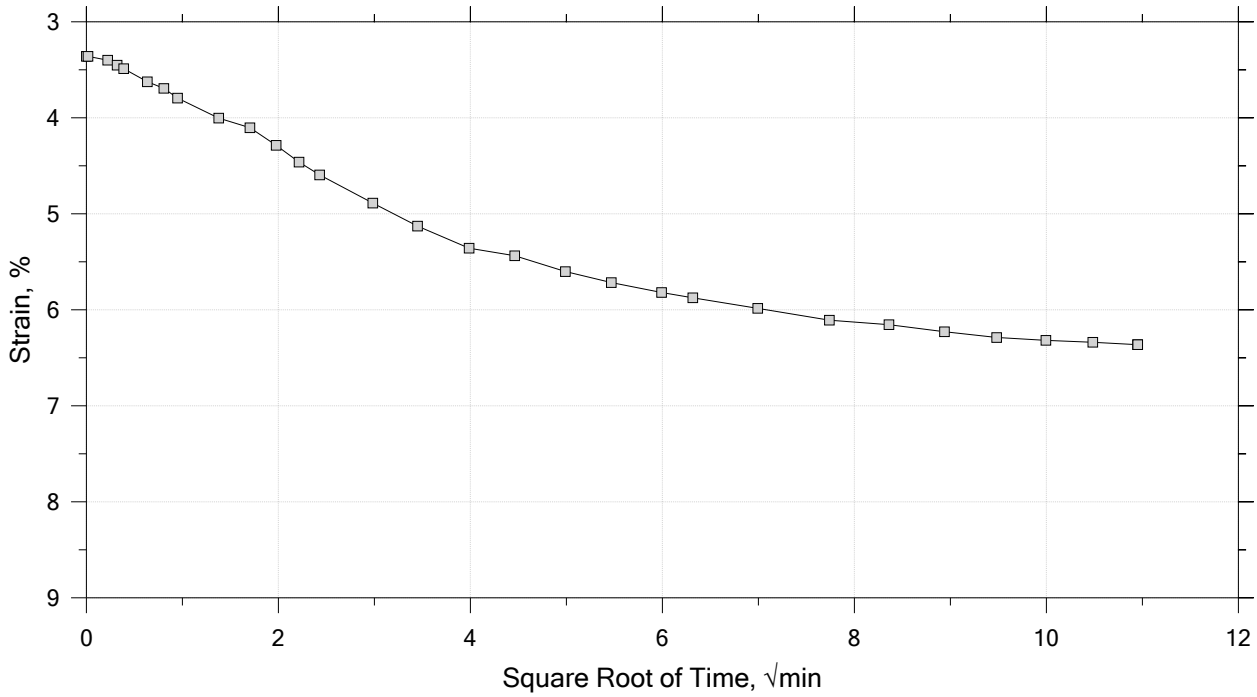
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf





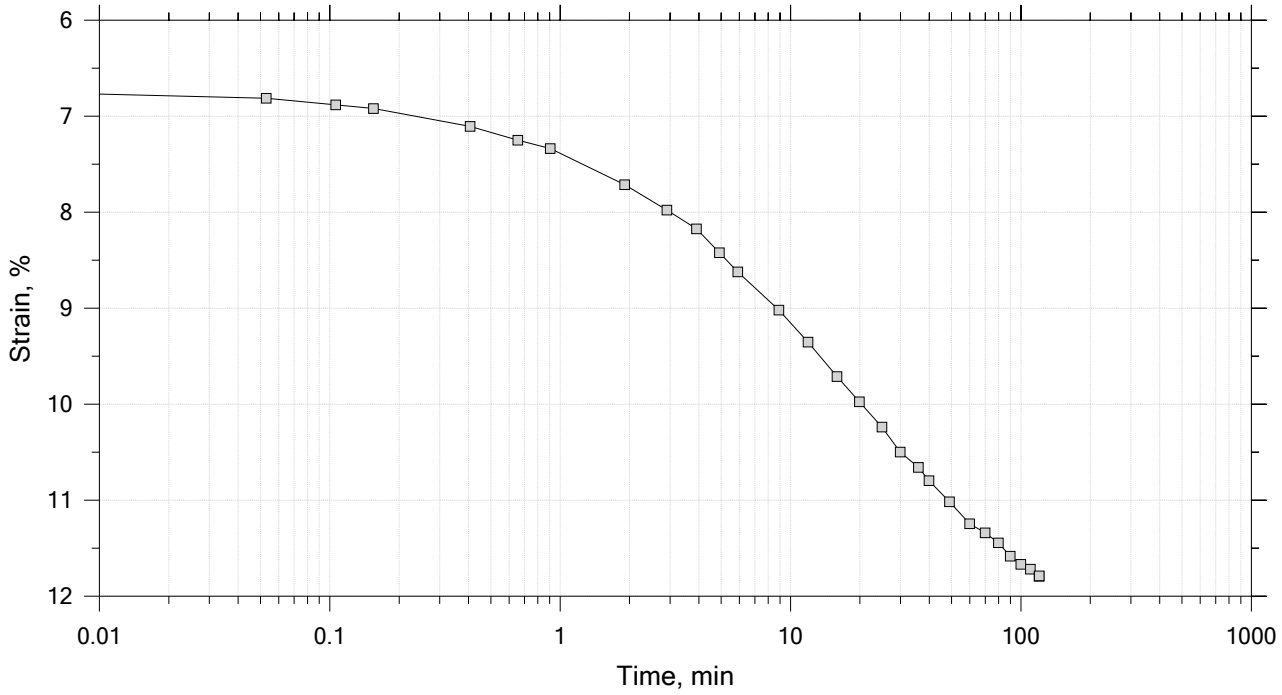
GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

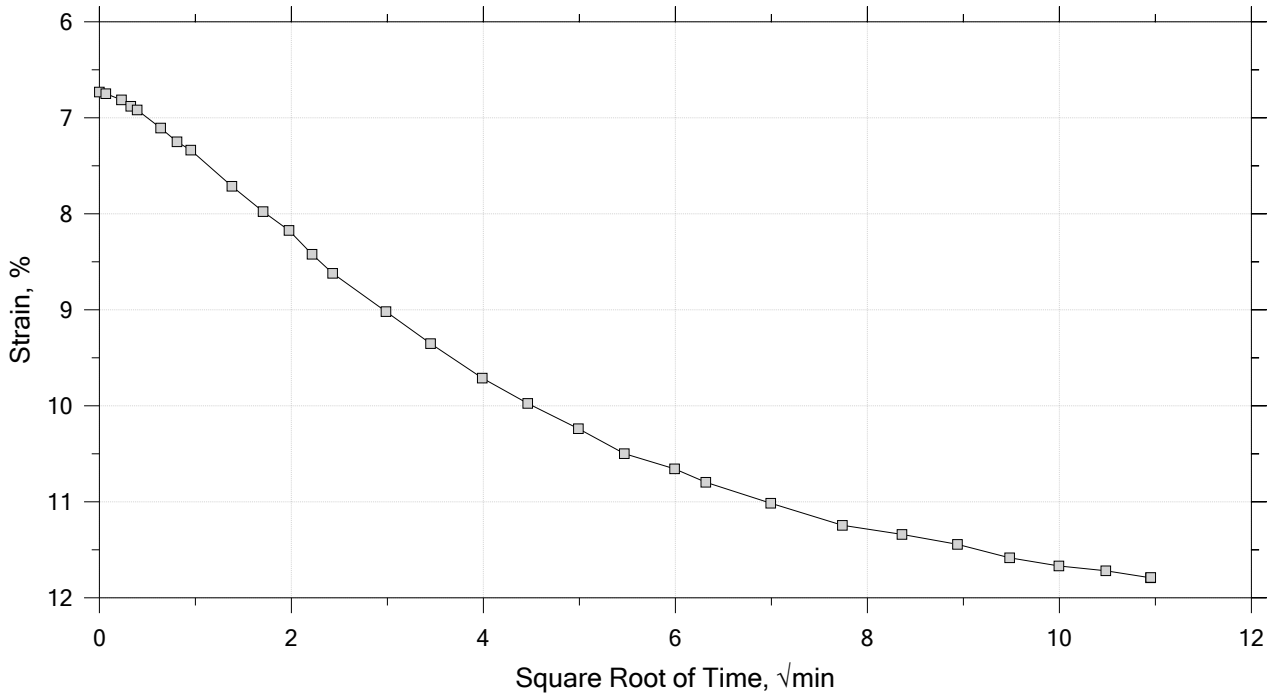
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf

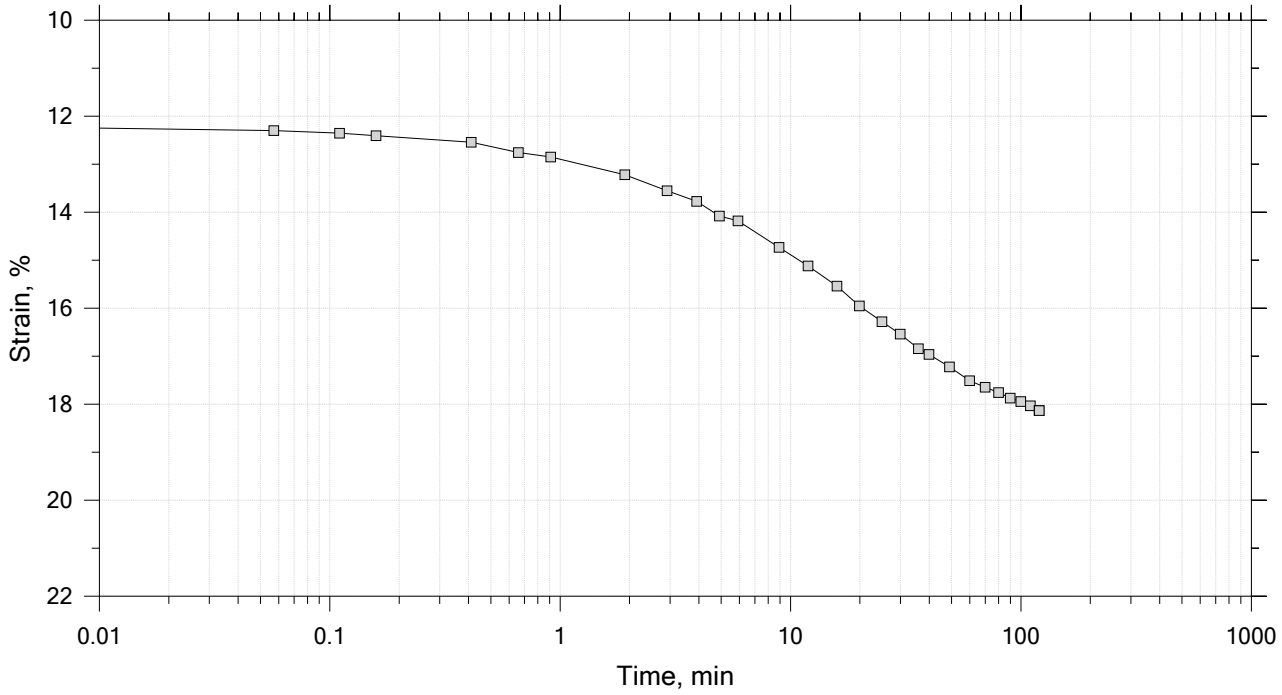


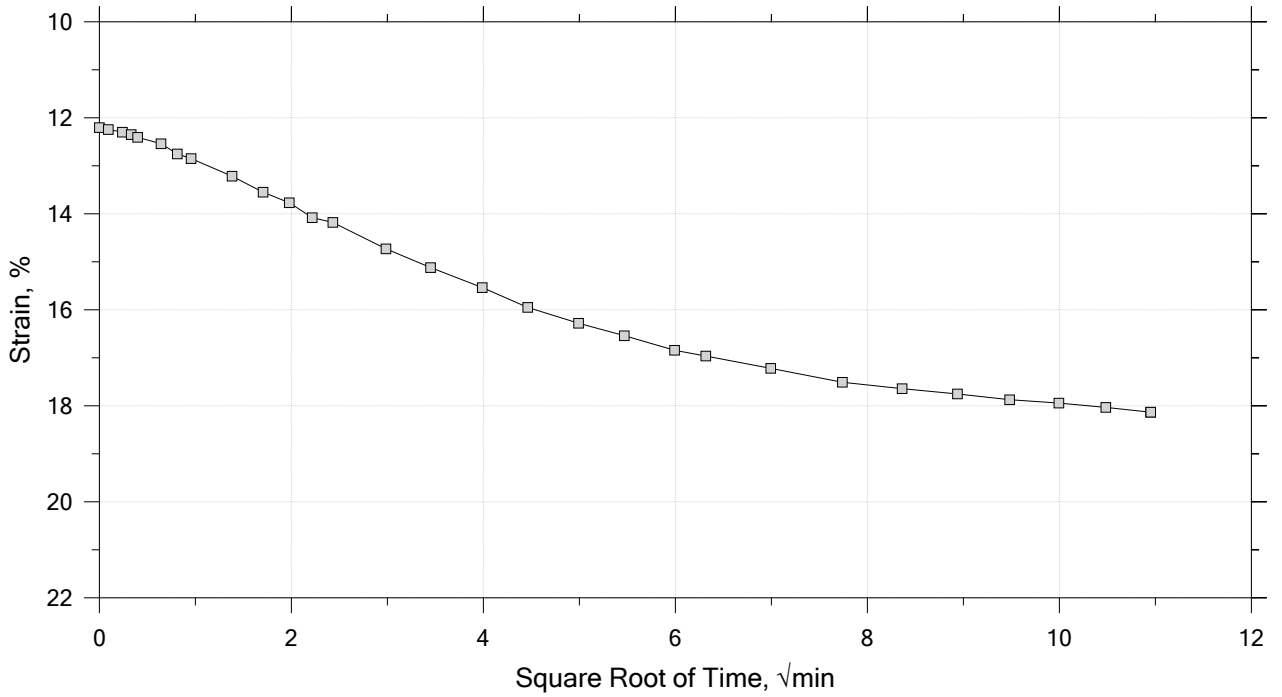


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15
Constant Load Step
Stress: 2 tsf





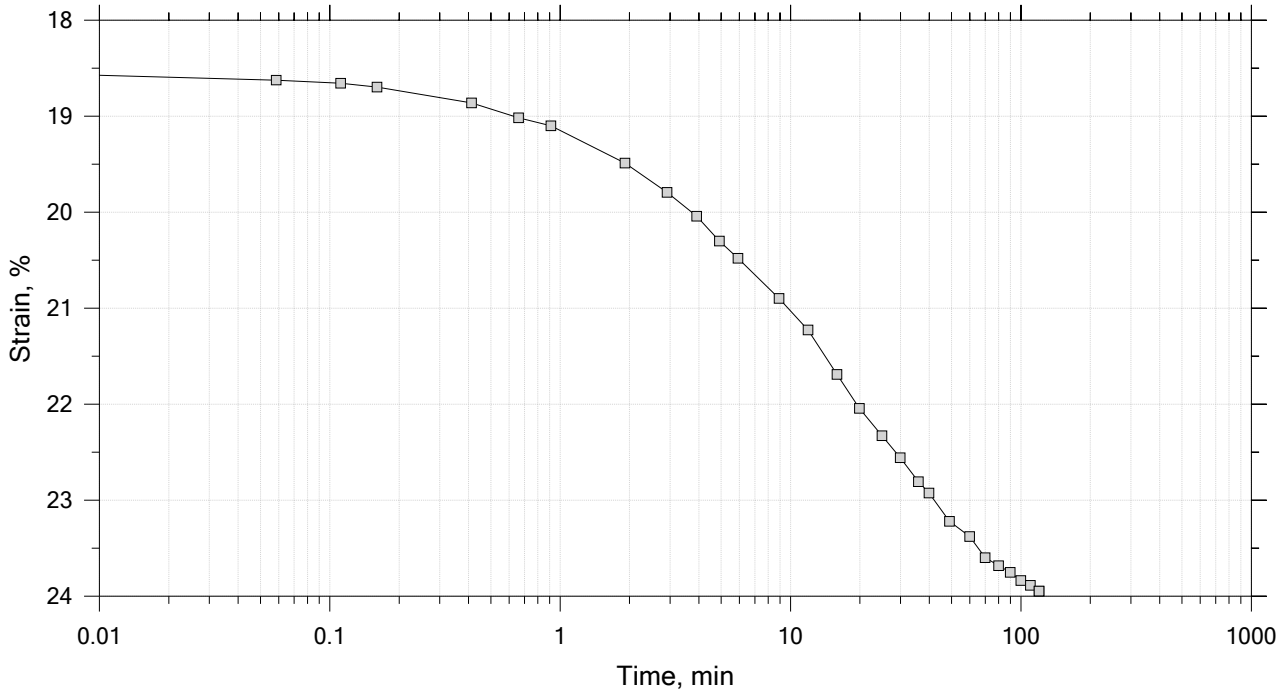
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

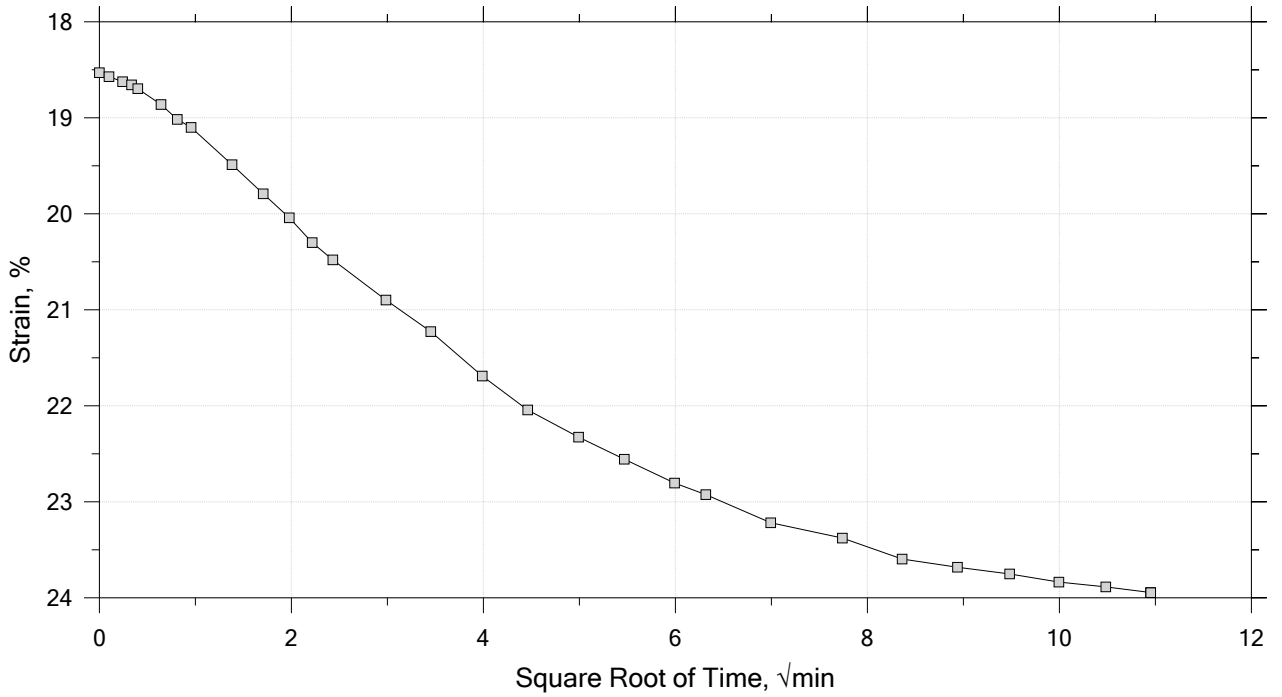
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf





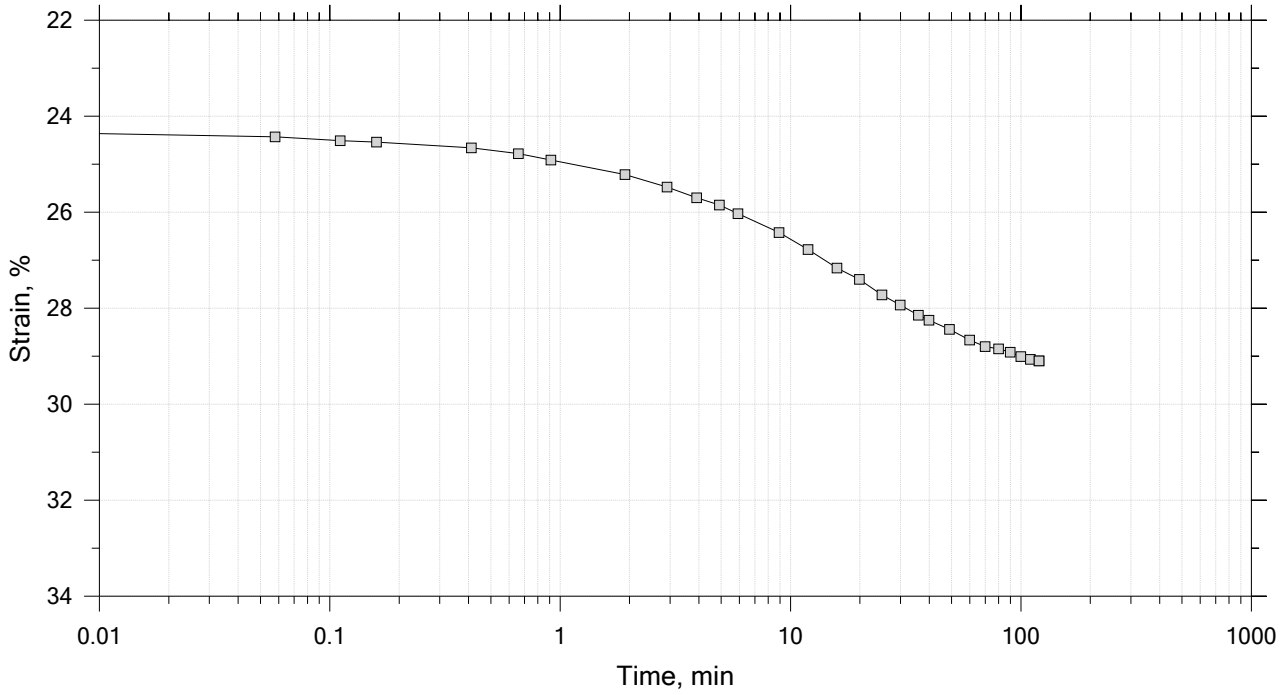
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

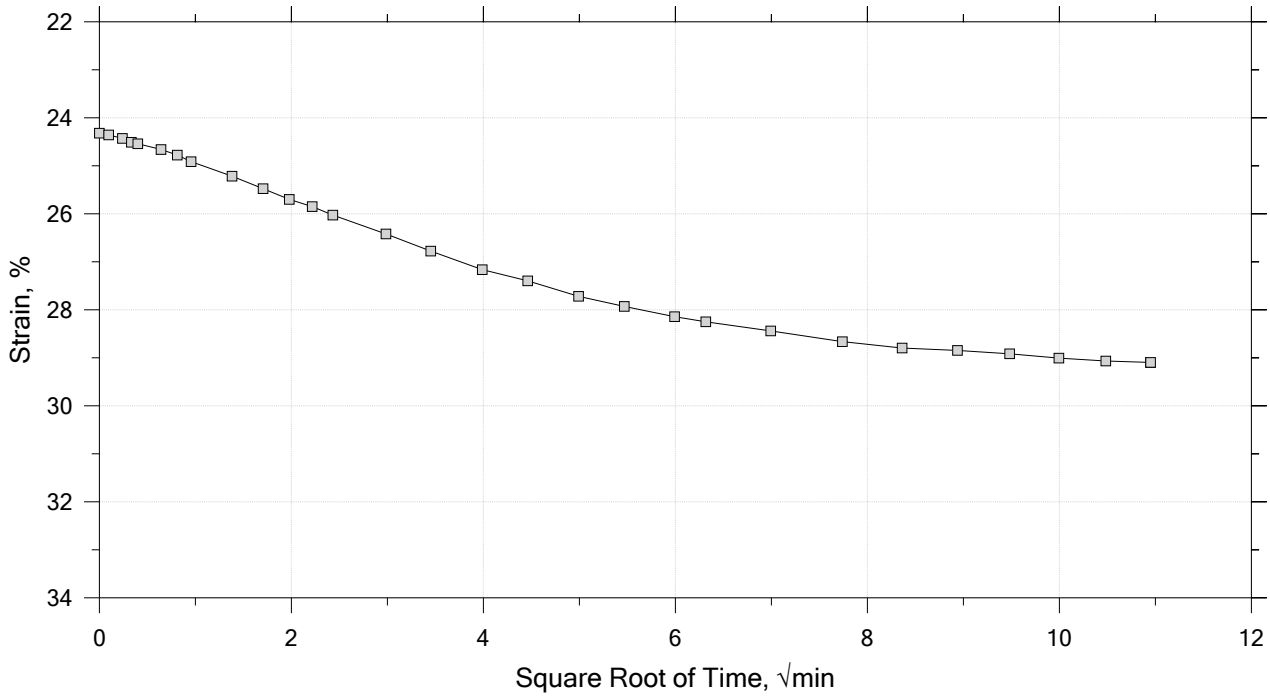
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 8 tsf

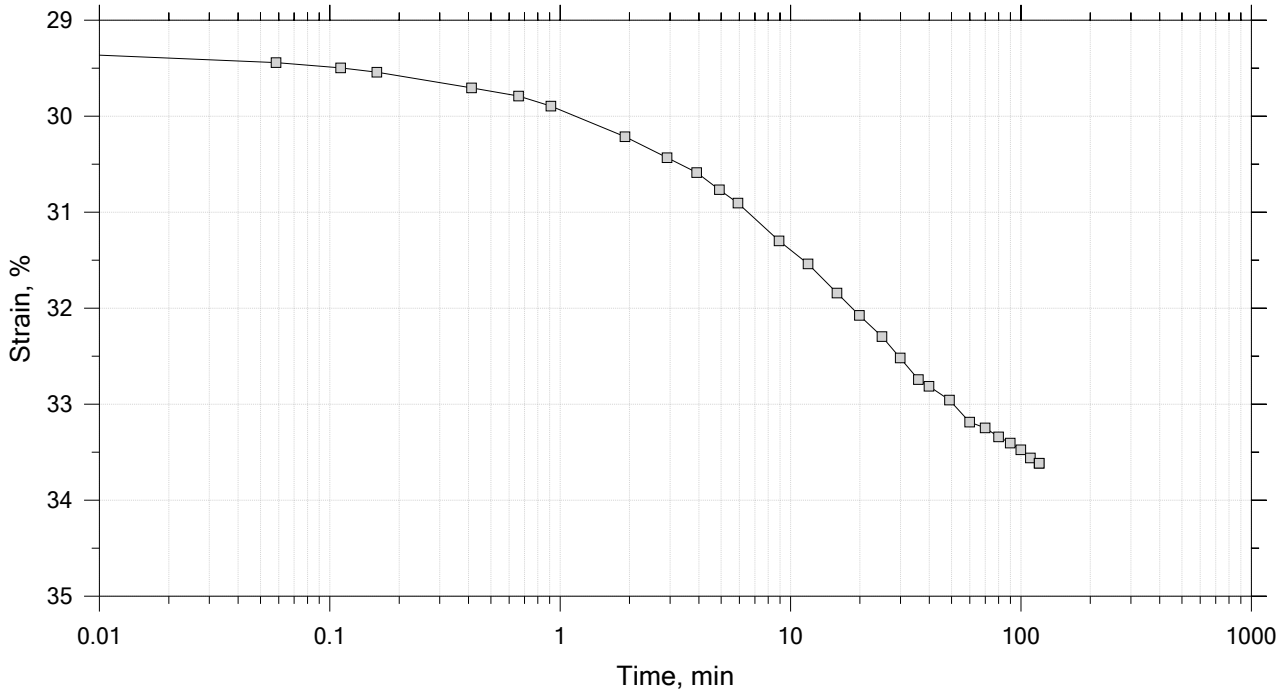


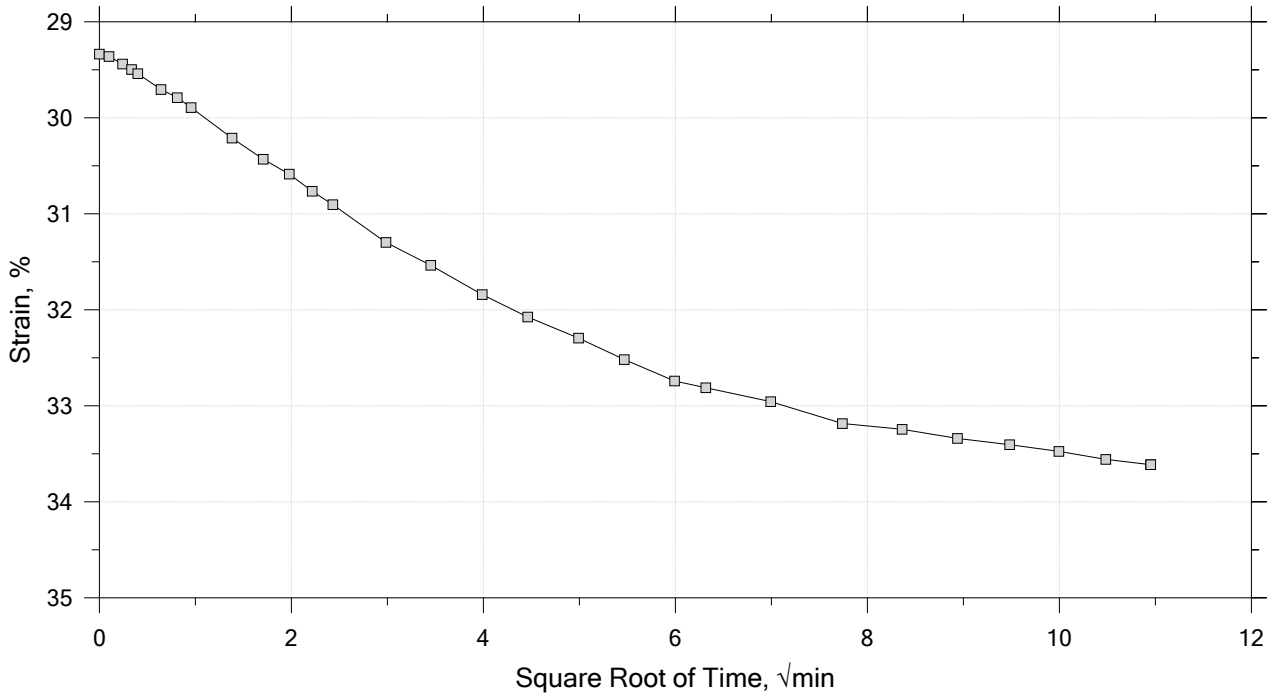


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

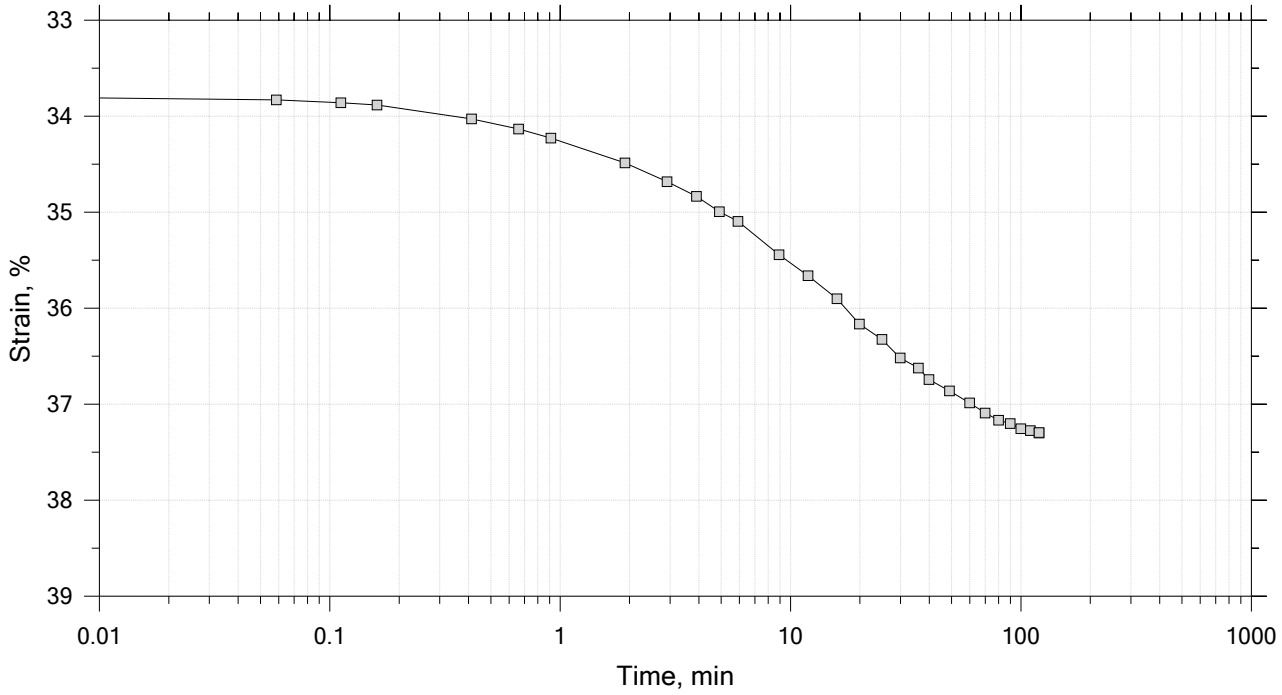


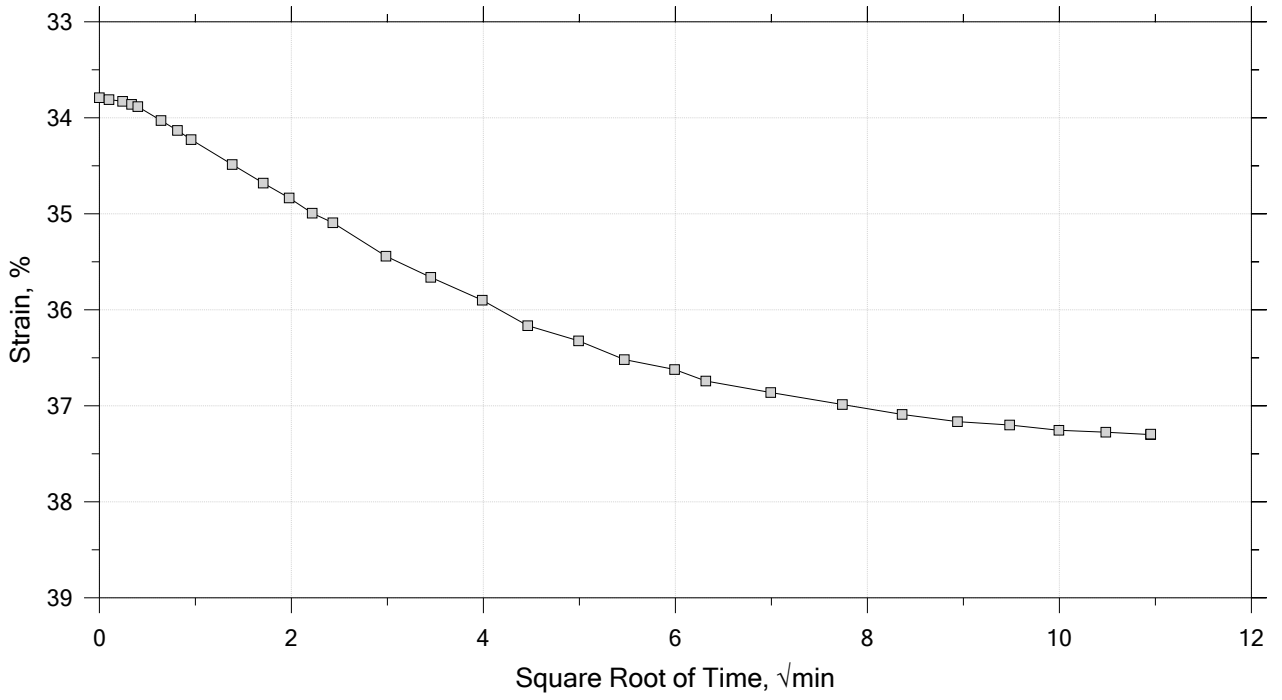


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

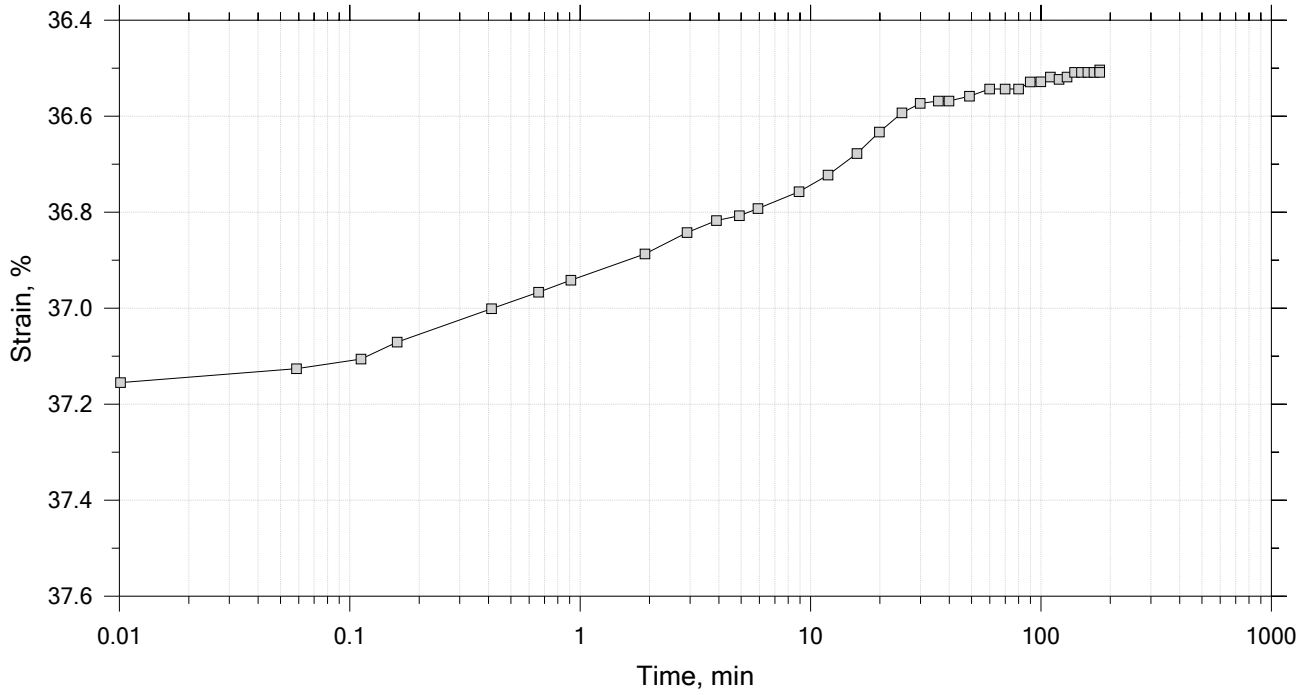


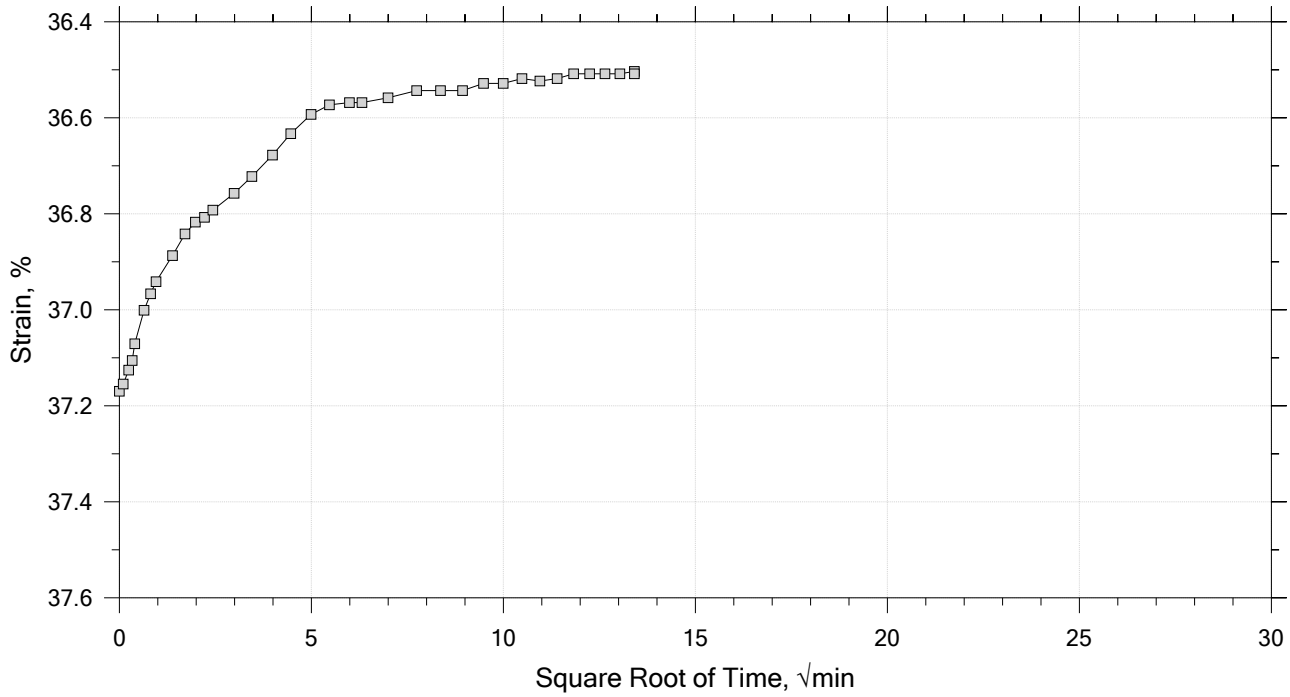


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

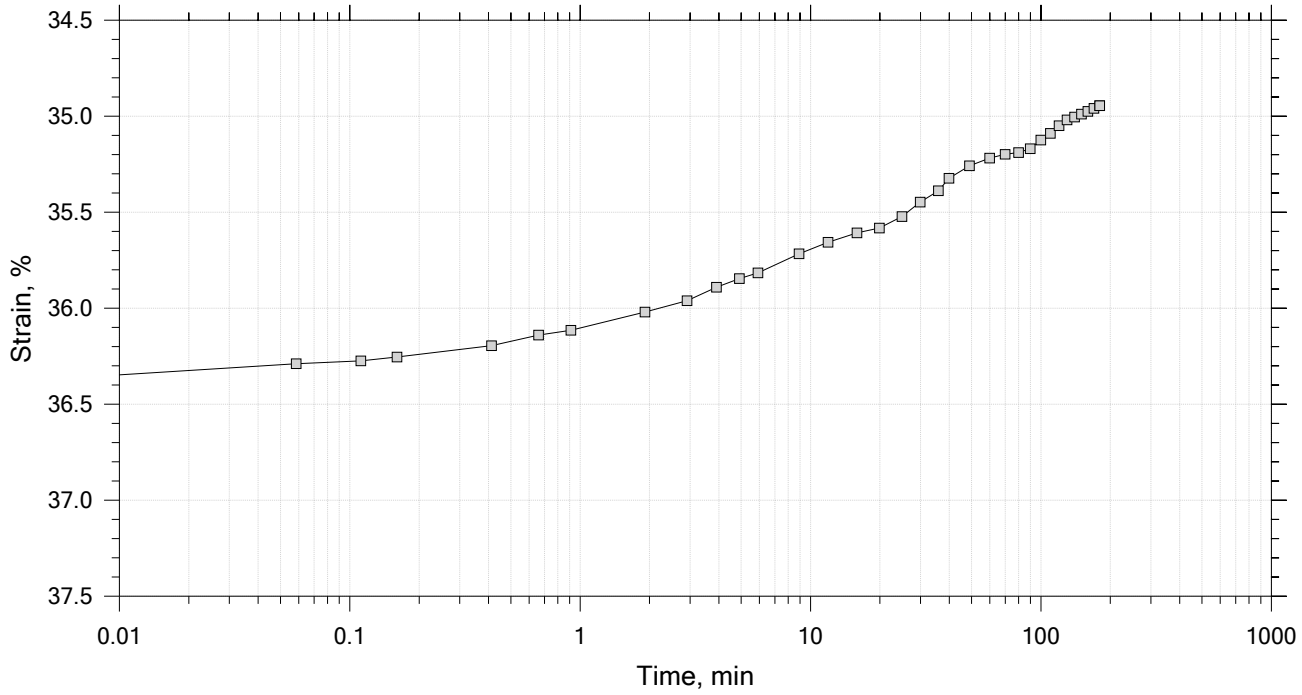


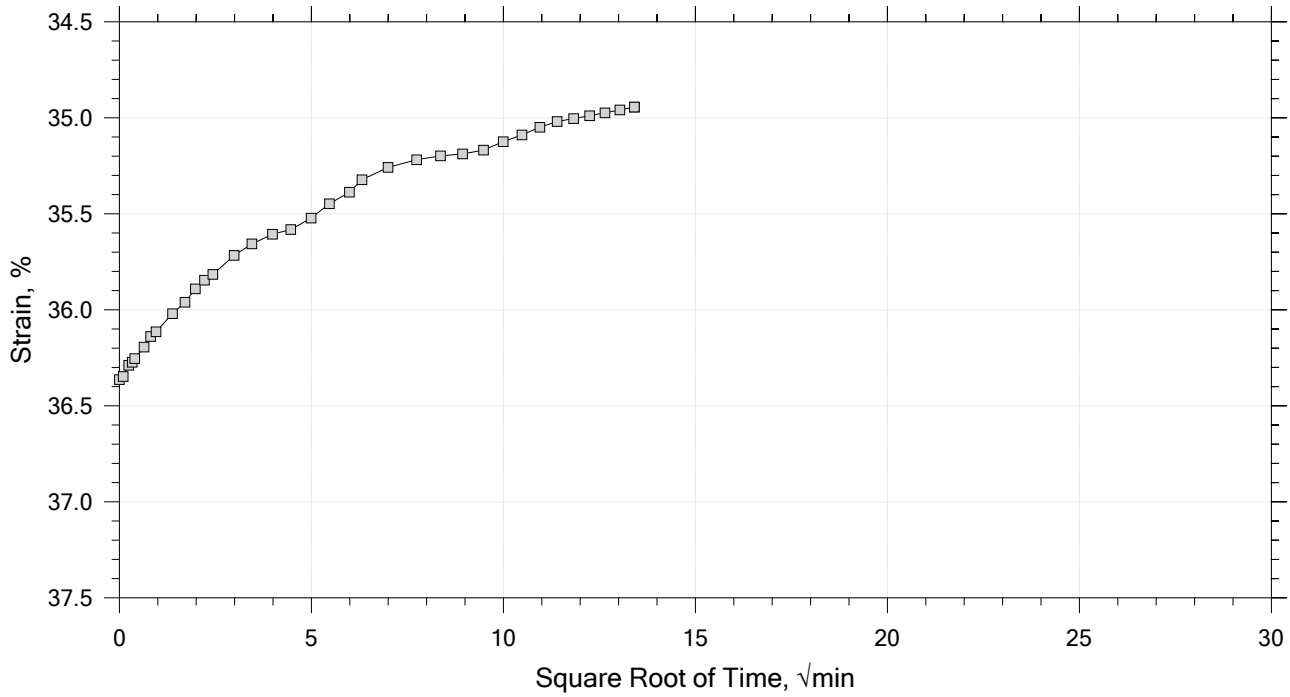


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

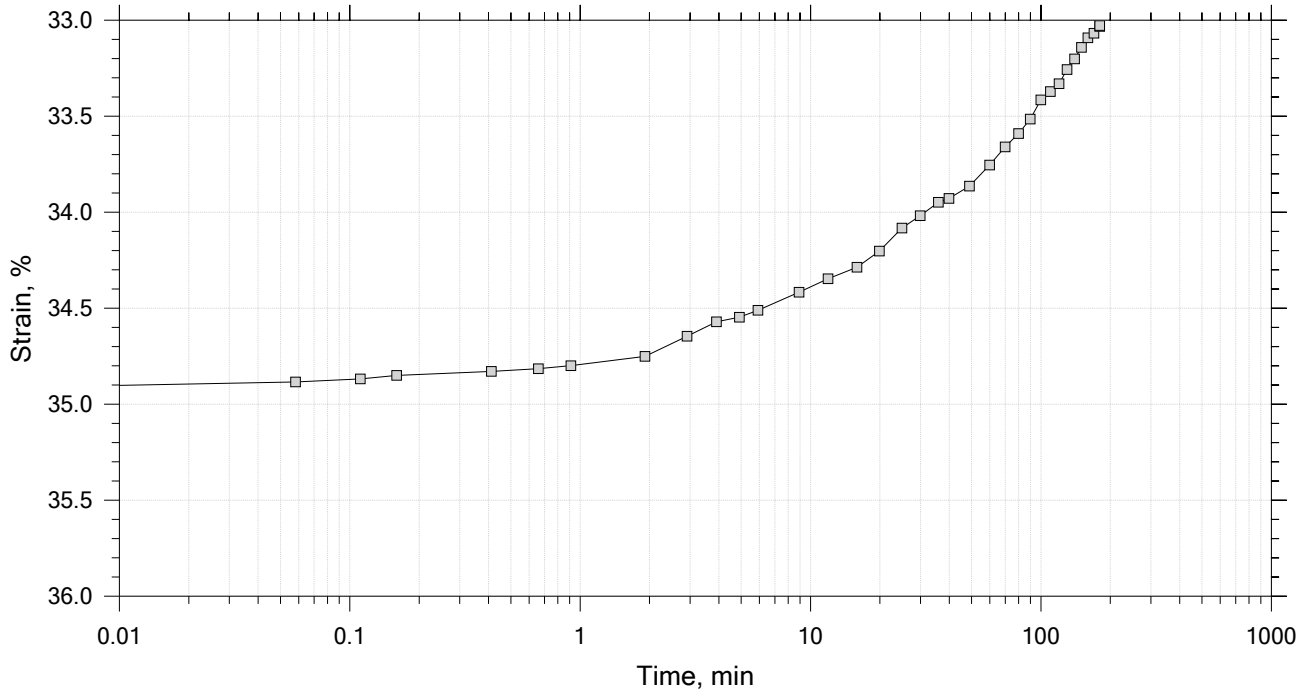


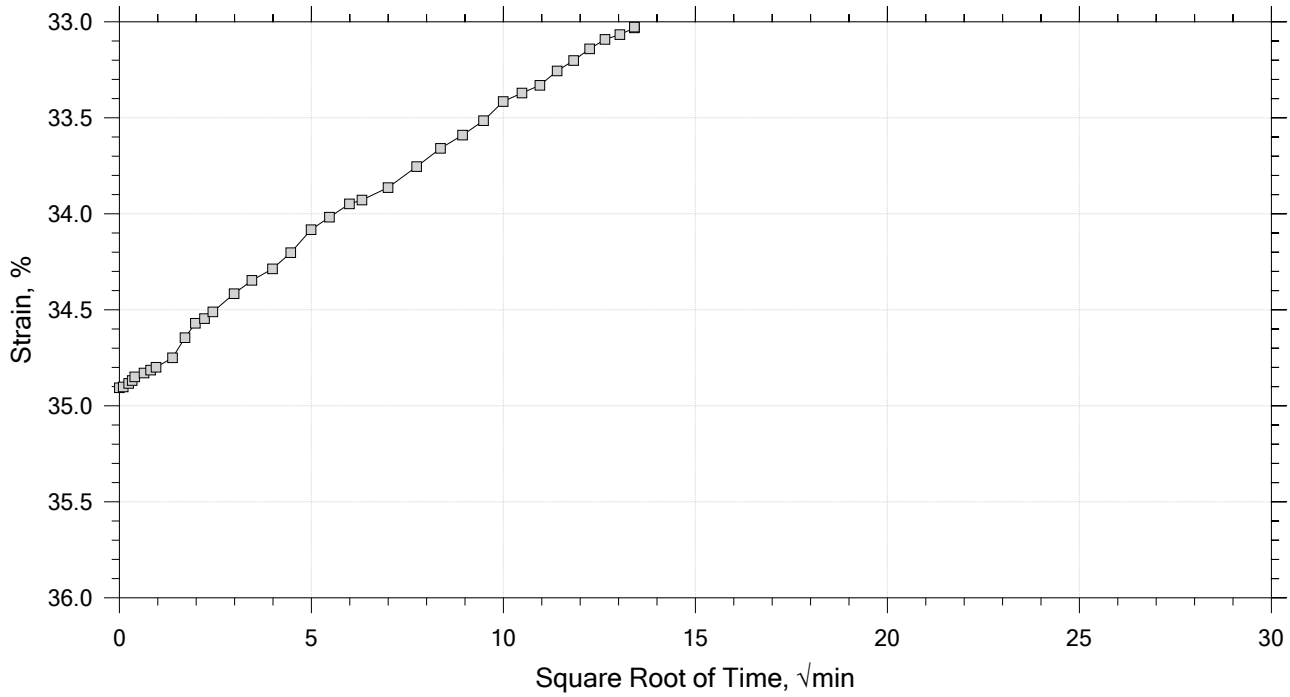


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

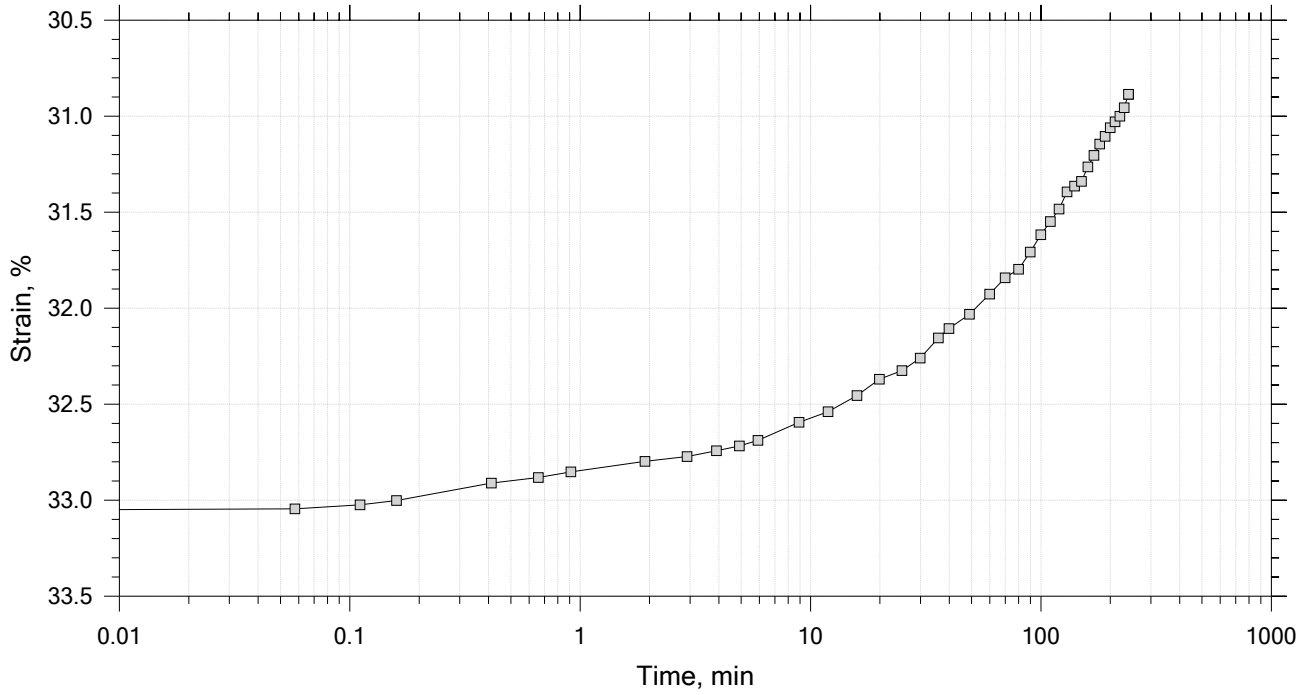


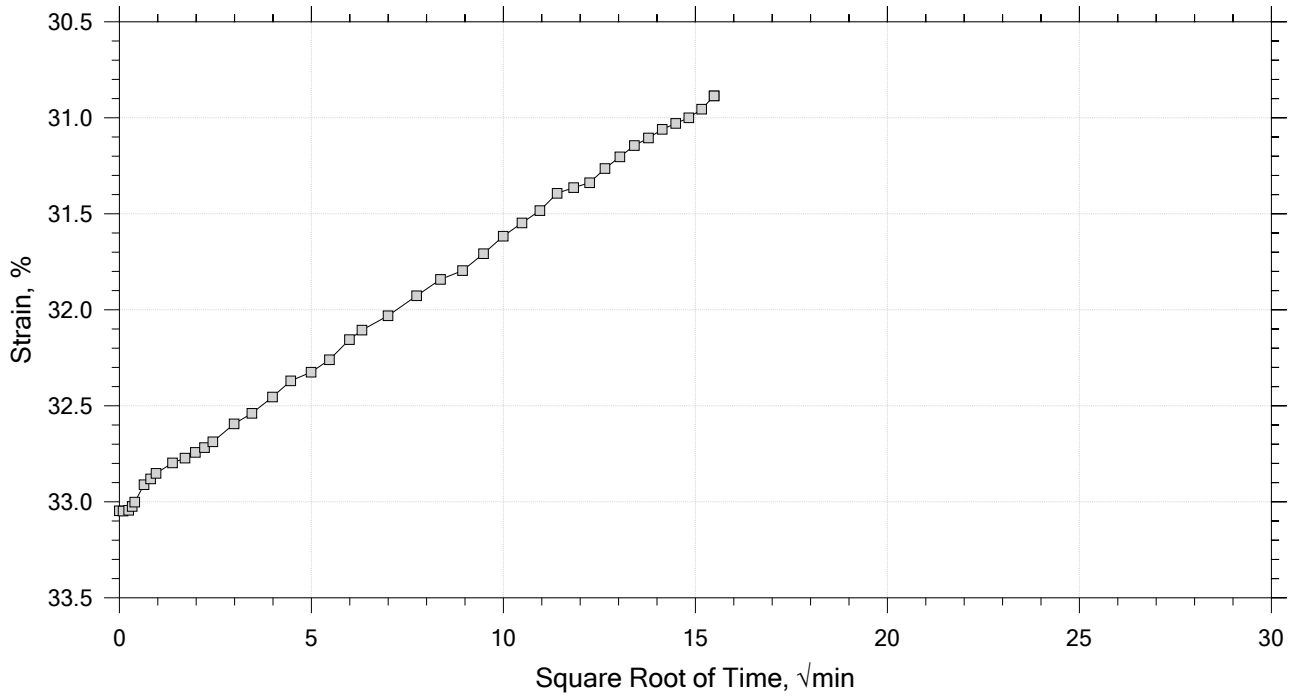


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

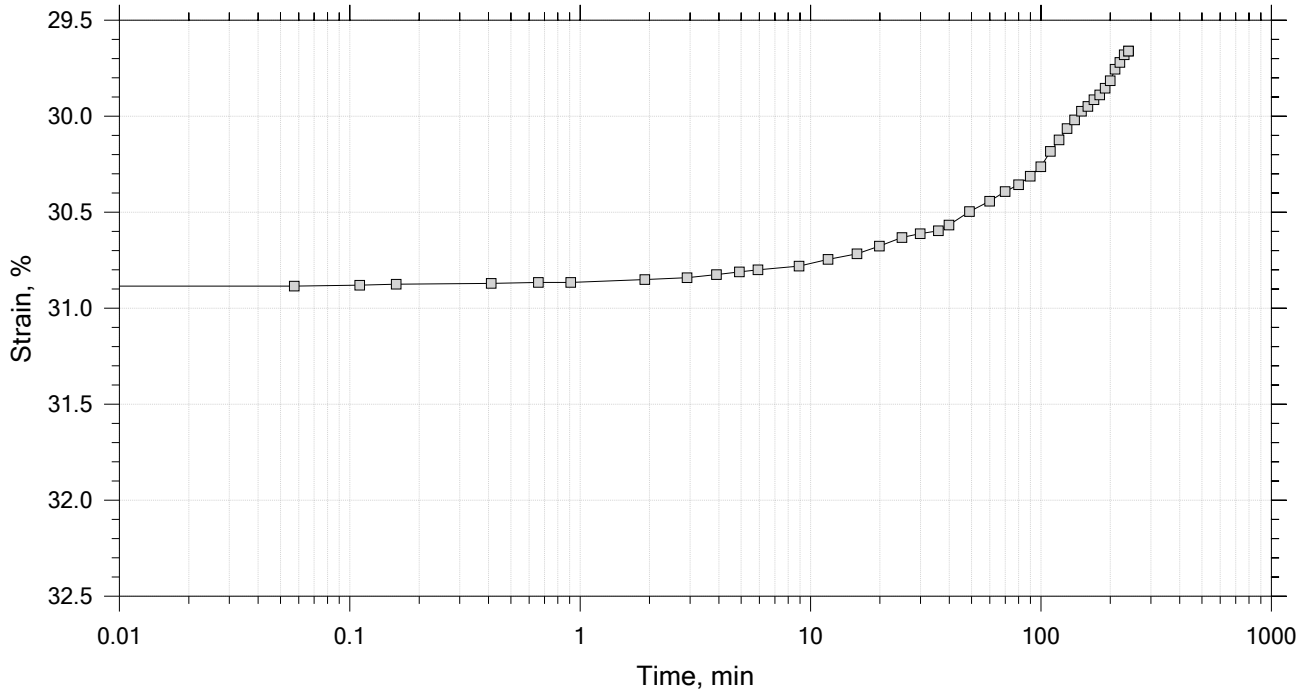


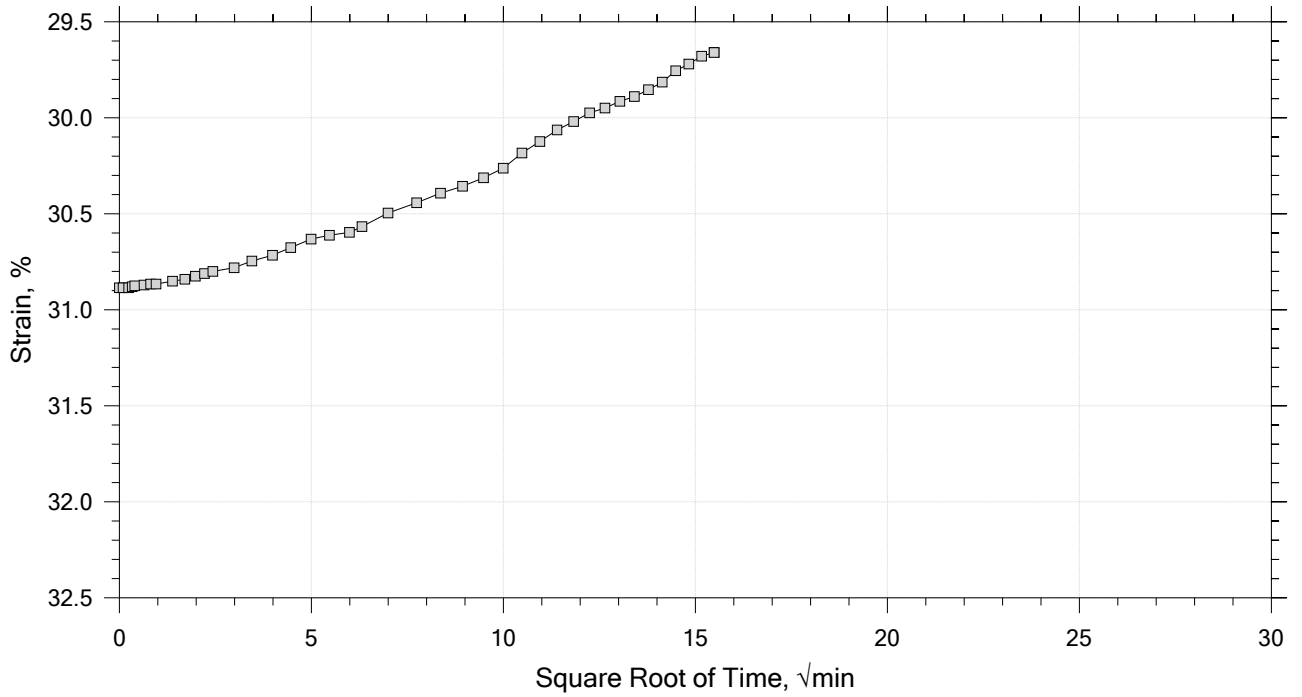


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.70	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 1.38	Plastic Limit: ---
Final Height: 0.72 in	Final Void Ratio: 0.711	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-1518	RING		Z-0240
Mass Container, gm	8.28	110.04	110.04	8.4
Mass Container + Wet Soil, gm	255.54	246.78	225.55	123.48
Mass Container + Dry Soil, gm	180.37	201.48	201.48	99.5
Mass Dry Soil, gm	172.09	91.44	91.44	91.1
Water Content, %	43.68	49.54	26.32	26.32
Void Ratio	---	1.38	0.71	---
Degree of Saturation, %	---	97.22	100.00	---
Dry Unit Weight, pcf	---	70.965	98.563	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB022	Tested By: md	Checked By: njh
	Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
	Test No.: IP-6	Sample Type: intact	Elevation: ---
	Description: Moist, brown and gray clay		
	Remarks: System K, Swell Pressure = 0.068 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0680	0.004598	1.37	0.460	1.052	5.39e-06	6.76e-02	9.84e-04	0.00e+00
2	0.125	0.01283	1.35	1.28	4.591	1.22e-06	1.44e-01	4.75e-04	0.00e+00
3	0.250	0.03156	1.30	3.16	4.391	1.24e-06	1.50e-01	5.02e-04	0.00e+00
4	0.500	0.06364	1.23	6.36	6.133	8.43e-07	1.28e-01	2.92e-04	0.00e+00
5	1.00	0.1179	1.10	11.8	10.804	4.36e-07	1.08e-01	1.28e-04	0.00e+00
6	2.00	0.1813	0.946	18.1	10.043	4.10e-07	6.35e-02	7.02e-05	0.00e+00
7	4.00	0.2395	0.807	23.9	10.207	3.48e-07	2.91e-02	2.73e-05	0.00e+00
8	8.00	0.2910	0.685	29.1	9.732	3.16e-07	1.29e-02	1.10e-05	0.00e+00
9	16.0	0.3361	0.578	33.6	0.000	0.00e+00	5.65e-03	0.00e+00	0.00e+00
10	32.0	0.3730	0.490	37.3	11.065	2.15e-07	2.30e-03	1.33e-06	0.00e+00
11	8.00	0.3651	0.509	36.5	0.000	0.00e+00	3.28e-04	0.00e+00	0.00e+00
12	2.00	0.3494	0.546	34.9	0.000	0.00e+00	2.61e-03	0.00e+00	0.00e+00
13	0.500	0.3303	0.592	33.0	0.000	0.00e+00	1.28e-02	0.00e+00	0.00e+00
14	0.125	0.3089	0.643	30.9	0.000	0.00e+00	5.71e-02	0.00e+00	0.00e+00
15	0.0625	0.2966	0.672	29.7	0.000	0.00e+00	1.96e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

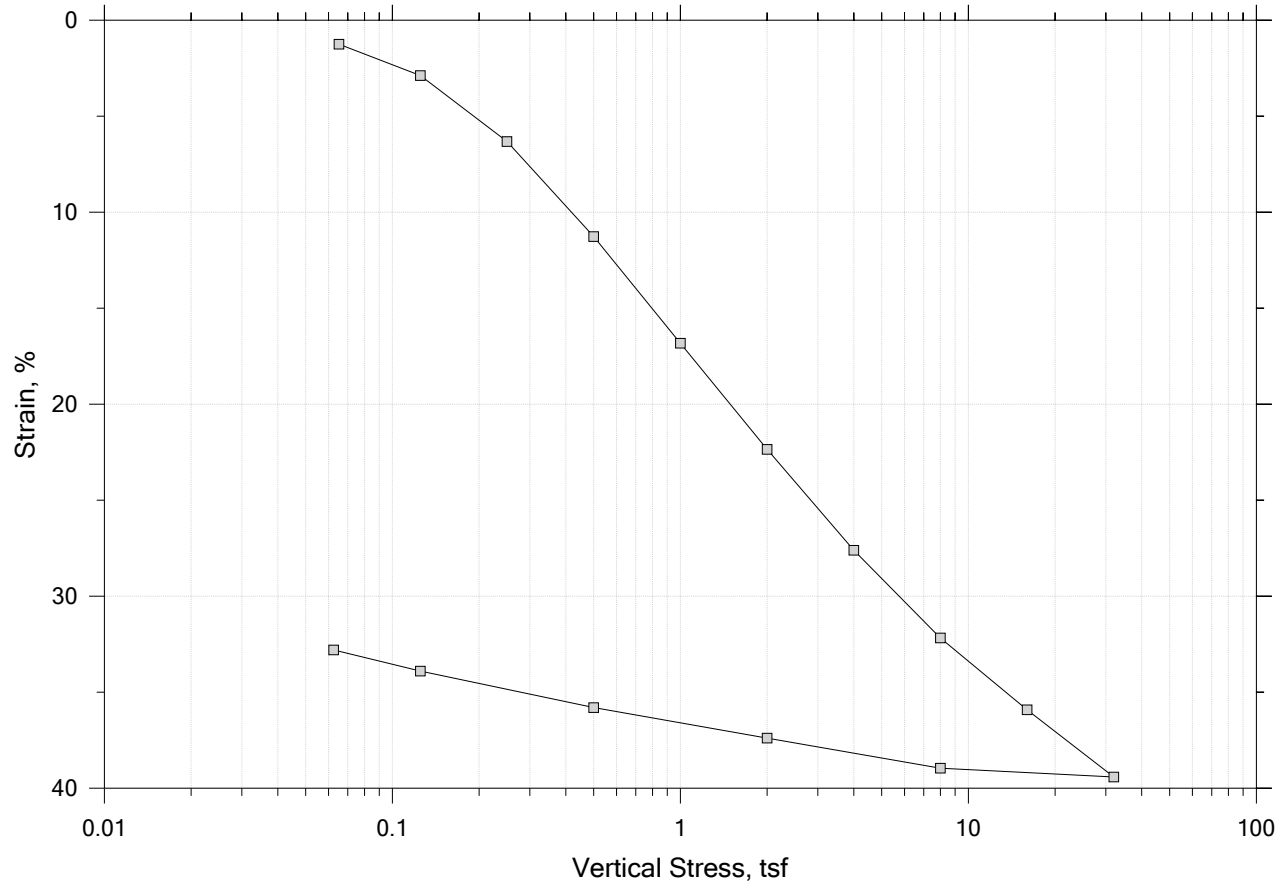
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0680	0.004598	1.37	0.460	4.741	5.15e-06	6.76e-02	9.40e-04
2	0.125	0.01283	1.35	1.28	17.245	1.40e-06	1.44e-01	5.45e-04
3	0.250	0.03156	1.30	3.16	20.331	1.15e-06	1.50e-01	4.66e-04
4	0.500	0.06364	1.23	6.36	27.914	7.97e-07	1.28e-01	2.76e-04
5	1.00	0.1179	1.10	11.8	35.443	5.72e-07	1.08e-01	1.67e-04
6	2.00	0.1813	0.946	18.1	46.813	3.79e-07	6.35e-02	6.49e-05
7	4.00	0.2395	0.807	23.9	51.081	2.99e-07	2.91e-02	2.35e-05
8	8.00	0.2910	0.685	29.1	45.375	2.92e-07	1.29e-02	1.01e-05
9	16.0	0.3361	0.578	33.6	38.323	3.02e-07	5.65e-03	4.59e-06
10	32.0	0.3730	0.490	37.3	42.053	2.43e-07	2.30e-03	1.51e-06
11	8.00	0.3651	0.509	36.5	20.804	4.70e-07	3.28e-04	4.15e-07
12	2.00	0.3494	0.546	34.9	72.455	1.40e-07	2.61e-03	9.83e-07
13	0.500	0.3303	0.592	33.0	172.403	6.20e-08	1.28e-02	2.14e-06
14	0.125	0.3089	0.643	30.9	179.686	6.32e-08	5.71e-02	9.74e-06
15	0.0625	0.2966	0.672	29.7	0.000	0.00e+00	1.96e-01	0.00e+00

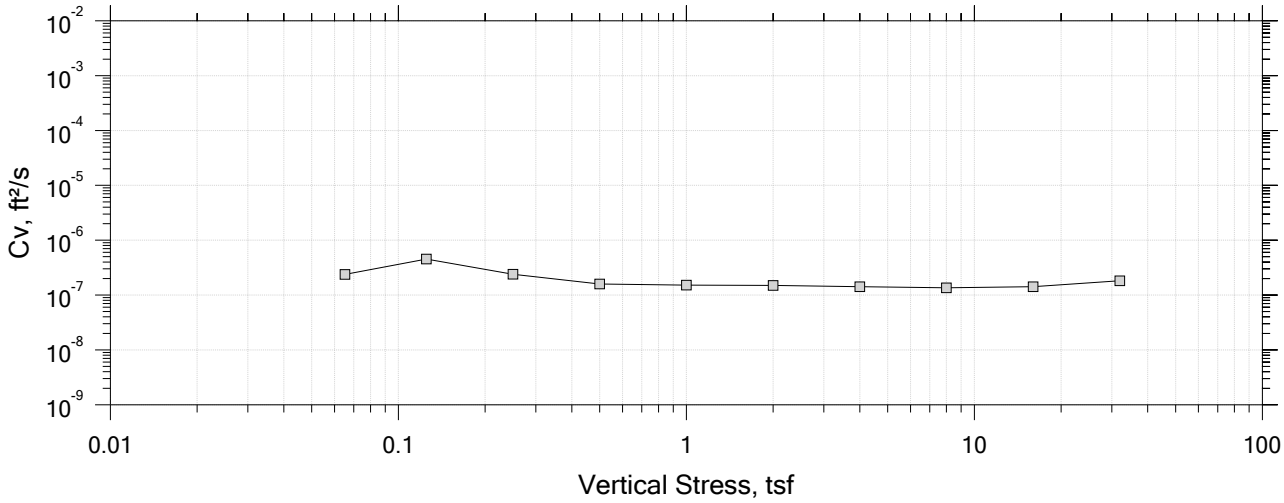
GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB022	Tested By: md	Checked By: njh
Sample No.: SL0812	Test Date: 01/10/19	Depth: 7-9 ft
Test No.: IP-6	Sample Type: intact	Elevation: ---
Description: Moist, brown and gray clay		
Remarks: System K, Swell Pressure = 0.068 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





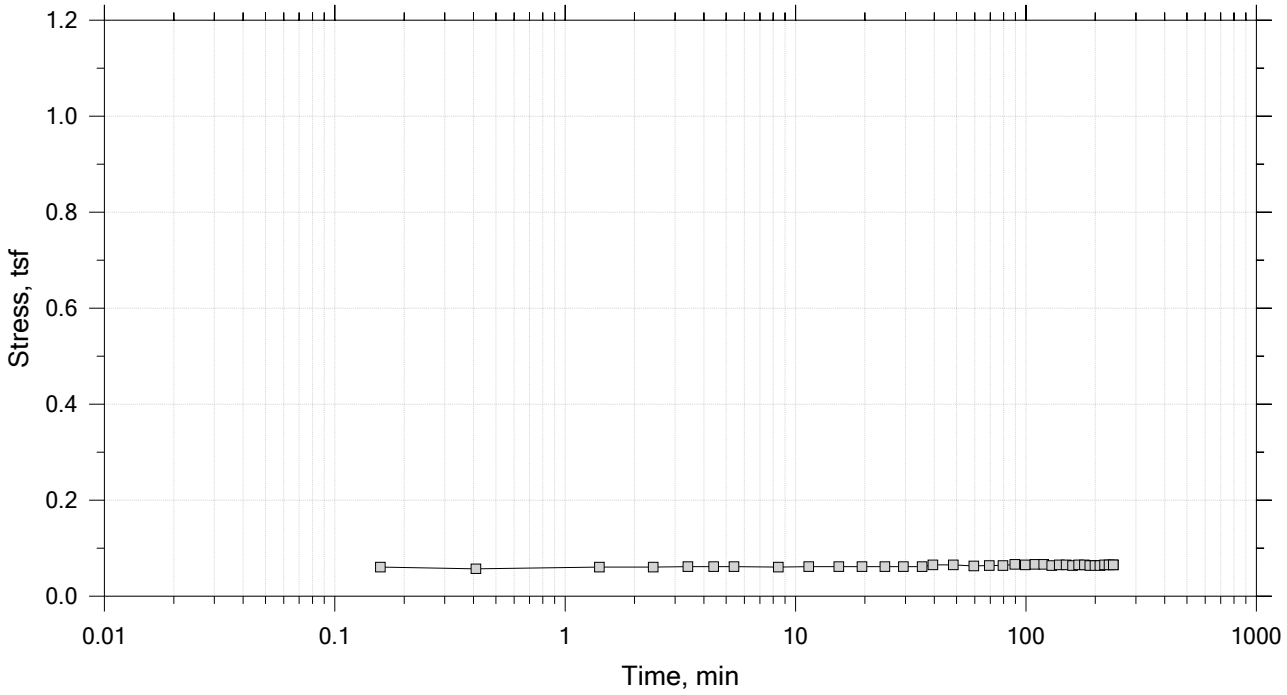
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
	Displacement at End of Increment		

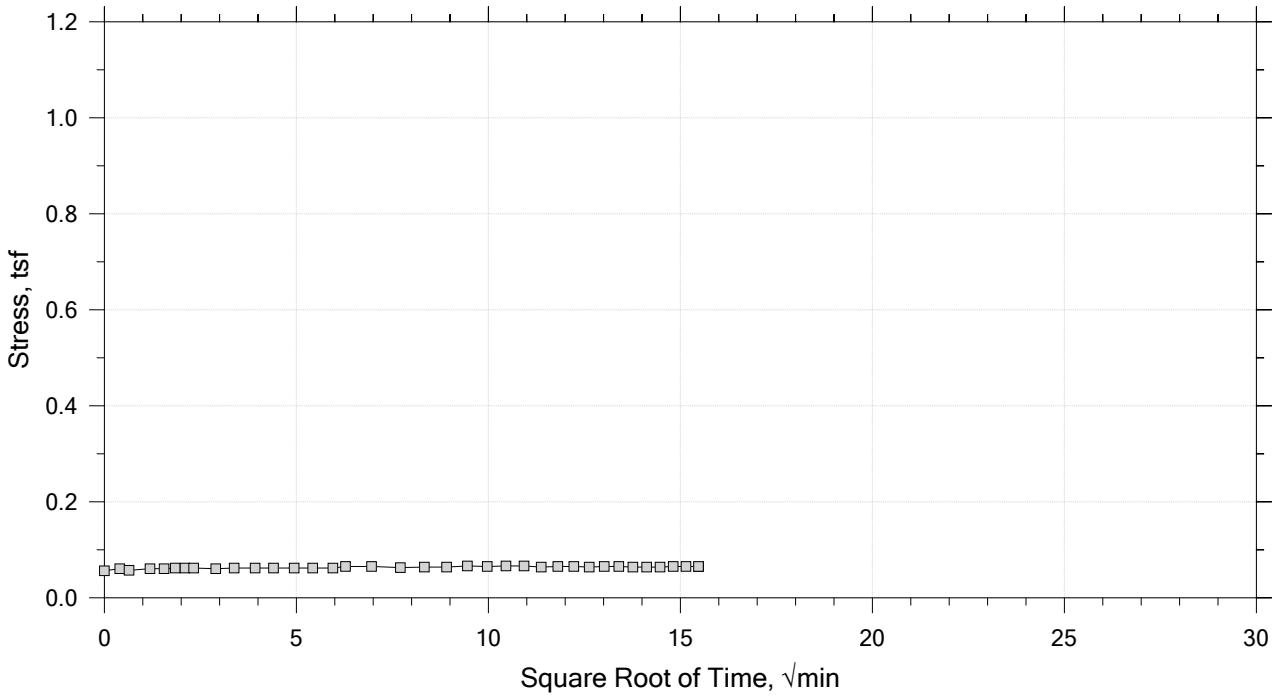
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0652 tsf

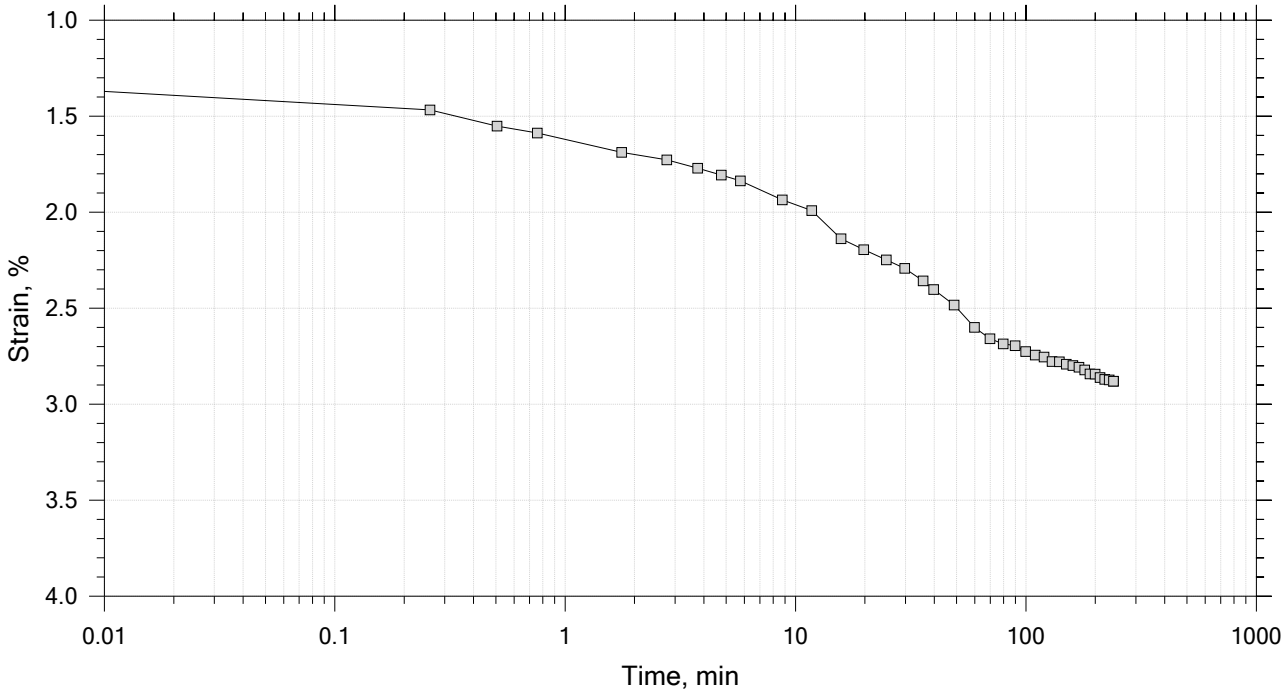


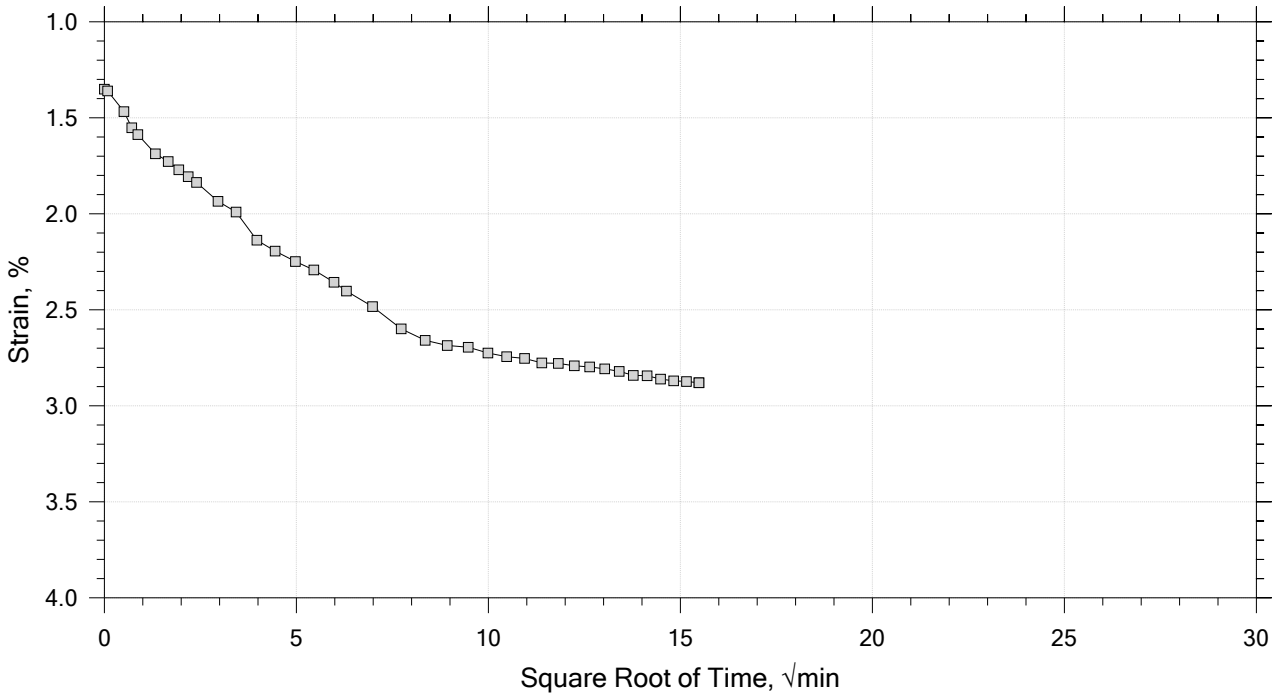


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf





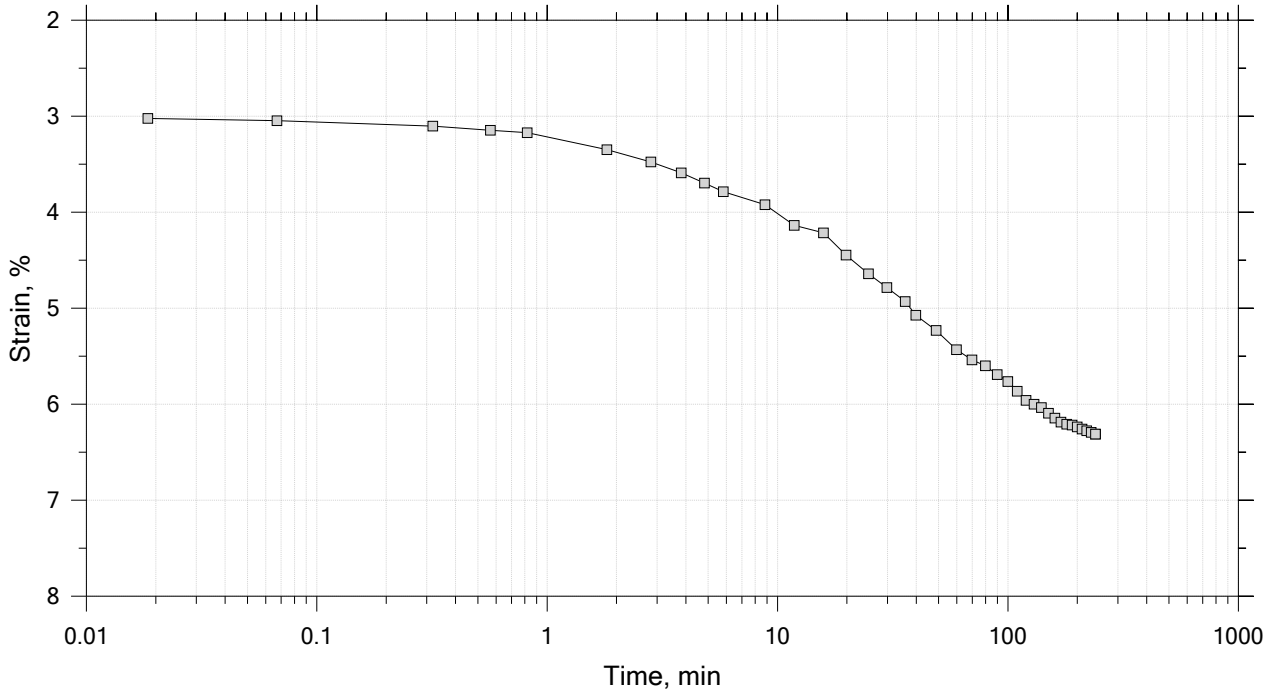
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

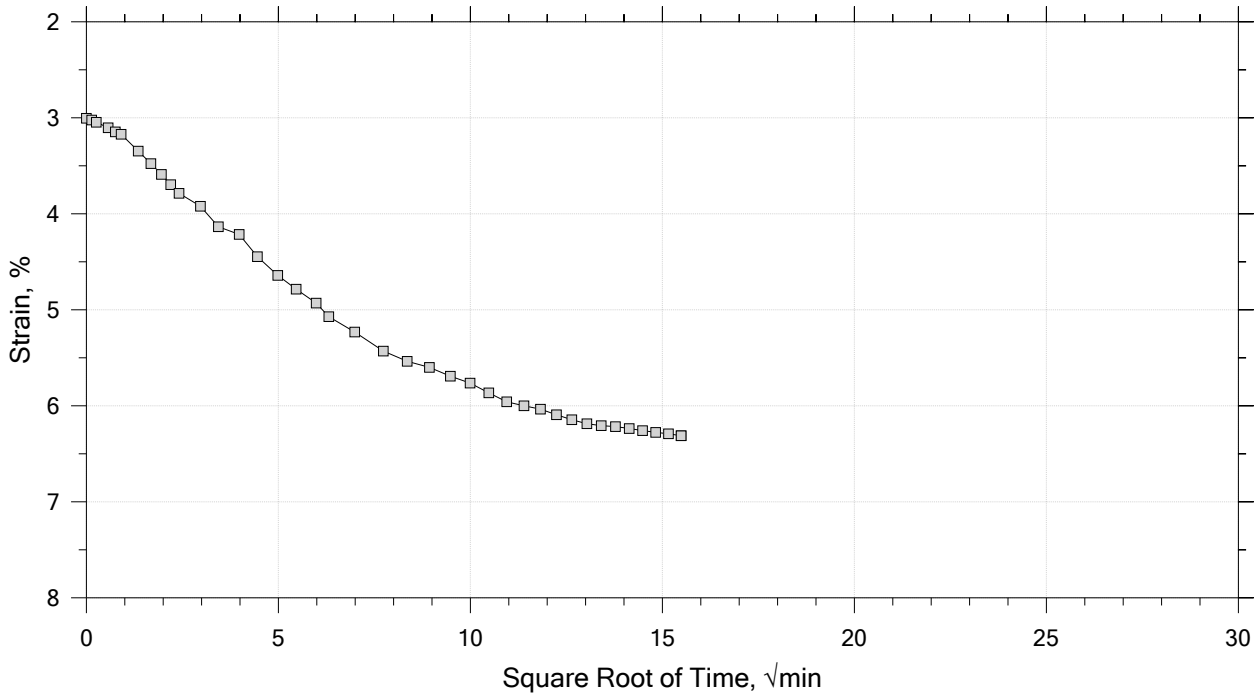
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15

Constant Load Step

Stress: 0.25 tsf





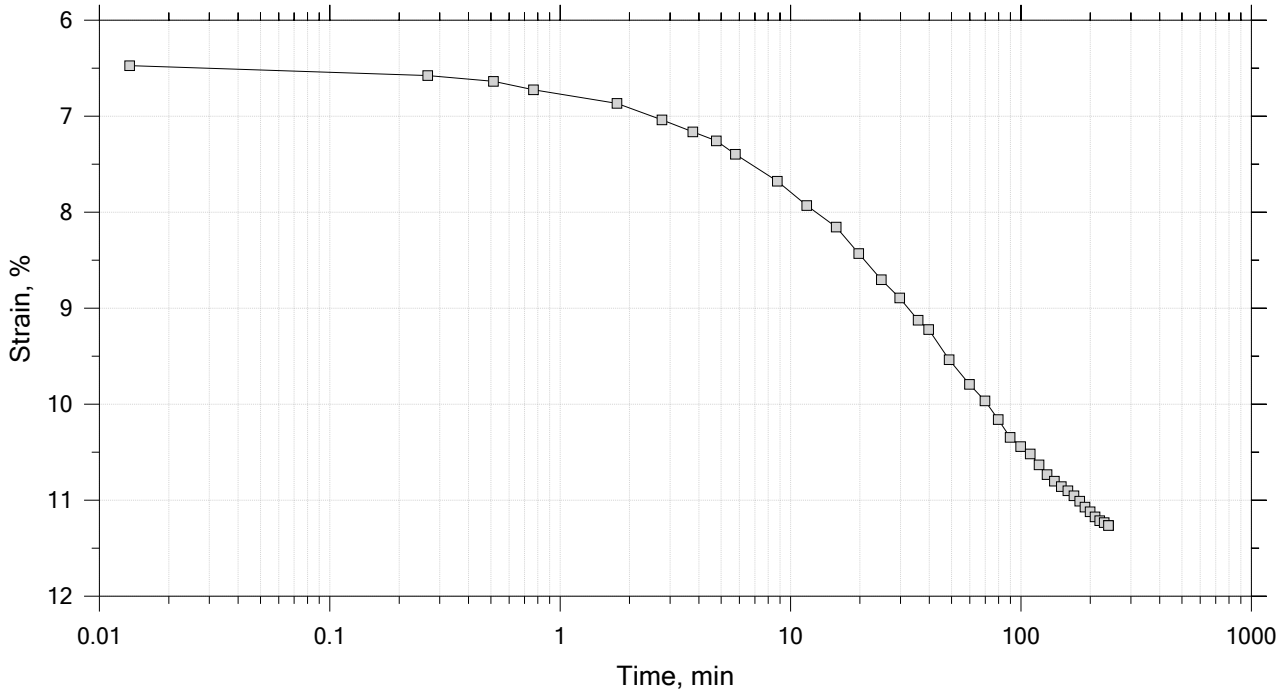
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

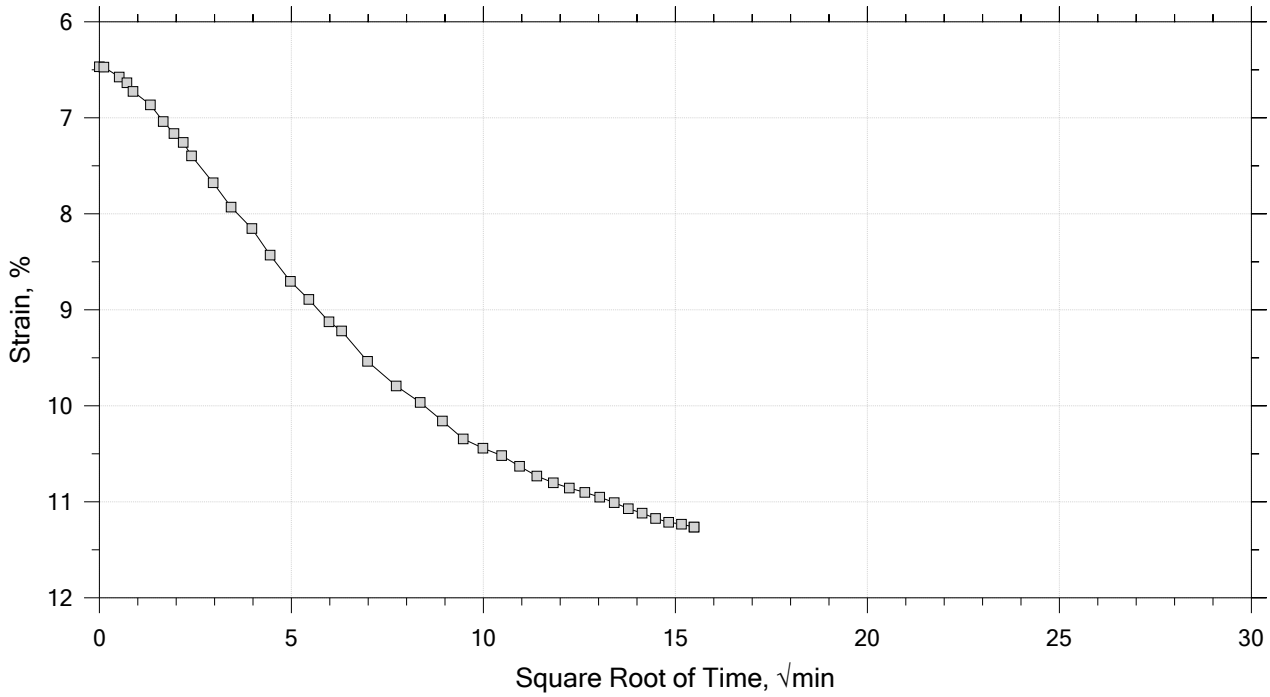
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf

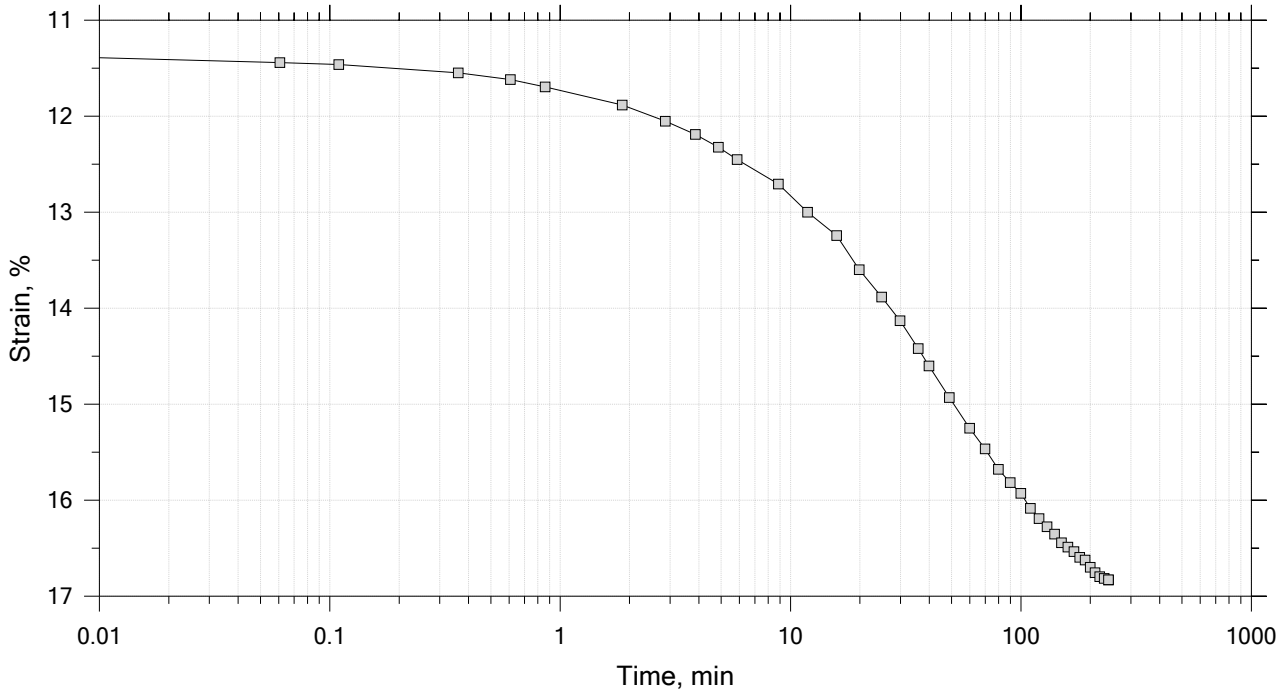


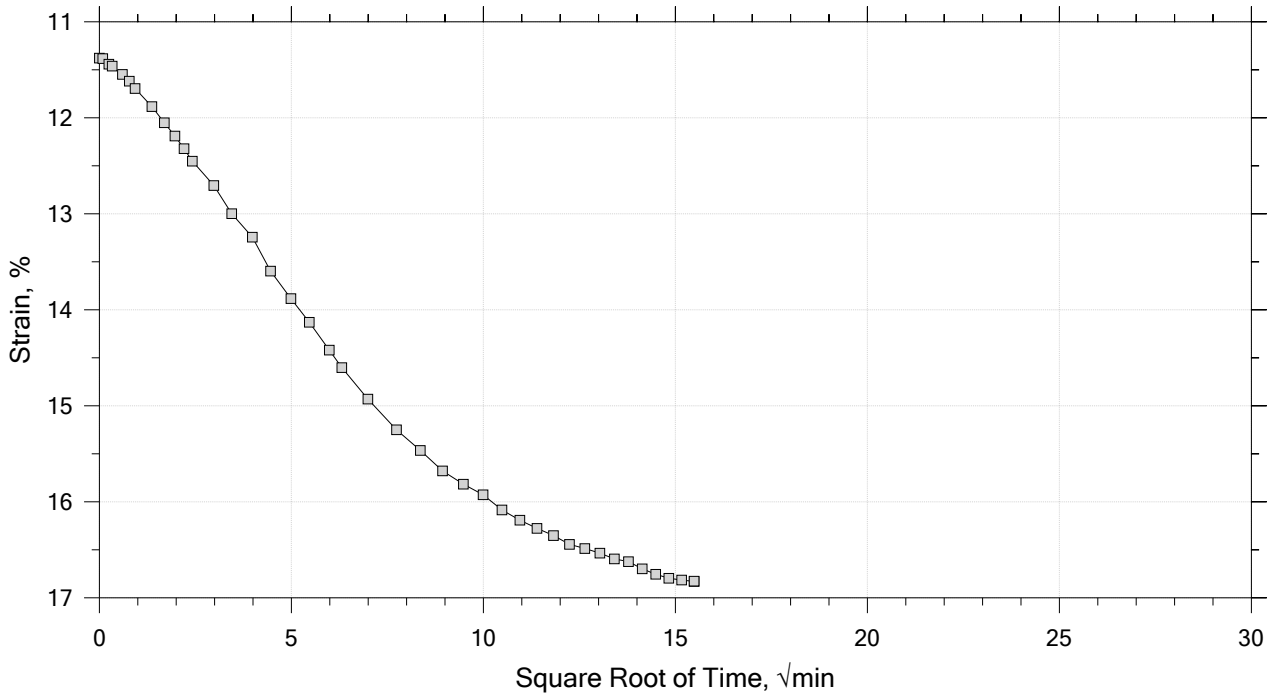


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf





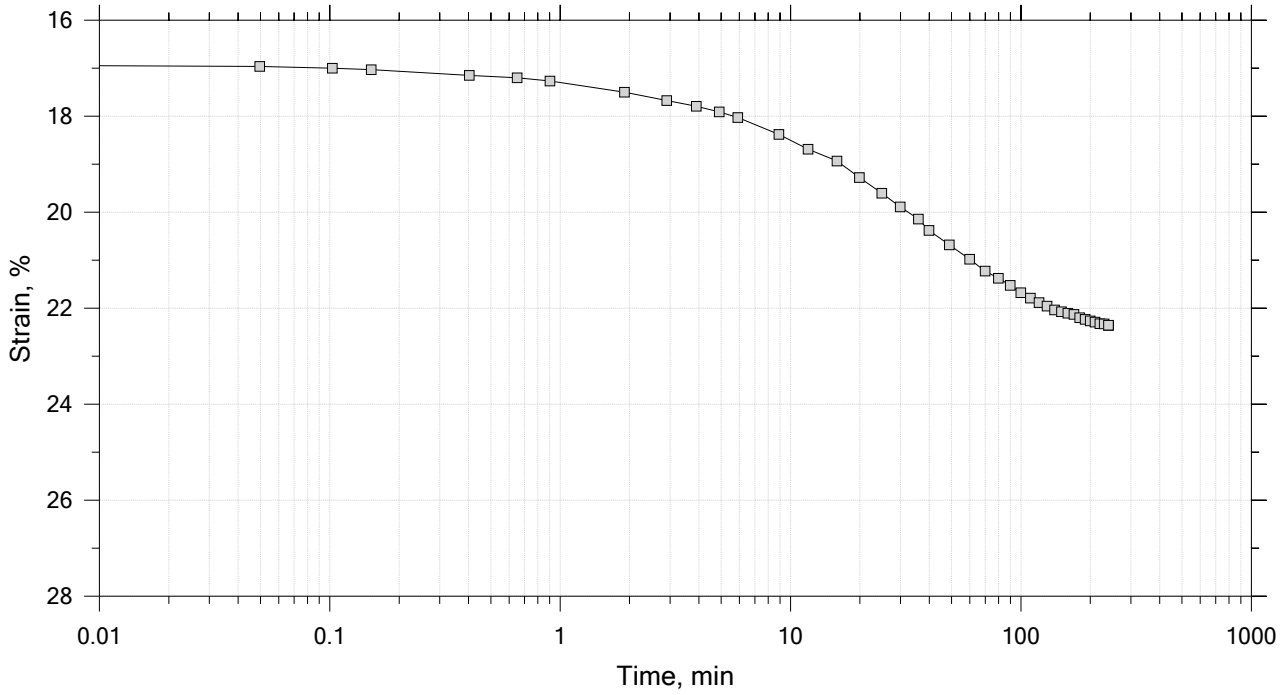
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

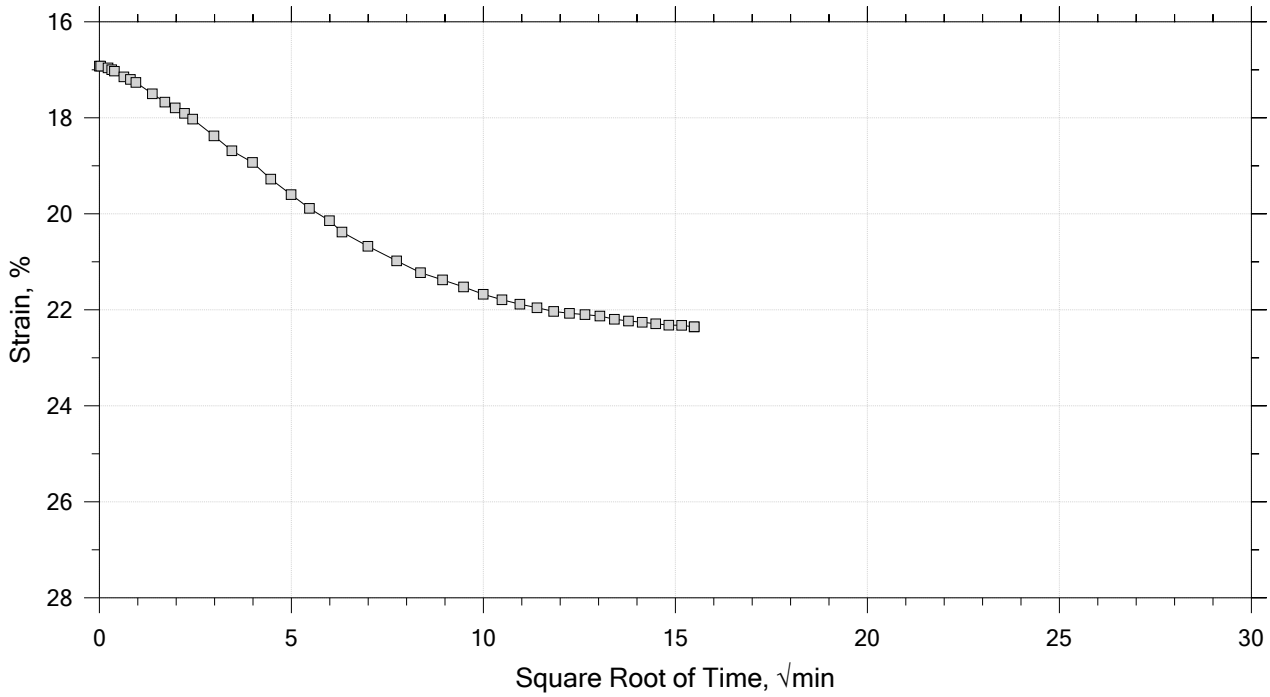
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf





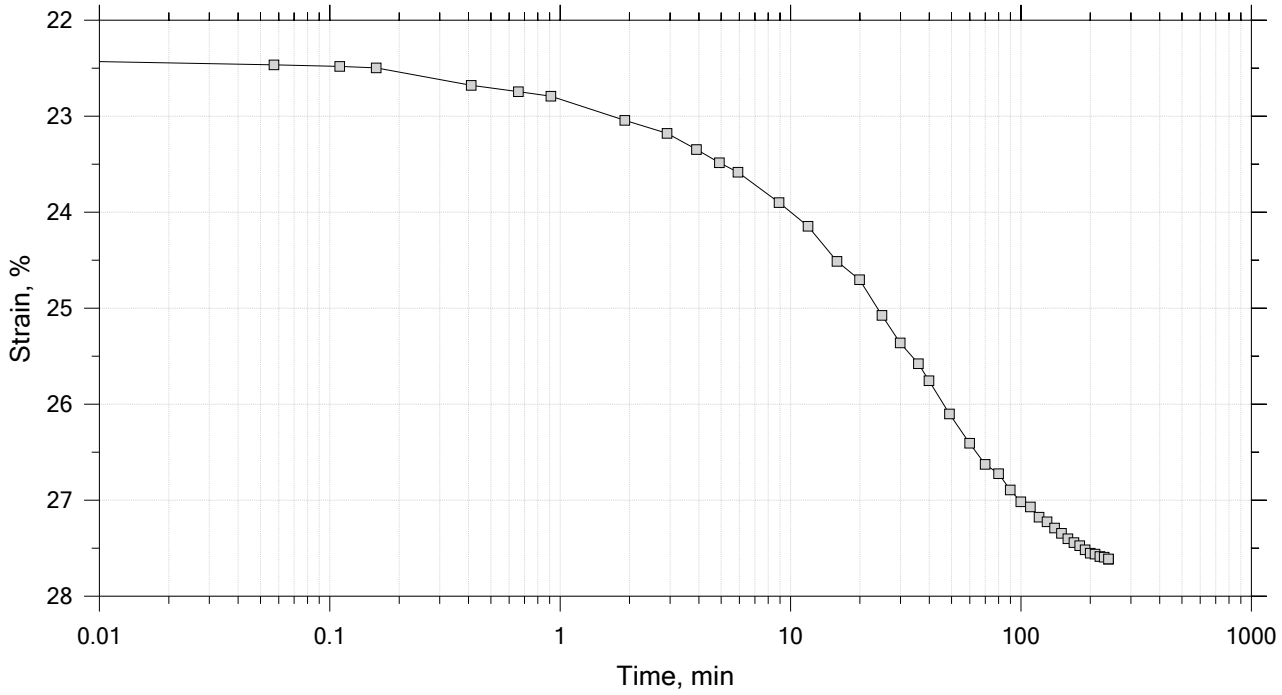
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

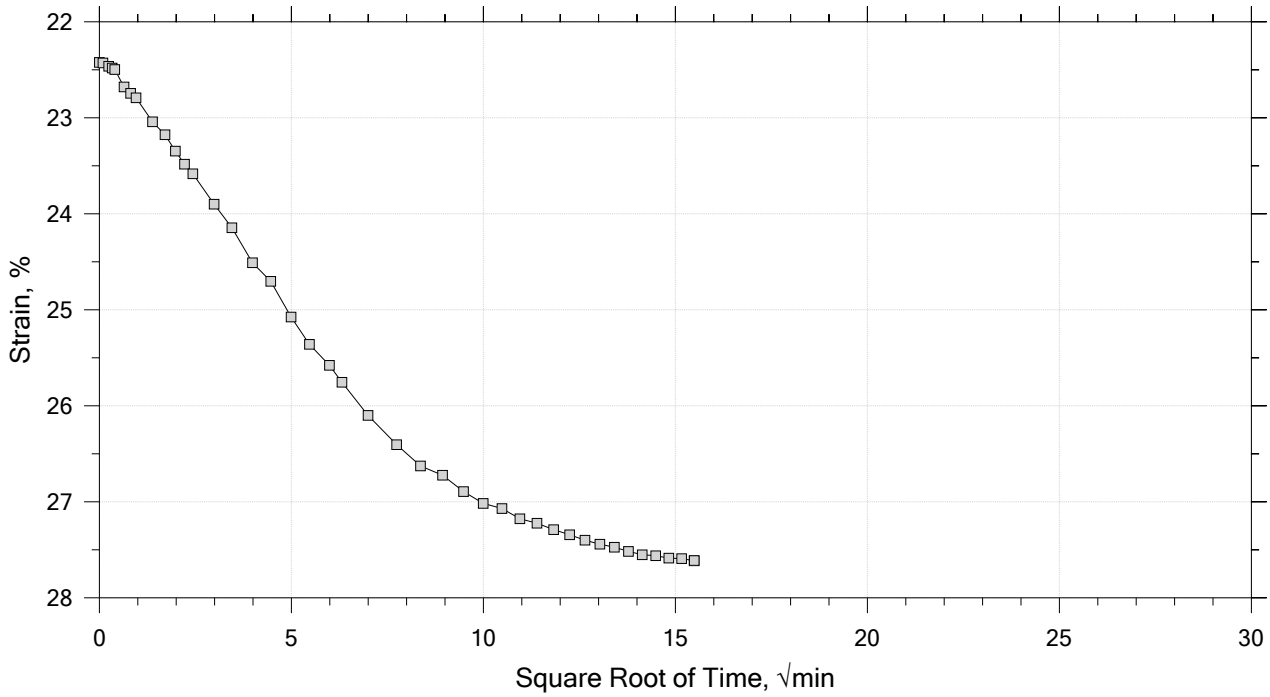
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

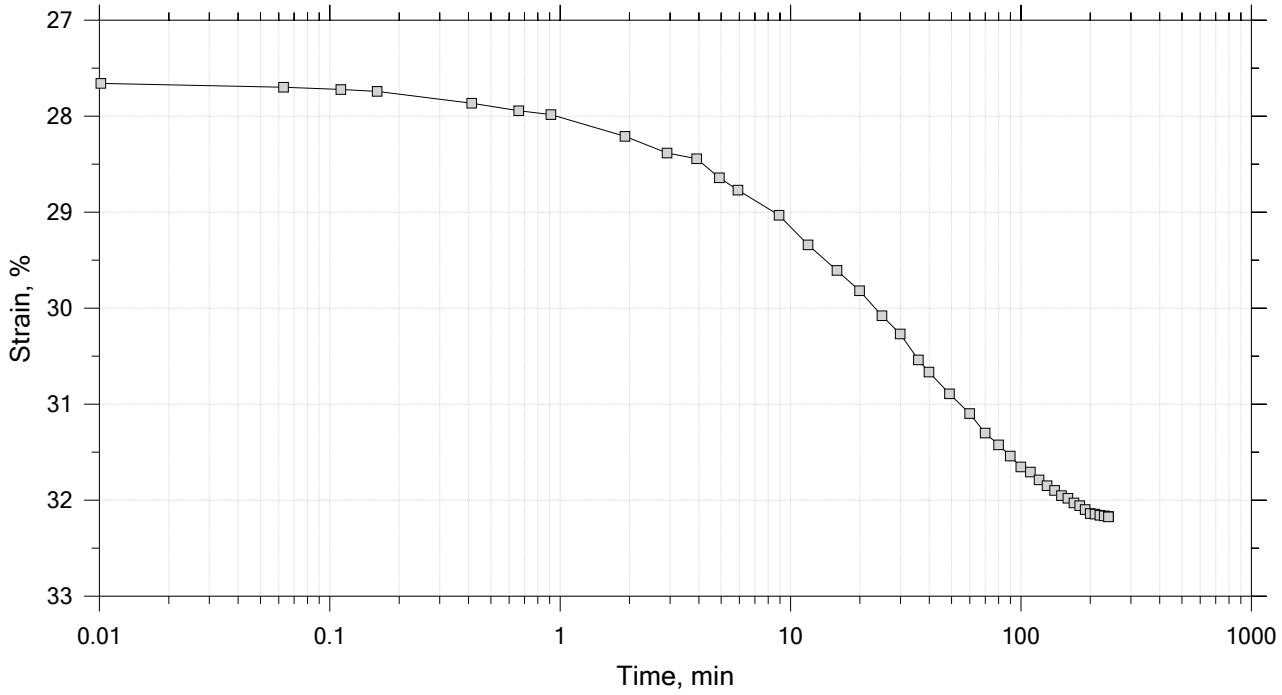


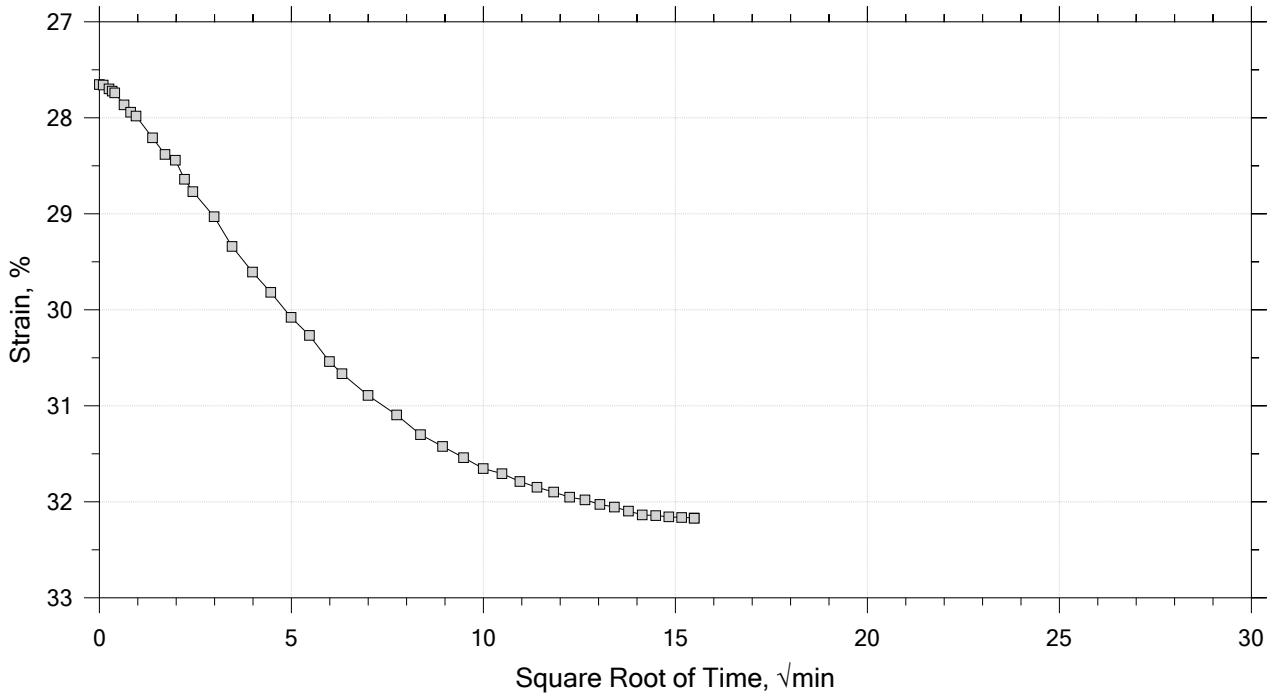


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf





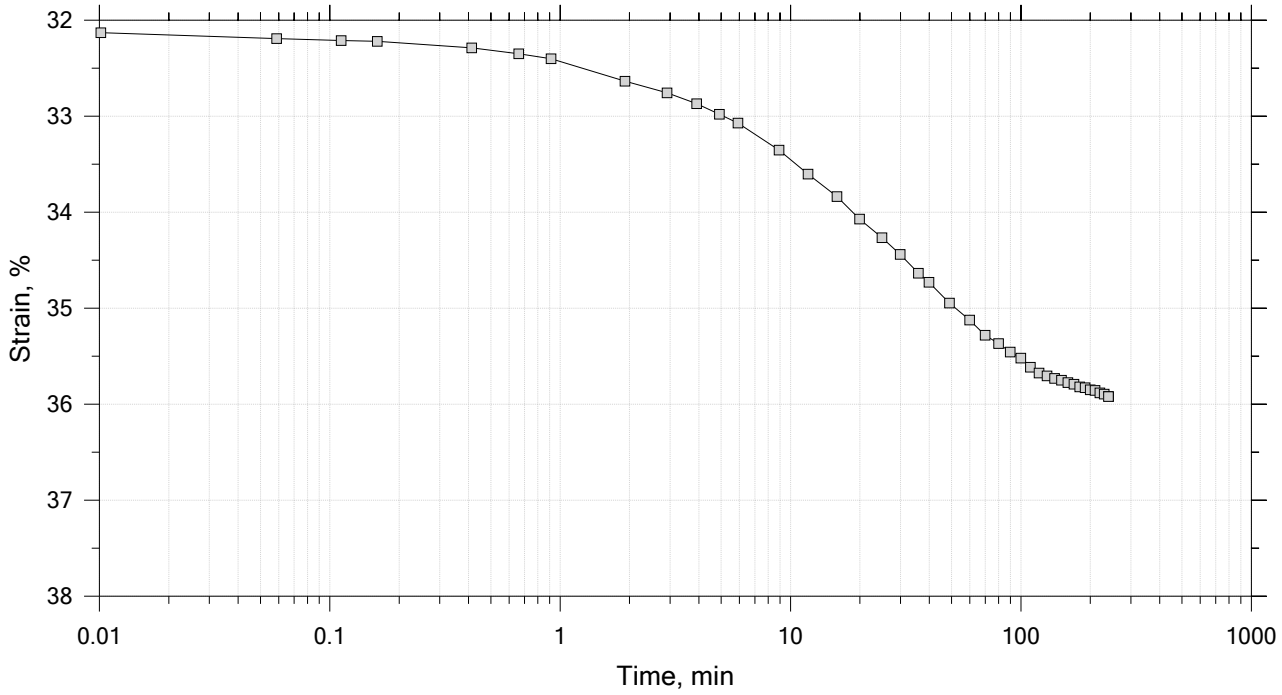
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

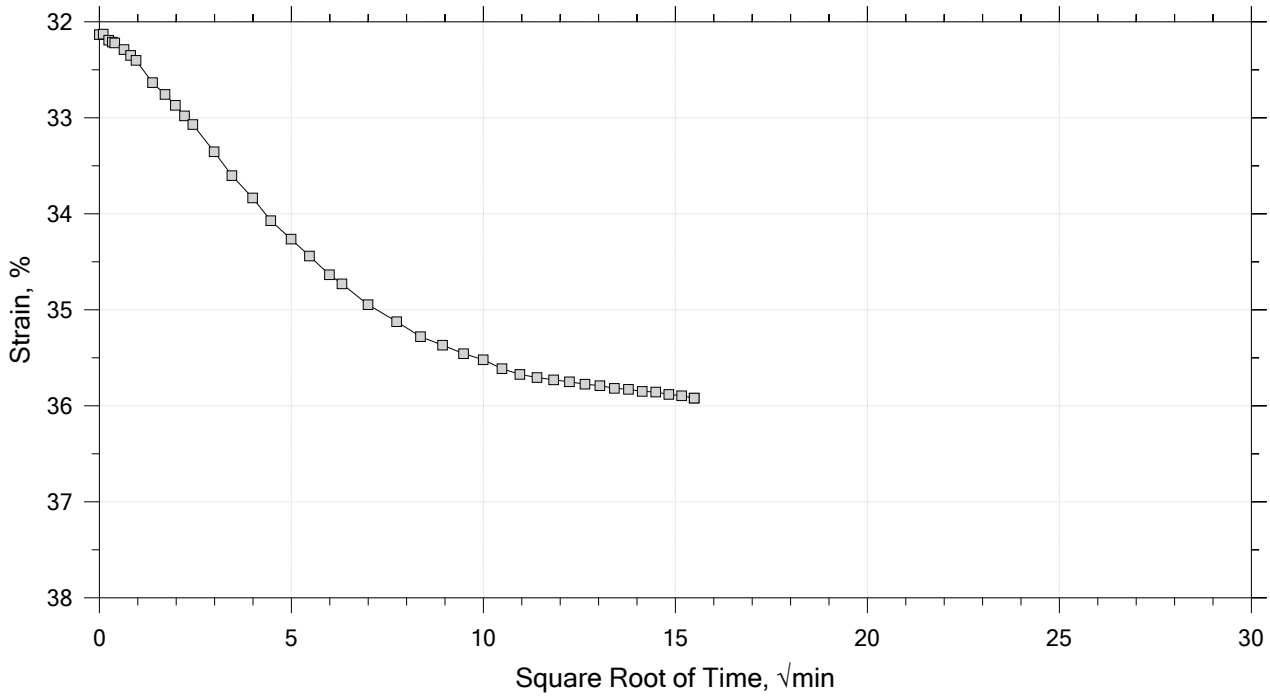
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 16 tsf

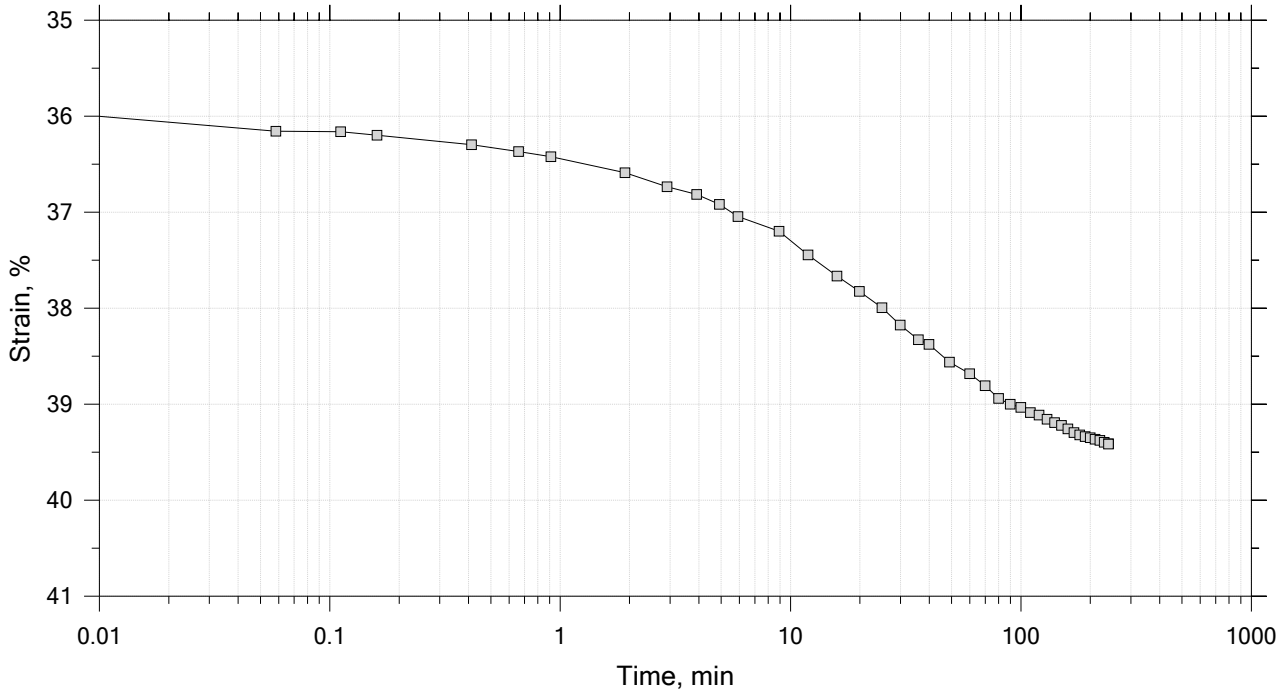


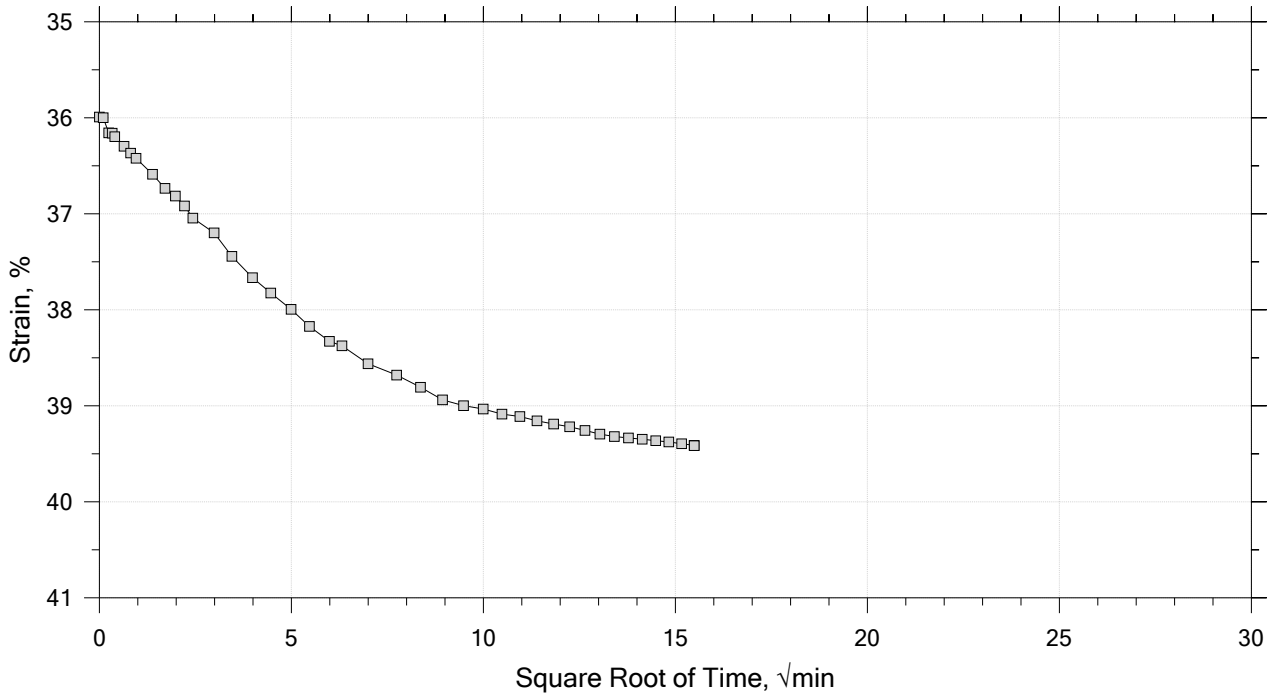


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

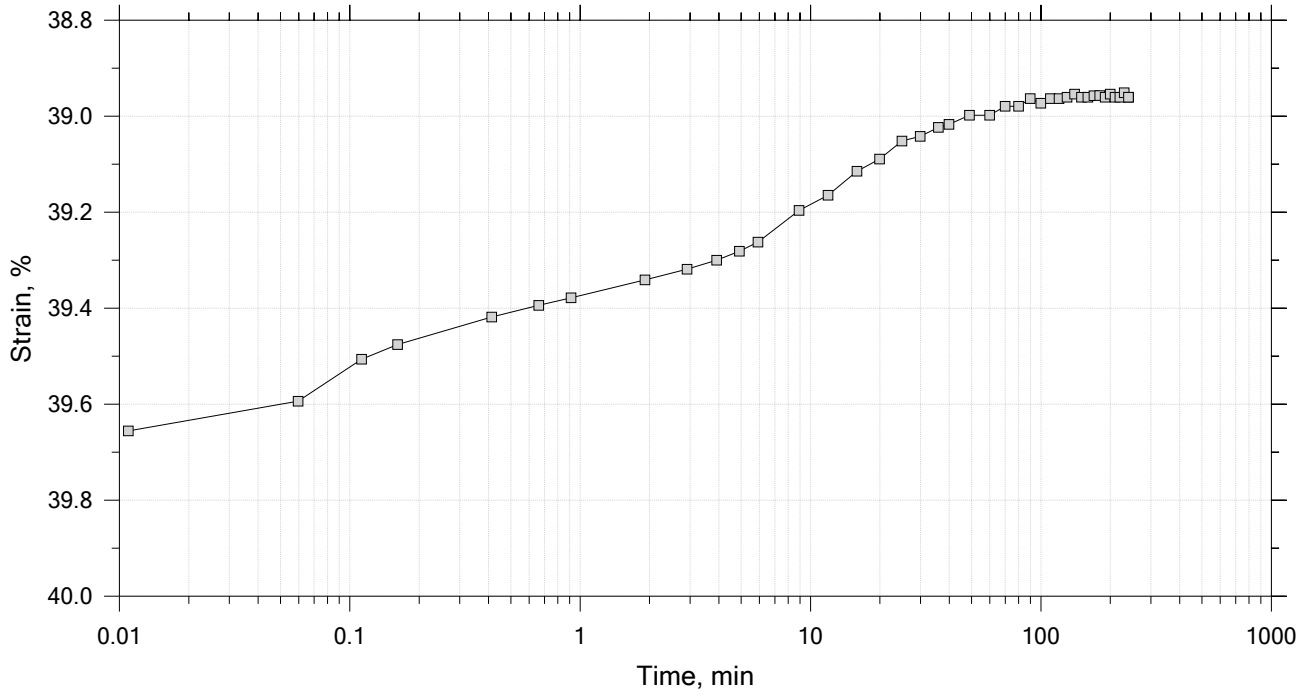


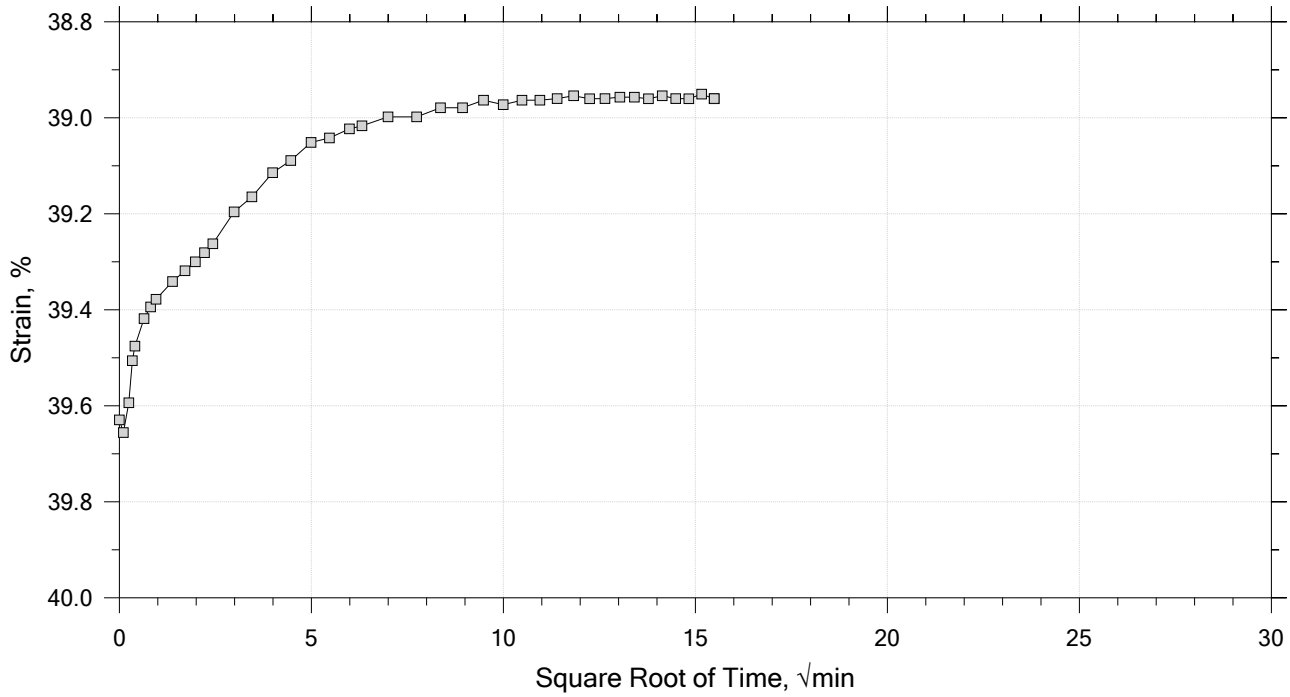


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

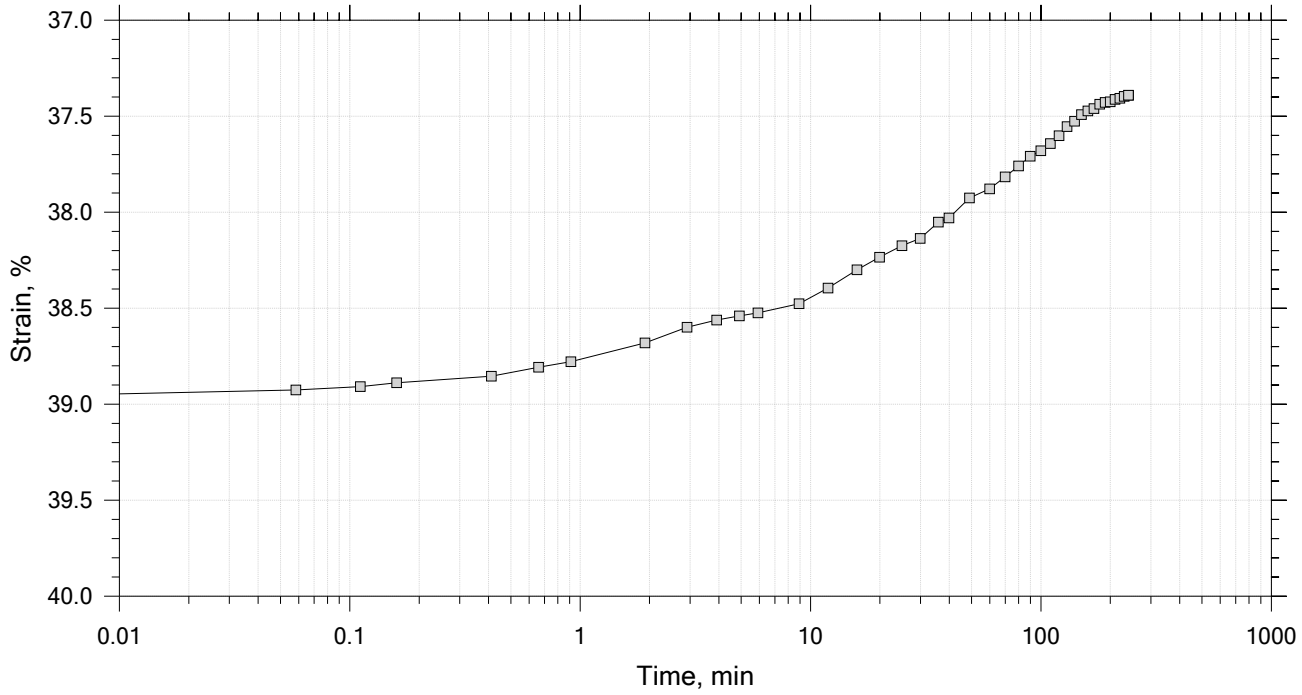


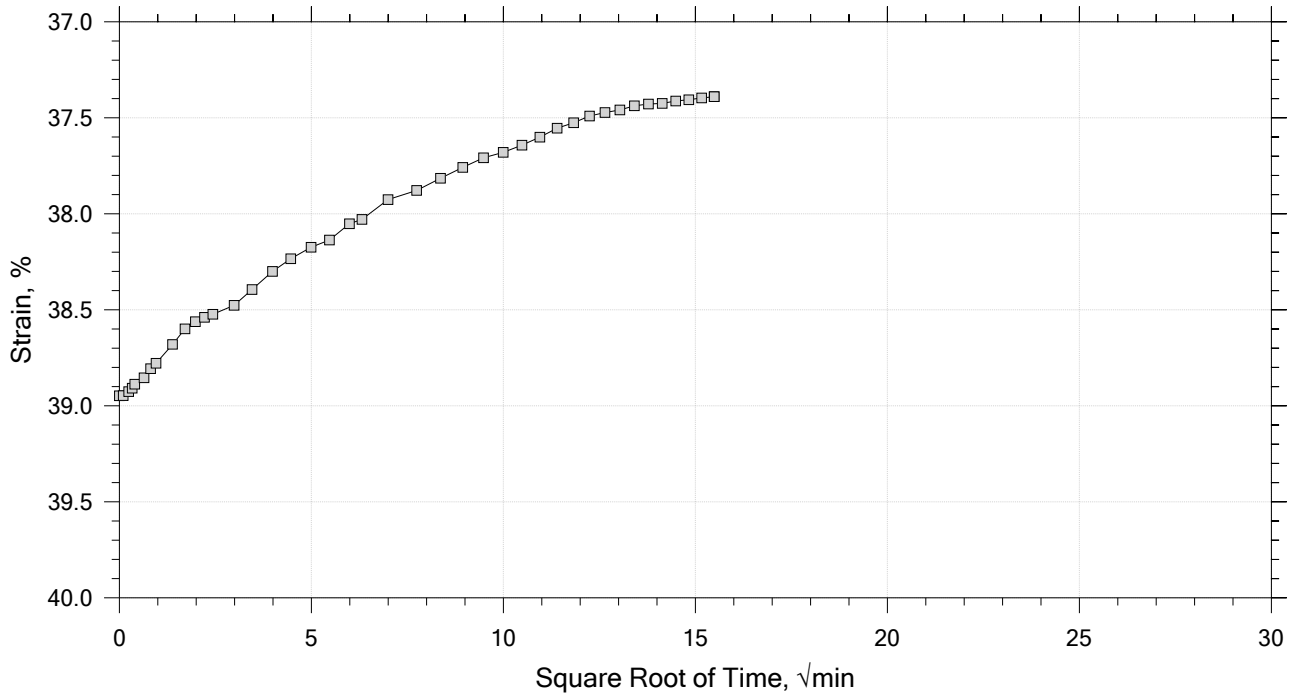


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

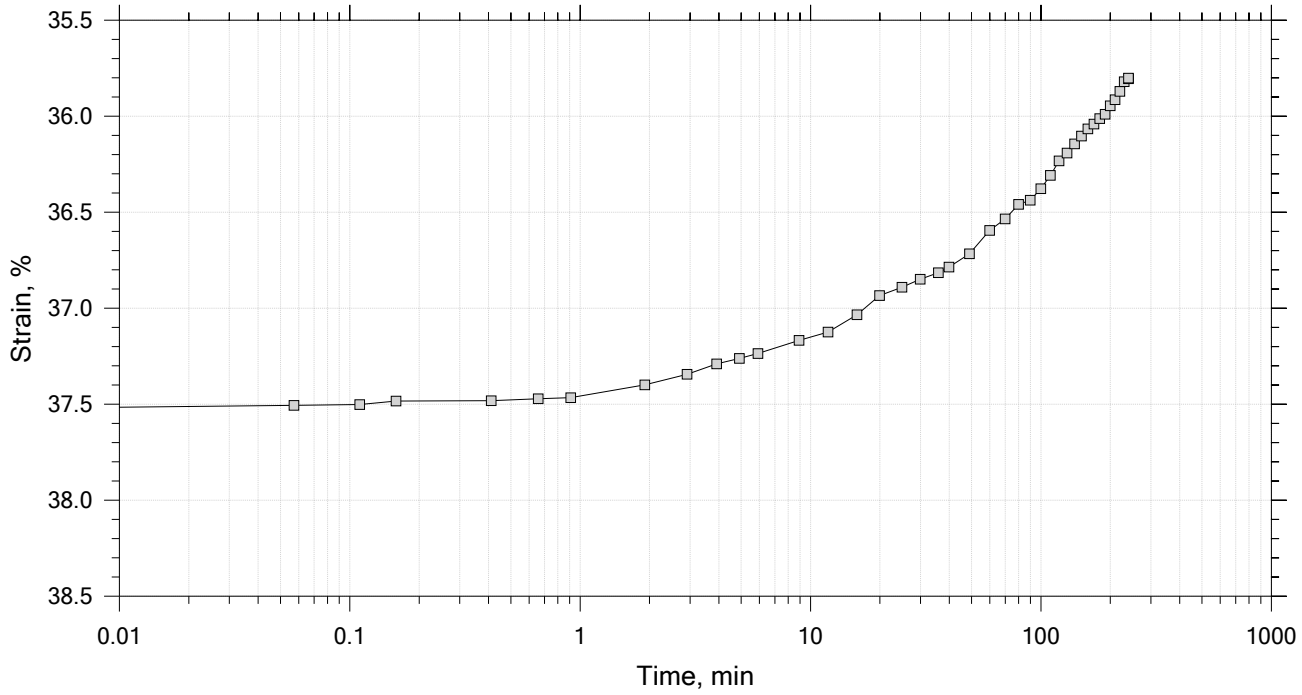


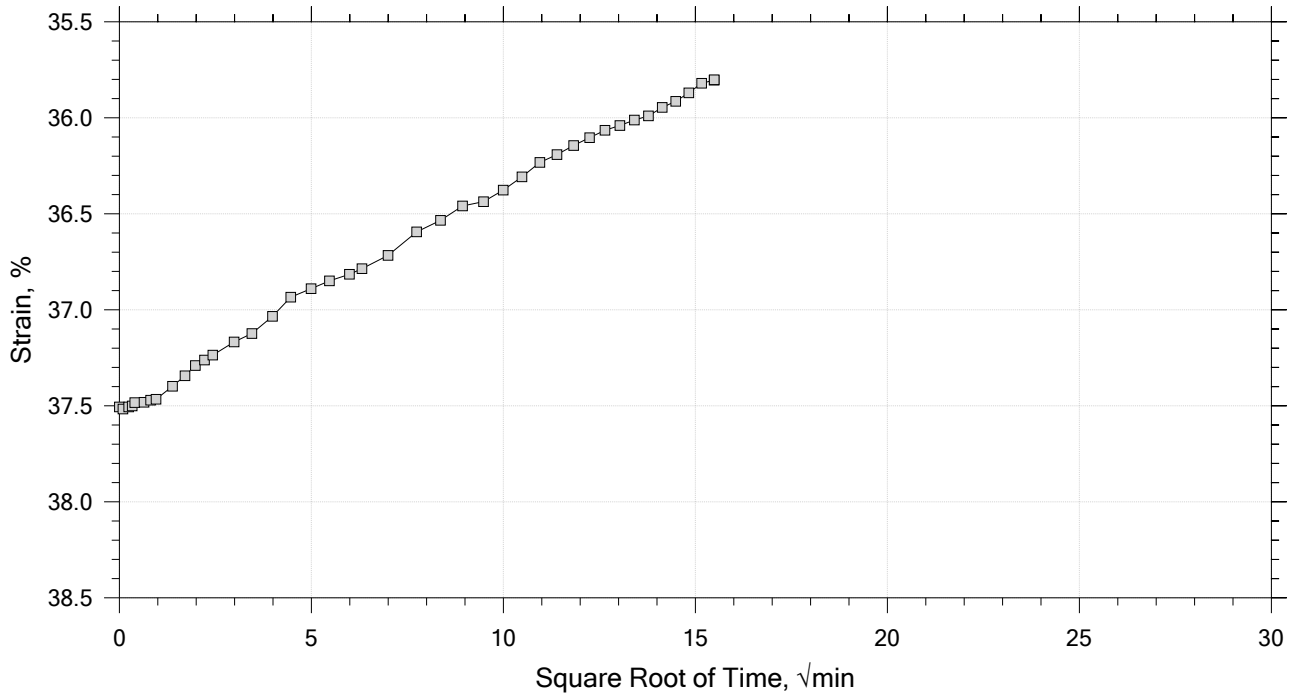


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

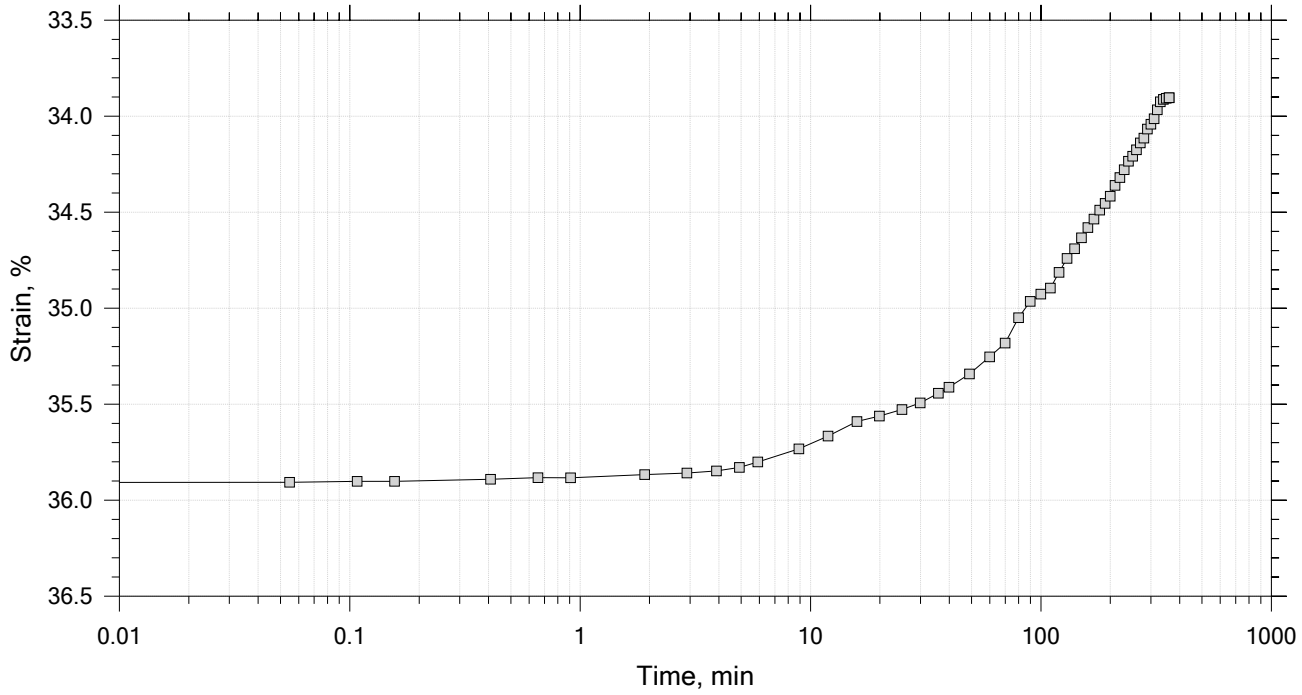


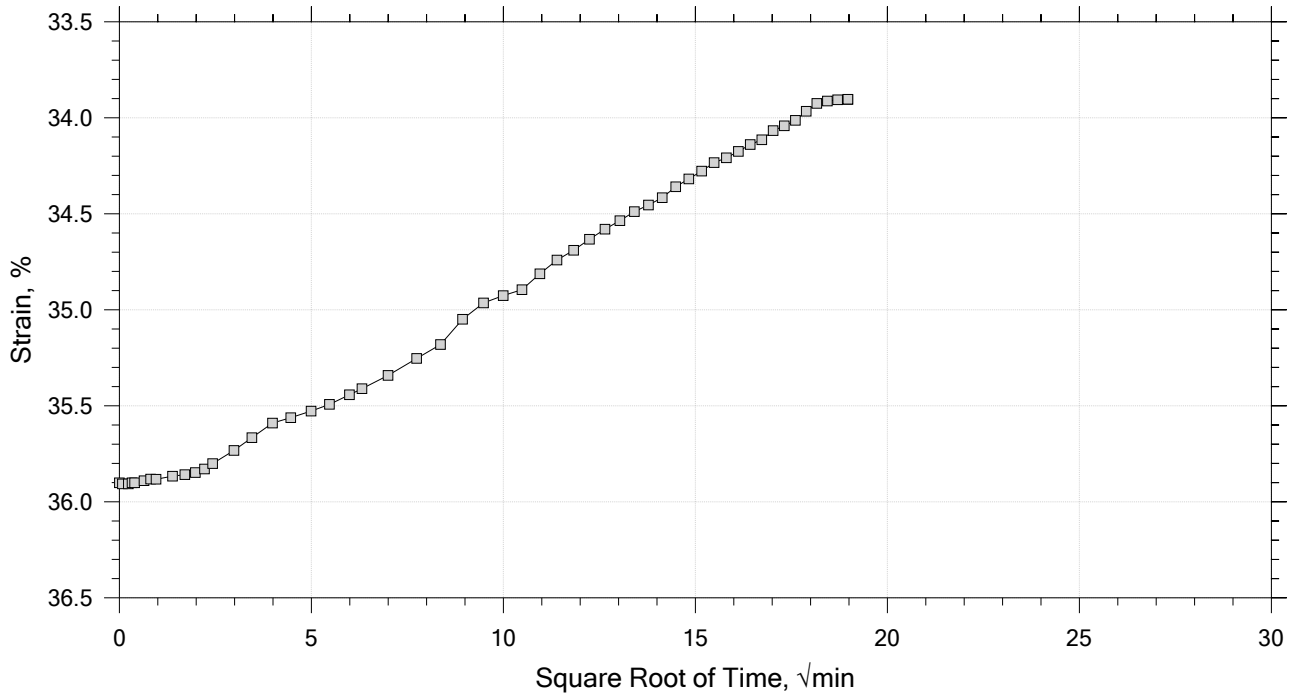


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

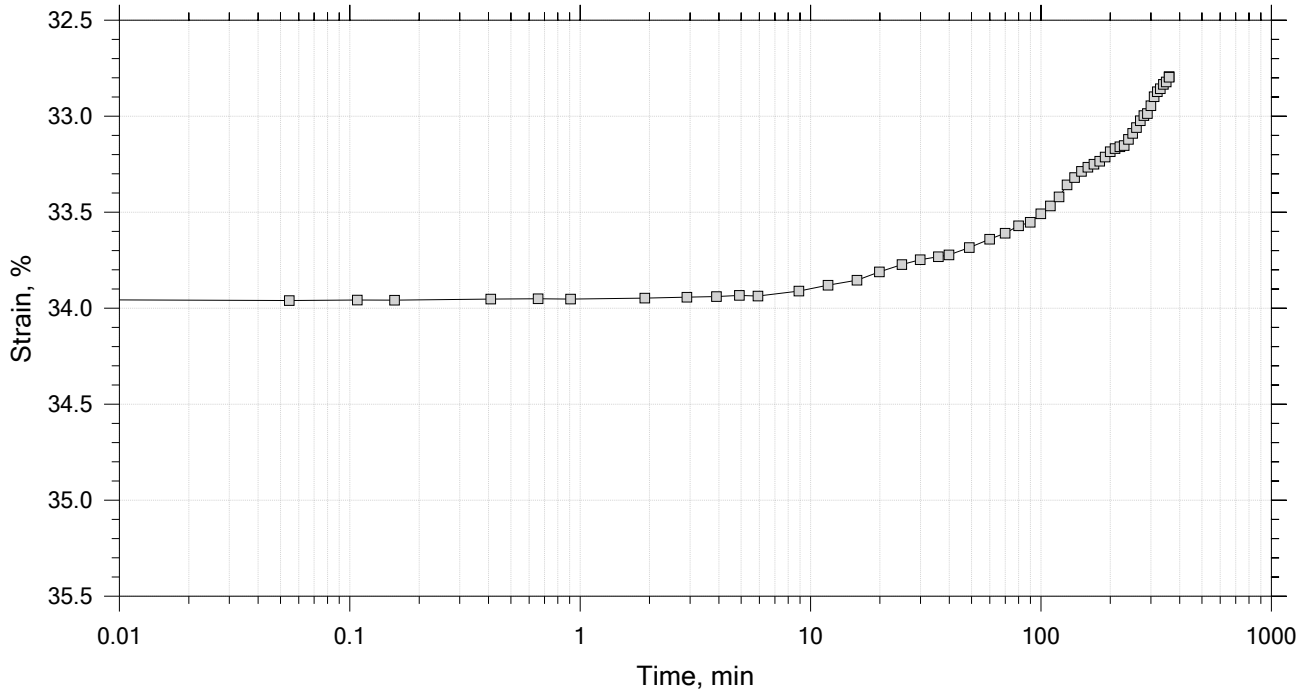


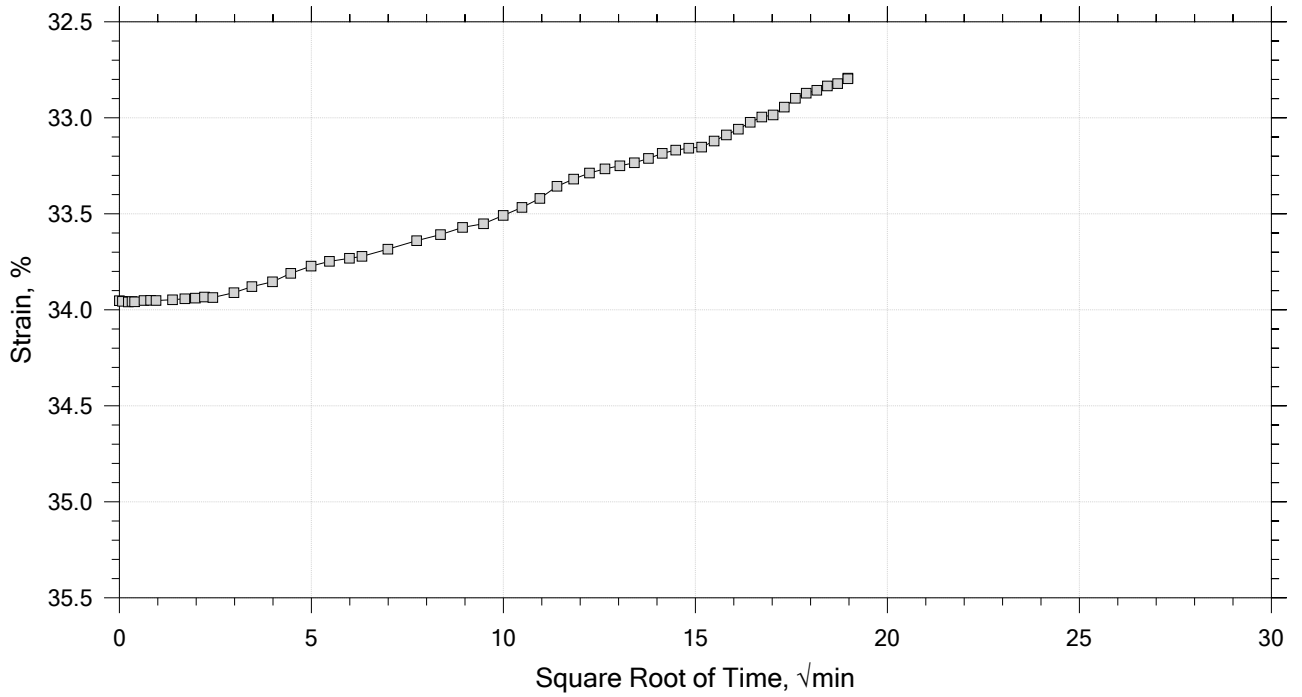


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.70	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 1.51	Plastic Limit: ---
Final Height: 0.70 in	Final Void Ratio: 0.756	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-2879	RING		D-2631
Mass Container, gm	8.34	112.4	112.4	8.31
Mass Container + Wet Soil, gm	175.43	247.41	223.28	116.9
Mass Container + Dry Soil, gm	115.34	199.03	199.03	93.15
Mass Dry Soil, gm	107	86.629	86.629	84.84
Water Content, %	56.16	55.85	27.99	27.99
Void Ratio	---	1.51	0.76	---
Degree of Saturation, %	---	100.00	100.00	---
Dry Unit Weight, pcf	---	67.231	96.045	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB038	Tested By: md	Checked By: njh
	Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
	Test No.: IP-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0652	0.01249	1.48	1.25	0.000	0.00e+00	1.92e-01	0.00e+00	0.00e+00
2	0.125	0.02880	1.44	2.88	0.000	0.00e+00	2.73e-01	0.00e+00	0.00e+00
3	0.250	0.06312	1.35	6.31	20.753	2.50e-07	2.75e-01	1.85e-04	0.00e+00
4	0.500	0.1126	1.23	11.3	31.560	1.50e-07	1.98e-01	8.03e-05	0.00e+00
5	1.00	0.1683	1.09	16.8	25.477	1.65e-07	1.11e-01	4.96e-05	0.00e+00
6	2.00	0.2235	0.948	22.4	21.548	1.71e-07	5.53e-02	2.55e-05	0.00e+00
7	4.00	0.2761	0.816	27.6	21.161	1.52e-07	2.63e-02	1.07e-05	0.00e+00
8	8.00	0.3217	0.702	32.2	19.651	1.43e-07	1.14e-02	4.38e-06	0.00e+00
9	16.0	0.3592	0.608	35.9	17.225	1.44e-07	4.68e-03	1.82e-06	0.00e+00
10	32.0	0.3941	0.520	39.4	13.738	1.61e-07	2.18e-03	9.50e-07	0.00e+00
11	8.00	0.3896	0.532	39.0	0.000	0.00e+00	1.89e-04	0.00e+00	0.00e+00
12	2.00	0.3739	0.571	37.4	0.000	0.00e+00	2.62e-03	0.00e+00	0.00e+00
13	0.500	0.3580	0.611	35.8	0.000	0.00e+00	1.06e-02	0.00e+00	0.00e+00
14	0.125	0.3390	0.659	33.9	0.000	0.00e+00	5.06e-02	0.00e+00	0.00e+00
15	0.0625	0.3280	0.686	32.8	0.000	0.00e+00	1.77e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

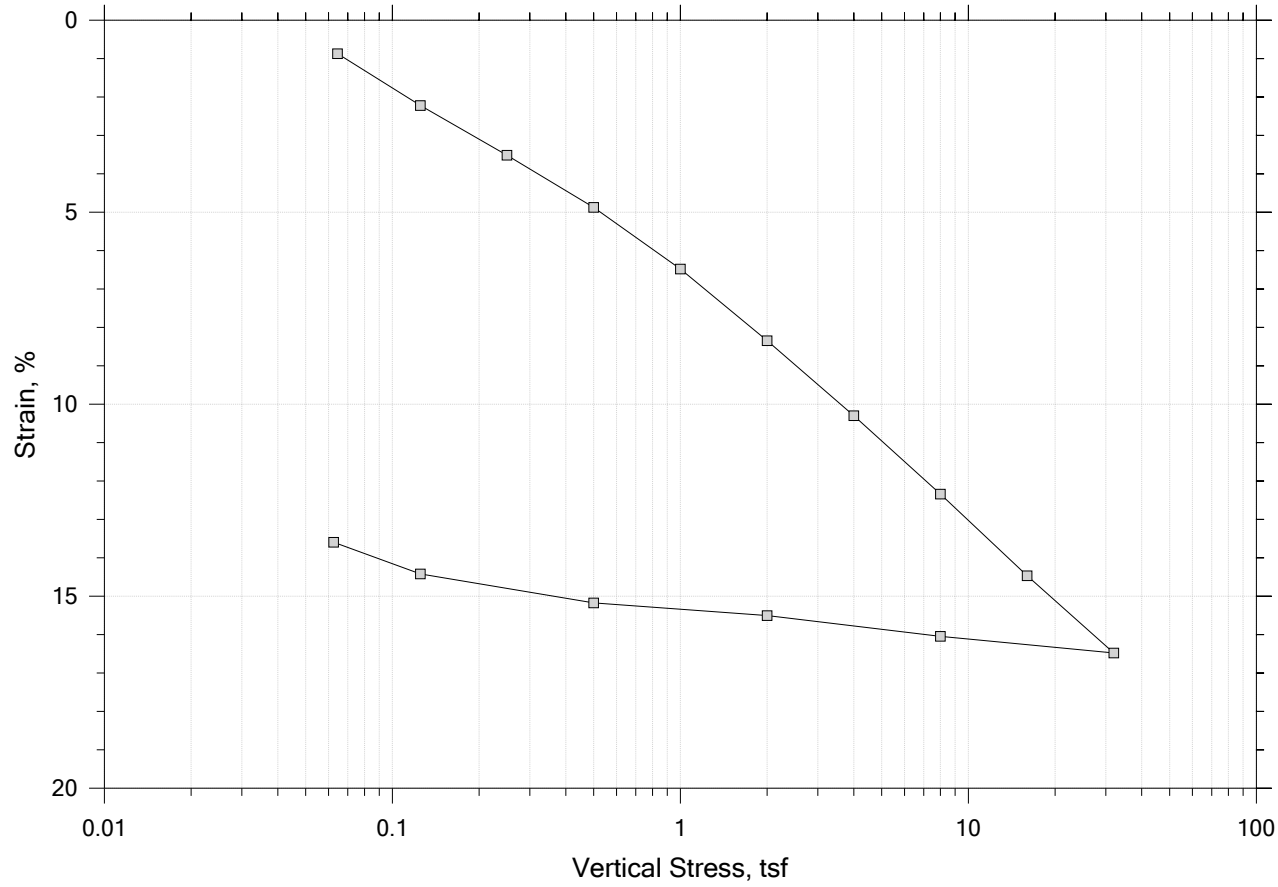
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0652	0.01249	1.48	1.25	96.629	2.51e-07	1.92e-01	1.30e-04
2	0.125	0.02880	1.44	2.88	47.949	4.91e-07	2.73e-01	3.61e-04
3	0.250	0.06312	1.35	6.31	97.171	2.30e-07	2.75e-01	1.70e-04
4	0.500	0.1126	1.23	11.3	121.893	1.67e-07	1.98e-01	8.95e-05
5	1.00	0.1683	1.09	16.8	127.922	1.42e-07	1.11e-01	4.25e-05
6	2.00	0.2235	0.948	22.4	119.701	1.33e-07	5.53e-02	1.98e-05
7	4.00	0.2761	0.816	27.6	103.320	1.34e-07	2.63e-02	9.48e-06
8	8.00	0.3217	0.702	32.2	94.051	1.28e-07	1.14e-02	3.94e-06
9	16.0	0.3592	0.608	35.9	79.373	1.34e-07	4.68e-03	1.70e-06
10	32.0	0.3941	0.520	39.4	41.670	2.29e-07	2.18e-03	1.35e-06
11	8.00	0.3896	0.532	39.0	11.565	7.85e-07	1.89e-04	4.01e-07
12	2.00	0.3739	0.571	37.4	88.400	1.06e-07	2.62e-03	7.49e-07
13	0.500	0.3580	0.611	35.8	193.701	5.09e-08	1.06e-02	1.45e-06
14	0.125	0.3390	0.659	33.9	275.794	3.78e-08	5.06e-02	5.16e-06
15	0.0625	0.3280	0.686	32.8	0.000	0.00e+00	1.77e-01	0.00e+00

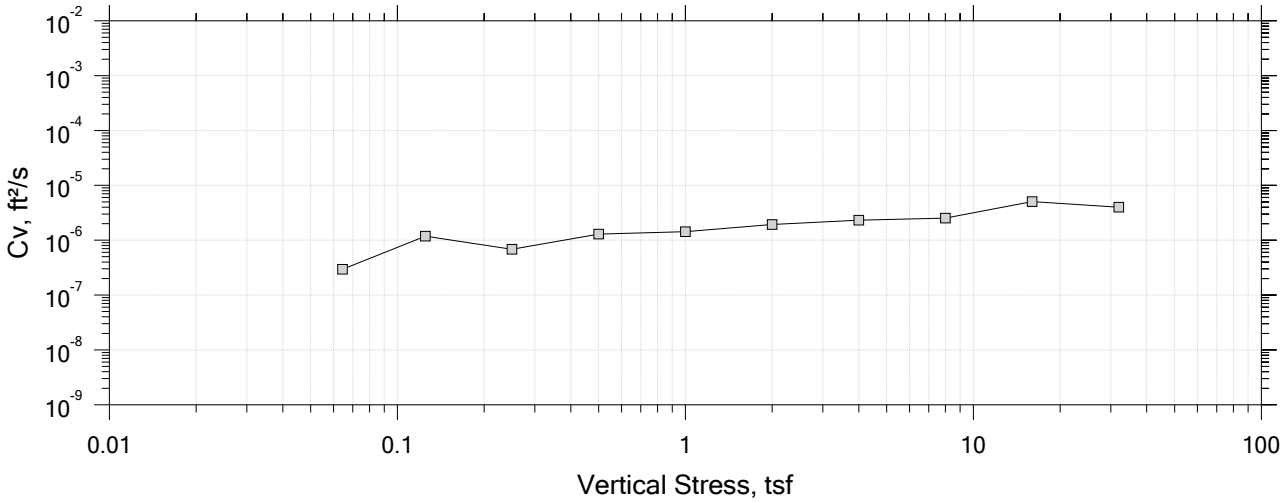
GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB038	Tested By: md	Checked By: njh
Sample No.: SL0896	Test Date: 02/14/19	Depth: 11-13 ft
Test No.: IP-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





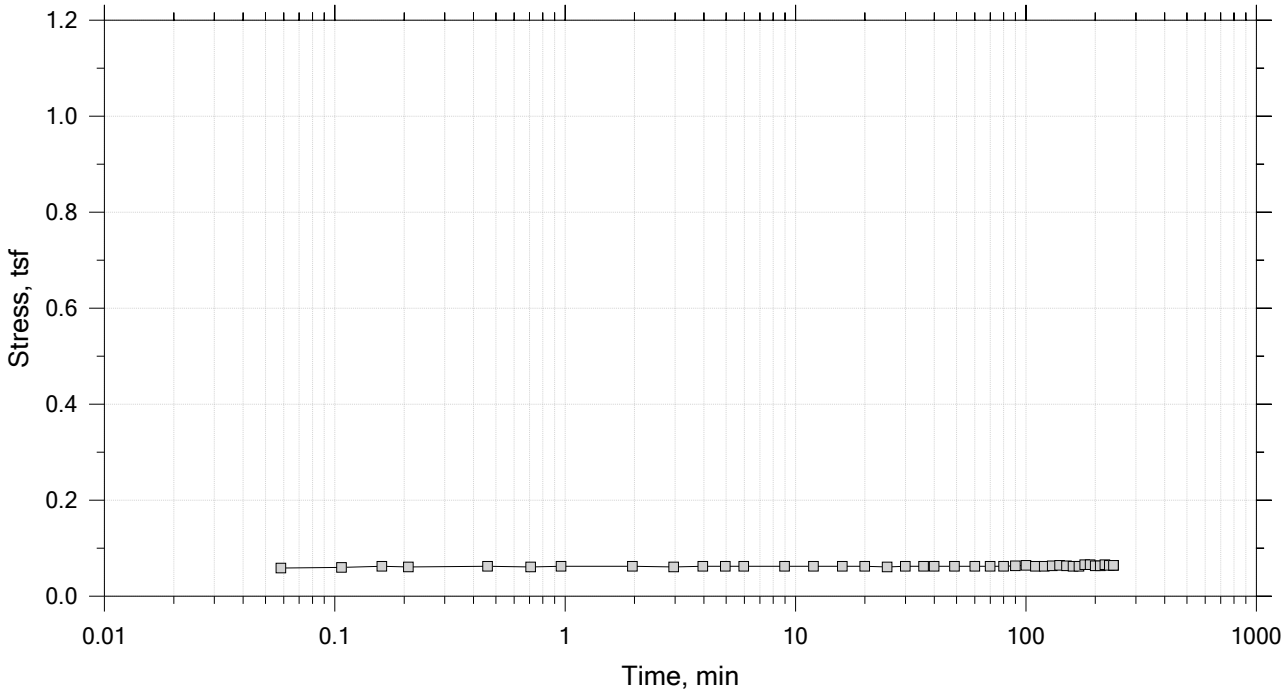
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		
	Displacement at End of Increment		

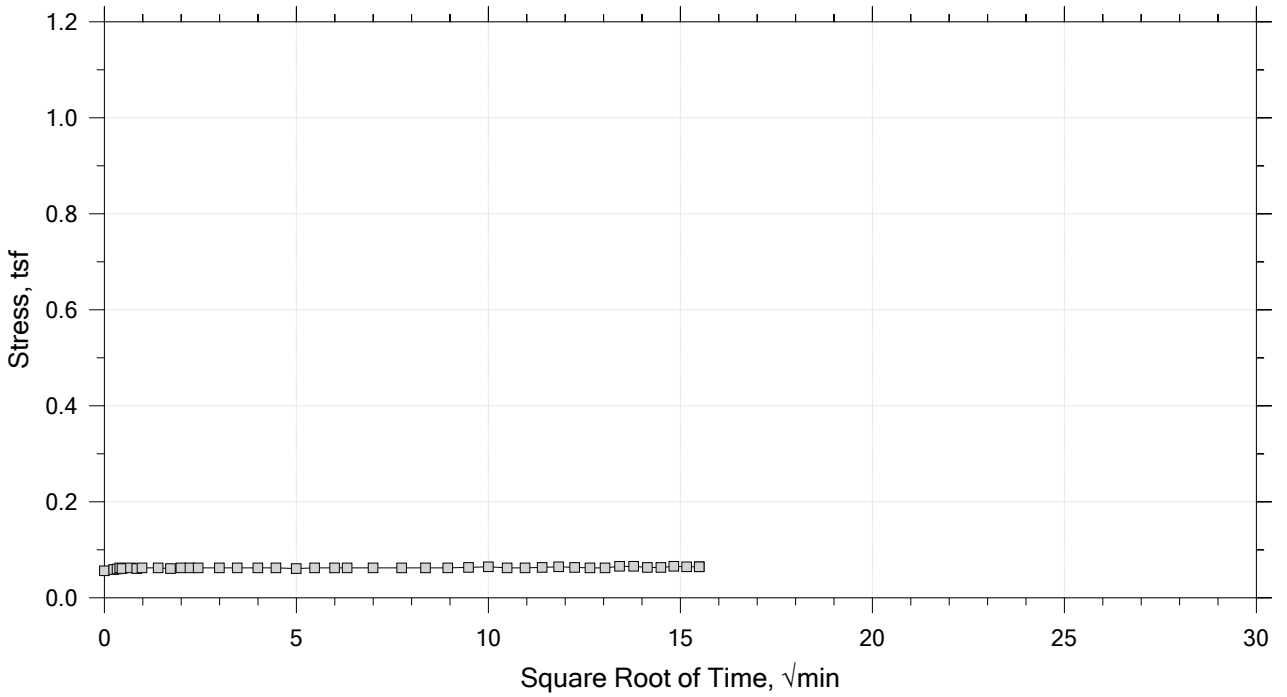
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0644 tsf

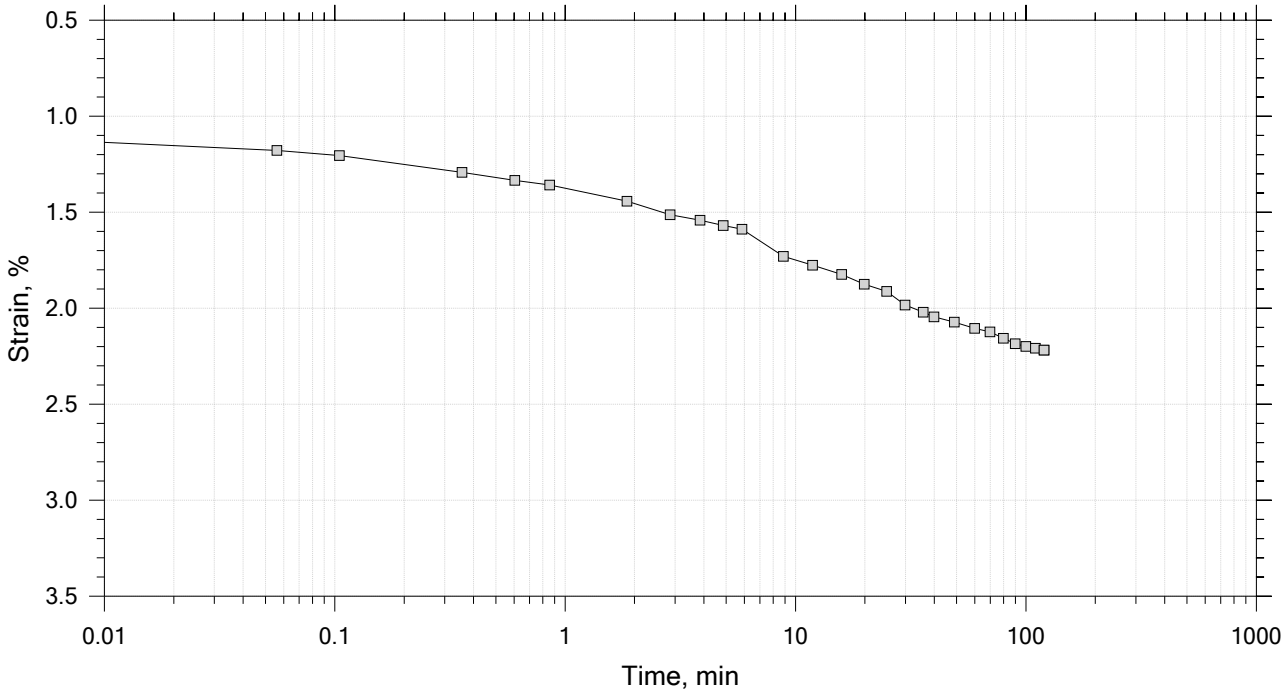


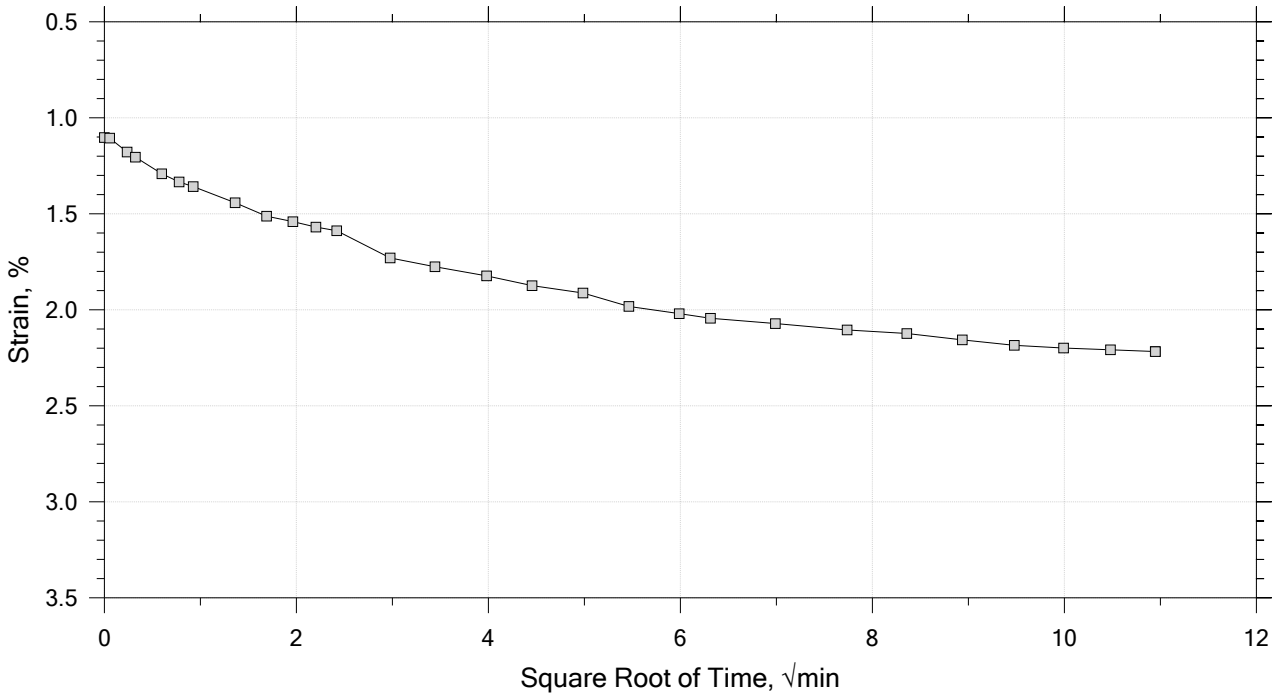


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

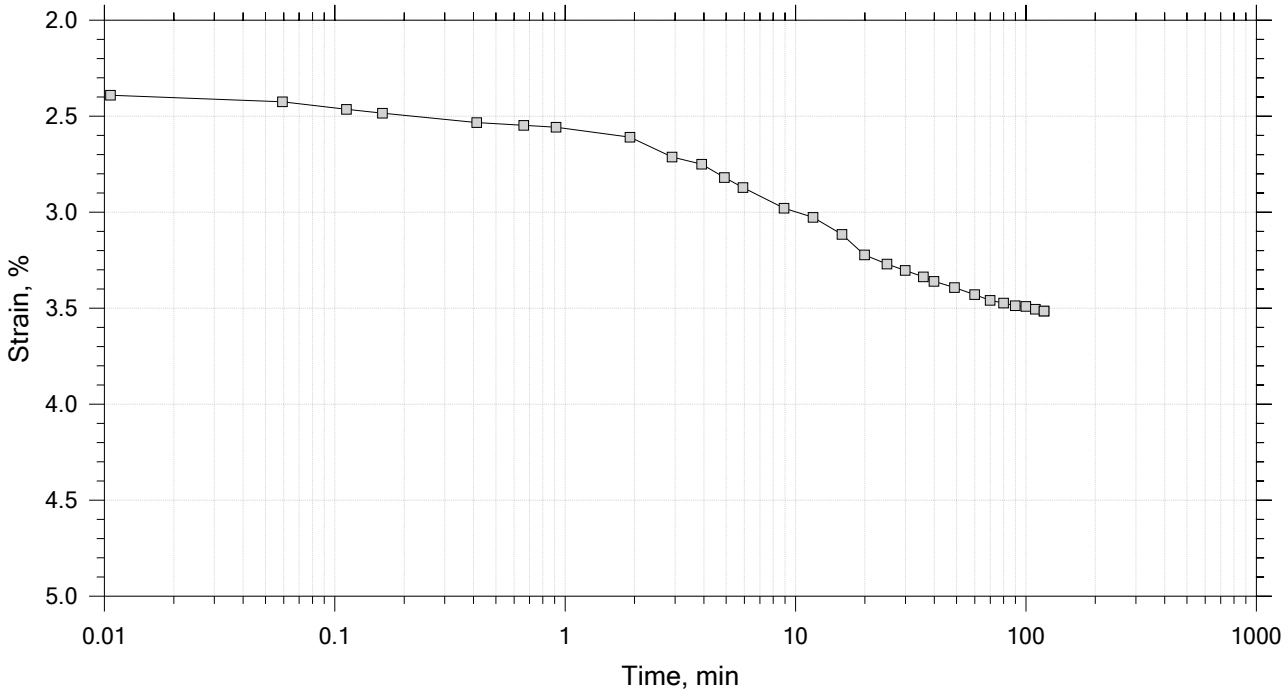


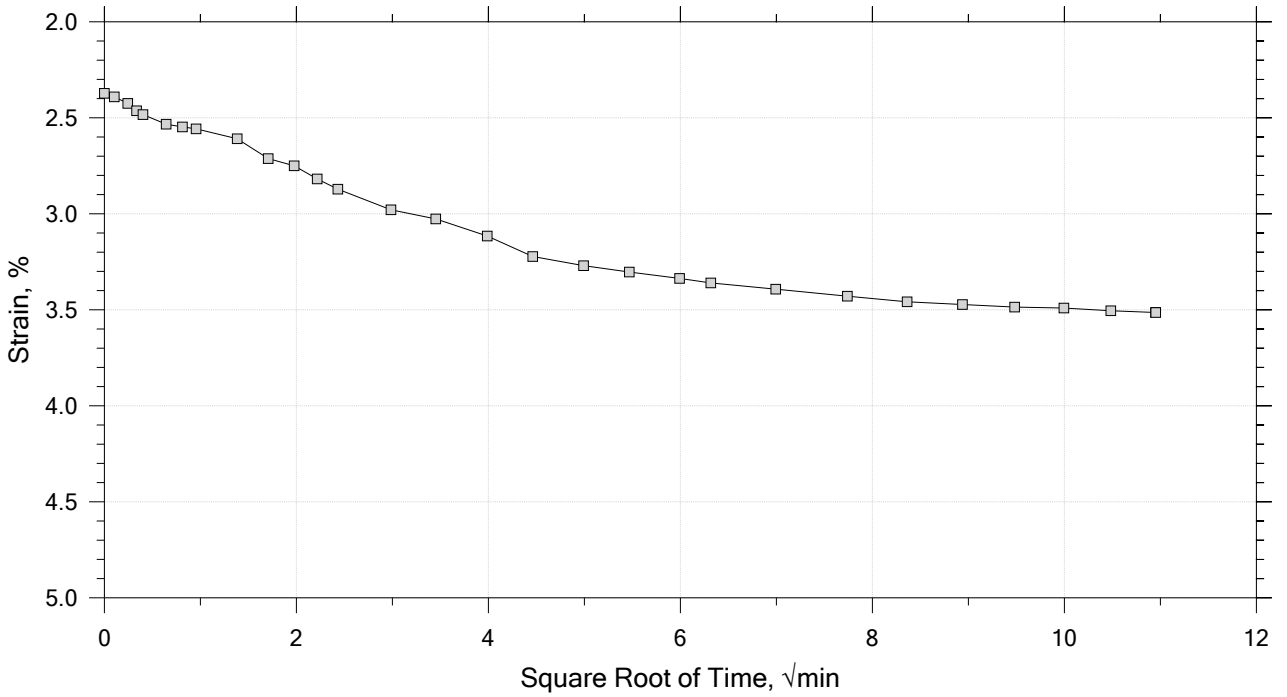


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf





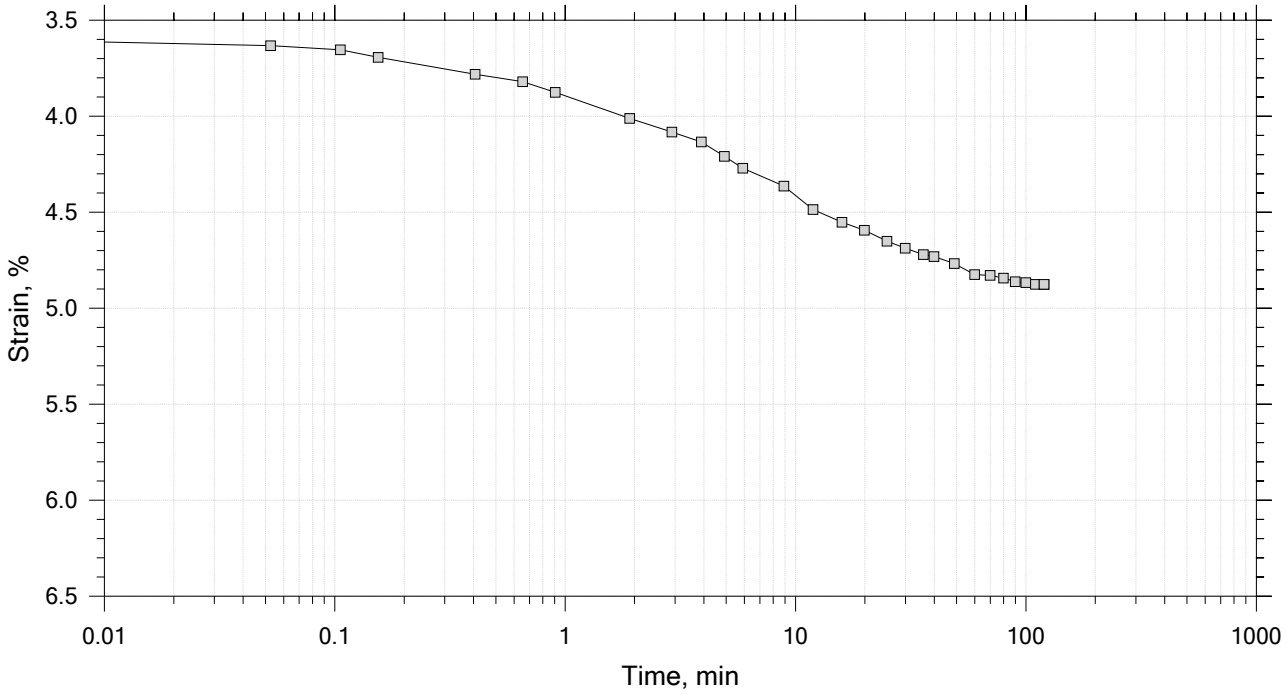
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

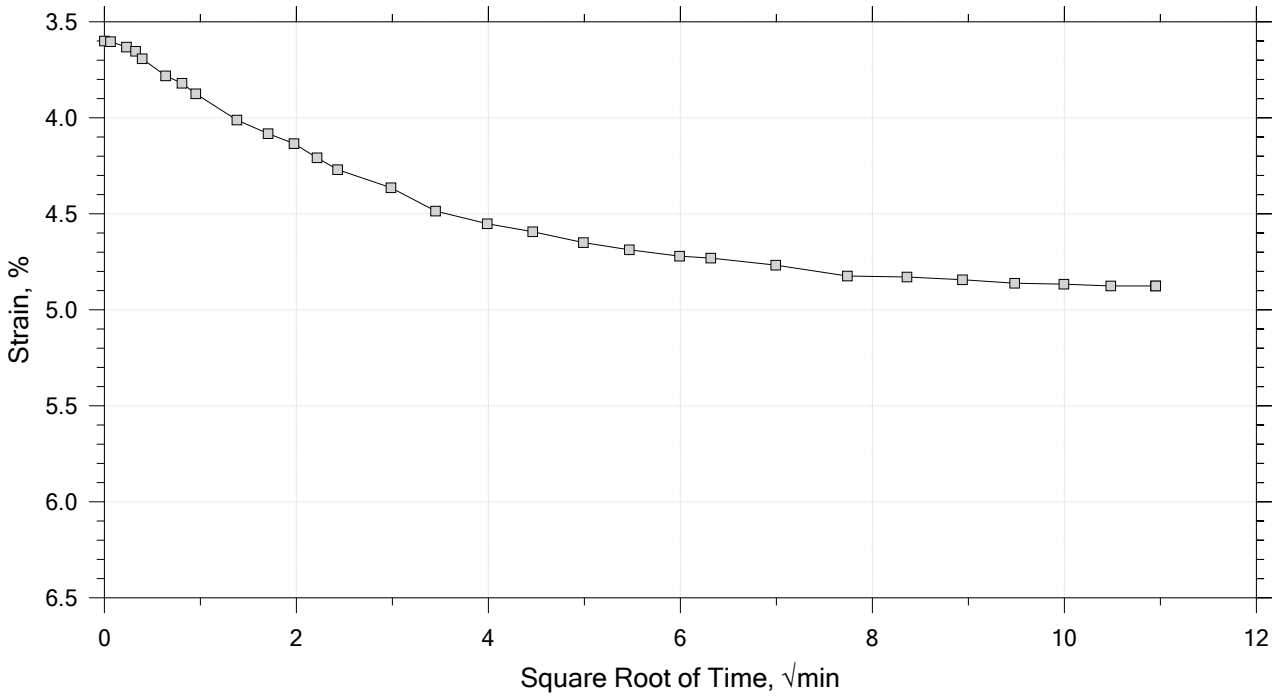
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15

Constant Load Step

Stress: 0.5 tsf

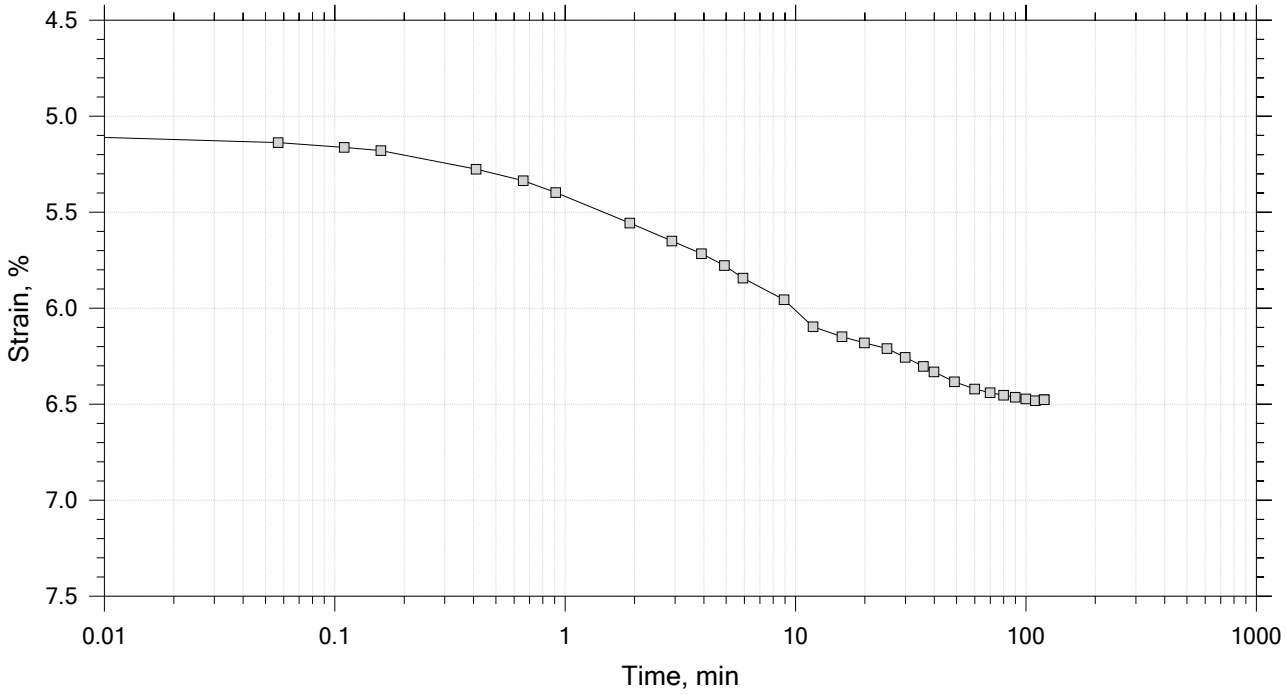


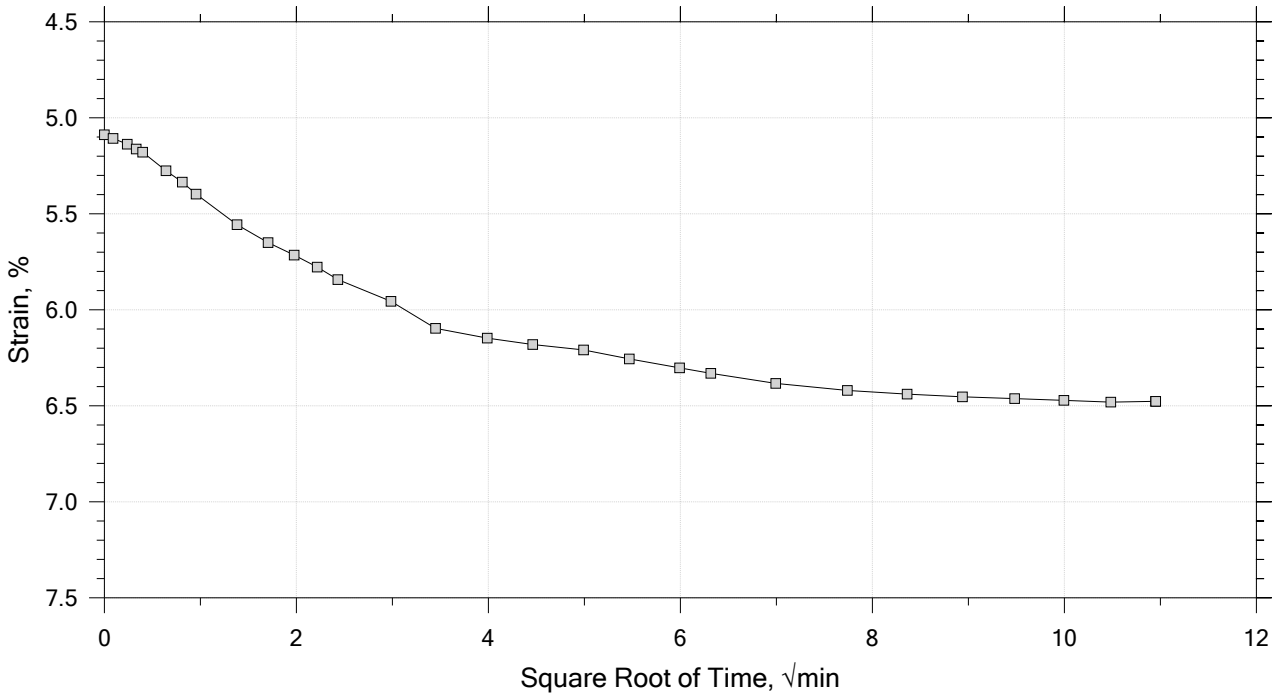


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf





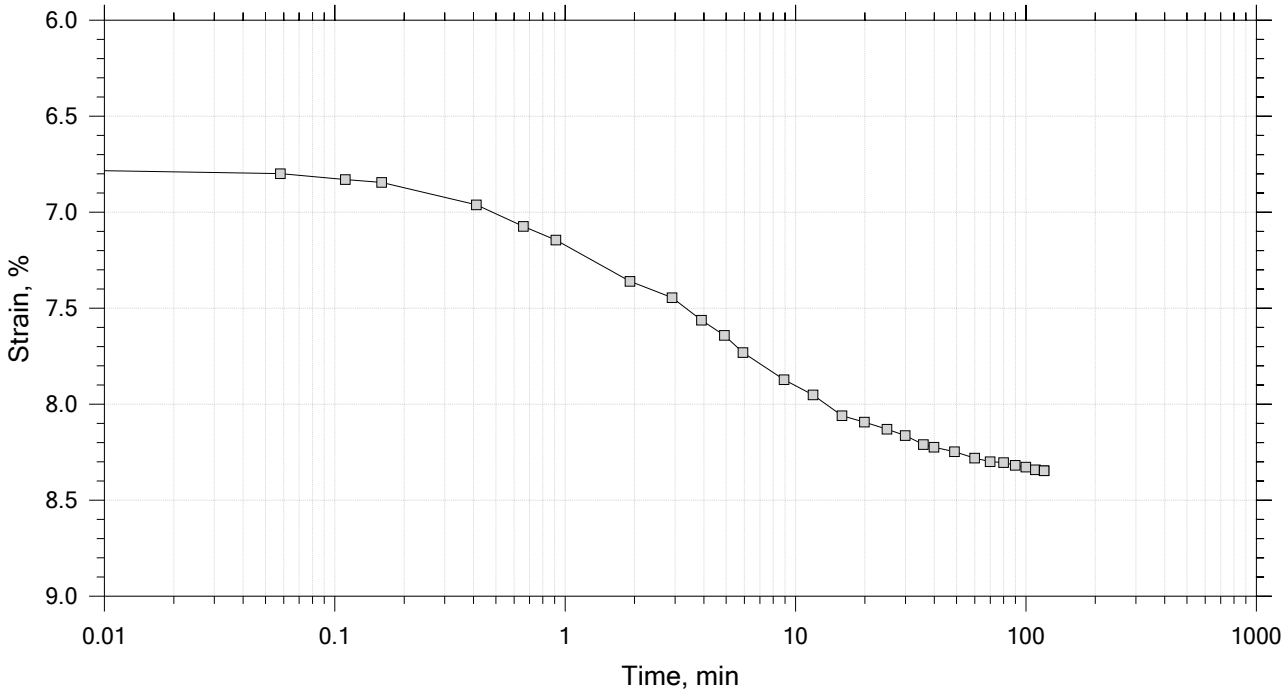
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

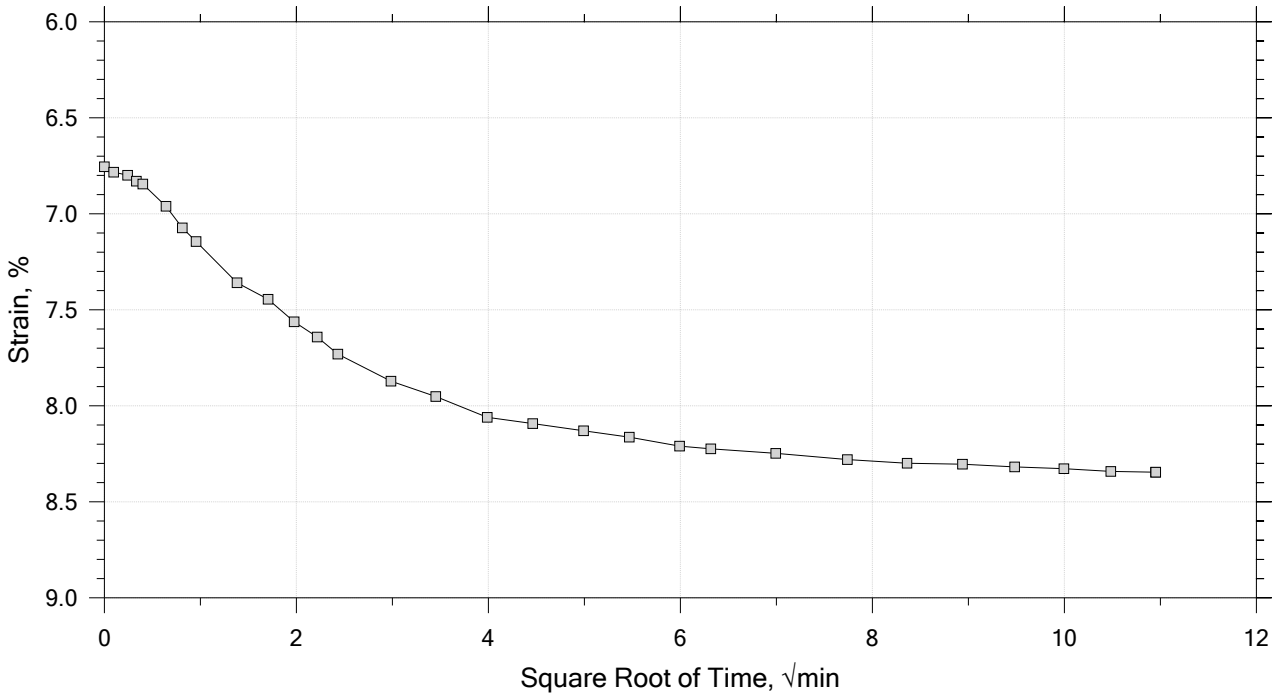
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf

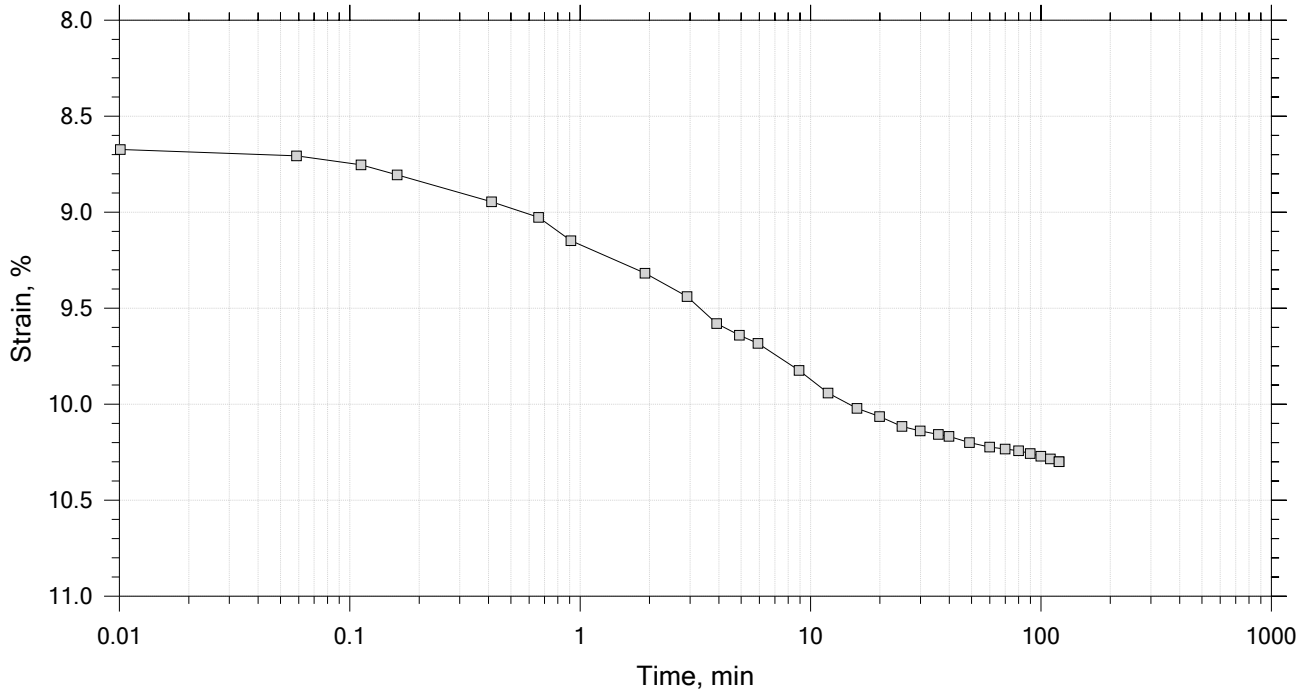


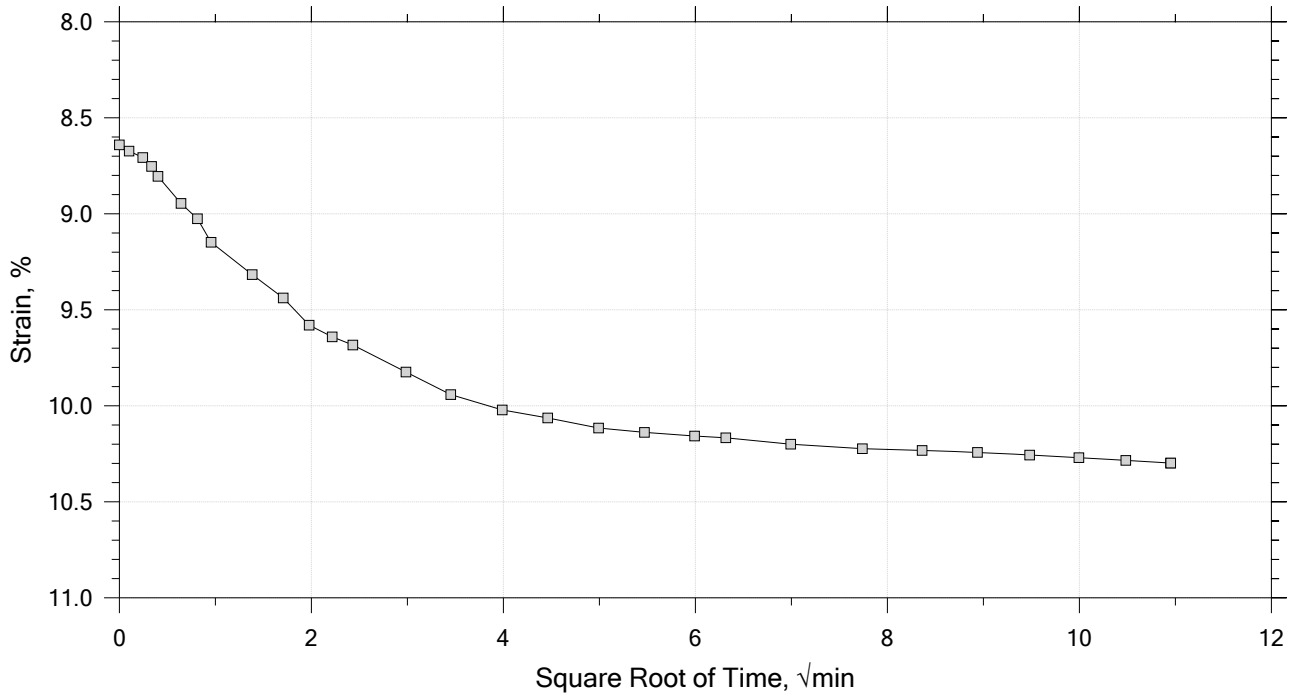


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15
Constant Load Step
Stress: 4 tsf

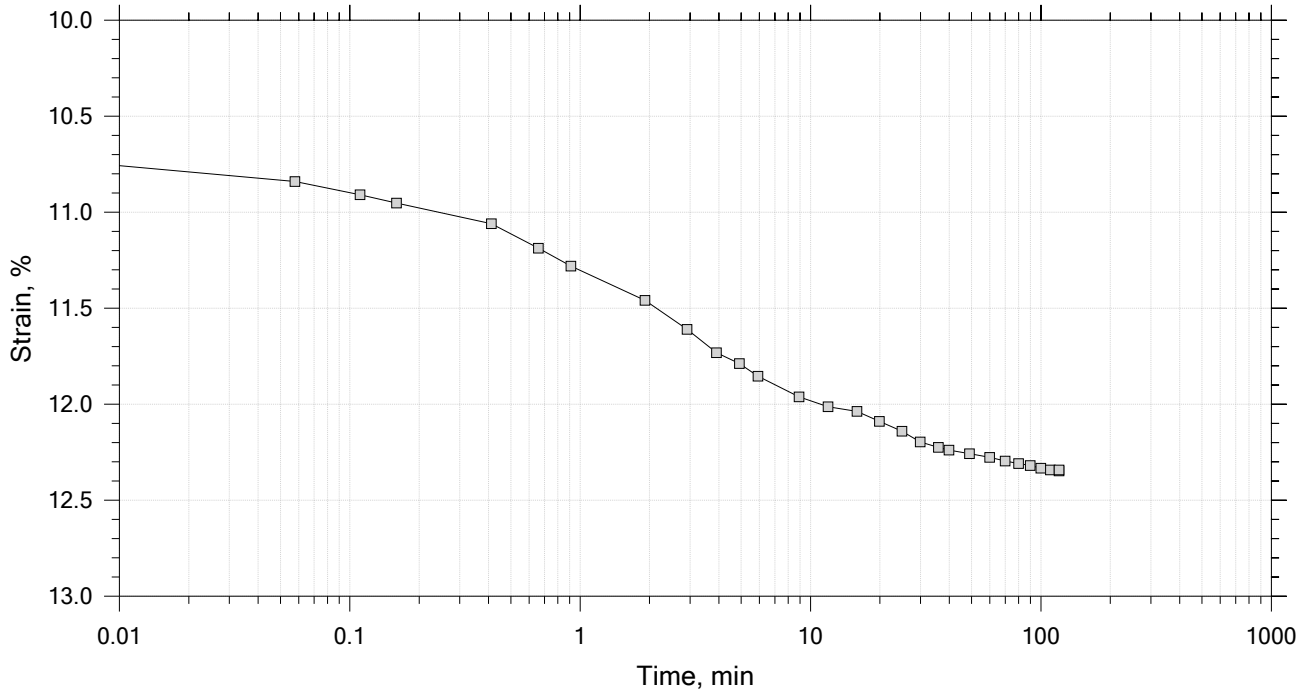


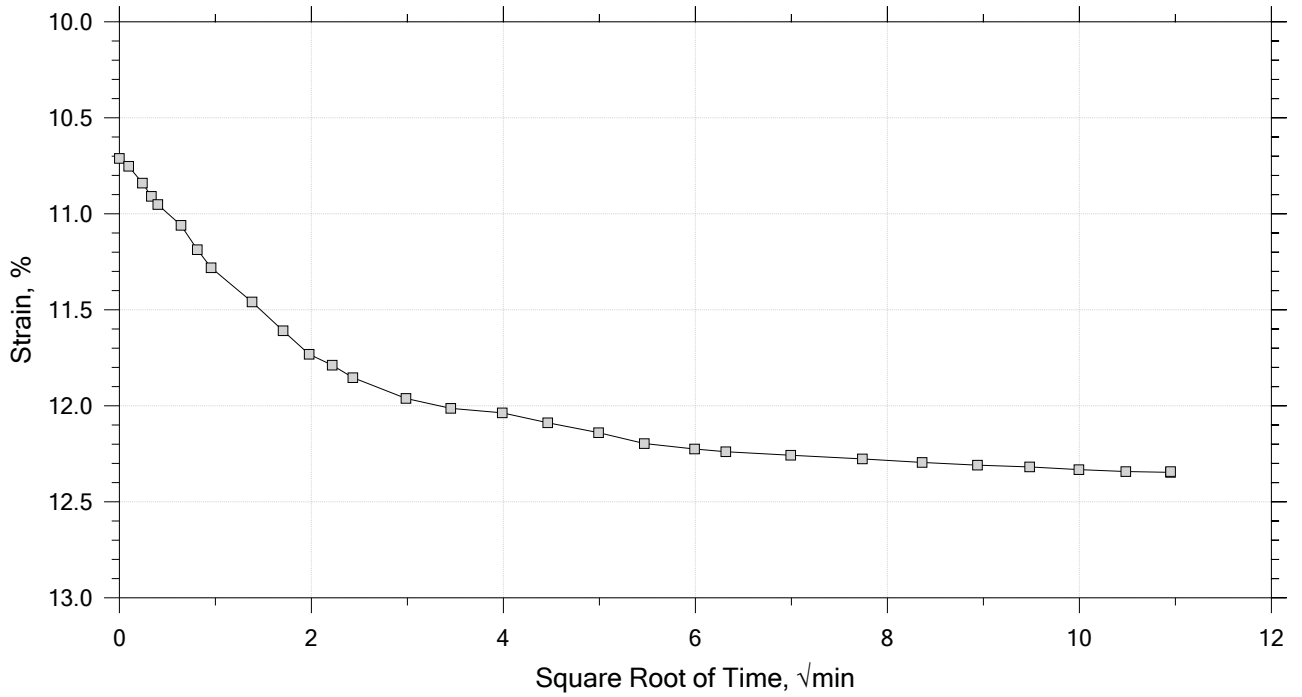


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf

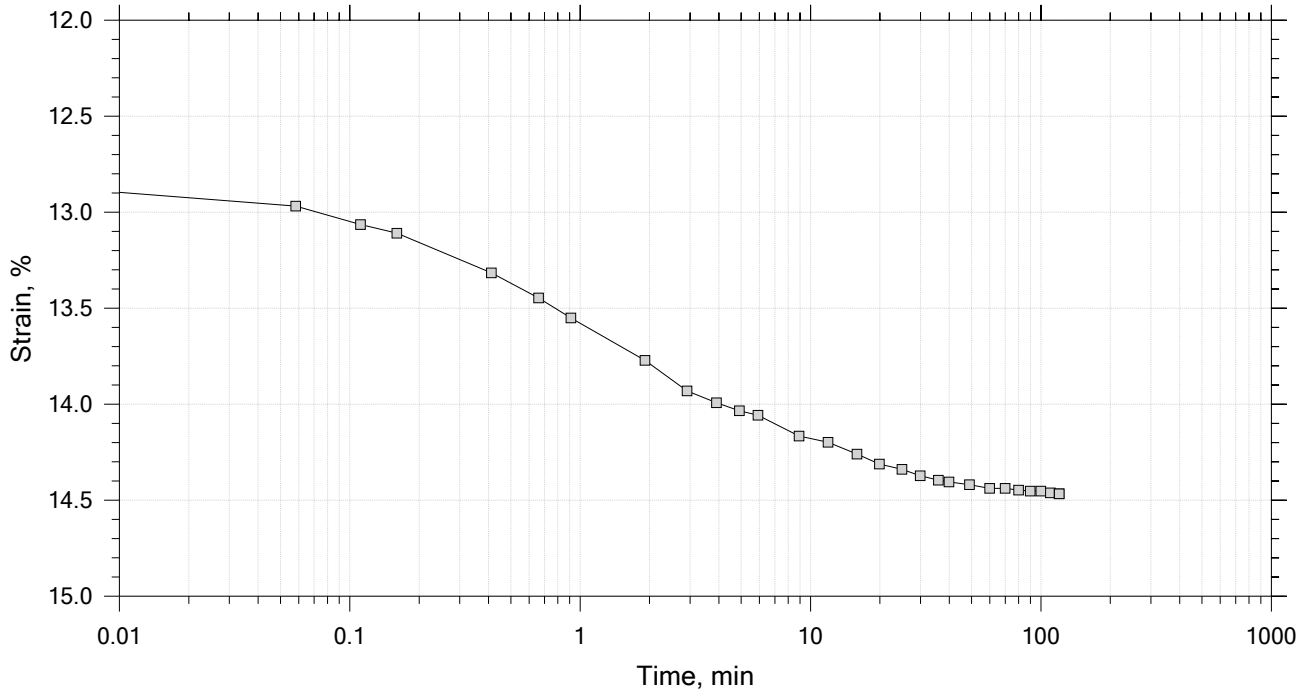


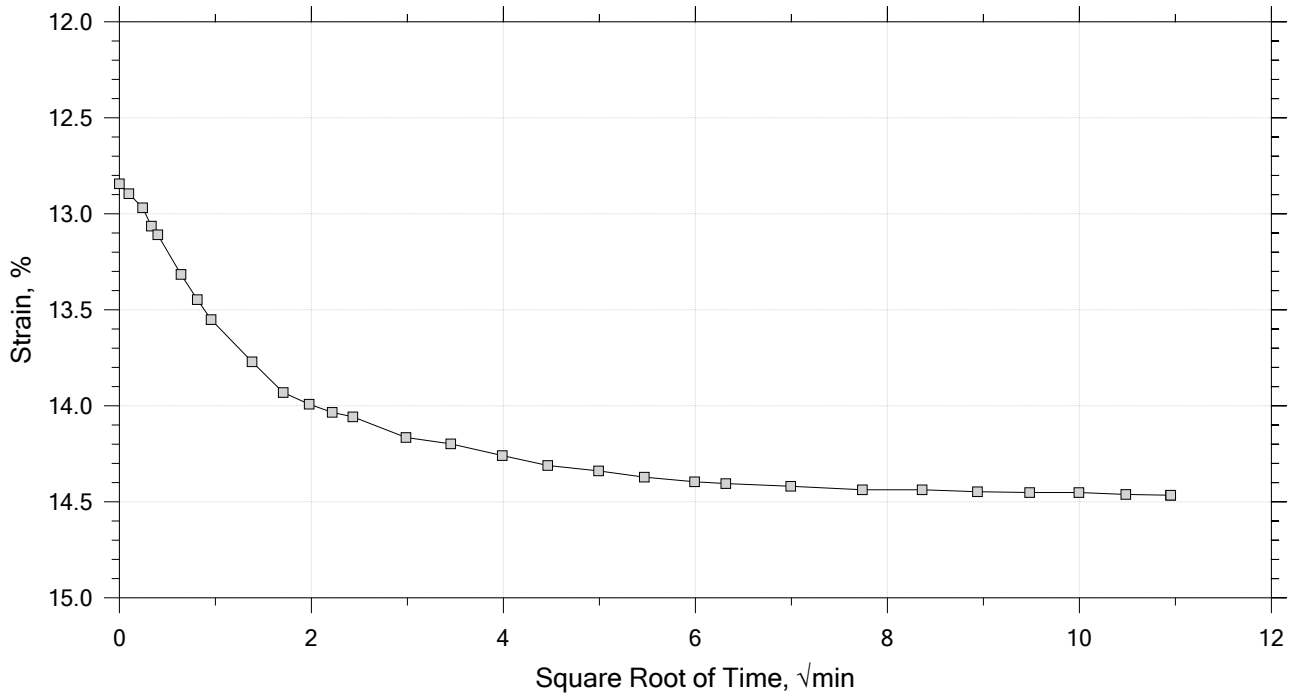


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

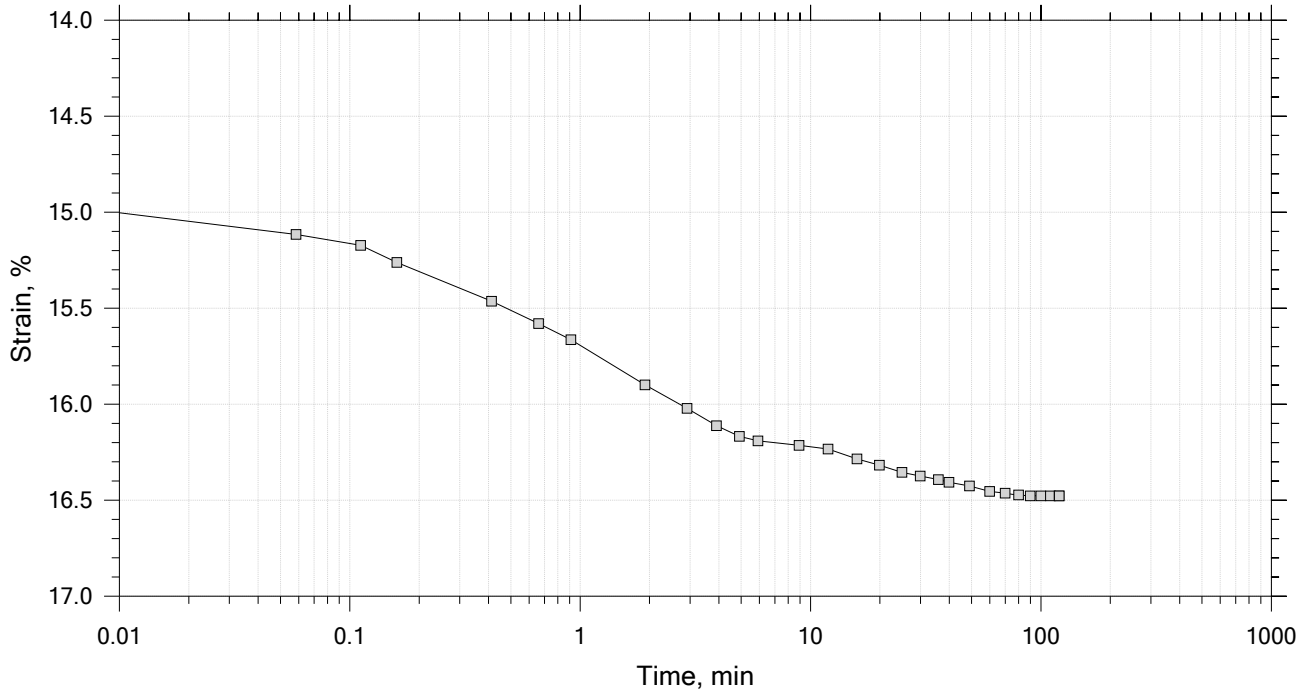


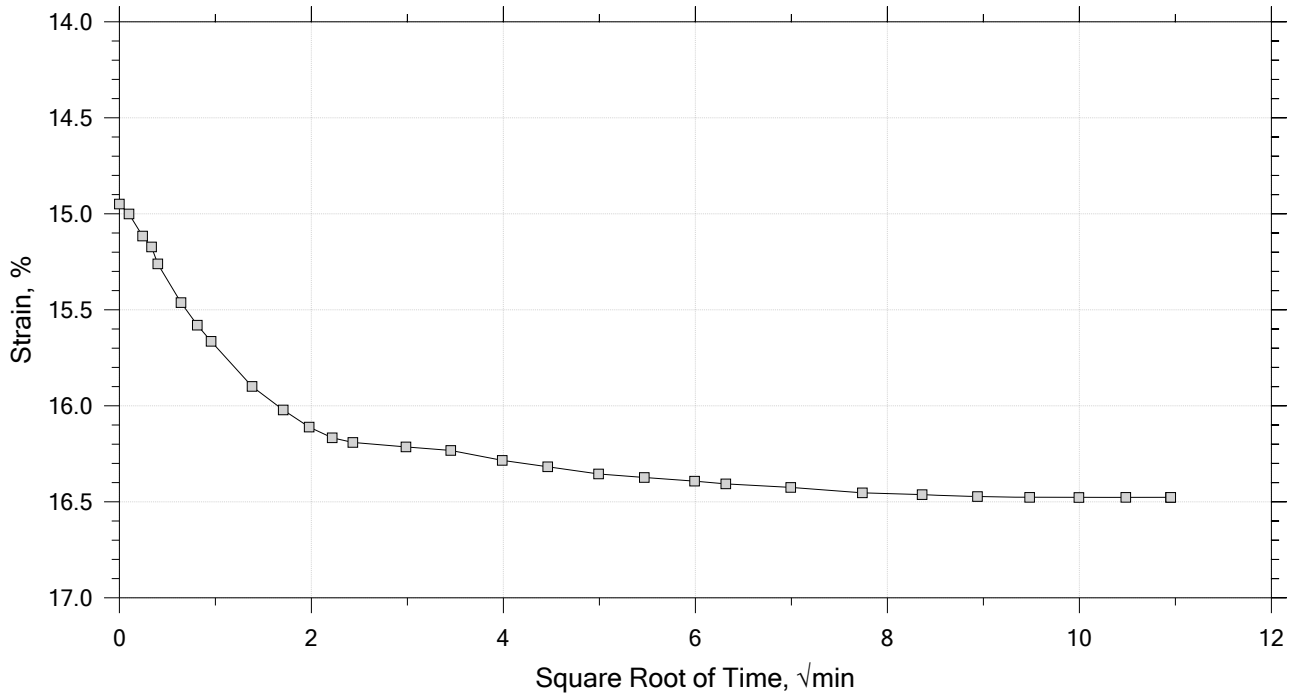


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

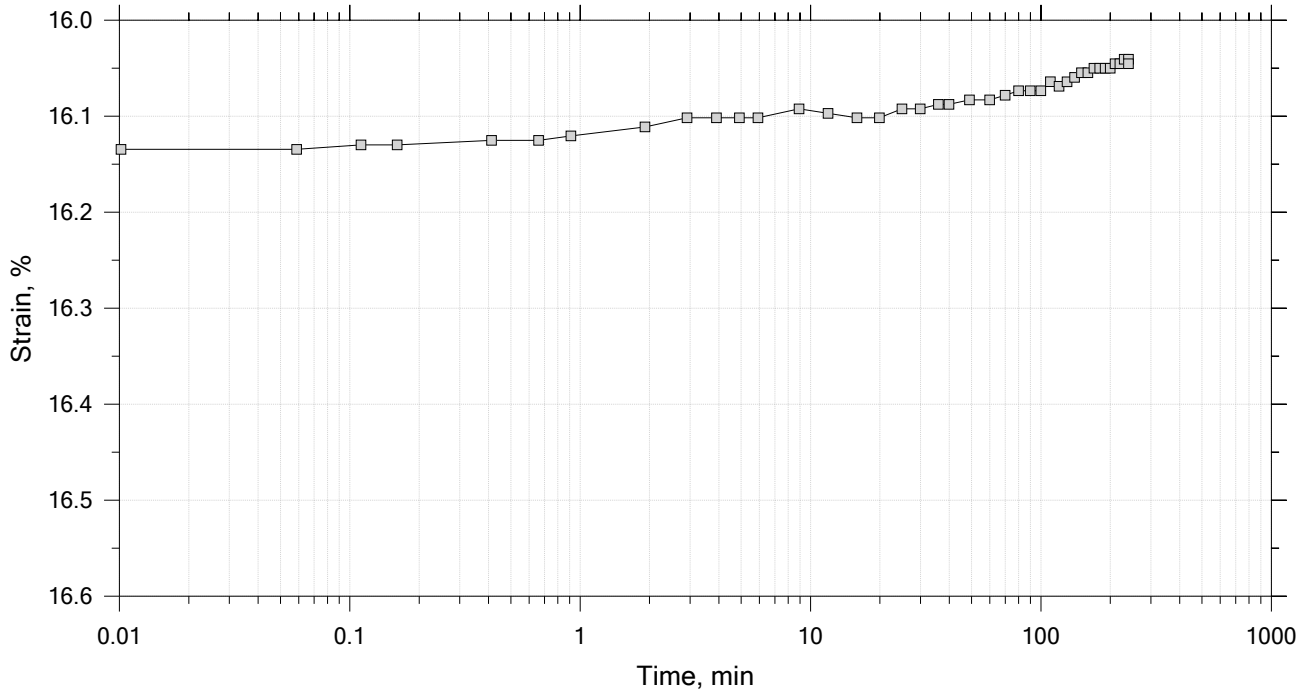


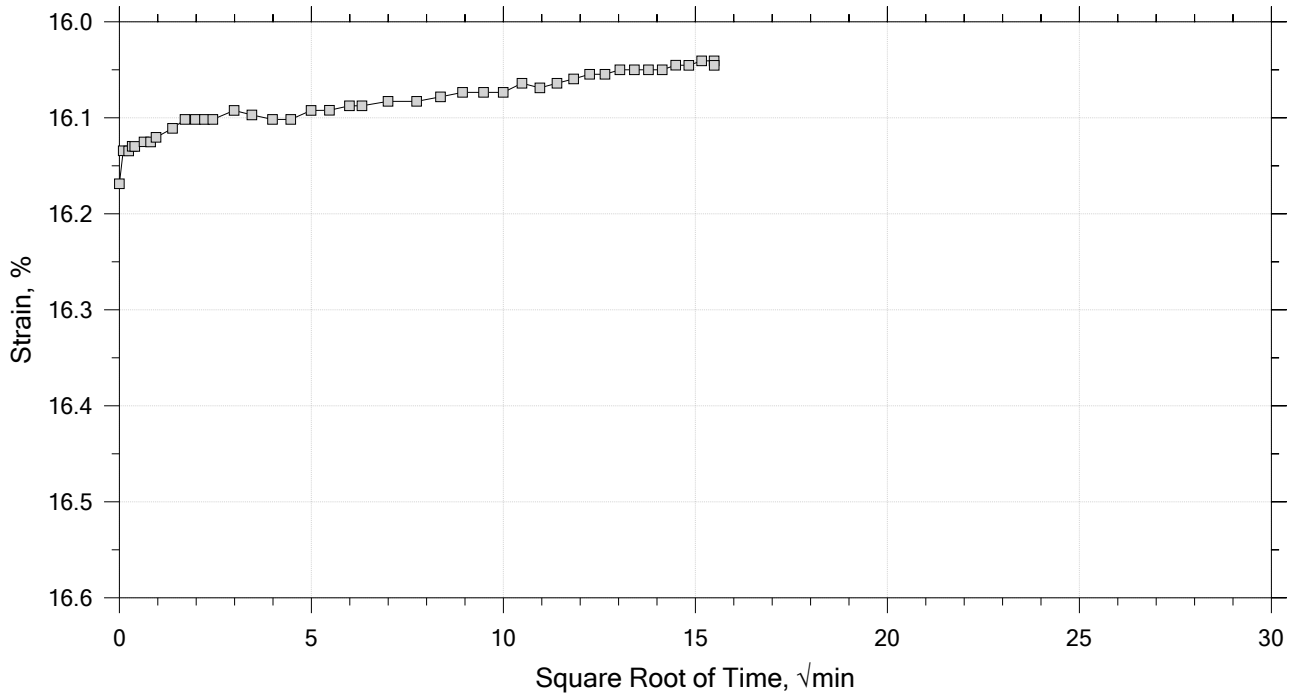


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

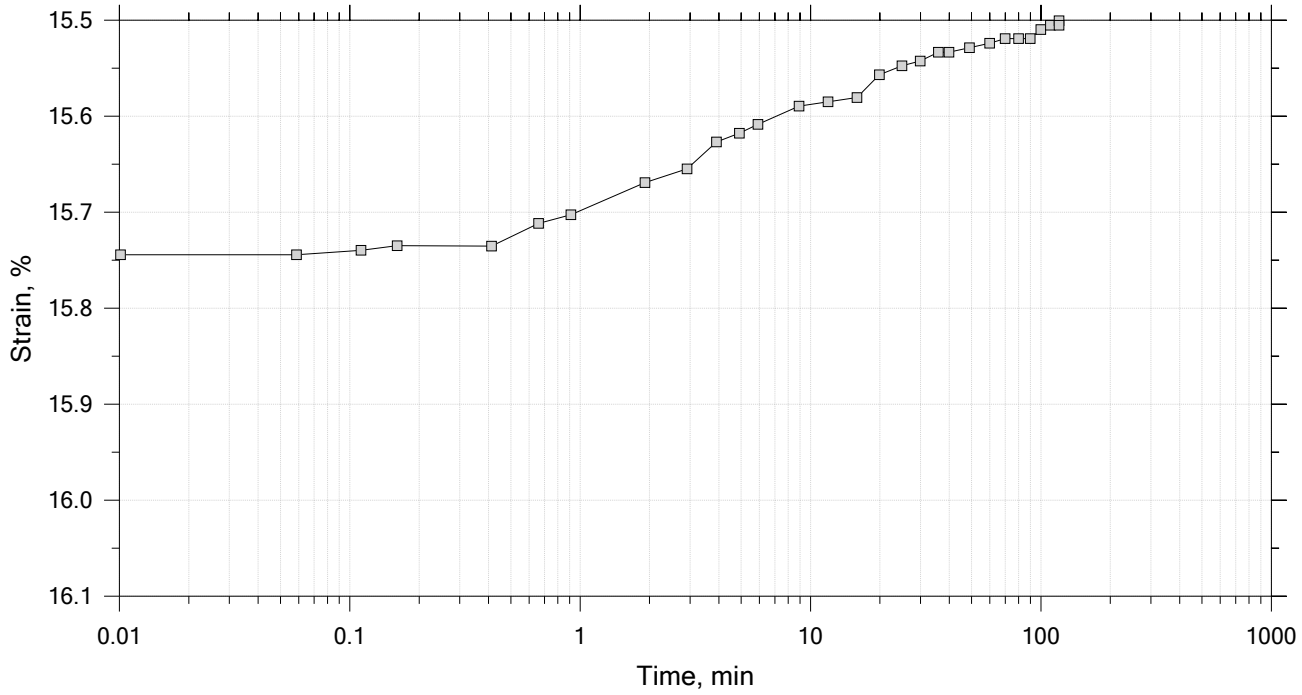


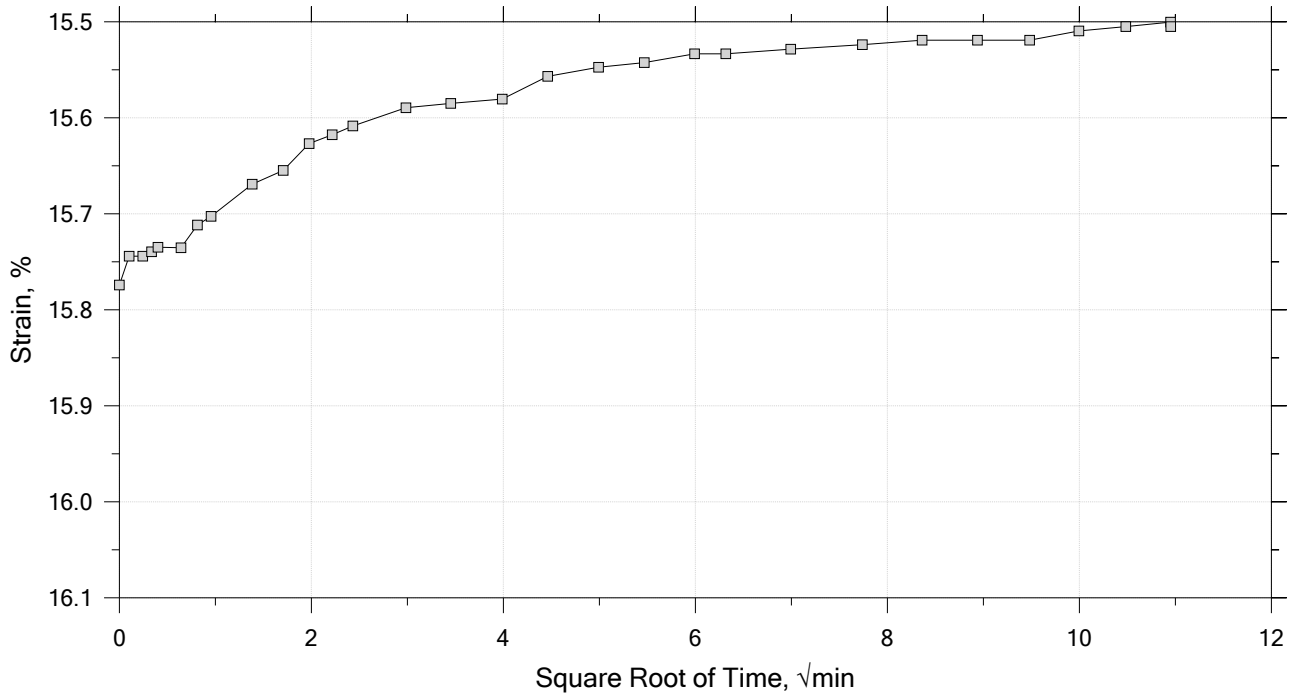


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

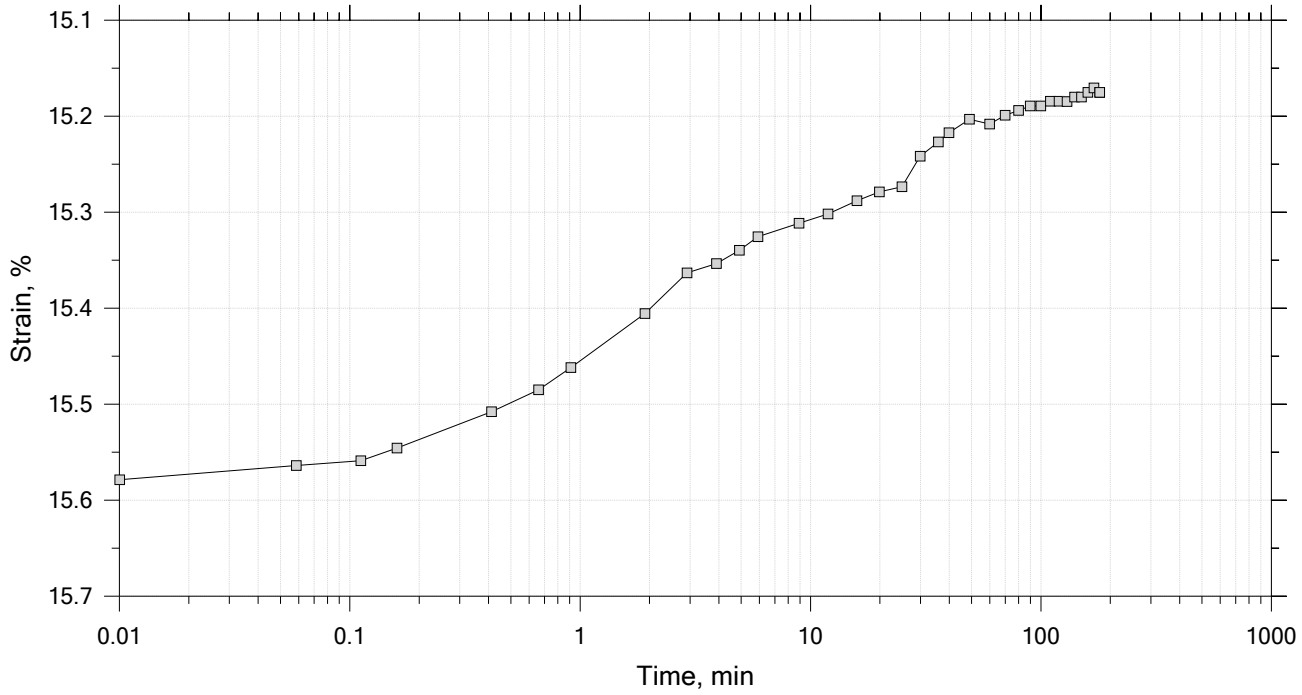


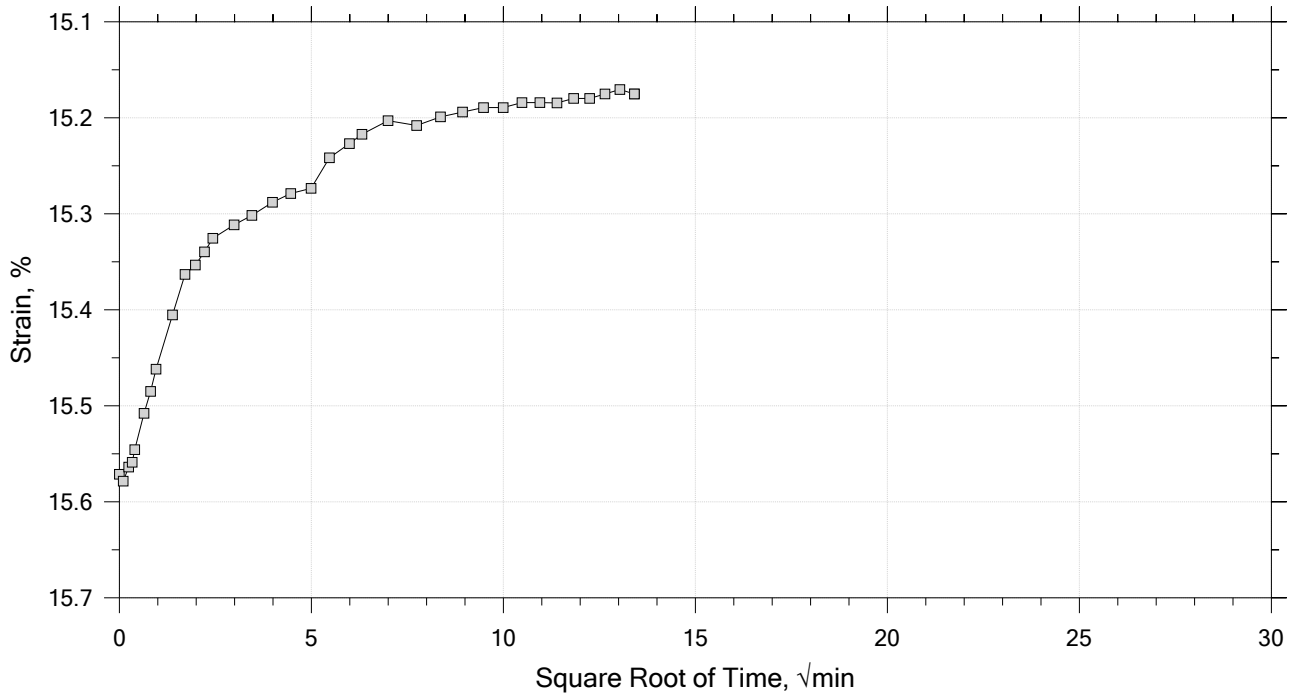


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

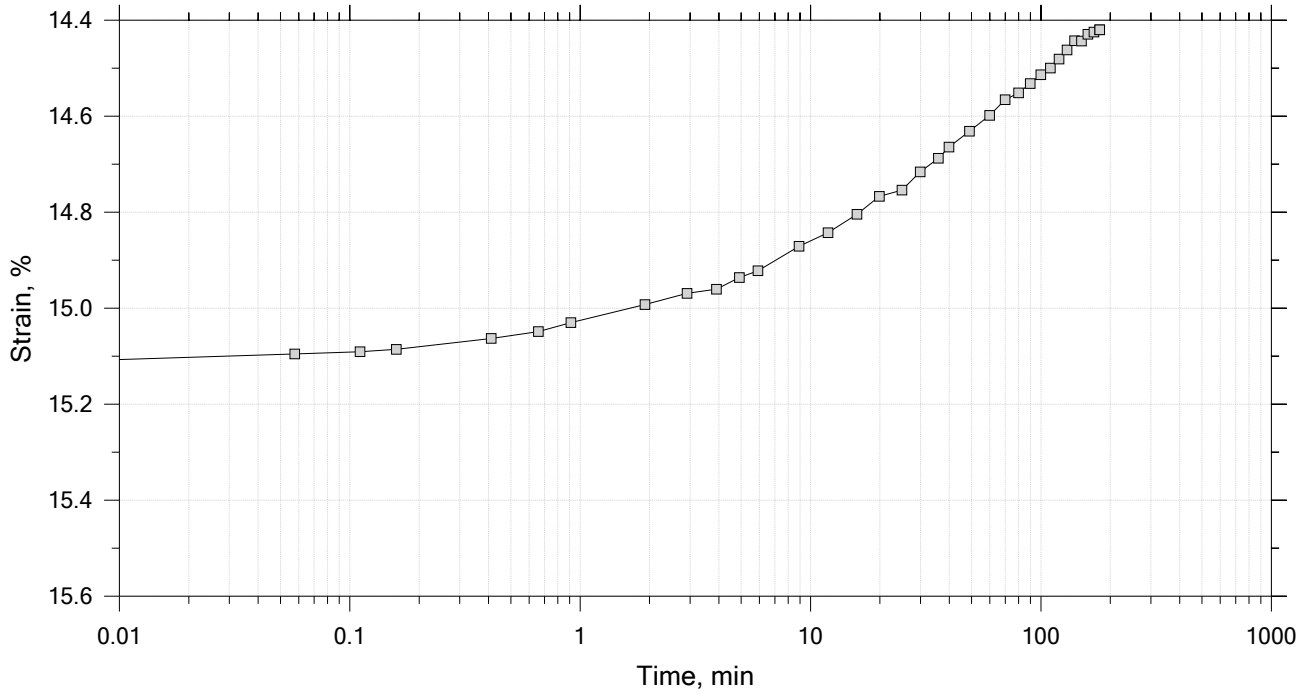


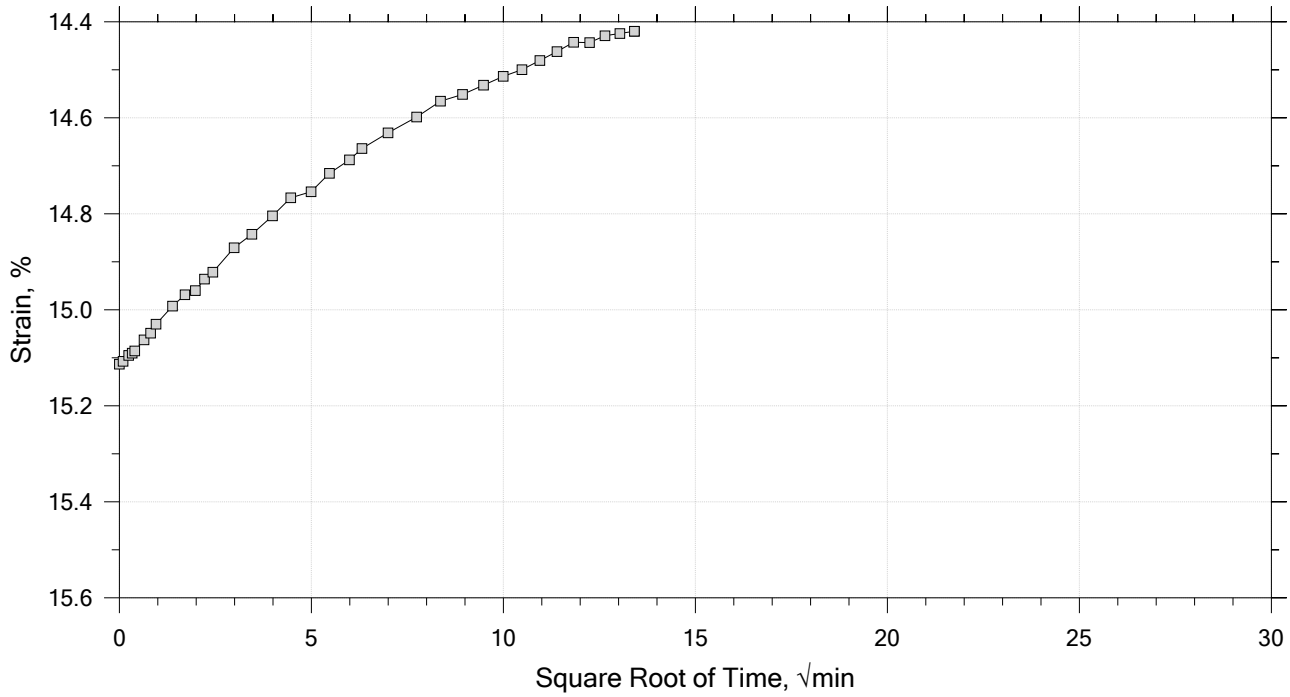


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

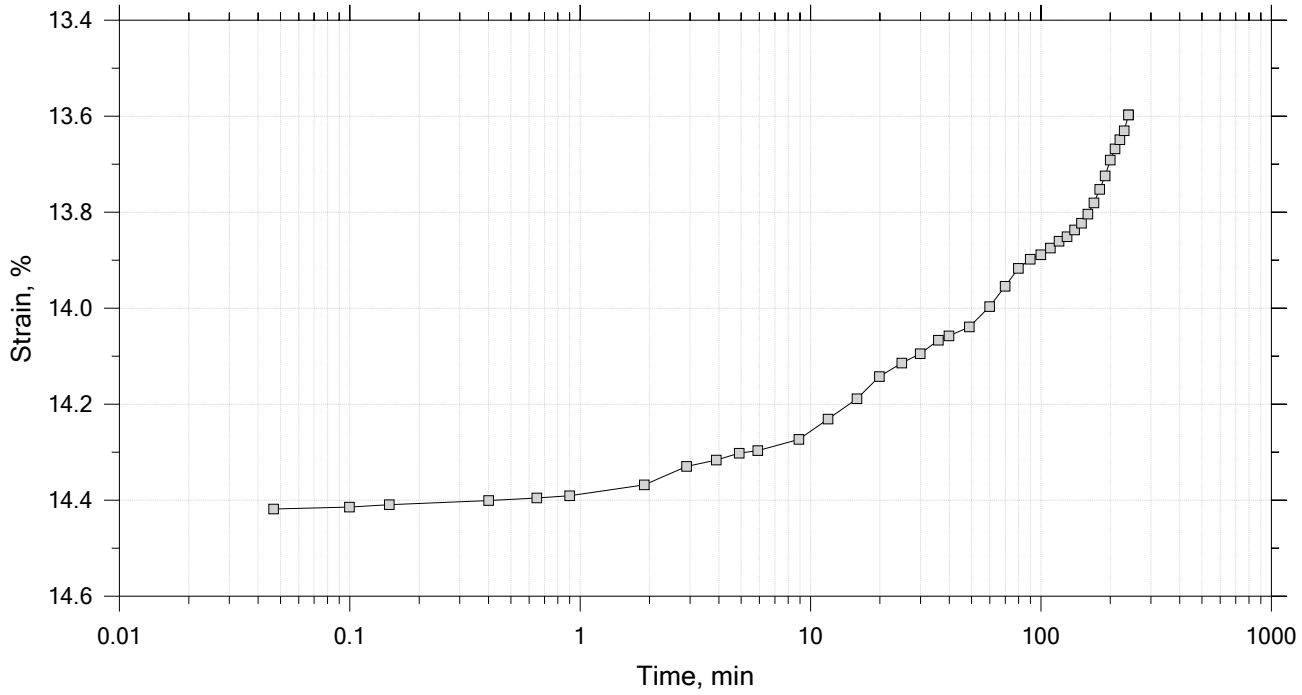


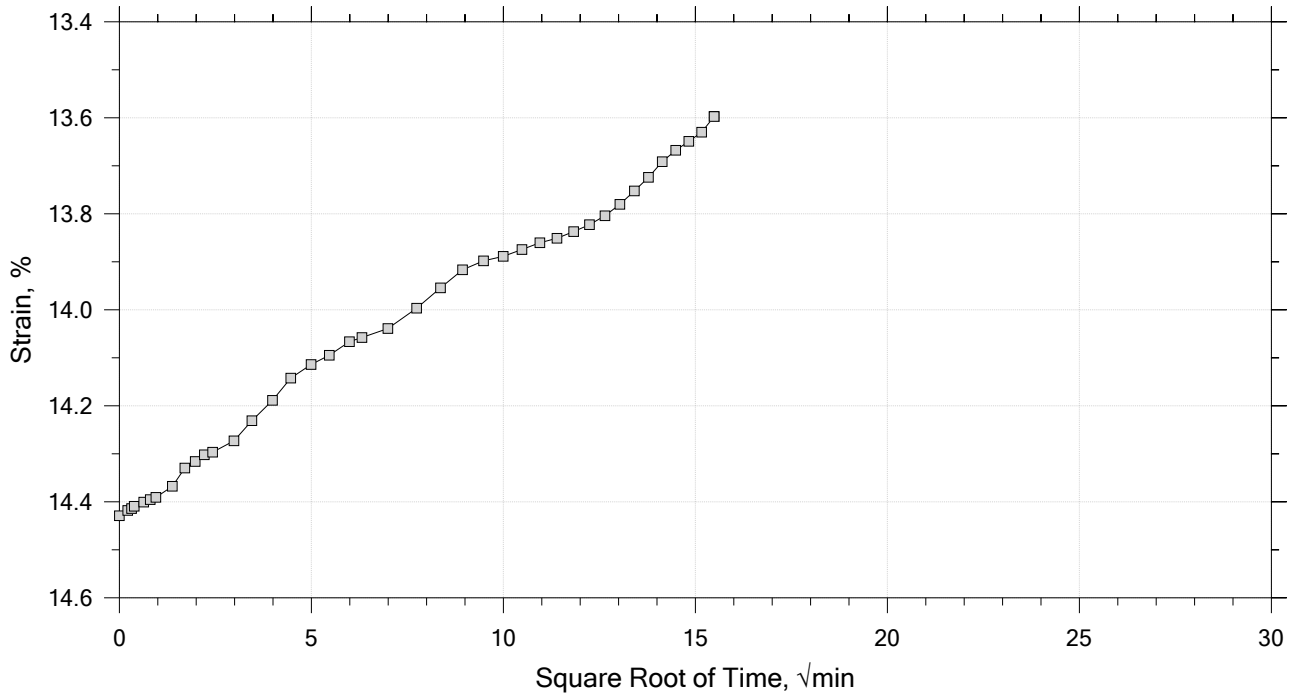


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.65	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.627	Plastic Limit: ---
Final Height: 0.90 in	Final Void Ratio: 0.464	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-1465	RING		D-1501
Mass Container, gm	8.62	111.25	111.25	8.34
Mass Container + Wet Soil, gm	272.44	273	265.28	160.75
Mass Container + Dry Soil, gm	217.06	242.32	242.32	138.03
Mass Dry Soil, gm	208.44	131.07	131.07	129.69
Water Content, %	26.57	23.41	17.52	17.52
Void Ratio	---	0.63	0.46	---
Degree of Saturation, %	---	98.96	100.00	---
Dry Unit Weight, pcf	---	101.72	113.02	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB012	Tested By: md	Checked By: njh
Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
Test No.: IP-2	Sample Type: intact	Elevation: ---
Description: Wet, gray sandy clay		
Remarks: System F, Swell Pressure = 0.0644 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0644	0.008683	0.613	0.868	14.352	3.94e-07	1.35e-01	1.43e-04	0.00e+00
2	0.125	0.02218	0.591	2.22	0.000	0.00e+00	2.23e-01	0.00e+00	0.00e+00
3	0.250	0.03515	0.570	3.51	0.000	0.00e+00	1.04e-01	0.00e+00	0.00e+00
4	0.500	0.04876	0.548	4.88	4.056	1.29e-06	5.45e-02	1.89e-04	0.00e+00
5	1.00	0.06477	0.522	6.48	3.867	1.31e-06	3.20e-02	1.13e-04	0.00e+00
6	2.00	0.08346	0.491	8.35	2.288	2.14e-06	1.87e-02	1.08e-04	0.00e+00
7	4.00	0.1030	0.460	10.3	1.937	2.42e-06	9.76e-03	6.37e-05	0.00e+00
8	8.00	0.1234	0.426	12.3	1.854	2.42e-06	5.11e-03	3.33e-05	0.00e+00
9	16.0	0.1447	0.392	14.5	0.831	5.14e-06	2.65e-03	3.68e-05	0.00e+00
10	32.0	0.1648	0.359	16.5	1.122	3.63e-06	1.26e-03	1.23e-05	0.00e+00
11	8.00	0.1605	0.366	16.0	0.000	0.00e+00	1.80e-04	0.00e+00	0.00e+00
12	2.00	0.1551	0.375	15.5	0.000	0.00e+00	9.00e-04	0.00e+00	0.00e+00
13	0.500	0.1518	0.380	15.2	0.000	0.00e+00	2.20e-03	0.00e+00	0.00e+00
14	0.125	0.1442	0.393	14.4	0.000	0.00e+00	2.01e-02	0.00e+00	0.00e+00
15	0.0625	0.1360	0.406	13.6	0.000	0.00e+00	1.32e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

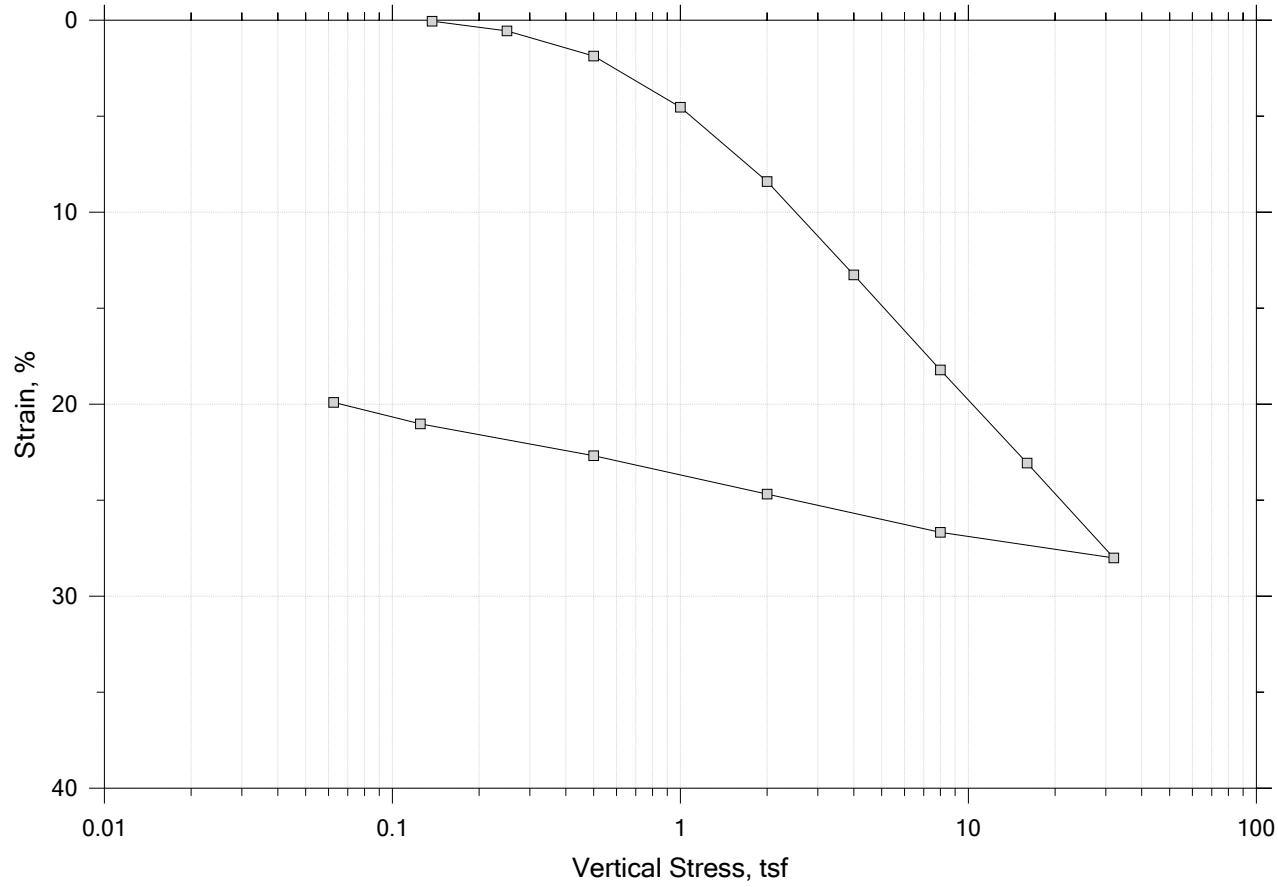
Square Root of Time Coefficients

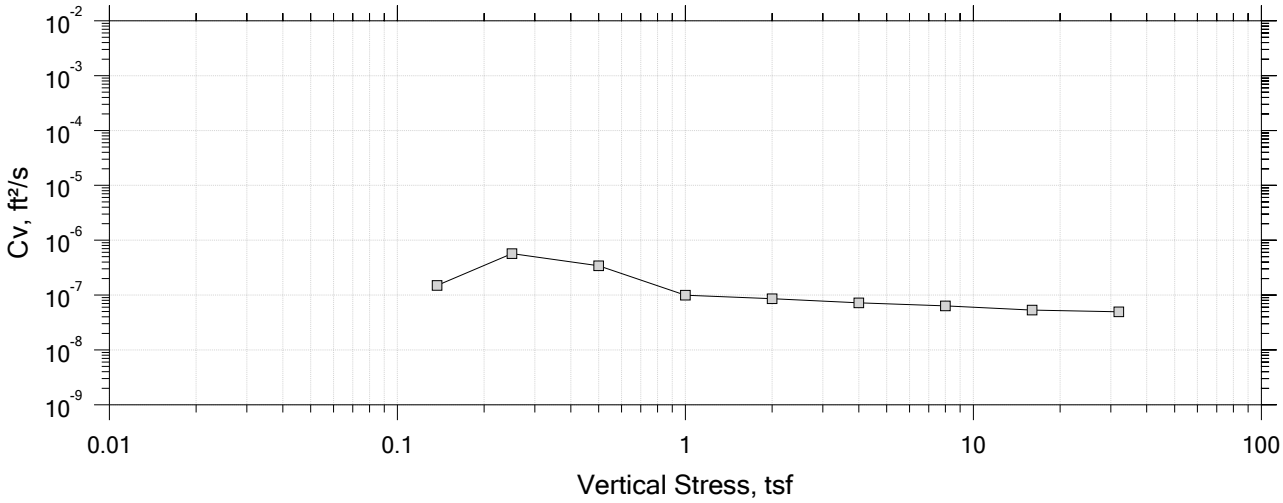
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0644	0.008683	0.613	0.868	101.978	2.39e-07	1.35e-01	8.67e-05
2	0.125	0.02218	0.591	2.22	20.692	1.15e-06	2.23e-01	6.91e-04
3	0.250	0.03515	0.570	3.51	35.822	6.46e-07	1.04e-01	1.81e-04
4	0.500	0.04876	0.548	4.88	16.684	1.35e-06	5.45e-02	1.98e-04
5	1.00	0.06477	0.522	6.48	13.926	1.57e-06	3.20e-02	1.35e-04
6	2.00	0.08346	0.491	8.35	11.941	1.76e-06	1.87e-02	8.88e-05
7	4.00	0.1030	0.460	10.3	8.888	2.27e-06	9.76e-03	5.98e-05
8	8.00	0.1234	0.426	12.3	7.297	2.64e-06	5.11e-03	3.64e-05
9	16.0	0.1447	0.392	14.5	3.960	4.65e-06	2.65e-03	3.33e-05
10	32.0	0.1648	0.359	16.5	4.062	4.32e-06	1.26e-03	1.46e-05
11	8.00	0.1605	0.366	16.0	168.249	1.02e-07	1.80e-04	4.96e-08
12	2.00	0.1551	0.375	15.5	40.157	4.33e-07	9.00e-04	1.05e-06
13	0.500	0.1518	0.380	15.2	45.769	3.84e-07	2.20e-03	2.28e-06
14	0.125	0.1442	0.393	14.4	58.791	3.03e-07	2.01e-02	1.65e-05
15	0.0625	0.1360	0.406	13.6	0.000	0.00e+00	1.32e-01	0.00e+00

GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB012	Tested By: md	Checked By: njh
	Sample No.: SL1049	Test Date: 12/21/18	Depth: 13-15 ft
	Test No.: IP-2	Sample Type: intact	Elevation: ---
	Description: Wet, gray sandy clay		
	Remarks: System F, Swell Pressure = 0.0644 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

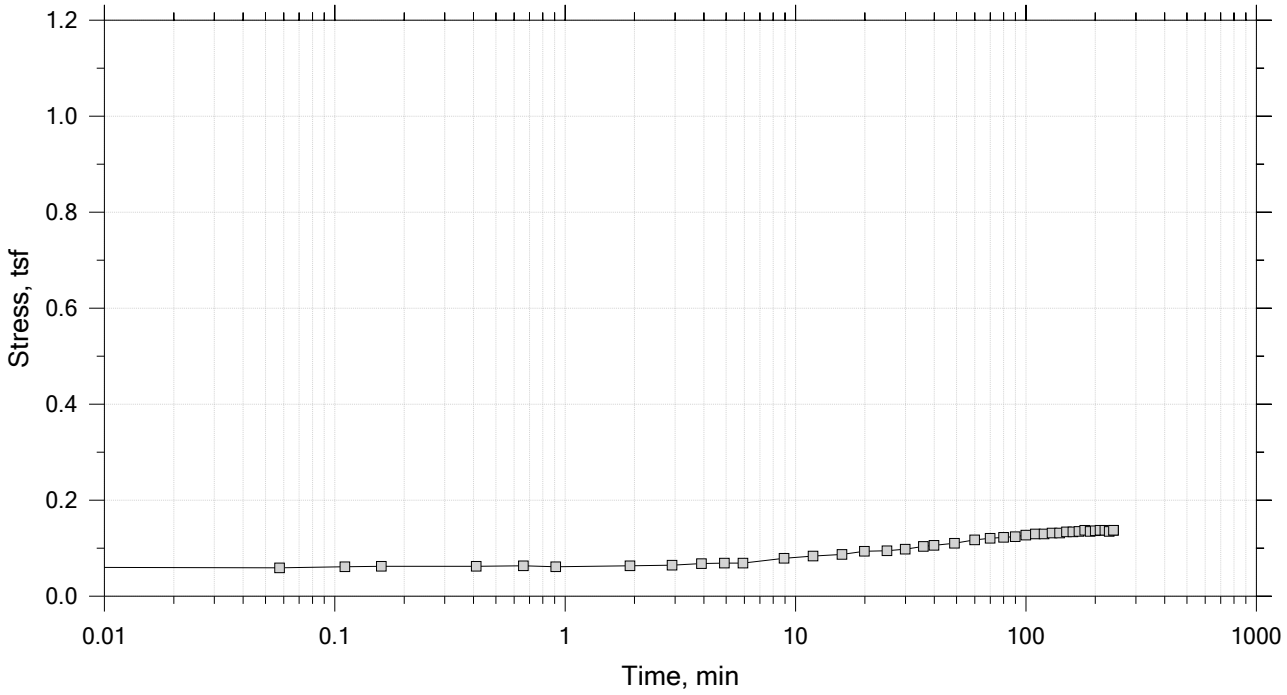


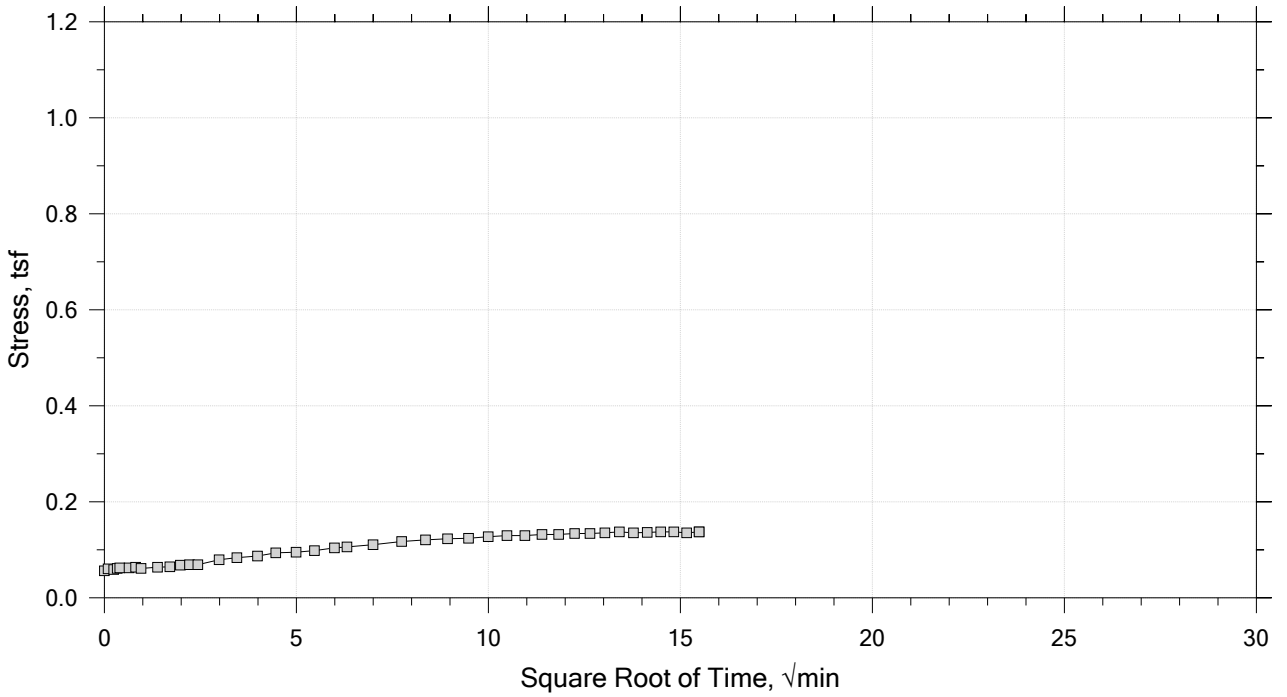


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 14
Constant Volume Step
Stress: 0.137 tsf

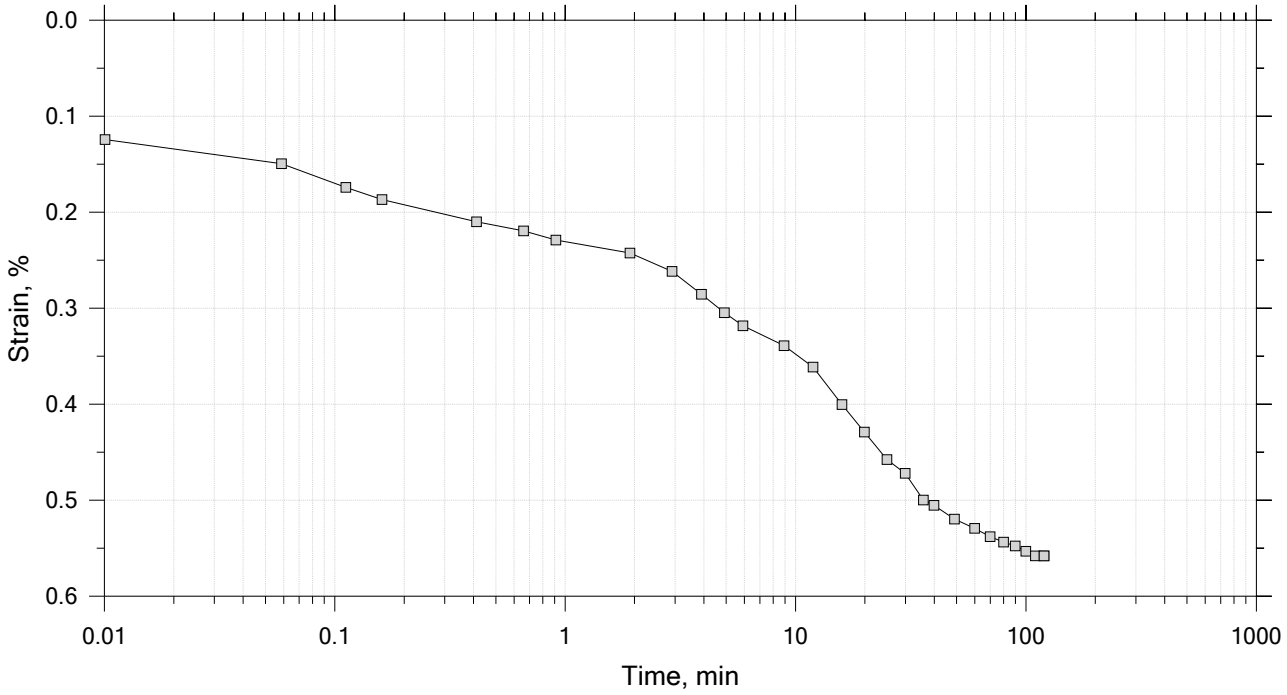


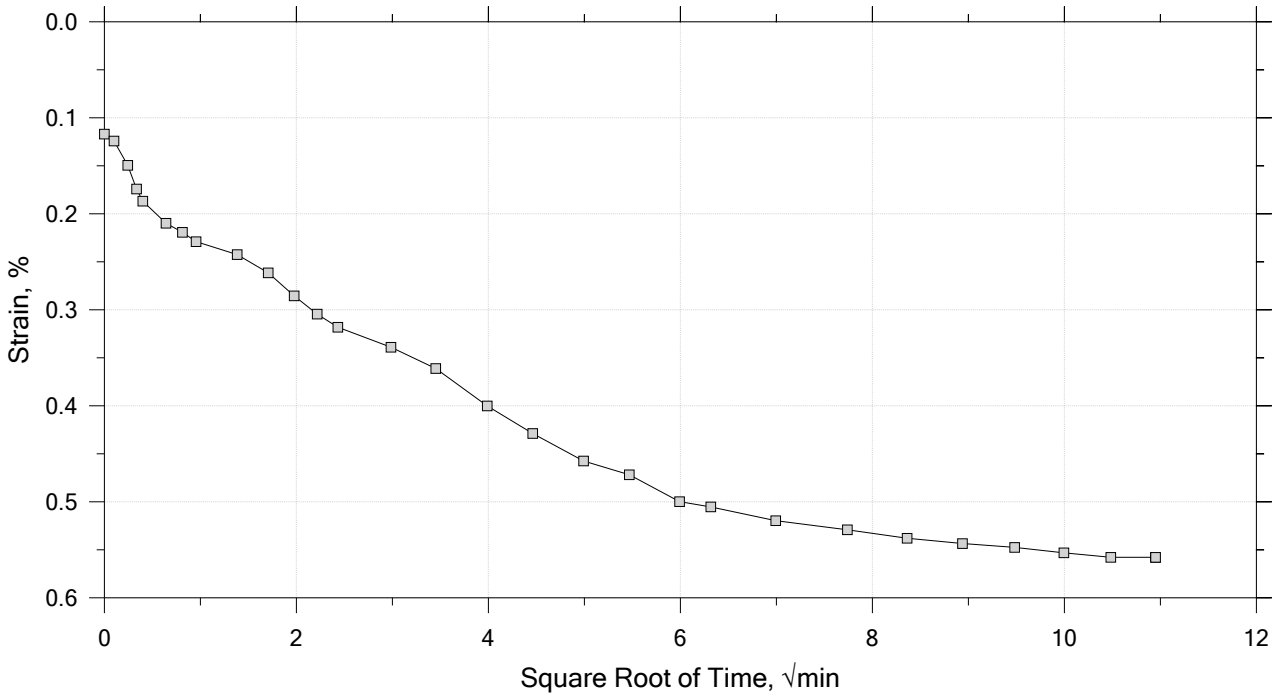


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 14
Constant Load Step
Stress: 0.25 tsf





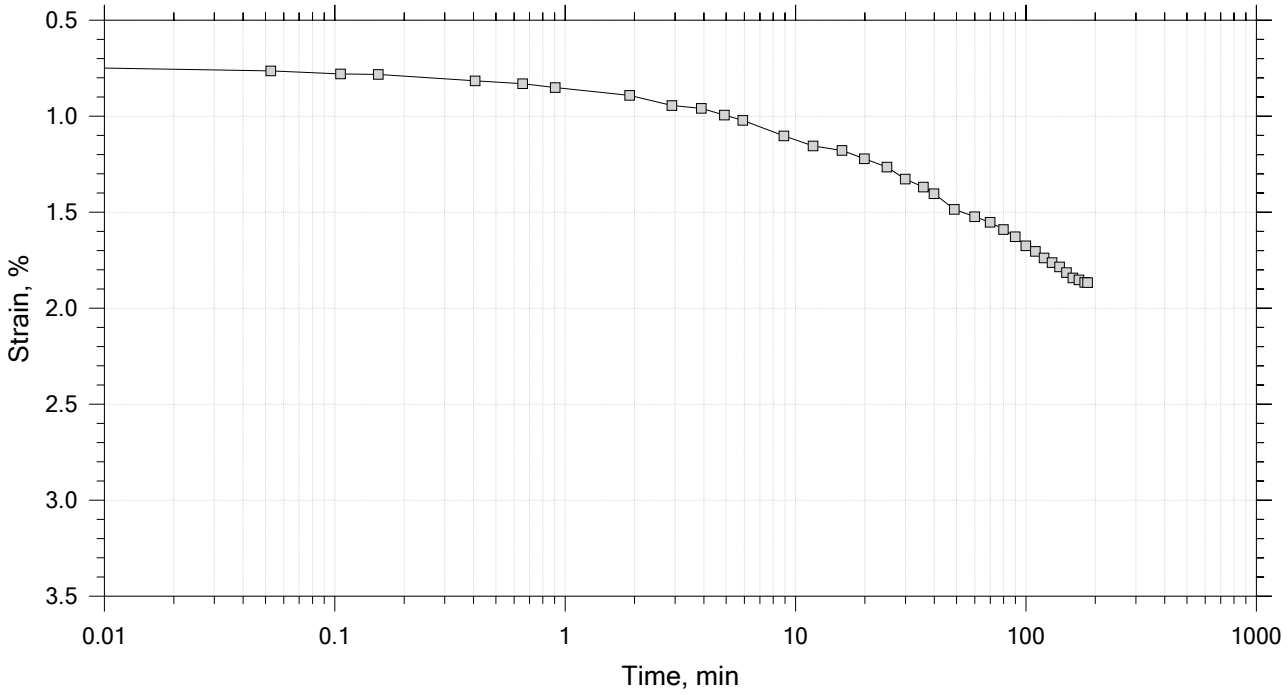
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

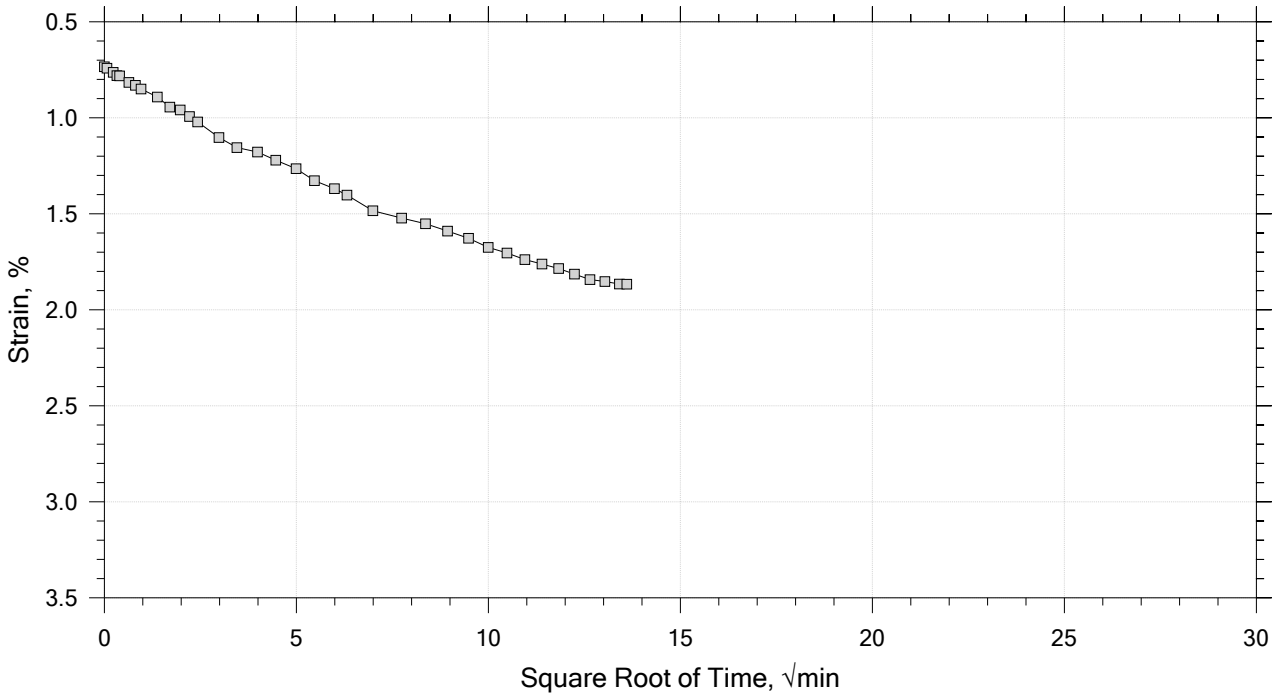
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 14

Constant Load Step

Stress: 0.5 tsf





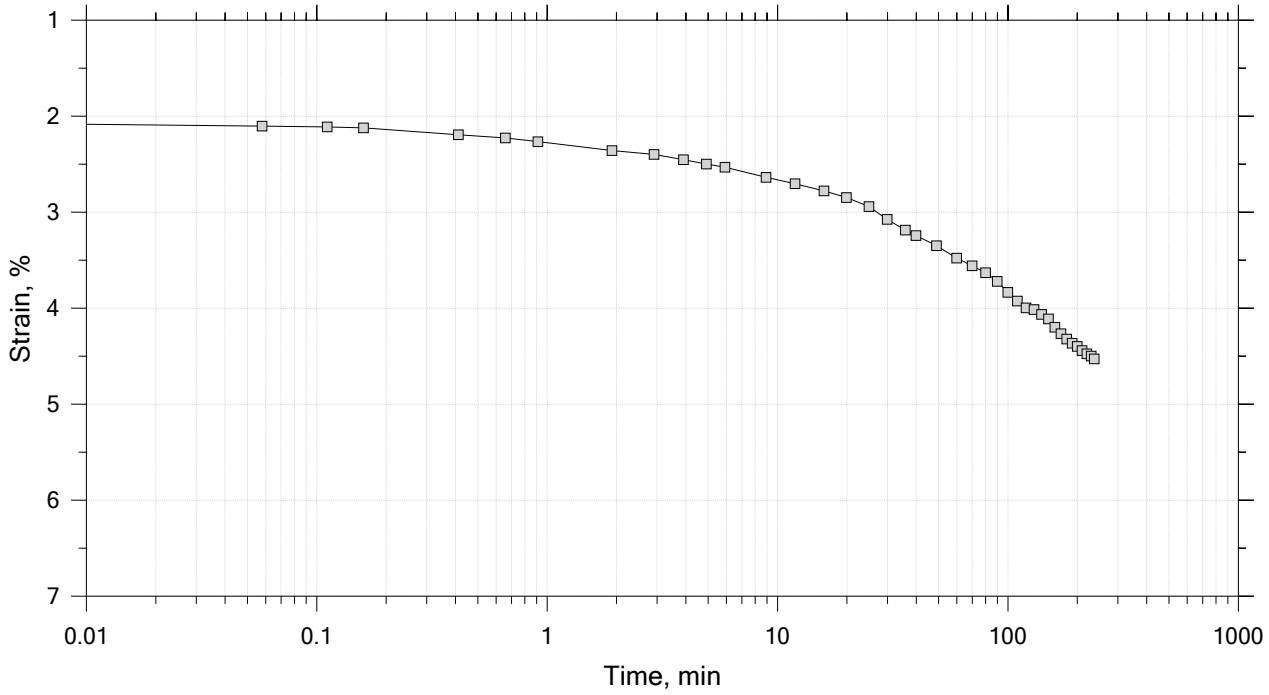
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB025	Tested By: md	Checked By: njh
Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, black clay		
Remarks: System E, Swell Pressure = 0.137 tsf		

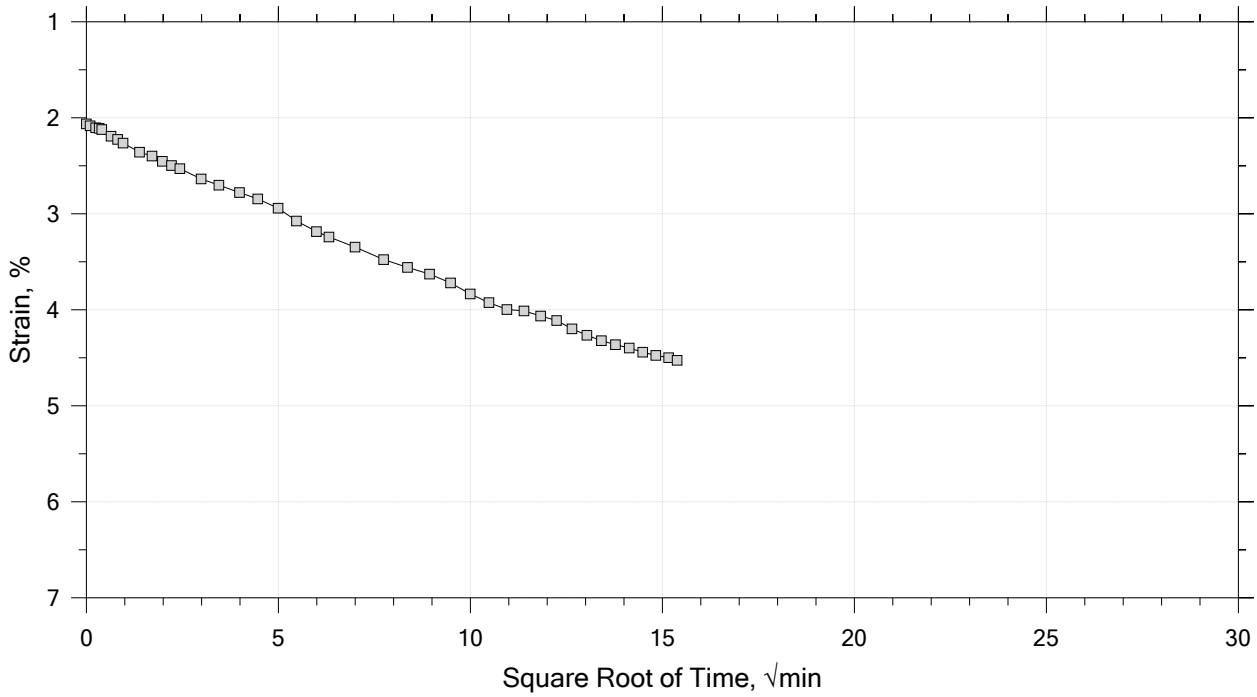
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 14

Constant Load Step

Stress: 1 tsf

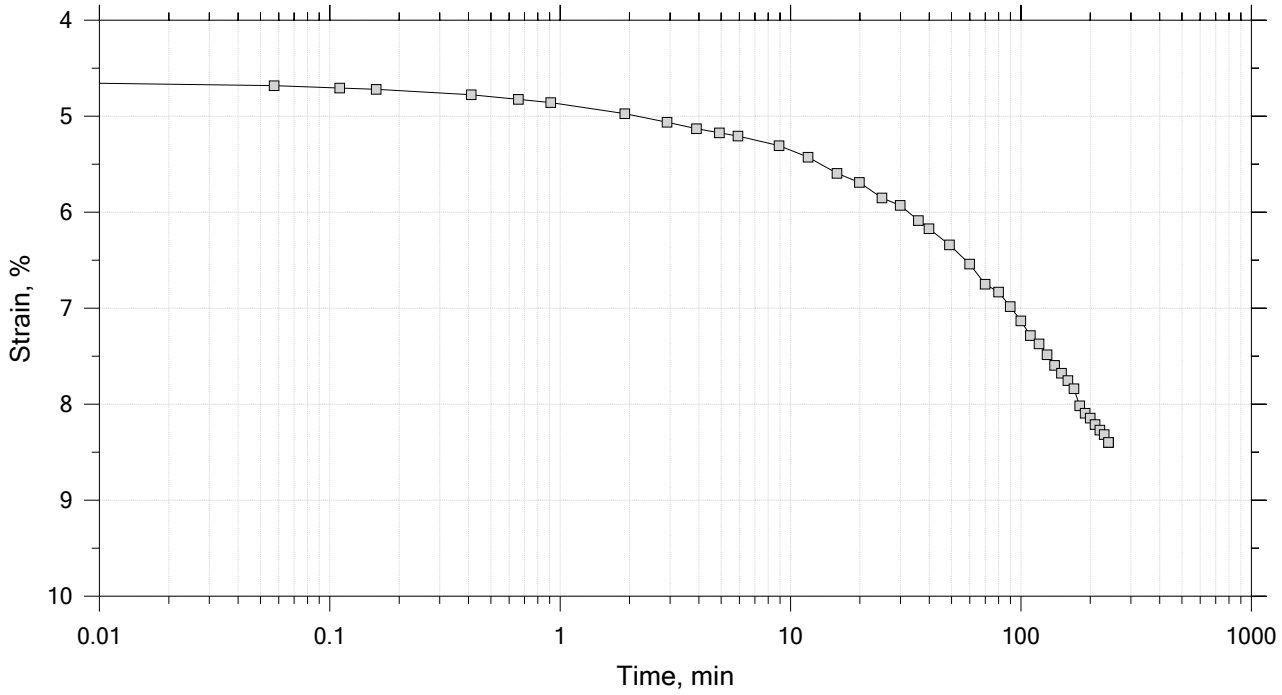


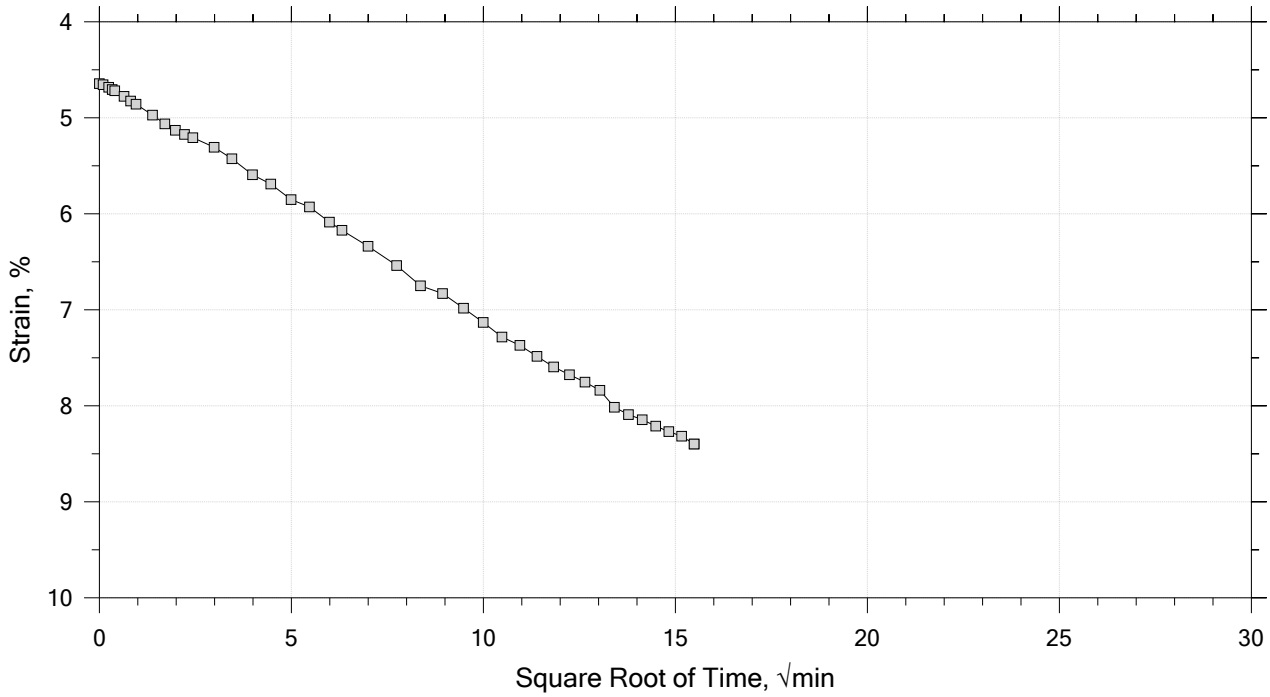


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 14
Constant Load Step
Stress: 2 tsf

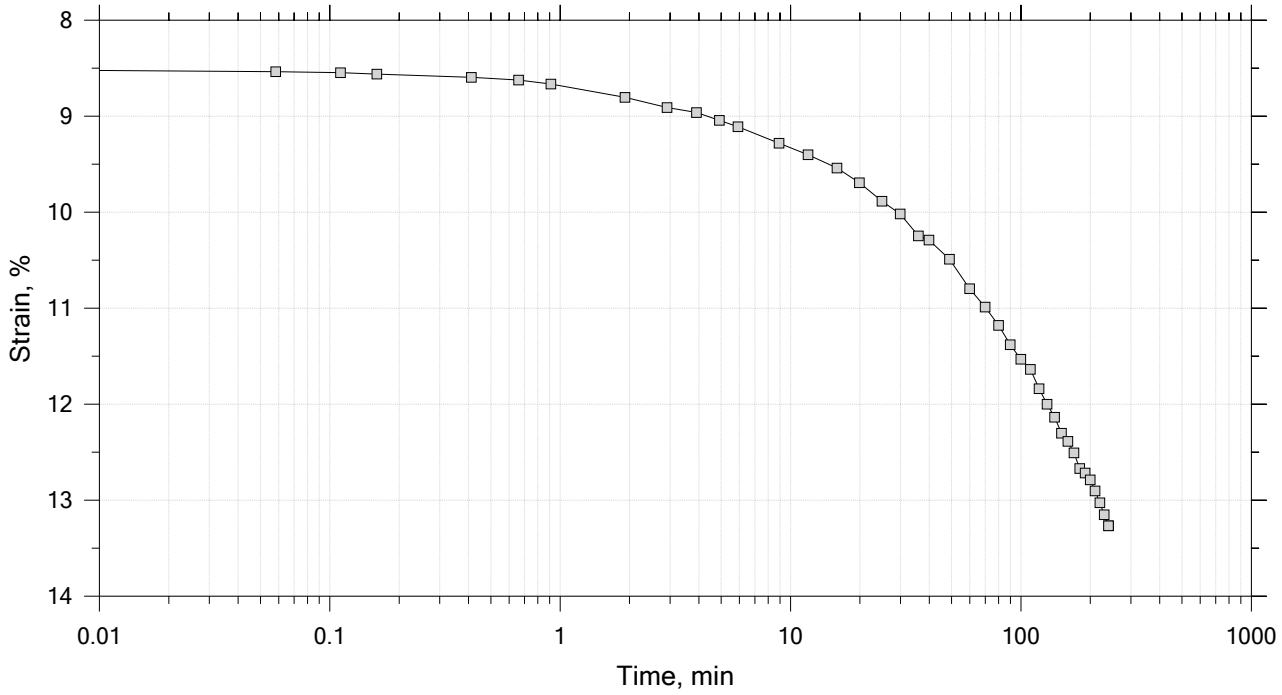


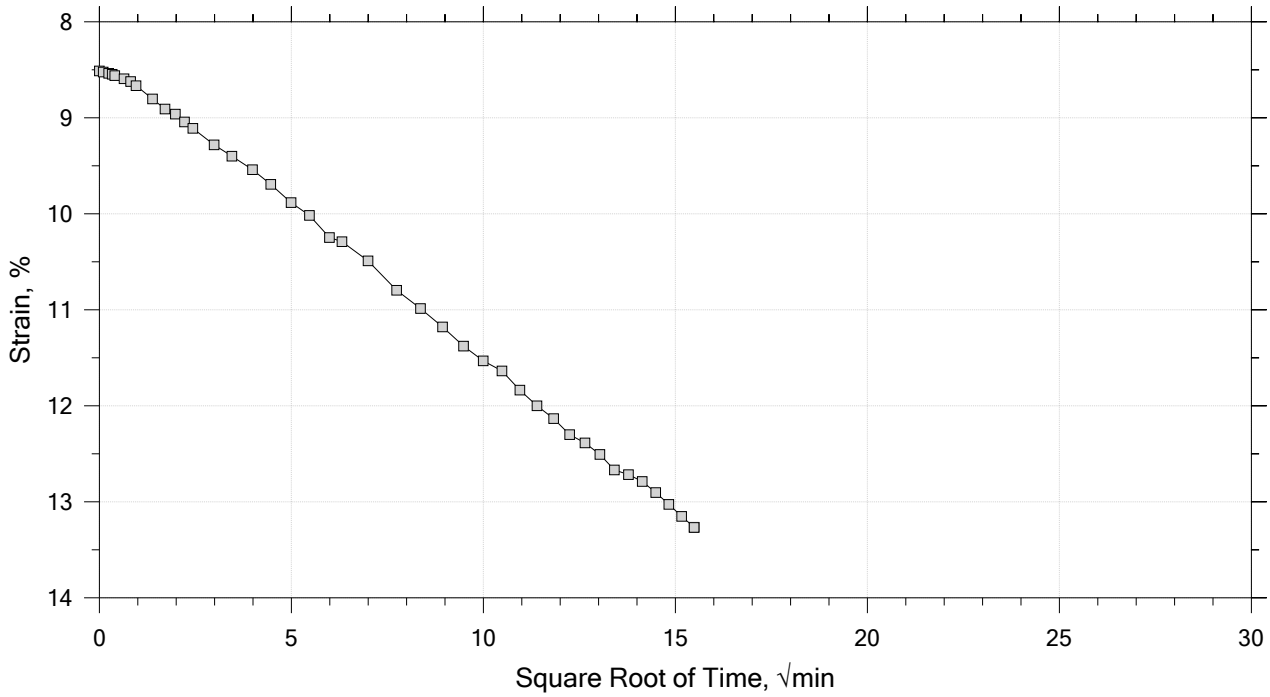


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 14
Constant Load Step
Stress: 4 tsf





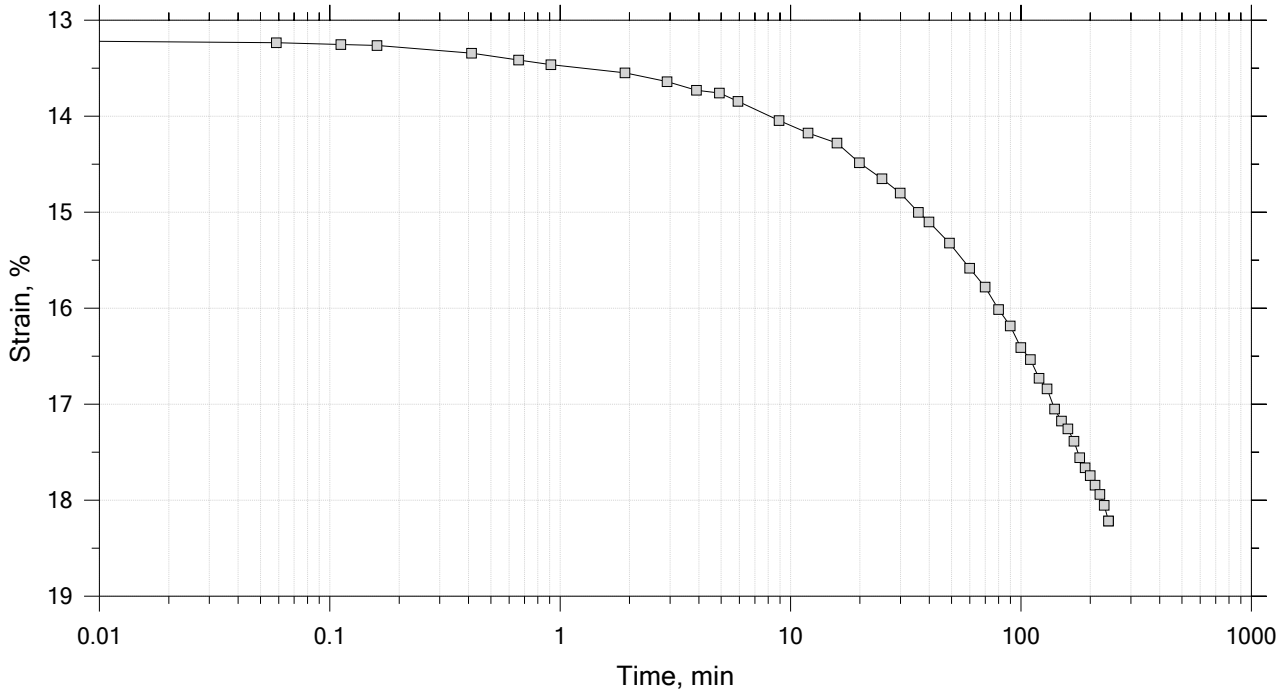
GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

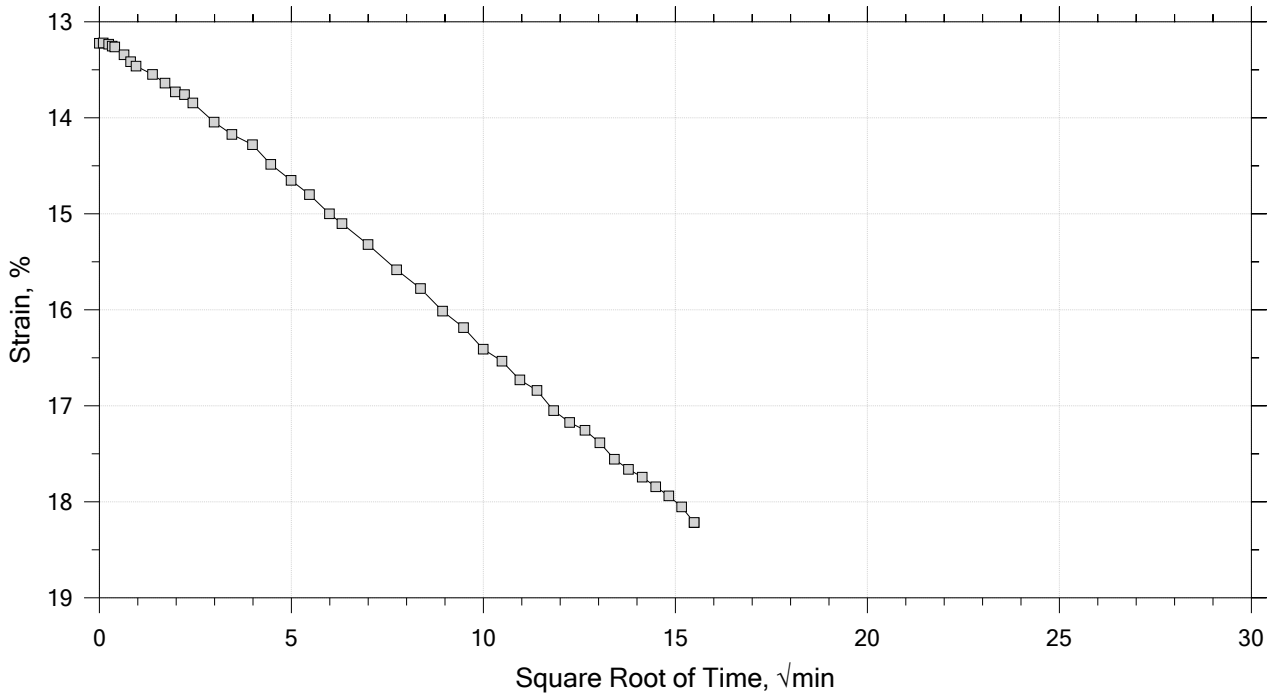
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 14

Constant Load Step

Stress: 8 tsf

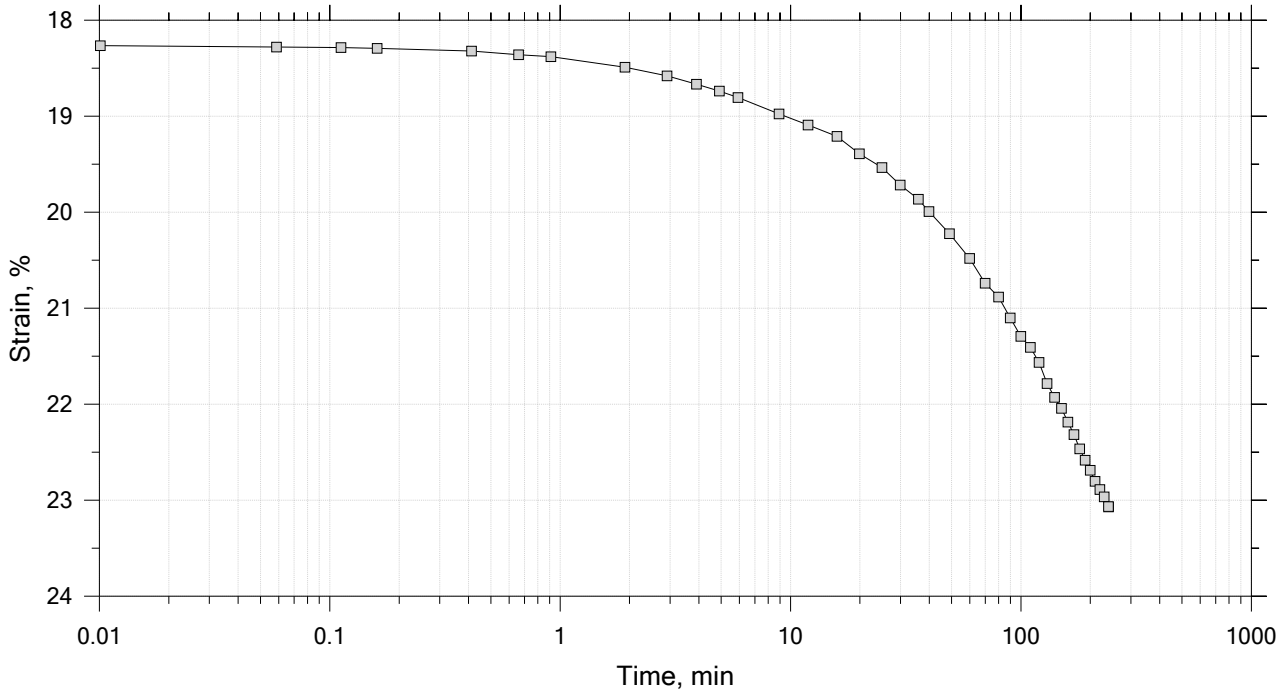


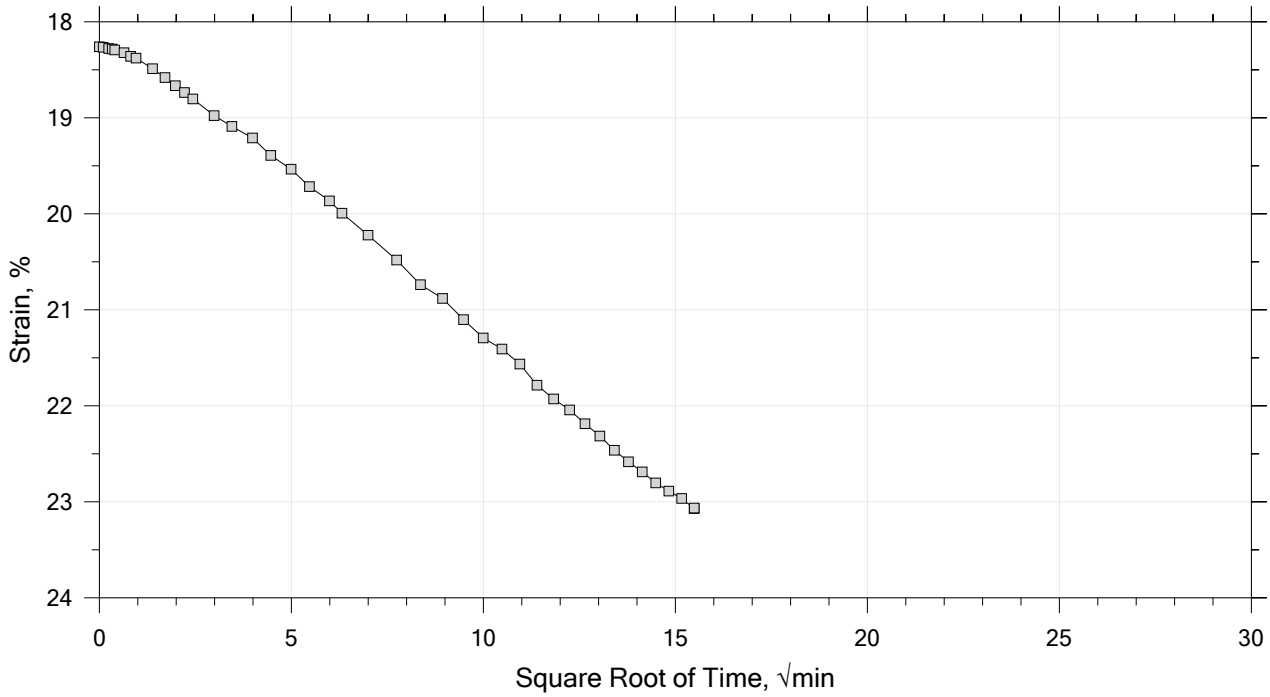


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 14
Constant Load Step
Stress: 16 tsf

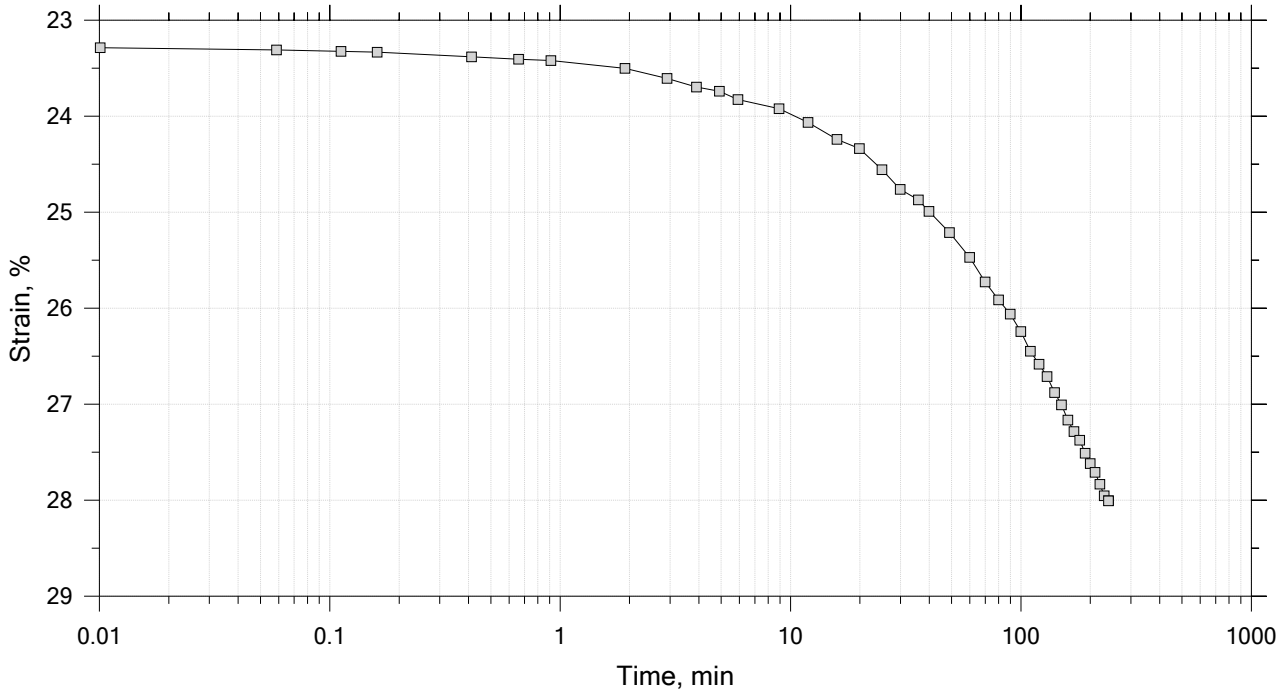


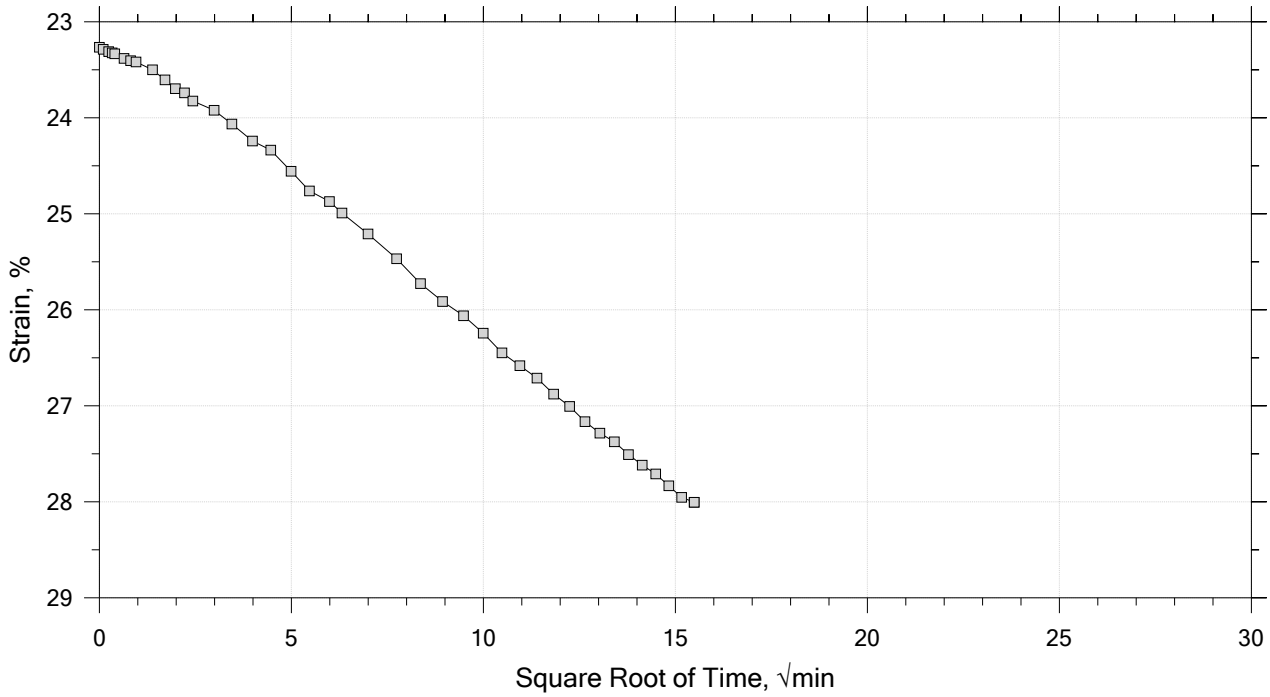


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 14
Constant Load Step
Stress: 32 tsf

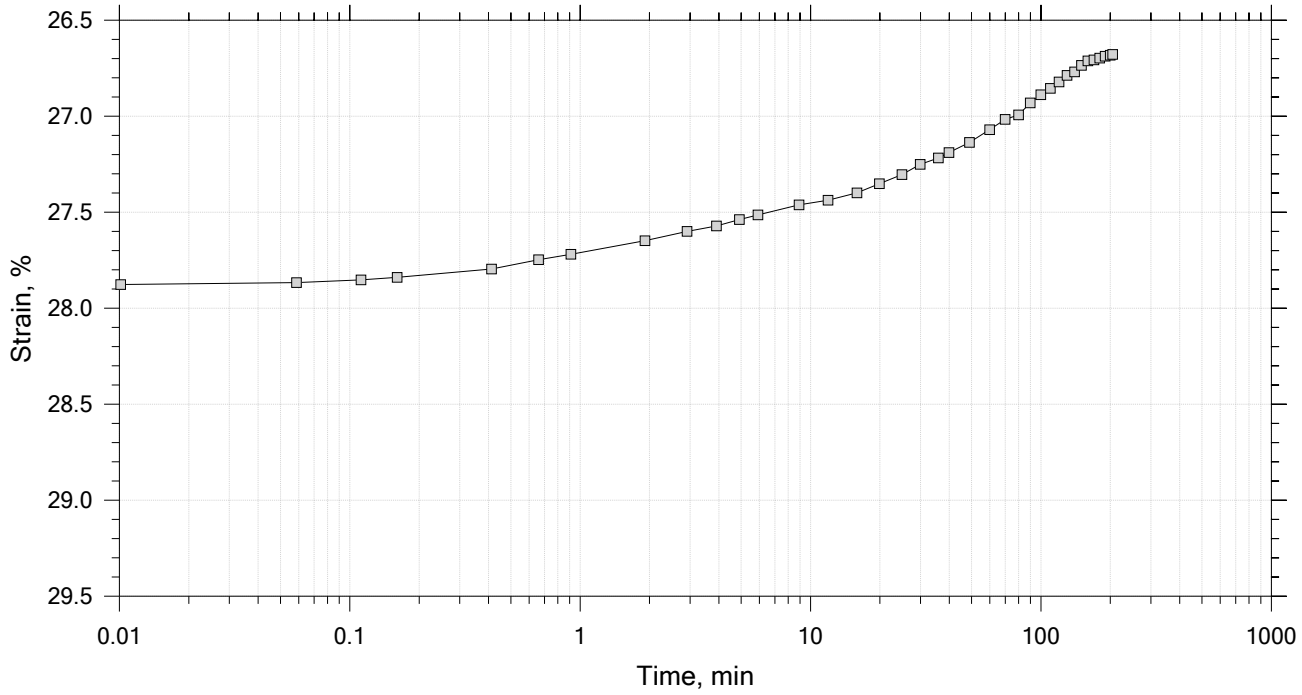


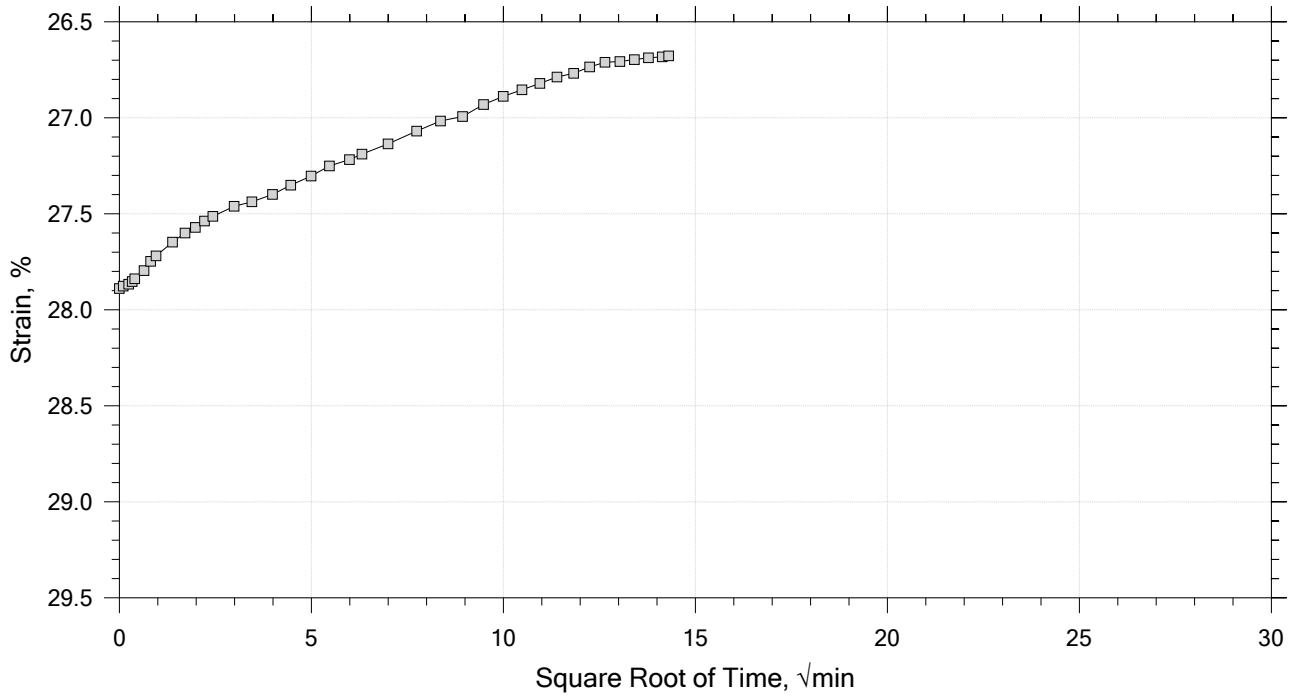


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 14
Constant Load Step
Stress: 8 tsf

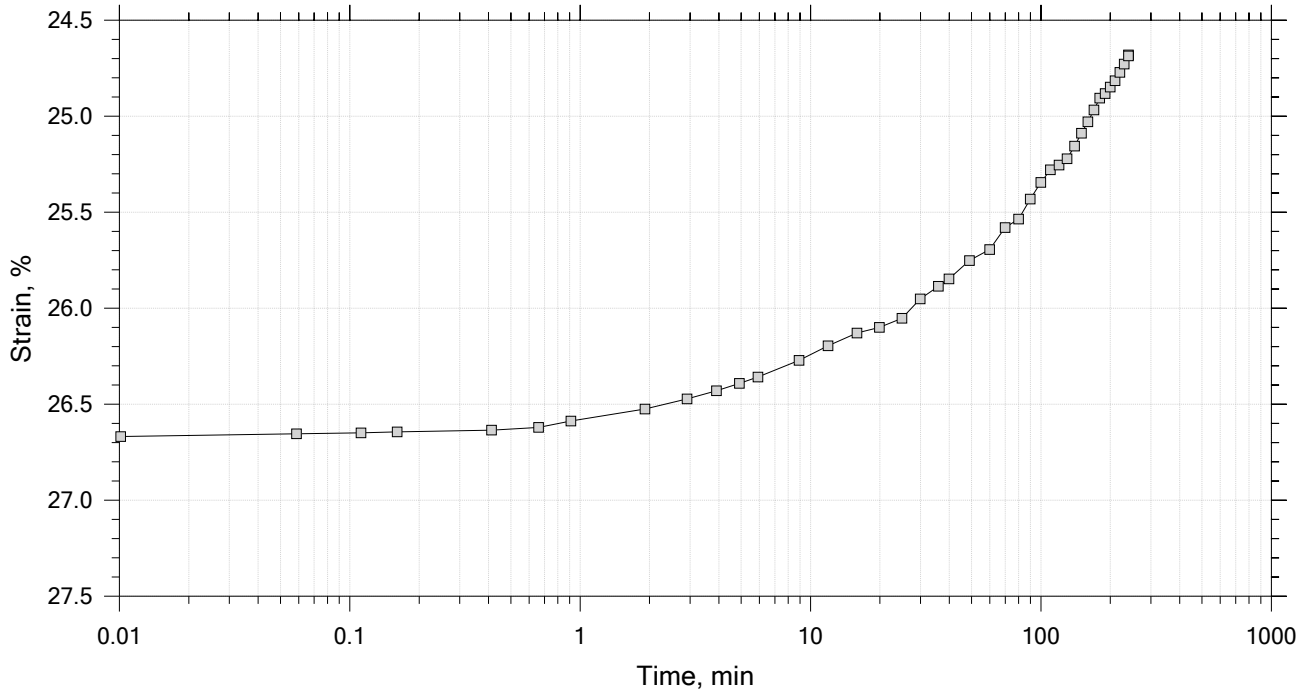


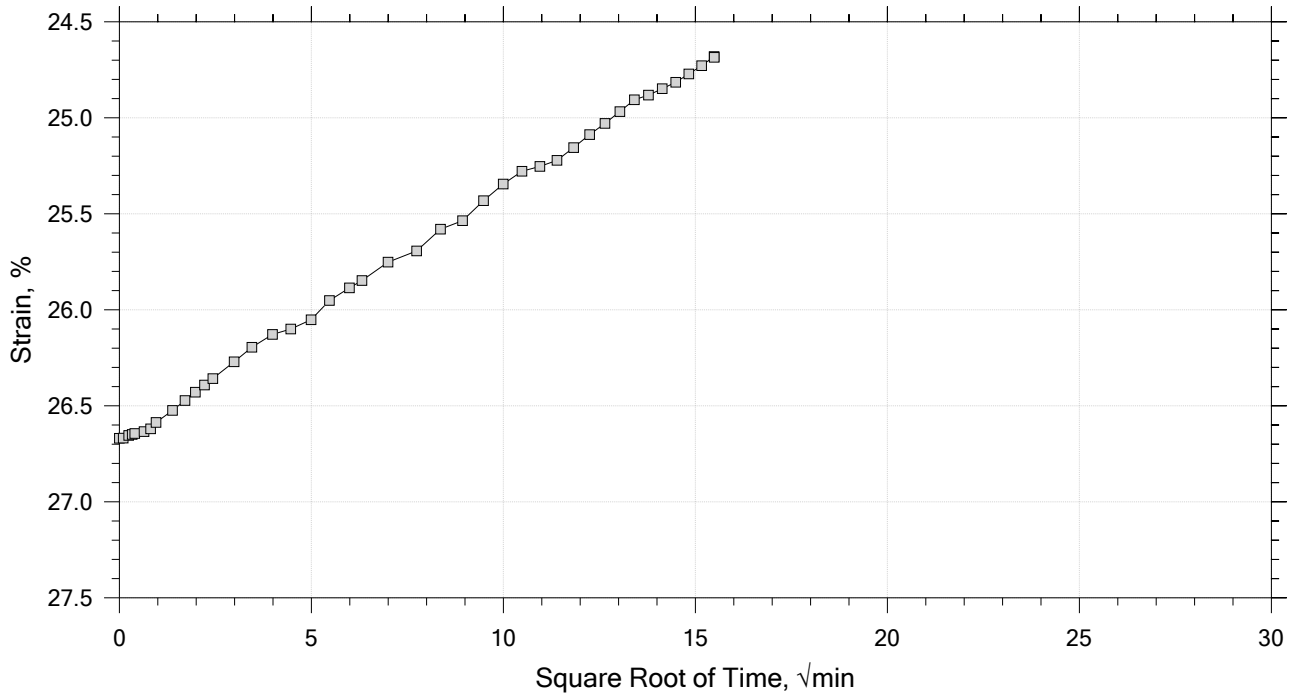


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 14
Constant Load Step
Stress: 2 tsf

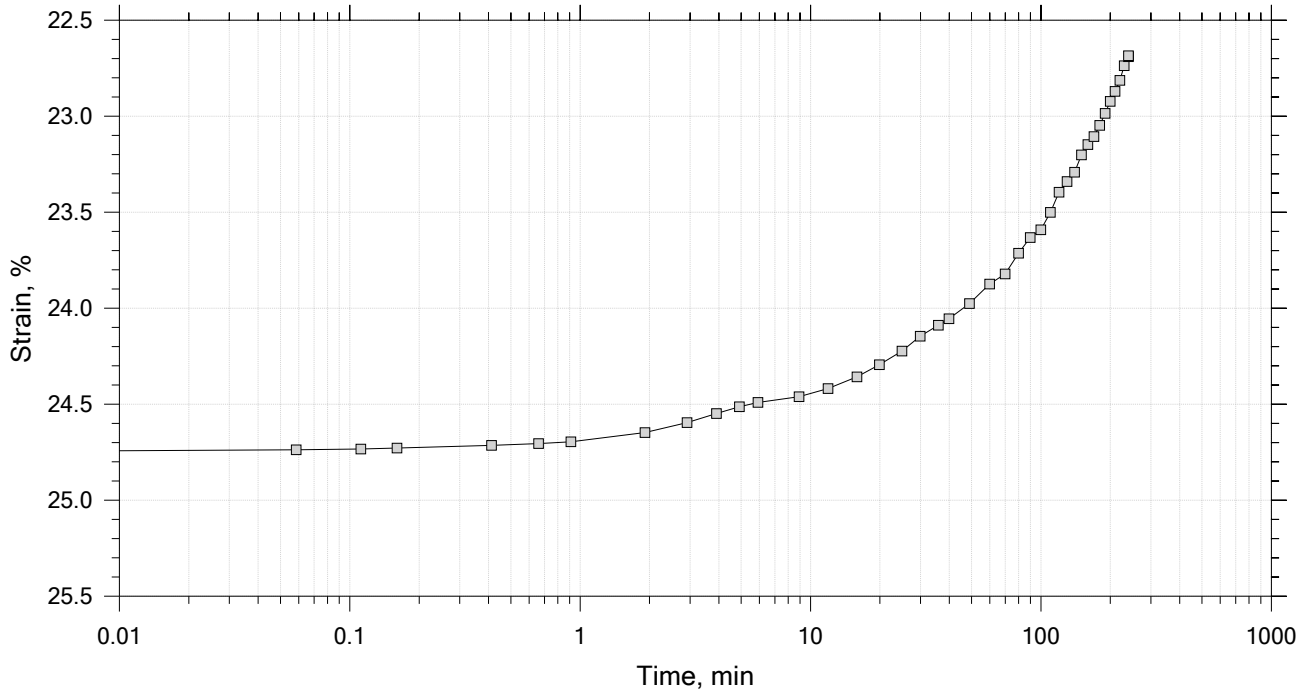


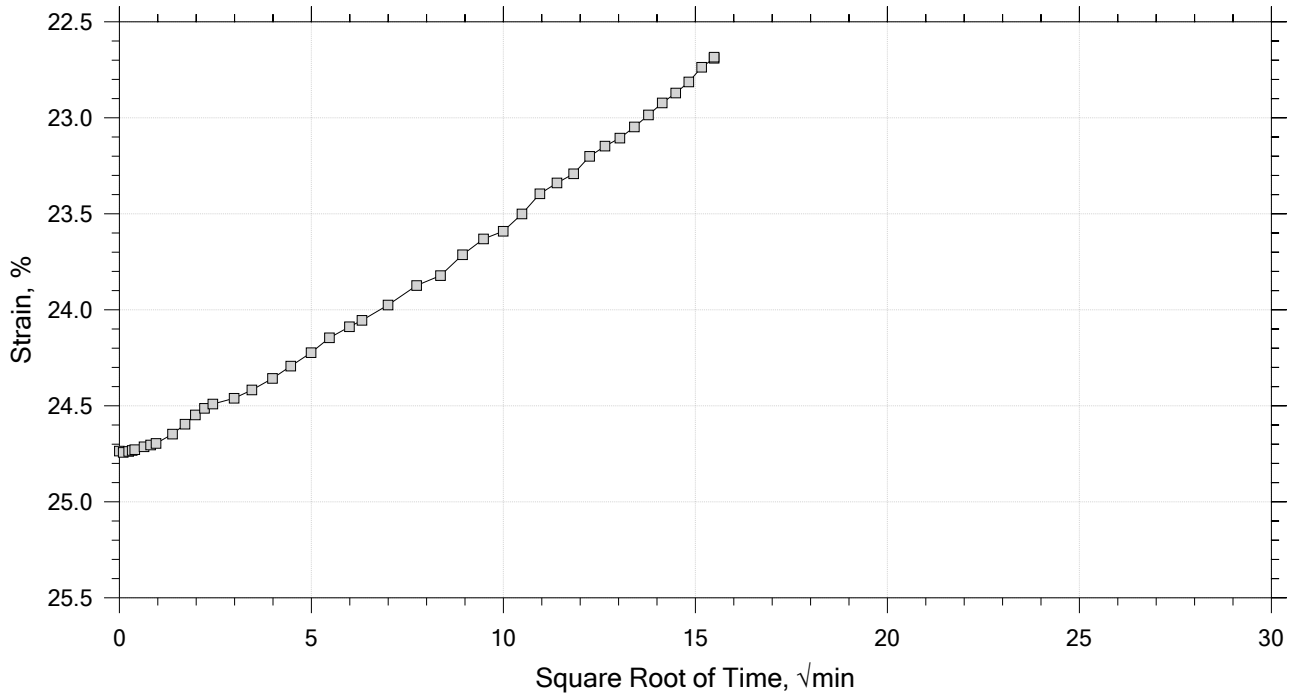


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB025	Tested By: md	Checked By: njh
Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, black clay		
Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 14
Constant Load Step
Stress: 0.5 tsf

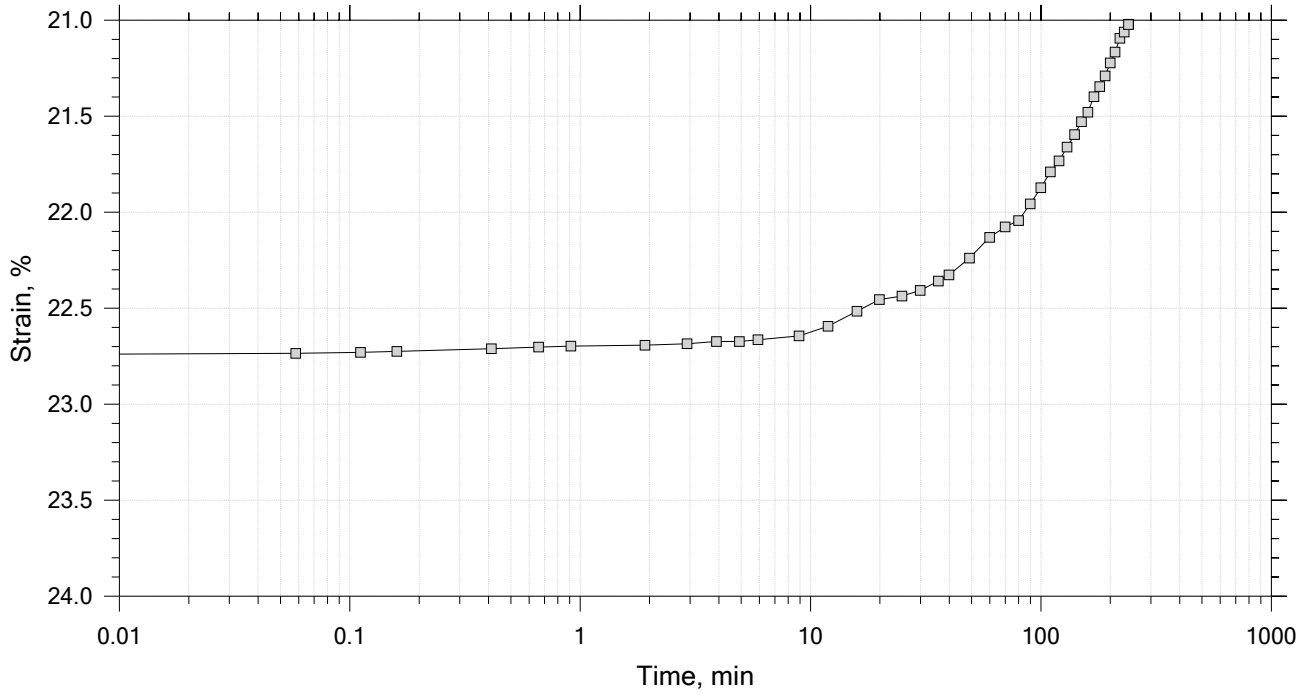


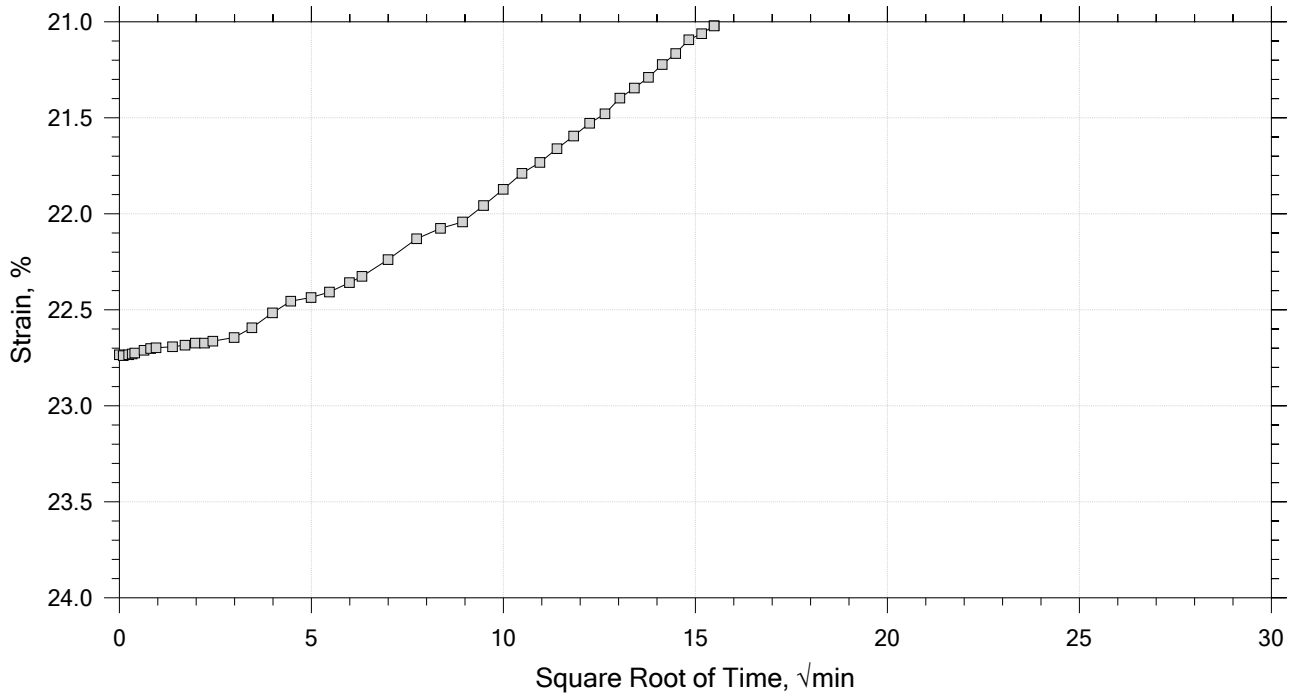


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB025	Tested By: md	Checked By: njh
Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, black clay		
Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 14
Constant Load Step
Stress: 0.125 tsf

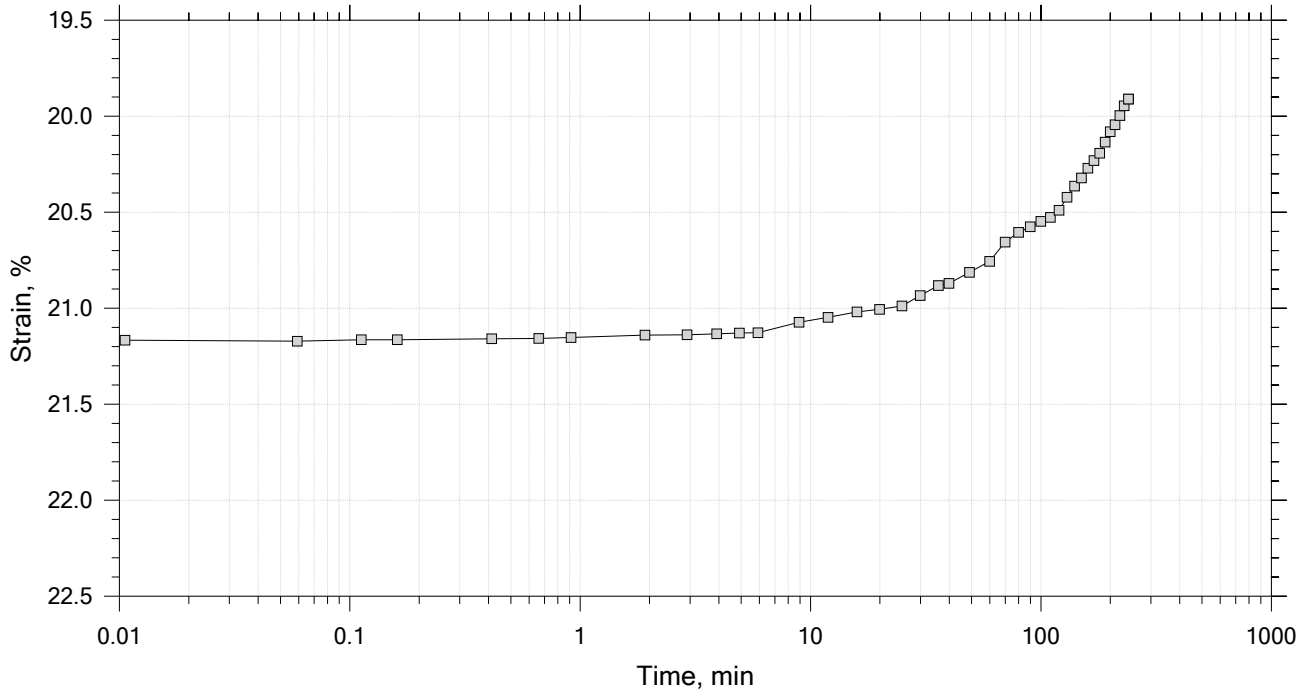


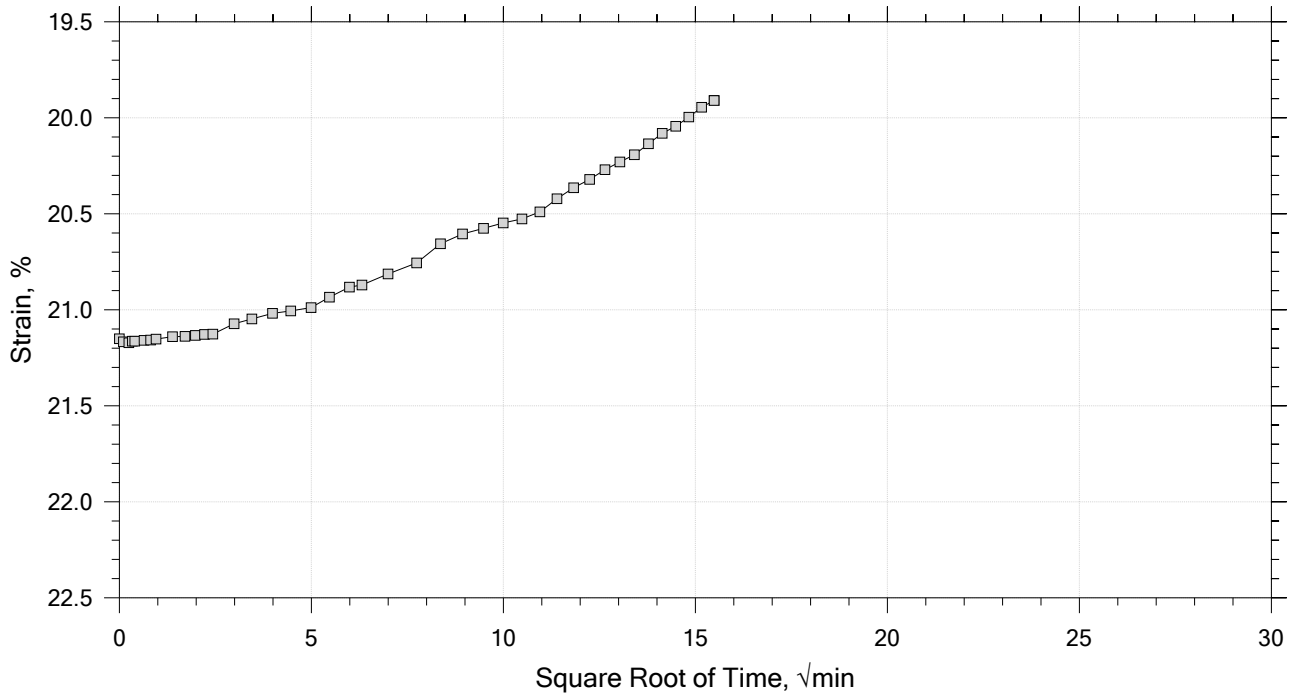


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 14
Constant Load Step
Stress: 0.0625 tsf





GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.80	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 1.21	Plastic Limit: ---
Final Height: 0.79 in	Final Void Ratio: 0.744	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-164	RING		B-1998
Mass Container, gm	8.43	110.53	110.53	8.27
Mass Container + Wet Soil, gm	240.89	256.57	239.7	139.95
Mass Container + Dry Soil, gm	172.99	212.59	212.59	112.31
Mass Dry Soil, gm	164.56	102.06	102.06	104.04
Water Content, %	41.26	43.10	26.57	26.57
Void Ratio	---	1.21	0.74	---
Degree of Saturation, %	---	99.95	100.00	---
Dry Unit Weight, pcf	---	79.205	100.26	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.137	0.0005068	1.21	0.0507	0.000	0.00e+00	3.69e-03	0.00e+00	0.00e+00
2	0.250	0.005579	1.20	0.558	9.256	6.12e-07	4.50e-02	7.44e-05	0.00e+00
3	0.500	0.01867	1.17	1.87	0.000	0.00e+00	5.24e-02	0.00e+00	0.00e+00
4	1.00	0.04528	1.11	4.53	0.000	0.00e+00	5.32e-02	0.00e+00	0.00e+00
5	2.00	0.08398	1.02	8.40	0.000	0.00e+00	3.87e-02	0.00e+00	0.00e+00
6	4.00	0.1327	0.915	13.3	0.000	0.00e+00	2.43e-02	0.00e+00	0.00e+00
7	8.00	0.1822	0.806	18.2	0.000	0.00e+00	1.24e-02	0.00e+00	0.00e+00
8	16.0	0.2307	0.699	23.1	0.000	0.00e+00	6.06e-03	0.00e+00	0.00e+00
9	32.0	0.2801	0.589	28.0	0.000	0.00e+00	3.09e-03	0.00e+00	0.00e+00
10	8.00	0.2668	0.619	26.7	0.000	0.00e+00	5.54e-04	0.00e+00	0.00e+00
11	2.00	0.2469	0.663	24.7	0.000	0.00e+00	3.32e-03	0.00e+00	0.00e+00
12	0.500	0.2268	0.707	22.7	0.000	0.00e+00	1.33e-02	0.00e+00	0.00e+00
13	0.125	0.2102	0.744	21.0	0.000	0.00e+00	4.43e-02	0.00e+00	0.00e+00
14	0.0625	0.1991	0.768	19.9	0.000	0.00e+00	1.78e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB025	Tested By: md	Checked By: njh
Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
Test No.: IP-3	Sample Type: intact	Elevation: ---
Description: Moist, black clay		
Remarks: System E, Swell Pressure = 0.137 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

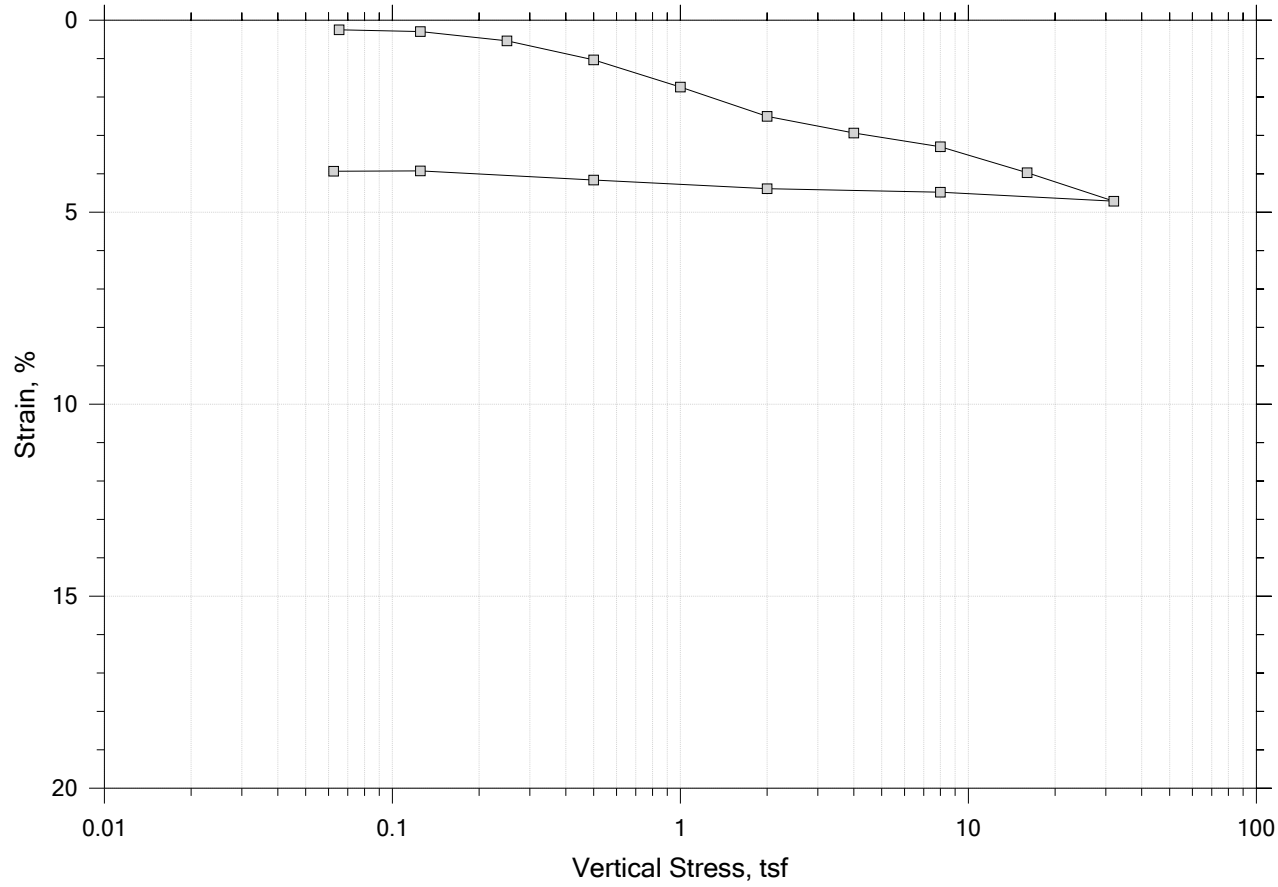
Square Root of Time Coefficients

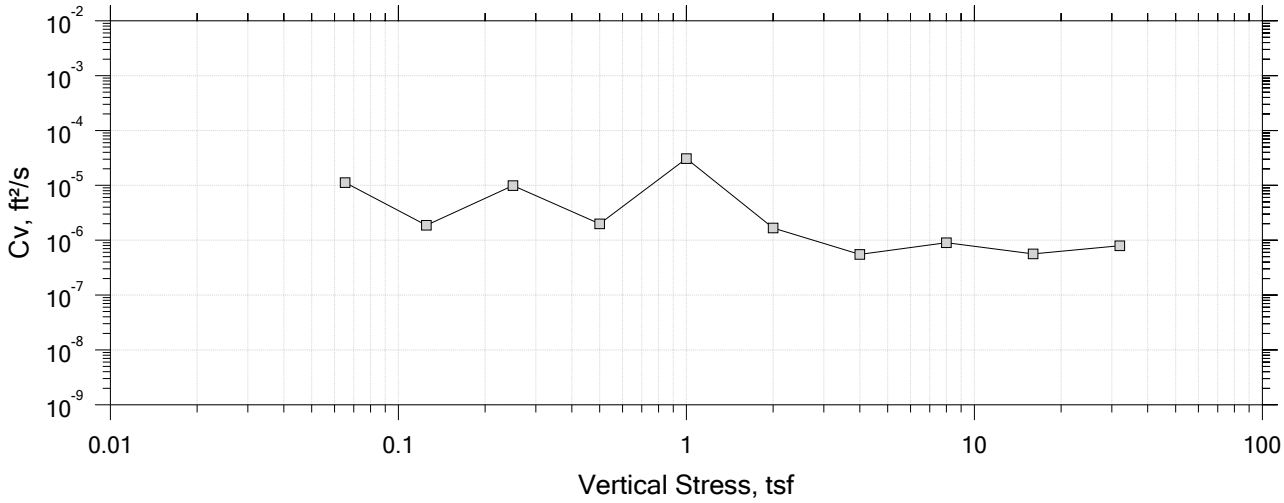
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.137	0.0005068	1.21	0.0507	97.980	2.50e-07	3.69e-03	2.49e-06
2	0.250	0.005579	1.20	0.558	45.482	5.36e-07	4.50e-02	6.51e-05
3	0.500	0.01867	1.17	1.87	63.155	3.79e-07	5.24e-02	5.35e-05
4	1.00	0.04528	1.11	4.53	203.581	1.13e-07	5.32e-02	1.62e-05
5	2.00	0.08398	1.02	8.40	178.049	1.21e-07	3.87e-02	1.26e-05
6	4.00	0.1327	0.915	13.3	177.706	1.10e-07	2.43e-02	7.21e-06
7	8.00	0.1822	0.806	18.2	179.019	9.73e-08	1.24e-02	3.25e-06
8	16.0	0.2307	0.699	23.1	180.850	8.54e-08	6.06e-03	1.40e-06
9	32.0	0.2801	0.589	28.0	182.440	7.46e-08	3.09e-03	6.21e-07
10	8.00	0.2668	0.619	26.7	182.867	7.08e-08	5.54e-04	1.06e-07
11	2.00	0.2469	0.663	24.7	176.543	7.68e-08	3.32e-03	6.87e-07
12	0.500	0.2268	0.707	22.7	0.000	0.00e+00	1.33e-02	0.00e+00
13	0.125	0.2102	0.744	21.0	0.000	0.00e+00	4.43e-02	0.00e+00
14	0.0625	0.1991	0.768	19.9	0.000	0.00e+00	1.78e-01	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB025	Tested By: md	Checked By: njh
	Sample No.: SL1042	Test Date: 12/21/18	Depth: 16-18 ft
	Test No.: IP-3	Sample Type: intact	Elevation: ---
	Description: Moist, black clay		
	Remarks: System E, Swell Pressure = 0.137 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

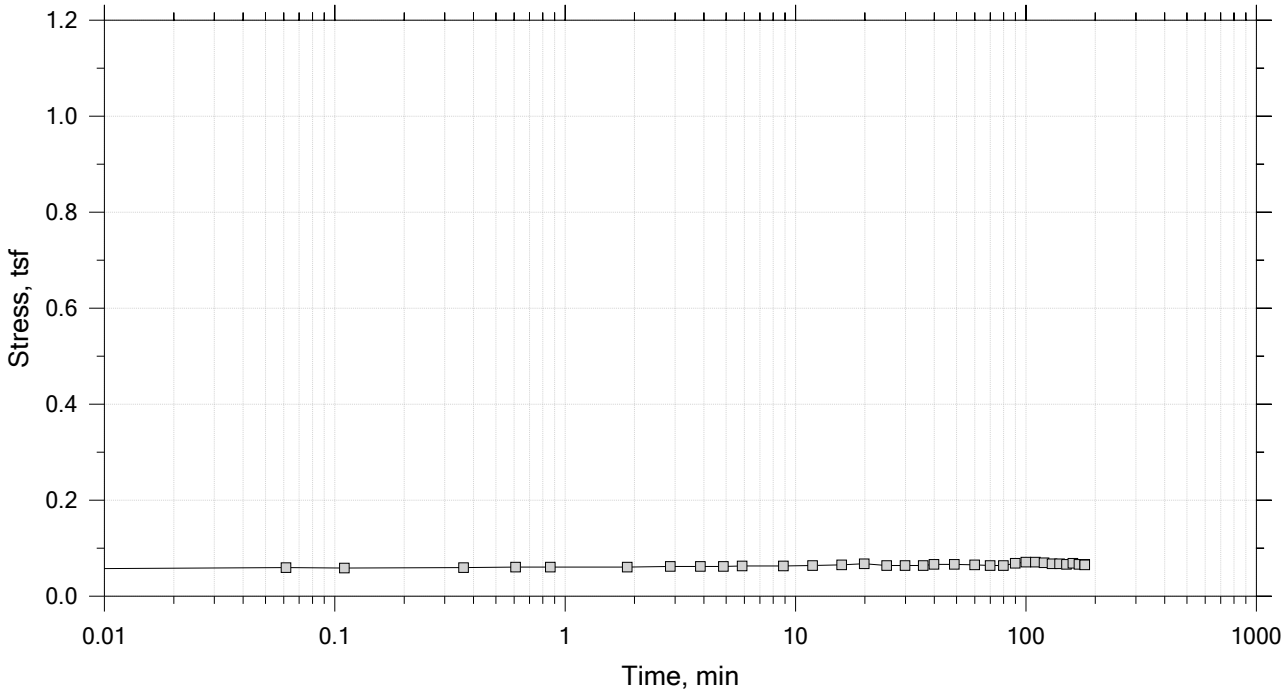


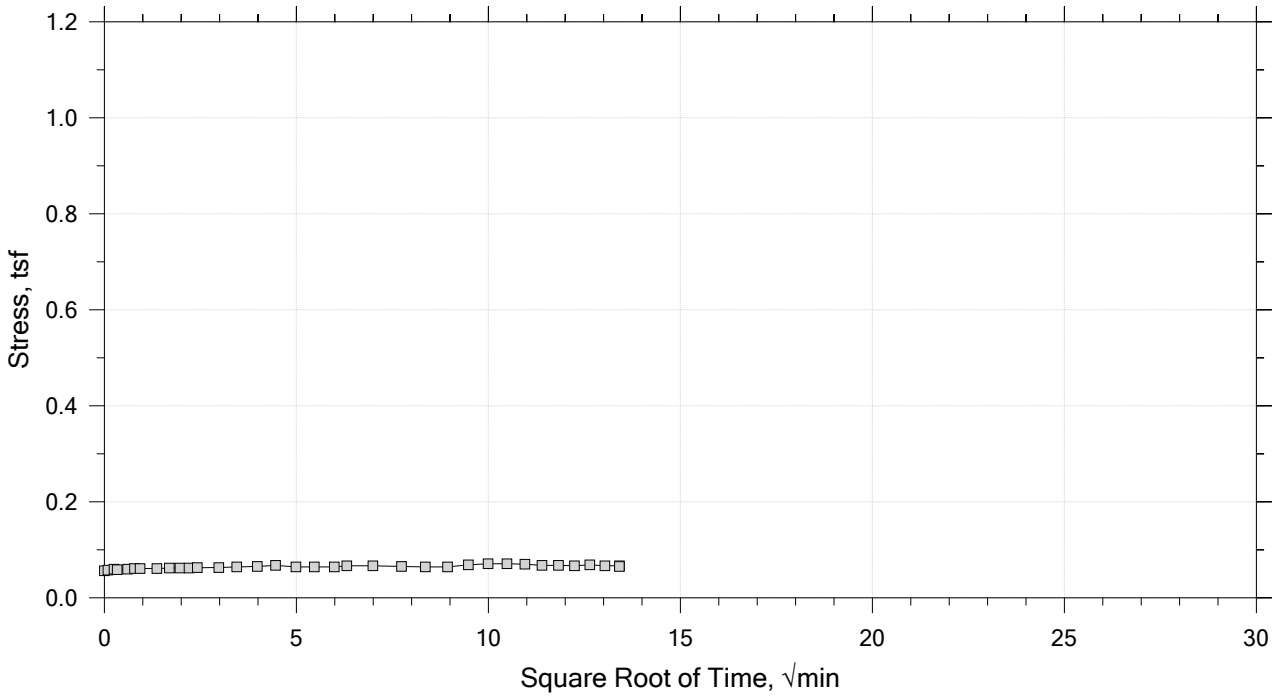


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0653 tsf

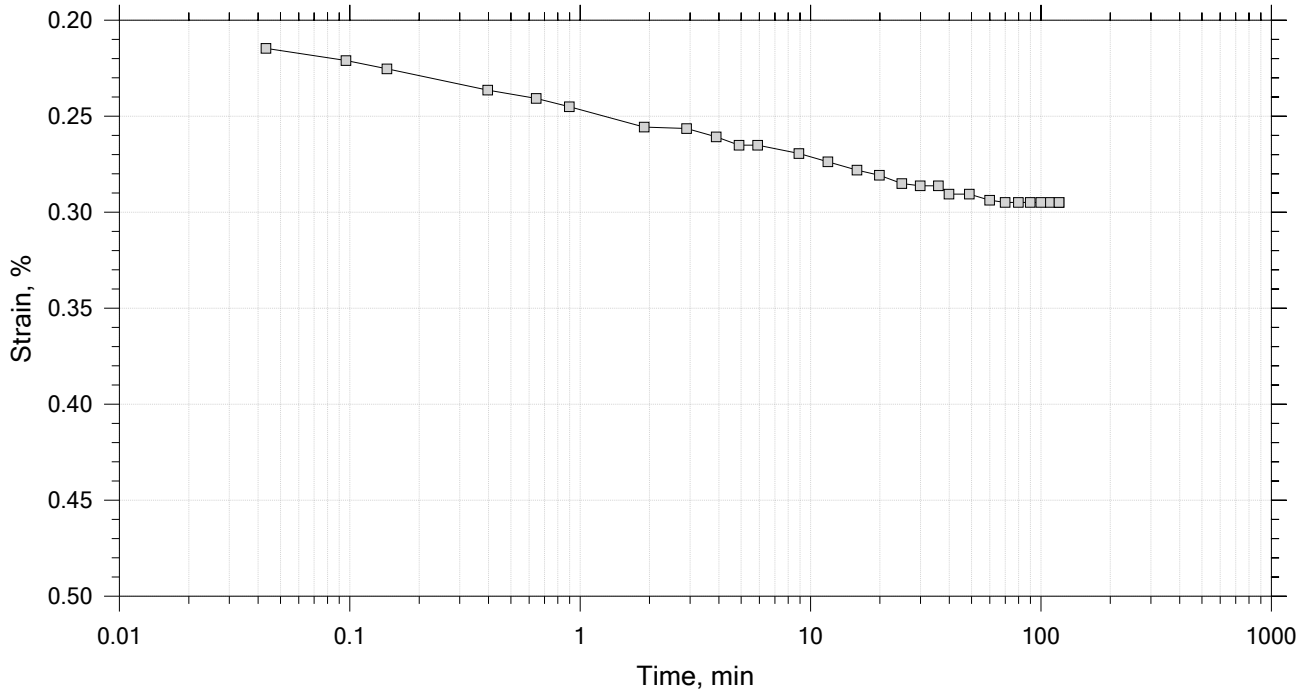


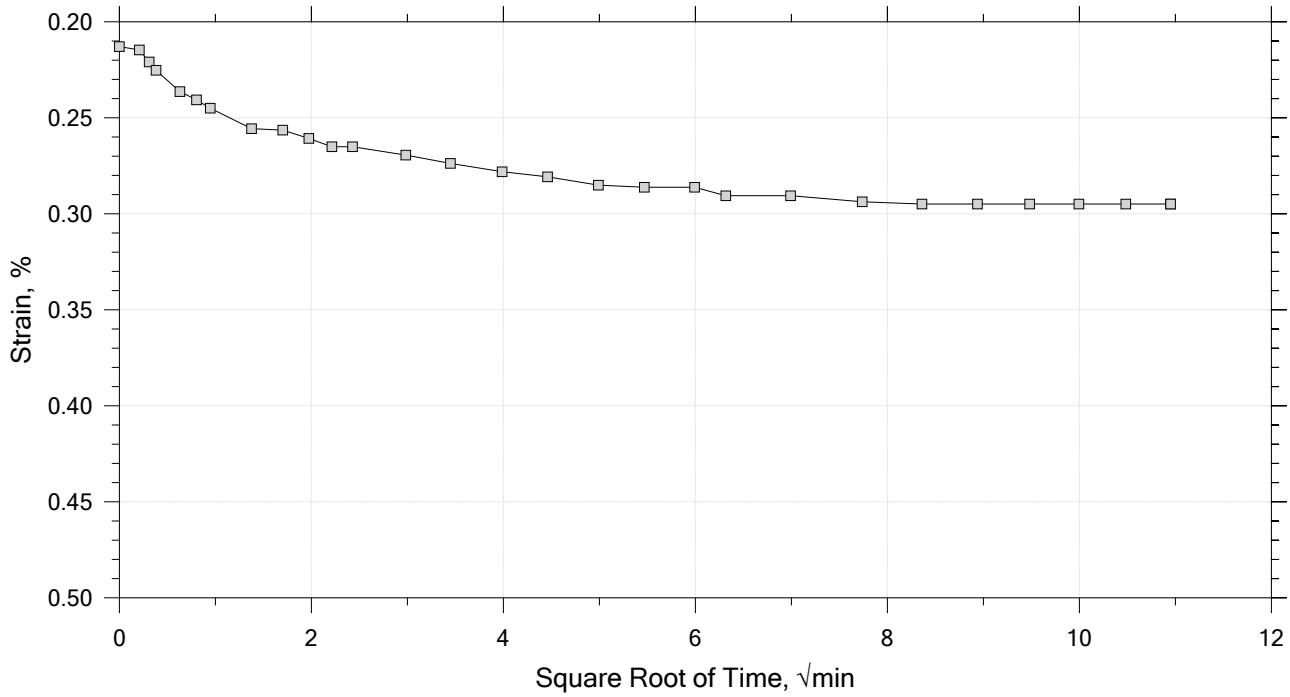


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

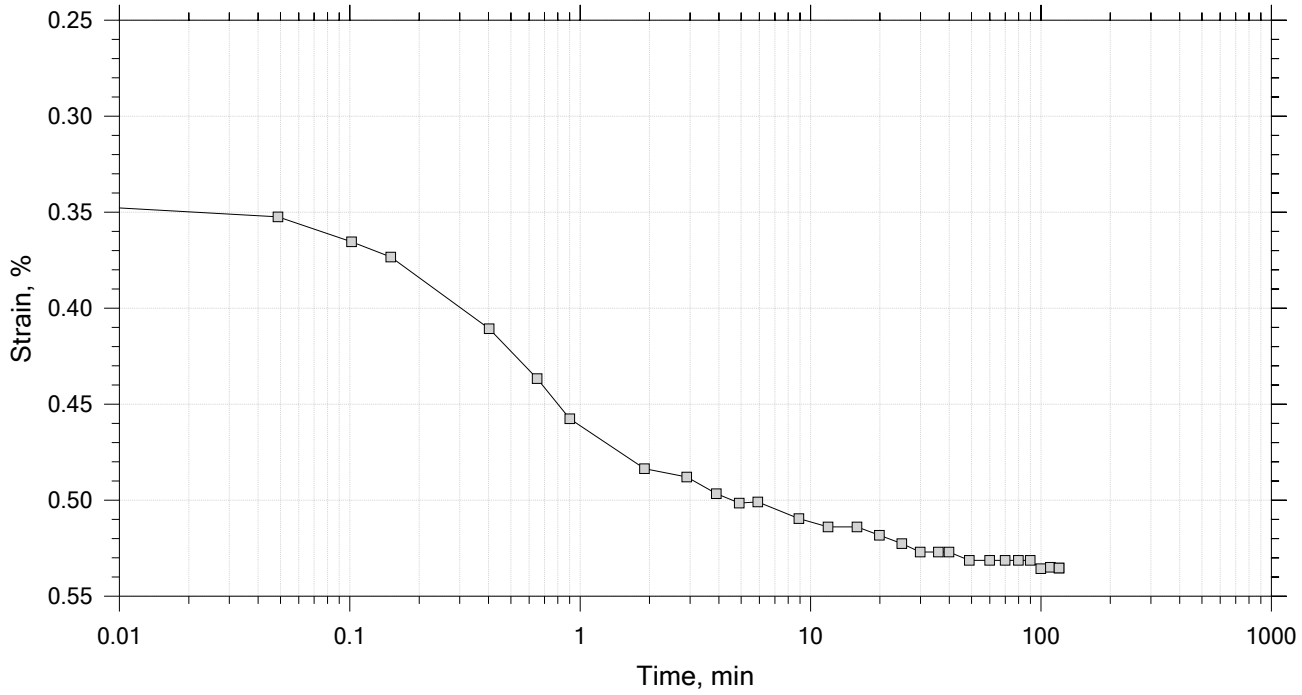


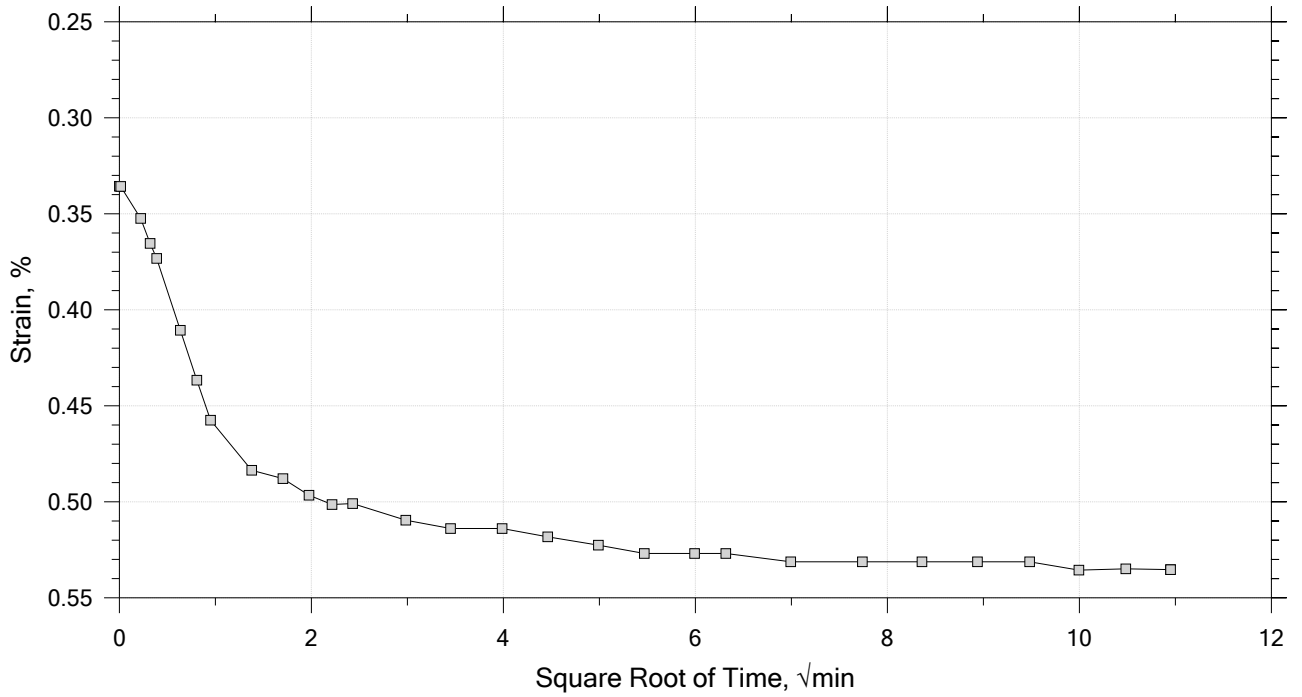


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

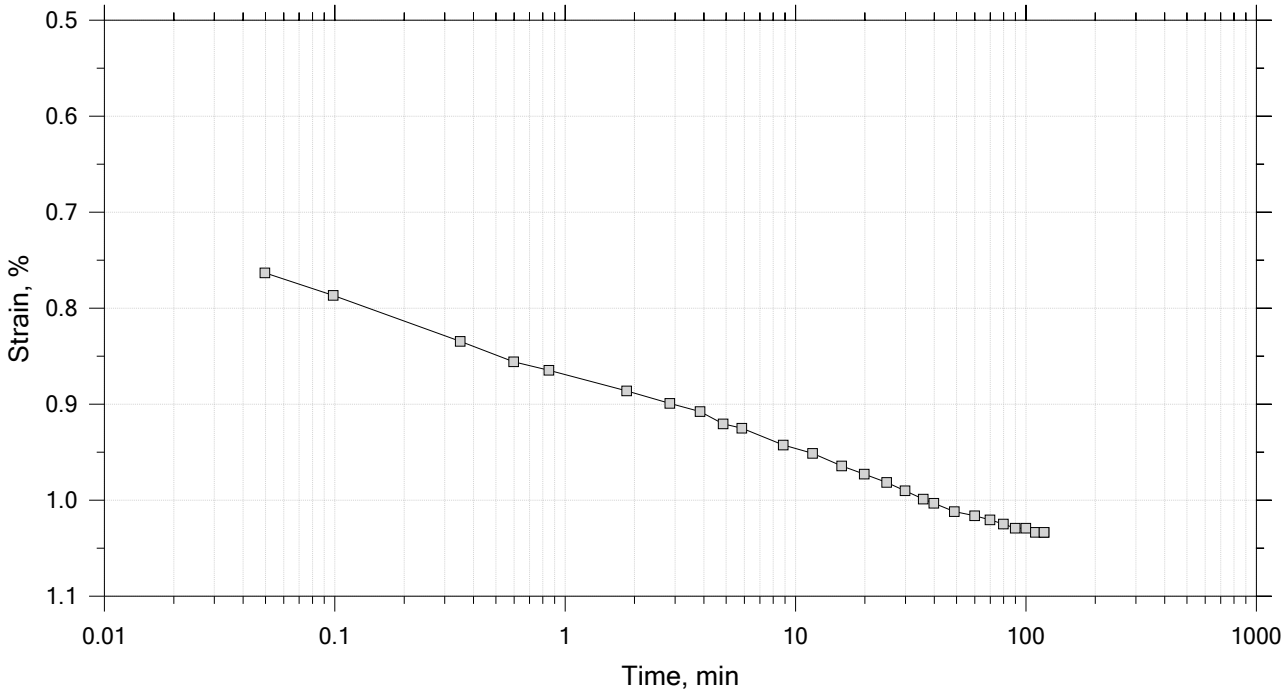


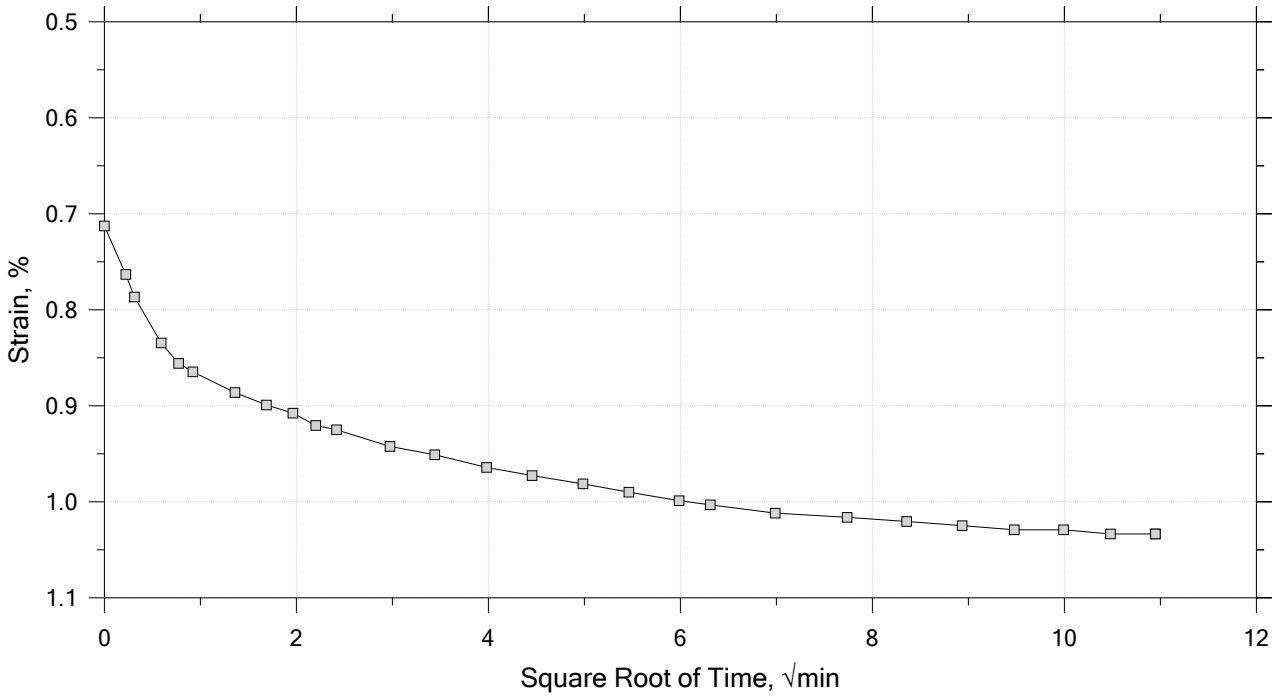


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf

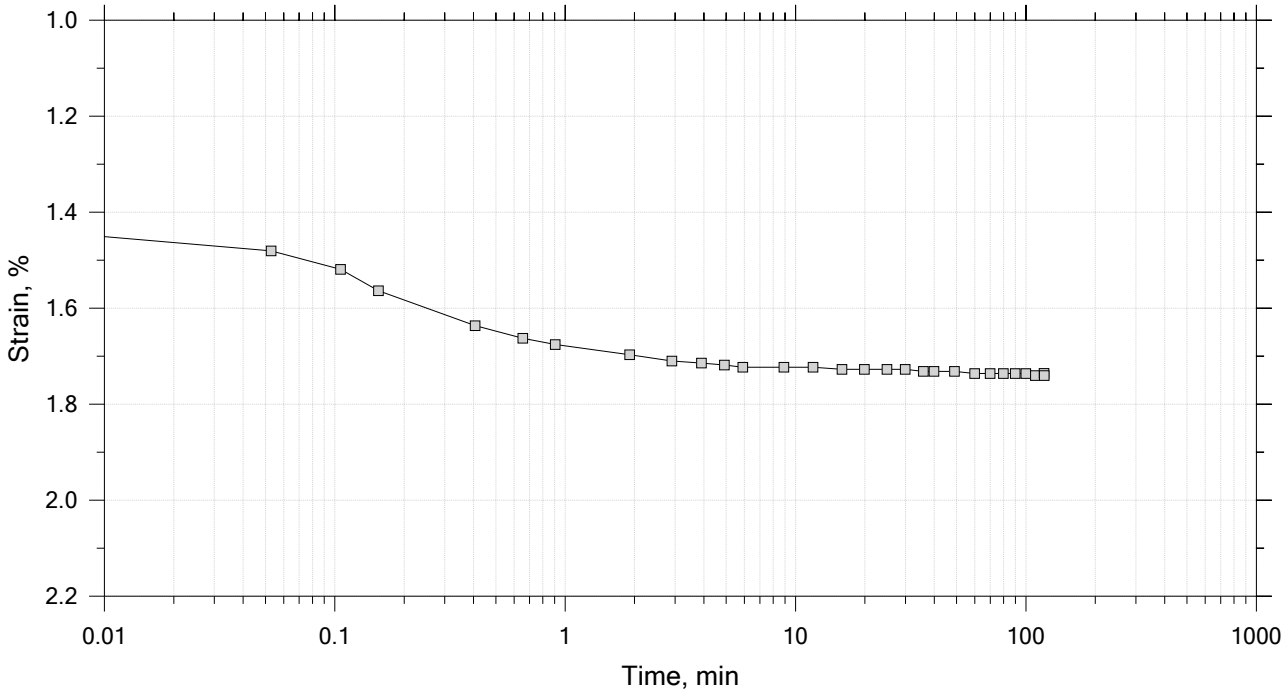


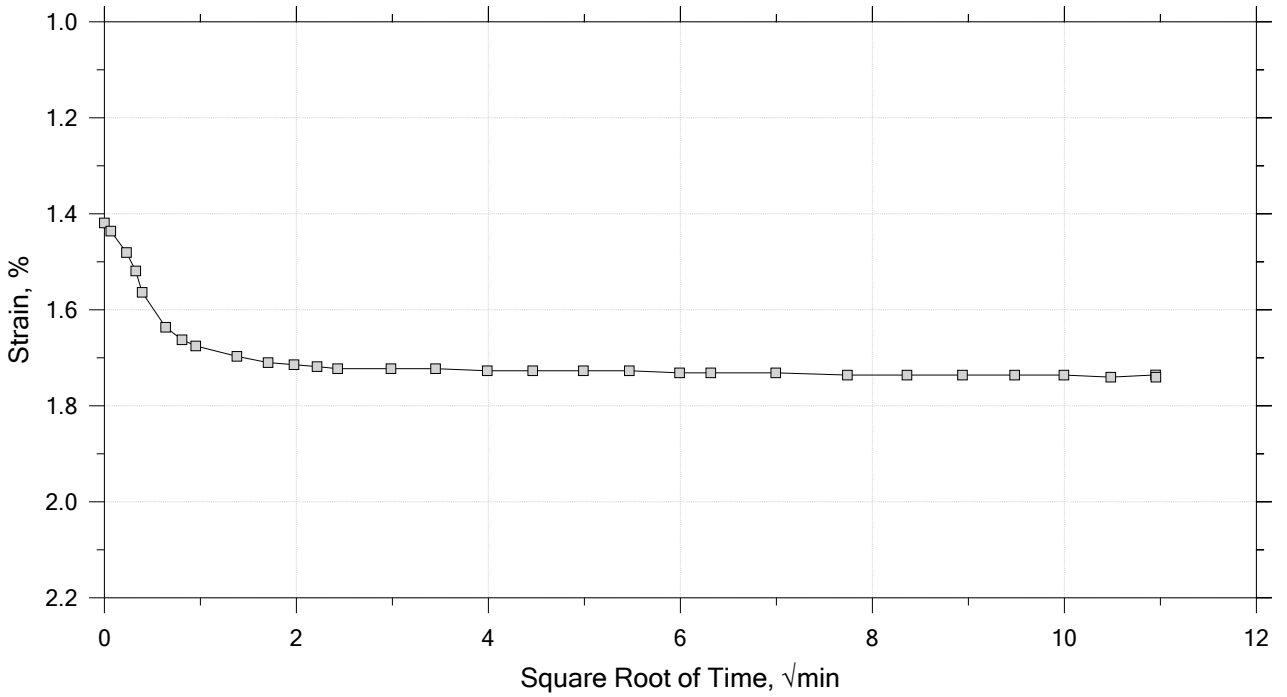


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15
Constant Load Step
Stress: 1 tsf





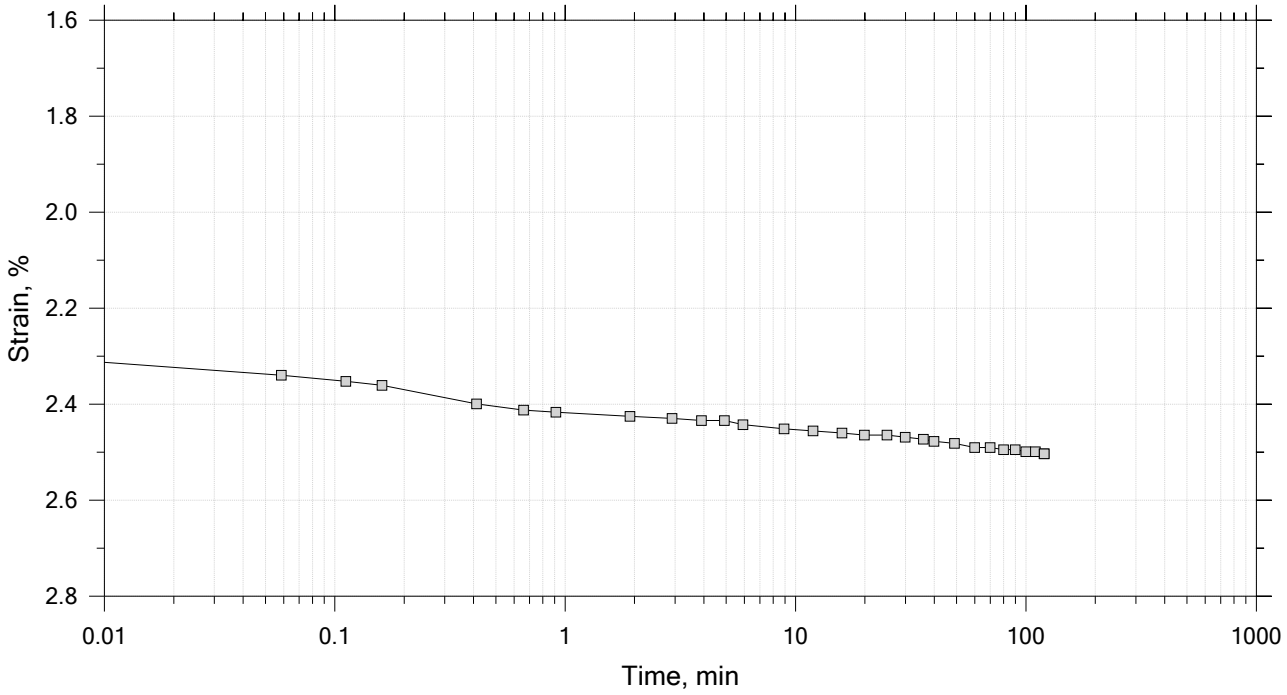
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

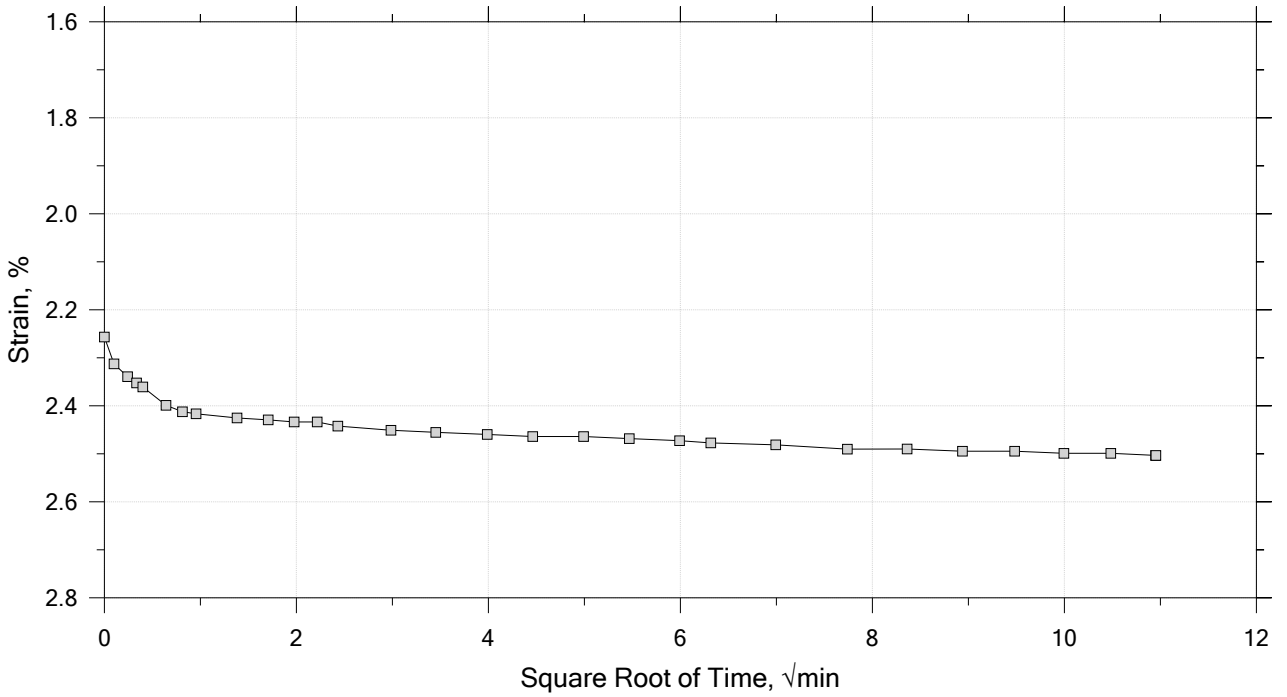
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf





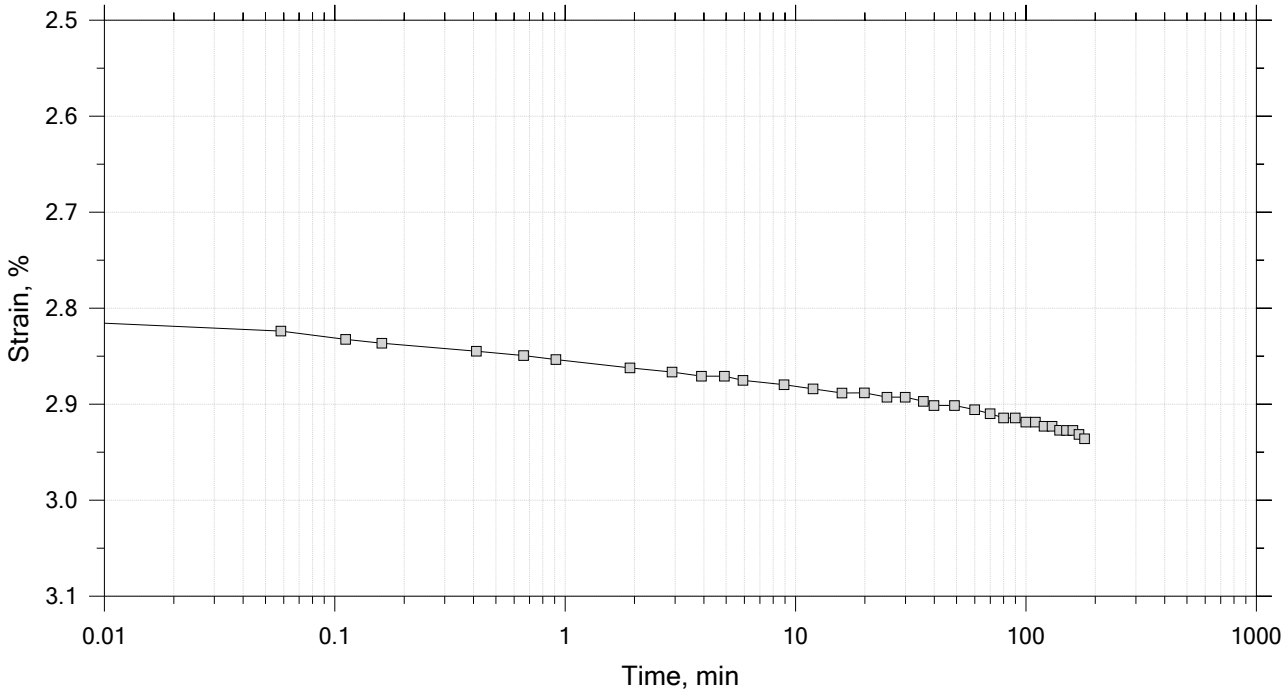
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

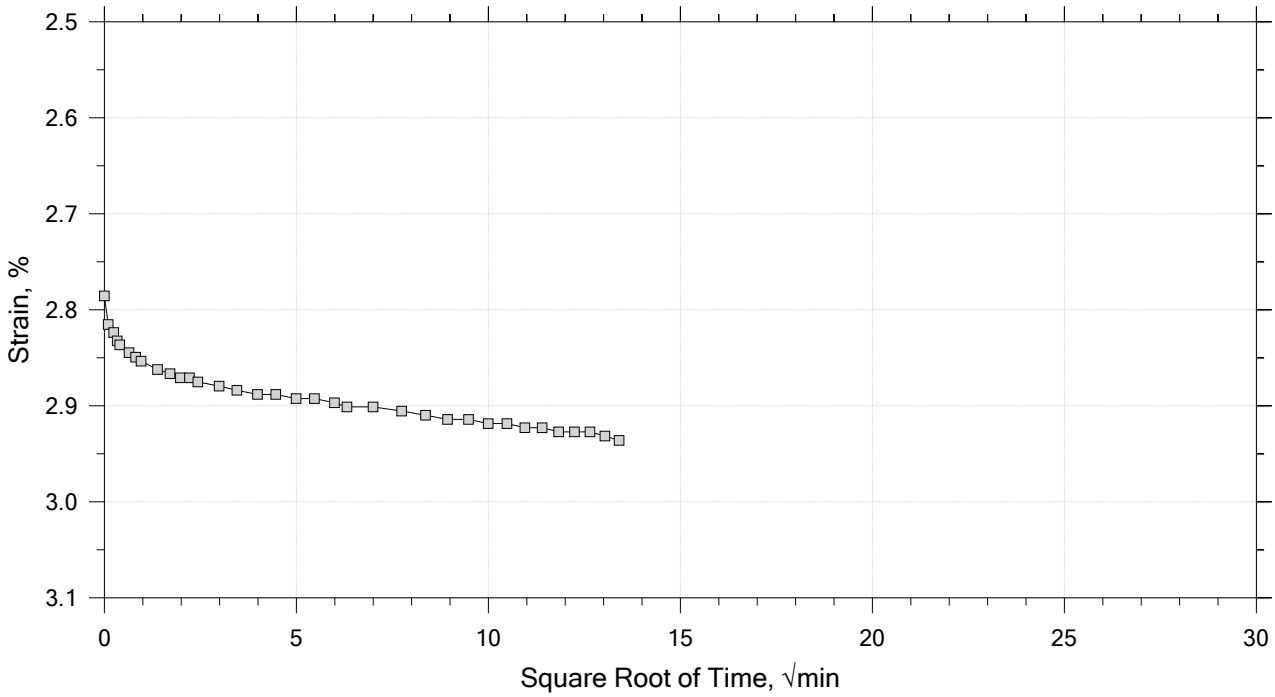
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

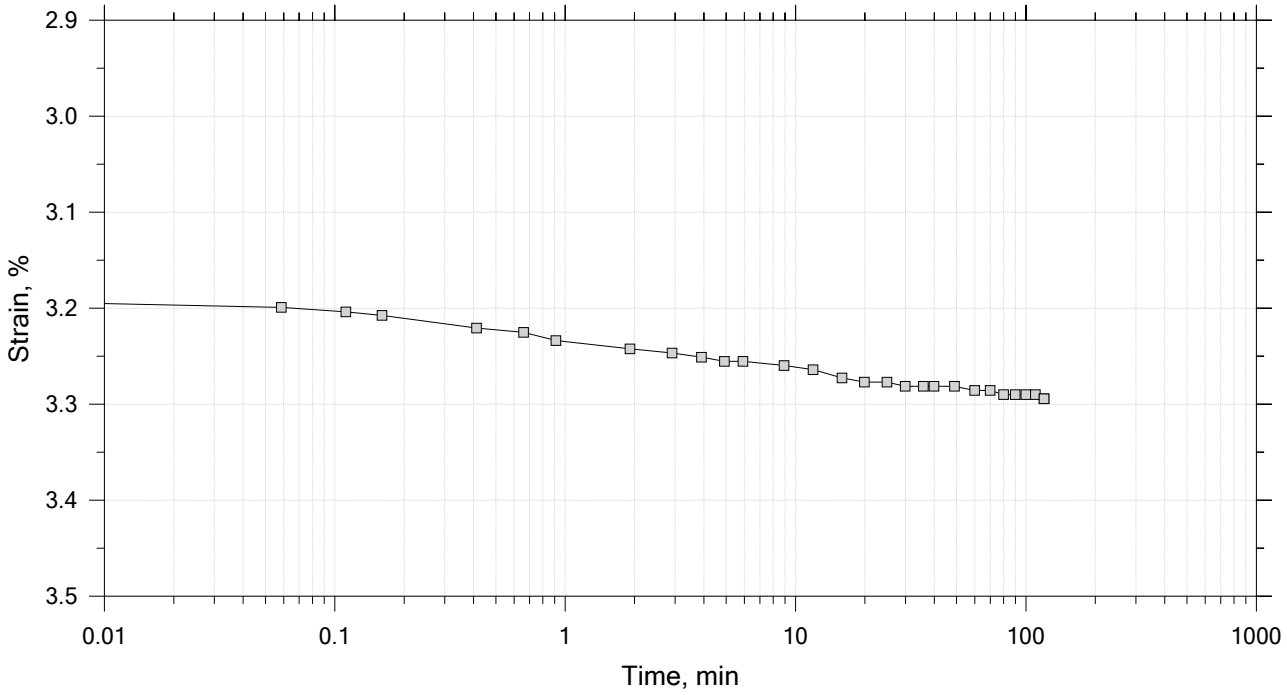


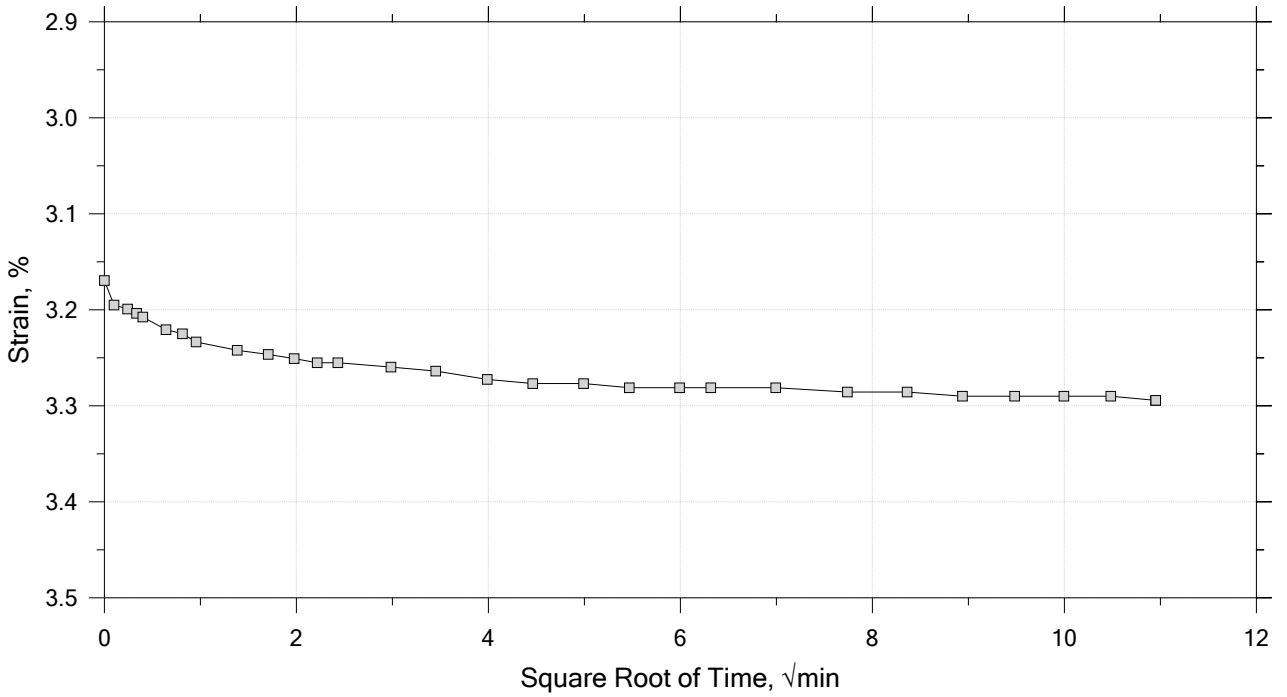


GeoTesti EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf

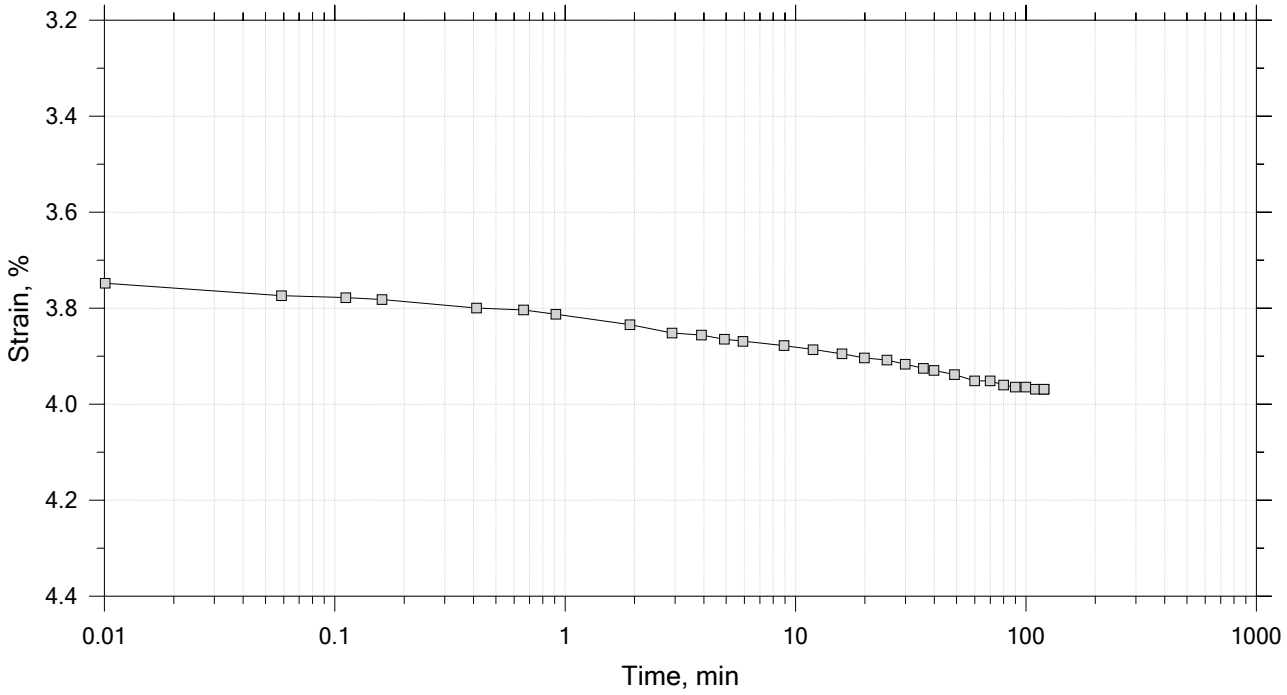


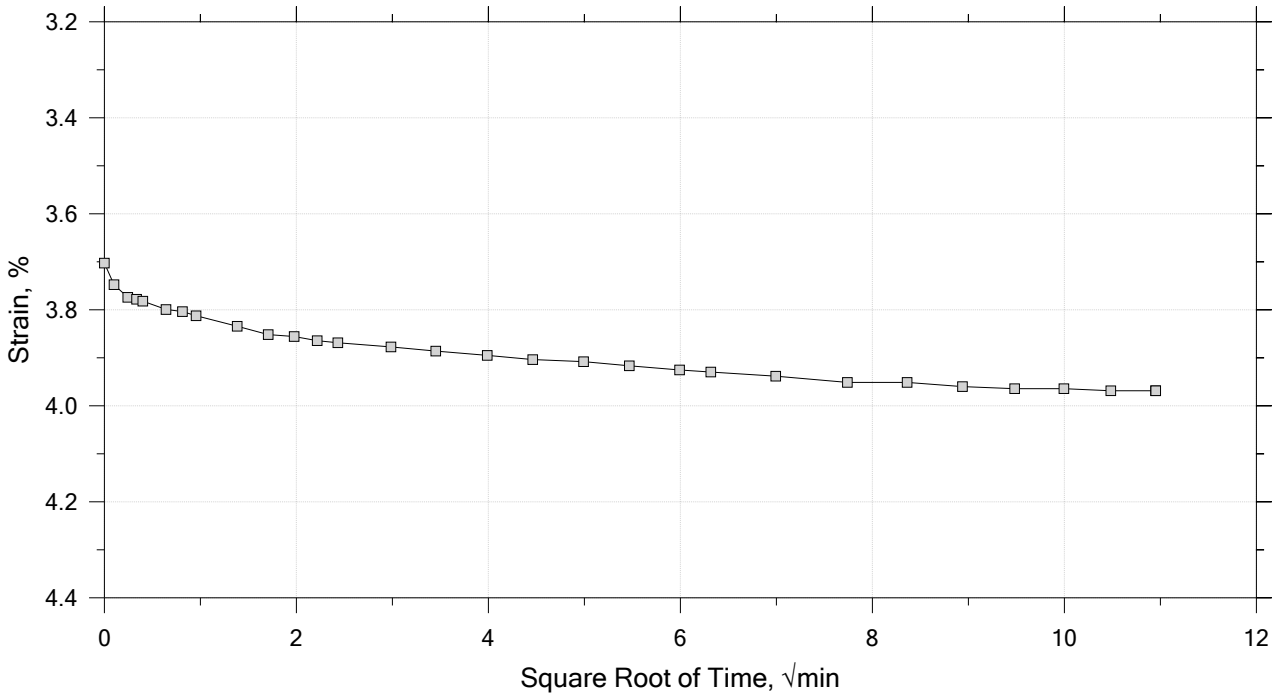


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

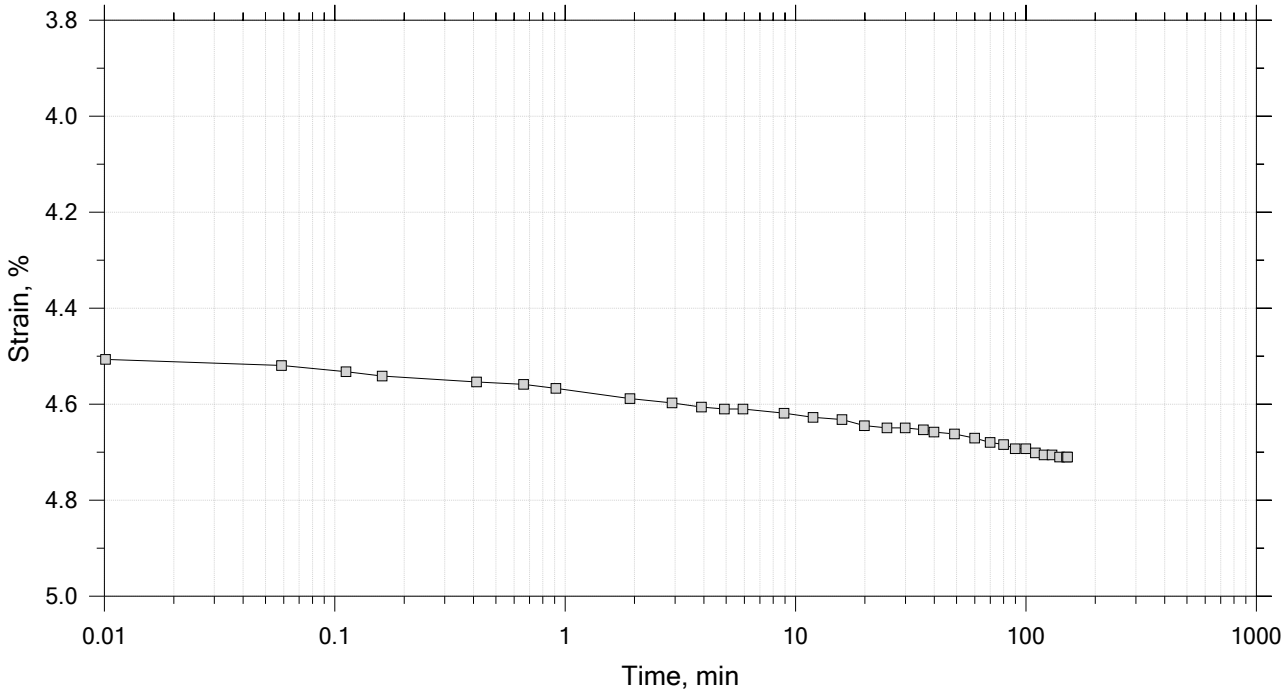


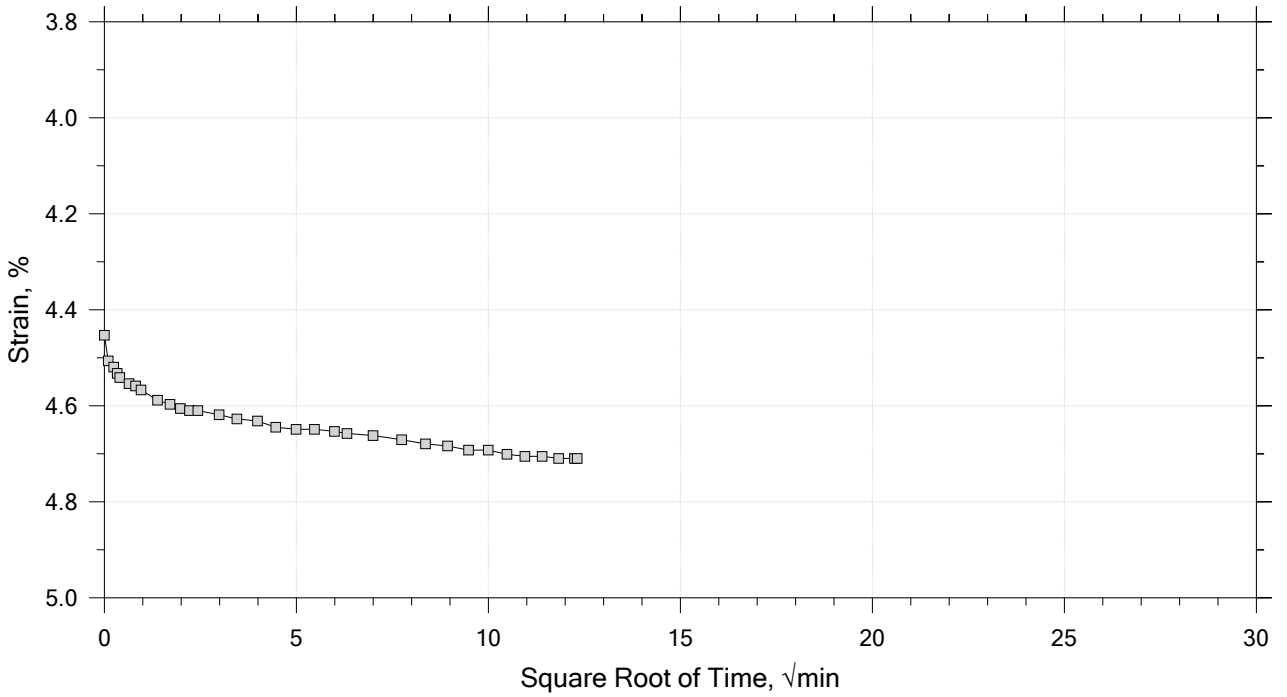


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf





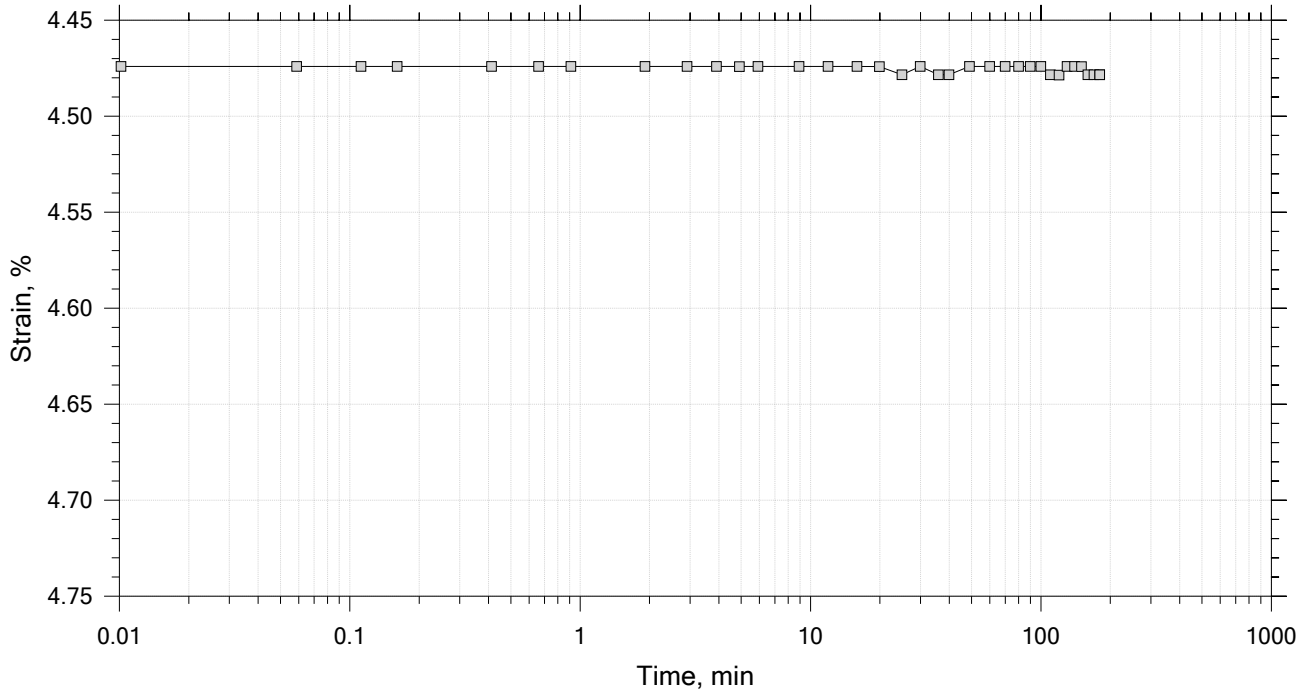
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

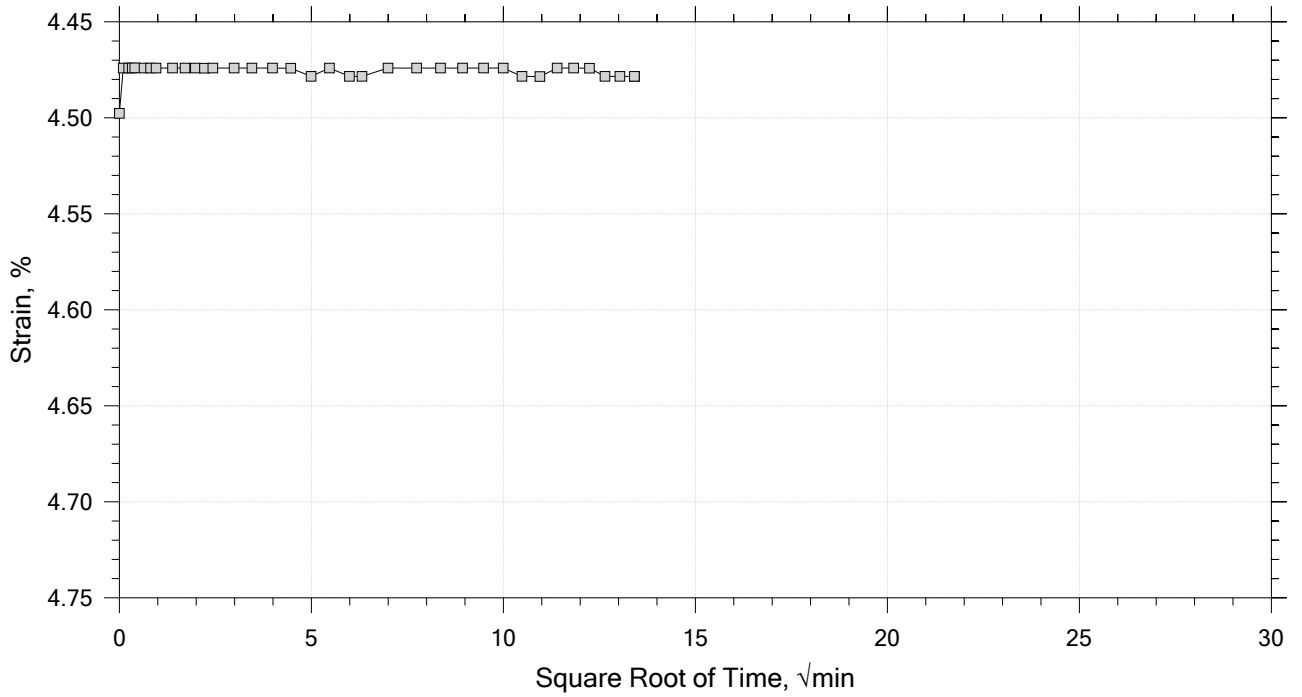
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15

Constant Load Step

Stress: 8 tsf

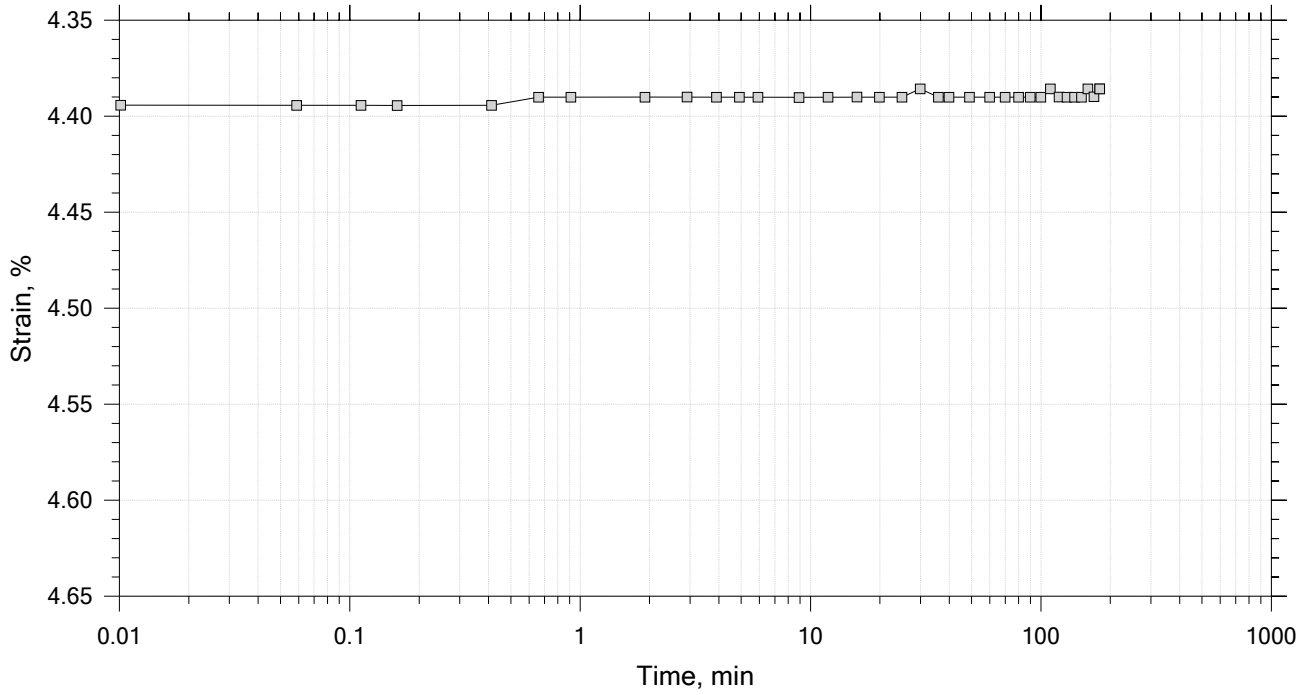


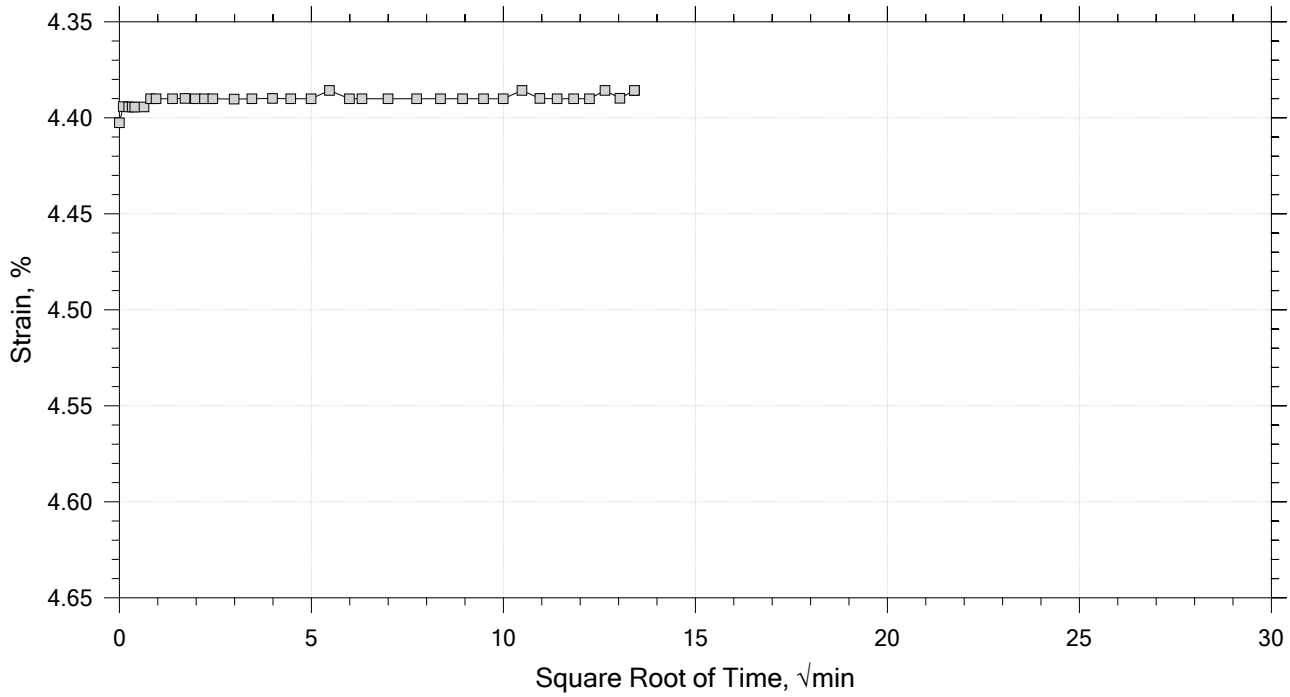


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

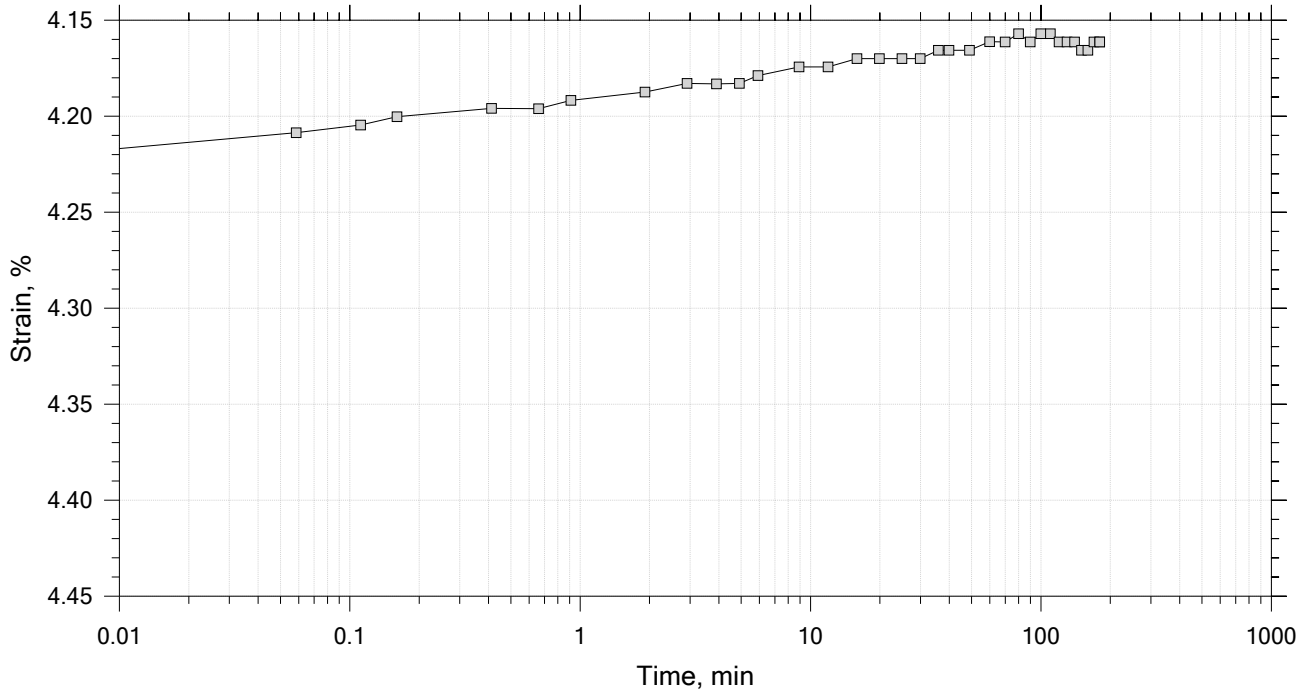


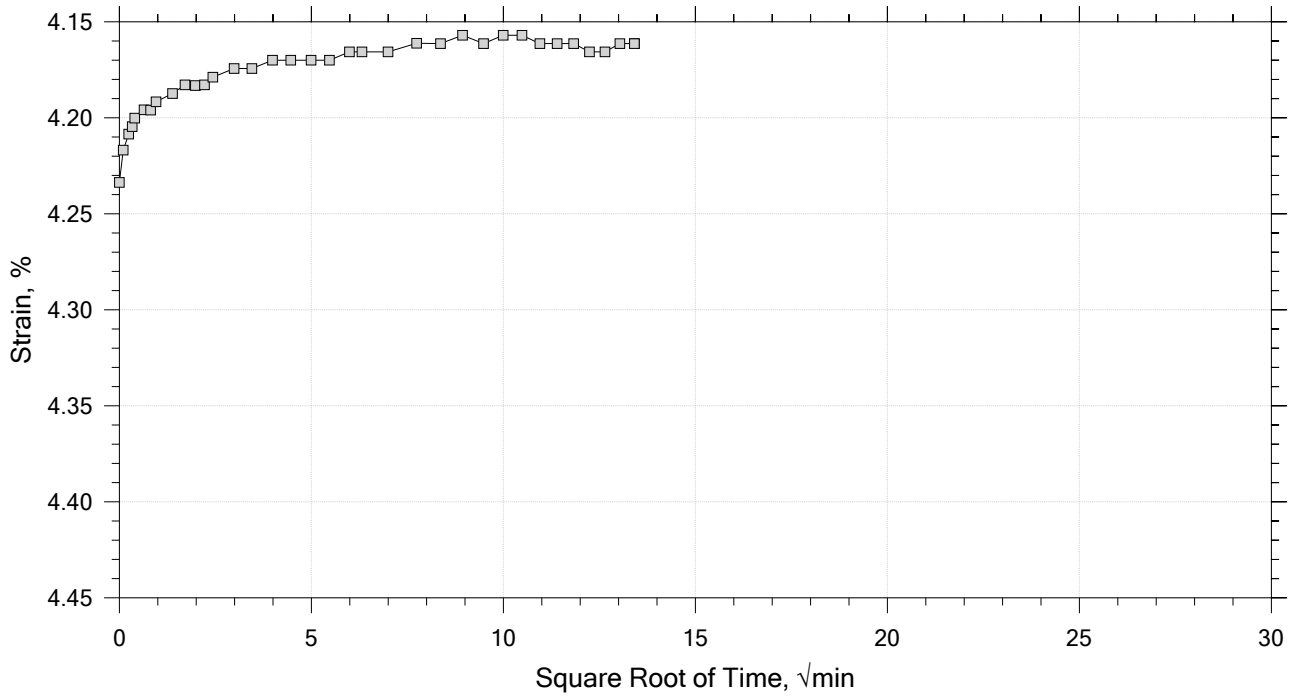


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

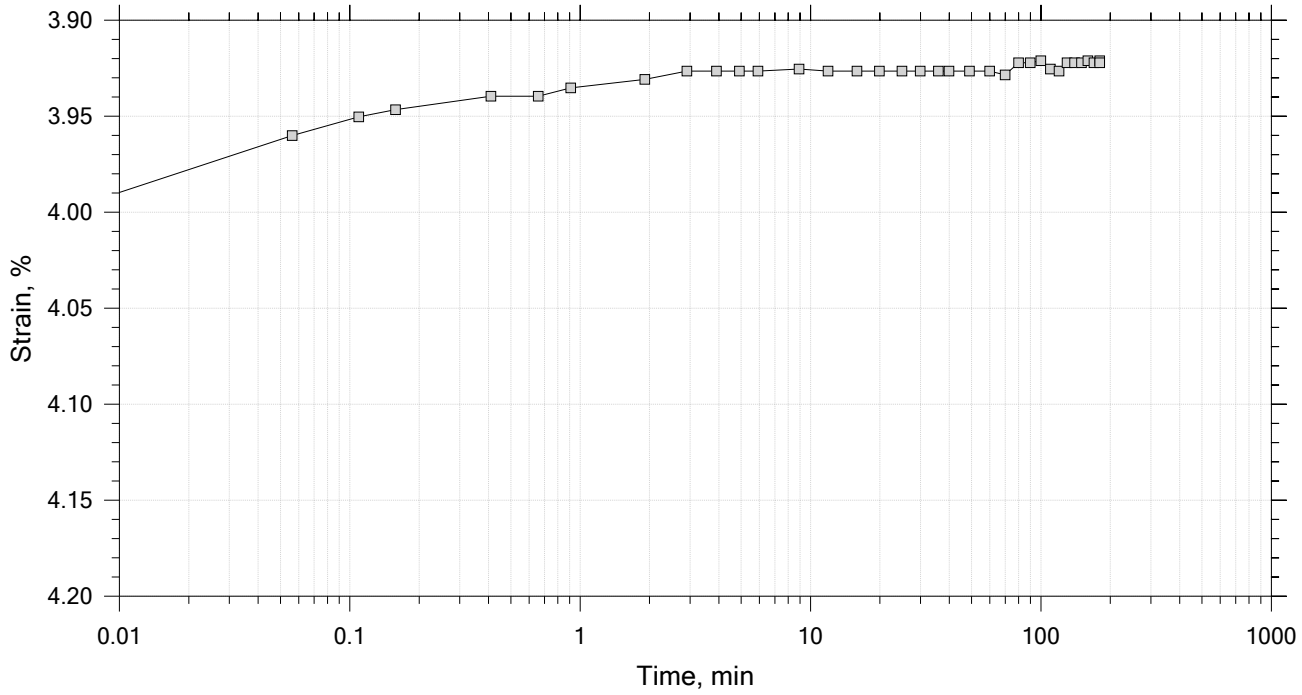


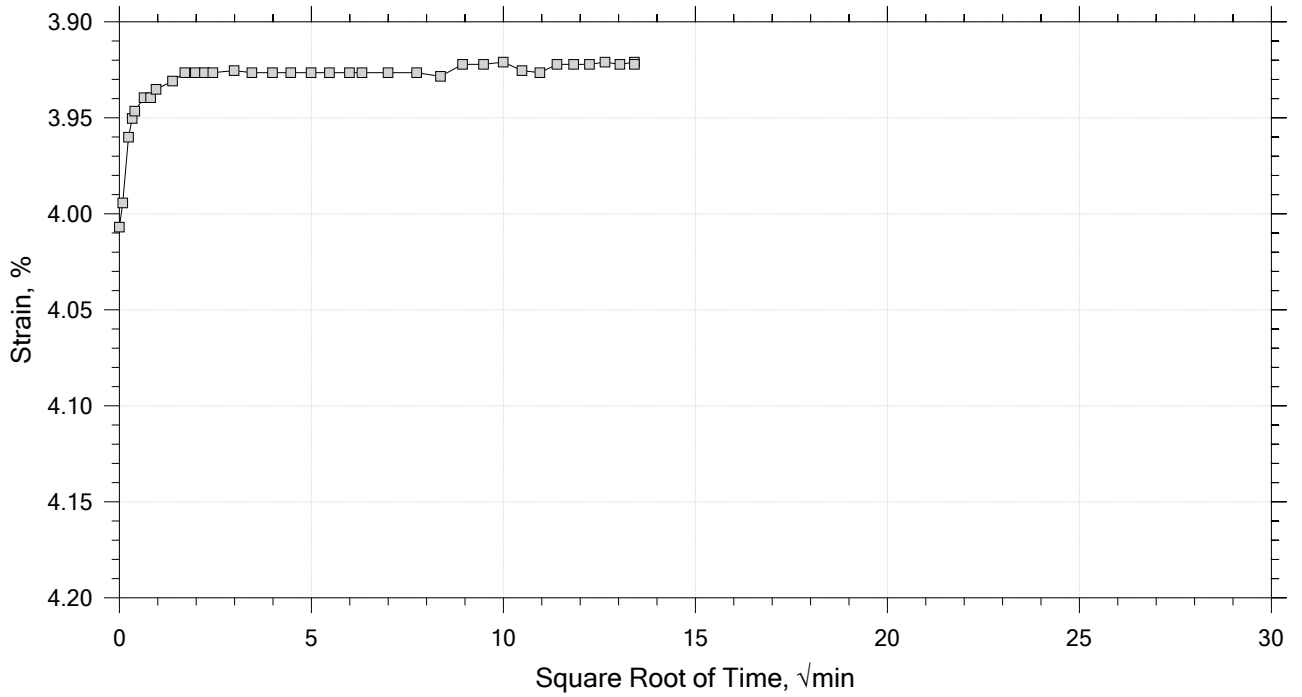


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

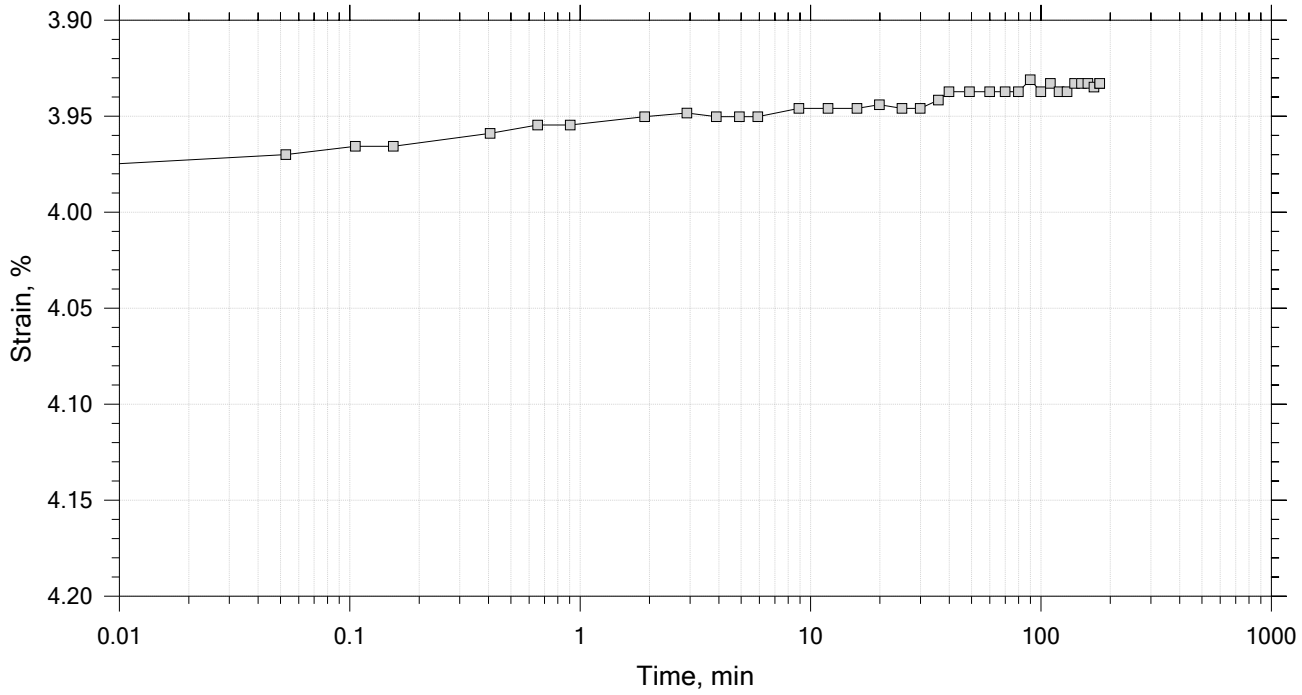


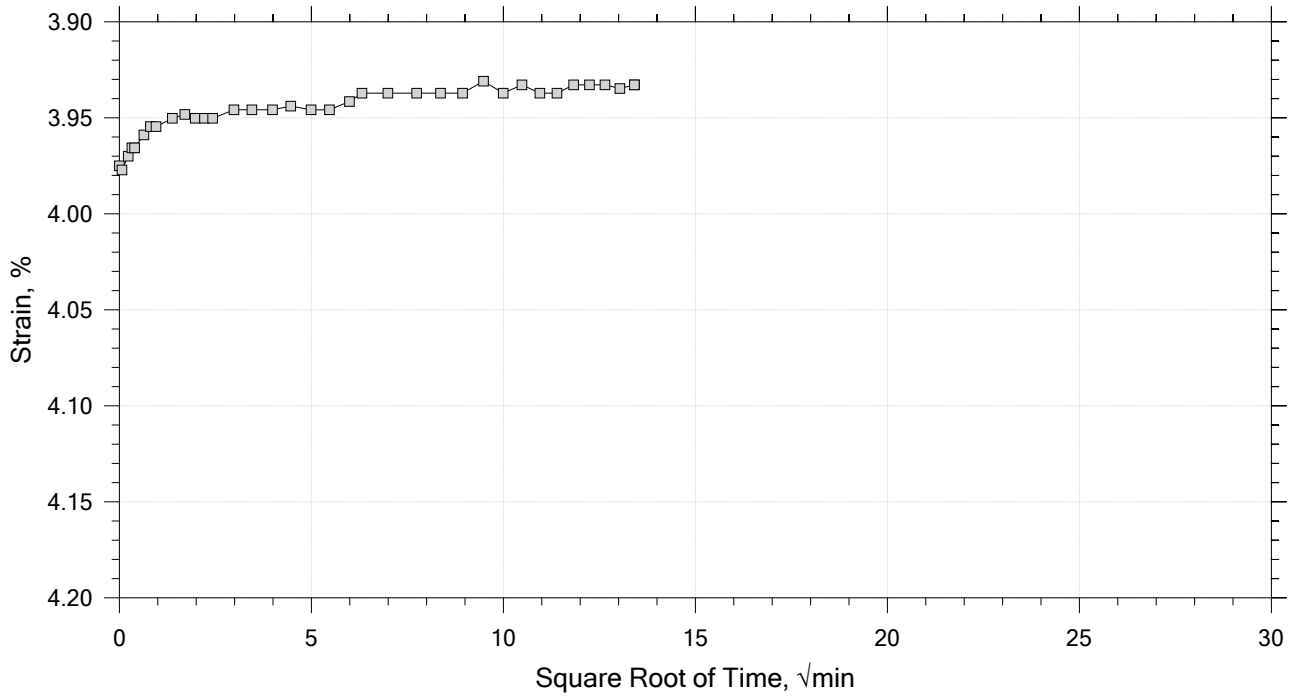


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.77	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.561	Plastic Limit: ---
Final Height: 0.95 in	Final Void Ratio: 0.483	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-350	RING		A-2465
Mass Container, gm	8.39	109.53	109.53	8.16
Mass Container + Wet Soil, gm	138.52	277.67	277.1	175.22
Mass Container + Dry Soil, gm	118.18	252.21	252.21	150.41
Mass Dry Soil, gm	109.79	142.68	142.68	142.25
Water Content, %	18.53	17.84	17.44	17.44
Void Ratio	---	0.56	0.48	---
Degree of Saturation, %	---	88.06	100.00	---
Dry Unit Weight, pcf	---	110.73	116.56	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0653	0.002490	0.557	0.249	0.000	0.00e+00	3.81e-02	0.00e+00	0.00e+00
2	0.125	0.002949	0.556	0.295	0.000	0.00e+00	7.68e-03	0.00e+00	0.00e+00
3	0.250	0.005354	0.553	0.535	0.000	0.00e+00	1.92e-02	0.00e+00	0.00e+00
4	0.500	0.01034	0.545	1.03	0.000	0.00e+00	1.99e-02	0.00e+00	0.00e+00
5	1.00	0.01740	0.534	1.74	0.190	2.92e-05	1.41e-02	1.11e-03	0.00e+00
6	2.00	0.02503	0.522	2.50	0.000	0.00e+00	7.63e-03	0.00e+00	0.00e+00
7	4.00	0.02936	0.515	2.94	0.000	0.00e+00	2.16e-03	0.00e+00	0.00e+00
8	8.00	0.03294	0.510	3.29	0.000	0.00e+00	8.96e-04	0.00e+00	0.00e+00
9	16.0	0.03969	0.499	3.97	0.000	0.00e+00	8.43e-04	0.00e+00	0.00e+00
10	32.0	0.04710	0.487	4.71	0.000	0.00e+00	4.63e-04	0.00e+00	0.00e+00
11	8.00	0.04478	0.491	4.48	0.000	0.00e+00	9.64e-05	0.00e+00	0.00e+00
12	2.00	0.04386	0.493	4.39	0.000	0.00e+00	1.54e-04	0.00e+00	0.00e+00
13	0.500	0.04161	0.496	4.16	0.000	0.00e+00	1.50e-03	0.00e+00	0.00e+00
14	0.125	0.03922	0.500	3.92	0.000	0.00e+00	6.38e-03	0.00e+00	0.00e+00
15	0.0625	0.03933	0.500	3.93	0.000	0.00e+00	-1.71e-03	-0.00e+00	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB033	Tested By: md	Checked By: njh
	Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
	Test No.: IP-1	Sample Type: intact	Elevation: ---
	Description: Moist, light brown sandy clay		
	Remarks: System Y, Swell Pressure = 0.0653 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

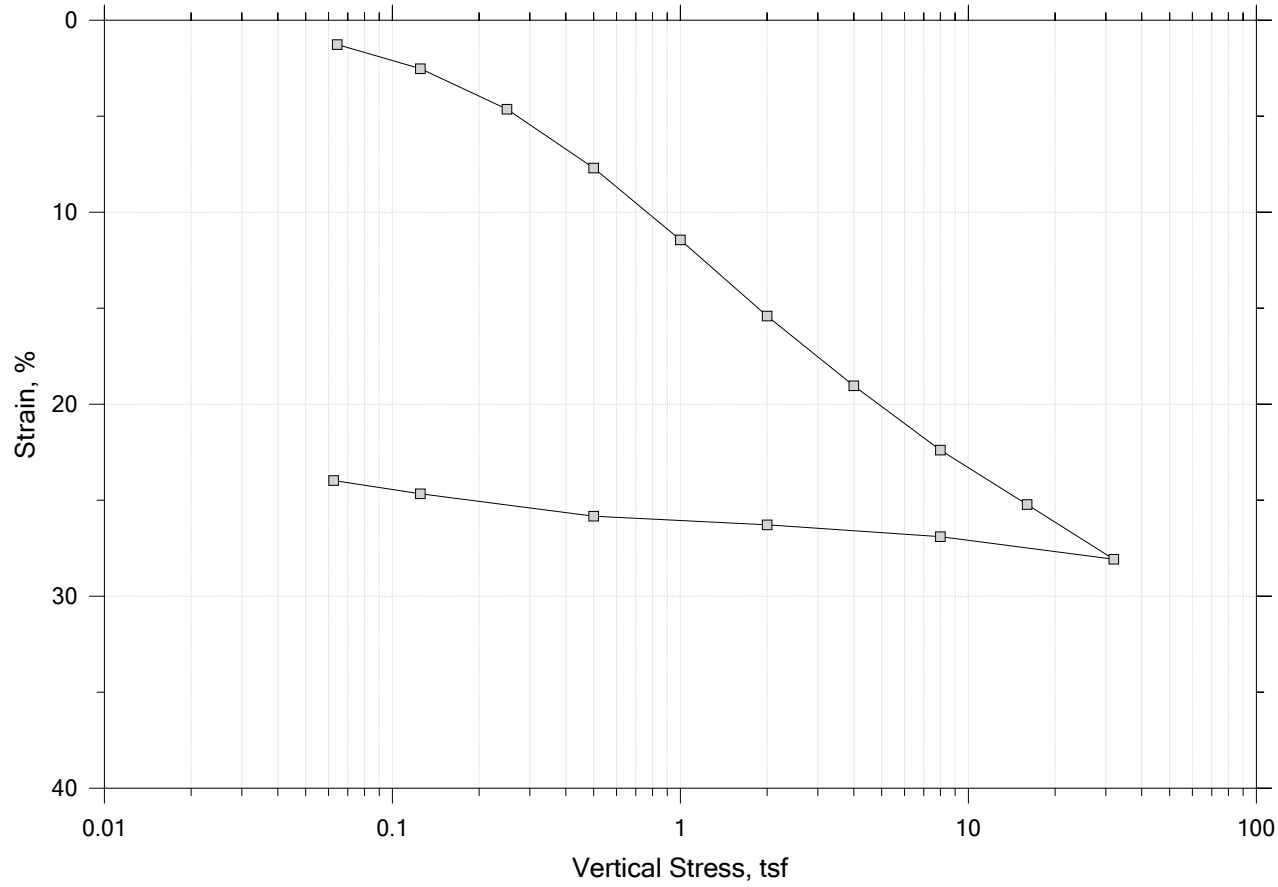
Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0653	0.002490	0.557	0.249	3.227	7.59e-06	3.81e-02	7.80e-04
2	0.125	0.002949	0.556	0.295	12.428	1.96e-06	7.68e-03	4.07e-05
3	0.250	0.005354	0.553	0.535	2.426	1.00e-05	1.92e-02	5.20e-04
4	0.500	0.01034	0.545	1.03	12.207	1.98e-06	1.99e-02	1.06e-04
5	1.00	0.01740	0.534	1.74	0.877	2.72e-05	1.41e-02	1.04e-03
6	2.00	0.02503	0.522	2.50	15.578	1.51e-06	7.63e-03	3.11e-05
7	4.00	0.02936	0.515	2.94	39.909	5.82e-07	2.16e-03	3.39e-06
8	8.00	0.03294	0.510	3.29	29.911	7.70e-07	8.96e-04	1.86e-06
9	16.0	0.03969	0.499	3.97	38.679	5.89e-07	8.43e-04	1.34e-06
10	32.0	0.04710	0.487	4.71	24.912	9.01e-07	4.63e-04	1.13e-06
11	8.00	0.04478	0.491	4.48	0.000	0.00e+00	9.64e-05	0.00e+00
12	2.00	0.04386	0.493	4.39	0.000	0.00e+00	1.54e-04	0.00e+00
13	0.500	0.04161	0.496	4.16	8.912	2.52e-06	1.50e-03	1.02e-05
14	0.125	0.03922	0.500	3.92	0.410	5.51e-05	6.38e-03	9.48e-04
15	0.0625	0.03933	0.500	3.93	86.782	2.61e-07	-1.71e-03	-1.20e-06

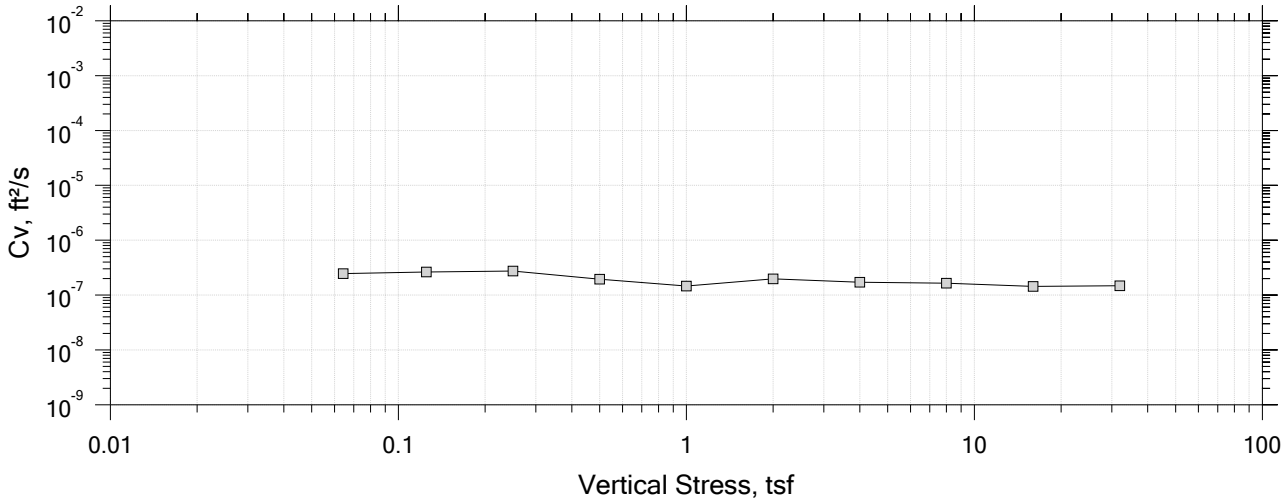
GeoTesting EXPRESS

Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB033	Tested By: md	Checked By: njh
Sample No.: SL0650	Test Date: 12/21/18	Depth: 5-7 ft
Test No.: IP-1	Sample Type: intact	Elevation: ---
Description: Moist, light brown sandy clay		
Remarks: System Y, Swell Pressure = 0.0653 tsf		
Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report





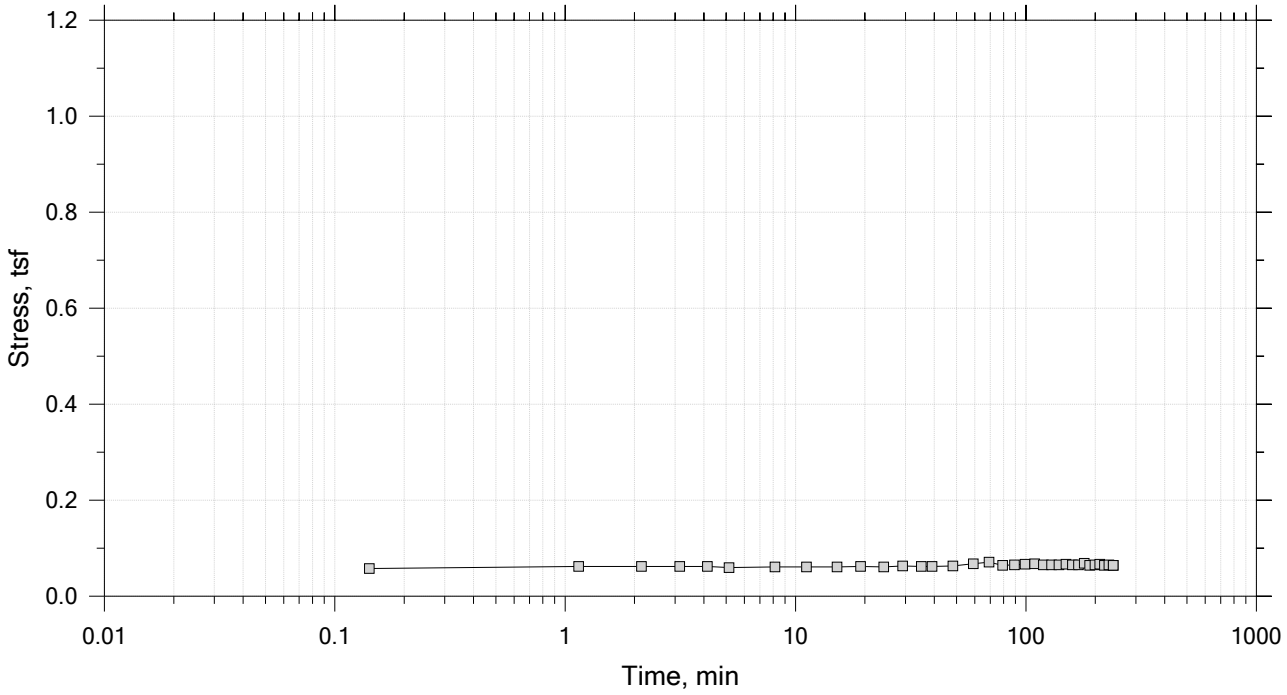
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		
	Displacement at End of Increment		

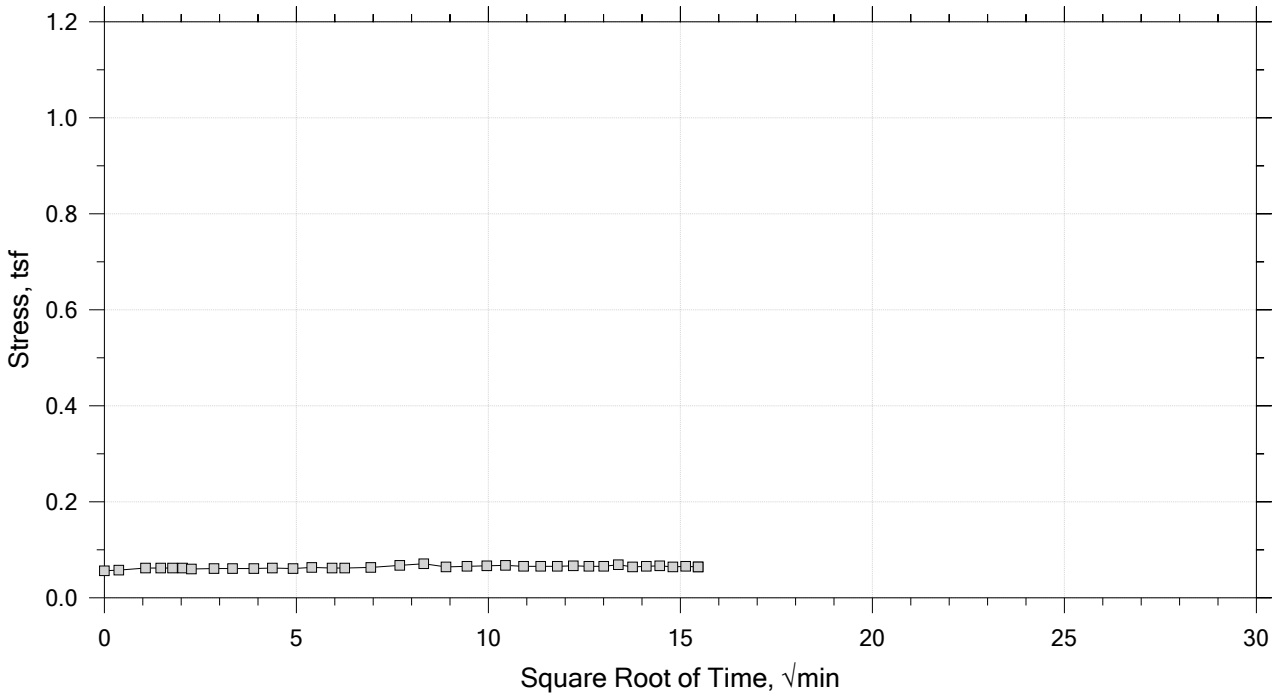
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15

Constant Volume Step

Stress: 0.0643 tsf

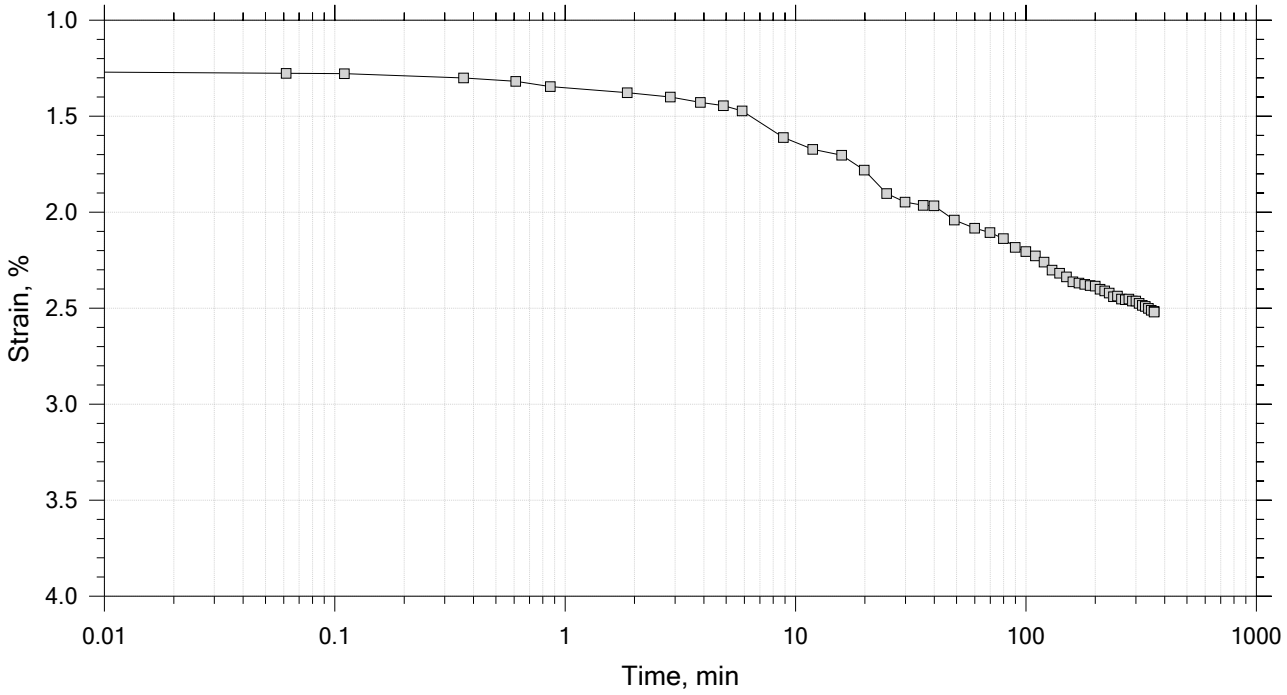


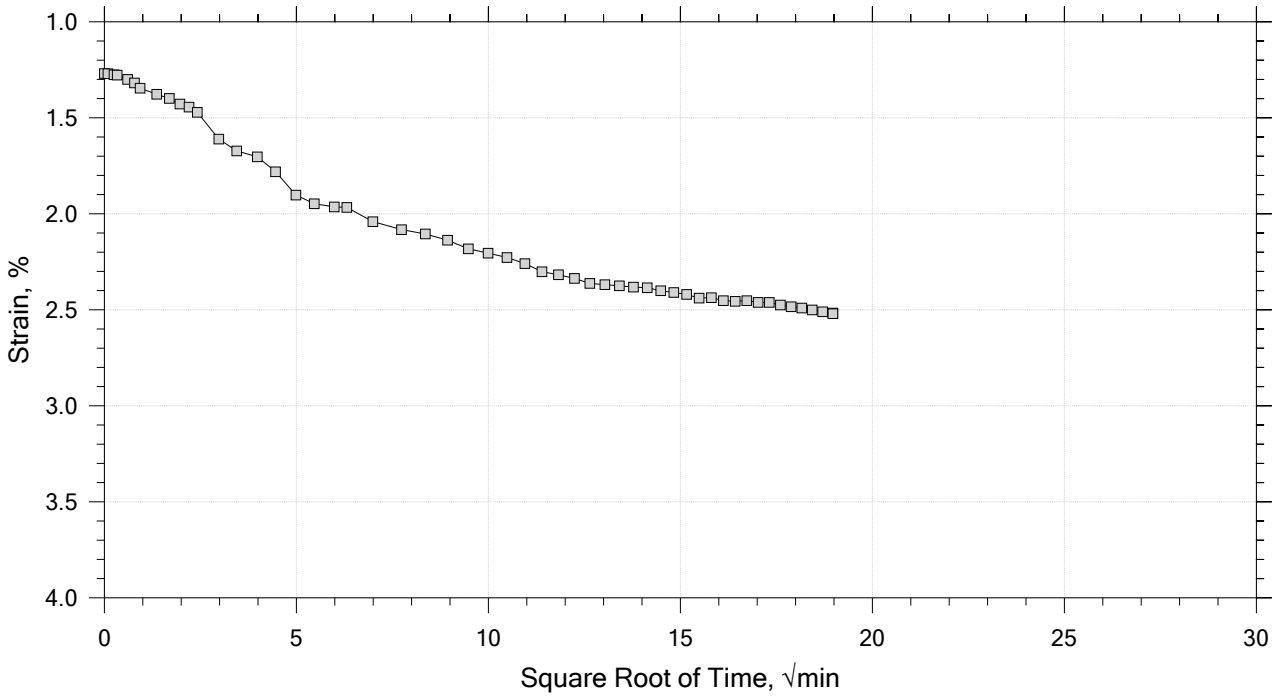


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15
Constant Load Step
Stress: 0.125 tsf

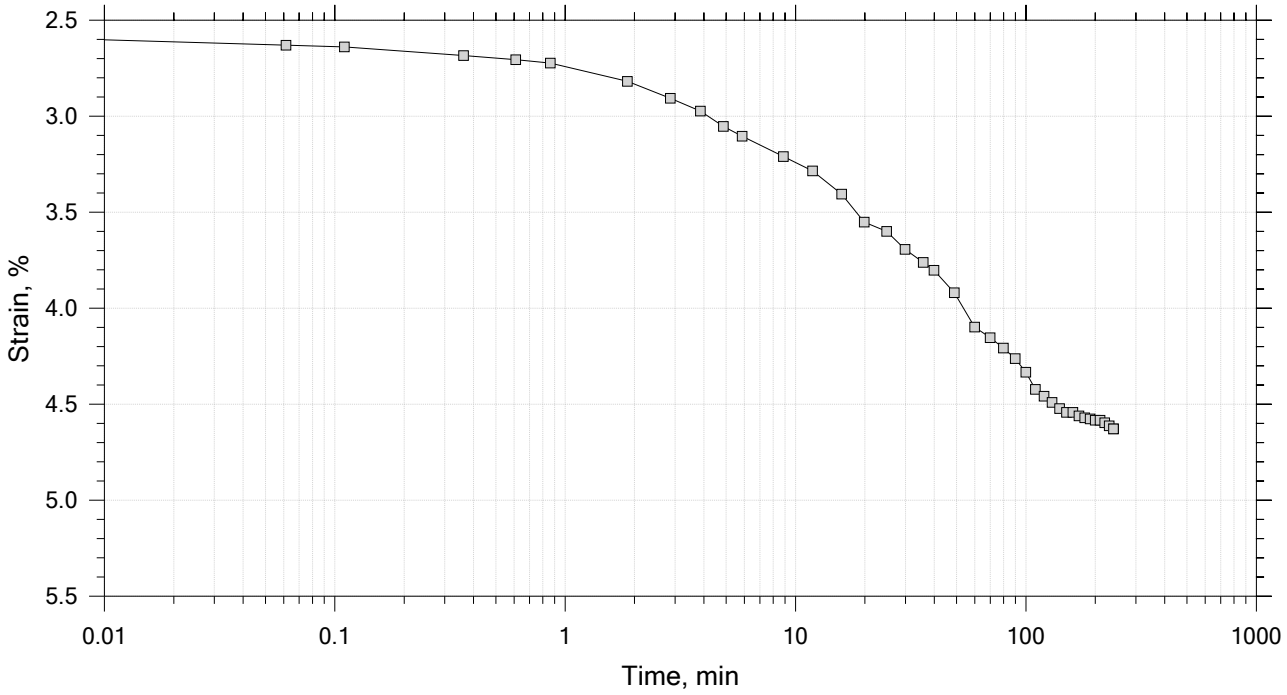


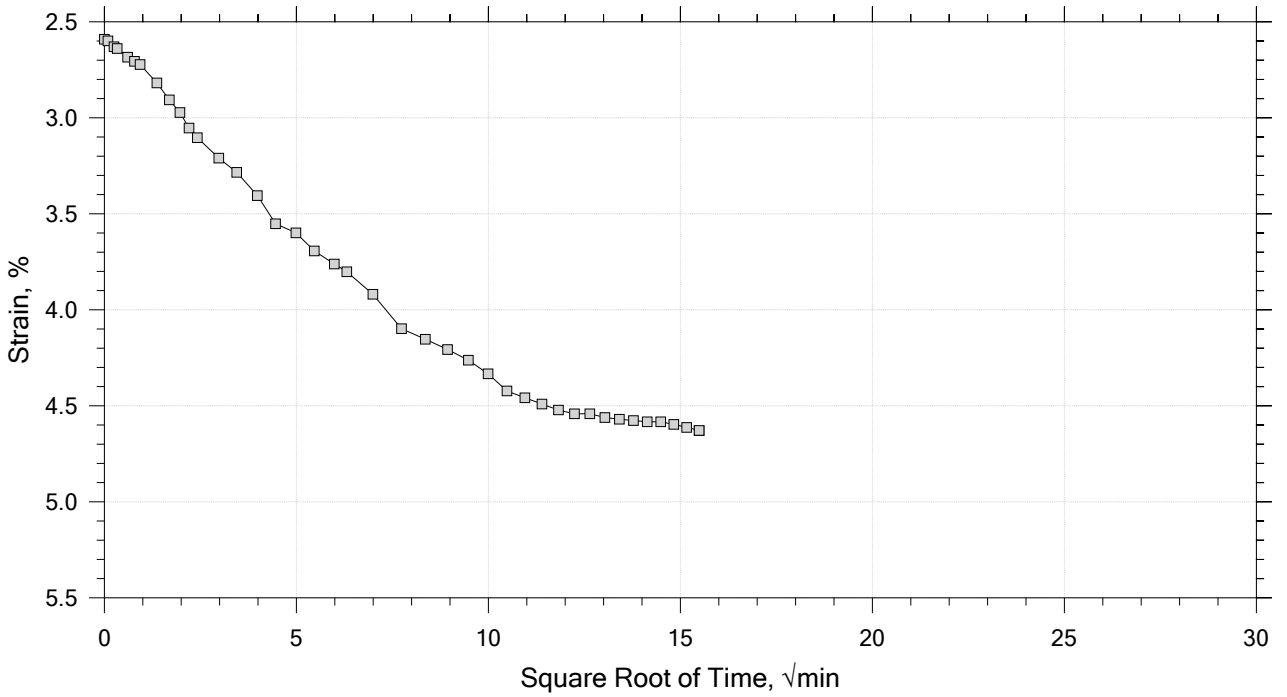


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

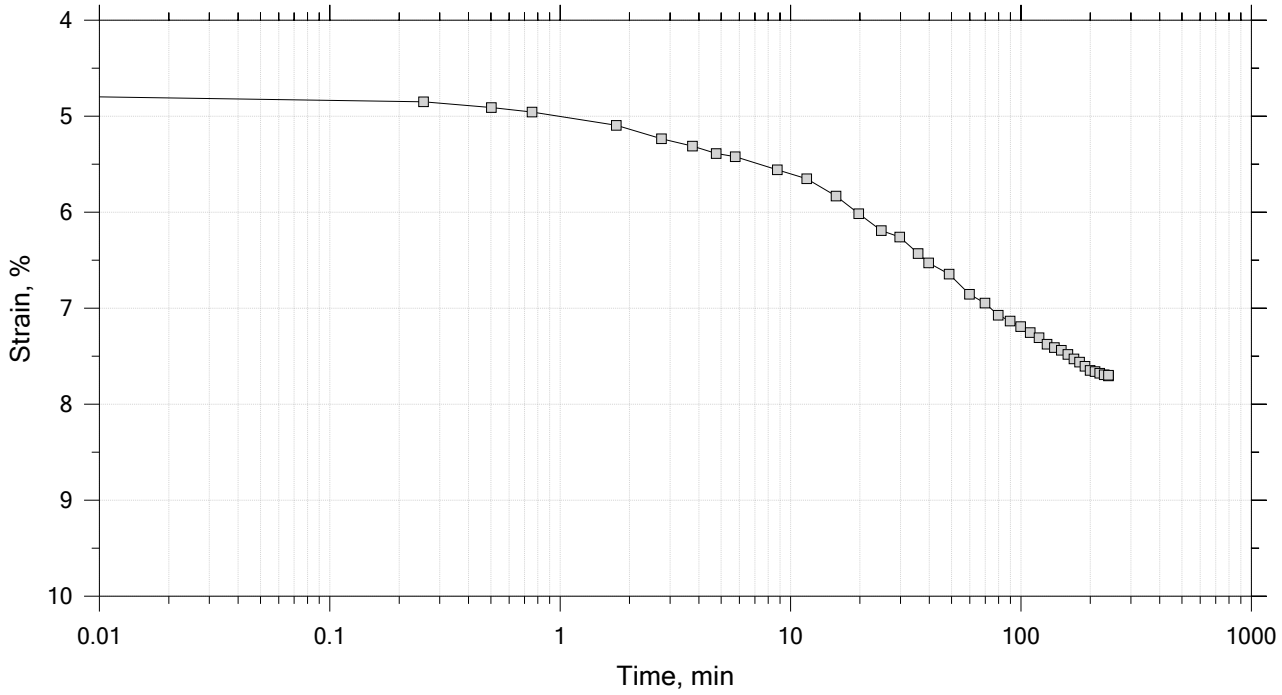


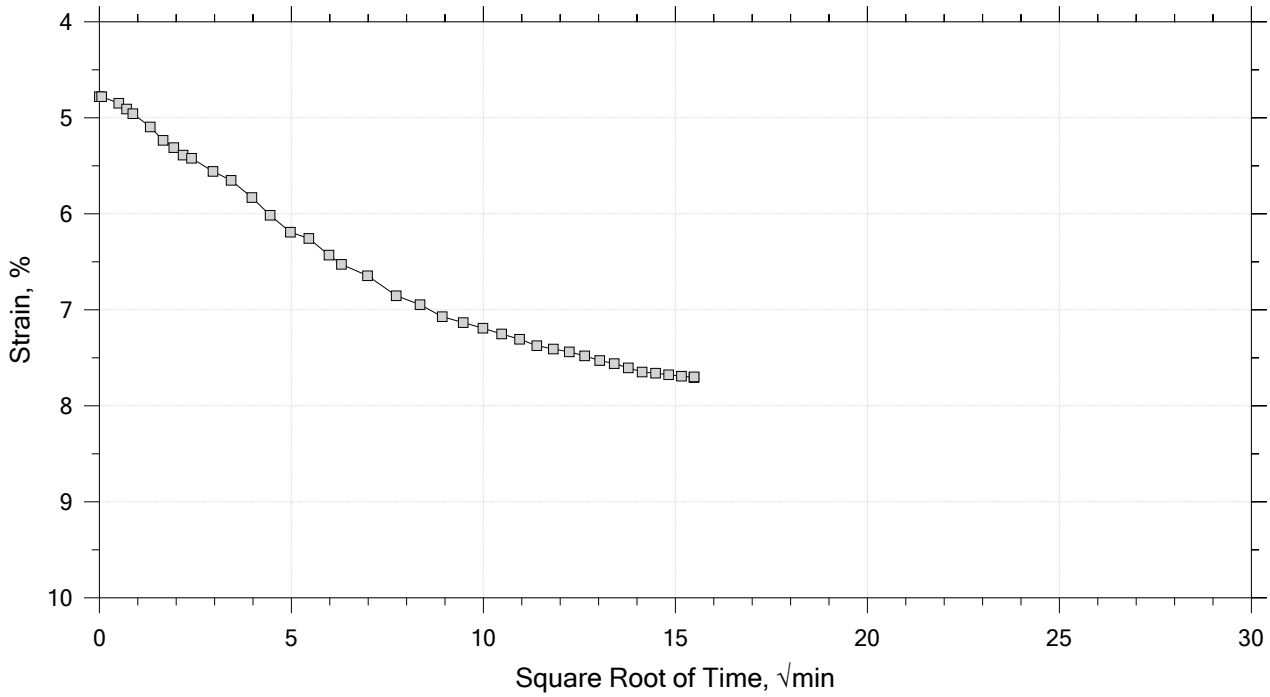


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf





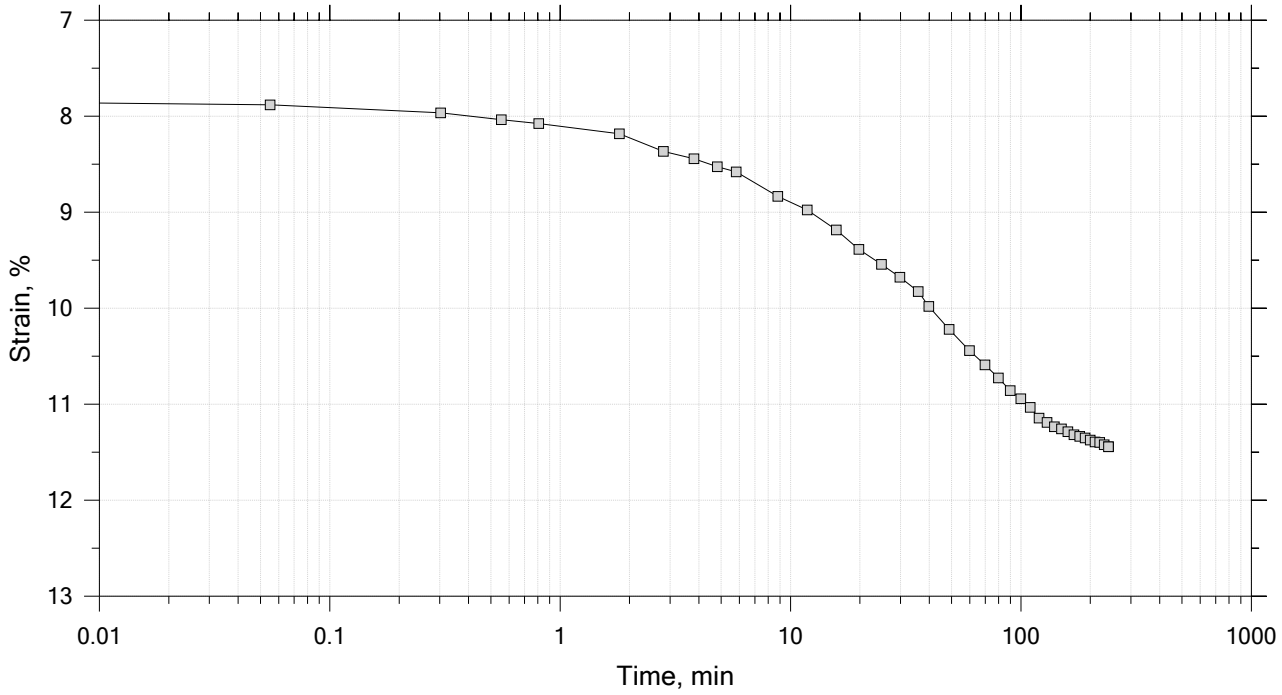
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

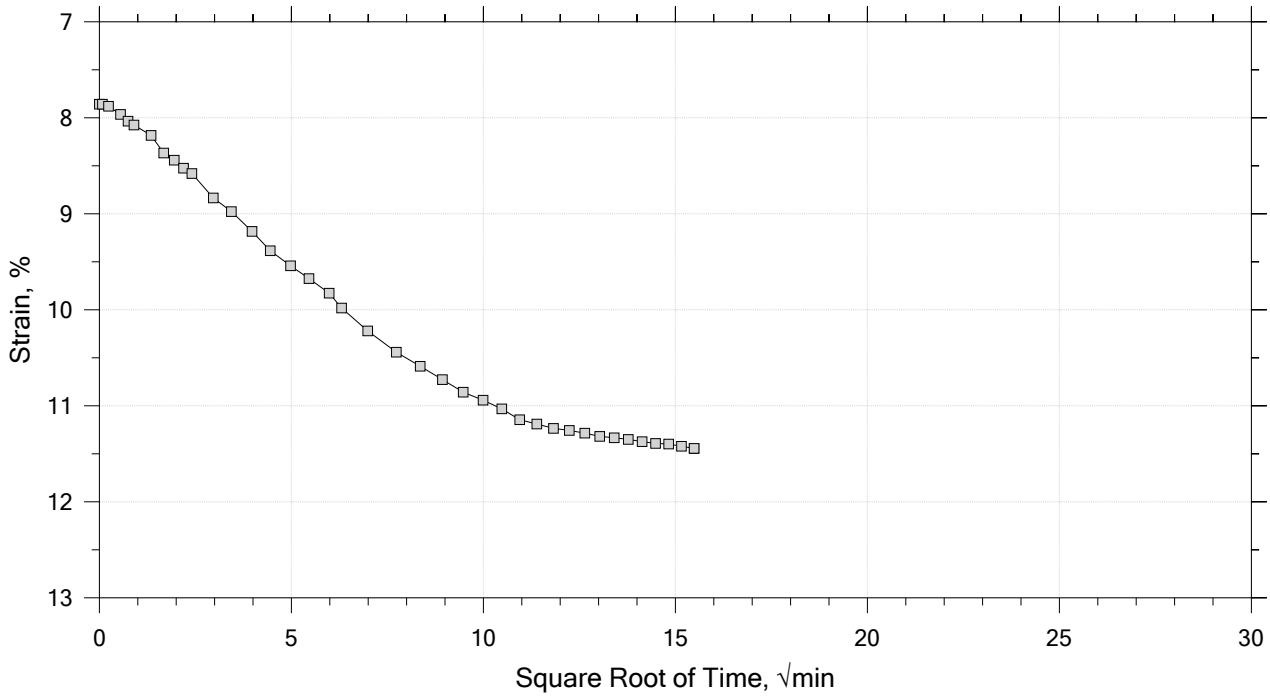
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf





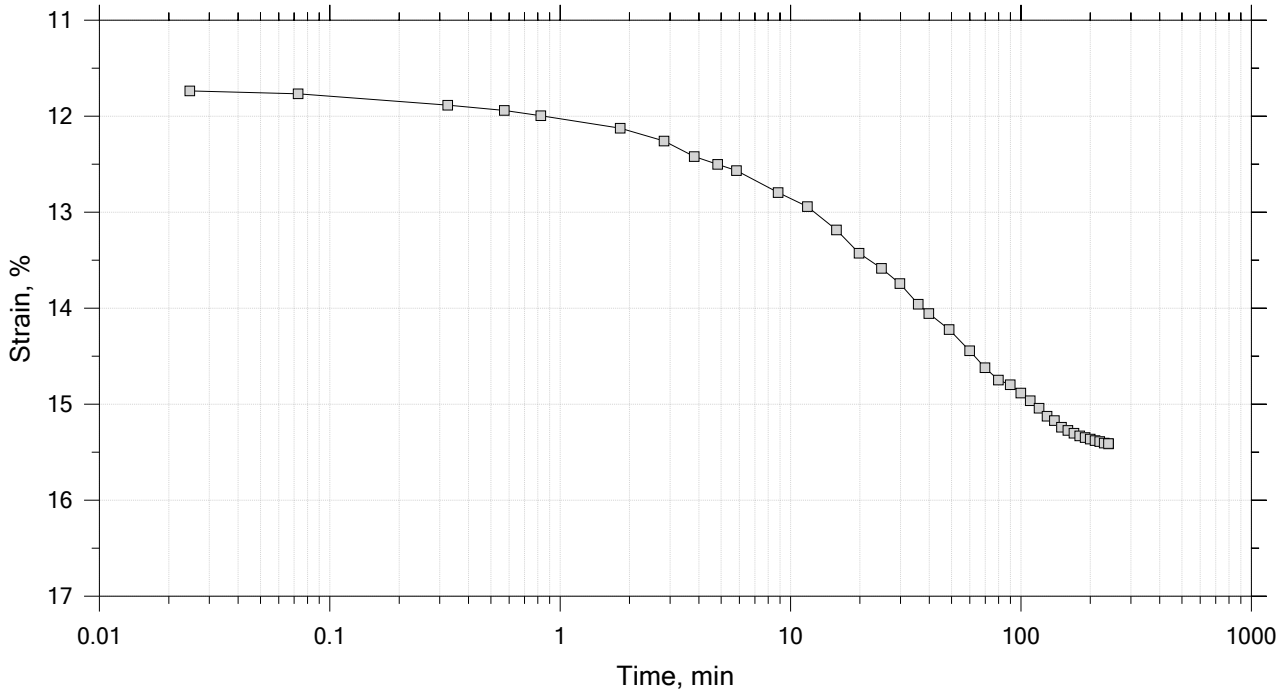
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

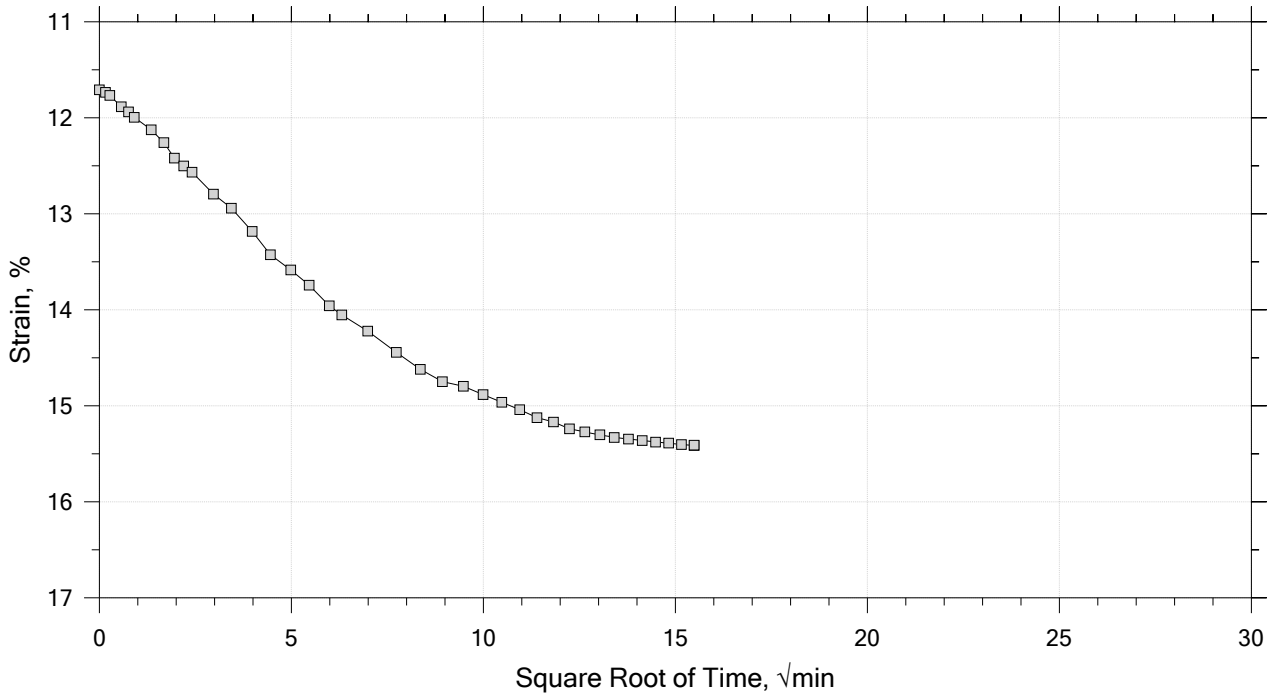
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf





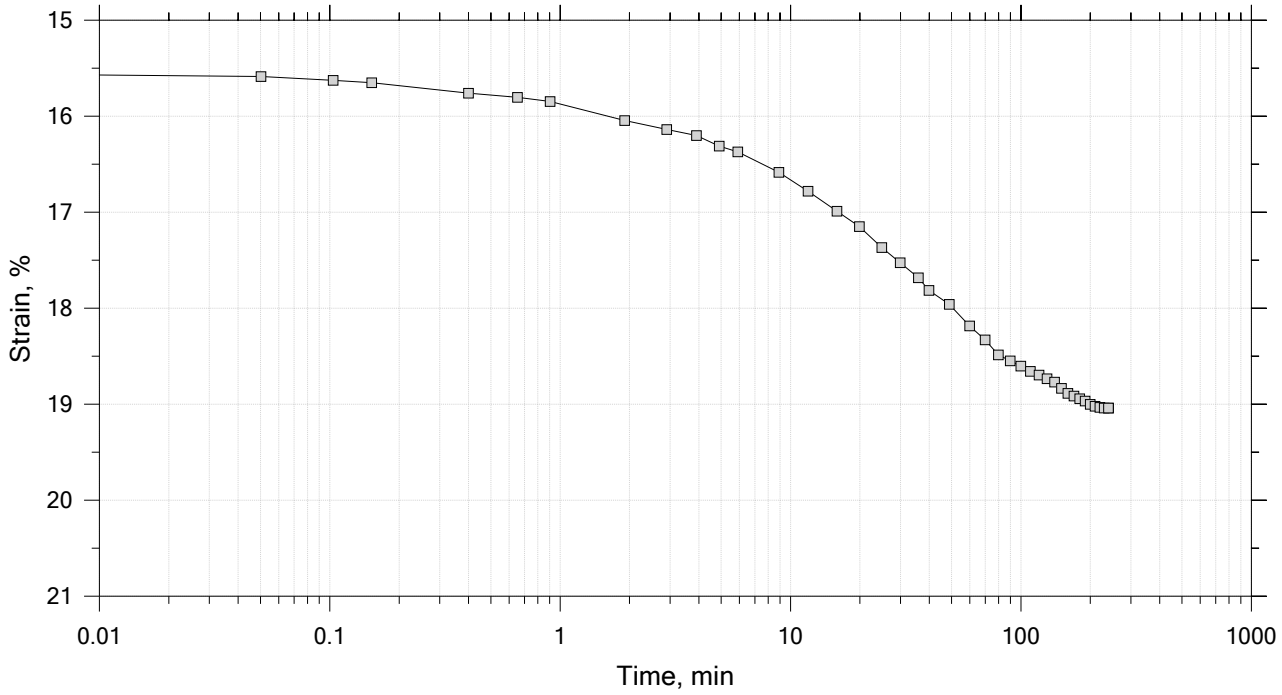
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

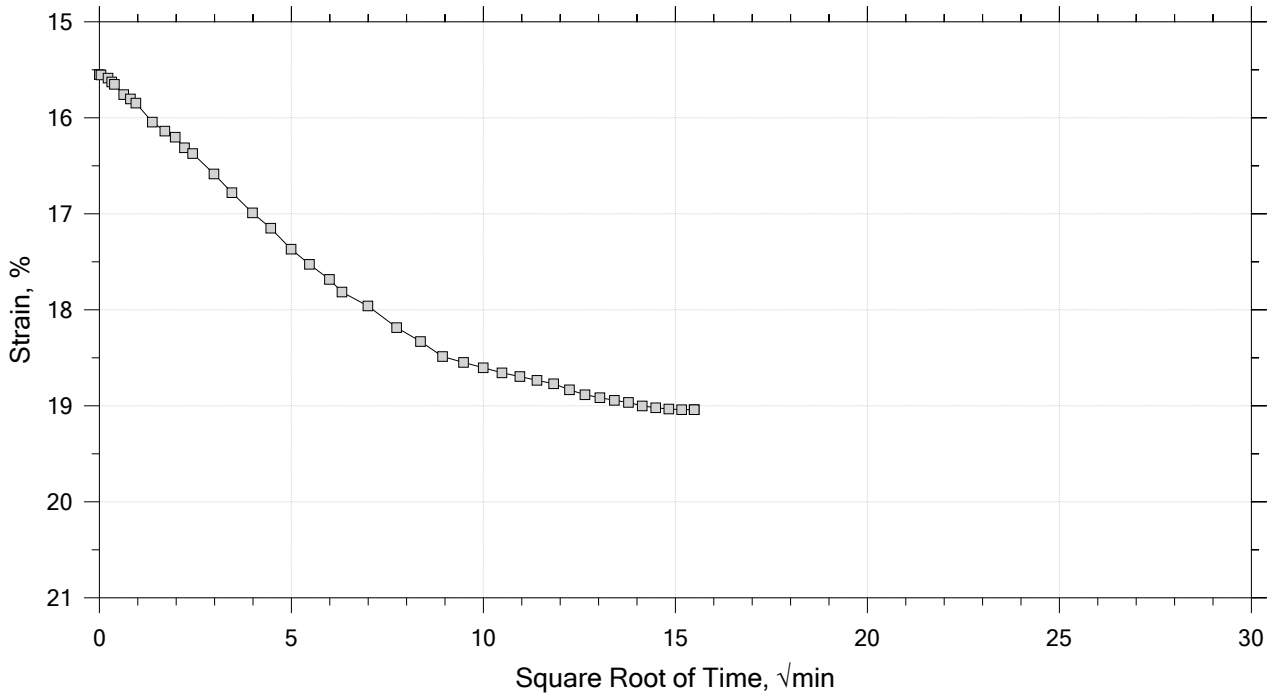
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15

Constant Load Step

Stress: 4 tsf

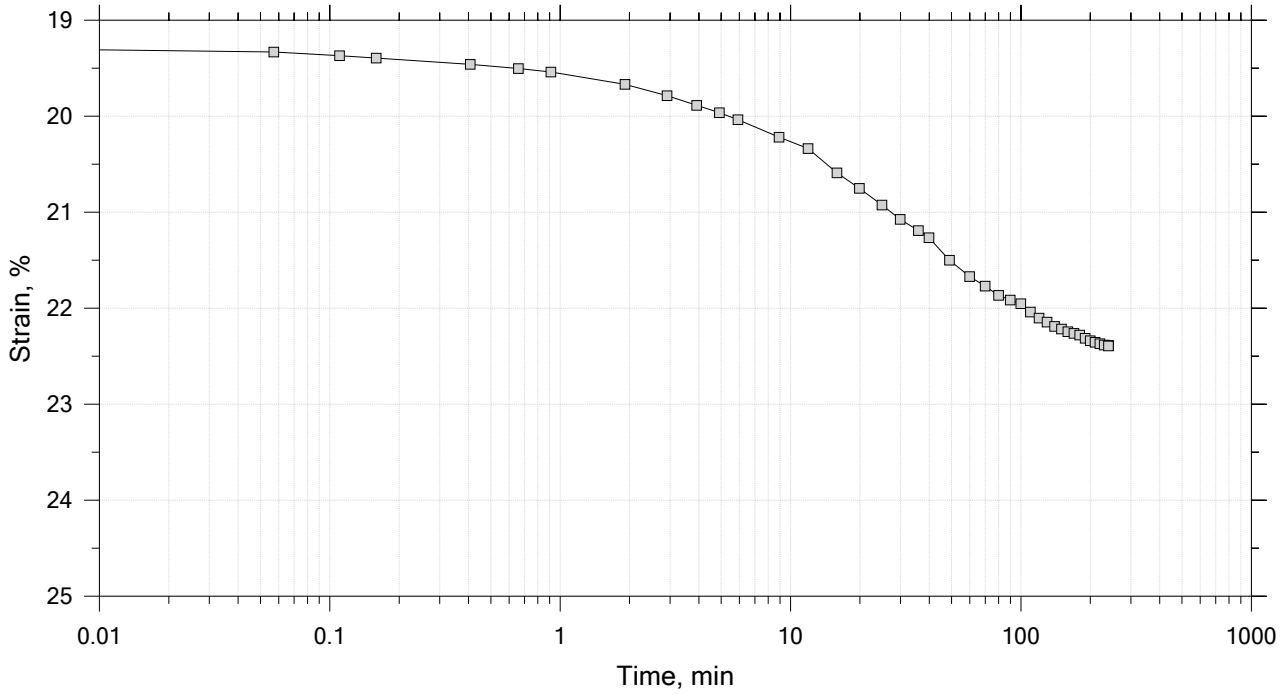


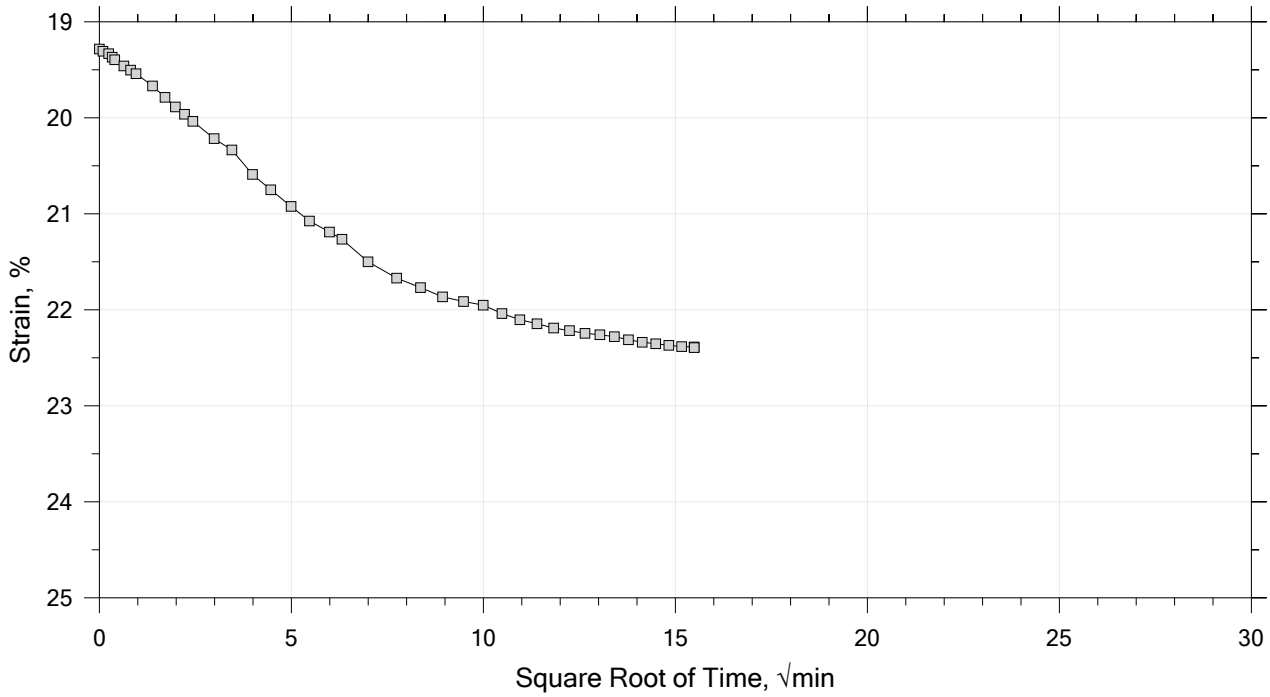


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15
Constant Load Step
Stress: 8 tsf





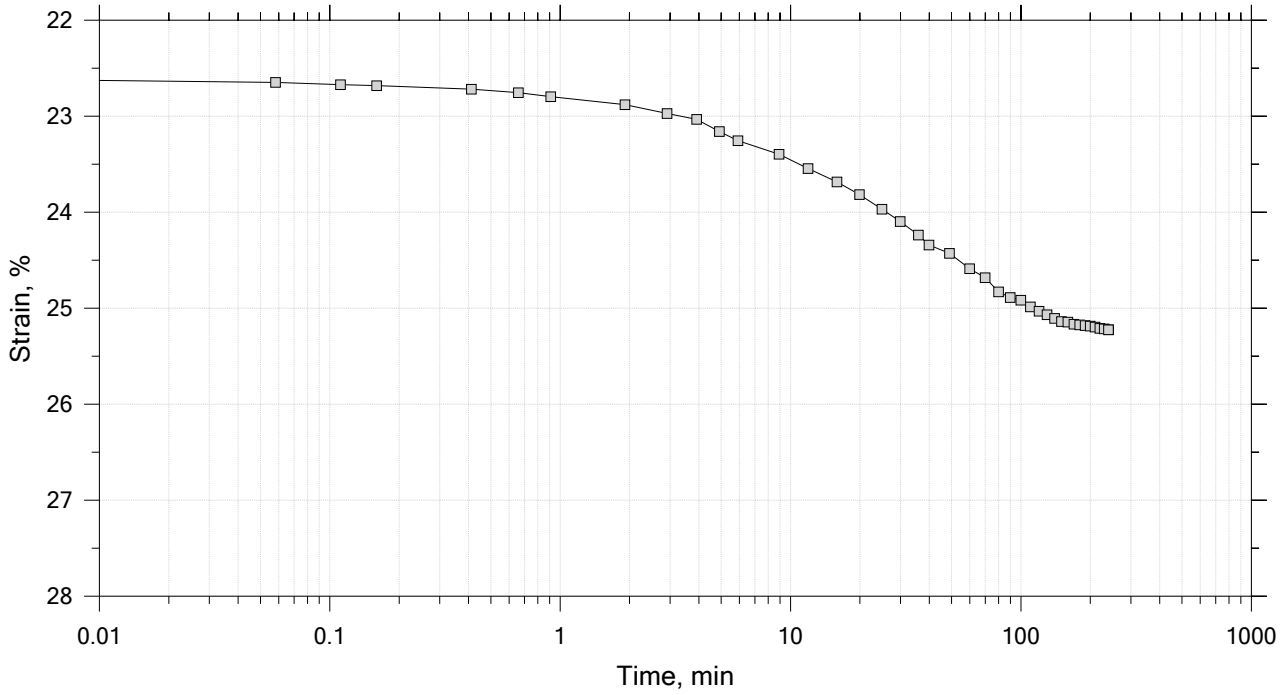
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

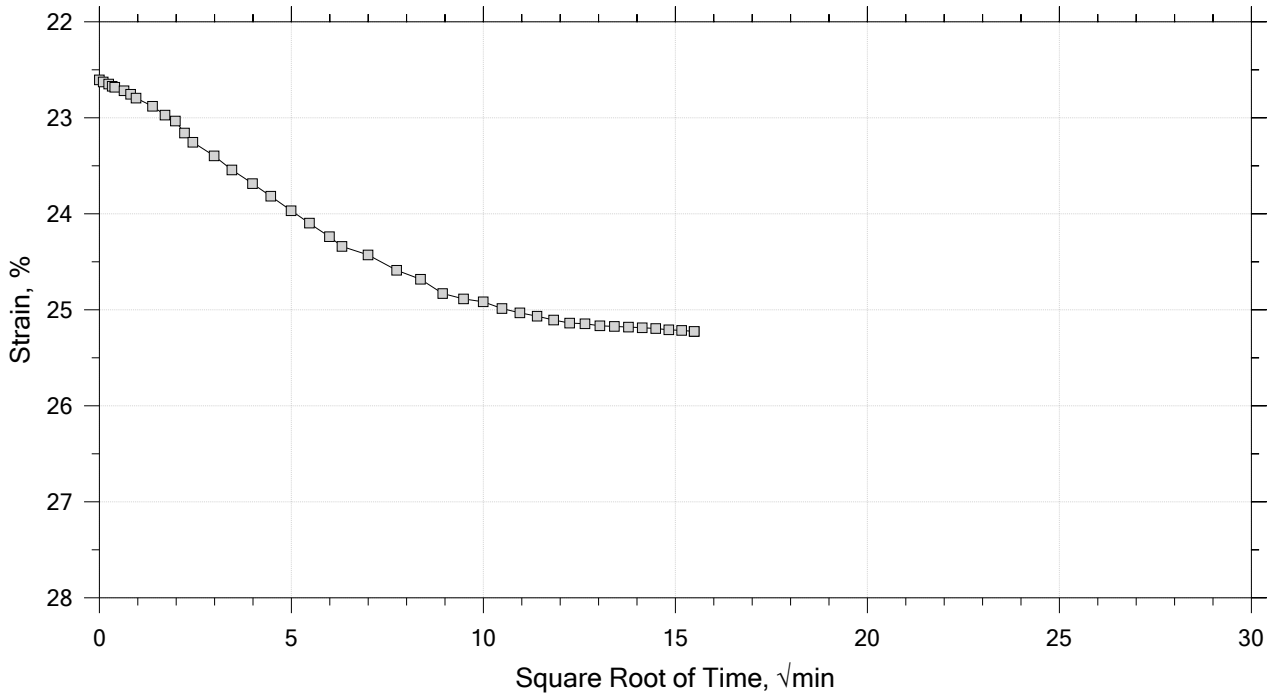
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15

Constant Load Step

Stress: 16 tsf

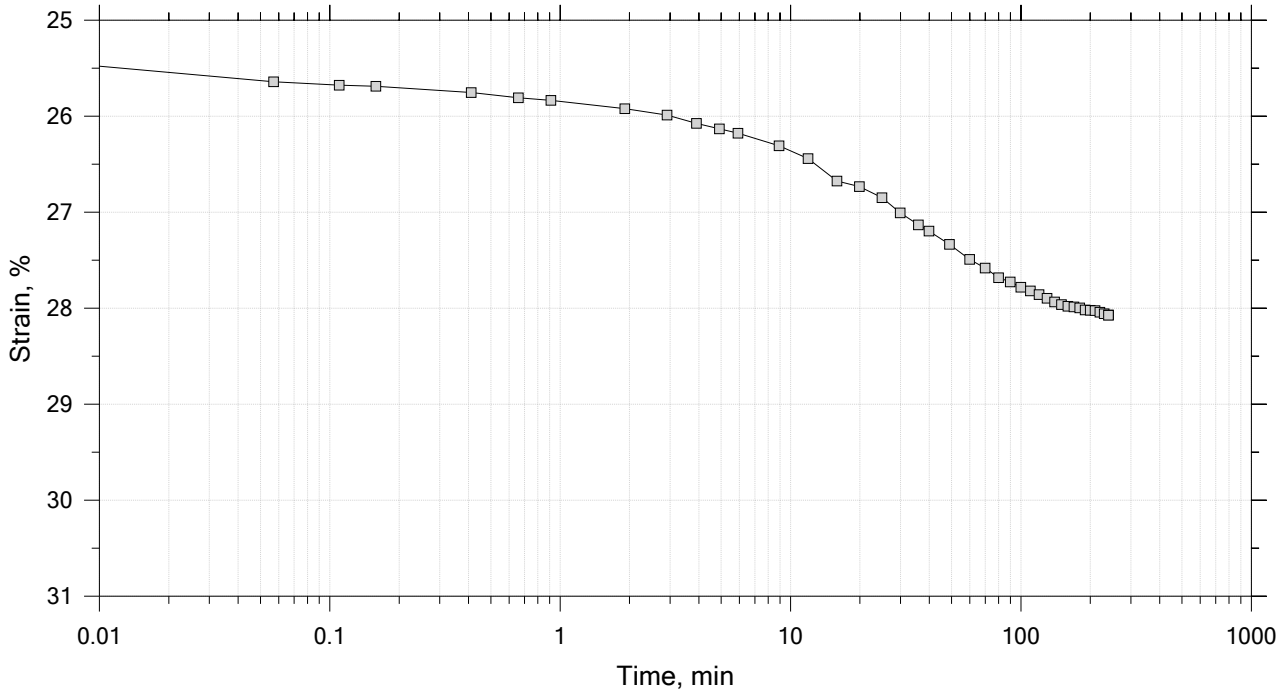


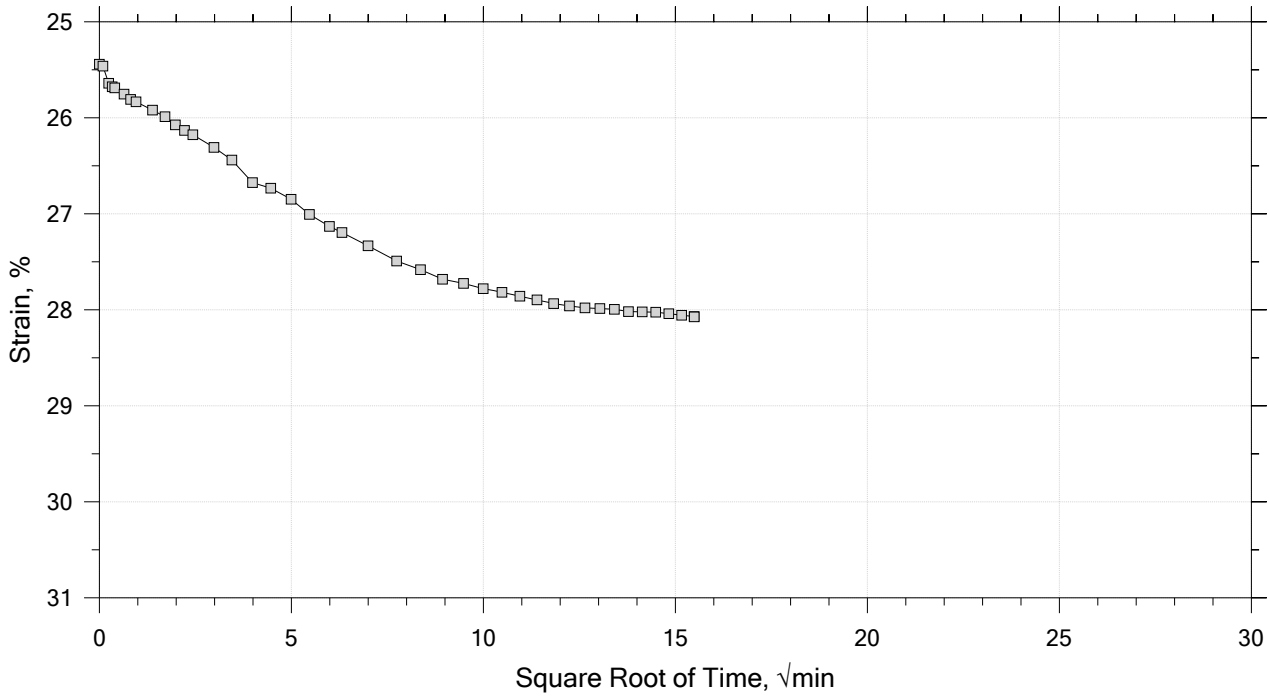


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

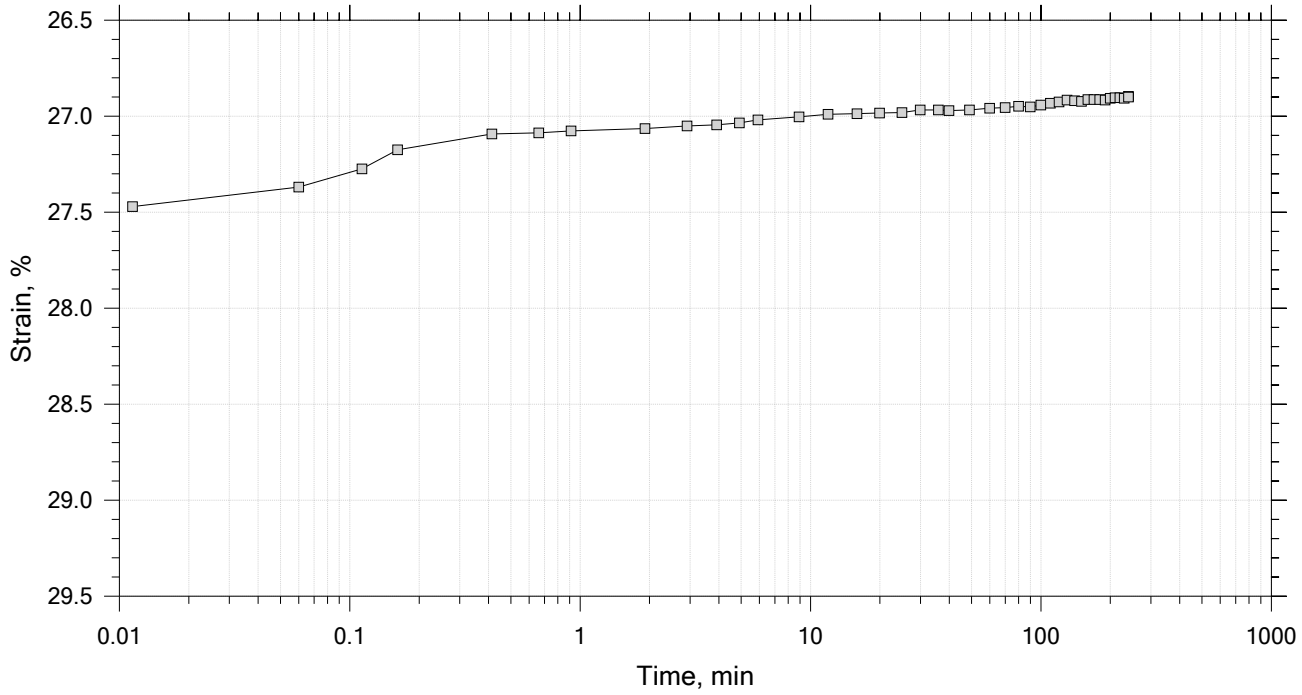


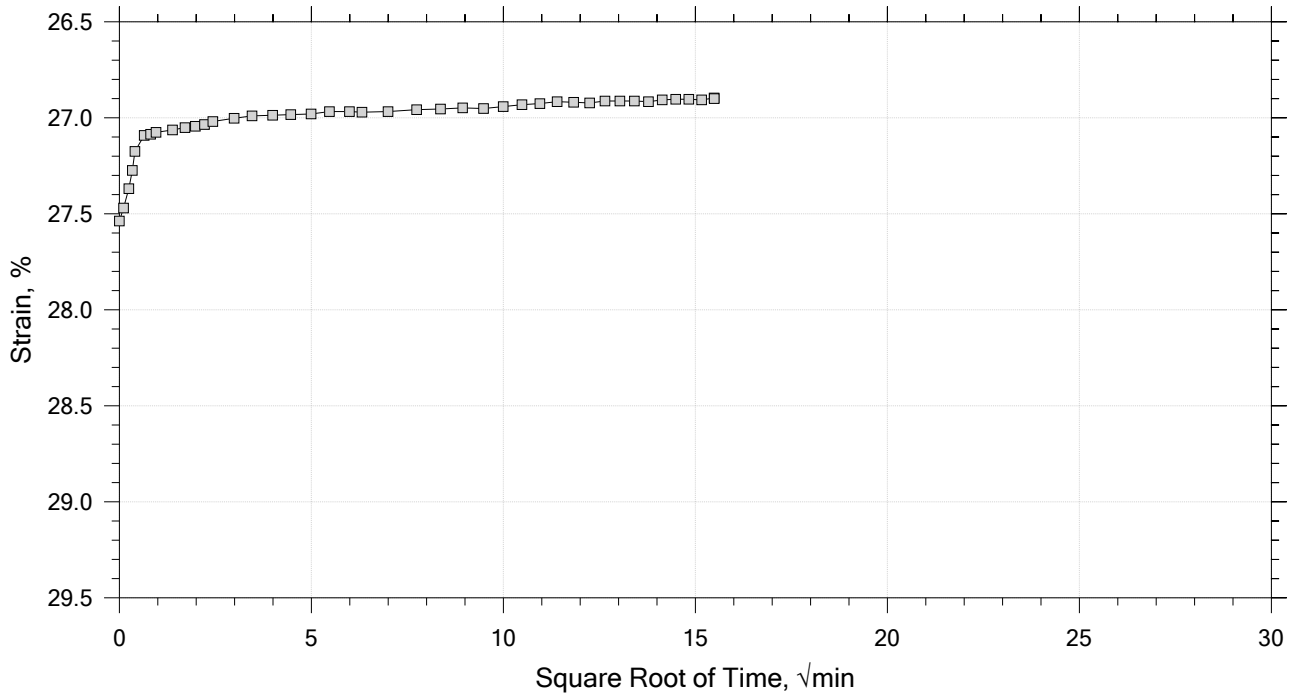


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf





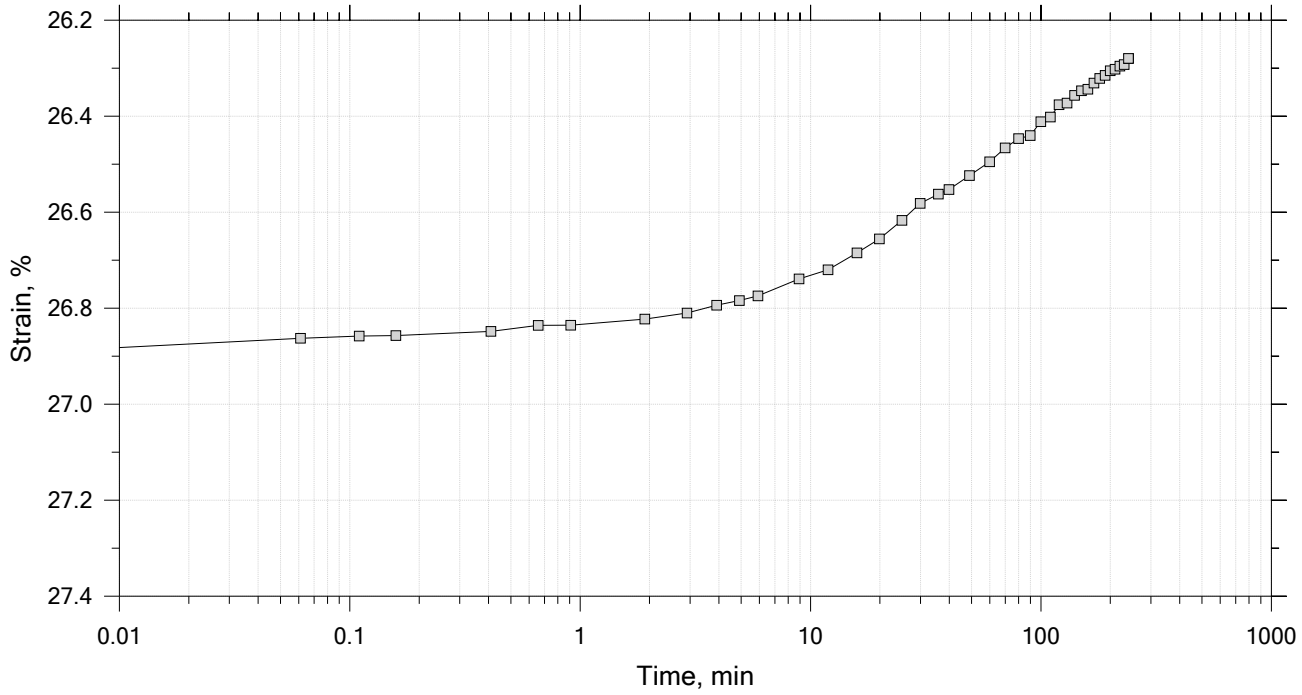
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

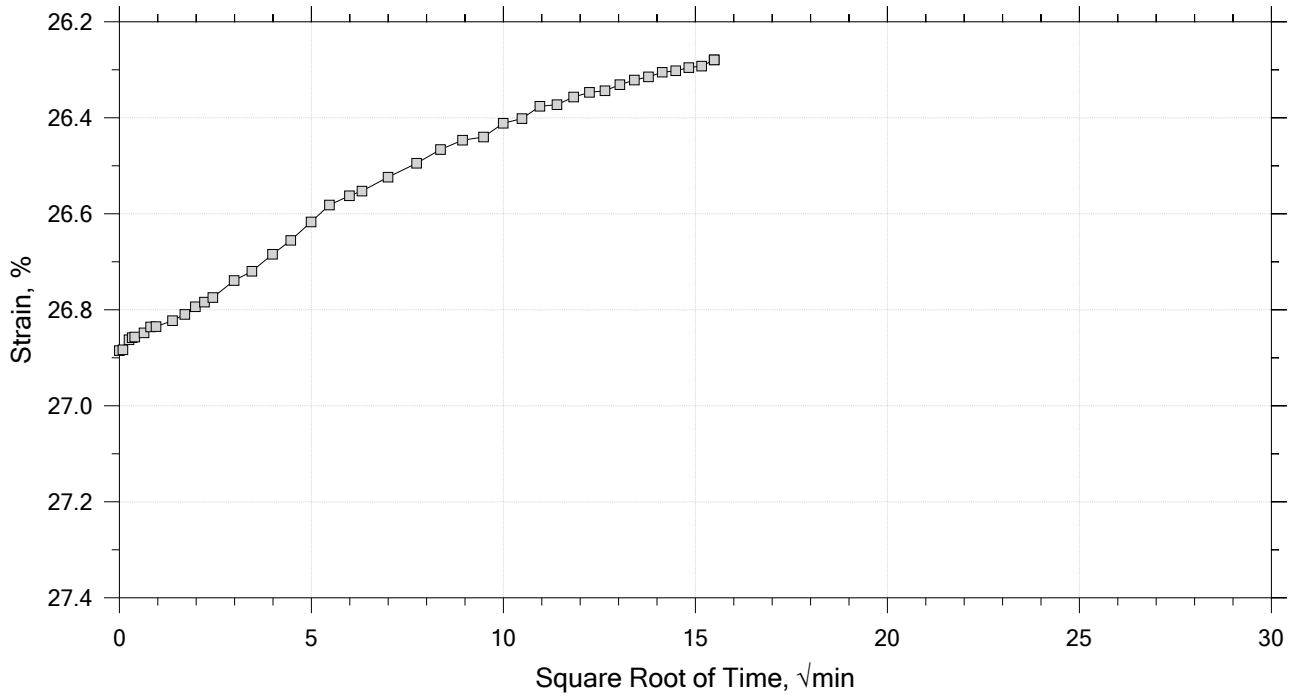
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15

Constant Load Step

Stress: 2 tsf

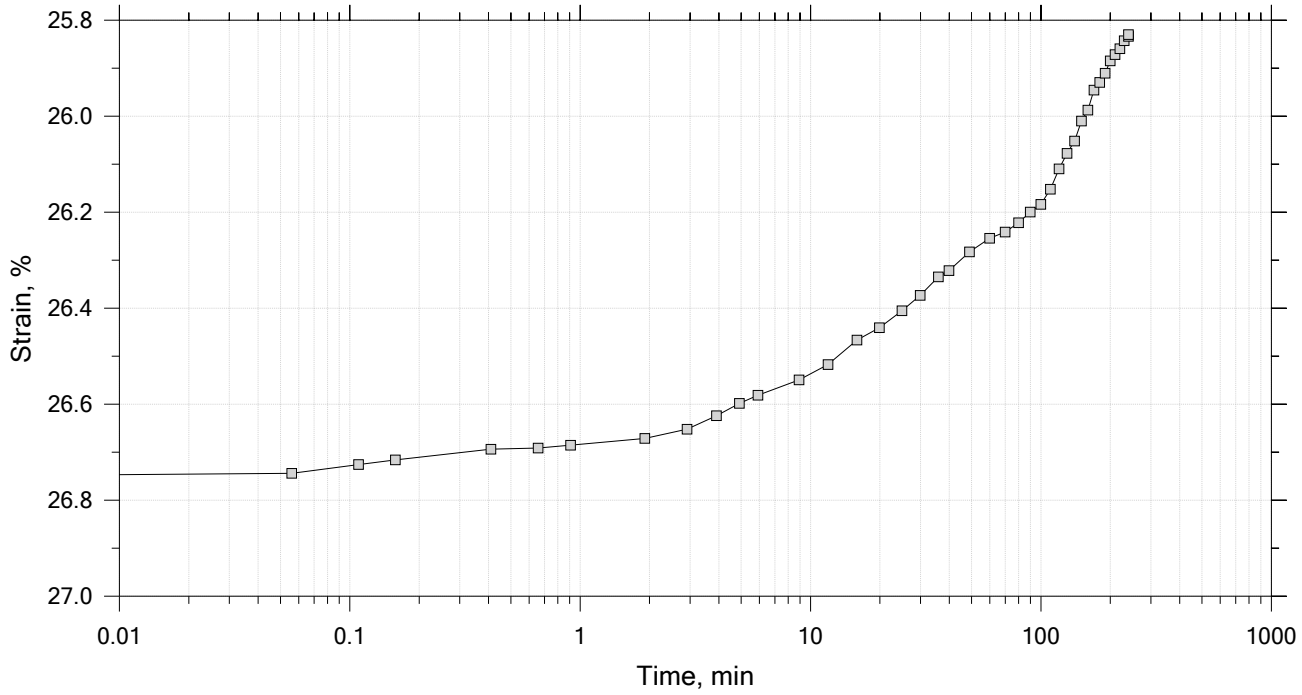


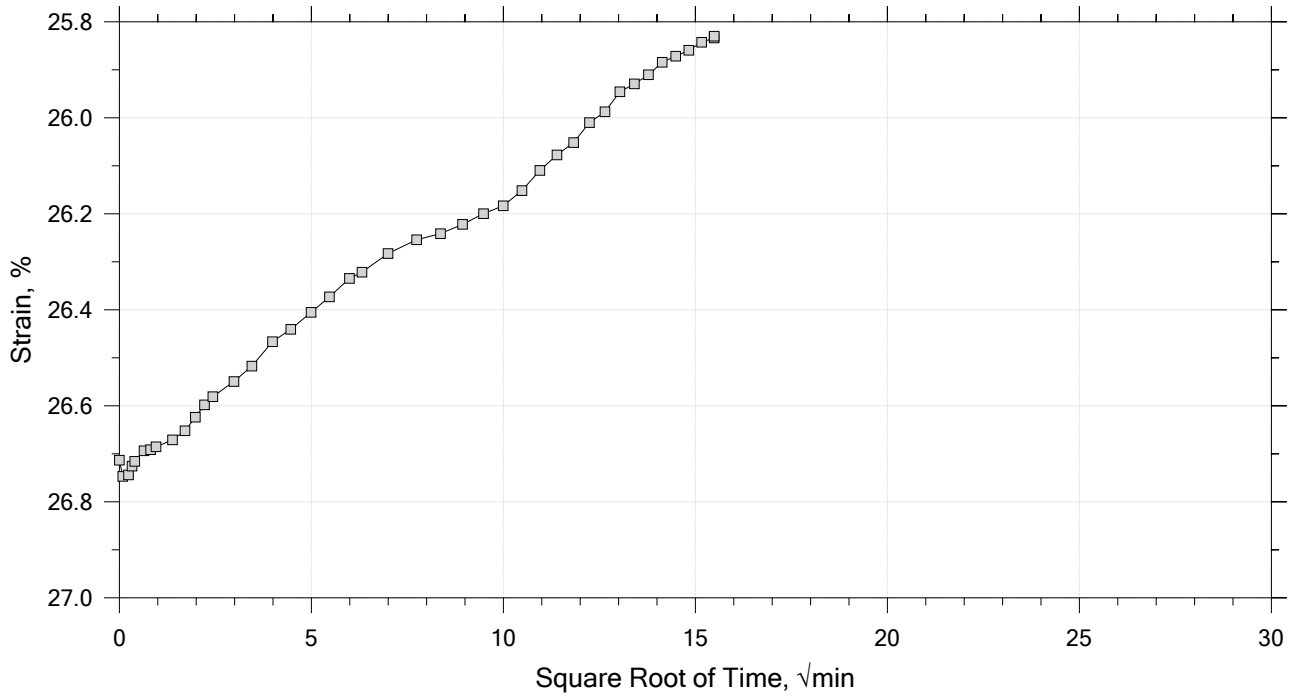


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf





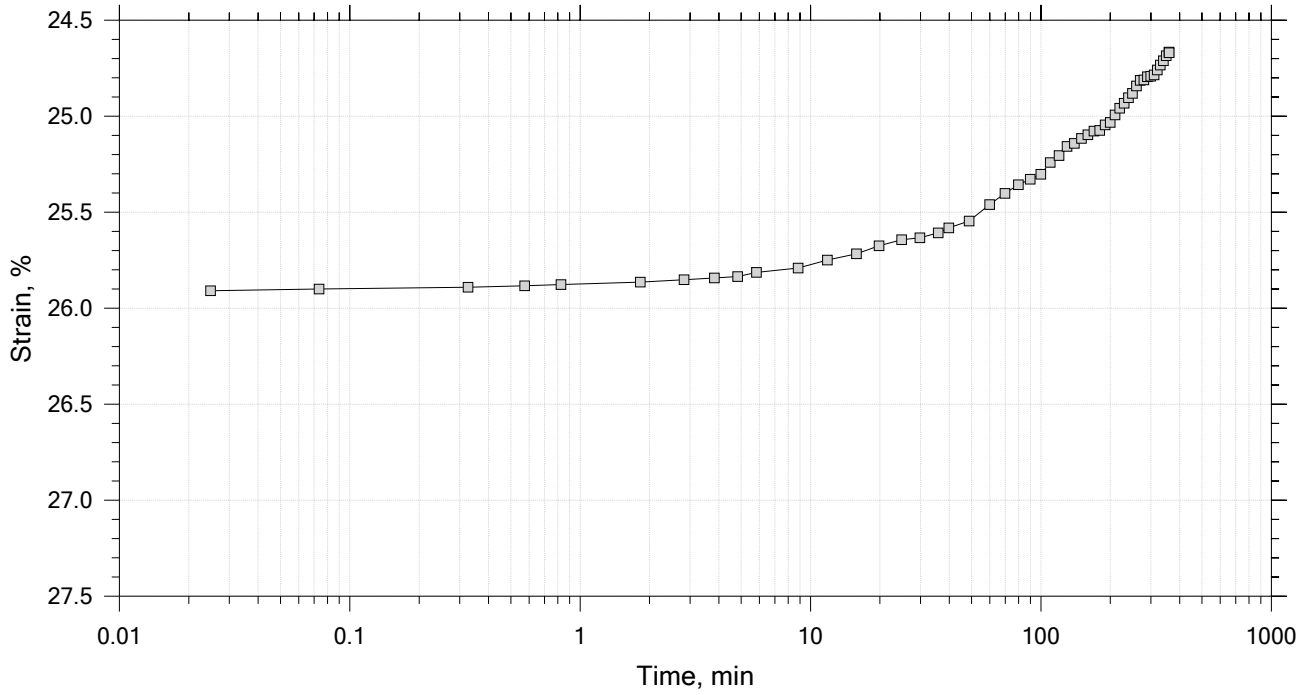
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

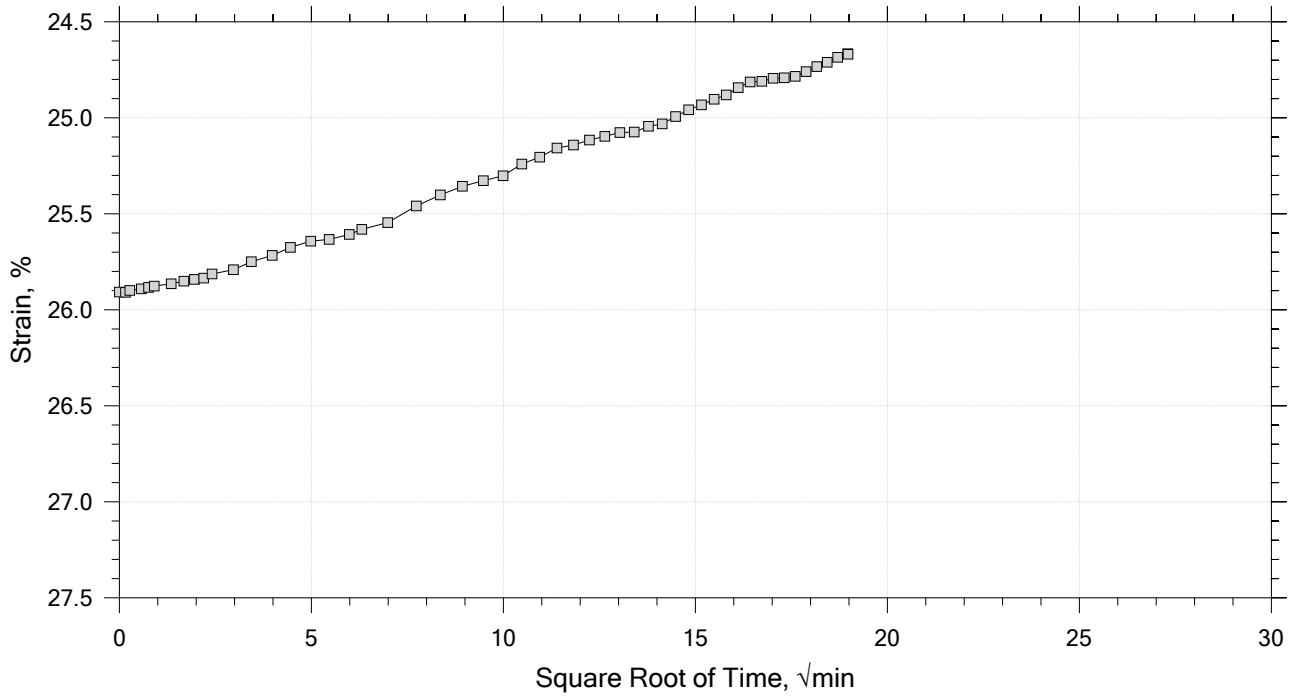
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15

Constant Load Step

Stress: 0.125 tsf

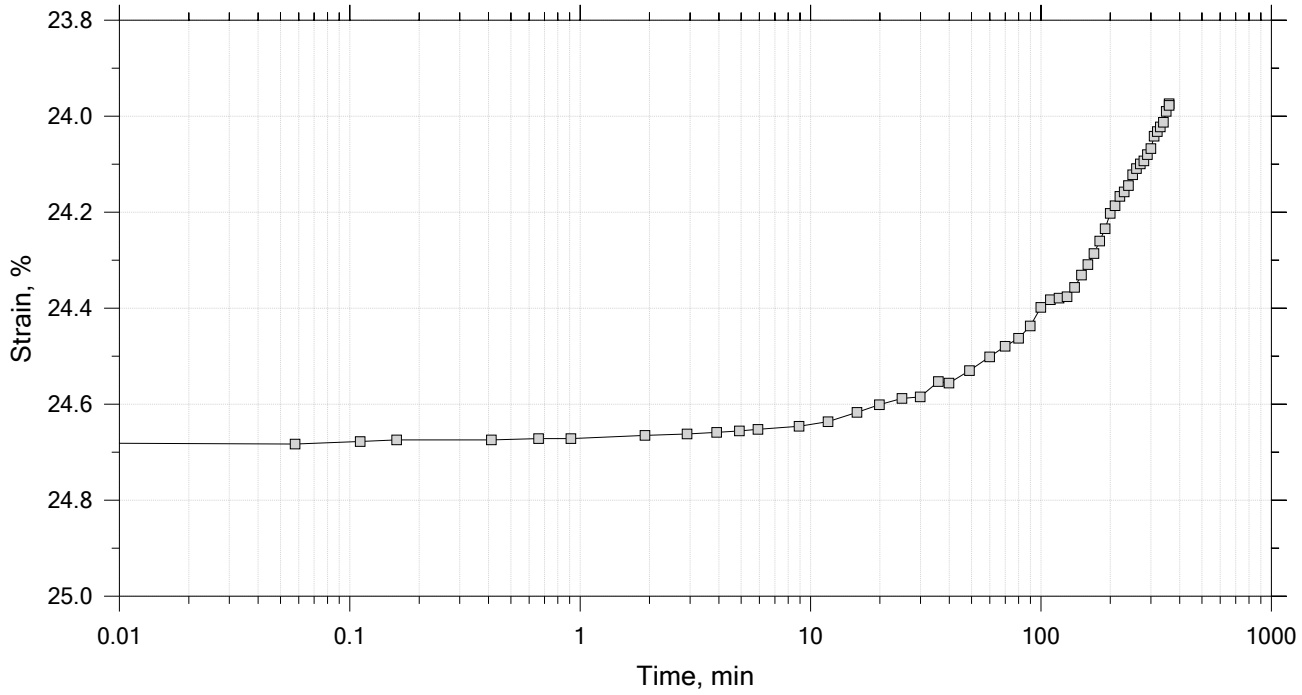


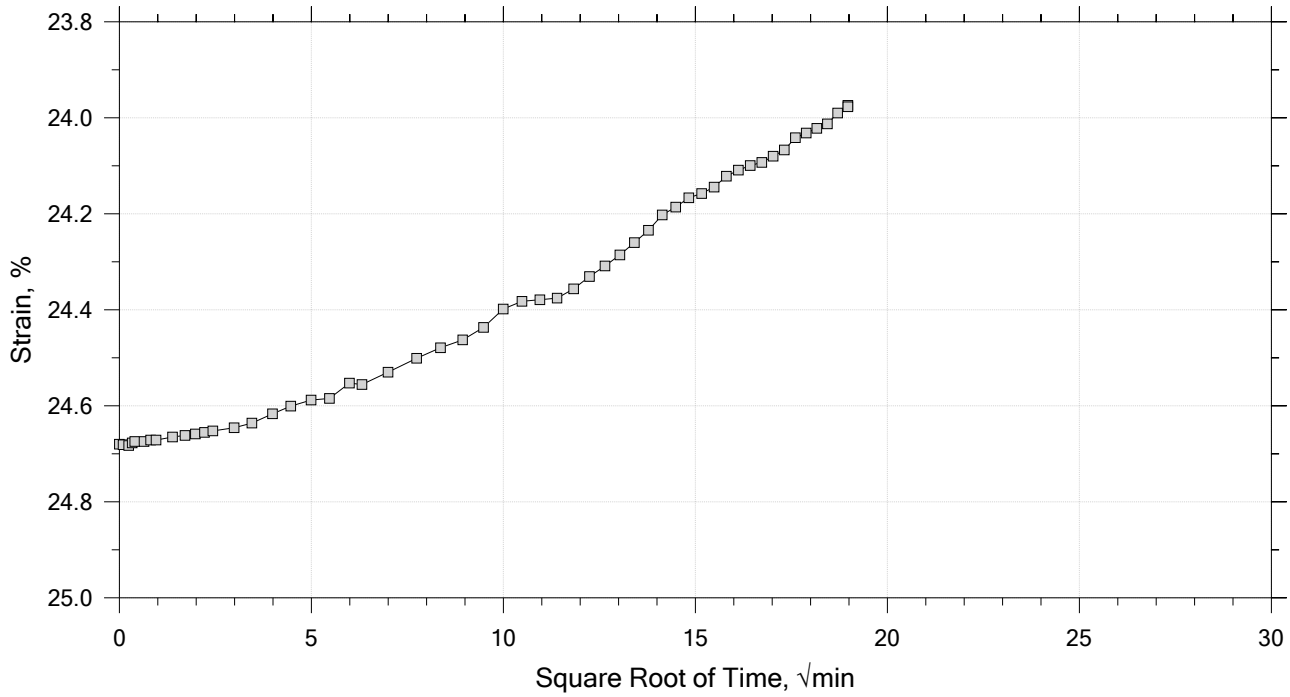


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.67	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.953	Plastic Limit: ---
Final Height: 0.77 in	Final Void Ratio: 0.504	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A2541	RING		A-1376
Mass Container, gm	8.24	110.88	110.88	8.21
Mass Container + Wet Soil, gm	238.58	259.95	241.45	138.22
Mass Container + Dry Soil, gm	181.51	220.69	220.69	117.55
Mass Dry Soil, gm	173.27	109.81	109.81	109.34
Water Content, %	32.94	35.75	18.90	18.90
Void Ratio	---	0.95	0.50	---
Degree of Saturation, %	---	100.00	100.00	---
Dry Unit Weight, pcf	---	85.222	110.68	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0643	0.01265	0.929	1.26	20.960	2.69e-07	1.97e-01	1.42e-04	0.00e+00
2	0.125	0.02520	0.904	2.52	0.000	0.00e+00	2.07e-01	0.00e+00	0.00e+00
3	0.250	0.04628	0.863	4.63	0.000	0.00e+00	1.69e-01	0.00e+00	0.00e+00
4	0.500	0.07699	0.803	7.70	22.369	2.24e-07	1.23e-01	7.43e-05	0.00e+00
5	1.00	0.1144	0.730	11.4	30.831	1.51e-07	7.49e-02	3.05e-05	0.00e+00
6	2.00	0.1541	0.652	15.4	22.336	1.91e-07	3.97e-02	2.05e-05	0.00e+00
7	4.00	0.1904	0.581	19.0	22.559	1.73e-07	1.81e-02	8.47e-06	0.00e+00
8	8.00	0.2239	0.516	22.4	23.317	1.54e-07	8.38e-03	3.47e-06	0.00e+00
9	16.0	0.2523	0.461	25.2	22.954	1.44e-07	3.54e-03	1.38e-06	0.00e+00
10	32.0	0.2807	0.405	28.1	22.624	1.36e-07	1.78e-03	6.51e-07	0.00e+00
11	8.00	0.2690	0.428	26.9	0.147	2.03e-05	4.89e-04	2.68e-05	0.00e+00
12	2.00	0.2628	0.440	26.3	0.000	0.00e+00	1.03e-03	0.00e+00	0.00e+00
13	0.500	0.2583	0.449	25.8	0.000	0.00e+00	3.00e-03	0.00e+00	0.00e+00
14	0.125	0.2467	0.472	24.7	0.000	0.00e+00	3.10e-02	0.00e+00	0.00e+00
15	0.0625	0.2398	0.485	24.0	0.000	0.00e+00	1.11e-01	0.00e+00	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJSB036	Tested By: trm	Checked By: njh
	Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
	Test No.: IP-8	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0643	0.01265	0.929	1.26	100.137	2.42e-07	1.97e-01	1.28e-04
2	0.125	0.02520	0.904	2.52	92.019	2.57e-07	2.07e-01	1.43e-04
3	0.250	0.04628	0.863	4.63	91.011	2.51e-07	1.69e-01	1.14e-04
4	0.500	0.07699	0.803	7.70	120.783	1.79e-07	1.23e-01	5.92e-05
5	1.00	0.1144	0.730	11.4	138.043	1.45e-07	7.49e-02	2.94e-05
6	2.00	0.1541	0.652	15.4	93.298	1.97e-07	3.97e-02	2.11e-05
7	4.00	0.1904	0.581	19.0	100.794	1.67e-07	1.81e-02	8.16e-06
8	8.00	0.2239	0.516	22.4	90.617	1.70e-07	8.38e-03	3.85e-06
9	16.0	0.2523	0.461	25.2	99.063	1.44e-07	3.54e-03	1.37e-06
10	32.0	0.2807	0.405	28.1	81.349	1.62e-07	1.78e-03	7.79e-07
11	8.00	0.2690	0.428	26.9	1.429	9.03e-06	4.89e-04	1.19e-05
12	2.00	0.2628	0.440	26.3	135.930	9.73e-08	1.03e-03	2.71e-07
13	0.500	0.2583	0.449	25.8	179.034	7.49e-08	3.00e-03	6.06e-07
14	0.125	0.2467	0.472	24.7	264.522	5.18e-08	3.10e-02	4.33e-06
15	0.0625	0.2398	0.485	24.0	0.000	0.00e+00	1.11e-01	0.00e+00

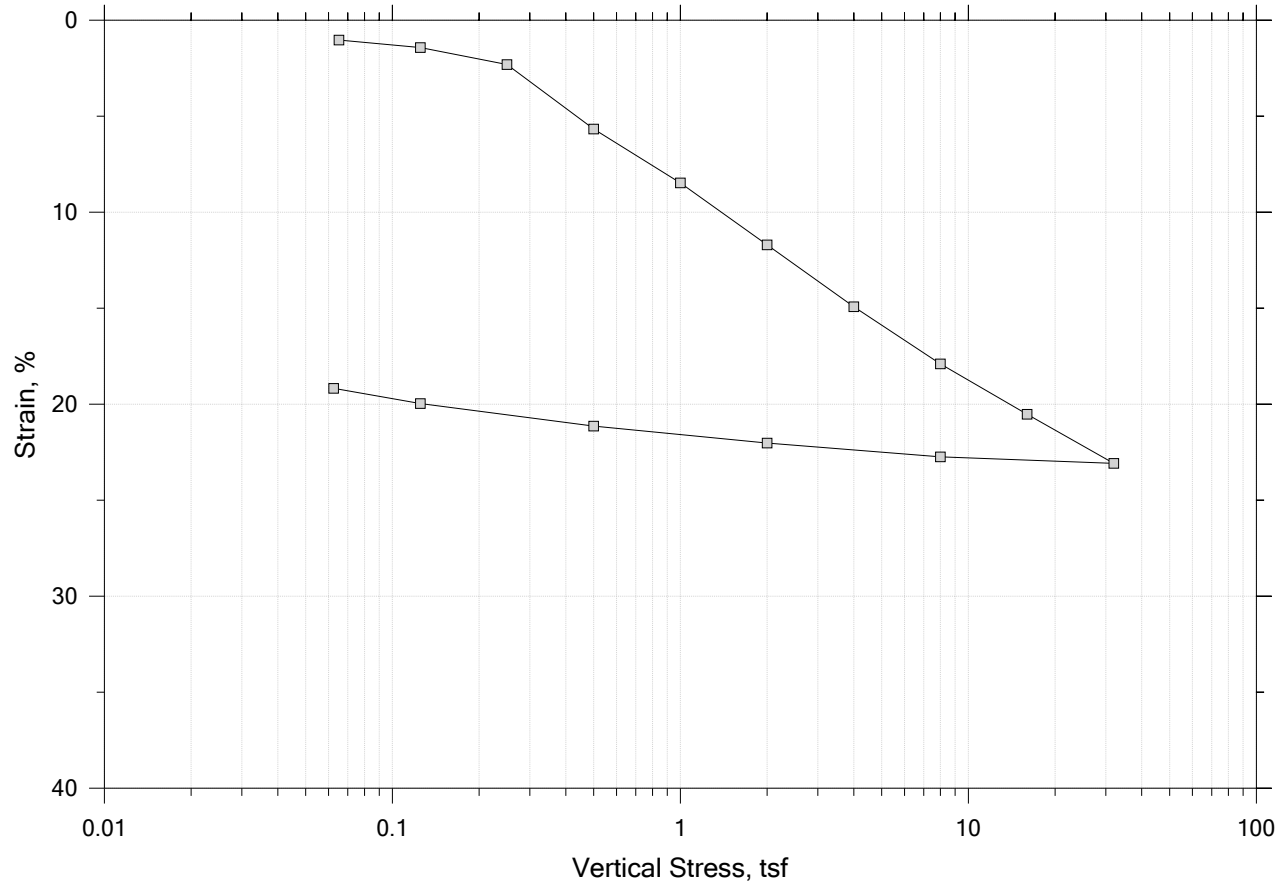
GeoTesting EXPRESS

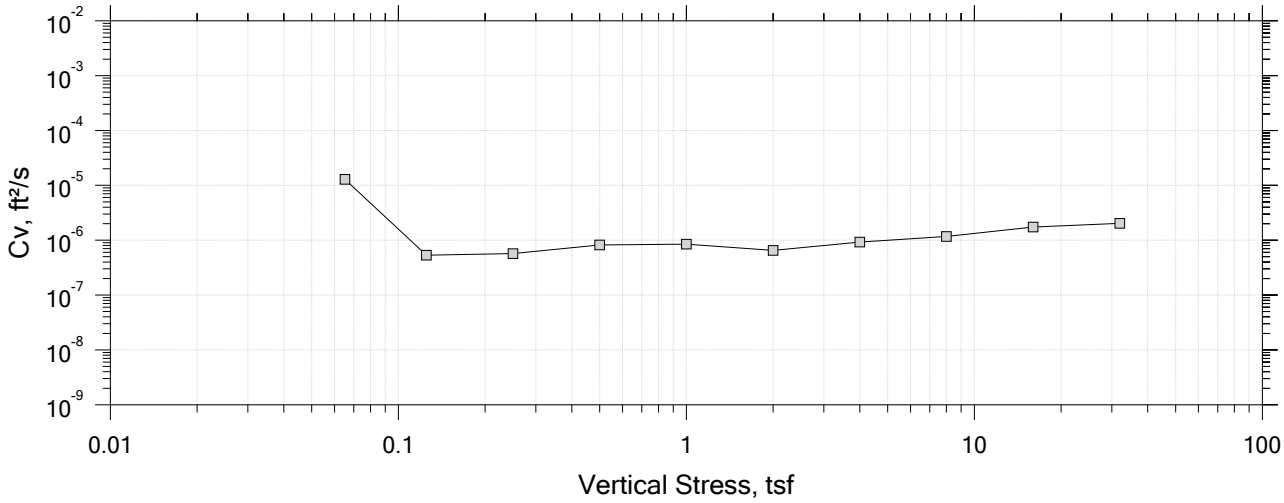
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJSB036	Tested By: trm	Checked By: njh
Sample No.: SL0674	Test Date: 2/25/19	Depth: 8-10 ft
Test No.: IP-8	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-B, Swell Pressure = 0.0643 tsf		
Displacement at End of Increment		

Attachment Figure A.4-313

One-Dimensional Consolidation by ASTM D2435 - Method B

Summary Report

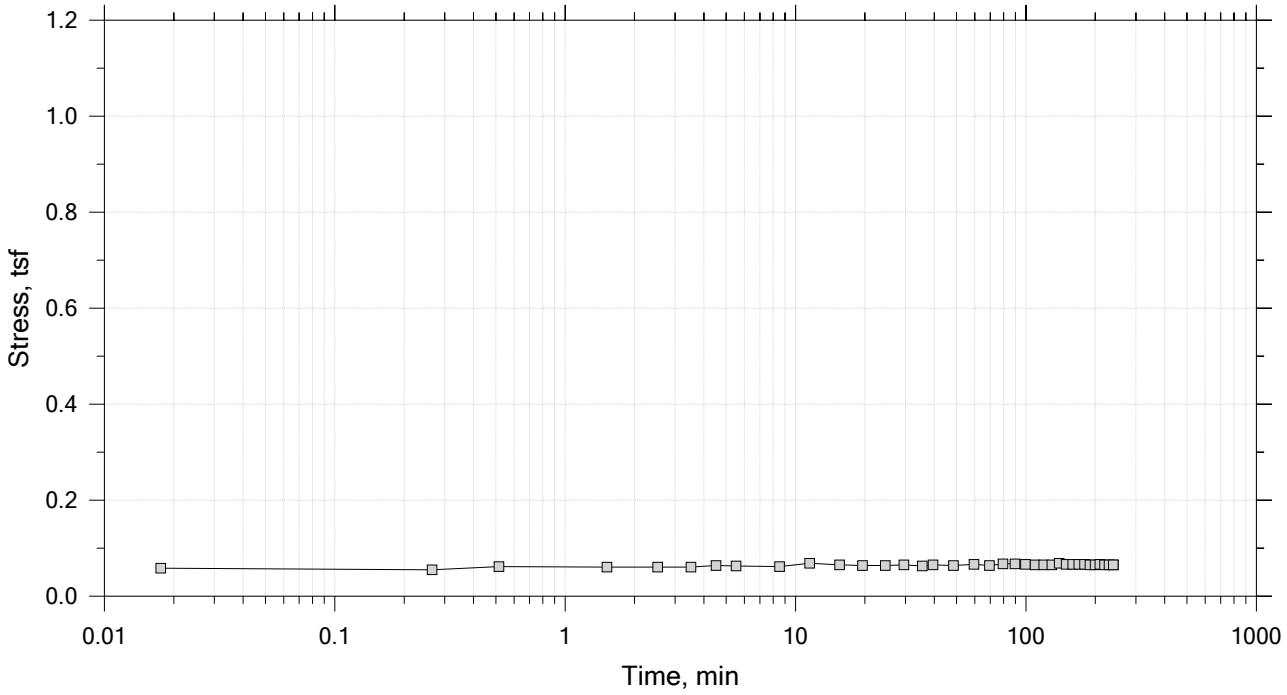


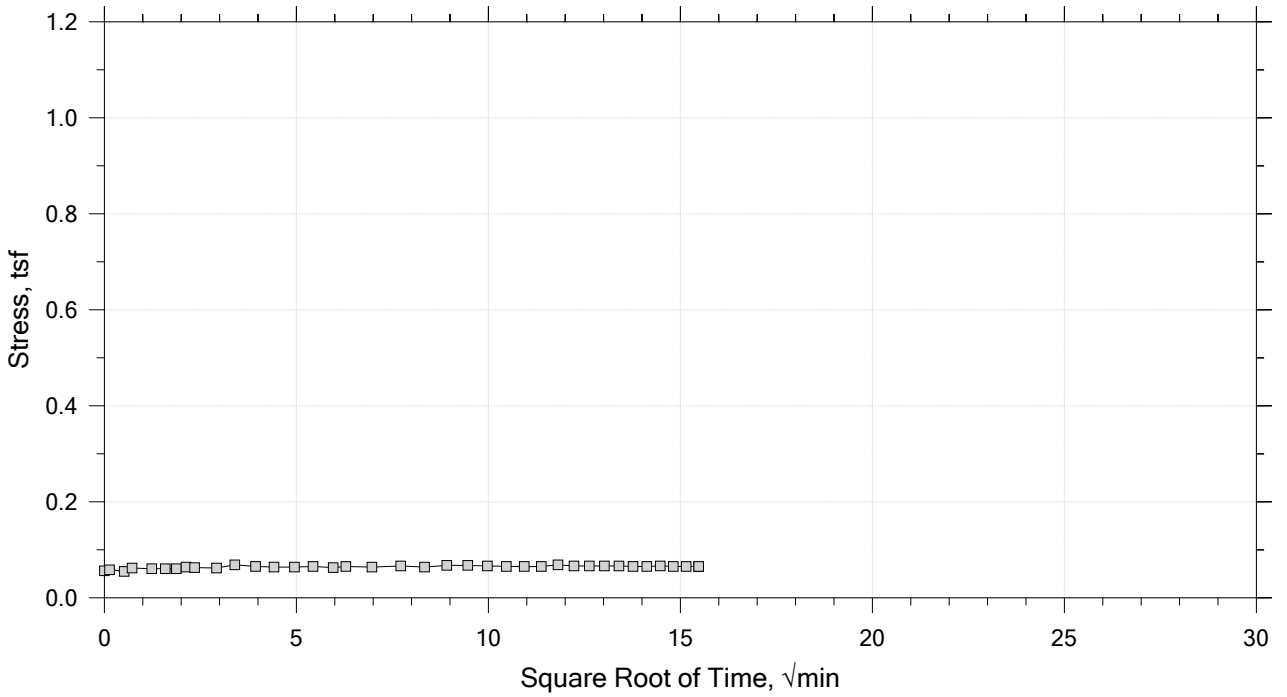


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 1 of 15
Constant Volume Step
Stress: 0.0652 tsf





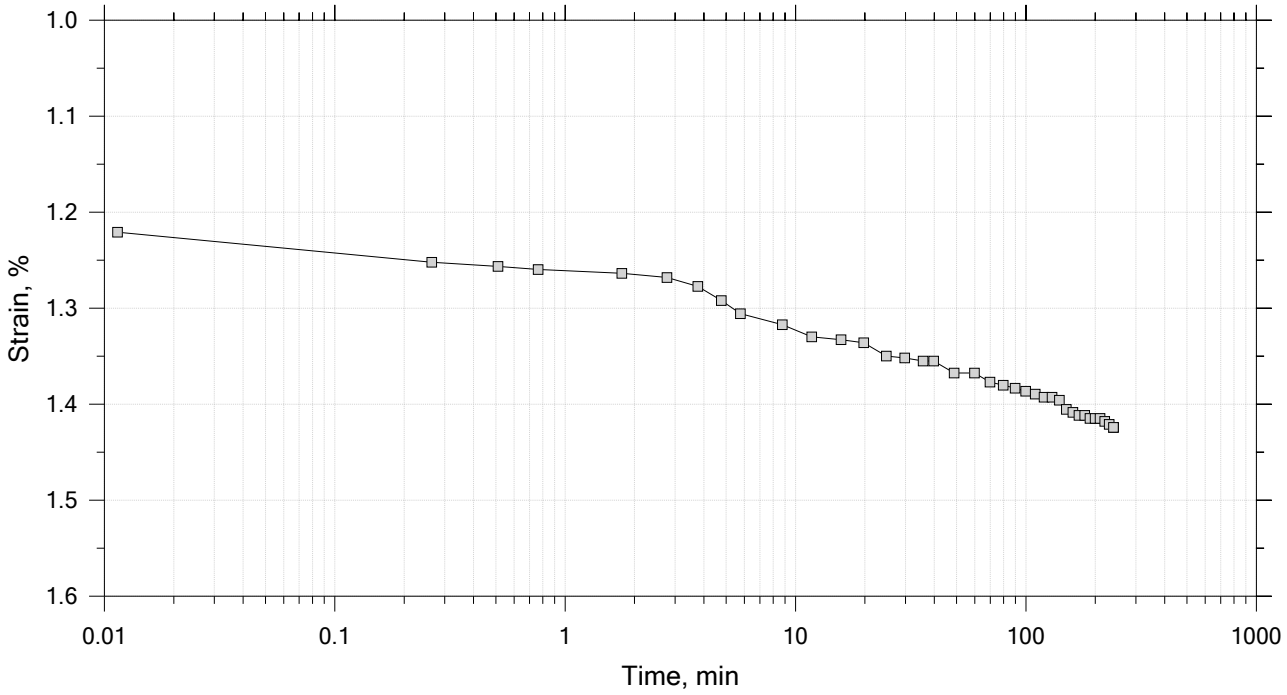
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

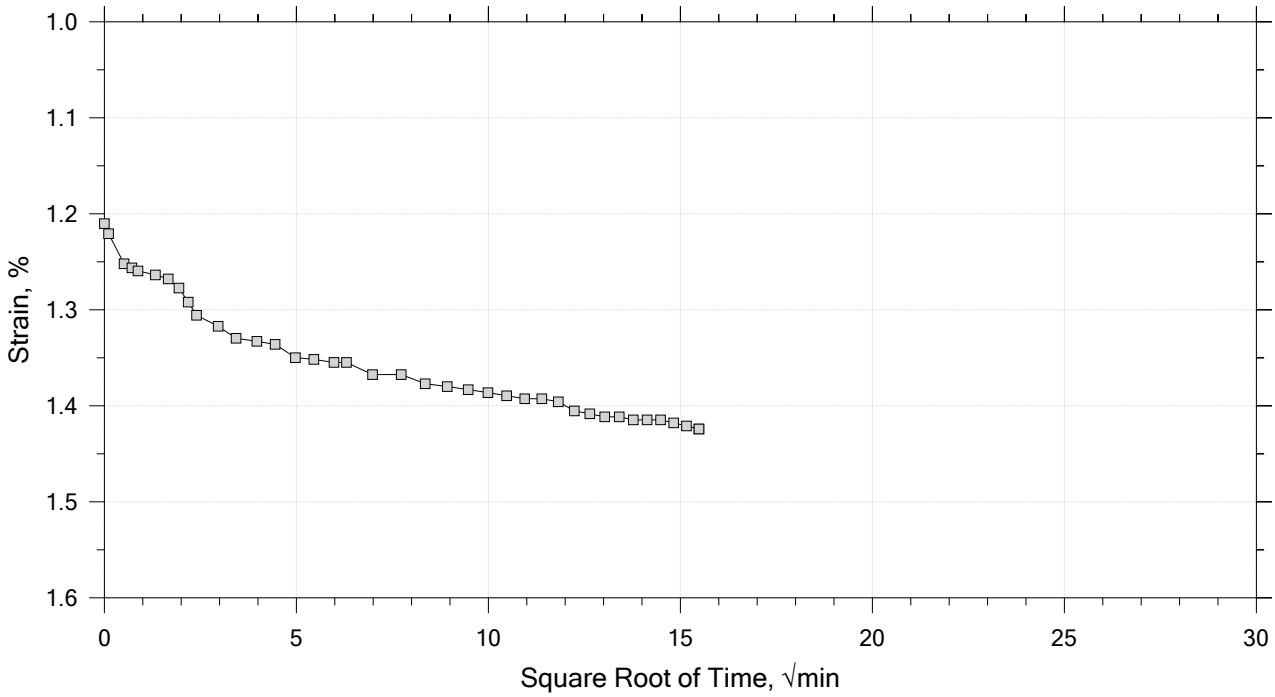
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 2 of 15

Constant Load Step

Stress: 0.125 tsf

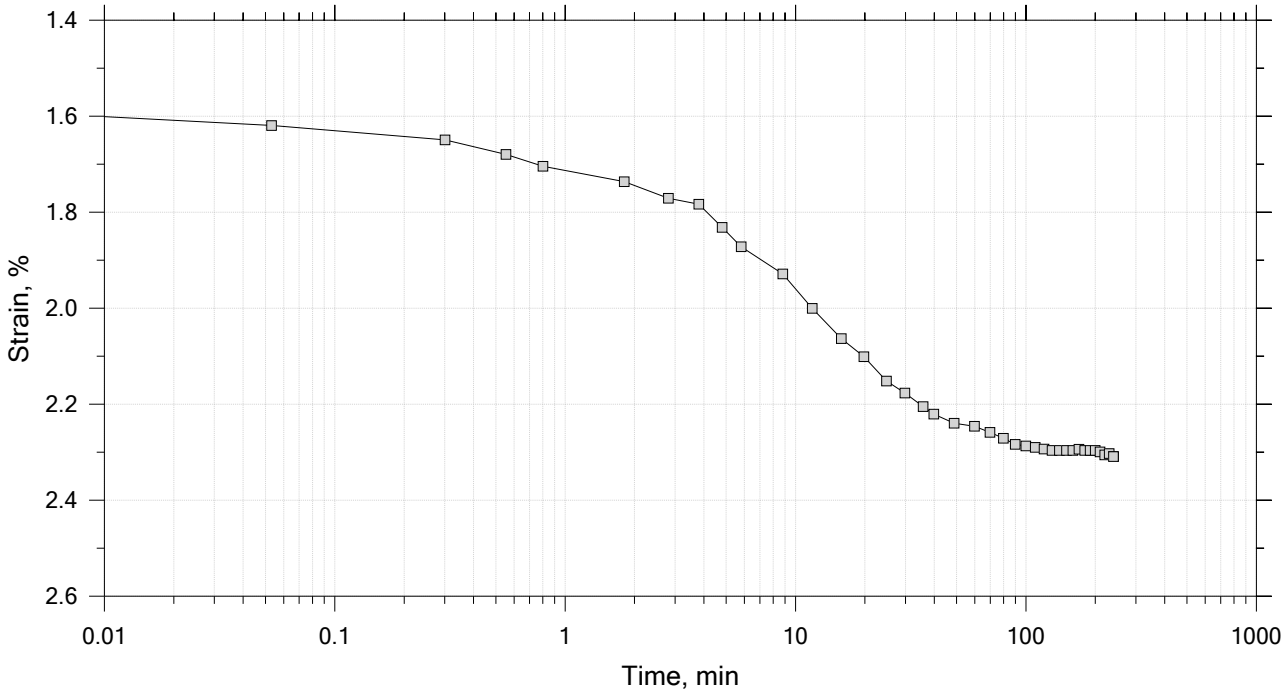


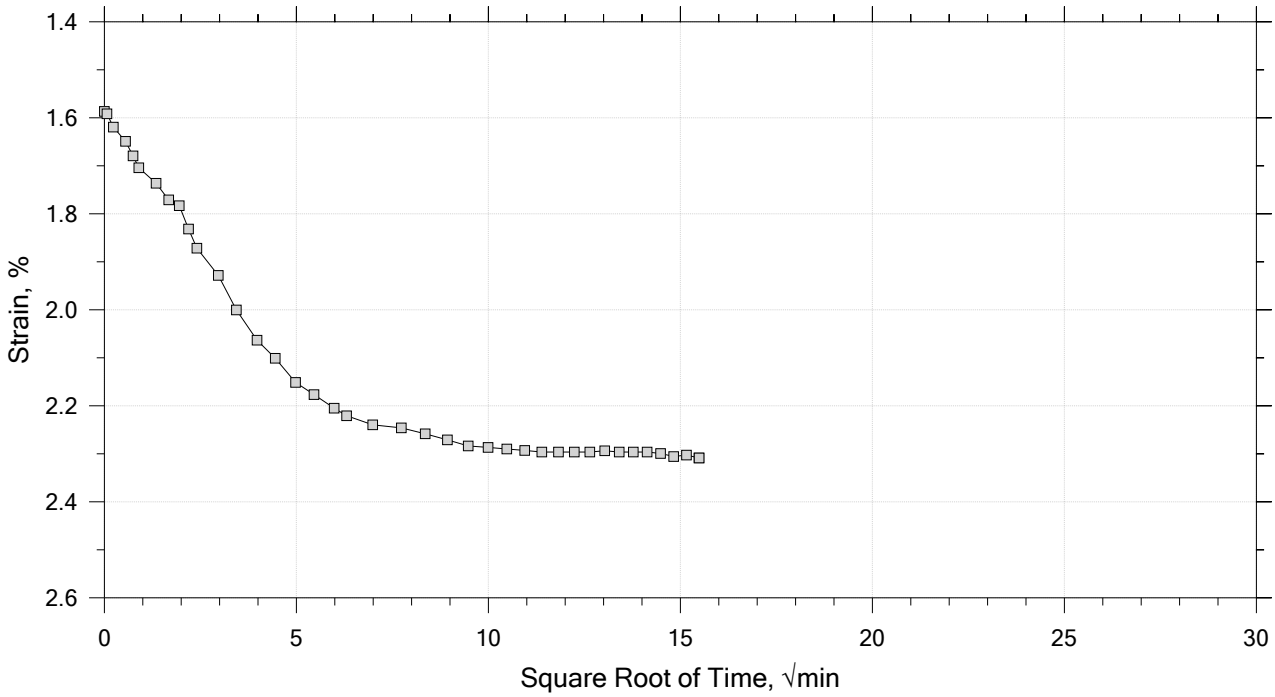


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 3 of 15
Constant Load Step
Stress: 0.25 tsf

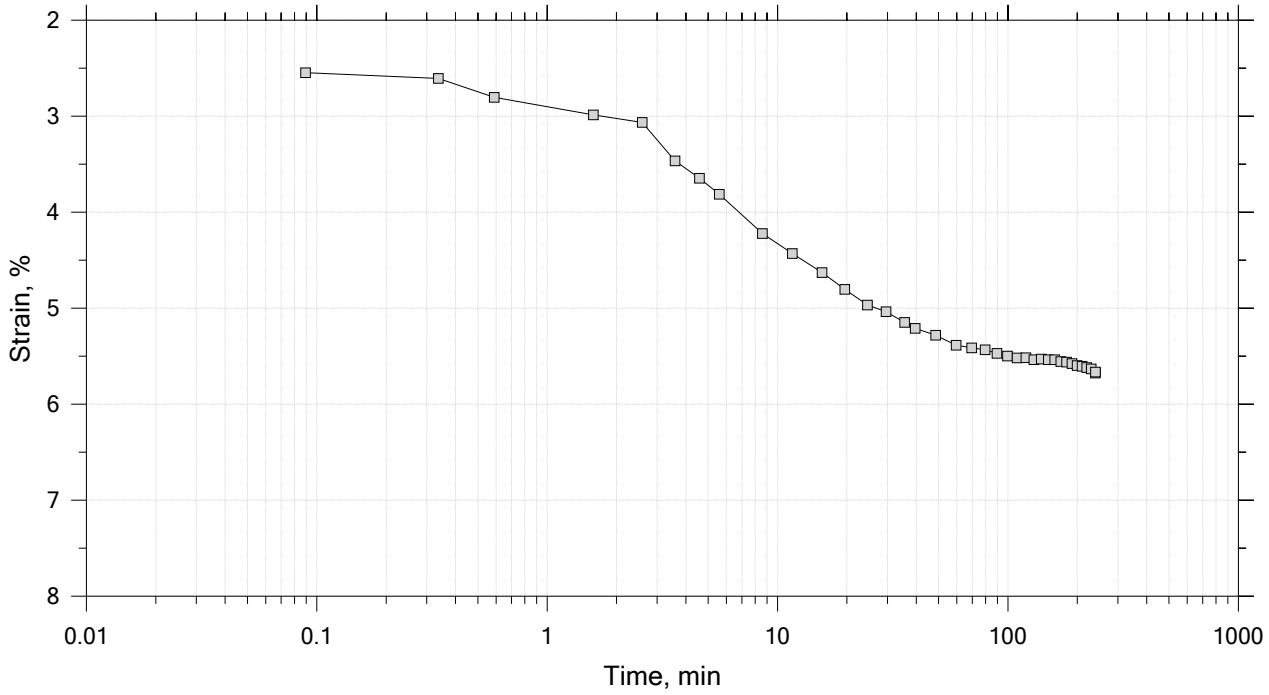


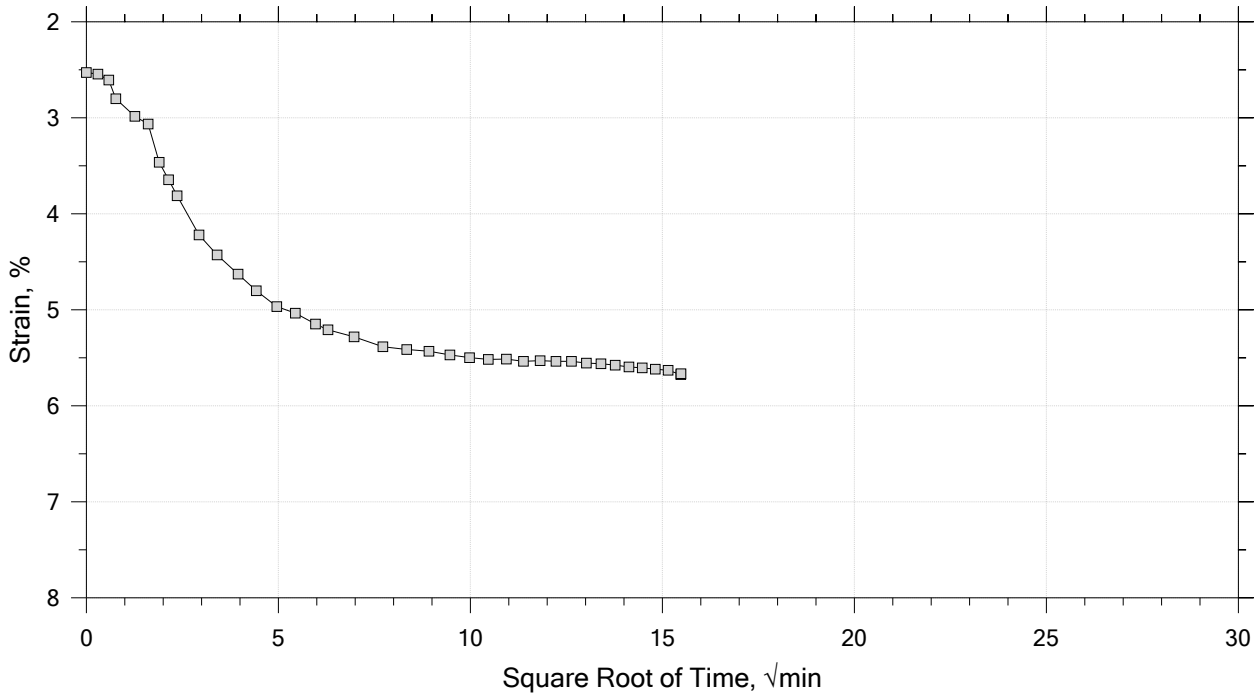


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 4 of 15
Constant Load Step
Stress: 0.5 tsf





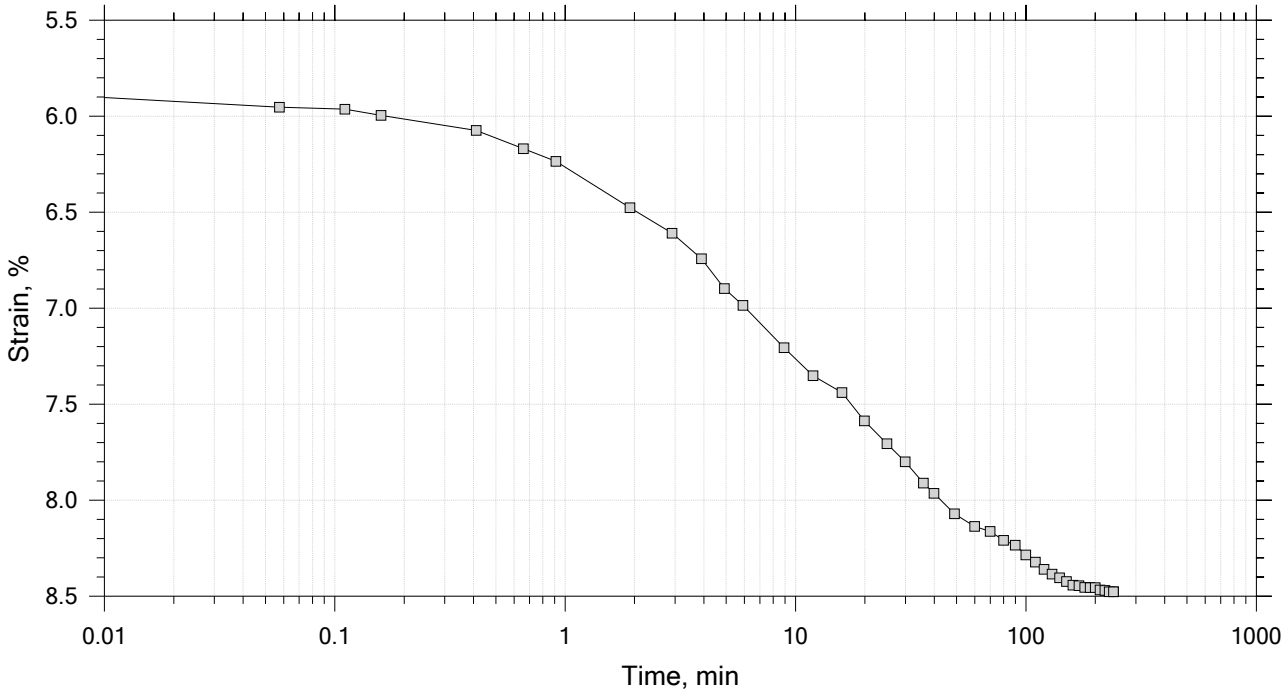
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

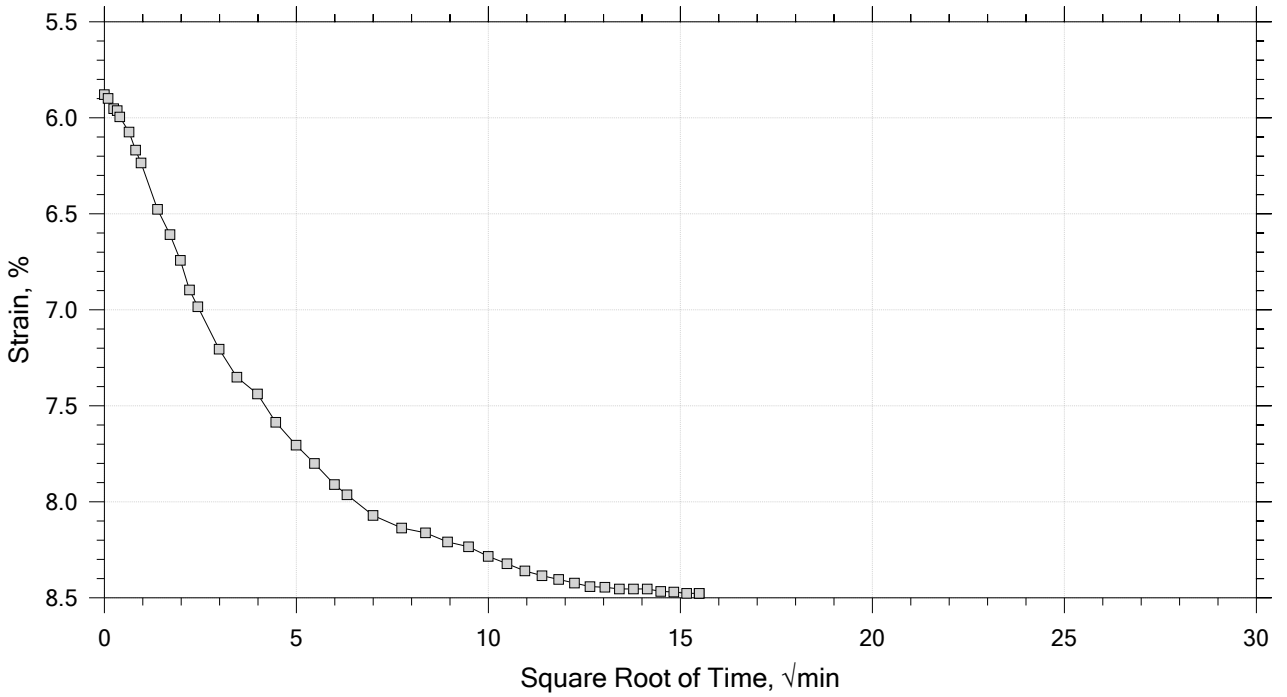
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 5 of 15

Constant Load Step

Stress: 1 tsf





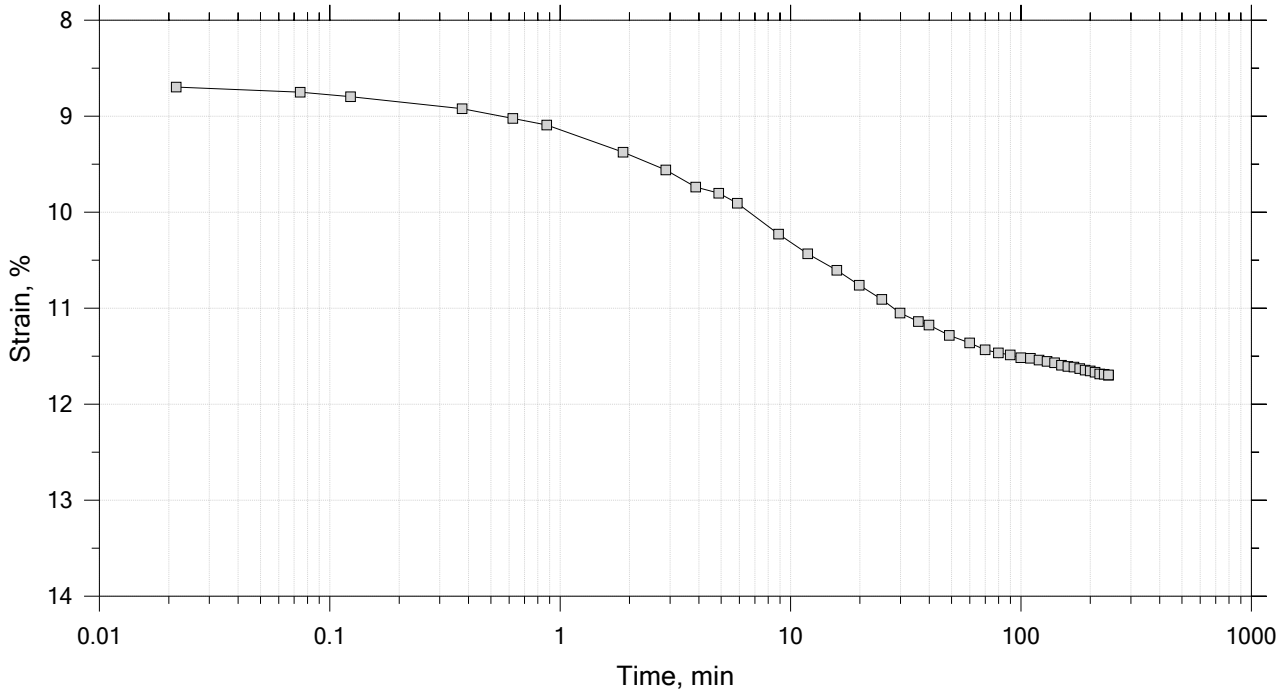
GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

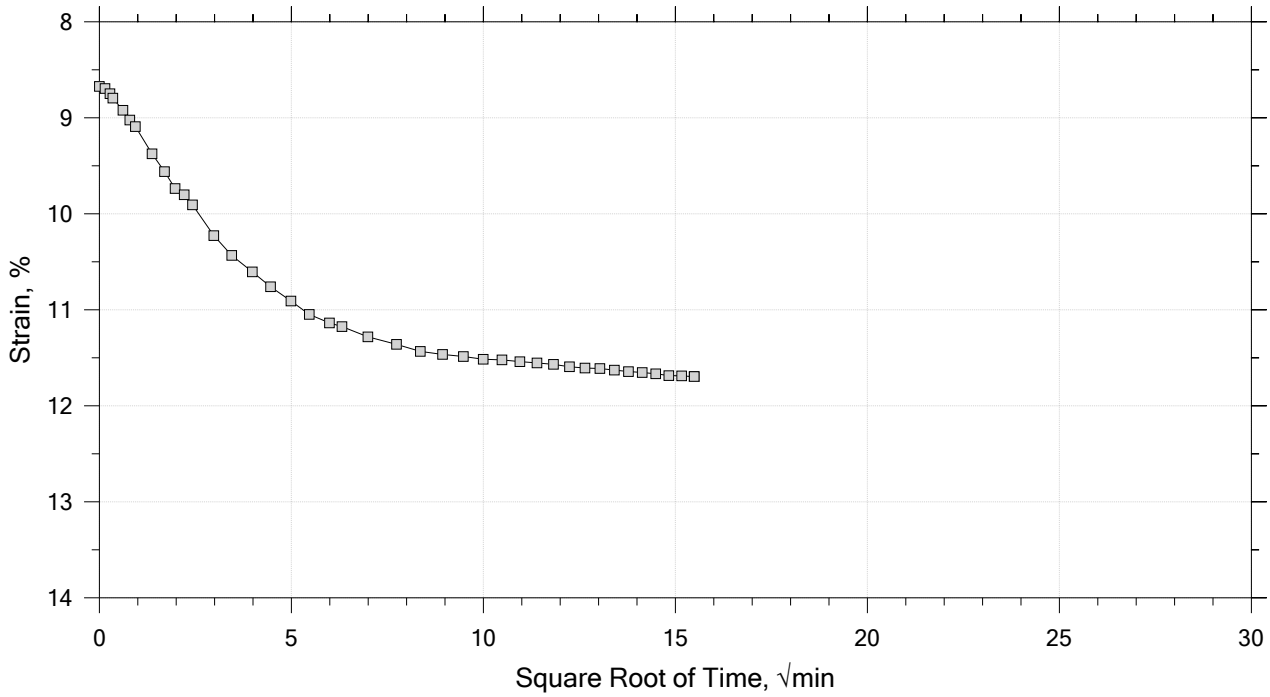
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 6 of 15

Constant Load Step

Stress: 2 tsf

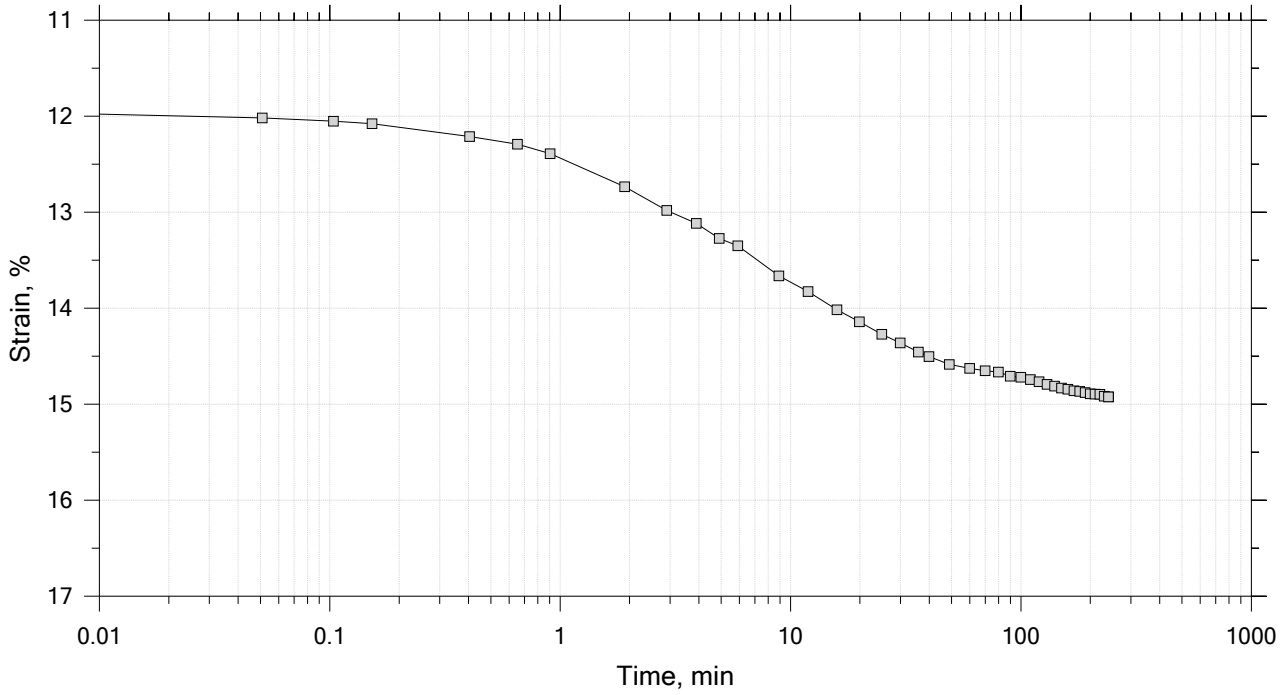


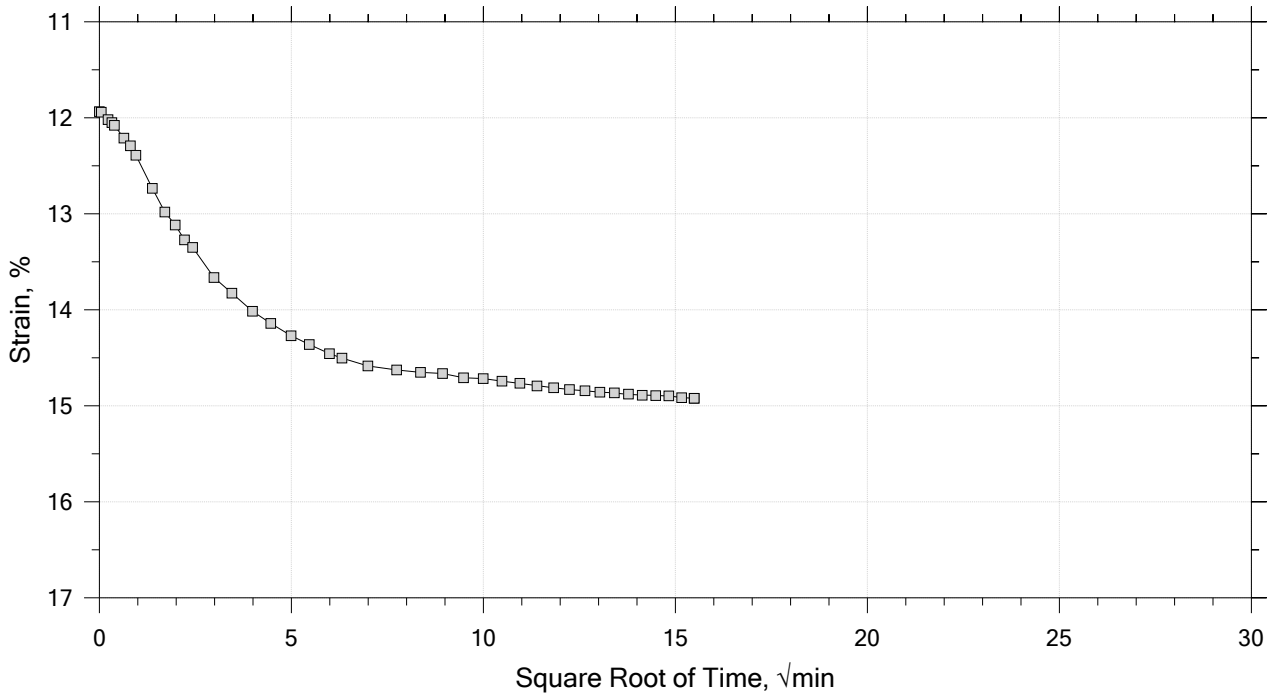


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 7 of 15
Constant Load Step
Stress: 4 tsf





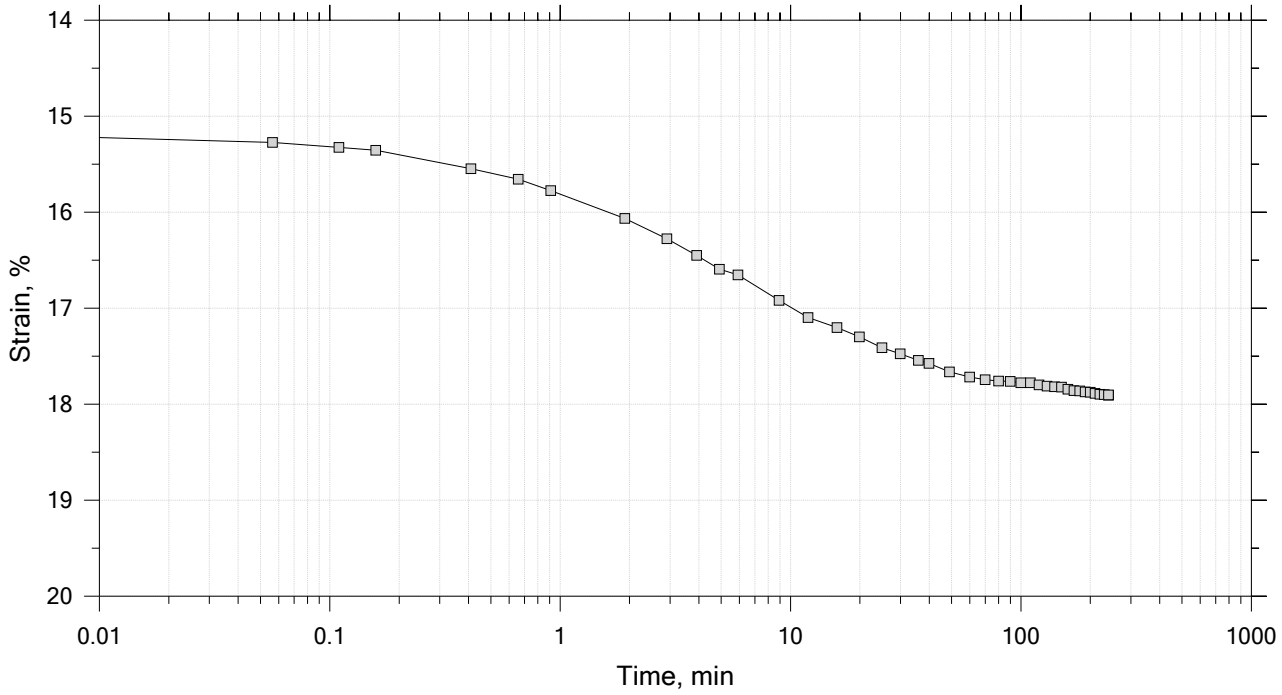
Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB037	Tested By: md	Checked By: njh
Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
Test No.: IP-9	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

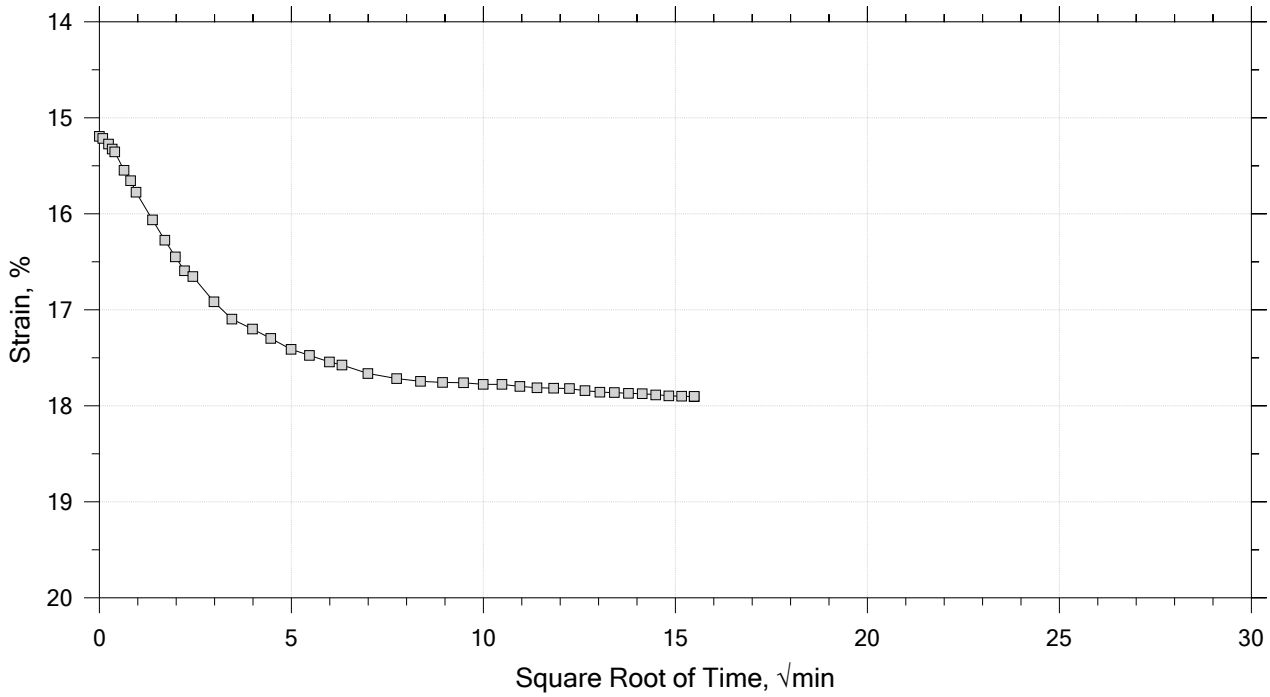
One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 8 of 15

Constant Load Step

Stress: 8 tsf

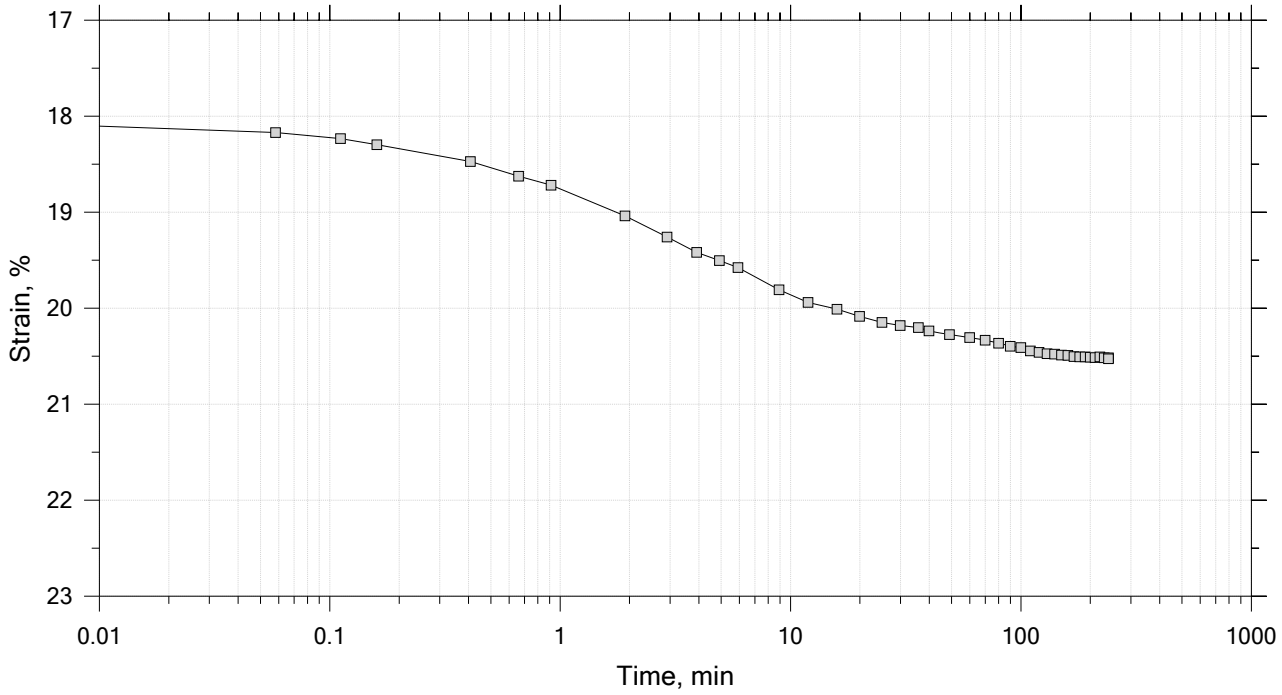


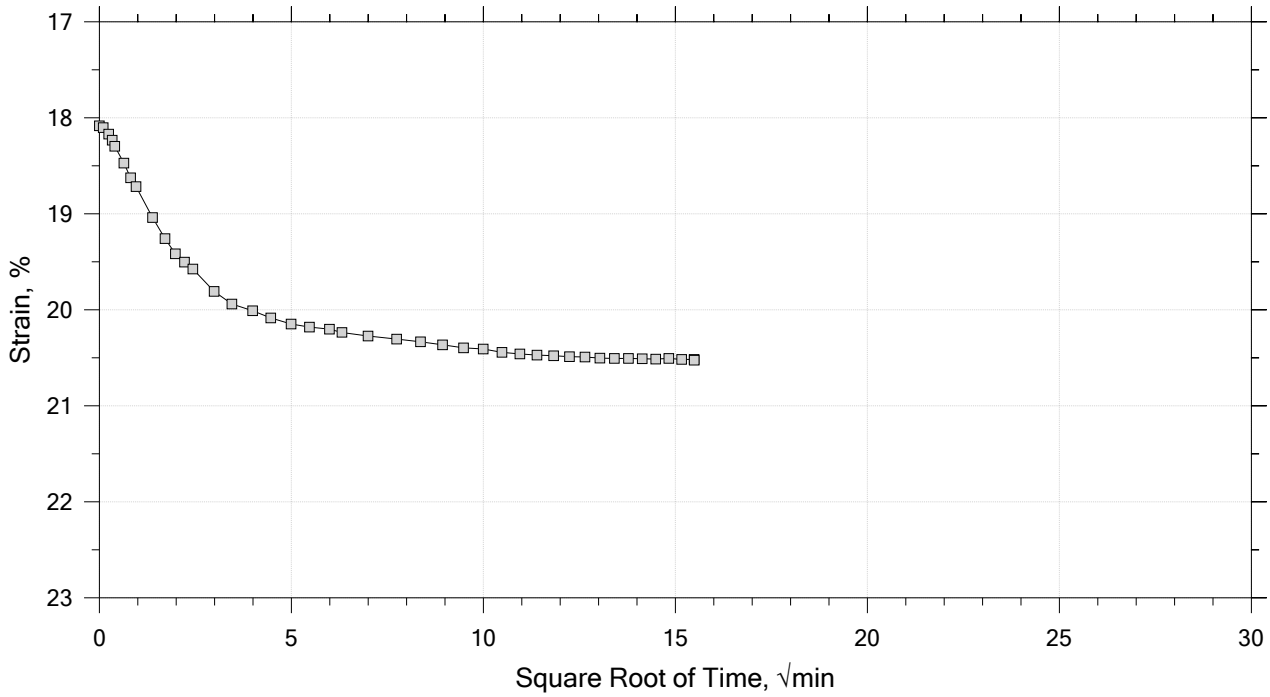


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 9 of 15
Constant Load Step
Stress: 16 tsf

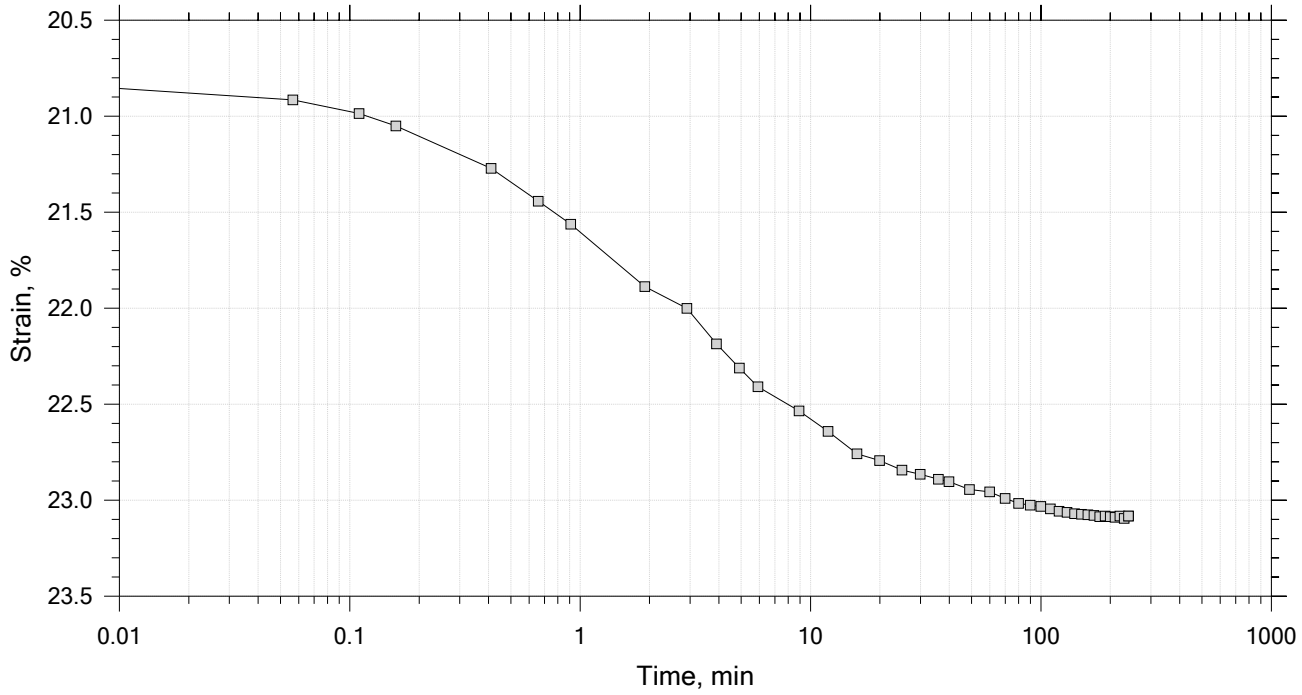


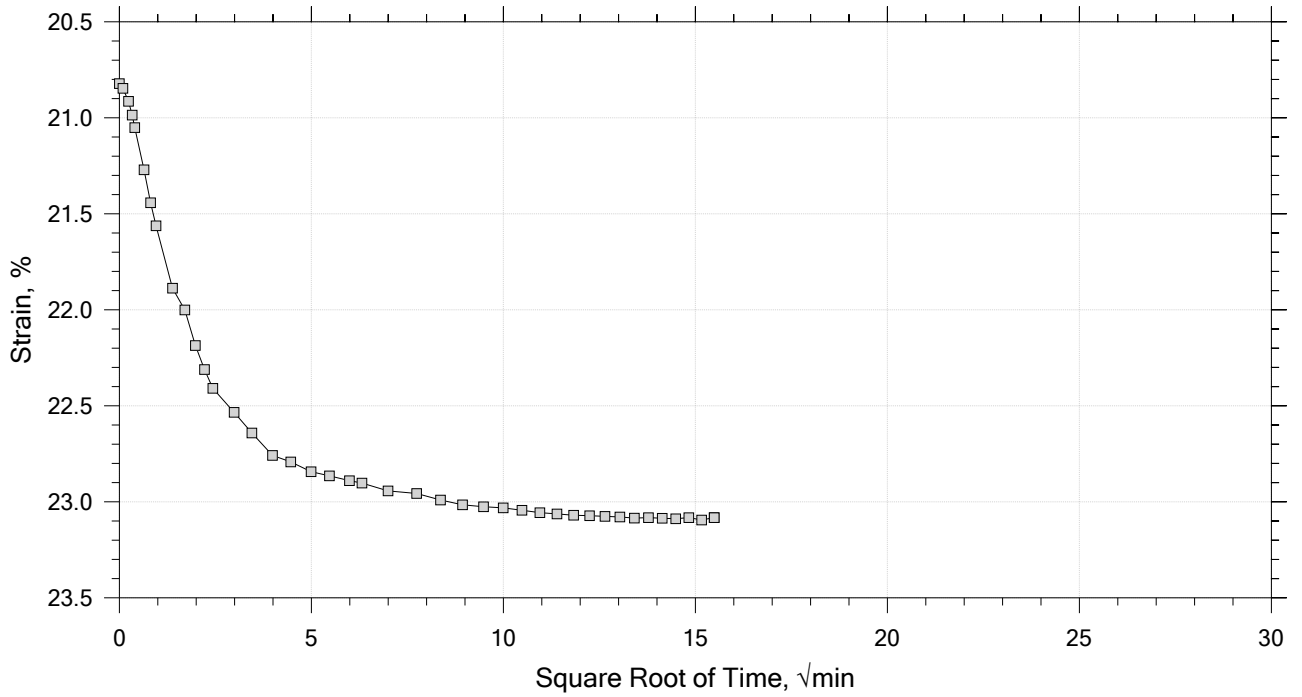


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 10 of 15
Constant Load Step
Stress: 32 tsf

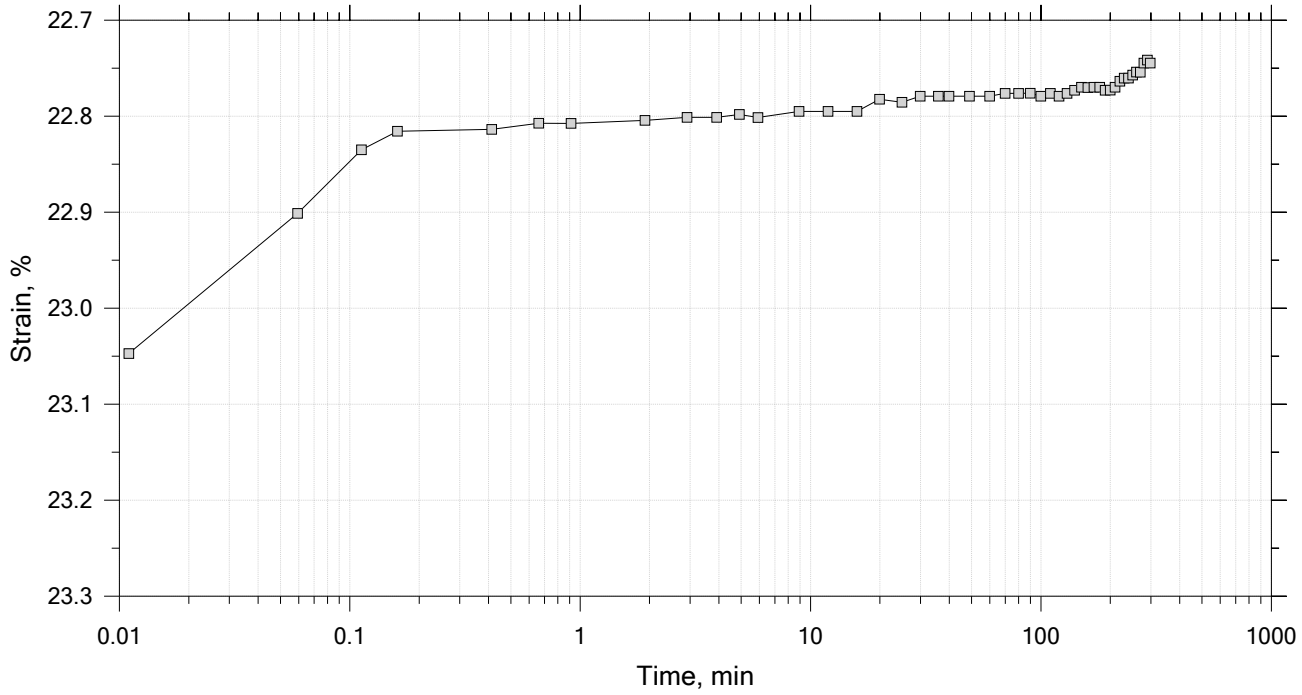


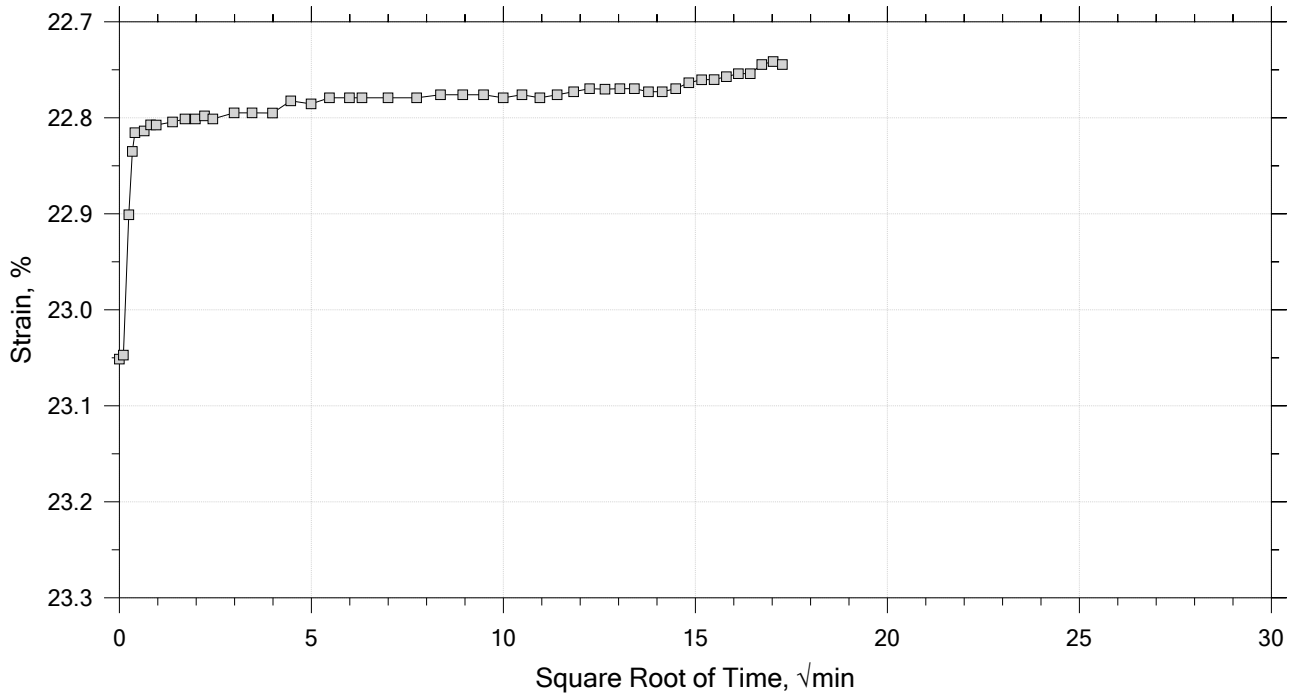


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB037	Tested By: md	Checked By: njh
Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
Test No.: IP-9	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 11 of 15
Constant Load Step
Stress: 8 tsf

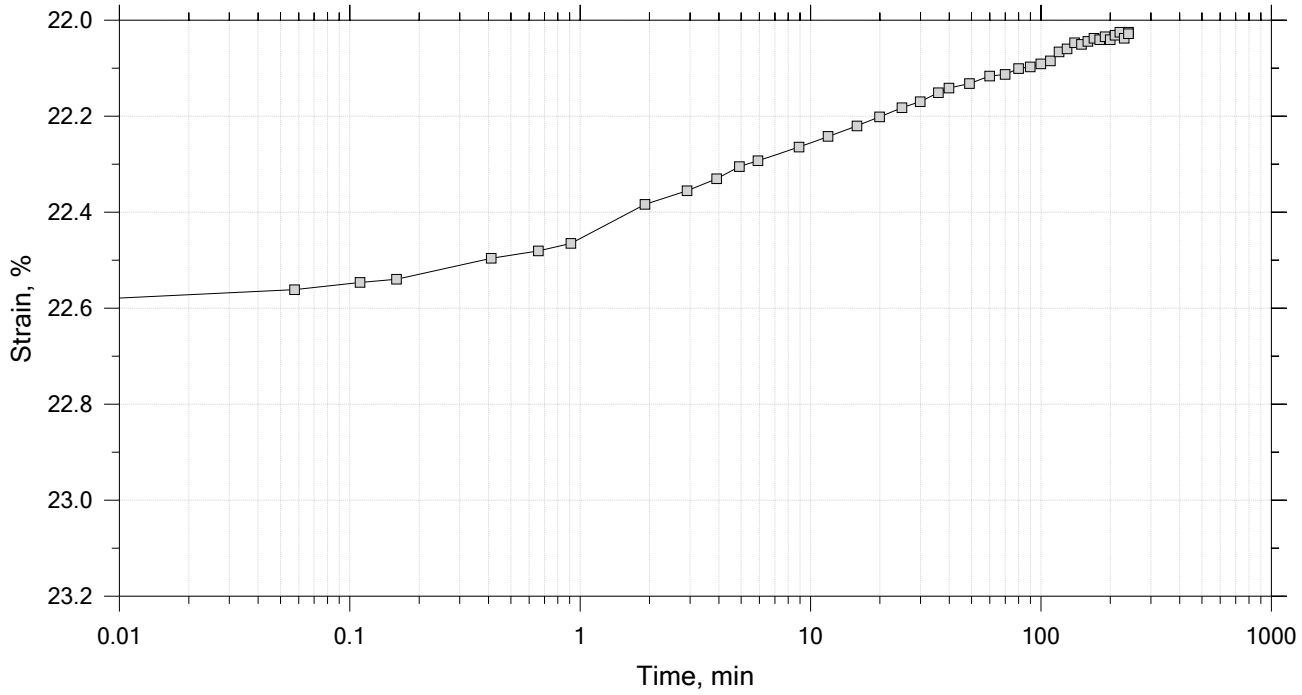


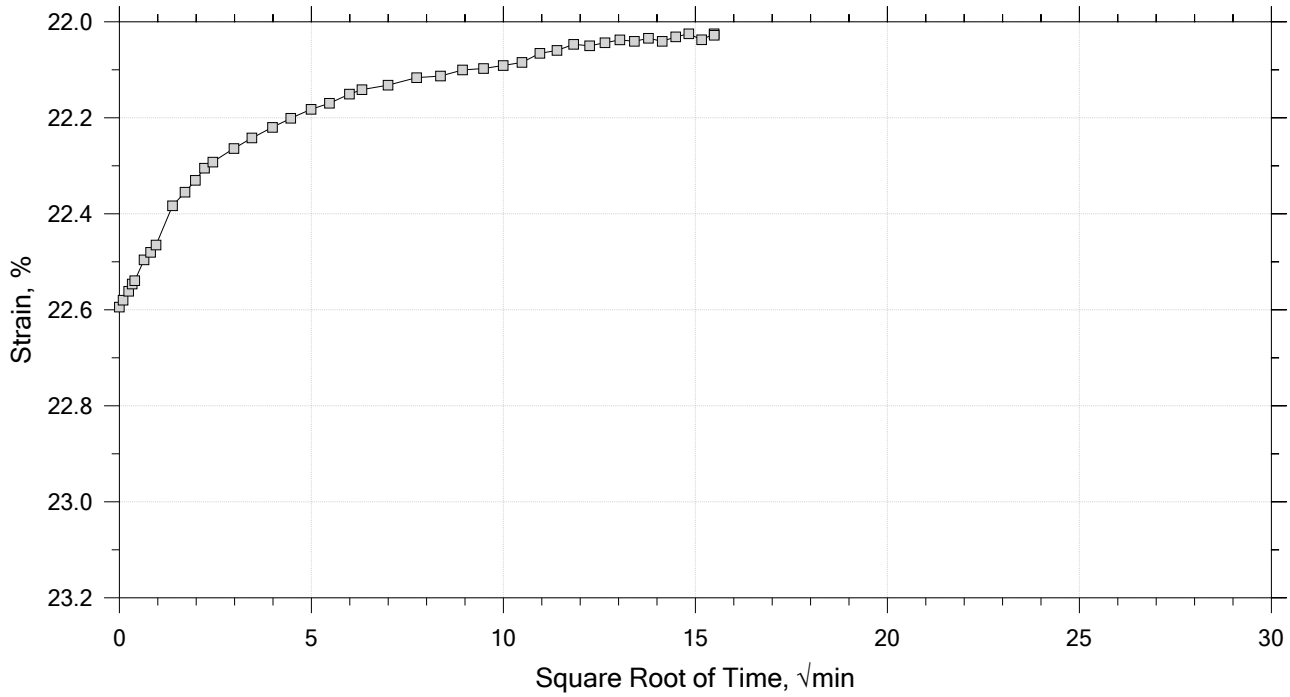


Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
Boring No.: SJGB037	Tested By: md	Checked By: njh
Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
Test No.: IP-9	Sample Type: intact	Elevation: ---
Description: Moist, gray clay with sand		
Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 12 of 15
Constant Load Step
Stress: 2 tsf

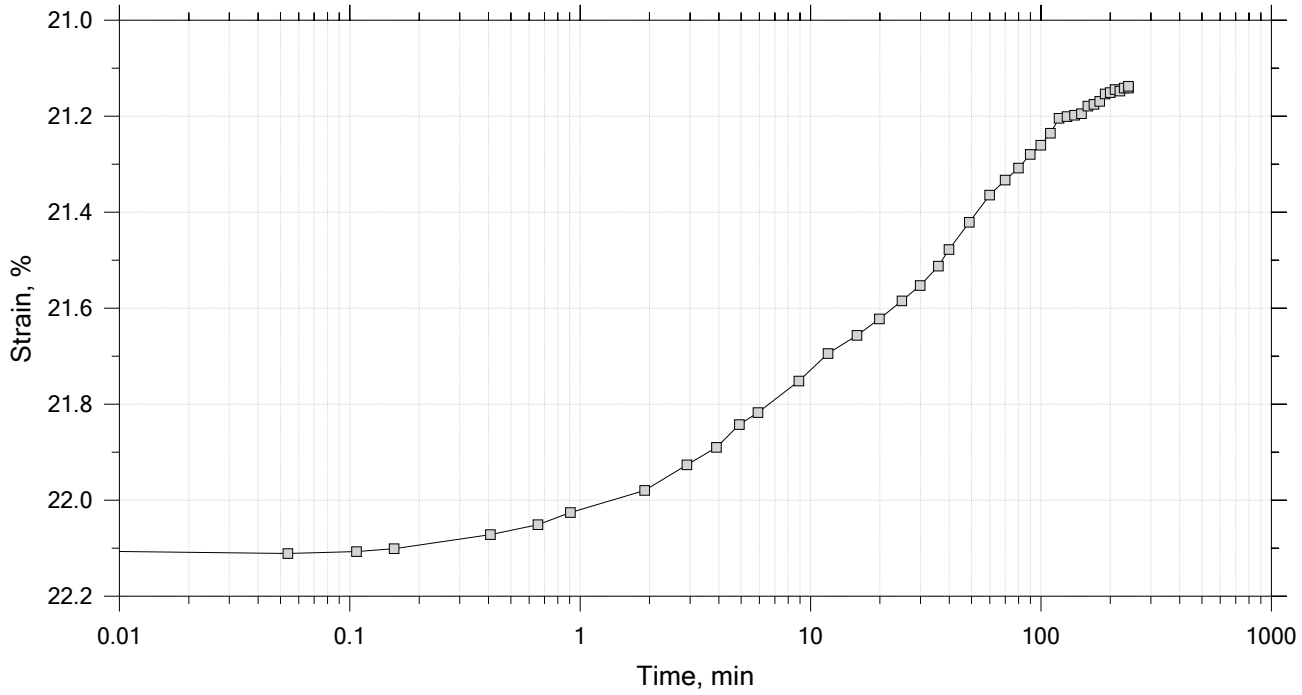


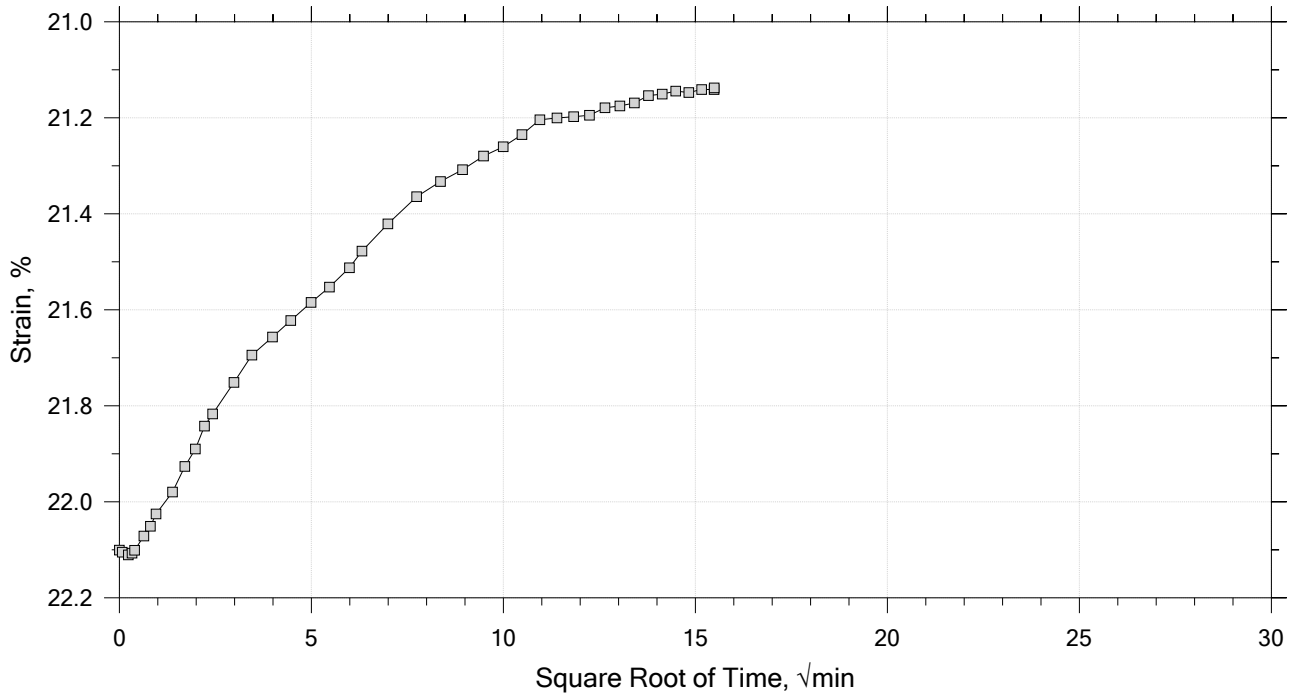


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 13 of 15
Constant Load Step
Stress: 0.5 tsf

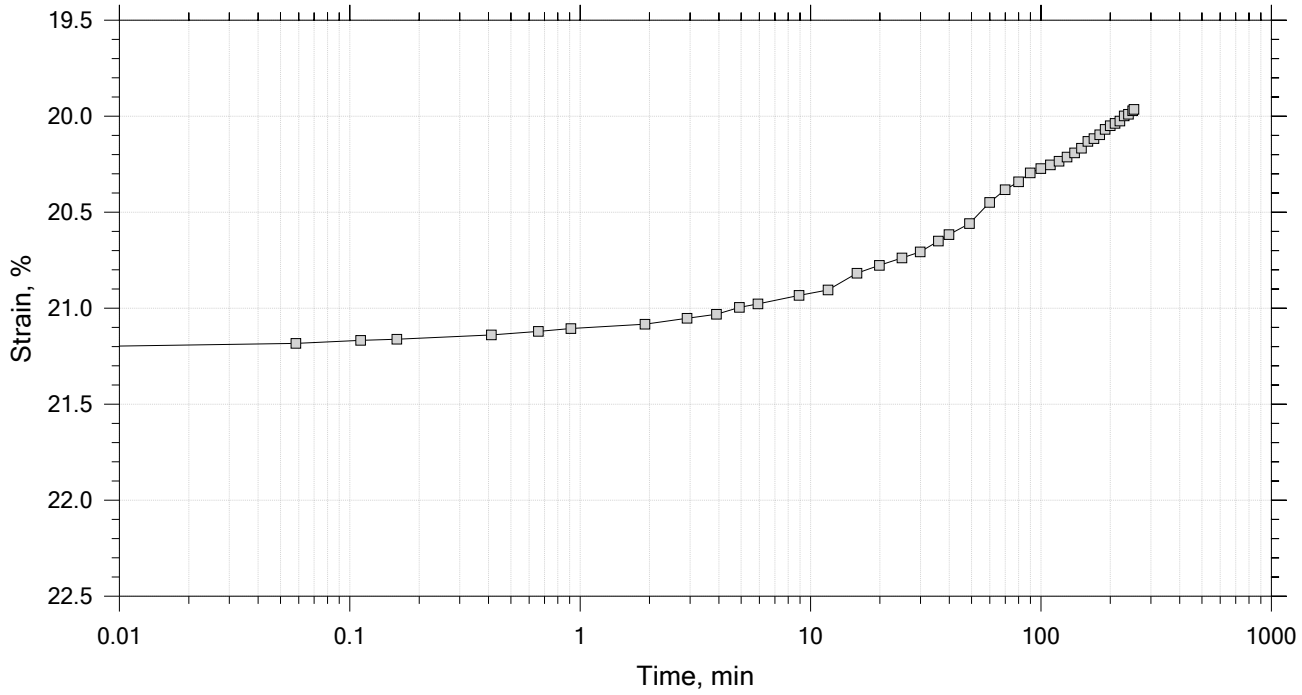


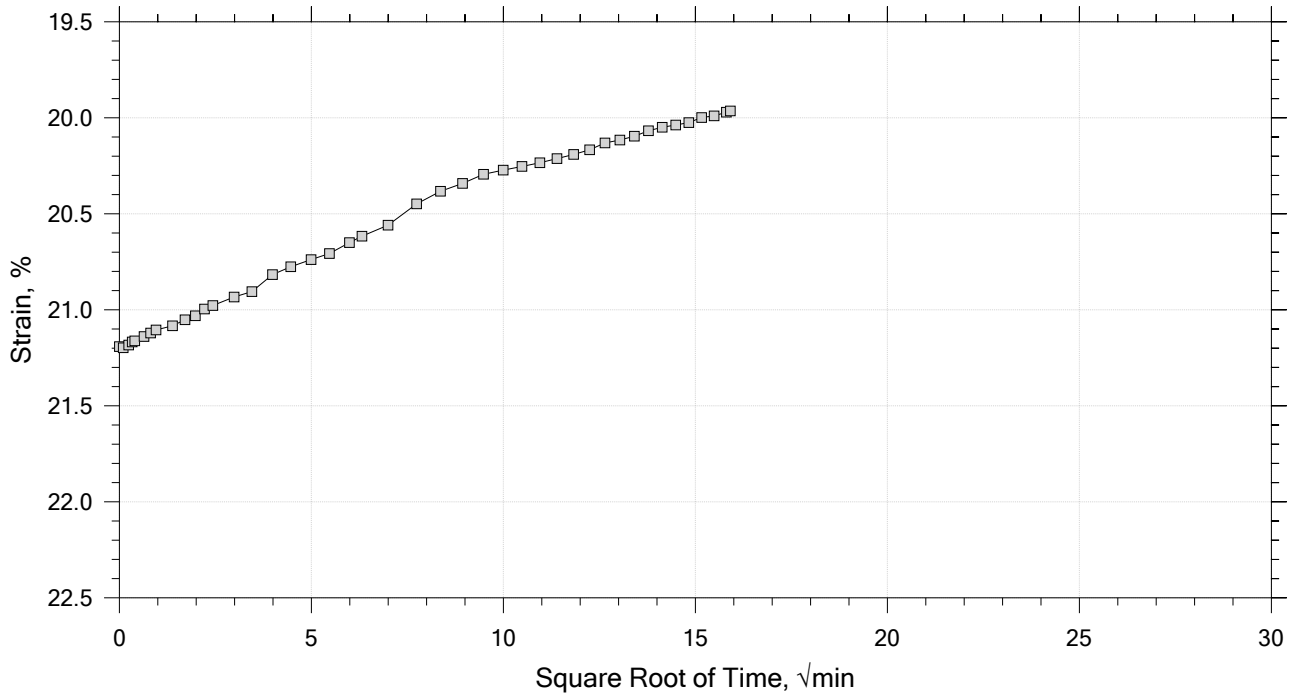


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 14 of 15
Constant Load Step
Stress: 0.125 tsf

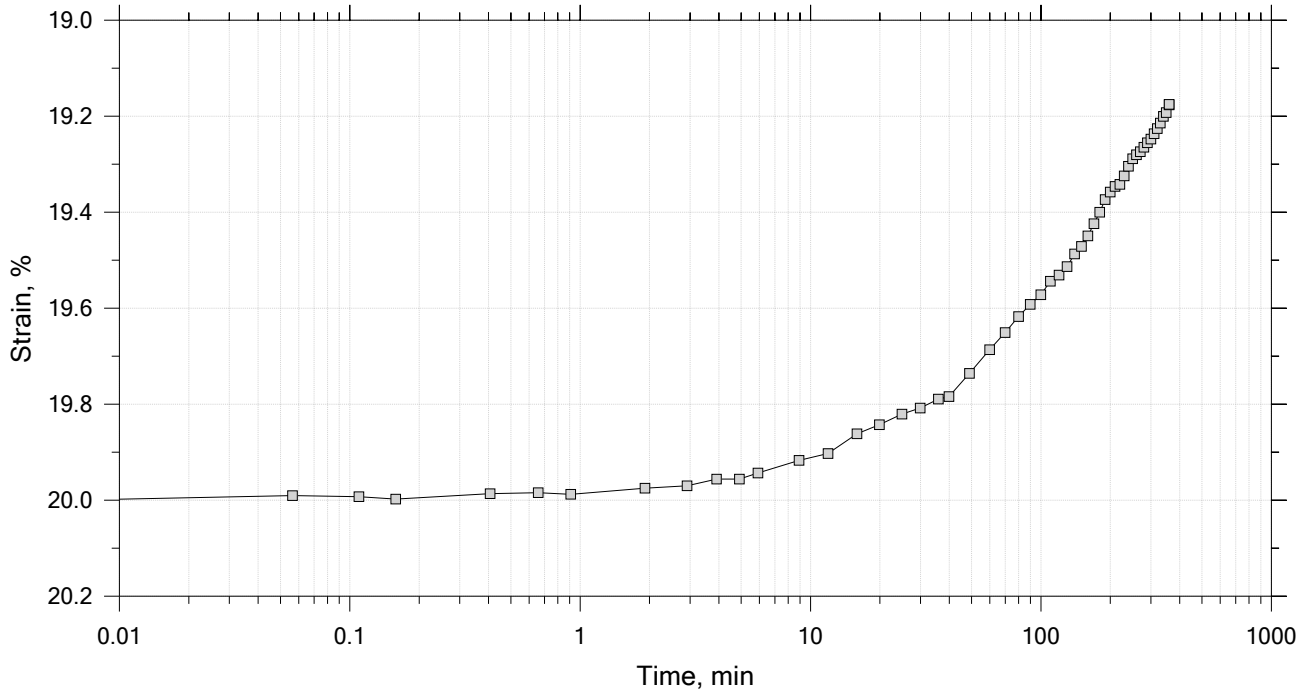


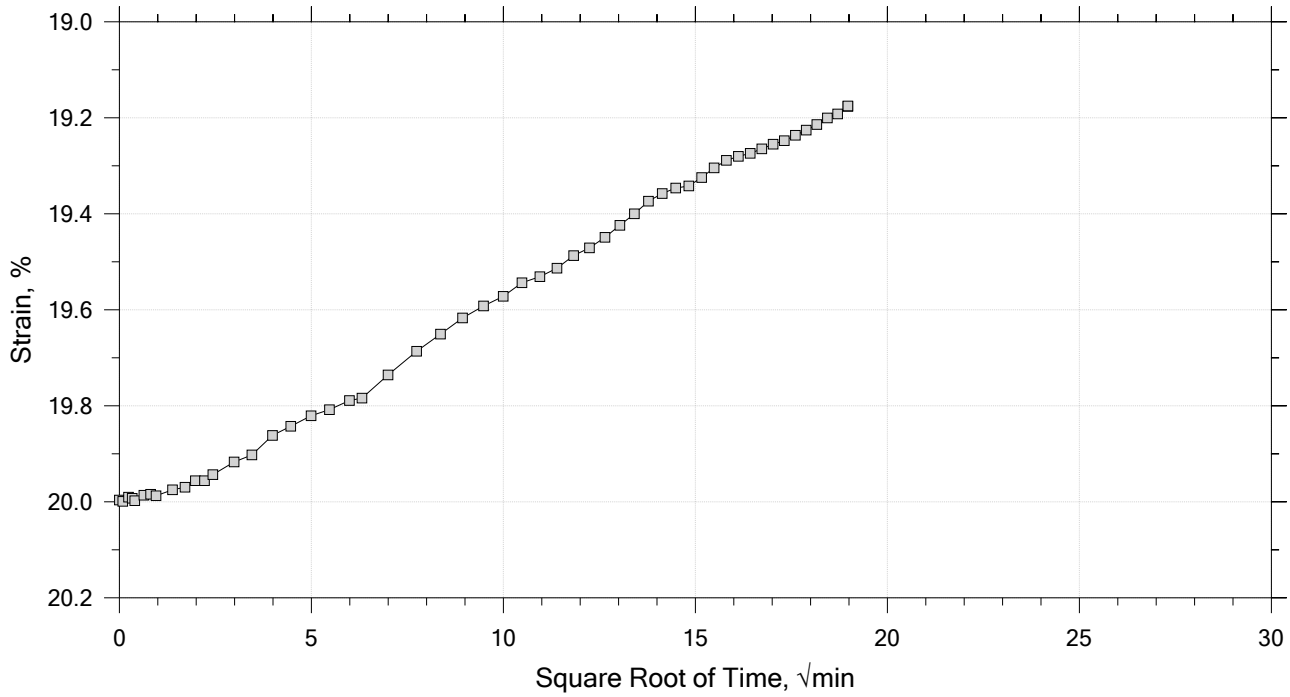


GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Time Curve 15 of 15
Constant Load Step
Stress: 0.0625 tsf





GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Specimen Diameter: 2.50 in	Estimated Specific Gravity: 2.70	Liquid Limit: ---
Initial Height: 1.00 in	Initial Void Ratio: 0.911	Plastic Limit: ---
Final Height: 0.81 in	Final Void Ratio: 0.548	Plasticity Index: ---

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A3073	RING		D1599
Mass Container, gm	8.35	108.06	108.06	8.59
Mass Container + Wet Soil, gm	232.79	257.49	244.6	144.76
Mass Container + Dry Soil, gm	194.74	221.53	221.53	121.75
Mass Dry Soil, gm	186.39	113.47	113.47	113.16
Water Content, %	20.41	31.69	20.33	20.33
Void Ratio	---	0.91	0.55	---
Degree of Saturation, %	---	93.76	100.00	---
Dry Unit Weight, pcf	---	88.06	108.72	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		

One-Dimensional Consolidation by ASTM D2435 - Method B

Log of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft²/s	Mv 1/tsf	k ft/day	Ca %
1	0.0652	0.01031	0.892	1.03	0.000	0.00e+00	1.58e-01	0.00e+00	0.00e+00
2	0.125	0.01424	0.884	1.42	0.000	0.00e+00	6.58e-02	0.00e+00	0.00e+00
3	0.250	0.02309	0.867	2.31	0.000	0.00e+00	7.08e-02	0.00e+00	0.00e+00
4	0.500	0.05665	0.803	5.67	6.067	8.66e-07	1.34e-01	3.14e-04	0.00e+00
5	1.00	0.08477	0.749	8.48	0.000	0.00e+00	5.62e-02	0.00e+00	0.00e+00
6	2.00	0.1169	0.688	11.7	7.151	6.44e-07	3.22e-02	5.59e-05	0.00e+00
7	4.00	0.1492	0.626	14.9	5.089	8.42e-07	1.61e-02	3.66e-05	0.00e+00
8	8.00	0.1790	0.569	17.9	3.792	1.05e-06	7.45e-03	2.11e-05	0.00e+00
9	16.0	0.2053	0.519	20.5	2.160	1.72e-06	3.28e-03	1.52e-05	0.00e+00
10	32.0	0.2308	0.470	23.1	1.948	1.79e-06	1.60e-03	7.71e-06	0.00e+00
11	8.00	0.2274	0.477	22.7	0.000	0.00e+00	1.41e-04	0.00e+00	0.00e+00
12	2.00	0.2203	0.490	22.0	0.000	0.00e+00	1.19e-03	0.00e+00	0.00e+00
13	0.500	0.2114	0.507	21.1	0.000	0.00e+00	5.94e-03	0.00e+00	0.00e+00
14	0.125	0.1996	0.530	20.0	0.000	0.00e+00	3.13e-02	0.00e+00	0.00e+00
15	0.0625	0.1918	0.545	19.2	100.192	3.68e-08	1.26e-01	1.25e-05	0.00e+00

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D2435 - Method B

Square Root of Time Coefficients

Step	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt. T90 min	Cv ft²/s	Mv 1/tsf	k ft/day
1	0.0652	0.01031	0.892	1.03	3.449	7.04e-06	1.58e-01	3.00e-03
2	0.125	0.01424	0.884	1.42	48.762	4.91e-07	6.58e-02	8.71e-05
3	0.250	0.02309	0.867	2.31	40.470	5.84e-07	7.08e-02	1.11e-04
4	0.500	0.05665	0.803	5.67	30.142	7.50e-07	1.34e-01	2.72e-04
5	1.00	0.08477	0.749	8.48	27.988	7.57e-07	5.62e-02	1.15e-04
6	2.00	0.1169	0.688	11.7	30.880	6.42e-07	3.22e-02	5.57e-05
7	4.00	0.1492	0.626	14.9	19.279	9.56e-07	1.61e-02	4.16e-05
8	8.00	0.1790	0.569	17.9	14.095	1.22e-06	7.45e-03	2.44e-05
9	16.0	0.2053	0.519	20.5	10.081	1.59e-06	3.28e-03	1.40e-05
10	32.0	0.2308	0.470	23.1	7.593	1.98e-06	1.60e-03	8.52e-06
11	8.00	0.2274	0.477	22.7	1.249	1.17e-05	1.41e-04	4.43e-06
12	2.00	0.2203	0.490	22.0	26.504	5.58e-07	1.19e-03	1.80e-06
13	0.500	0.2114	0.507	21.1	49.703	3.04e-07	5.94e-03	4.86e-06
14	0.125	0.1996	0.530	20.0	203.840	7.60e-08	3.13e-02	6.41e-06
15	0.0625	0.1918	0.545	19.2	284.207	5.59e-08	1.26e-01	1.90e-05

GeoTesting EXPRESS	Project: San Jacinto Pre-Design	Location: ---	Project No.: GTX-309154
	Boring No.: SJGB037	Tested By: md	Checked By: njh
	Sample No.: SL0657	Test Date: 2/19/19	Depth: 15-17 ft
	Test No.: IP-9	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay with sand		
	Remarks: System LTIII-A, Swell Pressure = 0.0652 tsf		
	Displacement at End of Increment		

Attachment B. PDI-2 BORING LOGS AND GEOTECHNICAL TESTING RESULTS

This Attachment contains the following:
(Digital Copies Only)

B.1 Field Logs (Northern Impoundment) – TWE

B.2 Lab Testing Data (Northern Impoundment) – TWE

B.3 Soil Boring Logs (Northern Impoundment) - Ardaman

BORING LOG

Project: 11187072 San Jacinto
Client: IPC/MIMC
No. SJGB024
File No.:
Date: 9/7/19
Drilling Co.: TWE
Supervisor: Nick Groves
Type Rig: Tracked Geoprobe/Auger
Logged by: Breanna North

LABORATORY TEST DATA					FIELD DATA					BORING DATA	
Volumetric Moisture Content	Atterberg Test: Liquid Limit (%)	Atterberg Test: Plastic Index (%)	% Finer than #200 Sieve	Other Rec:	Organic Vapor Meter (1) (ppm)	Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot)	Sampling	Depth (feet)	Water Level	Screen Interval	Start Time: 1115 Finish Time: 1610
				45%		med. push	ST				Dark black-brown soil w/organics - cohesive
				75%		med/stiff push	ST				Dark black-brown soil w/organics - cohesive (evidence of liner)
				90%		med/stiff push	ST	5			Dark black-brown clayey, w/minor traces of brown-tan clay - cohesive
				90%		med/stiff push	ST				Dark grey, wet, clayey, silty-sands
				100%		med/stiff push	ST				Dark grey, wet, clayey, silty-sands
				100%		med/stiff push	ST	10			Dark-grey, wet, clayey, silty-sands
				100%		med/stiff push	ST				Dark grey, wet, clayey silty sands
				100%		med/stiff push	ST	15			Grey, wet, ~~sandy clay~~ BN clayey, silty sand
				100%		soft/med push	ST	20			Grey, very wet, clayey silty sands
				100%		soft/med push	ST	25			Grey, very wet, ~~silty sands~~ BN clayey silty sands
				100%		med push	ST	30			Grey clay - cohesive

TD @ 30'

Note:
Visual description from bottom of Shelby Tubes.

Shelby Tube
Direct-Push Sampler
Auger Cuttings
No Recovery

PID:

Water First Noted
Level After min
NP Non Plastic
* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure
GHD Services, Inc.

BORING LOG

Project: 11187072 San Jacinto

Client: IPC/MIMC

No. SJGB025

File No.:
Date: 9/10/19
Drilling Co.: TWE
Supervisor: Nick Groves (GHD), Keith
Type Rig: Tracked Geoprobe/Auger
Logged by: Breanna North

LABORATORY TEST DATA					FIELD DATA					BORING DATA	
Volumetric Moisture Content	Atterberg Test: Liquid Limit (%)	Atterberg Test: Plastic Index (%)	% Finer than #200 Sieve	Other Rec:	Organic Vapor Meter (1) (ppm)	Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot)	Sampling	Depth (feet)	Water Level	Screen Interval	Start Time: 0925 Finish Time: 1415
				75%		30,18,9	SS				grey/tan loose sands, some gravel
				100%		med push	ST				dark grey clayey sand wet BN damp, cohesive
				100%		med push	ST	5			dark grey clayey sand, damp, cohesive
				100%		med/stiff push	ST				grey clayey sand, damp
				100%		med/stiff push	ST				grey clayey sand, damp
				100%		stiff push	ST	10			grey clayey sand, ~~damp~~ wet BN
				95%		med push	ST				grey clayey sand, wet
				30%		med push	ST	15			grey clayey sand, very wet
				0%		med push	ST	20			No recovery – evidence of grey sand, very wet
				100%		6,14,30	SS				Flow back to approx. 18'-20'. Took SS sample. BN Grey sands, wet, very loose
				9%		2,2,4	SS				Flow back to approx. 20-22'. Took SS sample. Grey sands, wet, very loose
				90%		1,2,3	SS	25			Grey sands, wet, very loose
											Hit significant water, Water flowing out of top of augers as drill bit being raised
				90%		5,7,11	SS	30			Grey sands, wet, Loose
											TD = 30'
											Note: Visual description from bottom of Shelby tubes.

■ Shelby Tube = ST

⊠ Direct-Push Sampler — Split Spoon = SS

▯ Auger Cuttings

▨ No Recovery

PID:

▽ Water First Noted

▼ Level After min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

GHD Services, Inc.

Attachment Figure B.1-2

BORING LOG

Project: 11187072 San Jacinto
Client: IPC / MIMC
No. SJGB026
File No.:
Date: 9/9/19
Drilling Co.: TWE
Supervisor: Nick Graves
Type Rig: Tracked Geoprobe / Auger
Logged by: Breanna North

LABORATORY TEST DATA					FIELD DATA					BORING DATA	
Volumetric Moisture Content	Atterberg Test: Liquid Limit (%)	Atterberg Test: Plastic Index (%)	% Finer than #200 Sieve	Other	Organic Vapor Meter (1) (ppm)	Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot)	Sampling	Depth (feet)	Water Level	Screen Interval	Start Time: 0910 Finish Time: 1425
				Rec: 75%		med push	ST				light grey, sandy clay, damp
				75%		med push	ST				light grey, some tan, sandy clay, wet
				75%		med push	ST	5			light/med grey, some tan, sandy clay wet
				100%		Med/stiff Push	ST				dark grey sandy clay, wet
				75%		med push	ST				med grey clayey sands, wet
				80%		med push	ST	10			grey clayey sands, wet
				100%		med push	ST				grey clayey sands, wet
				0%	↓ 1/3 1/3	stiff push soft push		15			No recovery (grey wet residue inside tube
				0%		soft push set for 20 mins	ST	20			No recovery (grey sand, wet observed on drill bit from drill down 18'-20')
				100%		4,3,3	SS				Dark grey/brown sand, wet
											TD: 22'

Note: Visual description from bottom of Shelby Tubes.

Shelby Tube = ST
Direct-Push Sampler
Split Spoon = SS
Auger Cuttings
No Recovery

PID:

Water First Noted
Level After min
NP Non Plastic
* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

GHD Services, Inc.

Attachment Figure B.1-3

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJGB027
DATE COMPLETED: 12/4/19 -
DRILLING METHOD: Auger/Mud Rotary (truck mounted)
FIELD PERSONNEL: B. North (GHD); Keith,
DRILLING COMPANY SUPERVISOR: Keith Barge (TWE)

SJGB027

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		DEPTH ft BGS	SAMPLE NUMBER / Blow counts	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE Pocket pen PID (ppm) (tsf)
0	(0'-2') Dark grey sandy clay	ST	0'-2'			10%		
2	(2'-4') Dark grey sandy soft clay w/some organics	ST	2'-4'			90%		
4	(4'-6') Dark grey sandy clay w/some organics	ST	4'-6'			100%		
6	(6'-8') Dark grey sandy clay w/some organics, shells	ST	6'-8'			100%		
8	(8'-10') Dark Grey sandy clay w/some organics, shells	ST	8'-10'			90%		
10	(10'-12') Dark grey BN clayey sands	ST	10-12'			80%		
12	(12'-14') Dark grey clayey sands, fine-med, slightly cohesive	SS	12'-14'	wt. of hammer		70%		
14	(14'-16') Dark grey fine-med sands	SS	14'-16'	wt. of hammer		40%		
16								
18	(18'-20') Dark grey clayey sands, fine-med, some cohesiveness	SS	18'-20'	hammer, 2,2		40%		
20								
22								
23	(23'-25') Grey clayey sands, fine-med, loose	SS	23'-25'	1,1,1		50%		
24								
25								
26								
28	(28'-30') Grey clayey sands-fine-med, some cohesiveness in clay	SS	28'-30'	2,3,6		40%		
30								
32								
33	(33'-35') Tan Grey sands, med-coarse, some gravel, loose	SS	33'-35'	3,4,5		40%		
34	(~34.5-40') Grey clay, hard cohesive							
35								
36								
38	(38'-40') Tan, Reddish brown-grey sandy clay, some coarse sands, cohesive, some plasticity	ST (E)	38-40'			90%		1.7

Observed bottom of Shelby Tube

Auger

Mud Rotary

NOTES: ST = Shelby Tube E = Extruded on site
SS = Split Spoon

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJGB027
DATE COMPLETED: 12/4/19 -
DRILLING METHOD: Mud Rotary (Truck mounted)
FIELD PERSONNEL: B. North (GHD)
DRILLING COMPANY SUPERVISOR

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE Pocket pen PID (ppm) (tsf)
	SJGB027						
42							
43	(43'-45') Reddish-brown clay, ~~that~~ Bv w/some organics/shells, hard, cohesive, plasticity ST (E)	43'-45'			100%		2.4
44							
45							
46							
48	(48'-50') Reddish-brown clay, hard, cohesive, some plasticity ST (E)	48'-50'			90%		2.7
50							
52	TD @ 50'						
54							
56							
58							
60							
62							
64							
66							
68							
70							
72							
74							
76							
78							

mud Rotary

NOTES: ST = Shelby Tube E = Extruded on Site
SS = Split Spoon

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB047-G (geotech)
DATE COMPLETED:
DRILLING METHOD: mud rotary geotech on a barge
FIELD PERSONNEL: Stephen Salter
DRILLING COMPANY SUPERVISOR: Keith Barge

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	Type
	Brown silty sand to sandy silt, saturated, organics				50%	WH	SS
2	-- no recovery				0%	WH	SS
4	-- continued brown silty sand w/ sandy silt, saturated				50%	WH	SS
6 7					80%	WH	SS
8	Brown sandy clay w/ interbedded fine grained sand layers, wet to saturated						
9	Brown silty clay w/ interbedded sand layers, moist to wet (sand)				100%	WH	SS
10	-- clay % ↑ w/ depth						
	-- continued brown silty clay w/ interbedded 1-2 mm sand layers				100%	WH	SS
12	-- SAA				90%	WH	SS
14	-- SAA, clay % ↑ w/ depth				14	WH/WH/1	SS
16					16		
18	-- SAA, 1 sand layer @ 19' was ~3 cm thick				18	PP 0.25	ST(E)
20					20		
22	Gray clay with yellowish brown oxidation mottling, moist				23	PP 2.5	ST(E)
24	-- Slight sand and white gravel nodules				25		
26							
28	- SAA				28	PP ~1.5	ST(E)
30					30		
32						33 PP 3.25	ST(E)
34	Reddish brown clay with gray inclusions firm					3.5	
36							
38	- SAA					38 PP 3.0	ST(E)
						40	

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-6

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB 047 -G (geotech)
DATE COMPLETED:
DRILLING METHOD: Mud rotary geotech on a barge
FIELD PERSONNEL: N. Groves / S. Sailer
DRILLING COMPANY SUPERVISOR Keith Barge

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
42						43	
44	gray clay					15 / 45	ST(E)
46							
48	light gray clay with interbedded fine sand					48 / 35 / 50	ST(E)
50							
52							
54	light gray fine grain sand with clay			100%	53 / 55	8 8 6	SS
56							
58	light gray fine grain sand			70%	58 / 60	12 16 17	SS
60							
62							
64	light gray clayey sand fine grain			80%	63 / 65	3 1 1	SS
66							
68	- SAA			100%	68 / 70	4 8 21	SS
70							
72							
74	- light gray medium grain sand			100%	73 / 75	15 21 30	SS
76							
78	- light gray med-coarse grain sand			100%	78 / 80	25 31 44	SS

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-7

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB047-G (Geotech)
DATE COMPLETED:
DRILLING METHOD: Mud Rotary geotech on a barge
FIELD PERSONNEL: N. Graves / S. Salter
DRILLING COMPANY SUPERVISOR Keith Bergy

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
82				17	83		
			100%	23		[illegible]	SS
84	- light gray Med- coarse grain sand			27	85		
86					88		
88	- SAA			100%		16 23 30	SS
90					90		
92					93		
94	- SAA			100%		25 35 30	SS
96					95		
98	gray clay Firm				50 FT 2.0 100		ST(E)
100							
102							
104							
106							
108							
110							
112							
114							
116							
118							

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-8

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB050-6 (geotech)
DATE COMPLETED: 11/20/19
DRILLING METHOD: mud rotary geotech on a barge
FIELD PERSONNEL: S. Sk
DRILLING COMPANY SUPERVISOR: K. Barge

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	Type
	Brown clayey silt to silty clay, wet, organic rich				100%	WH	SS
2	-- clay zone				2	—	
	-- sandy zone				50%	WH	SS
4	continued brown clayey silt, saturated to silty clay				4	— /	ST
6					6	— /	ST
8	Brown silty clay, moist				8		
9.5					60%	WH	SS
10	Light gray fine grained sand, saturated				10	—	
10.5					50%	WH	SS
12	Brown silty clay, moist. Rare interbedded sand layers (~2 mm)				12	WH	
13.5					100%	WH/WH/1	SS
14	~~-- 6" light gray sand layer~~ Light gray fine grained sand, saturated				14	3/5/5	SS
16					16		
18	-- slight clay, potential stuff continued lightgray sand, stained				18		
20					20	1/1/WH	
22	TD @ 20'						
24							
26							
28							
30							
32							
34							
36							
38							

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

GHD

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053- Geotech
DATE COMPLETED: Start 11/18/19 End 11/19/19
DRILLING METHOD: Mud rotary on a barge
FIELD PERSONNEL: Stephen Sailer
DRILLING COMPANY SUPERVISOR: Keith Brye

In 9 ft of water at start (~1300 11/18/19)

Drive 6" PVC casing 12 ft into sediment

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm) Type
	Brown silty sand w/ organics + slight clay. saturated [SM]				30%	WH	SS
2	Brown clayey silt, saturated, shell fragments (sparse)	low rec			20%	WH	SS
4	-- clay % ↑ w/ depth						
6	-- slight sand, clayey silt to silty clay, loose				70%	WH	SS
7	Brown silty clay w/ sand lenses, wet. Intermittent 1-2 mm thick sand lenses				100%	WH	SS
9	Gray fine grained sand, saturated [SP]				60%	2/6/6	SS
10	-- Brown clayey silt, potential sluff	low rec			20%	1/WH/WH	SS
12	-- continued sand						
	Brown clayey silt to silty clay				60%	WH/WH/1	SS
13.5	Gray fine grained sand, saturated [SP]						
14	-- Brown sandy clay, saturated				30%	WH/WH/1	SS
15	gray fine grained sand, saturated [SP]						
16	-- clay						
18	Light gray clay (CH), rare sand pockets from 18-19' moist				18 100 40	PP 3.5	ST(E)
22	-- yellowish brown oxidation mottling, rare ~~slight~~ white gravel nodule				23 100 25	PP 3.5	ST(E)
23							
26	-- reddish brown oxidation mottling, -- slightly sandy, rare white nodules						
28					29 100 30	PP 2.5	ST(E)
30	-- heavy reddish brown/red oxidation mottling, no sand or nodules [CH]						
32					33 100 35	PP 3.5	ST(E)
34							
36	-- continued heavy reddish brown/red oxidation mottling, [CH]				34 100 40	PP 3.5	ST(E)
38							

Switch to 5 ft runs at 16'

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-10

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053-G
DATE COMPLETED: 11/19/19
DRILLING METHOD: Mud Rotary Geotech on Base
FIELD PERSONNEL: S. Seller
DRILLING COMPANY SUPERVISOR: K. Bange

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	~~PID (ppm)~~ Type
42	-- continued light gray clay (CH), low mottling (y. brown), v. slightly moist (close to dry)				43 100% 45	PP 2.0	ST(E)
44							
46	-- occasional v. fine grained sand seams, still [CH], gray ~~[illegible]~~						
48					48 100% 50	PP 1.5	ST(E)
50							
52	wood debris (slight) @ 53' to 53.5' continued gray clay [CH], slightly silty				53 100% 55	PP 2.0	ST(E)
54							
56							
58	Gray v. fine grained sand w/ slight silt, saturated [SP]				58 30% 60	10/11/3	SS
60					60		
62	-- clayey layers, reddish brown mottling, ~~[illegible]~~ SS				63 40% 65	19/18/47	SS
64	continued gray sand, saturated						
66							
68	-- continued gray fine grained sand, saturated, slight reddish brown mottling w/ clay nodules				68 100% 70	19/28/39	SS
70							
72	-- continued gray fine grained sand, saturated, slightly clayey				73 100% 75	10/11/16	SS
74							
76							
78	-- continued gray fine grained sand, saturated, slight reddish brown mottling + clay nodules				78 100%	12/30/38	SS

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB053-6
DATE COMPLETED: 11/19/19
DRILLING METHOD: Mud Rotary Geotech on a Barge
FIELD PERSONNEL: S. Salter
DRILLING COMPANY SUPERVISOR: Keith Barge

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	~~PID (ppm)~~ Type
82	-- Continued gray sand w/ slight clay, fine grained sand, saturated, slight reddish brown oxidation [illegible]				83	8/12/14	SS
84					85		
86							
88	-- continued gray sand, fine grained, saturated				88	10/7/8	SS
89	Gray clay to silty clay, moist [CH]				90		
92	Dark brown / black clayey silt, organic rich, wood and detritus, ~~clay~~ / flaky, moist				93	PP 2.0	ST(E)
94					95		
96	Blueish-gray clay [CH], moist						
98					98	PP 2.5	ST(E)
100	TD @ 100' bml				100		
102							
104							
106							
108							
110							
112							
114							
116							
118							

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

Above Start
2 ft of silt
1 ft sand
1 ft rock

Start 11/6/19

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: STSB057 Geotech
DATE COMPLETED: 11/8/19
DRILLING METHOD: Barge Geotech Rig (mud rotary)
FIELD PERSONNEL: S. Sellers
DRILLING COMPANY SUPERVISOR: Keith Boye

0-16 continuous sampling, any tubes stay in tubes

16+ → 5 ft centers + extend

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	INTERVAL	REC (%)	'N' VALUE	PID (ppm)
	Dark brown / black clayey silt w/ organics, saturated. OL/ML				100%	WH	SS
2	-- slightly sandy						
	Dark brown clayey sand, saturated SC				80%	2/1/1	SS
4	-- low recovery						
	Dark brown ~~fine grained~~ clayey sand, saturated				10%	WH/WH/1	SS
6	-- continued clayey sand						
7.5					100%	1/1/1	SS
8	Light gray fine to medium grained sand w/						
	-- low recovery shell gravel, saturated SW				5%	WH/WH/1	SS
10	Medium to coarse grained sand w/ lithic gravel, saturated SW						
11.5	-- sandy gravel at bst 3" of contact GW				100%	3/4/6	SS
12	Reddish brown clay, moist heavy oxidation mottling						
	Gray clay, moist, oxidation mottling CH				100%	PP 0.5	ST
14							
	-- slight sluff gravel				100%	PP 1.25	ST
16	-- sand (sluff						
18	Continued gray clay, moist, oxidation mottling (yellowish brown)						
					100%	PP 3.0	ST(E)
20							
22	Continued gray clay, reddish brown ore mottling						
24					100%	PP 2.5	ST(E)
26	-- color transition to red w/ slight gray						
	heavy reddish brown to red mottling (Red clay)						
28					100%	PP 3.5	ST(E
30							
32	-- Red clay CH						
34					100%	PP 3.0	ST(E)
36							
38	-- color shift back to gray w/ reddish mottling				100%	PP 3.0	ST(E)

continues → start on 11/7

Switch to 5 ft centers @ 16', will extrude

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

Attachment Figure B.1-13

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB057-6 (Geotech)
DATE COMPLETED: 11/8/19
DRILLING METHOD: Barge Geotech Rig mud rotary
FIELD PERSONNEL: S.S/K.S
DRILLING COMPANY SUPERVISOR: Keith Boyce

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
42	gray clay, slightly sandy CH						ST(E)
44					100%	PP 2.5	ST(E)
46	-- dark gray clay, small black organic nodules/chips						
48					100%	PP 1.5	ST(E)
50							
52	-- dark gray clay, small black organic nodules/chips						
54					100	PP 1.5	ST(E)
56	dark gray clay w/ sand - small sand lenses, with sand % w/ depth						
58							
60					100%	PP 1.0	ST(E)
62	Brown fine grained sand, SP saturated						
64					20%	4/2/2	SS
66	-- color change to gray fine to medium grained sand, saturated						
68					50%	15/24	SS
70	Gray clayey sand to sandy clay, saturated SC						
72	--clay % w/ depth				80%	4/6/7	SS
74							
76	Gray fine grained sand w/ slight clay, saturated SP						
78					70%	15/35/42	SS
80							

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

STRATIGRAPHIC LOG

PROJECT NAME: San Jacinto River Waste Pits
PROJECT NUMBER: 11187072
CLIENT: IPC/MIMC
LOCATION: Channelview, TX
DRILLING COMPANY: TWE

HOLE DESIGNATION: SJSB057-6 (Geotech)
DATE COMPLETED: 11/8/19
DRILLING METHOD: Mud rotary geotech on Barge
FIELD PERSONNEL: Sailor, K. Weibel
DRILLING COMPANY SUPERVISOR Keith Barge

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	DEPTH ft BGS	SAMPLE NUMBER	SAMPLE INTERVAL	REC (%)	'N' VALUE	PID (ppm)	
82	-- Continued gray fine grained sand ~~w/ slightly clay, grained~~ SS wet to moist x v. fine grained							83
84					50%	15/33/55	SS	13/33/55 85
86								
88	Black organic-rich silty clay to clayey silt, moist flaky/brittle (friable) 0				100%	4/16/15	SS	88 4/16/15
90								90
92	Gray clay CH, moist					PP 1.5	ST(E)	93
94						tsf		95
96								
98	Continued gray clay, organic odor, moist					PP	ST(E)	98
100								100
102	TD @ 100'							
104								
106								
108								
110								
112								
114								
116								
118								

NOTES:

OVERBURDEN LOG BLANK TEMPLATE.GPJ CRA_CORP.GDT 9/1/15

BORING LOG

Project: 11187072 San Jacinto

Client: IPC / MIMC

No. SJSB058 (Geotech)

File No.:
Date: 10/13/19
Drilling Co.: TWE
Supervisor: Nick Graves (GHD), Keith Barge (TWE)
Type Rig: Tracked Geoprobe (Hollow Stem Augers)
Logged by: Breanna North

LABORATORY TEST DATA					FIELD DATA					BORING DATA	
Volumetric Moisture Content	Atterberg Test: Liquid Limit (%)	Atterberg Test: Plastic Index (%)	% Finer than #200 Sieve	Other	Organic Vapor Meter (1) (ppm)	Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot)	Sampling	Depth (feet)	Water Level	Screen Interval	Start Time: 1025 Finish Time: 1445
				Rec: 80%		med push	ST				Brown/Tan - grey silty sands
				0%		Refusal	↓				(Drilled down ↓ to 2')
				100%		med push	ST				Dark grey clayey sands, (moist)
				75%		med/ push stiff	ST	5			Dark grey sandy clay, w/ organics (moist)
				70%		med/stiff push	ST				Dark grey sandy clay (wet)
				70%		soft/med push	ST				Dark grey sandy clay (wet)
								10			
						med push	ST				Dark grey sandy clay (wet)
				100%		18"/24" 1,1,6	SS				Grey clayey sands (wet)
				100%		18"/24" 1,1,2	SS	15			Grey silty sands (wet)
—	—	—	—	—	—	—	↓		~~		Drilled down to 18'-20' ~~
				75%		18"/24" 6,17,30	SS				Grey silty sands (wet)
								20			

Sands began to flowback into augers

TD@20'

Note:
Soils observed from top and/or bottom of Shelby tubes.

■ Shelby Tube = SS Split spoon = SS PID:

⊠ Direct-Push Sampler

▯ Auger Cuttings

▨ No Recovery

▽ Water First Noted

▼ Level After ___ min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

GHD Services, Inc.

Attachment Figure B.1-16

BORING LOG

Project: 11187072 San Jacinto

Client: IPC / MIMC

No. SJSB058 (Direct Push) Analytical

File No.:
Date: 10/14/19
Drilling Co.: TWE
Supervisor: Nick Groves (GHD), Keith Barge (TWE)
Type Rig: Tracked Geoprobe (5' Liners)
Logged by: Breanna North

LABORATORY TEST DATA					FIELD DATA					BORING DATA	
Volumetric Moisture Content	Atterberg Test: Liquid Limit (%)	Atterberg Test: Plastic Index (%)	% Finer than #200 Sieve	Other Rec:	Organic Vapor Meter (1) (ppm)	Penetrometer (Tons/Sq.ft) or Std Pen. Test (blows/foot)	Sampling	Depth (feet)	Water Level	Screen Interval	Start Time: 1250 Finish Time: 1325
				30%							Tan/brown, gray clayey sands, w/some gravels (wet)
				25%							Grey, brown sandy clay, slightly cohesive (damp)
				80%							
				80%				5			Grey sandy clay, slightly cohesive (wet), w/some organics
				80%							Grey sandy clay, cohesive (damp), some organics
				80%							
				50%				10			Grey sandy clay, cohesive (damp)
											Grey, brown sandy clay, cohesive (wet)
				50%							Dark Grey sandy clay, cohesive, w/some organics (wet)
								15			Tan/Grey clayey sands, loose (wet)
				50%							Grey sandy clay, slightly cohesive (wet)
								20			TD @ 18'

Shelby Tube

Direct-Push Sampler

Auger Cuttings

No Recovery

PID:

Water First Noted

Level After min

NP Non Plastic

* No Penetrometer or SPT Value

Stratification is Inferred And May Not be Exact.
Soil Classification Based on Visual-Manual Procedure

GHD Services, Inc.

Attachment Figure B.1-17

SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
SJGB024																		
		0-2			Brown LEAN CLAY with SAND	CL	18.6	103.7							1.31	9.3	0.3	Bulge
		2-4	1.50		Brown and black FAT CLAY	CH	27.8	89.0							0.91	14.6	1.0	Bulge
		4-6			Brown and black FAT CLAY	CH	29.2	90.1	86	31	55				0.56	11.6	1.7	Bulge
		6-8				CH	31.4		78	23	55	94.2						
		8-10	0.50		Brown CLAYEY SAND	SC	29.1	89.2				43.2			0.21	11.8	3.1	Bulge
		10-12	0.50		Brown FAT CLAY; organics	CH	75.3	53.7	133	51	82	91.0			3.34	8.3	3.8	Bulge
		12-14	0.50		Brown and black FAT CLAY	CH	31.7	82.6				76.2			0.22	14.8	4.5	Bulge
		14-16	0.25		Brown CLAYEY SAND	SC	26.5	91.7	32	19	13	44.4			0.44	14.9	5.2	Bulge
		18-20	0.50		Brown SILTY CLAYEY SAND	SC-SM	24.9	98.4				25.5			0.94	15.0	6.6	Bulge
		23-25	0.50		Brown FAT CLAY	CH	49.5	66.4				92.1			0.39	6.6	8.3	Bulge
		28-30	0.25		Brown FAT CLAY	CH	61.3	59.0	122	58	64				0.28	11.3	10.1	Bulge
SJGB025																		
		0-2				SM	13.5					24.8						
		2-4	4.50		Brown LEAN CLAY with SAND	CL	15.5	115.8	36	18	18	81.8			1.05	14.8	1.0	Bulge
		4-6	2.50		Gray SANDY LEAN CLAY		18.8	112.5	34	17	17				0.84	14.6	1.7	Multiple Shear
		6-8				SP	19.5											
		8-10	1.25		Gray LEAN CLAY with SAND	CL	20.1	107.0	43	16	27	84.2						Too Short
		10-12				SC	21.4					46.5						
		12-14	1.00		Brown SANDY LEAN CLAY	CL	18.6	114.9	33	17	16	55.6			1.68	15.0	4.5	Bulge
		14-16				ML	23.6					61.5						
		20-22				SM	21.7					21.9						
		22-24				SM	34.4					43.9						
		24-26				SP	33.6		NV	NP	NP							
		28-30				SM	23.4					30.9						
SJGB026																		
		0-2	1.25		Brown SILT with SAND	ML	13.4	111.4	NV	NP	NP	80.9						Too short
		2-4	1.50		Gray LEAN CLAY	CL	20.6	128.5				98.4						Too short
		4-6	1.50		Tan and Gray LEAN CLAY with SAND	CL	19.1	104.8	41	18	23	84.3			1.42	5.3	1.7	Vertical
		6-8	2.00		Gray LEAN CLAY	CL	19.1	104.8				96.9			0.69	3.5	2.4	Multiple Shear
		8-10	1.50		Gray and brown LEAN CLAY with SAND	CL	21.4	103.8	35	17	18	82.6			0.87	13.6	3.1	Multiple Shear
		10-12				SC	23.0					49.8						
		12-14	1.00		Tan and Gray SANDY SILT	ML	20.6	109.4	NV	NP	NP	65.5			1.72	14.9	4.5	Bulge
		20-22				ML	26.1					55.4						

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SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
SJGB027																		
		0				GP-GM	10.6											
		2	0.50		Black FAT CLAY; Organics	CH	139.8	32.6	151	44	107	80.5			0.17	7.6	2.0	Bulge
		4	1.75		Gray CLAYEY SAND	SC	22.7	104.3	41	21	20	43.6			0.18	7.6	3.5	Bulge
		6	1.25		Gray SANDY LEAN CLAY	CL	20.3	107.6	37	17	20	55.5			1.15	14.8	4.0	Bulge
		8	1.25		Gray LEAN CLAY	CL	17.9	111.3	39	18	21				0.73	14.8	5.0	Bulge
		10				CL	22.5	106.8	30	17	13	80.6						
		12				CL	32.0		49	19	30	31.4						
		14				SM	26.9		24	16	8	27.3						
		16																
		18				SC-SM	28.3		NV	NP	NP	40.1						
		23				SP-SM	21.4		NV	NP	NP	7.8						
		28				SC-SM	21.9		26	16	10	11.3						
		33				SC	16.0		32	17	15	36.0						
		38	3.00			CL	19.5	107.4	40	18	22	79.1						
		43	3.00		Reddish-brown LEAN CLAY; calcareous	CL	32.3	89.5	49	19	30							
		48	3.50		Tan FAT CLAY	CH	31.2	92.1	59	21	38				1.95	6.3	21.0	Slickensid
SJGB028																		
		0				CL	16.2	112.2	37	16	21	57.4						
		2				SC	60.7	81.2	39	17	22	44.4						
		4	1.75		Black LEAN CLAY with SAND; sand seams and organics	SC	13.3	115.9	32	15	17	79.0			0.79	14.8	2.5	Bulge
		6				OH	198.4											
		8				OH	137.6											
		10				SM	27.6											
		12																
		14				CH	44.7		58	20	38	64.9						
		18	1.25		Gray SANDY LEAN CLAY	CL	27.8	94.3	41	18	23				0.72	14.8	8.3	Bulge
		23				SC-SM	25.9		NV	NP	NP	28.6						
		28			Gray poorly graded SAND with SILT	SP-SM	18.5					8.8						
		33			Gray poorly graded SAND with SILT	SP-SM	22.8					8.3						
		34																
		38			Gray poorly graded SAND with SILT	SP-SM	18.3					6.0						
		43			Gray poorly graded SAND	SP	19.6					4.6						
		48	3.75		Reddish-brown FAT CLAY	CH	26.1	97.8	70	23	47	98.4			2.00	3.2	20.8	Slickensid
		53	3.25		Reddish-brown FAT CLAY	CH	31.5	91.0	75	23	52	96.3			1.19	8.3	23.0	Slickensid
		58	3.25		Light gray and tan LEAN CLAY	CL	19.4	106.3	26	16	10	97.9						

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SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
		63	3.75		Tan and gray LEAN CLAY with SAND	CL	16.6	115.4	30	16	14	75.8			4.22	14.8	27.0	Bulge
		68	4.50		Gray SANDY LEAN CLAY	CL	18.0	113.5	28	16	12	50.4			5.64	15.0	29.0	Multiple shear
		73				SC	22.8		26	17	9	39.3						
SJGB029																		
		1				GP-GM	12.5											
		2				CH	14.5	106.9	NV	NP	NP							
		4				CH	33.8											
		6				CL	36.6											
		8				CH	108.7		70	22	48							
		10				SC	36.7					36.6						
		12				CH	71.9		74	24	50							
		14	0.75		Gray and tan FAT CLAY; organics	CH	28.6	98.5	62	21	41							
		18				CL	25.7	95.4	45	17	28	77.7						
		23			Gray poorly graded SAND with SILT	SP-SM	29.3					8.6						
		28			Gray SILTY SAND	SM	61.5					13.2						
		33			Gray poorly graded SAND with SILT	SP-SM	19.8					6.9						
		38			Gray poorly graded SAND with SILT	SP-SM	19.6					6.1						
		43			Gray poorly graded SAND with SILT	SP-SM	20.6					7.7						
		48			Gray FAT CLAY	CH	27.3					99.6						
		53	4.25		Gray FAT CLAY	CH	26.4	100.0	70	22	48	99.2			2.33	5.5	22.5	Multiple shear
		58	4.50		Tan and gray LEAN CLAY	CL	16.8	111.6	33	17	16				1.85	9.1	24.5	Bulge
		63	4.50		Gray SANDY LEAN CLAY	CL	17.7	113.0	36	17	19				4.15	14.6	26.6	Vertical shear
		68				SC	20.3		29	16	13	38.4						
		73				CL	22.5		38	17	21	95.0						
SJGB047																		
		0				CL-ML	30.6					97.3						
		2				ML	36.7											
		4				ML	42.9					94.2						
		8			Dark gray SANDY LEAN CLAY	CL	29.5					70.0						
		10				CL	38.8		39	20	19	73.8						
		12				CL	64.1											
		14				ML	57.7					96.5						
		18	0.50		Dark gray SANDY FAT CLAY; sand pockets	CH	37.6	72.1	79	24	55	55.6			0.29	7.3	6.6	60 Degree
		23	2.00		Gray LEAN CLAY with SAND	CL	20.1	113.6	42	18	24	73.3			1.44	13.9	8.3	Bulge

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SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
		28			Reddish-brown SANDY SILTY CLAY	CL-ML	15.6	107.1	27	21	6	59.6						
		33	4.00		Reddish Brown FAT CLAY	CH	29.0	96.5	59	39	20	98.4			1.00	1.3	11.8	60 degree
		38	3.75		Reddish Brown FAT CLAY	CH	31.3	96.0	74	34	40	99.5			1.73	14.6	13.5	Slickensli
		43	4.00		Gray LEAN CLAY with SAND	CL	18.6	116.0	42	18	24	84.3			3.36	14.8	15.3	Bulge
		48			Gray LEAN CLAY with SAND	CL	17.9		30	19	11	75.5						
		53				ML	20.4					92.9						
		58				ML	23.0					91.5						
		63				ML	27.4		NV	NP	NP	93.4						
		68				ML	25.9					97.5						
		73				ML	22.6					81.7						
		78				ML	21.8					68.4						
		83				SM	19.3		NV	NP	NP	46.4						
		88				SM	18.4					39.2						
		93				SM	17.6		NV	NP	NP	26.3						
		98	3.50		Tan and gray FAT CLAY	CH	21.4	98.0	73	23	50				0.33	5.3	35.0	Multiple shear
SJGB050																		
		0-2				CH	100.4					98.1						
		2-4				SC	81.8					41.2						
		4-6	0.50		Dark gray FAT CLAY	SC	28.6	85.0	32	16	16				0.30	14.8	1.7	Bulge
		6-8	0.50		Dark gray CLAYEY SAND	SC	32.8	85.3	34	17	17	43.3			0.08	12.6	2.4	Bulge
		8-10				CL	55.8					86.3						
		10-12				CL	48.5		41	18	23	82.6						
		12-14				CL	46.7					70.4						
		14-16				ML	22.6					51.5						
		18-20				SP-SM	36.9					9.8						
SJGB053																		
		0				SC	31.0					41.0						
		2				CL	57.0											
		4				CL	65.5											
		6				CH	60.8		55	22	33	59.8						
		8				SC	44.2		36	20	16							
		10				CL	41.7											
		12				CL	70.9					77.9						
		14				SC	31.2					47.2						
		18	4.25		Gray LEAN CLAY with SAND	CL	17.3	116.3	45	22	23				3.27	14.3	6.6	Bulge
		23	4.00		Tan LEAN CLAY with SAND	CL	17.3	116.2	46	21	25				3.32	12.1	8.3	Bulge

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SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
		28	3.00			CL	16.4											
		33	4.25		Reddish-brown FAT CLAY	CH	28.4	96.0	70	37	33				1.43	2.0	11.8	Slickenslic
		38	4.50		Tan FAT CLAY	CH	23.5		69	24	45	99.6						
		43	3.75		Gray FAT CLAY	CH	27.0	96.9	71	35	36				1.87	3.6	15.3	Slickenslic
		48	2.00		Gray LEAN CLAY	CL	20.5	106.7	47	21	26				1.87	3.9	16.9	60 degree
		53	3.00			CL	17.7											
		58			Tan CLAYEY SAND	SC	24.2					41.6						
		63				SC	23.8					34.3						
		68				SM	20.9					15.0						
		73				SC	23.5					46.8						
		78			Gray CLAYEY SAND	SC	18.0					42.9						
		83				SC	18.1					35.1						
		88				CL	24.7		64	24	40	62.3						
		93	3.25		Black FAT CLAY	MH	111.5	41.7	144	78	66	89.5			3.33	4.8	32.6	Bulge
		98	2.25		Gray FAT CLAY	CH	24.3	101.6	71	23	48				2.59	10.1	34.4	Bulge
SJGB057																		
		0				SC	109.2		102	64	38	46.0						
		2				SC	94.2		51	24	27	28.4						
		4				SC	59.9					18.3						
		6				SC	37.3		66	21	45	18.7						
		8				CL	89.0											
		10				SC	23.1					49.2						
		12	3.50		Gray and brown FAT CLAY	CH	20.4	111.0	66	23	43	85.1			2.29	15.0	3.8	Bulge
		14	0.75			SC	11.8	109.0										
		18	3.75		Tan SANDY LEAN CLAY	CL	18.7	112.8	45	16	29	67.7			2.27	14.6	6.6	60 degree
		23	3.00			CL	17.5	114.8										
		28	4.00			CH	28.2											
		33	4.00		Reddish Brown FAT CLAY	CH	26.8	98.3	65	22	43	99.7			2.31	3.5	10.8	Slickenslic
		38	4.50			CH	25.9	100.7										
		43	4.00		Gray FAT CLAY	CH	20.7	105.2	56	19	37	97.5			3.70	3.8	13.6	Slickenslic
		48	2.25		Gray FAT CLAY	CH	35.6	92.5	52	19	33	98.2			1.67	5.1	15.0	Slickenslic
		53				CL	26.9											
		58	1.25		Gray FAT CLAY with SAND	CH	24.4	106.0	52	20	32	84.4			1.49	10.6	20.5	Bulge
		63				SM	19.1					24.7						
		68				SC	23.0					34.6						

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SUMMARY OF LABORATORY TESTS

Project No. 19.15.131

Project: San Jacinto River Waste Pit Superfund Site

Boring No.	Sample No.	Depth (ft)	Pocket Pen. (tsf)	Torvane (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	pH	Lab Vane Shear (tsf)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
		73				CL-ML	22.2		23	18	5	64.6						
		78				CL	19.5					54.4						
		83				CL	19.6					71.4						
		88				OH	95.3		169	92	77	43.5						
		93	2.00		Gray LEAN CLAY	CL	26.1	100.3	41	18	23	97.8			1.67	9.8	32.6	Bulge
		98	3.50			CH	22.1					98.8						
SJGB058																		
		0-2	0.50			SP	14.9											
		2-4	1.00			CL	65.6		30	16	14	53.3						
		4-6	1.50		Dark brown LEAN CLAY	CL	25.5	89.3				97.1			0.92	14.6	1.7	Bulge
		6-8	1.50		Dark brown LEAN CLAY	CL	34.9	86.7	42	18	24	95.5			1.21	8.8	2.6	Multiple shear
		8-10	0.50		Dark brown FAT CLAY	CL	30.5	87.8				96.0			0.85	10.3	3.1	Bulge
		10-12				CL	32.9		44	17	27	93.4						
		12-14				SM	24.2		NV	NP	NP	41.7						
		14-16				SM	24.2		NV	NP	NP	43.3						
		18-20				SM	19.8					43.7						
SJRF-01																		
		0				CL	19.6											
		2				SM	9.0											
		4				SC-SM	15.0											
		6				CL	16.5	116.9										
		8				SP-SM	20.3											
		13				CL	21.2											
		18				CL	17.3											
		23				SC	25.0					32.0						
		28				SP-SM	25.2					10.1						
		33				SP-SM	22.2					6.9						
		38				SM	22.1					21.7						
		43				CL	33.6					55.7						
		48	4.25		Reddish-brown FAT CLAY	CH	24.9	102.2	60	25	35	95.3			0.26	1.7	20.8	Slickensid
		53	3.00		Tan and light gray FAT CLAY	CH	28.5	94.4	63	26	37	99.7						
		58	4.25		Gray and reddish-brown LEAN CLAY	CL	20.5	106.2	45	17	28	90.7			0.35	7.6	25.0	Slickensid
		63	2.50			CL	16.8					53.6						
		68				CL	21.2		28	16	12	78.1						
		73	4.50			CL	14.9		36	17	19	96.2						
SJRF-																		

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Tolunay-Wong Engineers, Inc.

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
ASTM D 2974 (Method C)

Project No.: 19.15.131 Project Name: San Jacinto River Waste Pit Superfund Site

	Boring No.	SJGB053			
	Sample No.				
	Depth	93-95'			
	Soil Description	CH			
Water Content	Tare No.	70			
	Wet Weight + Tare (a), g	93.32			
	Dry Weight + Tare (b), g	60.46			
	Tare Weight (c), g	30.98			
Organic Content	Tare No.	A			
	Oven Dried + Tare (d), g	63.11			
	Ash+ Tare (e), g	54.50			
	Tare Weight, gm (f), g	33.63			
Summary	Furnace Temperature, C	440	440	440	440
	Ash Content (h), % ((e-f)*100)/(d-f)	70.8			
	Organic Content (g), % 100-d	29.2			
	Water, % by dry mass ((a-b)/(b-c))*100	111			
	Water, % by total mass ((a-b)/a-c))*100	52.7			

Tested By:	LO				
Date:	2/8/20	Scale	Ohaus	E1821119172-	743
Computed By:	TB	Oven	Quincy Lab	B-0001	
Date:	2/13/20	Furance	FURN-1-10	1049000031735	-8-14
Checked By:	EEH				
Date:	2/13/20				

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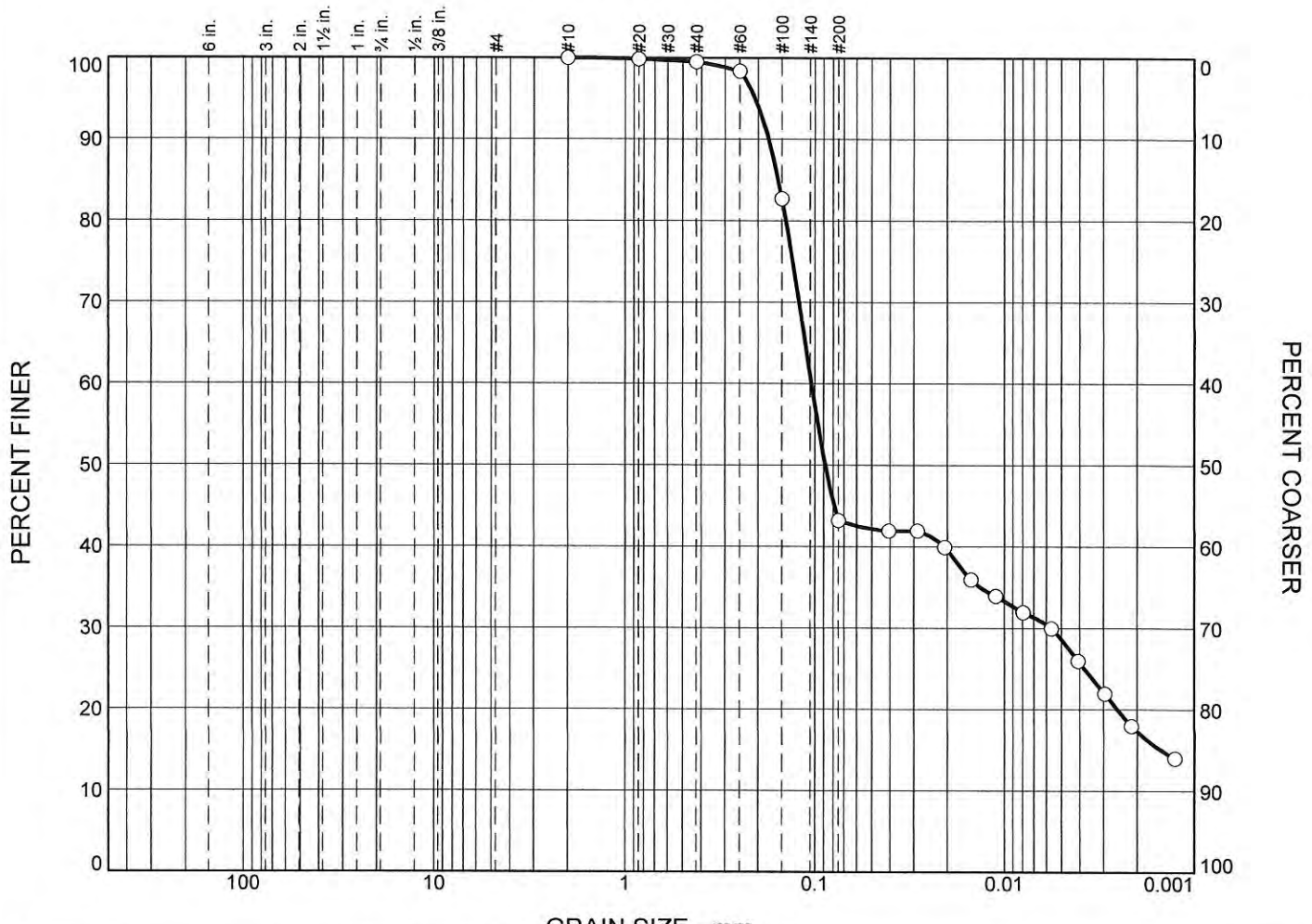
ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.5	56.3	14.6	28.6

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		8-10	Brown CLAYEY SAND	SC

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Houston, Texas

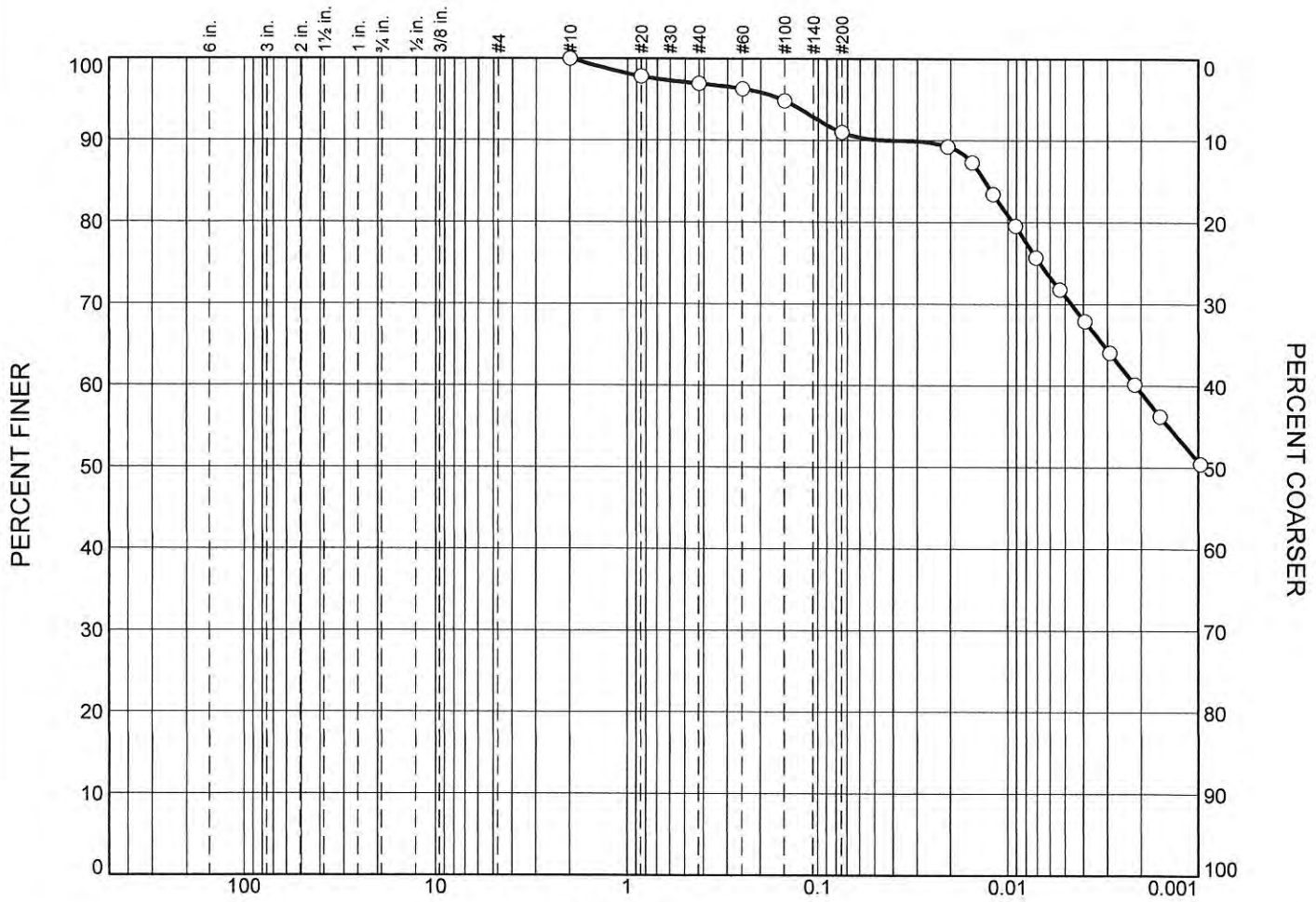
Client:

Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131 **Figure**

Attachment Figure B.2-8

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	3.1	5.9	20.0	71.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		10-12	Brown FAT CLAY	CH

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Houston, Texas

Client:

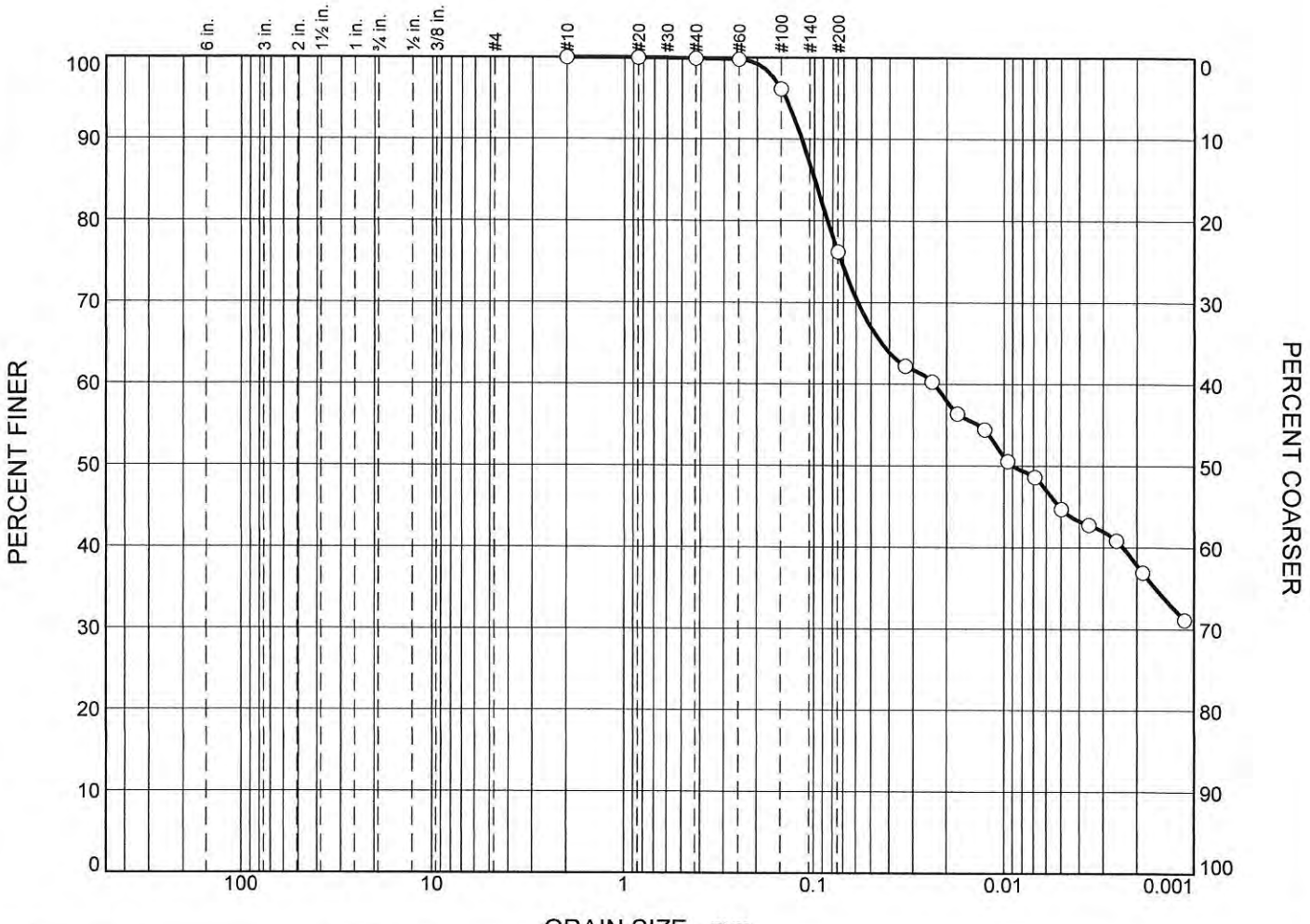
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-9

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	23.7	31.4	44.8

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		12-14	Brown and black LEAN CLAY	CH

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Houston, Texas

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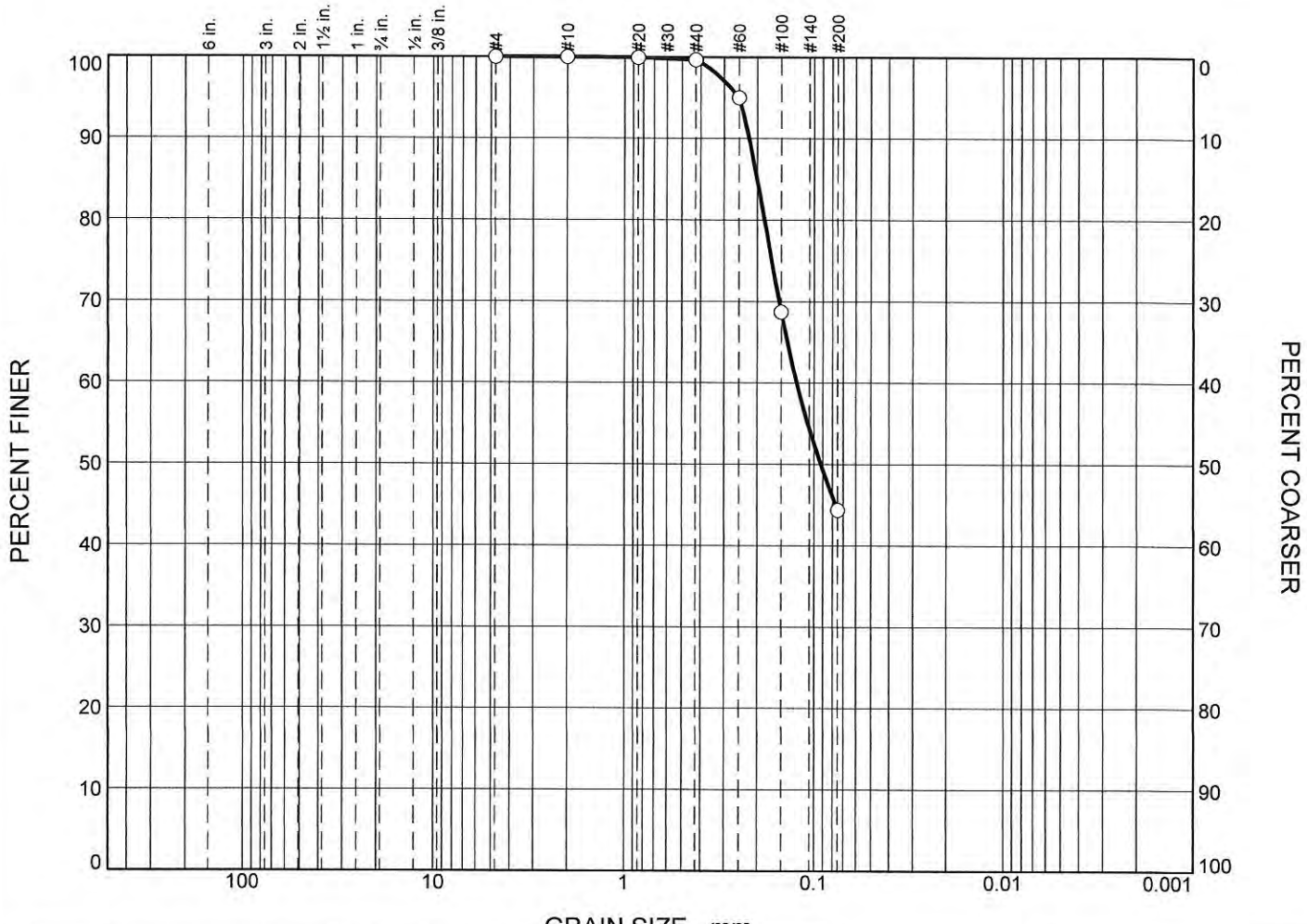
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131 **Figure**

Attachment Figure B.2-10

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.3	55.3	44.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		14-16	Brown CLAYEY SAND	SC

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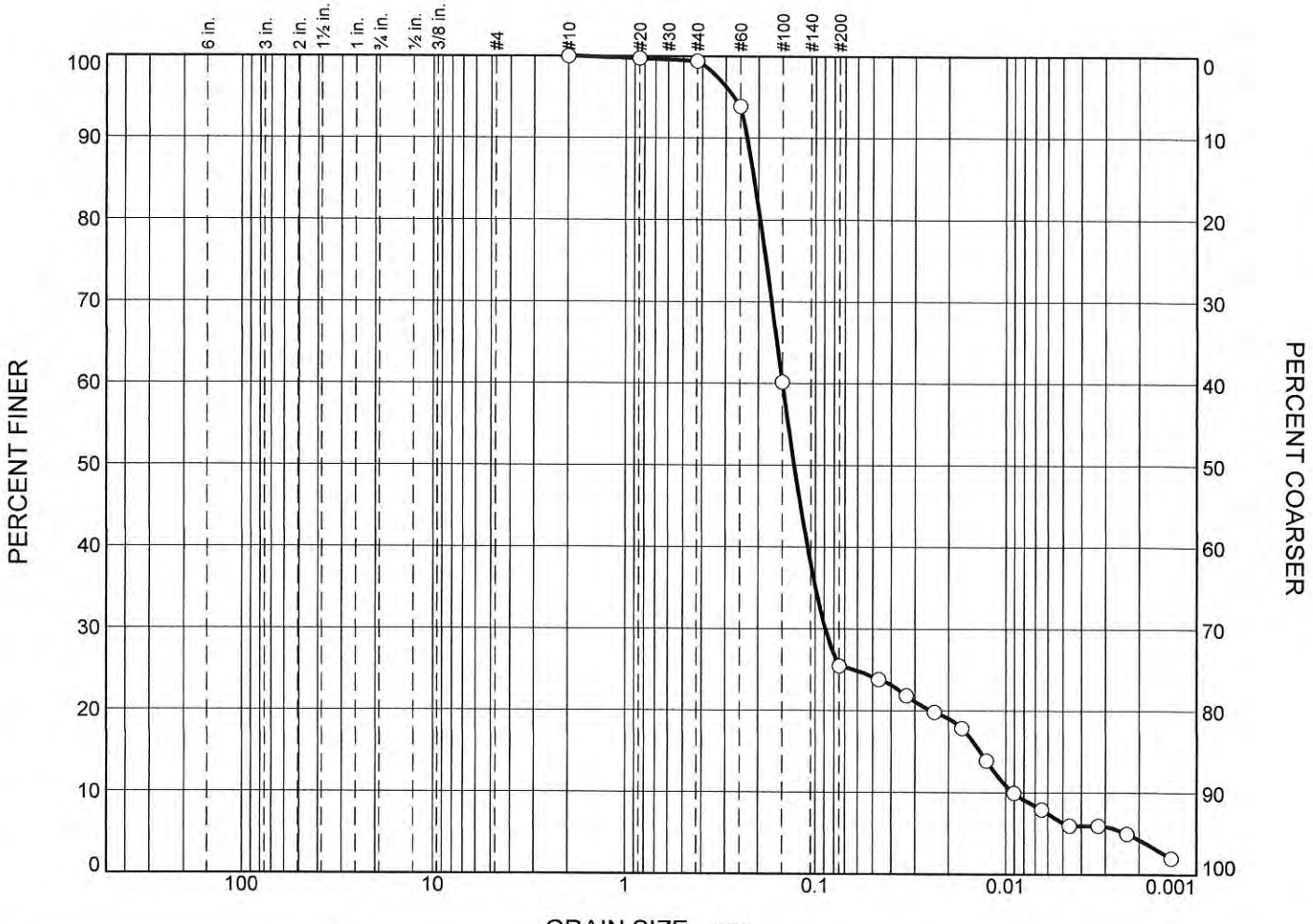
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-11

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.6	73.9	19.2	6.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		18-20	Brown SILTY CLAYEY SAND	SC-SM

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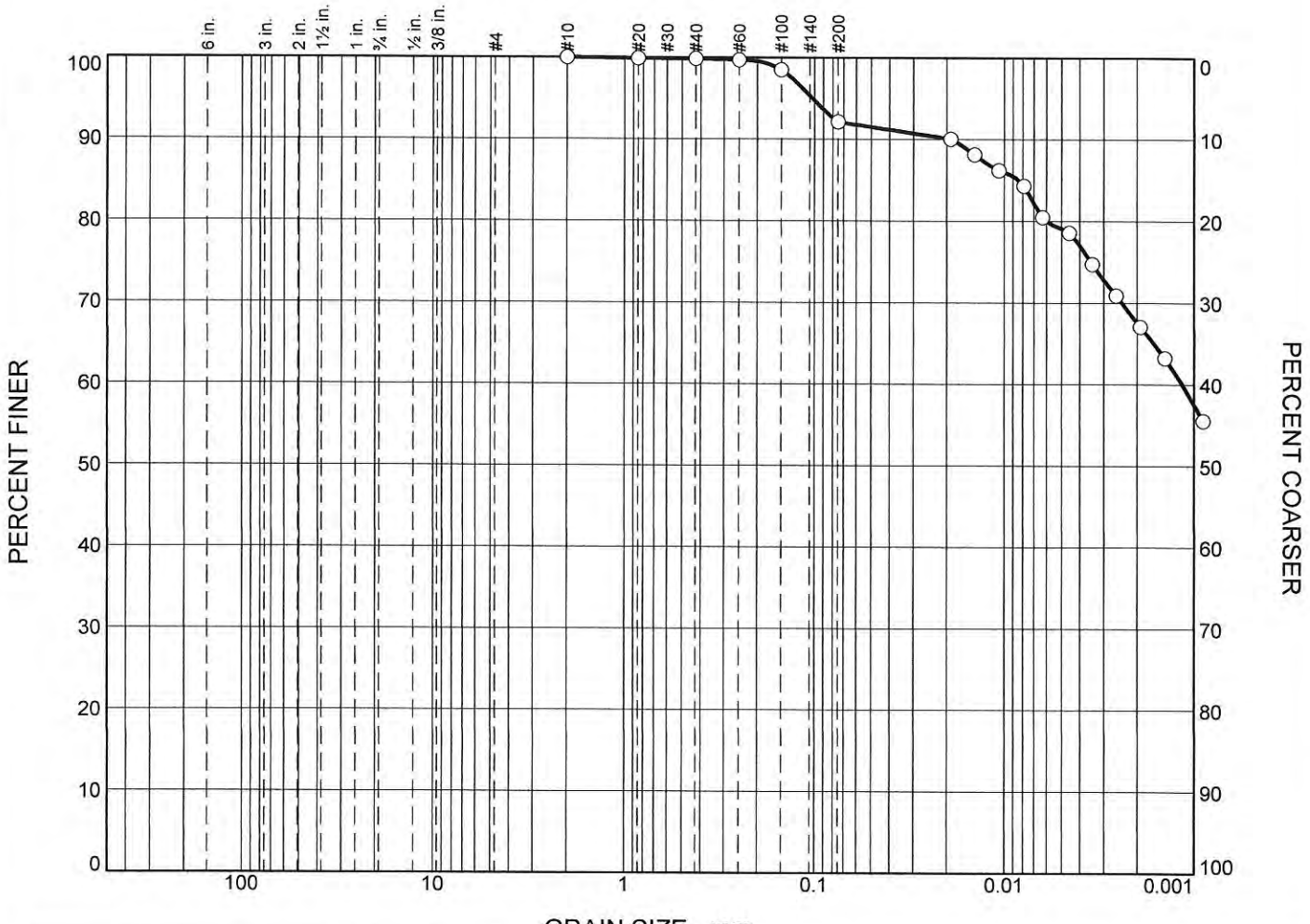
Project No.: 19.15.131

Figure

Attachment Figure B.2-12

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.2	7.7	13.0	79.1

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB024		23-25	Brown FAT CLAY	CH

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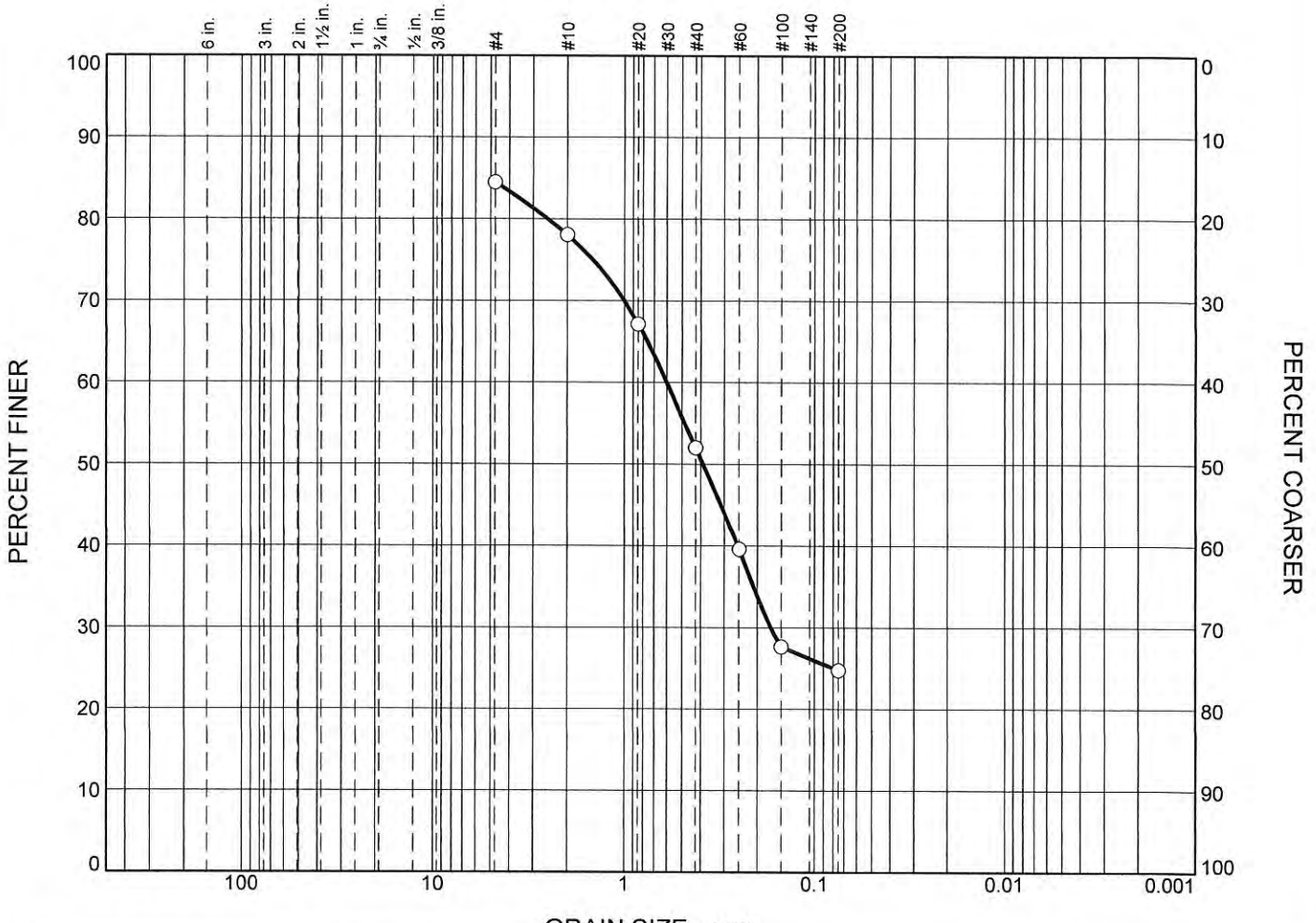
Project No.: 19.15.131

Figure

Attachment Figure B.2-13

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				6.5	26.0	27.2	24.8	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		0-2		SM

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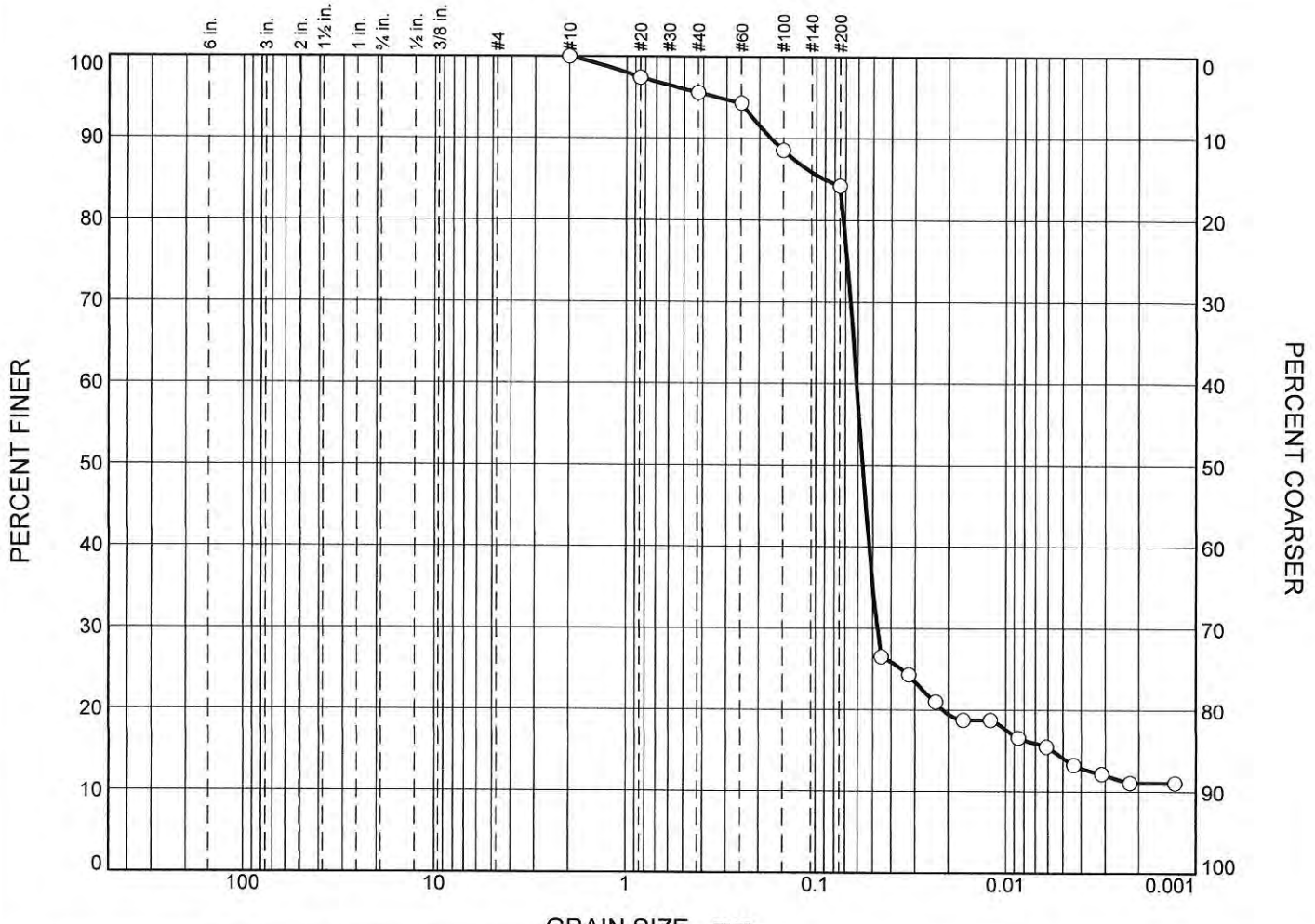
Project No.: 19.15.131

Figure

Attachment Figure B.2-14

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	4.4	11.4	70.1	14.1

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		8-10	Gray LEAN CLAY with SAND	CL

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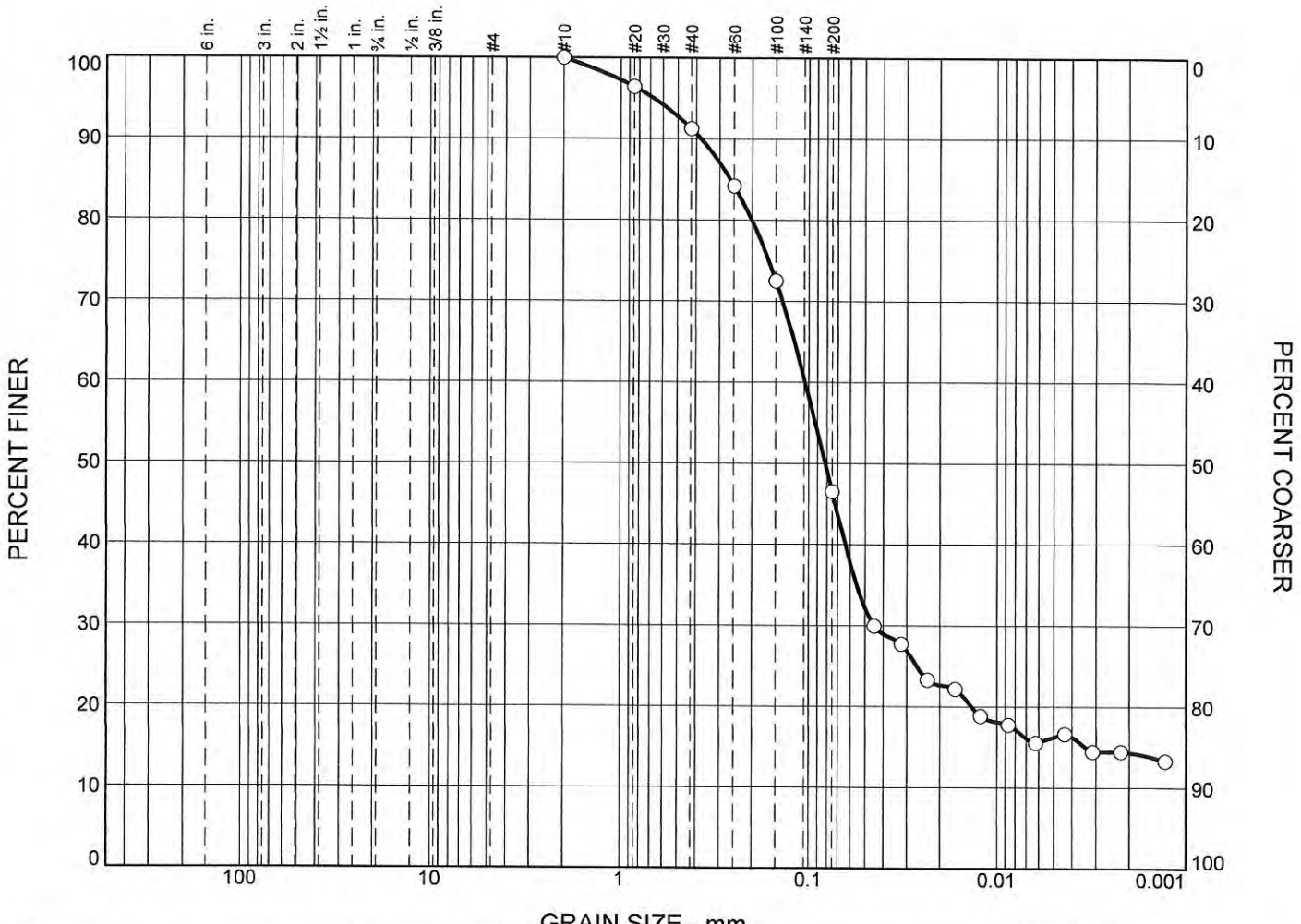
Project No.: 19.15.131

Figure

Attachment Figure B.2-15

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	8.8	44.7	30.3	16.2

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		10-12		SC

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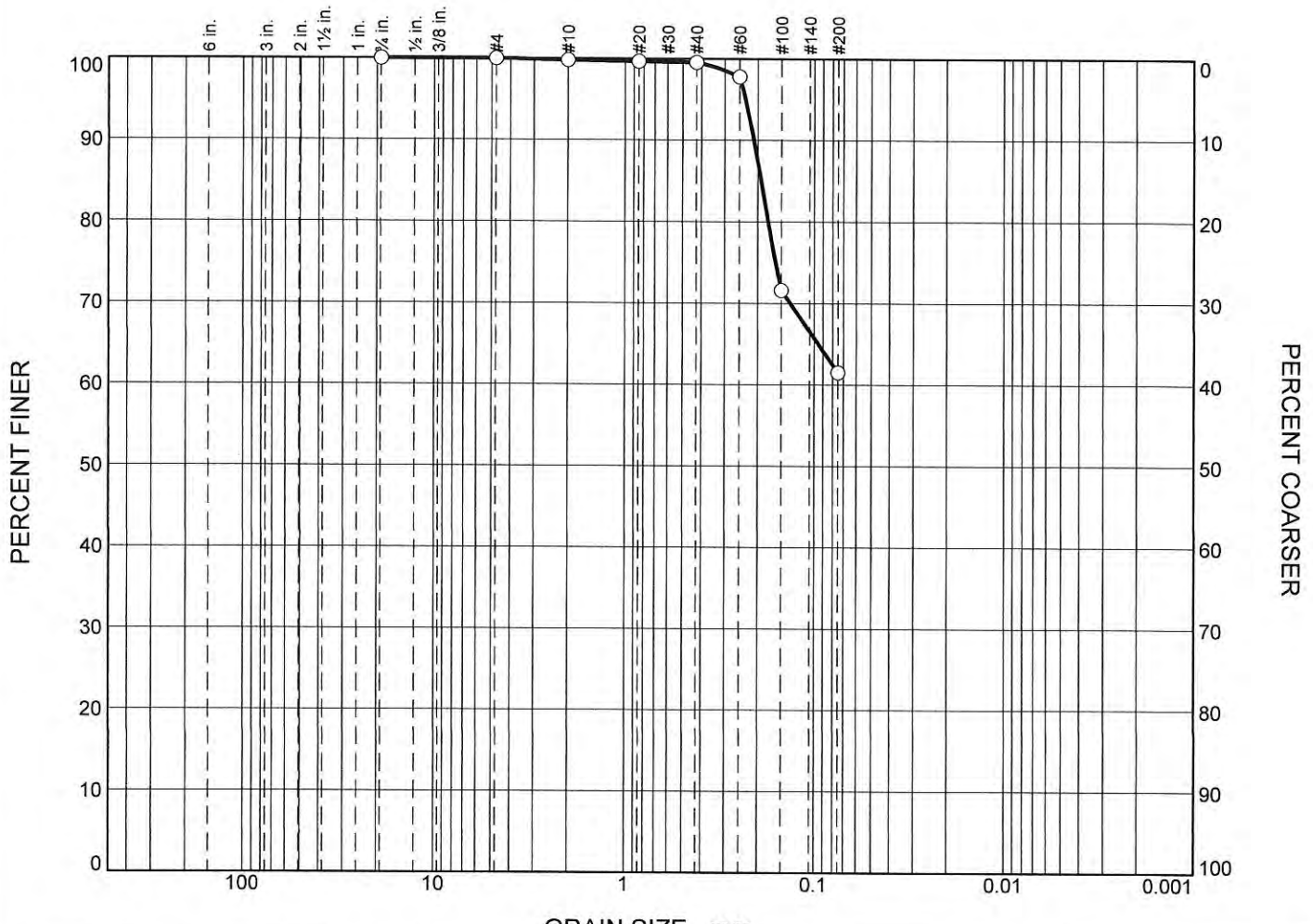
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-16

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.2	0.3	38.0	61.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		14-16		ML

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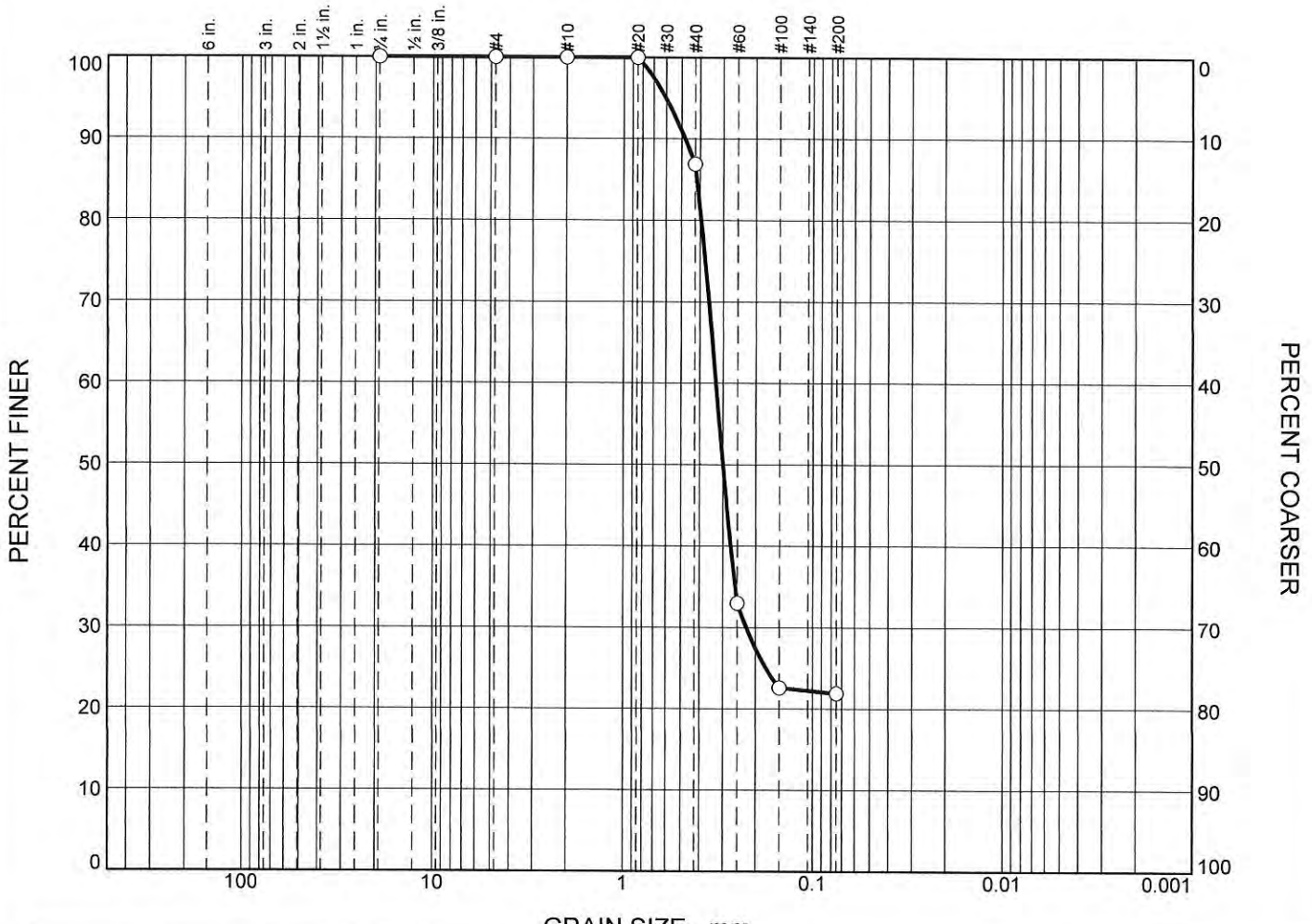
Project No.: 19.15.131

Figure

Attachment Figure B.2-17

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	13.1	65.0	21.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		20-22		SM

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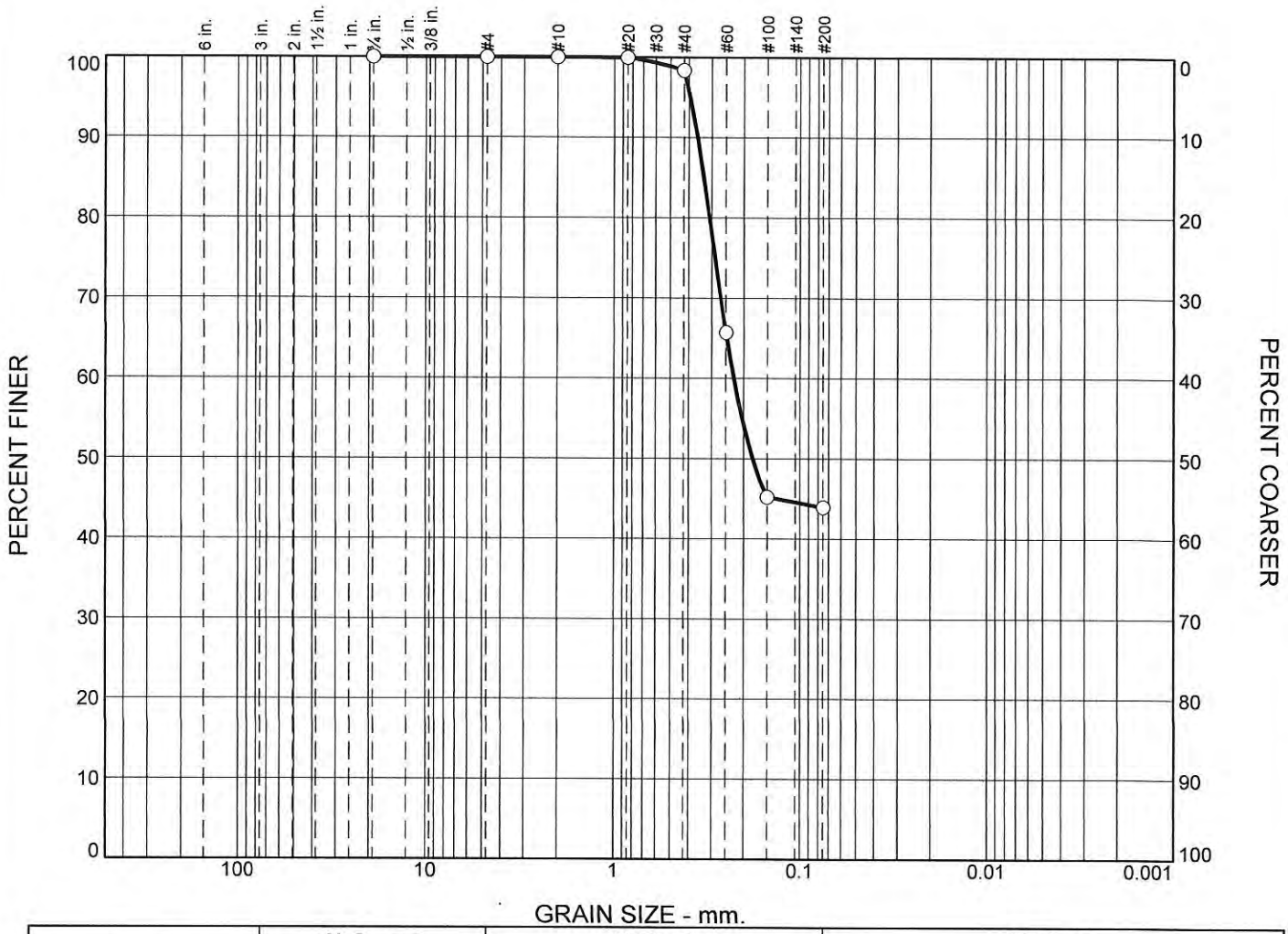
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-18

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.6	54.5	43.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		22-24		SM

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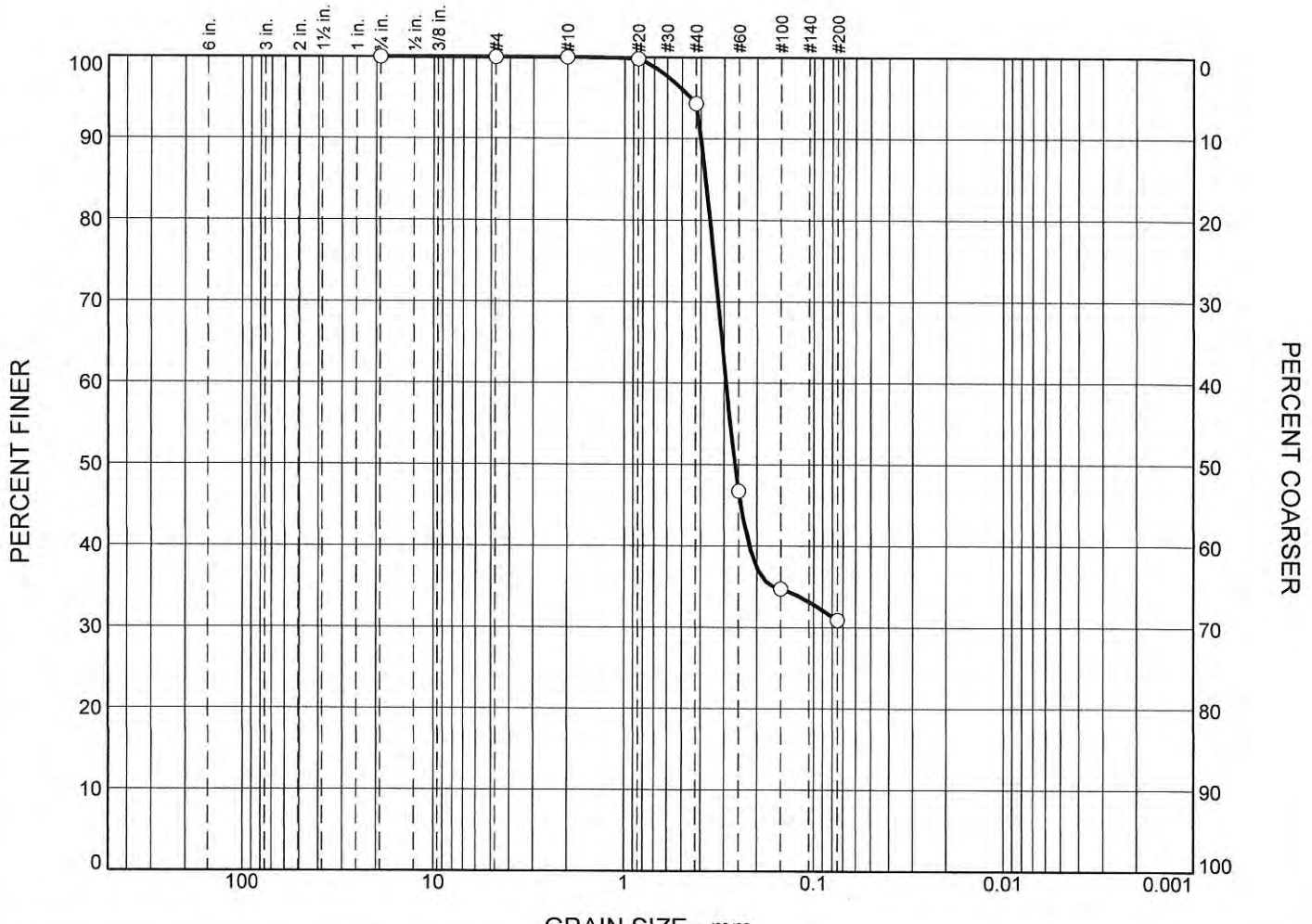
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-19

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	5.7	63.4	30.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB025		28-30		SM

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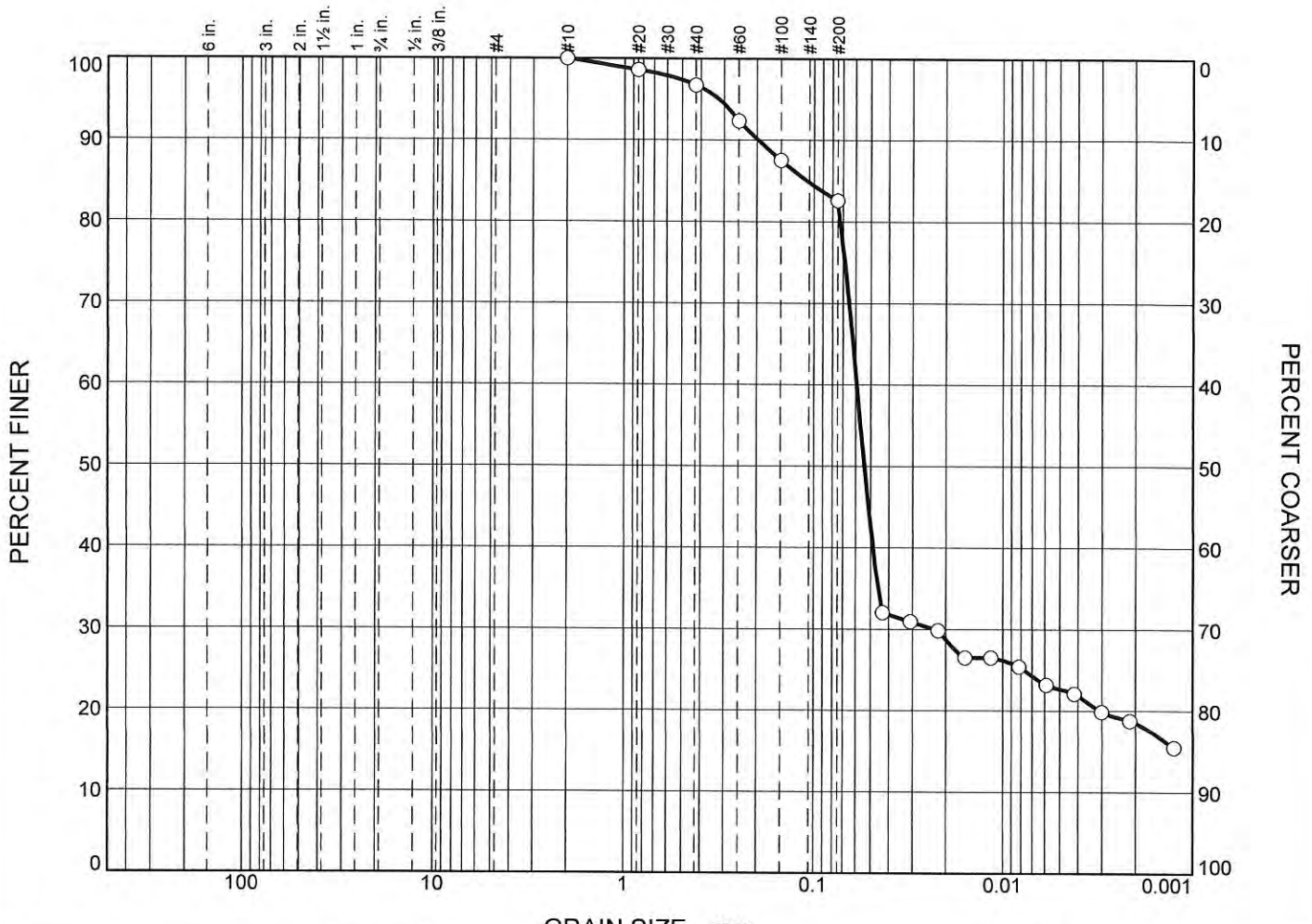
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-20

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	3.3	14.1	59.9	22.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB026		8-10	Gray and brown LEAN CLAY with SAND	CL

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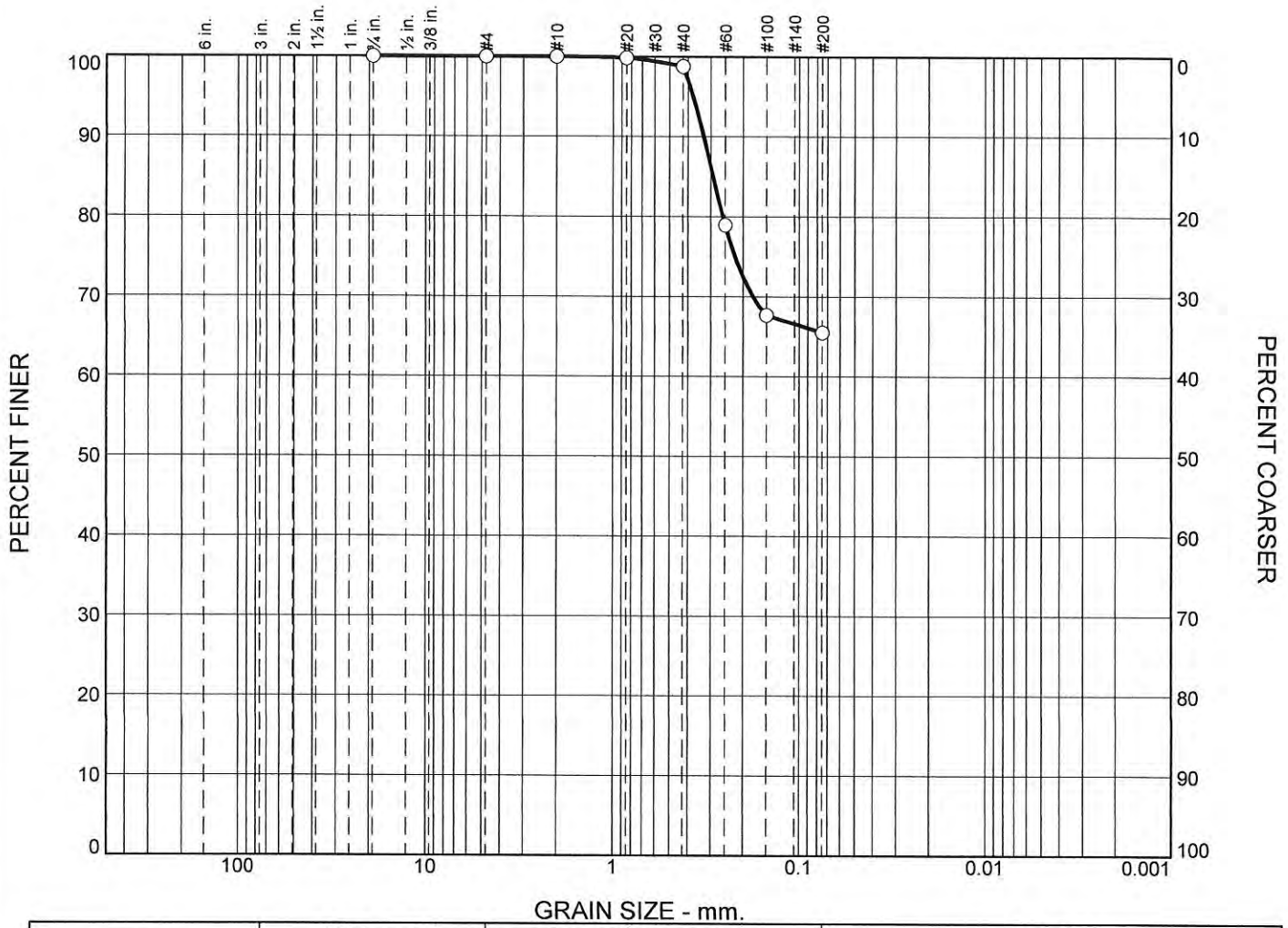
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-21

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.2	33.3	65.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB026		12-14	Tan and Gray SAND	ML

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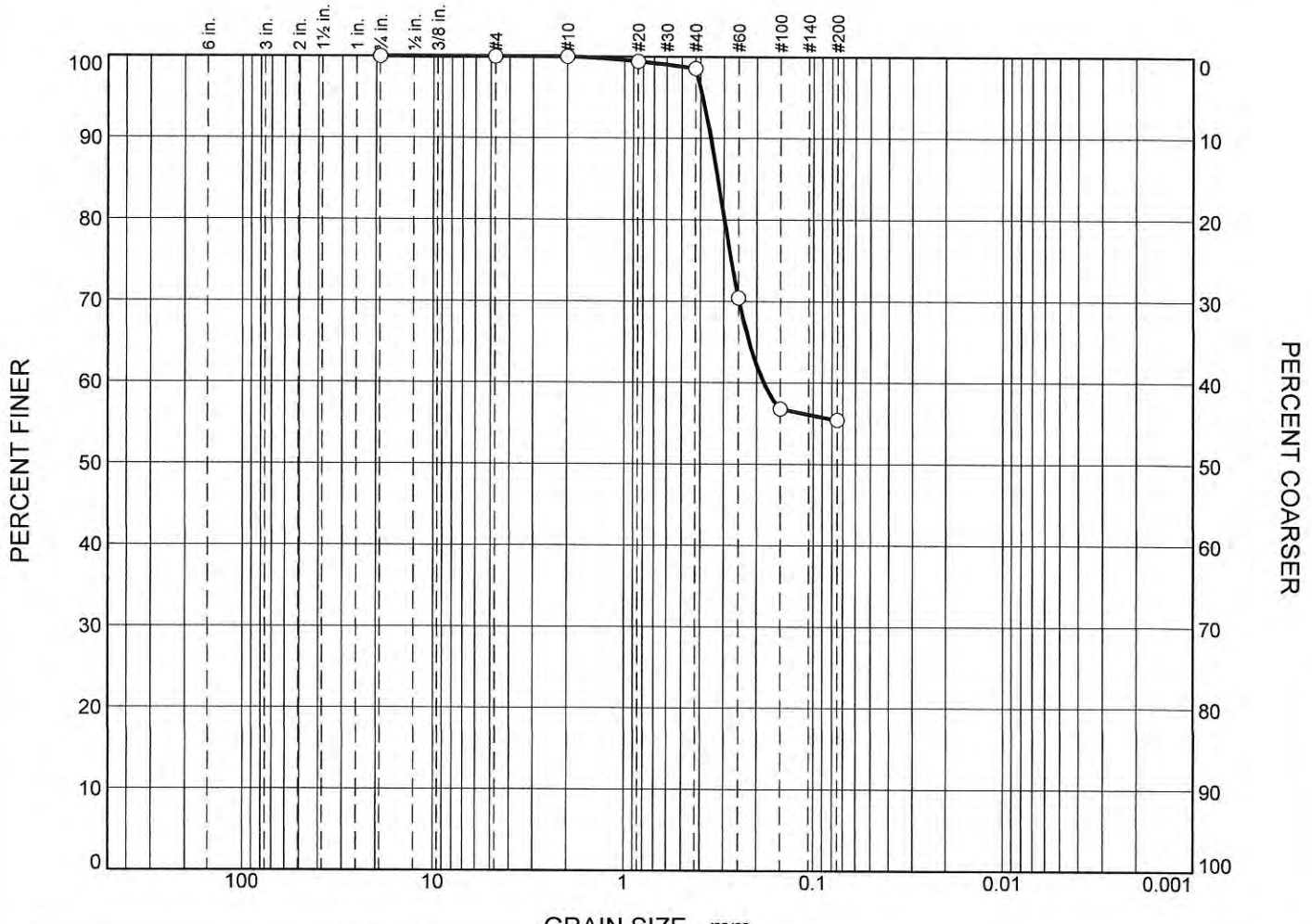
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-22

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.4	43.2	55.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB026		20-22		ML

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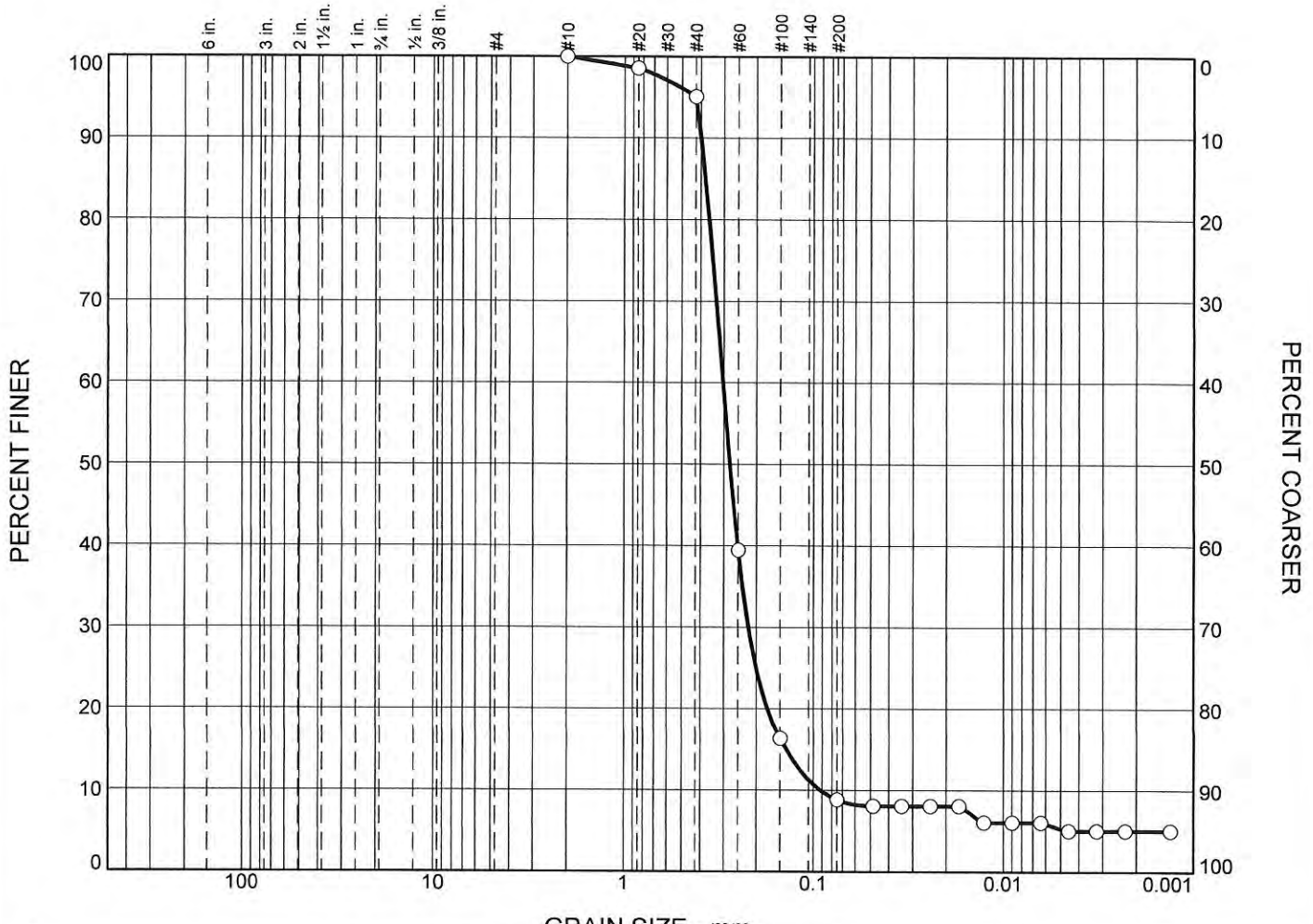
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-23

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	4.9	86.3	3.5	5.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB028		28	Gray poorly graded SAND with SILT	SP-SM

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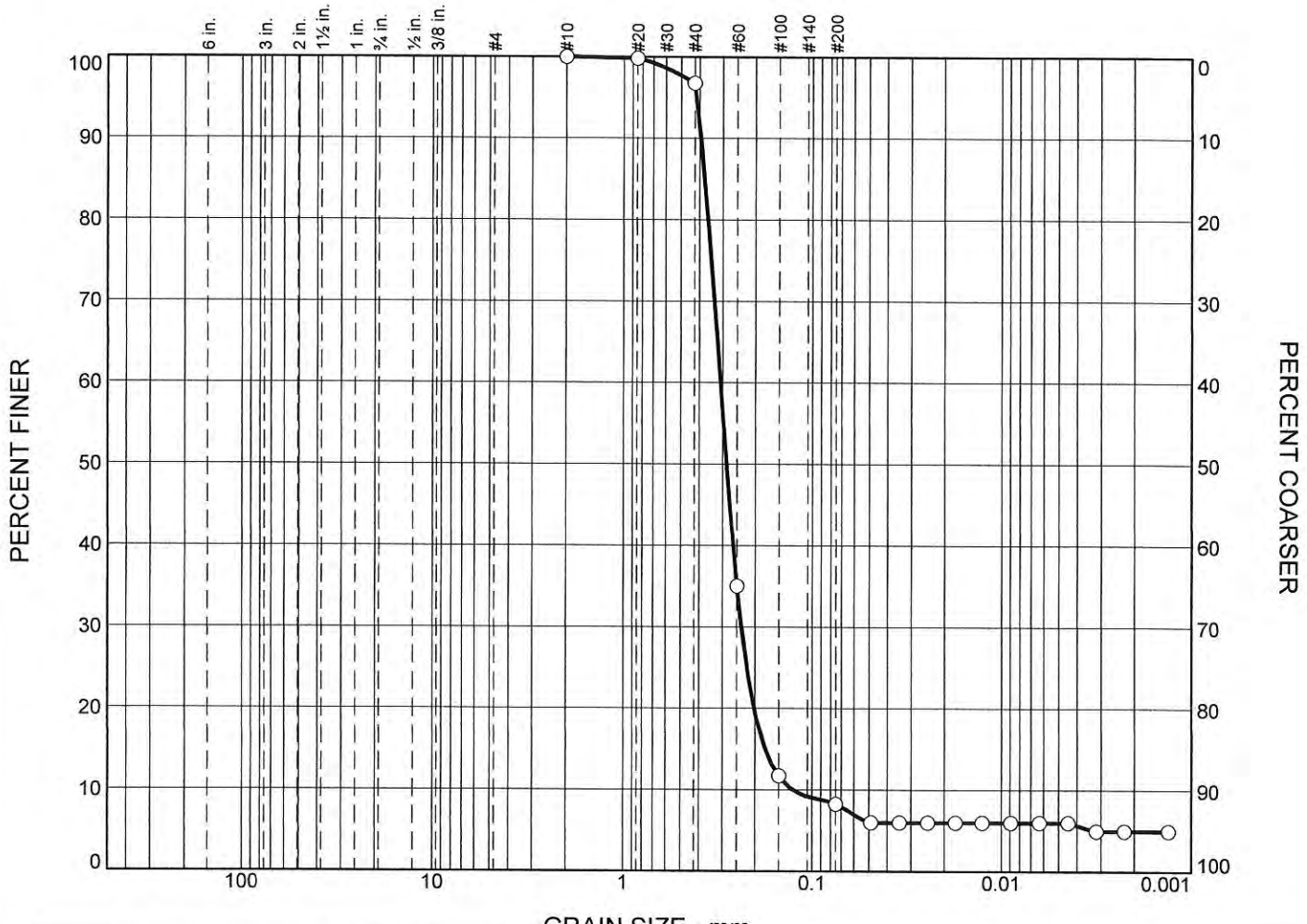
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-24

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	3.2	88.5	3.3	5.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB028		33	Gray poorly graded SAND with SILT	SP-SM

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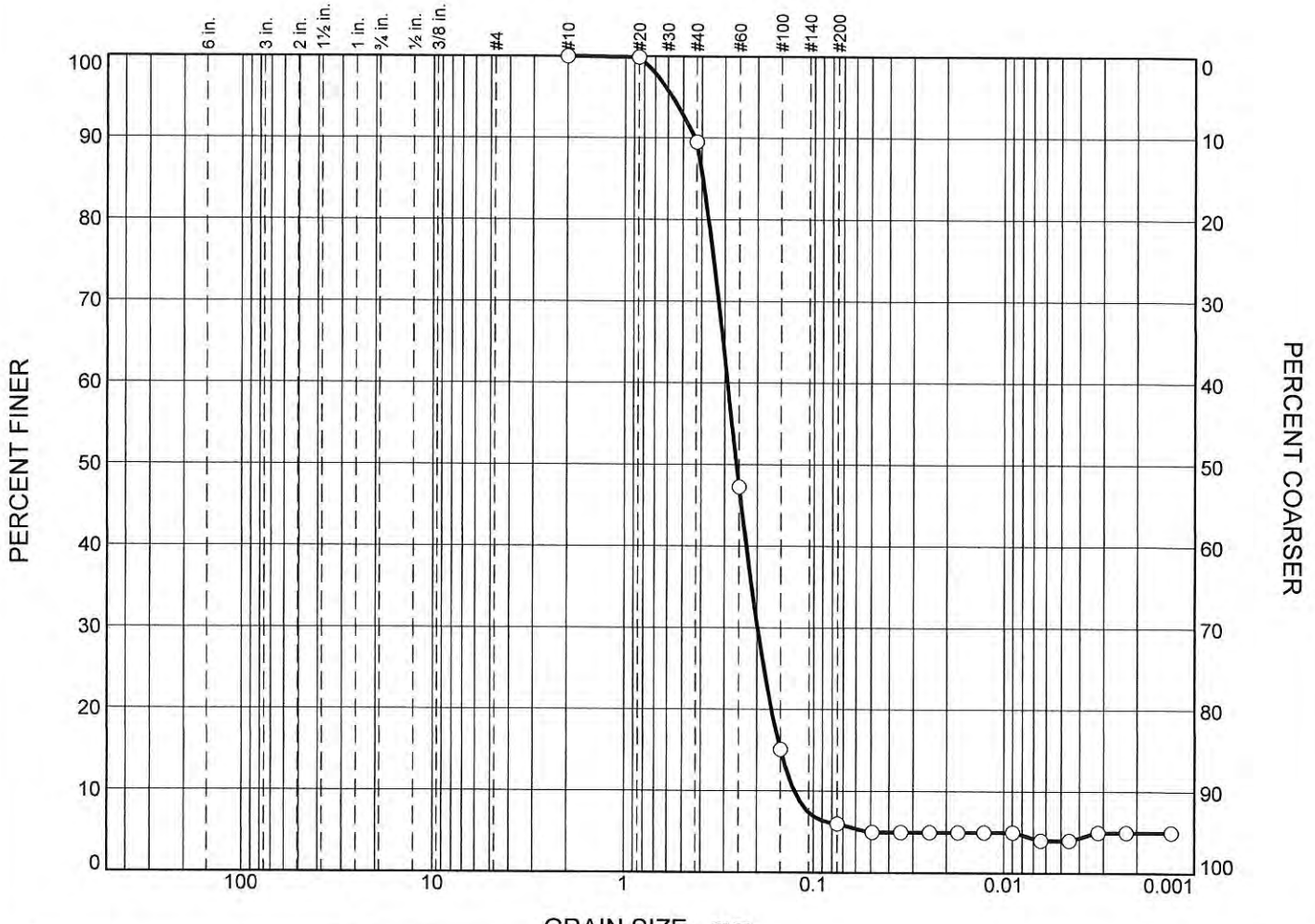
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-25

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	10.5	83.5	1.0	5.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB028		38	Gray poorly graded SAND with SILT	SP-SM

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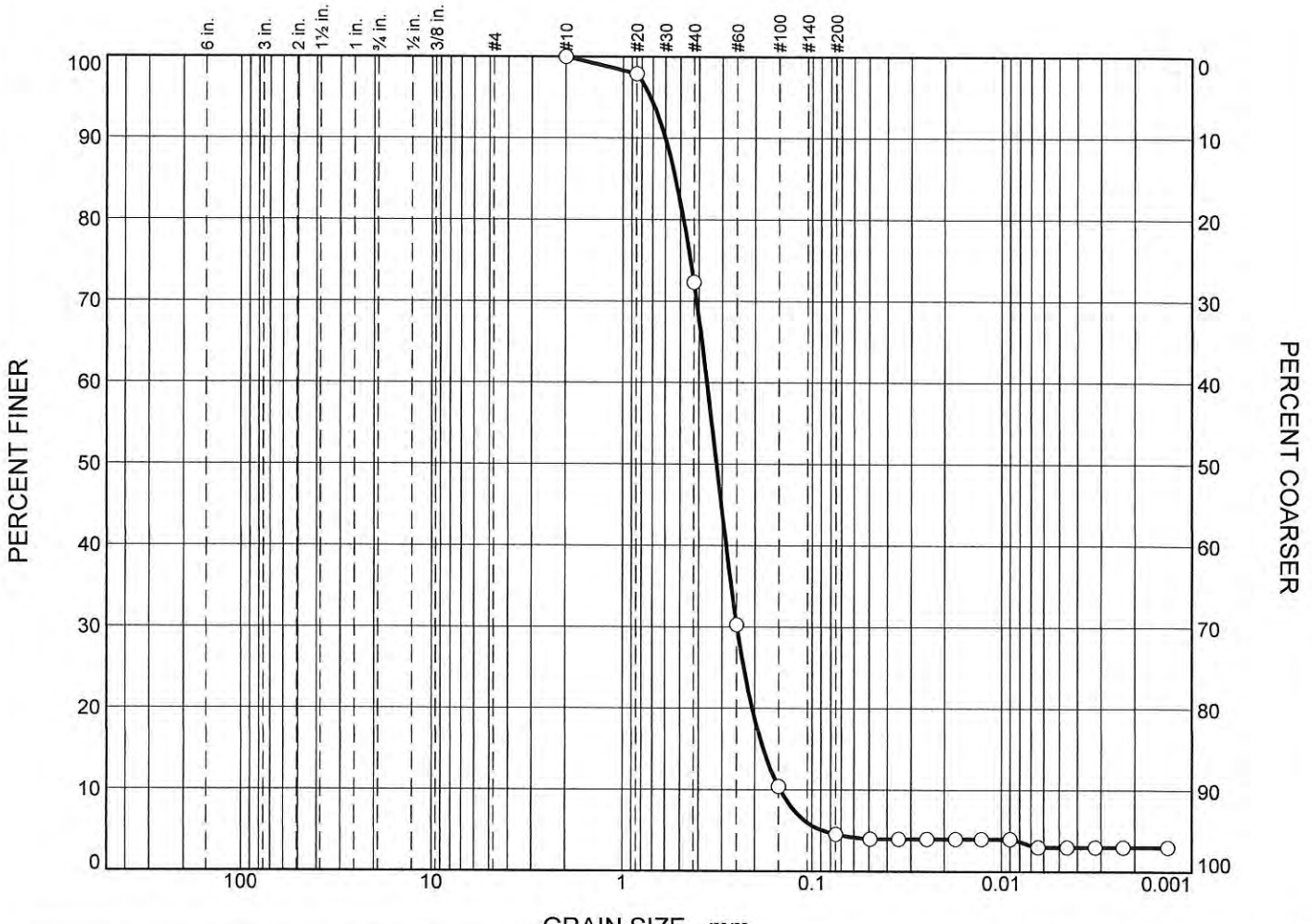
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-26

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	27.7	67.7	1.6	3.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB028		43	Gray poorly graded SAND	SP

Tolunay-Wong Engineers, Inc.
Houston, Texas

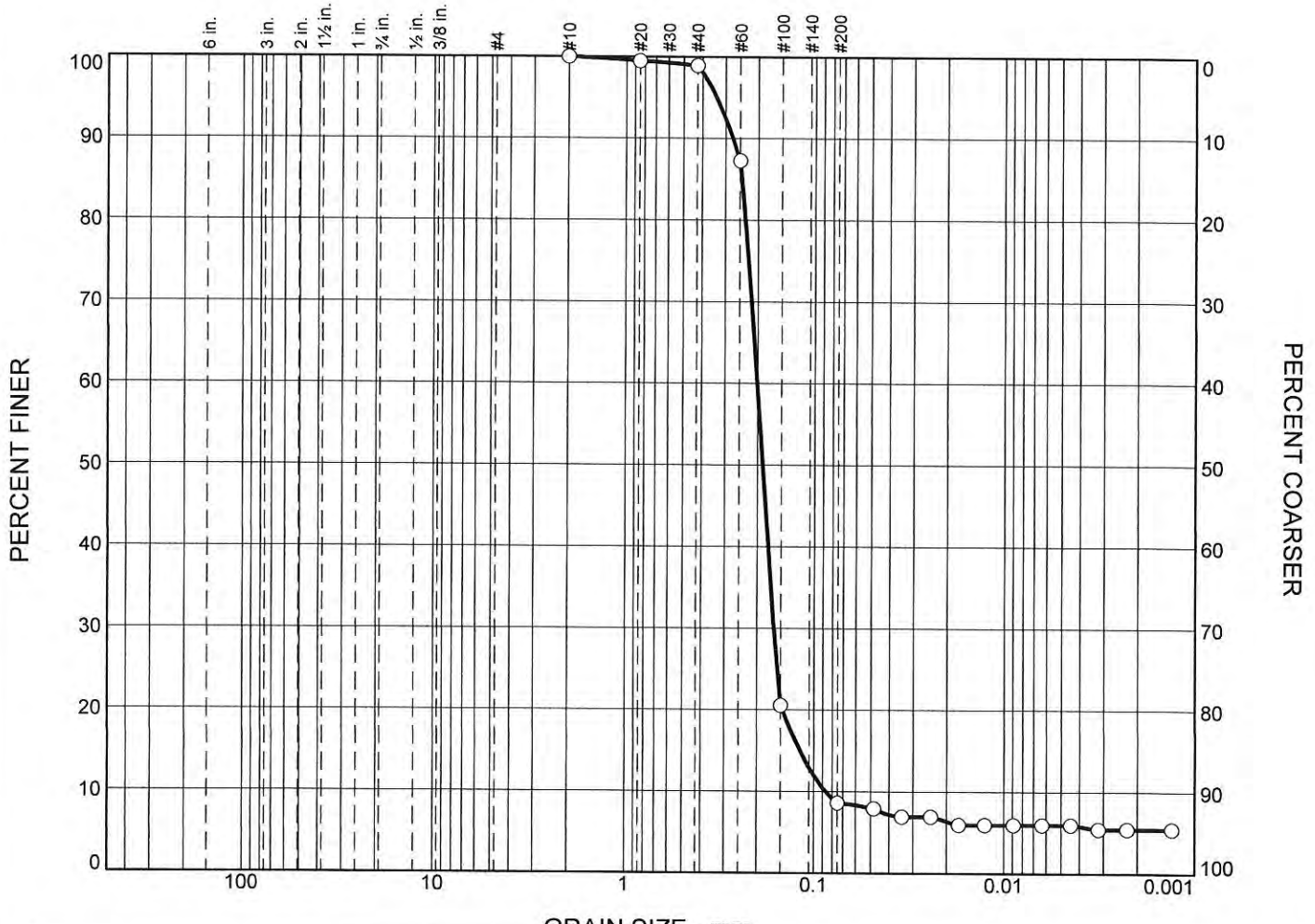
Client:

Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131 **Figure**

Attachment Figure B.2-27

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.1	90.3	3.2	5.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		23	Gray poorly graded SAND with SILT	SP-SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

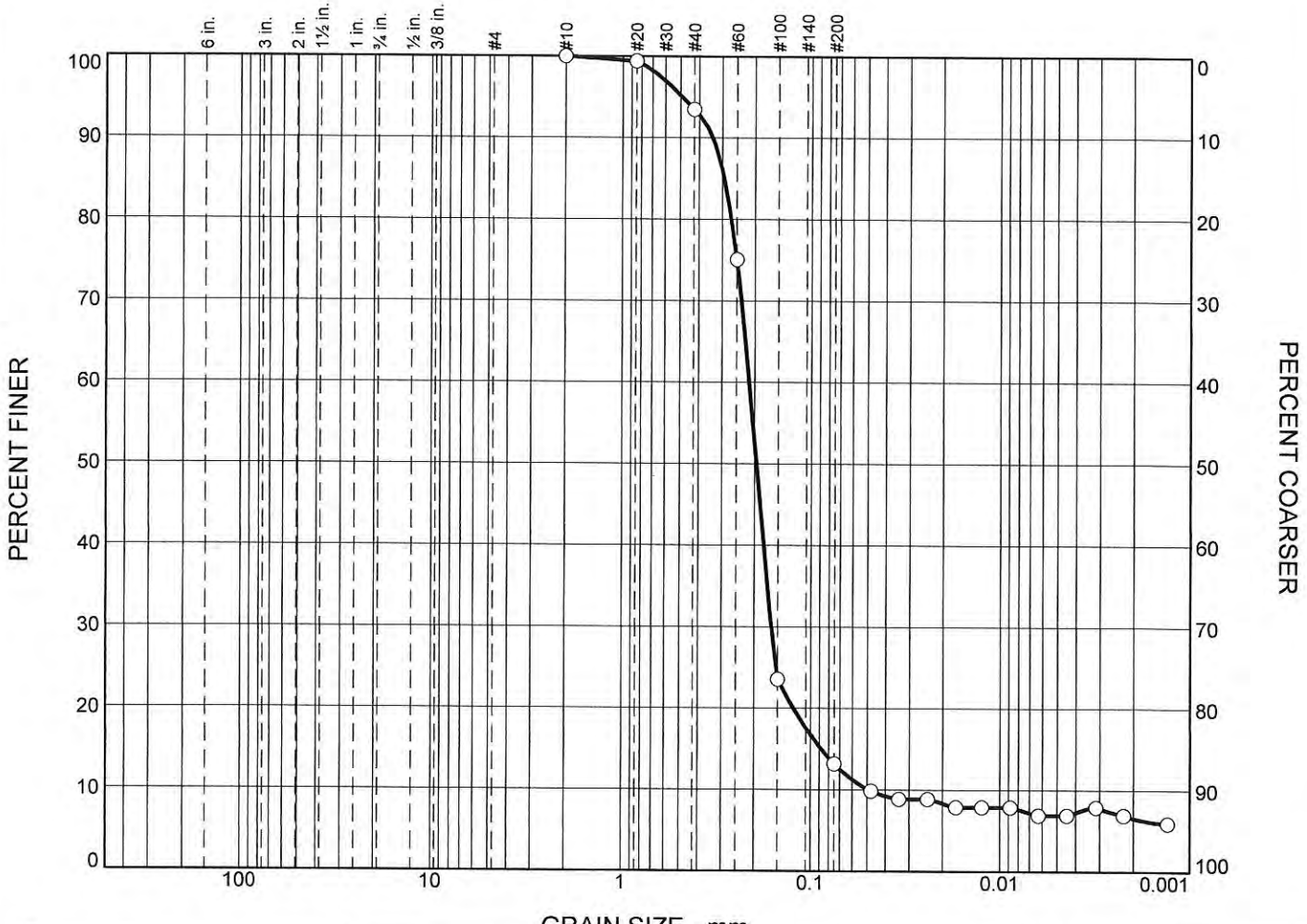
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-28

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	6.5	80.3	6.7	6.5

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		28	Gray SILTY SAND	SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

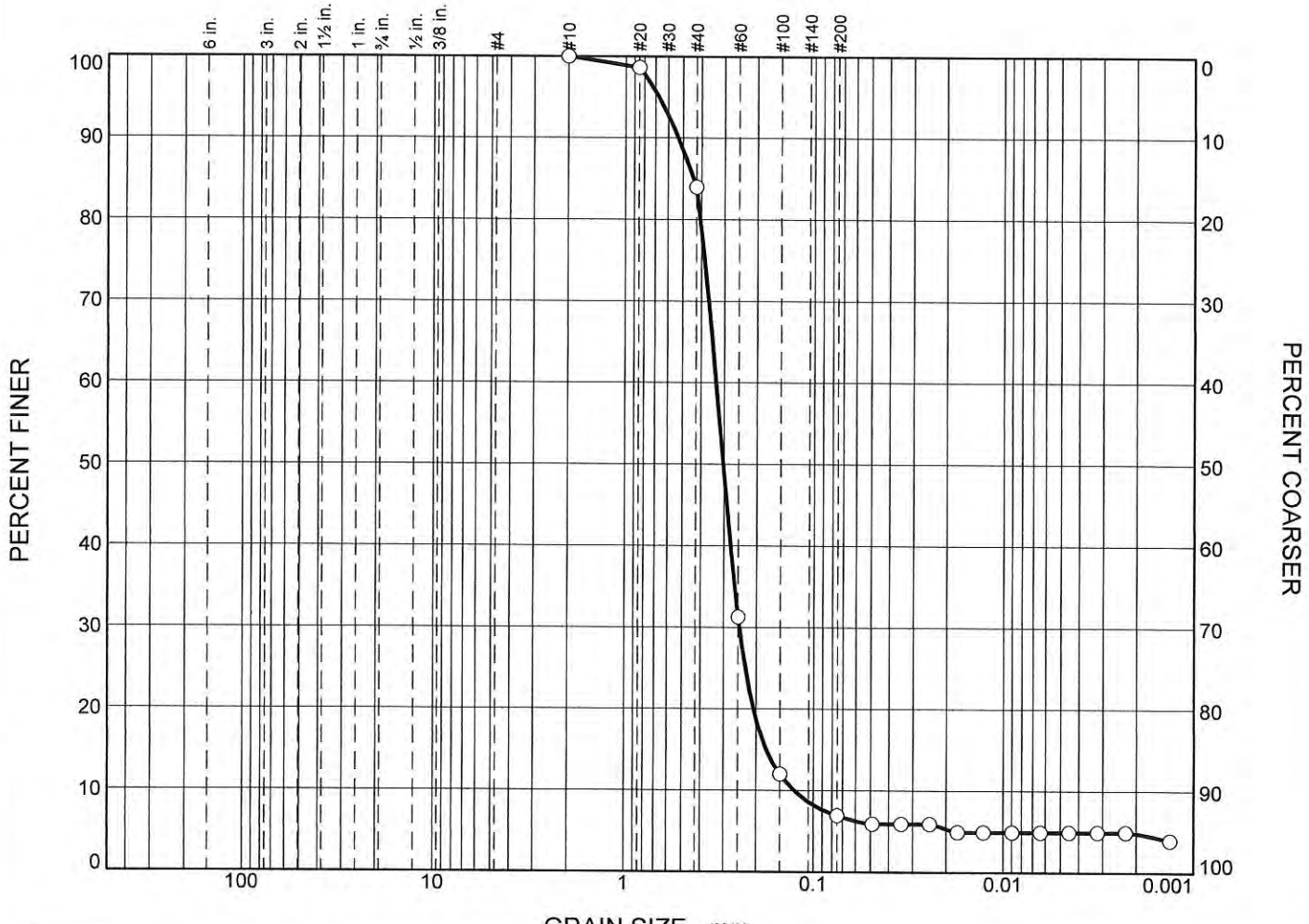
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-29

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	16.0	77.1	2.1	4.8

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		33	Gray poorly graded SAND with SILT	SP-SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

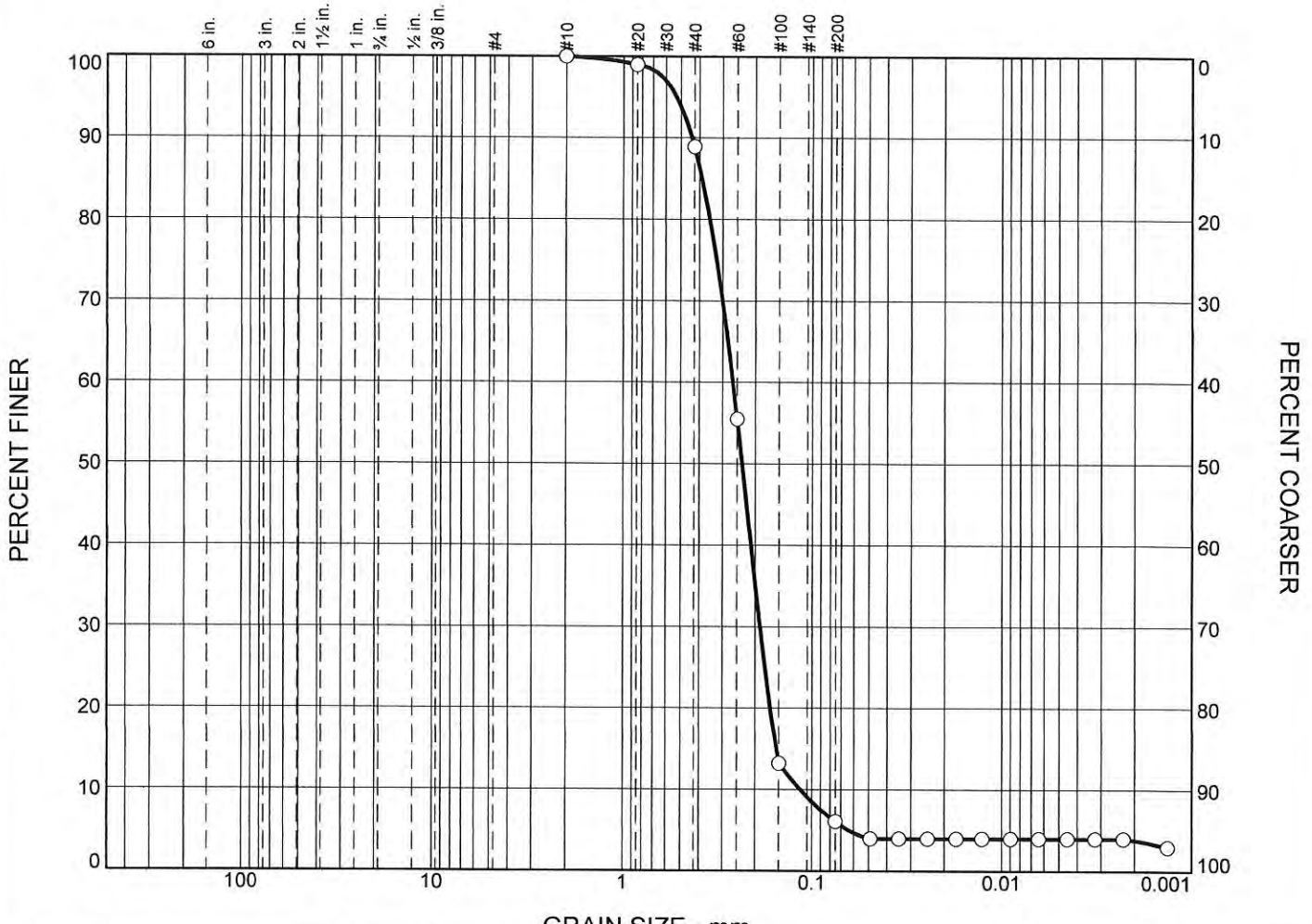
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-30

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	11.1	82.8	2.3	3.8

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		38	Gray poorly graded SAND with SILT	SP-SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

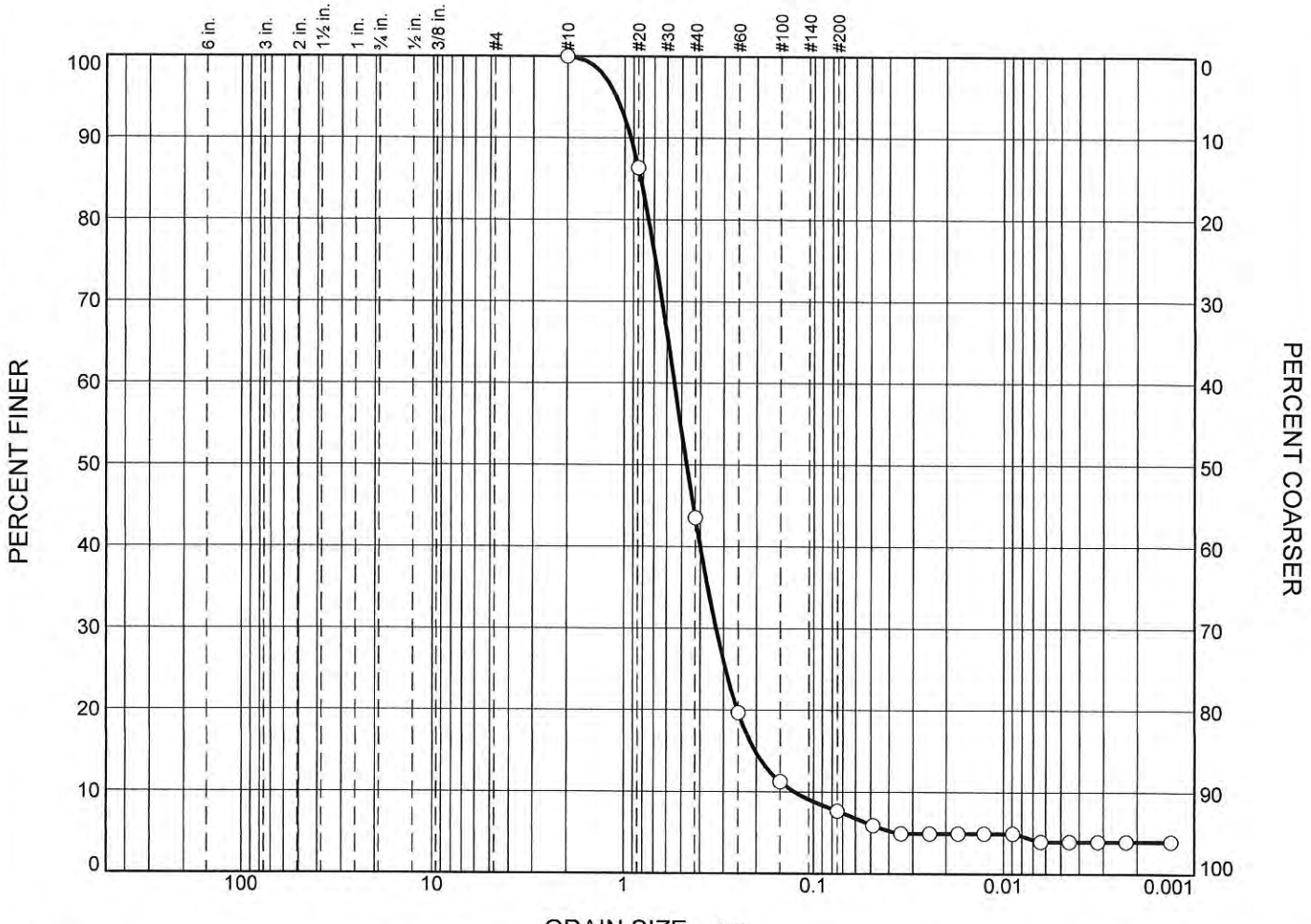
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-31

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	56.5	35.8	3.8	3.9

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		43	Gray poorly graded SAND with SILT	SP-SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

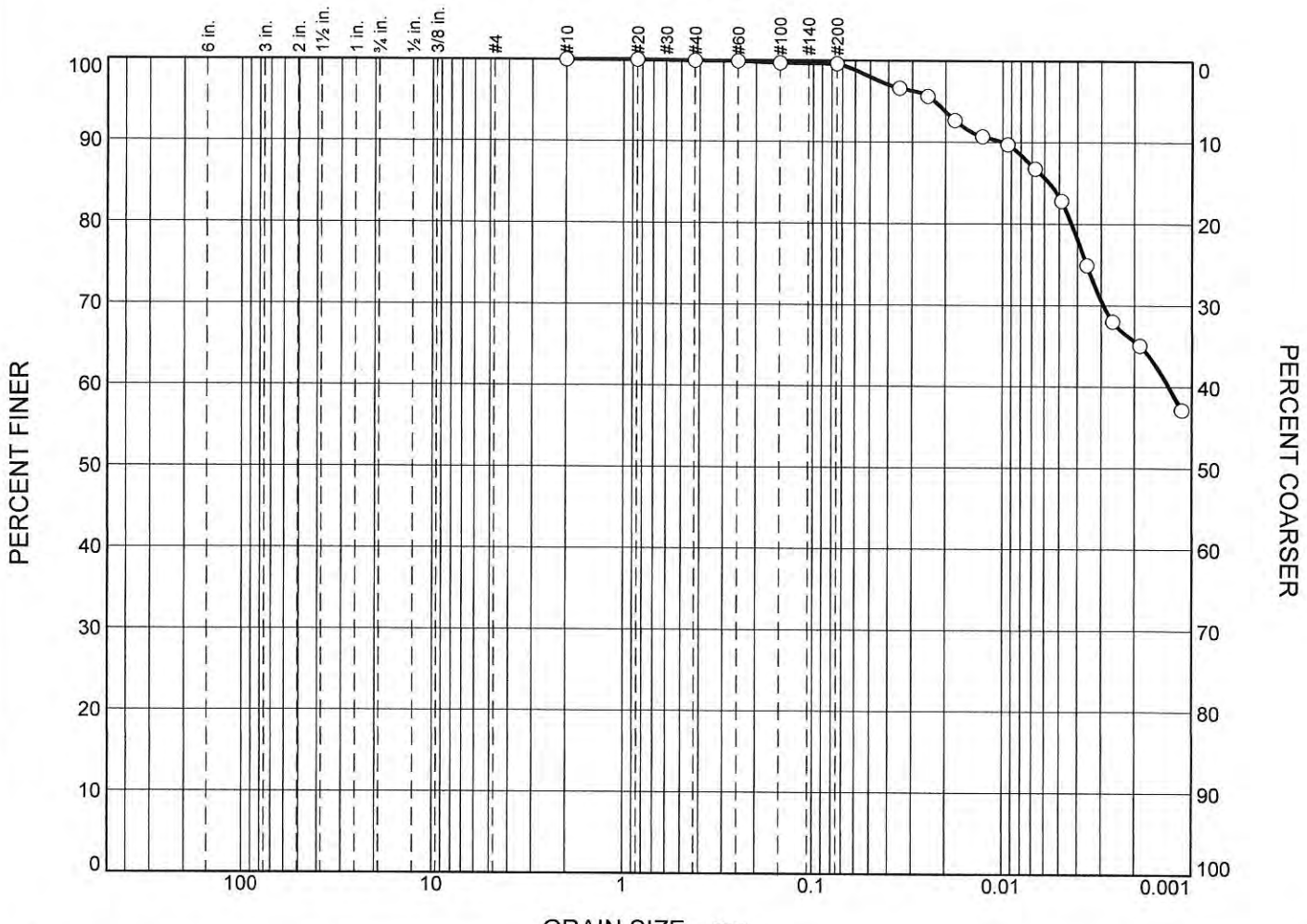
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-32

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	0.3	34.0	65.6

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB029		48	Gray FAT CLAY	CH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

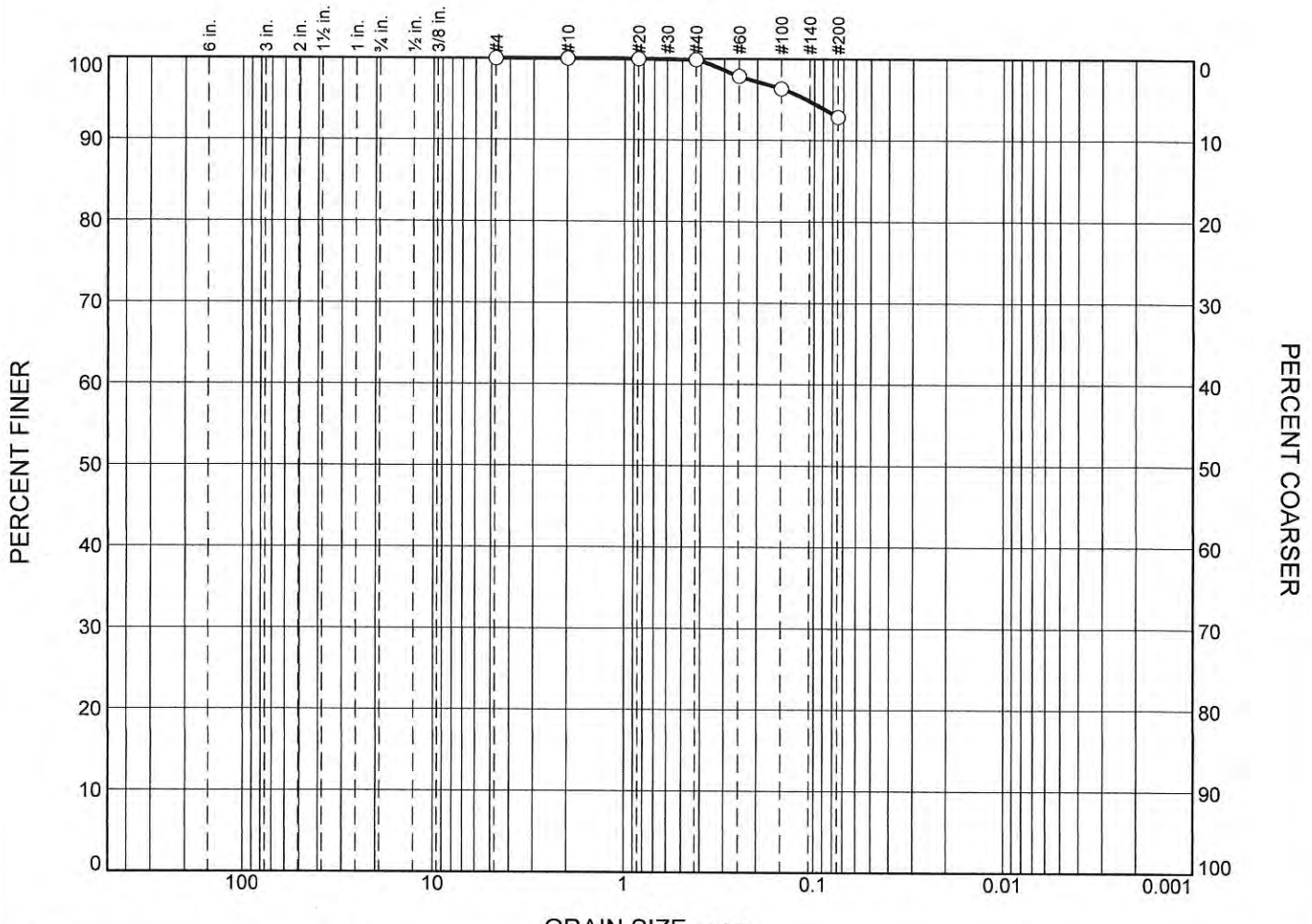
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-33

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	7.0	92.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB047		53		ML

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

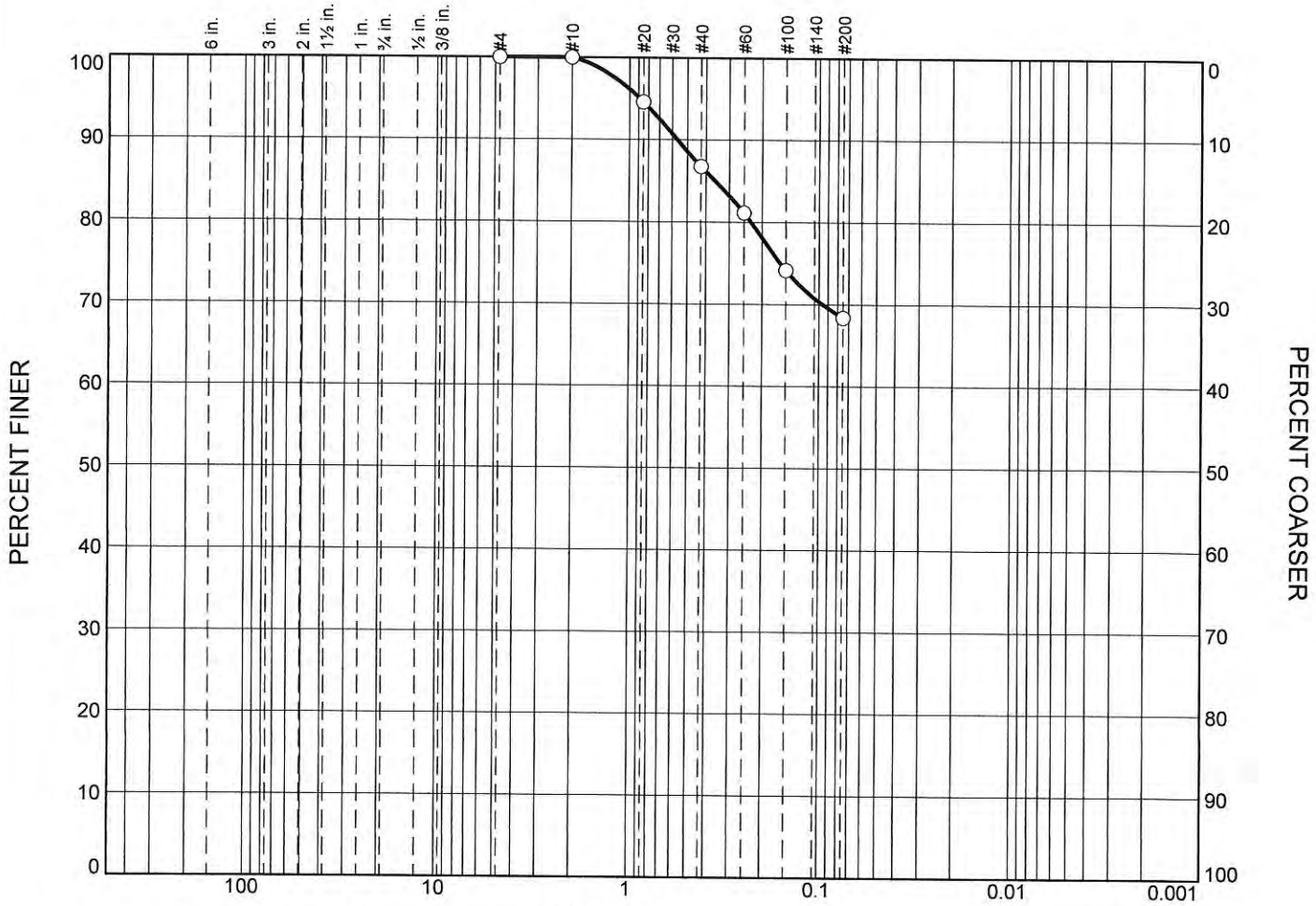
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-34

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	13.2	18.4	68.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB047		78		ML

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

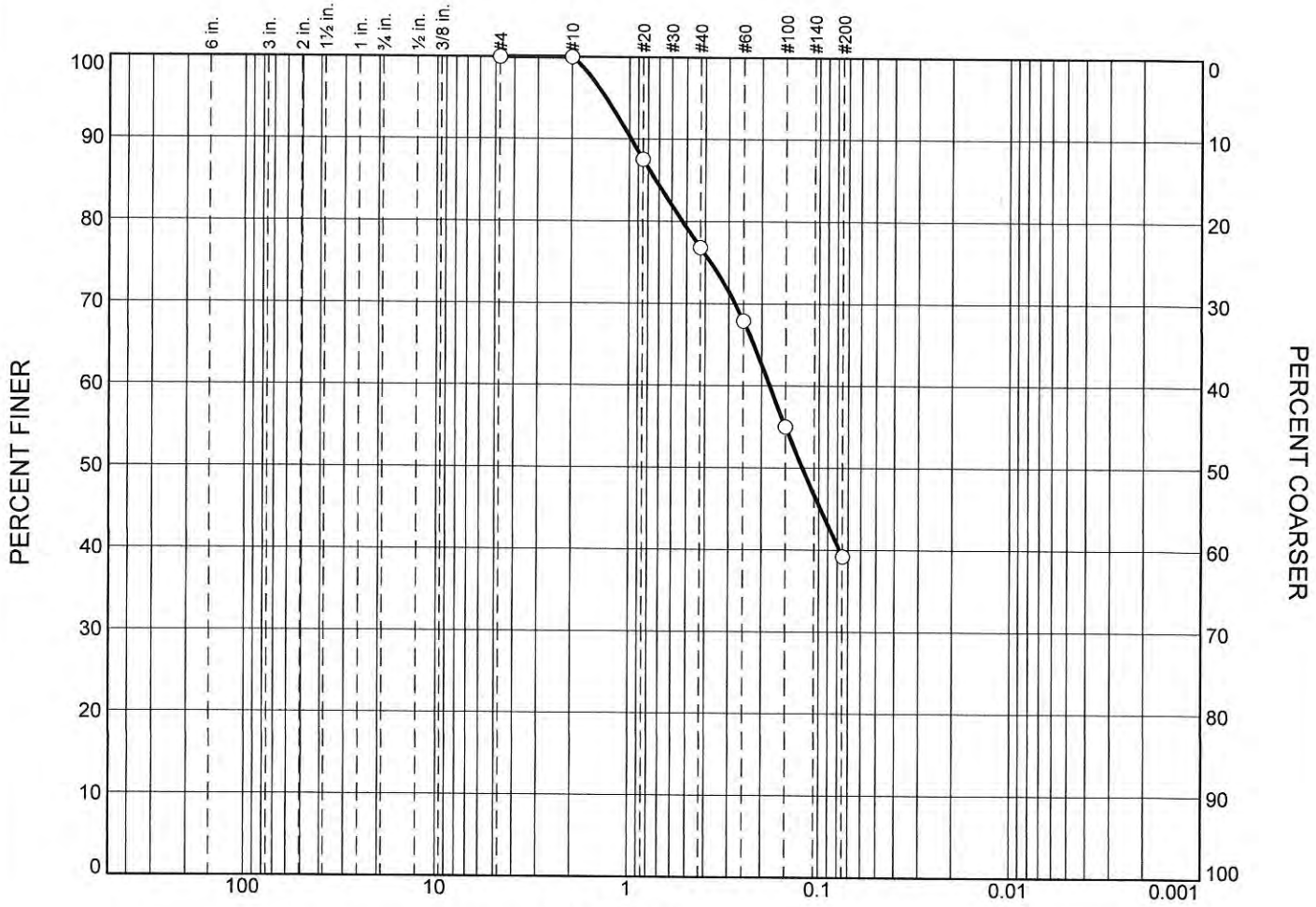
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-35

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	23.2	37.6	39.2	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB047		88		SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

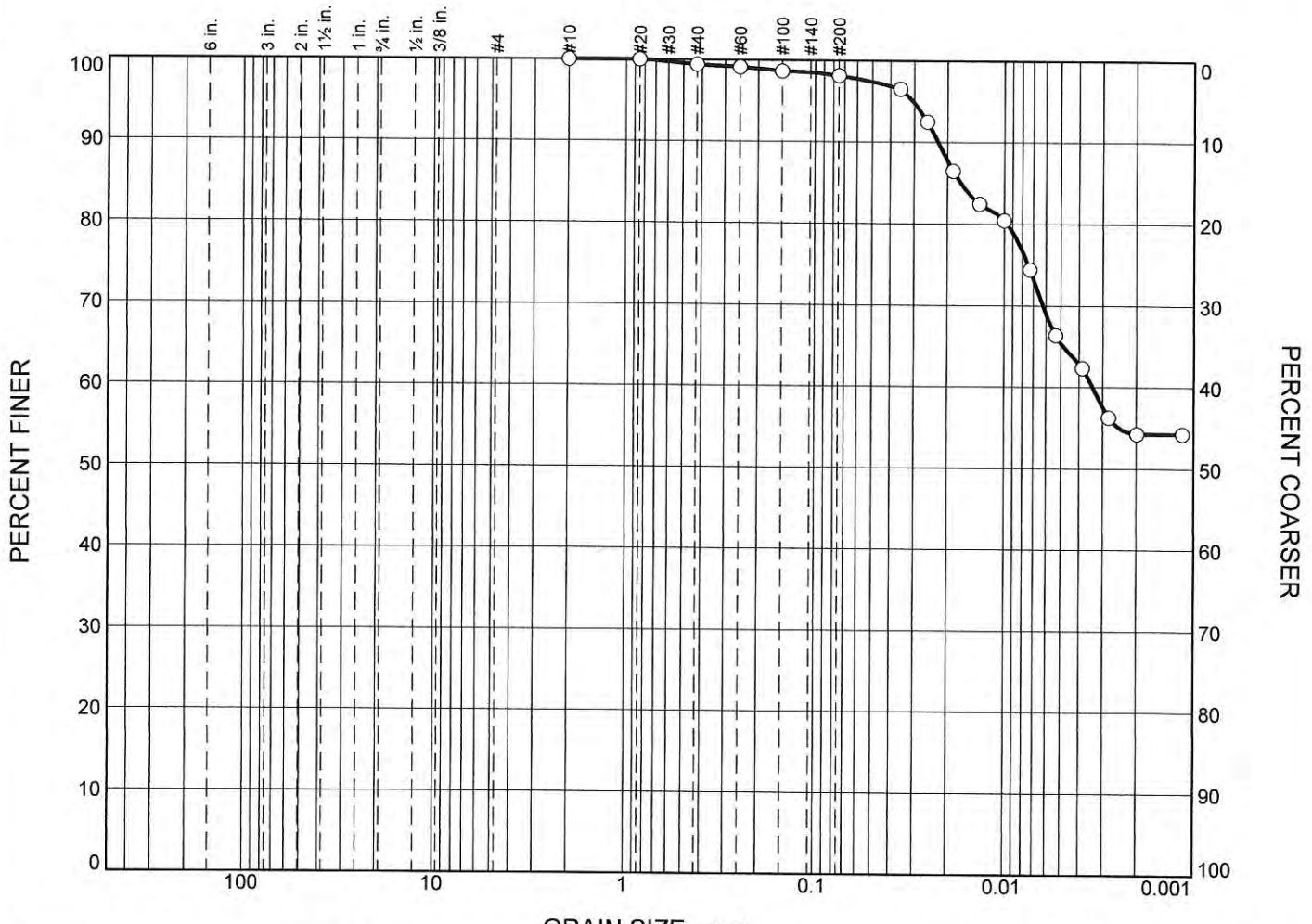
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-36

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.6	1.3	32.7	65.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB050		0-2		CH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

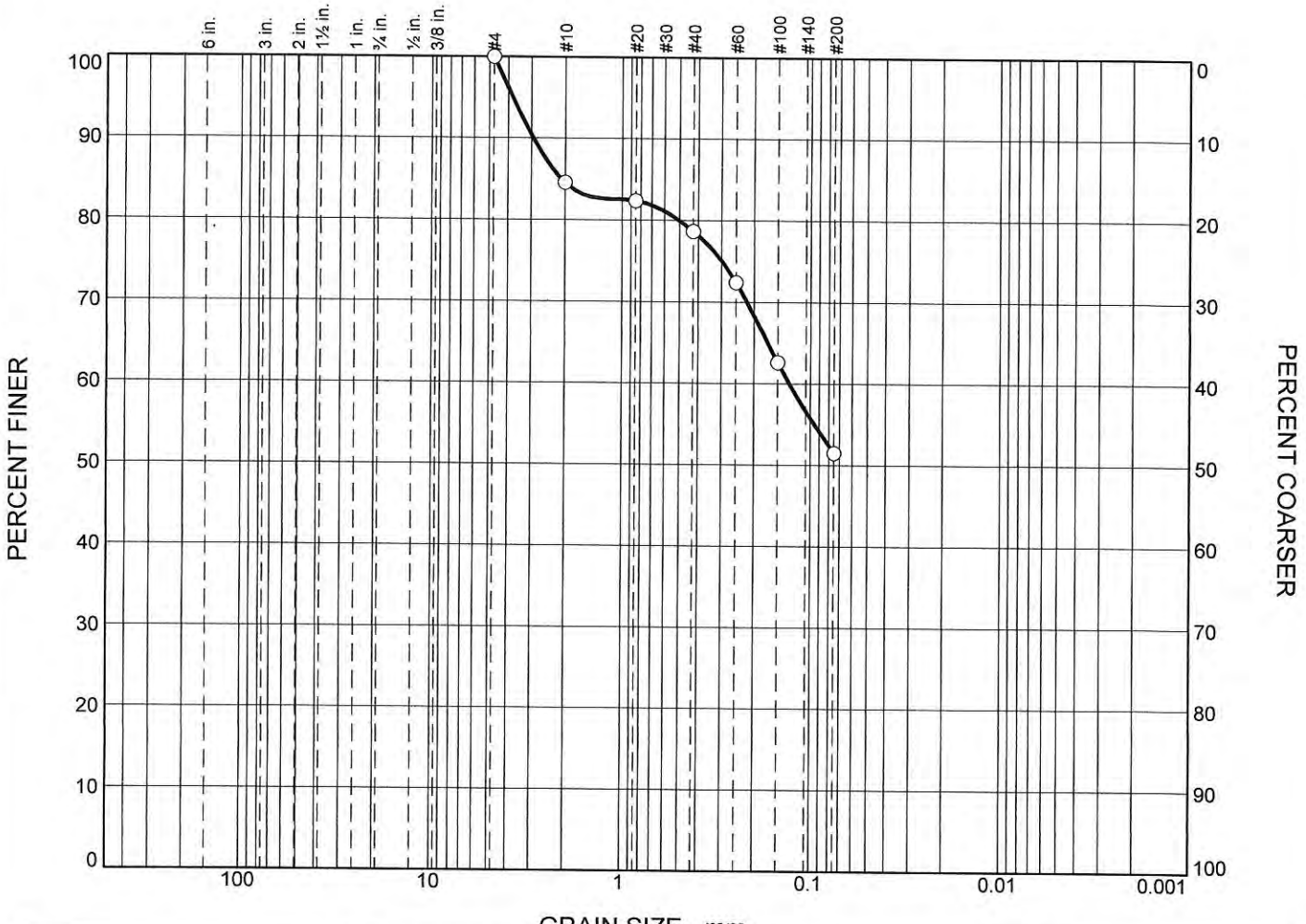
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-37

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	15.4	5.9	27.2	51.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB050		14-16		ML

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

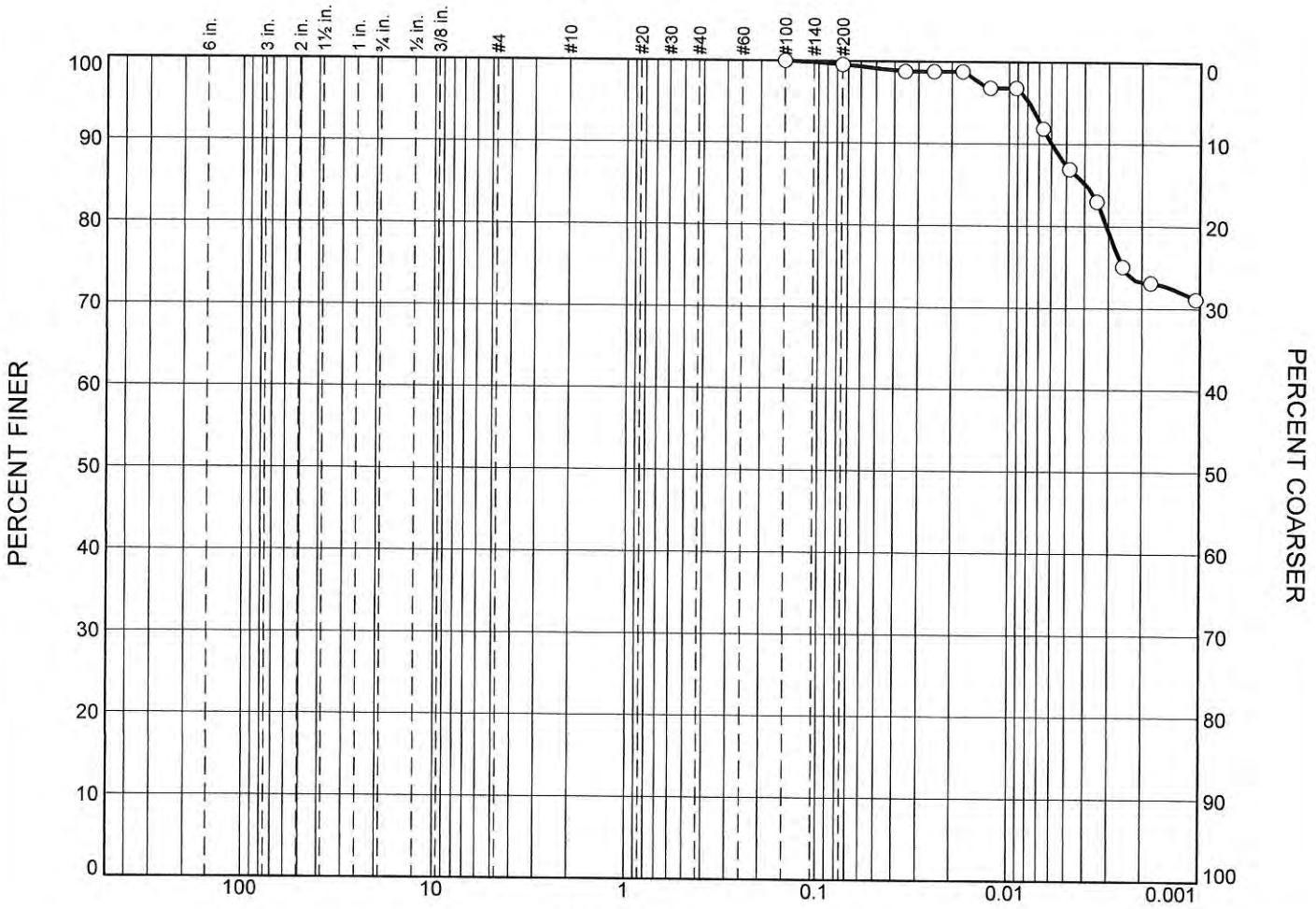
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-38

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.4	26.4	73.2

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB053		38	Tan FAT CLAY	CH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

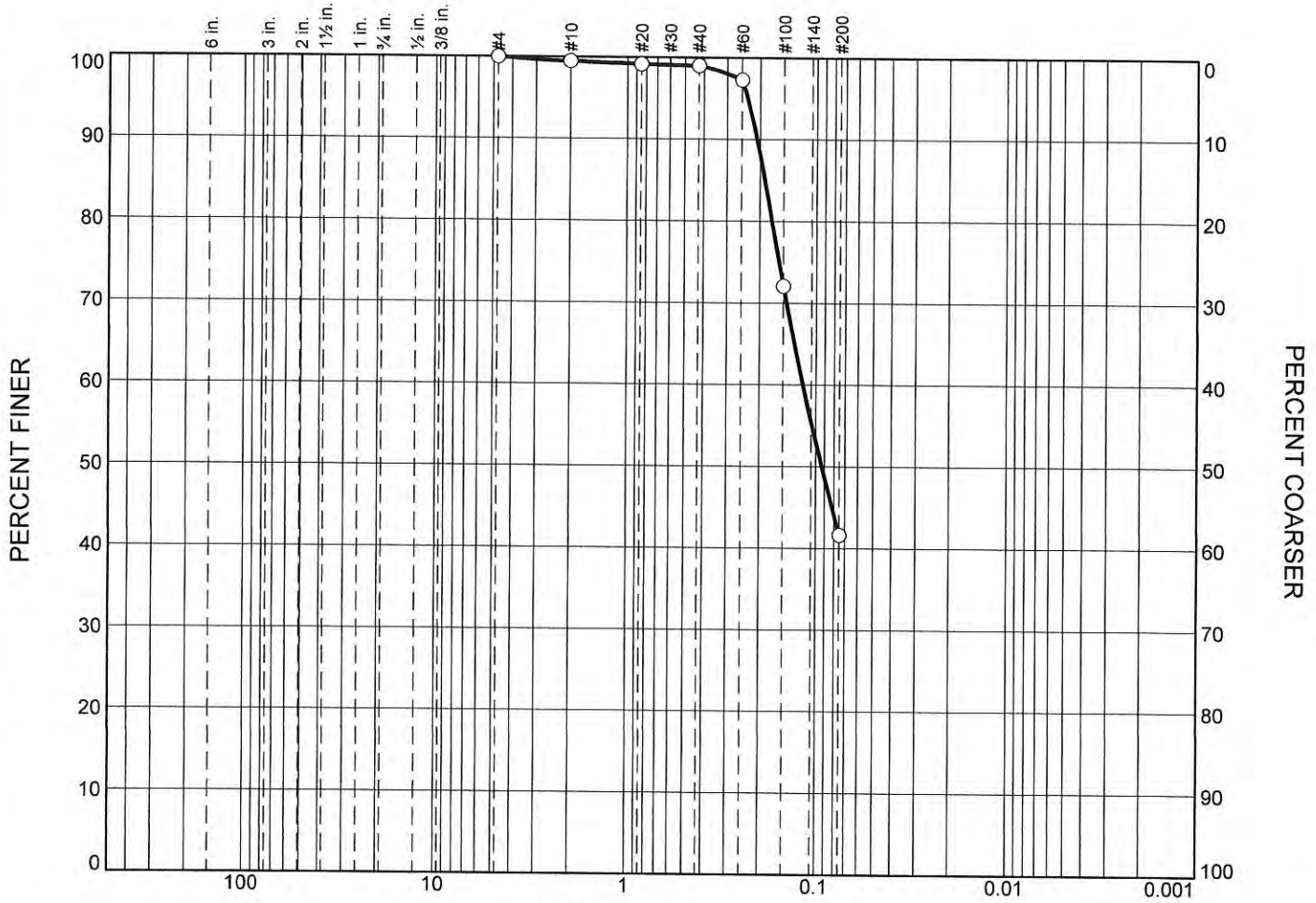
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-39

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.5	0.5	57.4	41.6	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB053		58	Tan CLAYEY SAND	SC

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

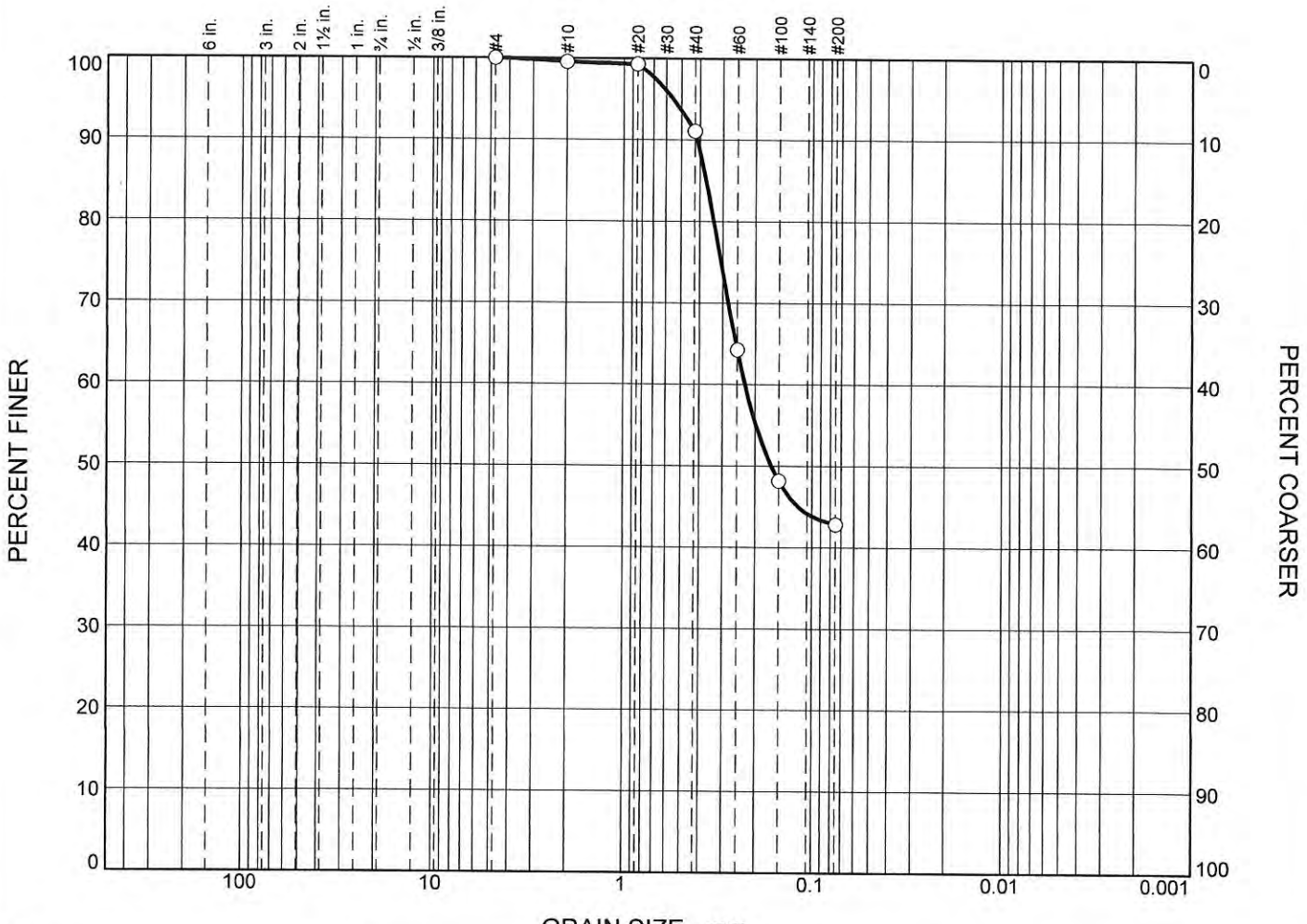
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-40

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.4	8.5	48.2	42.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB053		78	Gray CLAYEY SAND	SC

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

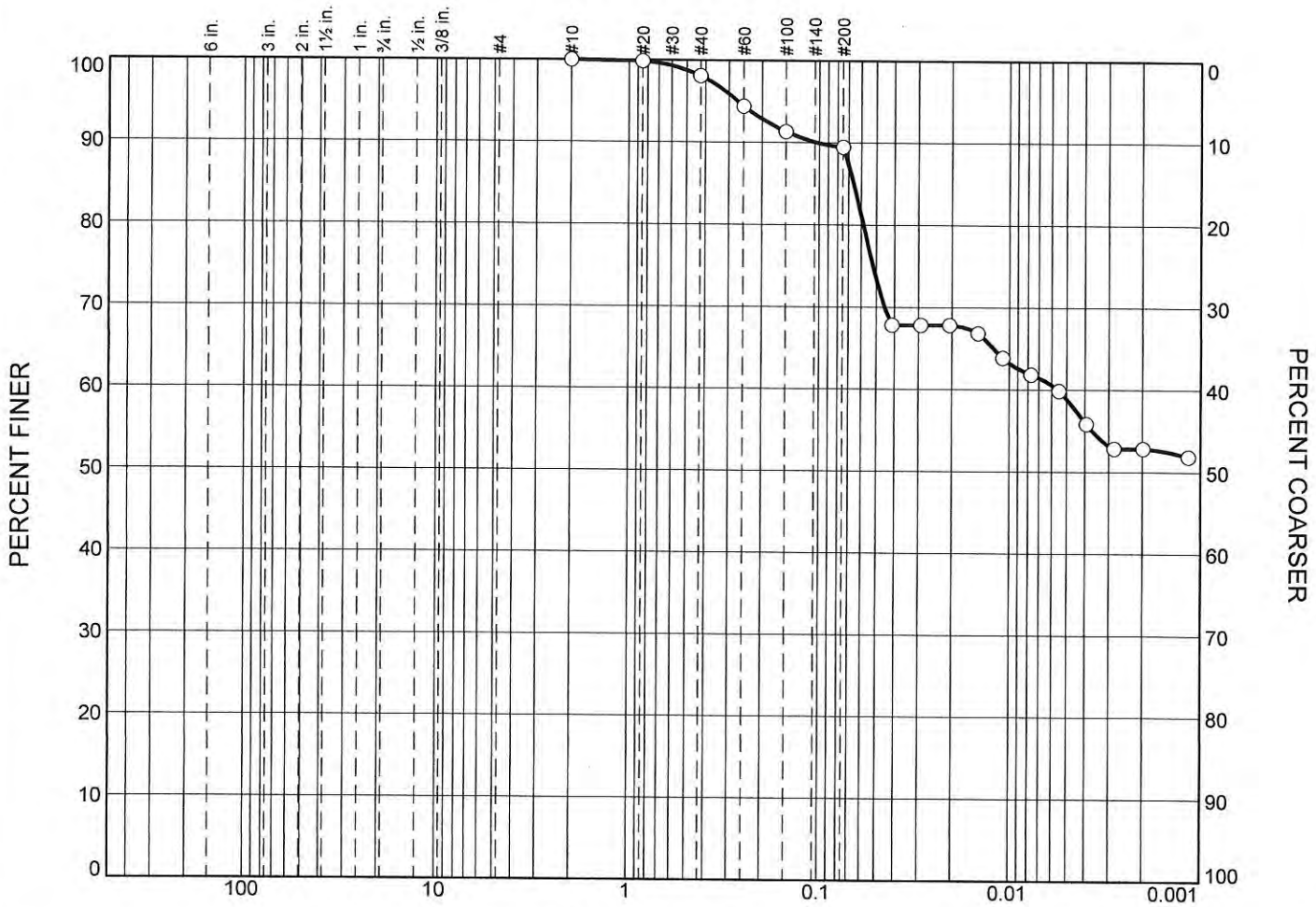
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-41

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.9	8.6	36.6	52.9

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB053		93	Black FAT CLAY; organics	MH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

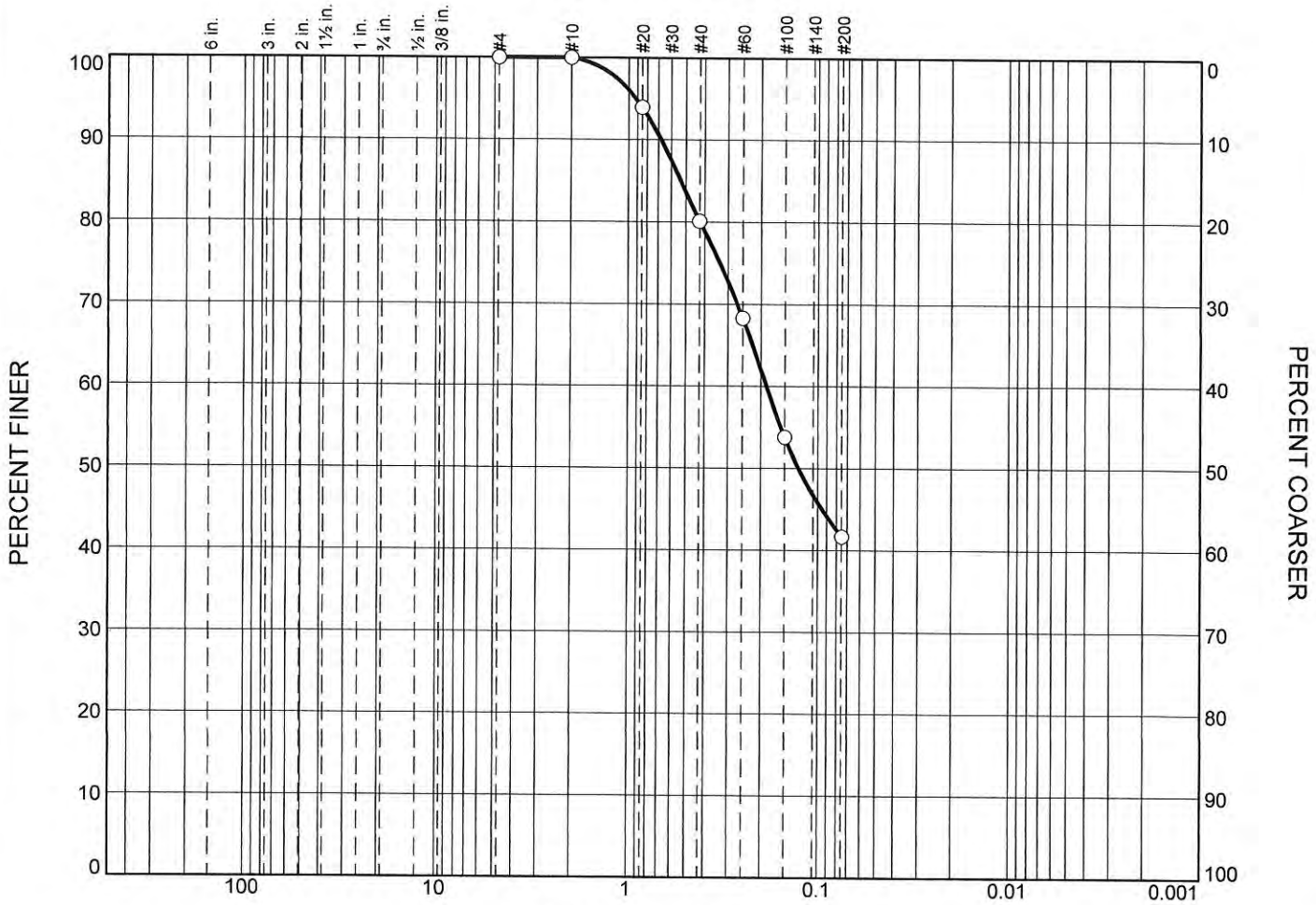
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-42

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	19.9	38.4	41.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB058		12-14		SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

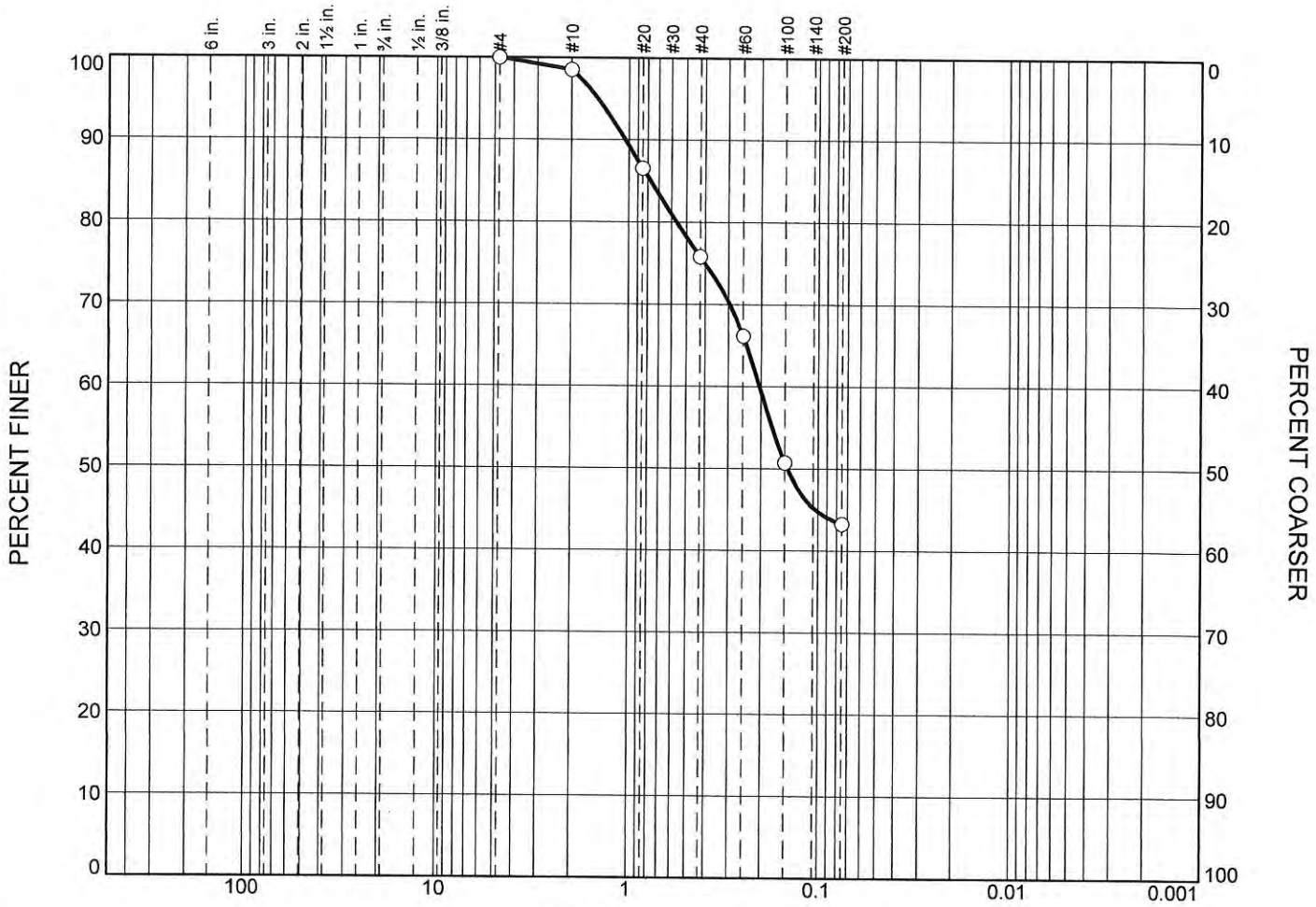
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-43

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	1.5	22.7	32.5	43.3	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB058		14-16		SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

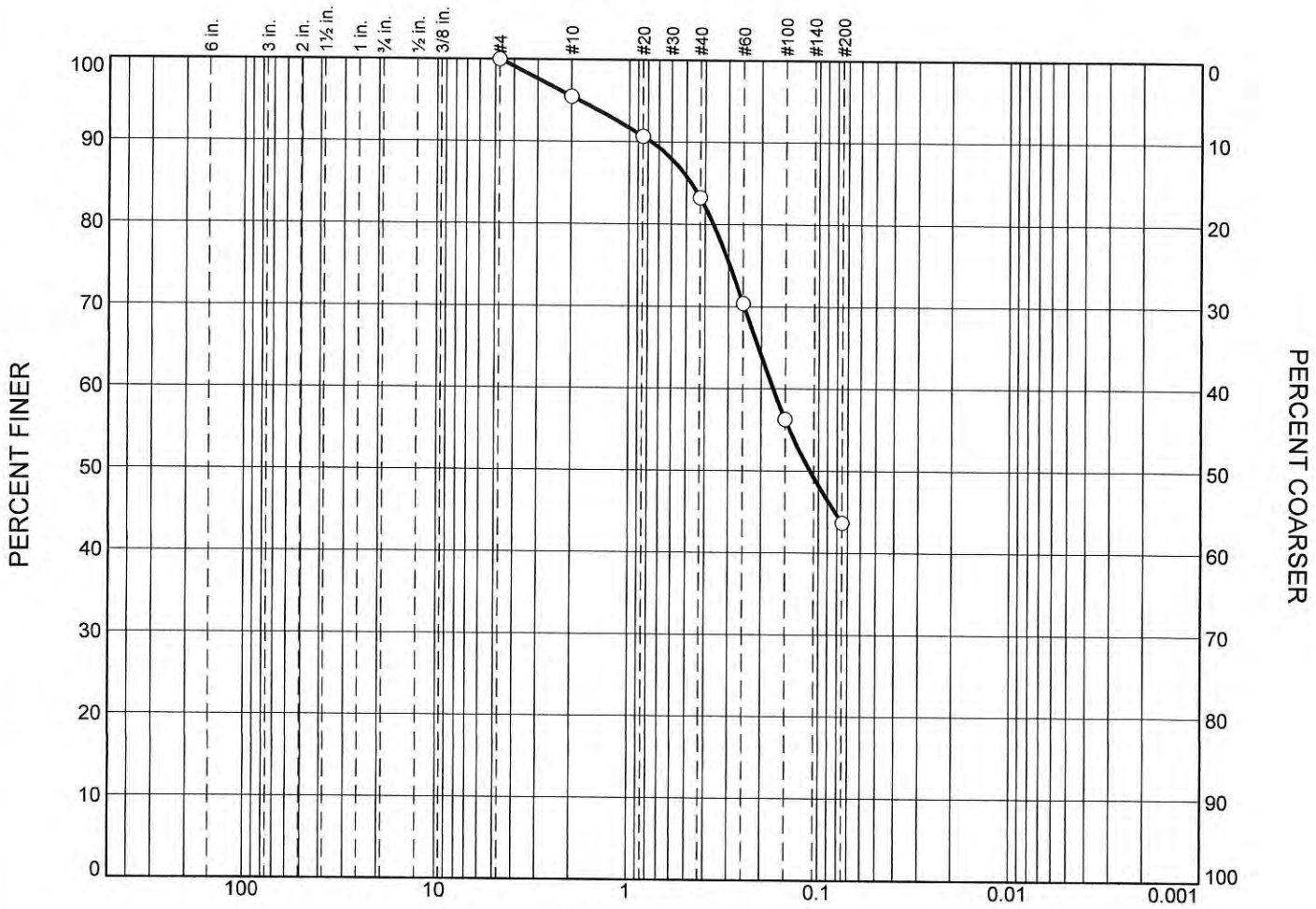
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-44

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	4.5	12.2	39.6	43.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJGB058		18-20		SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client:

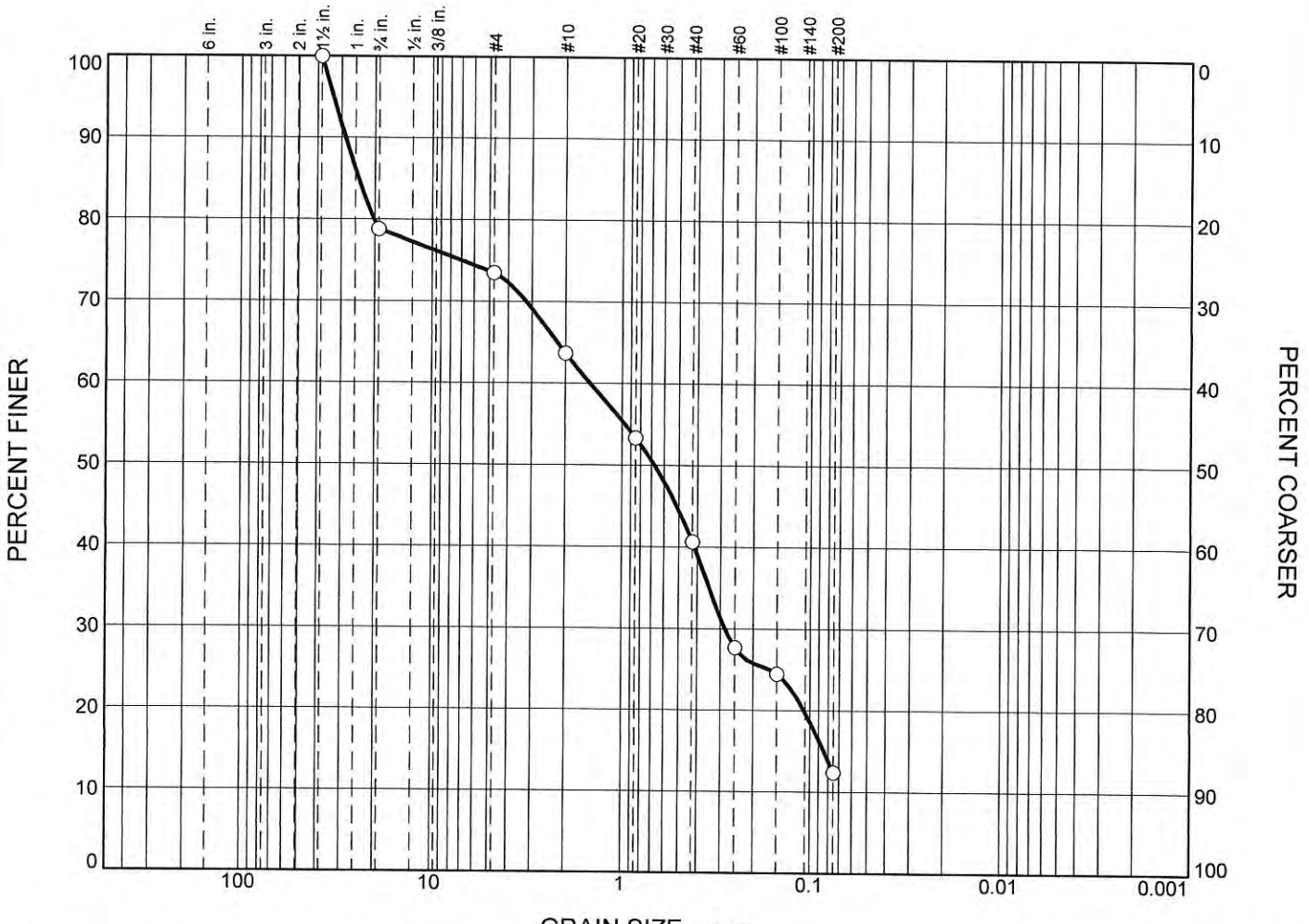
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-45

ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	21.2	5.3	9.8	23.1	28.2	12.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SJRF-04		0-2		SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

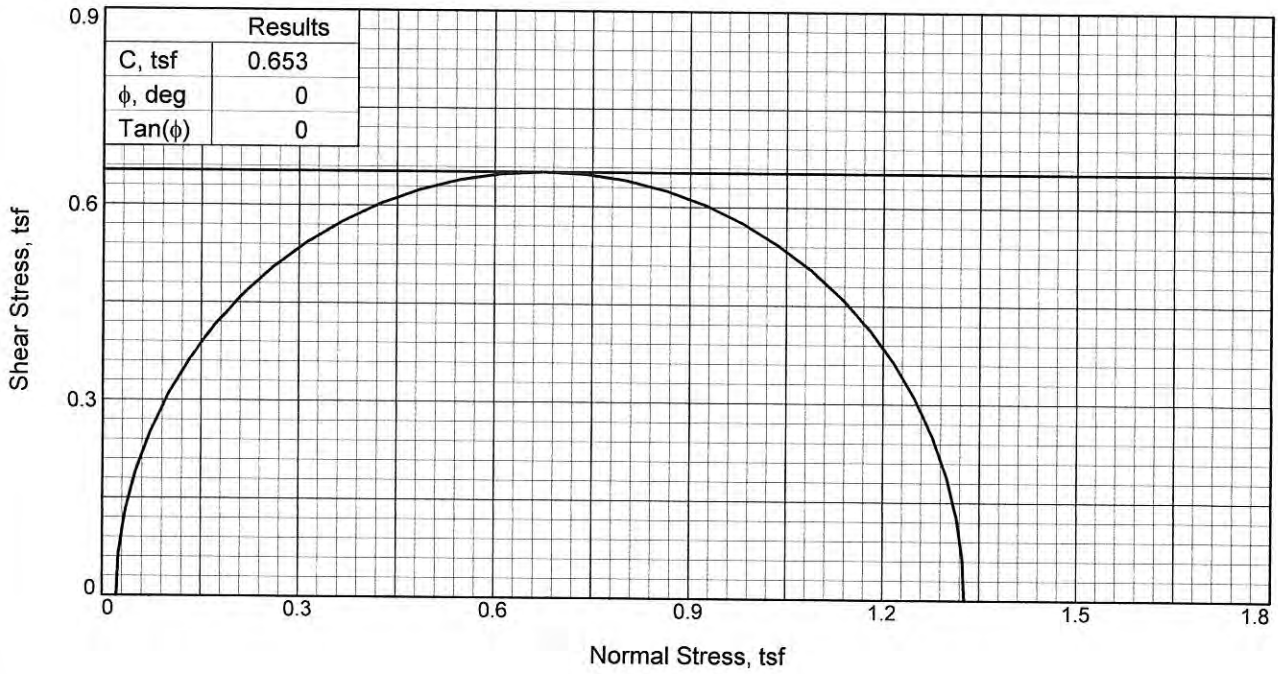
Client:

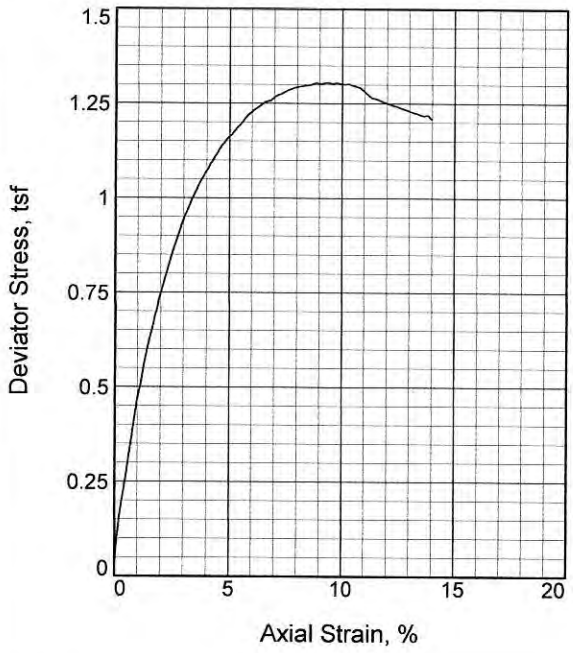
Project: San Jacinto River Waste Pit Superfund Site

Project No.: 19.15.131

Figure

Attachment Figure B.2-46





Sample No.		1
Initial	Water Content, %	18.6
	Dry Density, pcf	103.7
	Saturation, %	80.2
	Void Ratio	0.6256
	Diameter, in.	2.83
	Height, in.	5.79
At Test	Water Content, %	19.9
	Dry Density, pcf	103.7
	Saturation, %	85.8
	Void Ratio	0.6256
	Diameter, in.	2.83
	Height, in.	5.79
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		0.30
Fail. Stress, tsf		1.31
Strain, %		9.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.33
σ_3 Failure, tsf		0.02

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown LEAN CLAY with SAND

Assumed Specific Gravity= 2.70

Remarks:

Figure _____

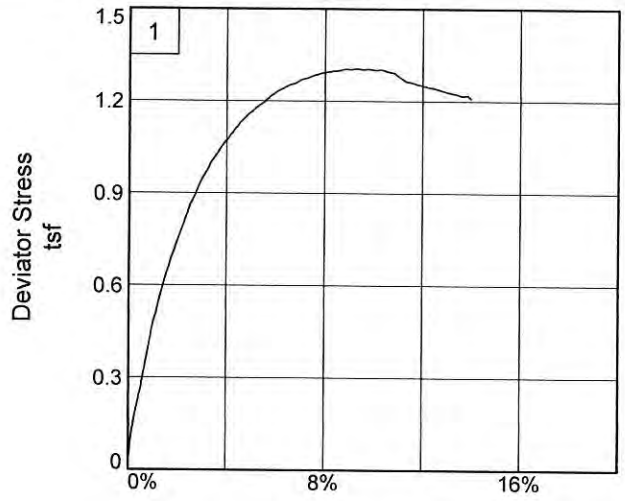
Client:

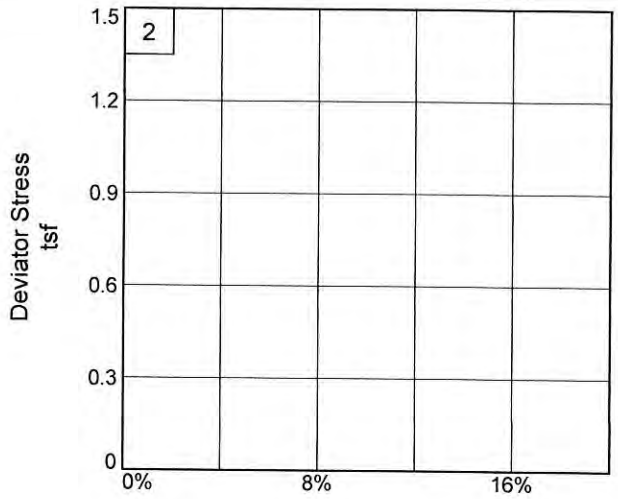
Project: San Jacinto River Waste Pit Superfund Site

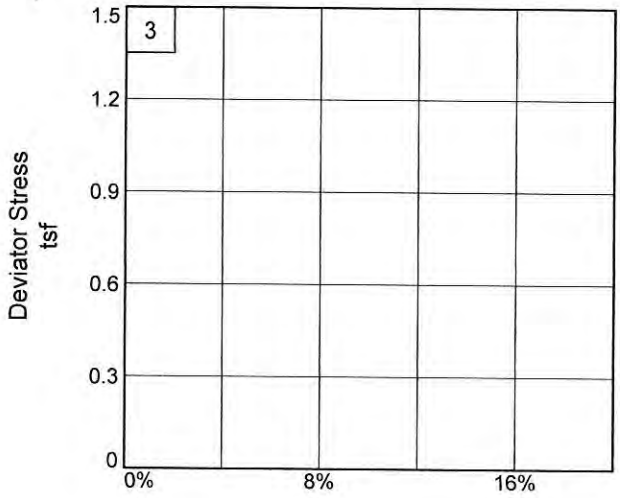
Source of Sample: SJGB024 **Depth:** 0-2

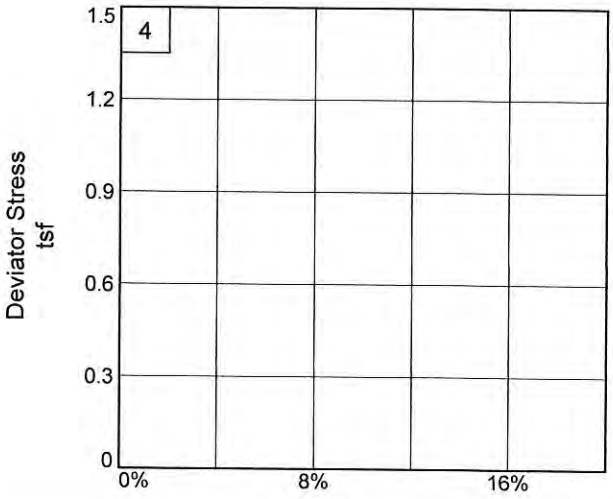
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

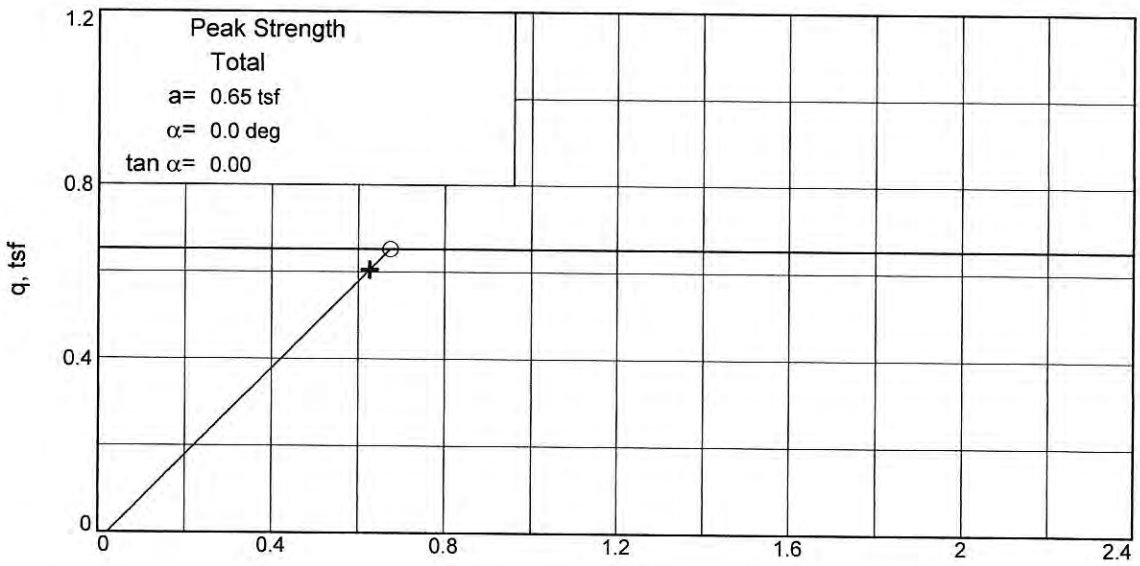
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

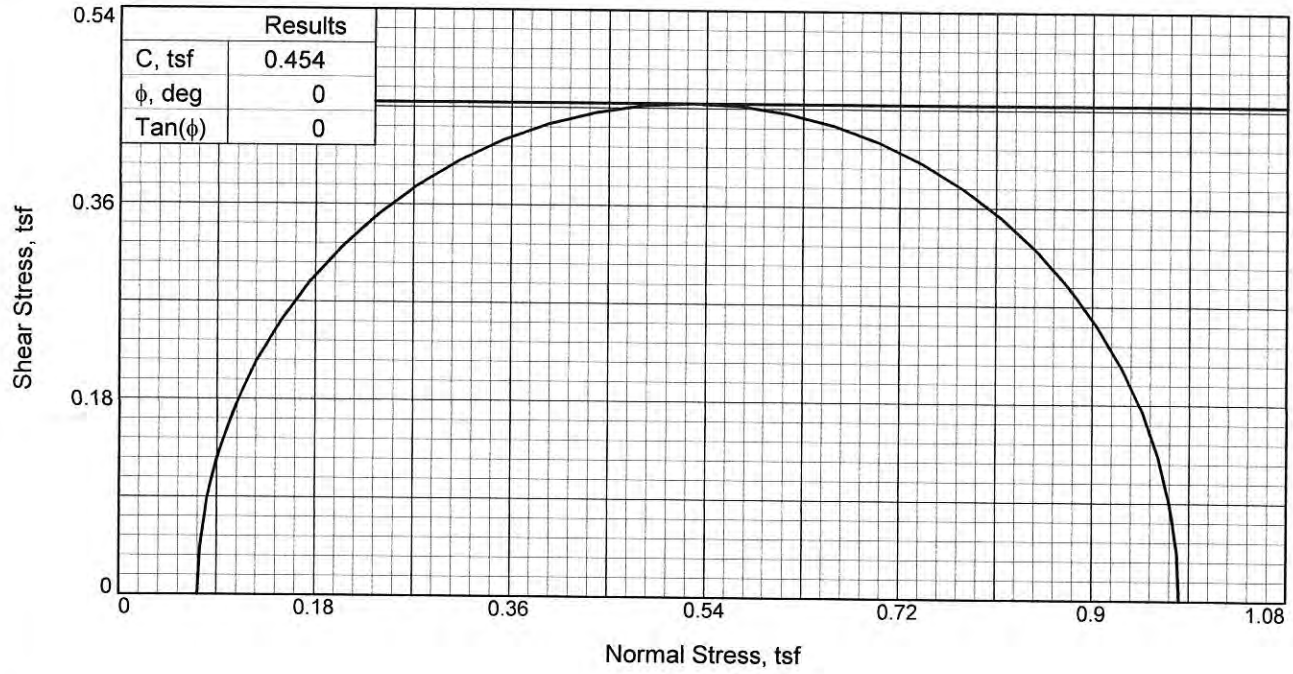
Client:

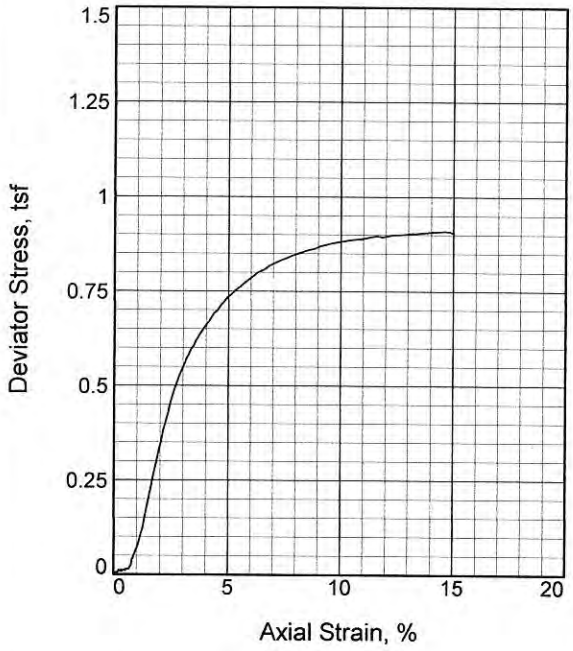
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 0-2

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	27.8
	Dry Density, pcf	89.0
	Saturation, %	84.0
	Void Ratio	0.8934
	Diameter, in.	2.81
	Height, in.	5.82
At Test	Water Content, %	28.0
	Dry Density, pcf	89.0
	Saturation, %	84.6
	Void Ratio	0.8934
	Diameter, in.	2.81
	Height, in.	5.82
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.00
Fail. Stress, tsf		0.91
Strain, %		14.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.98
σ_3 Failure, tsf		0.07

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown and black FAT CLAY

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

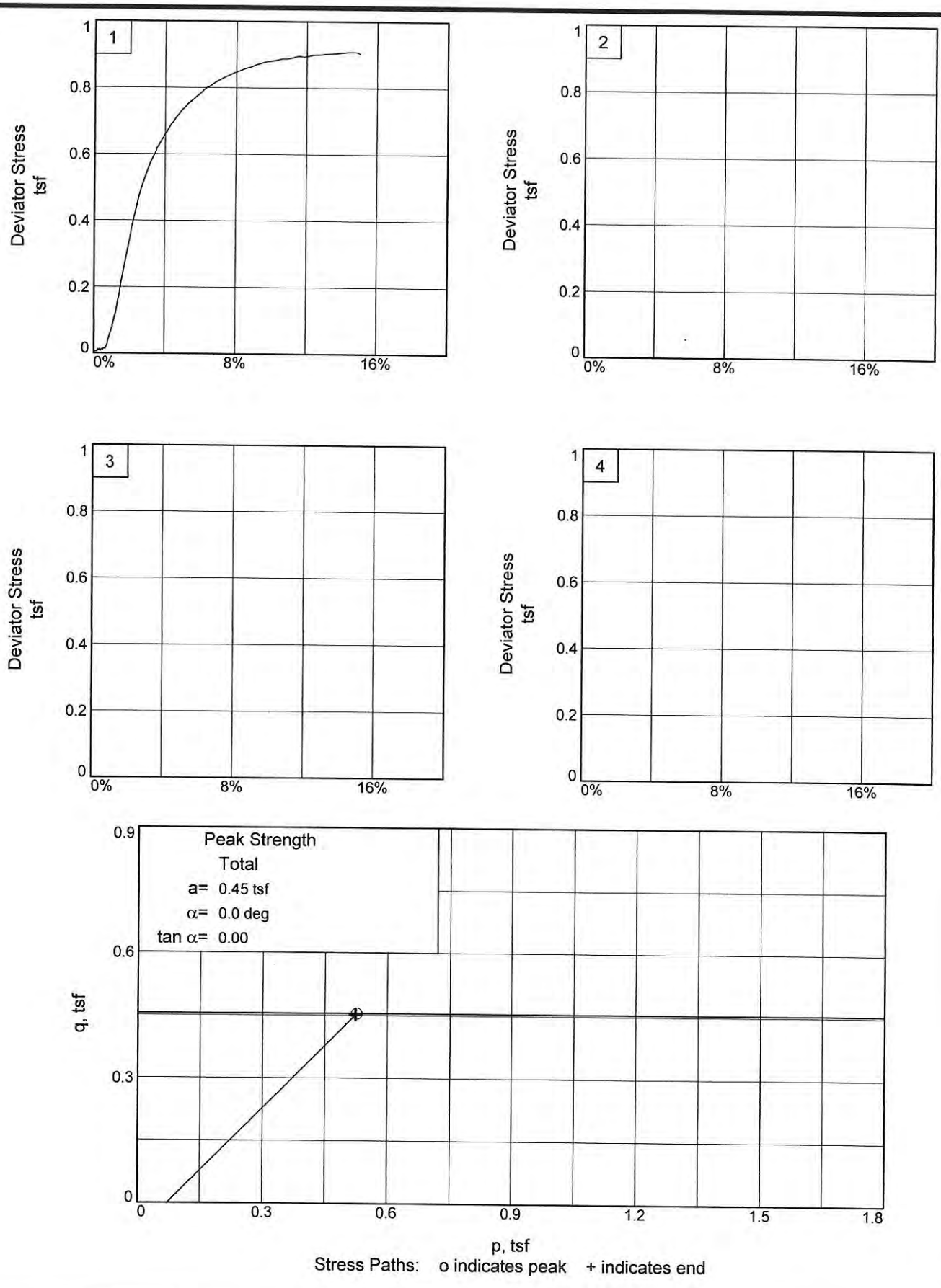
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 2-4

Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



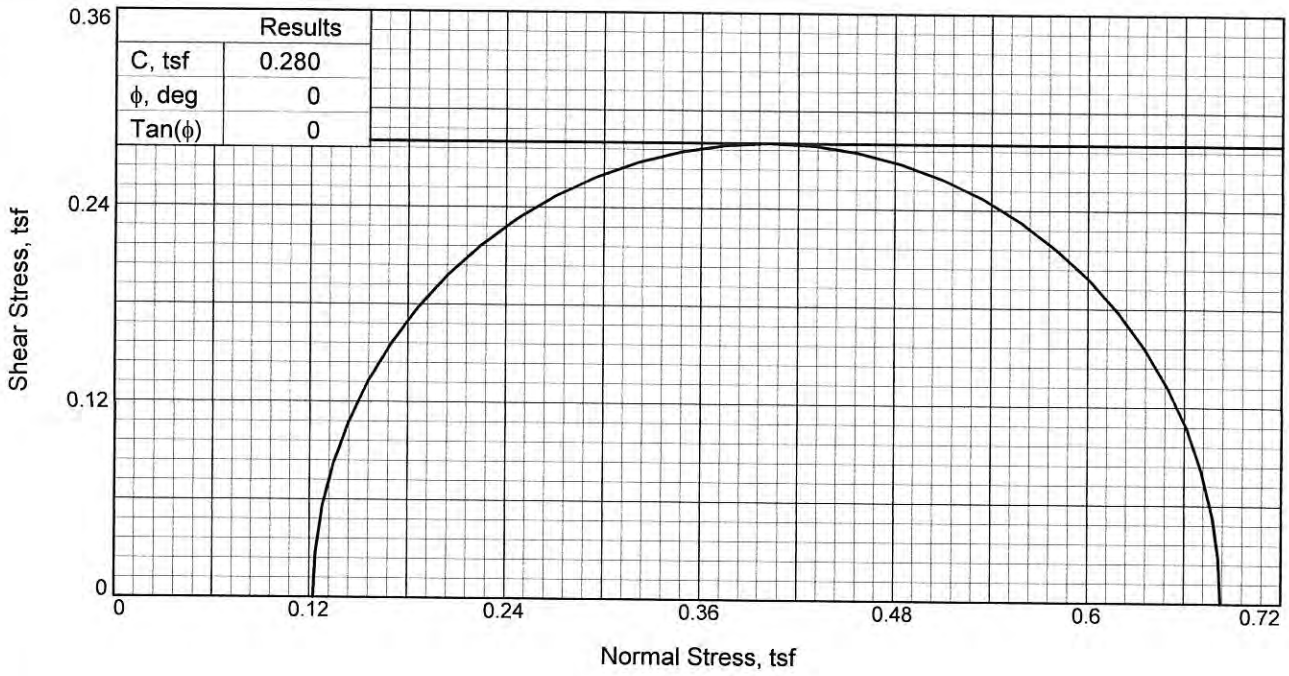
Client:

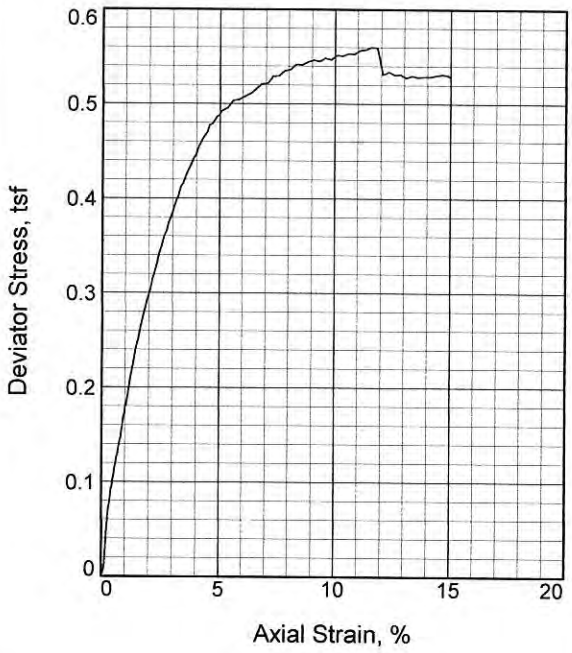
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 2-4

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	29.2
	Dry Density, pcf	90.1
	Saturation, %	90.6
	Void Ratio	0.8712
	Diameter, in.	2.85
	Height, in.	5.78
At Test	Water Content, %	31.2
	Dry Density, pcf	90.1
	Saturation, %	96.6
	Void Ratio	0.8712
	Diameter, in.	2.85
	Height, in.	5.78
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.70
Fail. Stress, tsf		0.56
Strain, %		11.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.68
σ_3 Failure, tsf		0.12

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown and black FAT CLAY

LL= 86 **PL=** 31 **PI=** 55
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

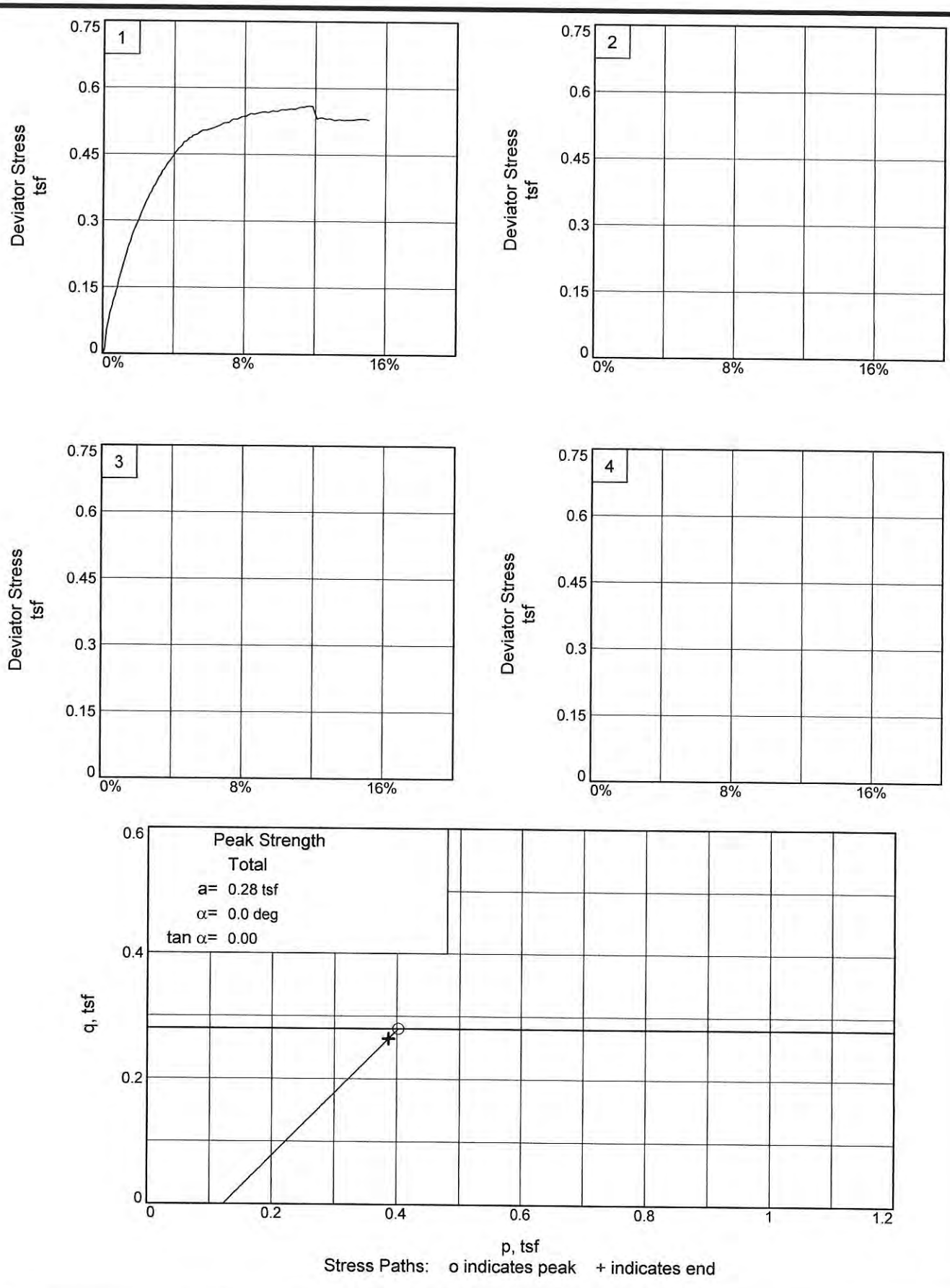
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 4-6

Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



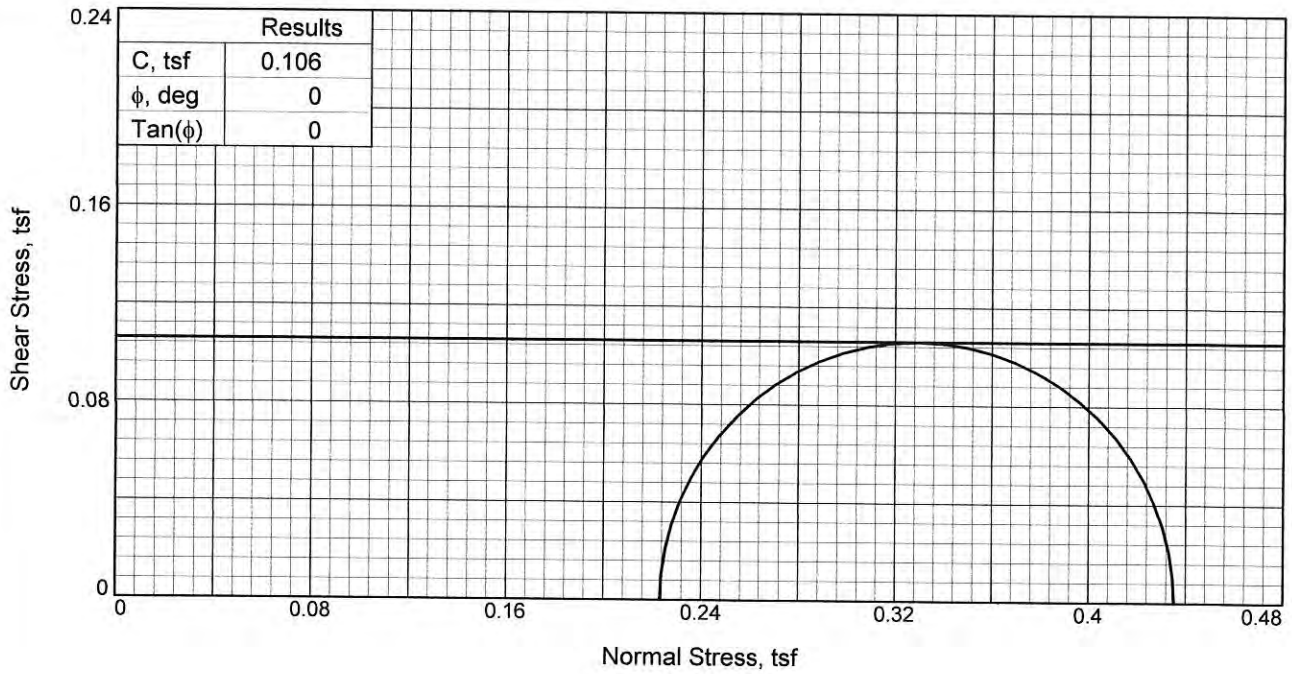
Client:

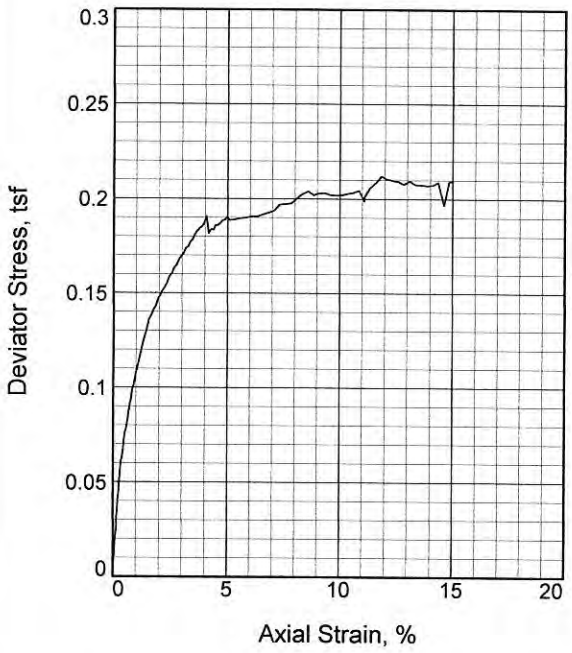
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 4-6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	29.1
	Dry Density, pcf	89.2
	Saturation, %	88.4
	Void Ratio	0.8890
	Diameter, in.	2.83
	Height, in.	5.54
At Test	Water Content, %	28.5
	Dry Density, pcf	89.2
	Saturation, %	86.5
	Void Ratio	0.8890
	Diameter, in.	2.83
	Height, in.	5.54
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.10
Fail. Stress, tsf		0.21
Strain, %		11.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.44
σ_3 Failure, tsf		0.22

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown CLAYEY SAND

Assumed Specific Gravity= 2.70

Remarks:

Figure _____

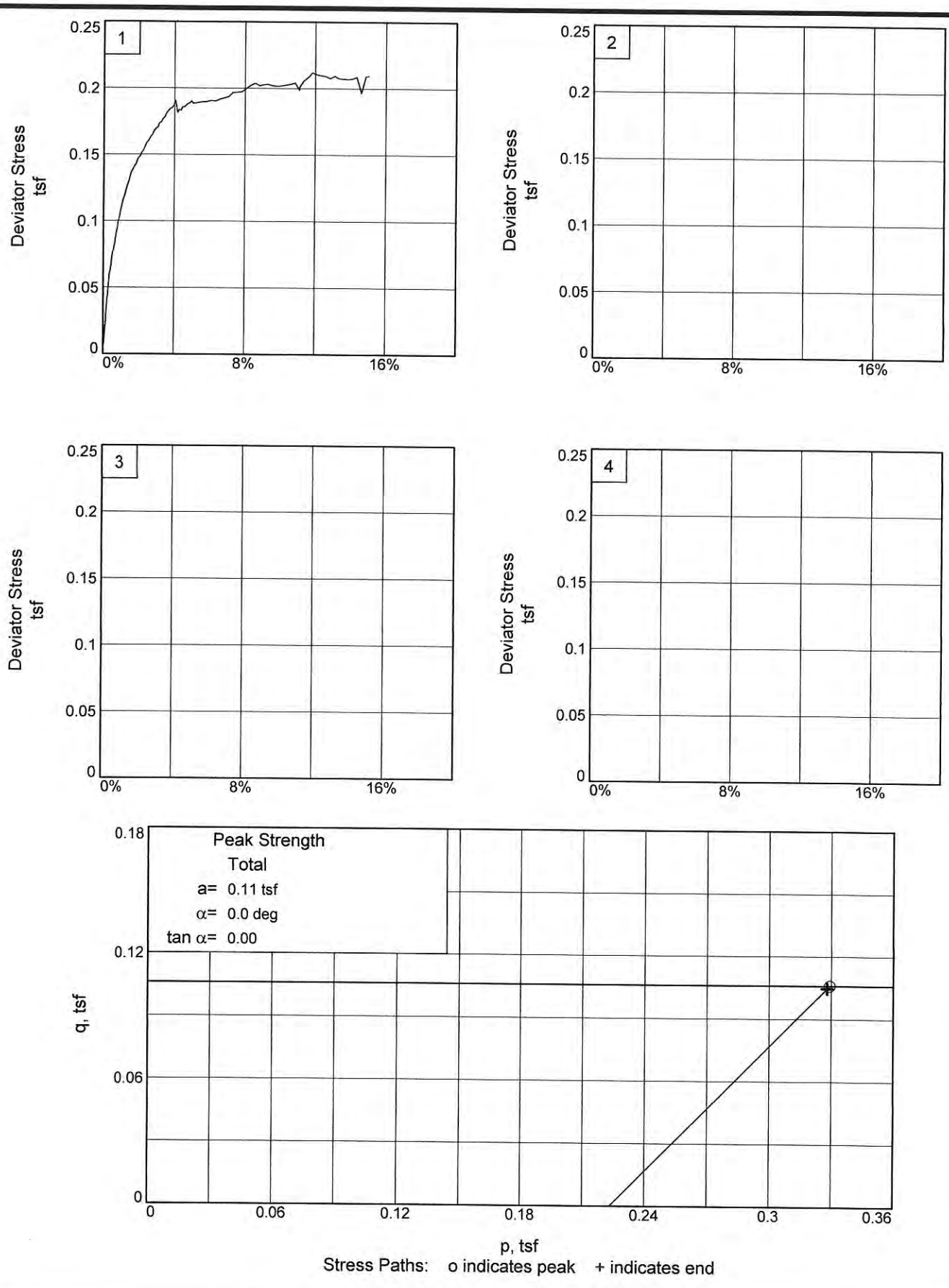
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 8-10

Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



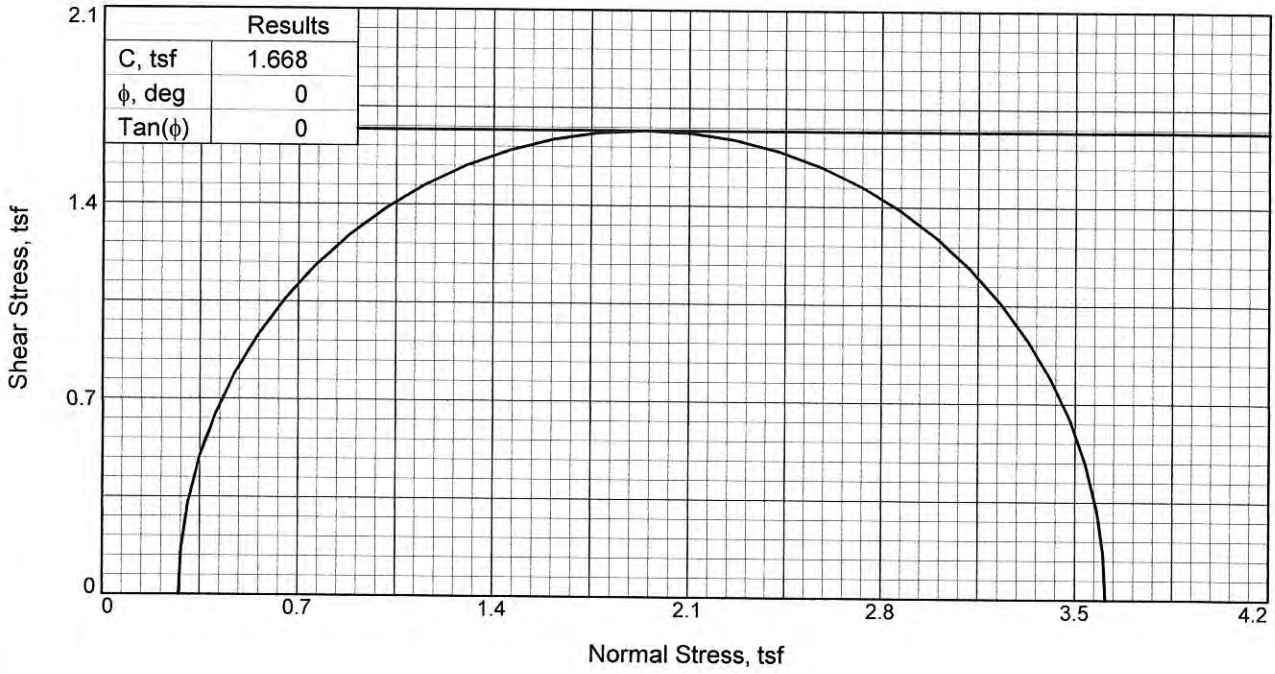
Client:

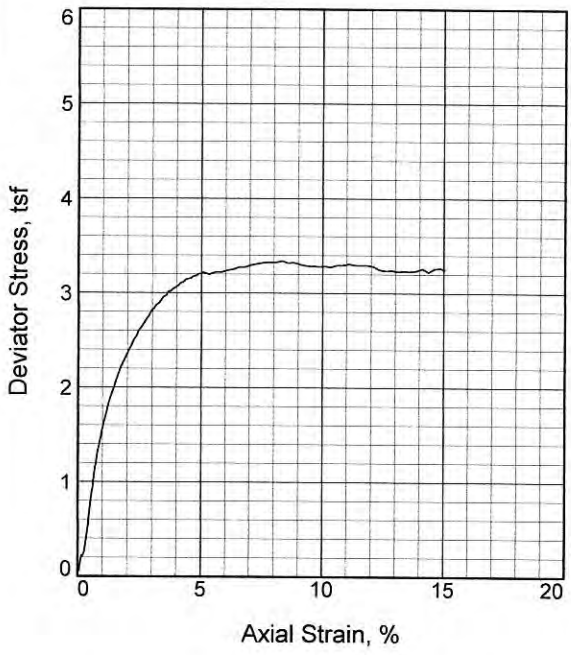
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 8-10

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	75.3
	Dry Density, pcf	53.7
	Saturation, %	95.1
	Void Ratio	2.1393
	Diameter, in.	2.82
	Height, in.	5.73
At Test	Water Content, %	76.5
	Dry Density, pcf	53.7
	Saturation, %	96.5
	Void Ratio	2.1393
	Diameter, in.	2.82
	Height, in.	5.73
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.80
Fail. Stress, tsf		3.34
Strain, %		8.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.61
σ_3 Failure, tsf		0.27

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown FAT CLAY

LL= 133 **PL=** 51 **PI=** 82

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

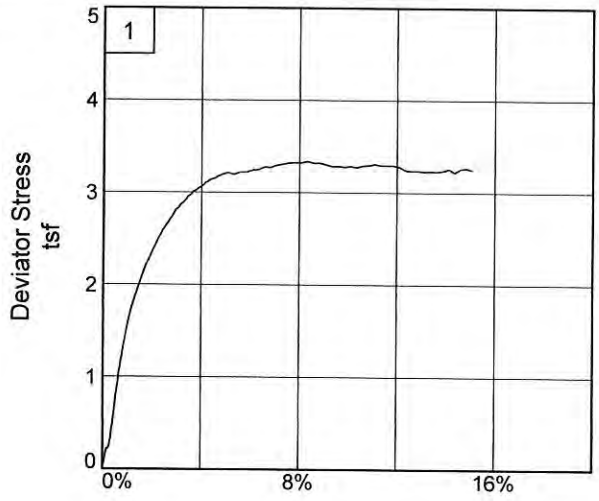
Client:

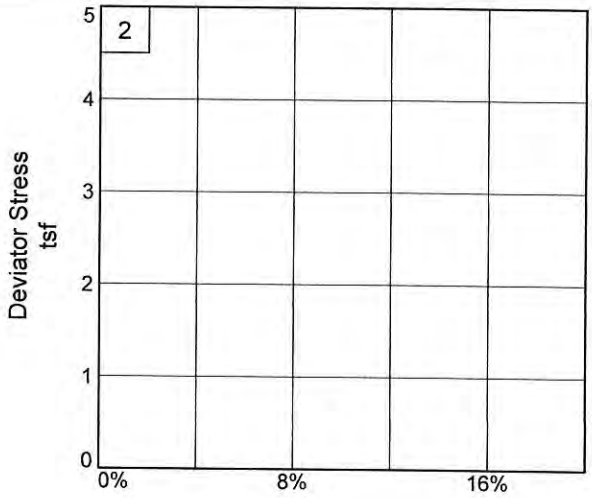
Project: San Jacinto River Waste Pit Superfund Site

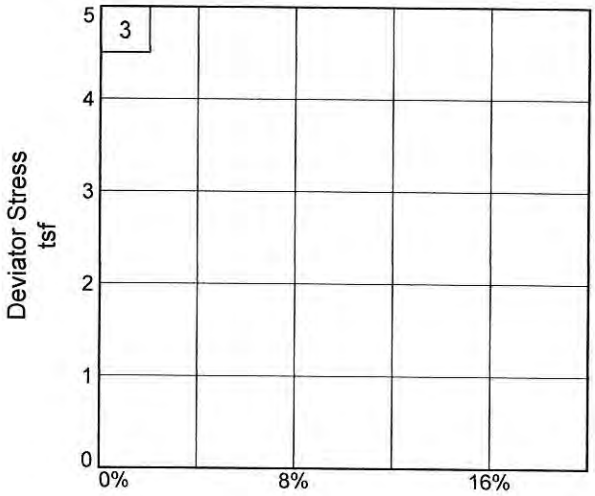
Source of Sample: SJGB024 **Depth:** 10-12

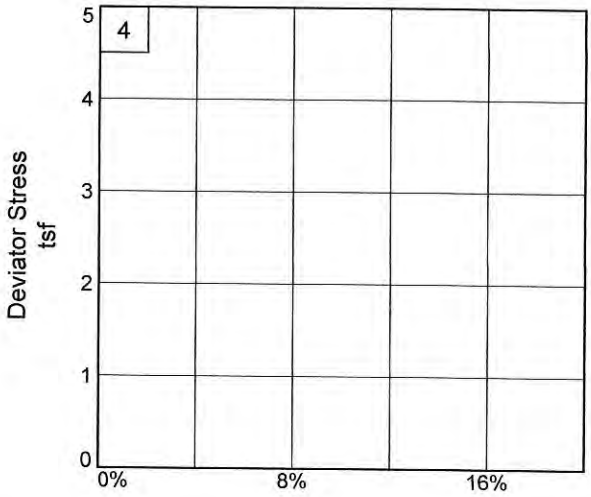
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

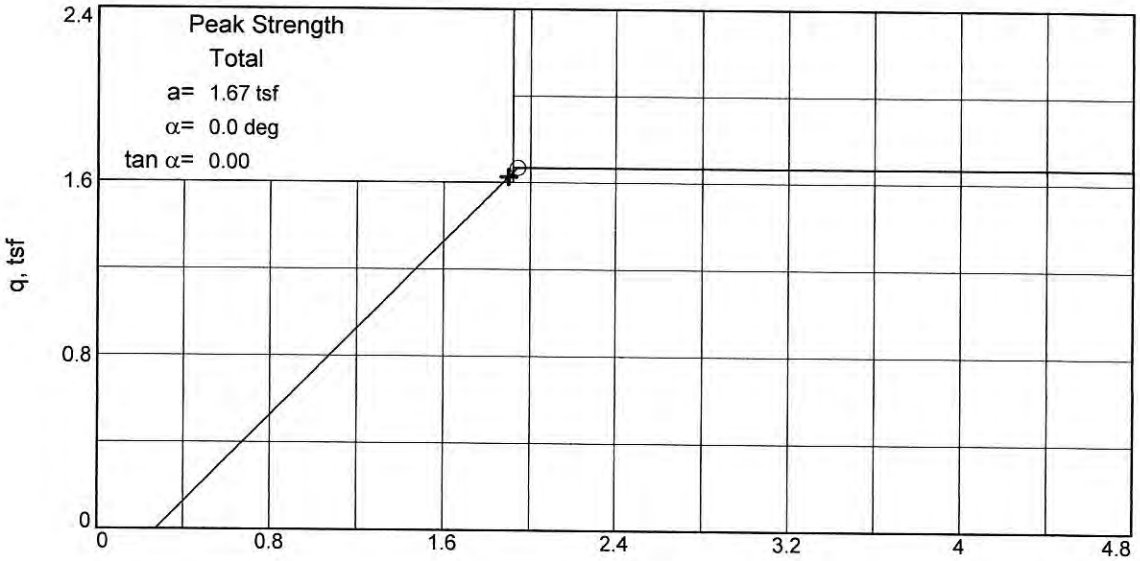
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

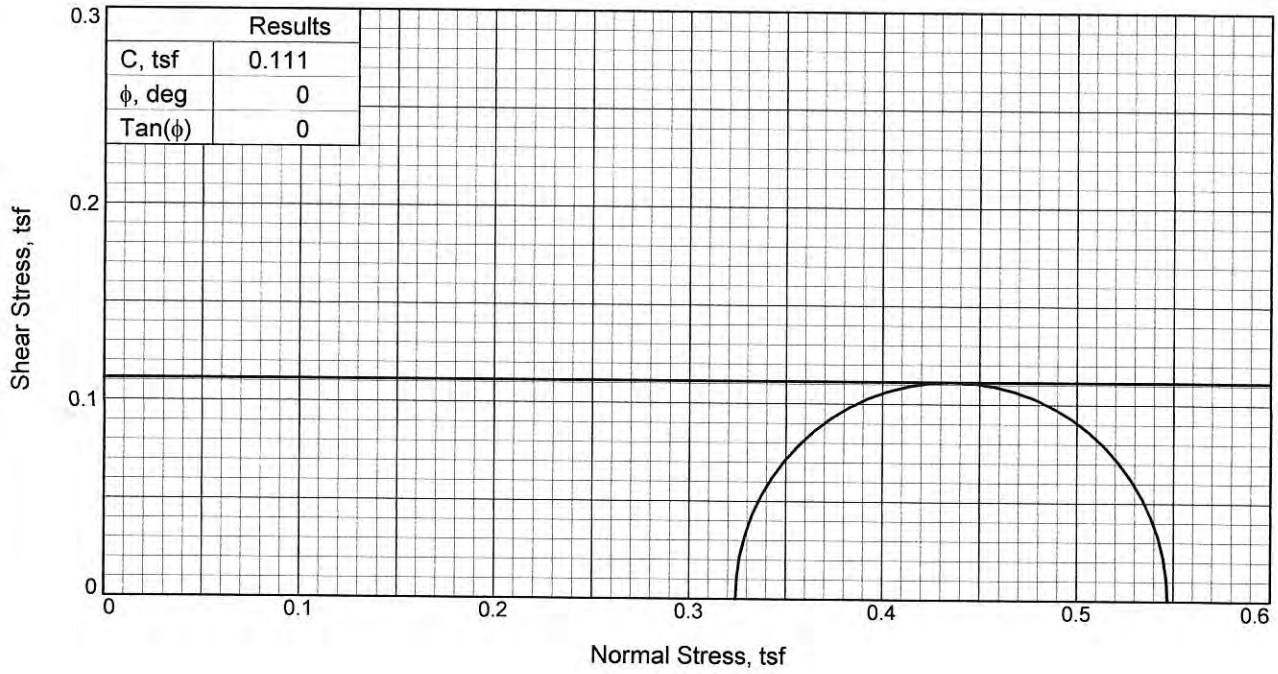
Client:

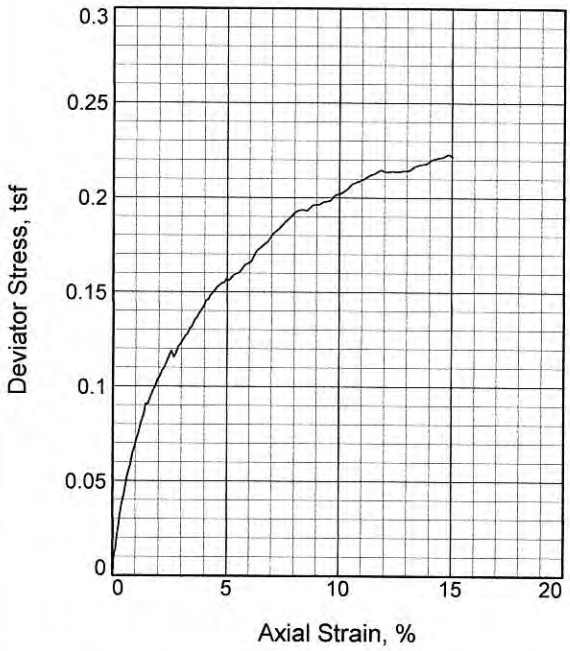
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 10-12

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	31.7
	Dry Density, pcf	82.6
	Saturation, %	82.3
	Void Ratio	1.0402
	Diameter, in.	2.87
	Height, in.	5.67
At Test	Water Content, %	37.0
	Dry Density, pcf	82.6
	Saturation, %	96.1
	Void Ratio	1.0402
	Diameter, in.	2.87
	Height, in.	5.67
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		4.50
Fail. Stress, tsf		0.22
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.55
σ_3 Failure, tsf		0.32

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown and black LEAN CLAY

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

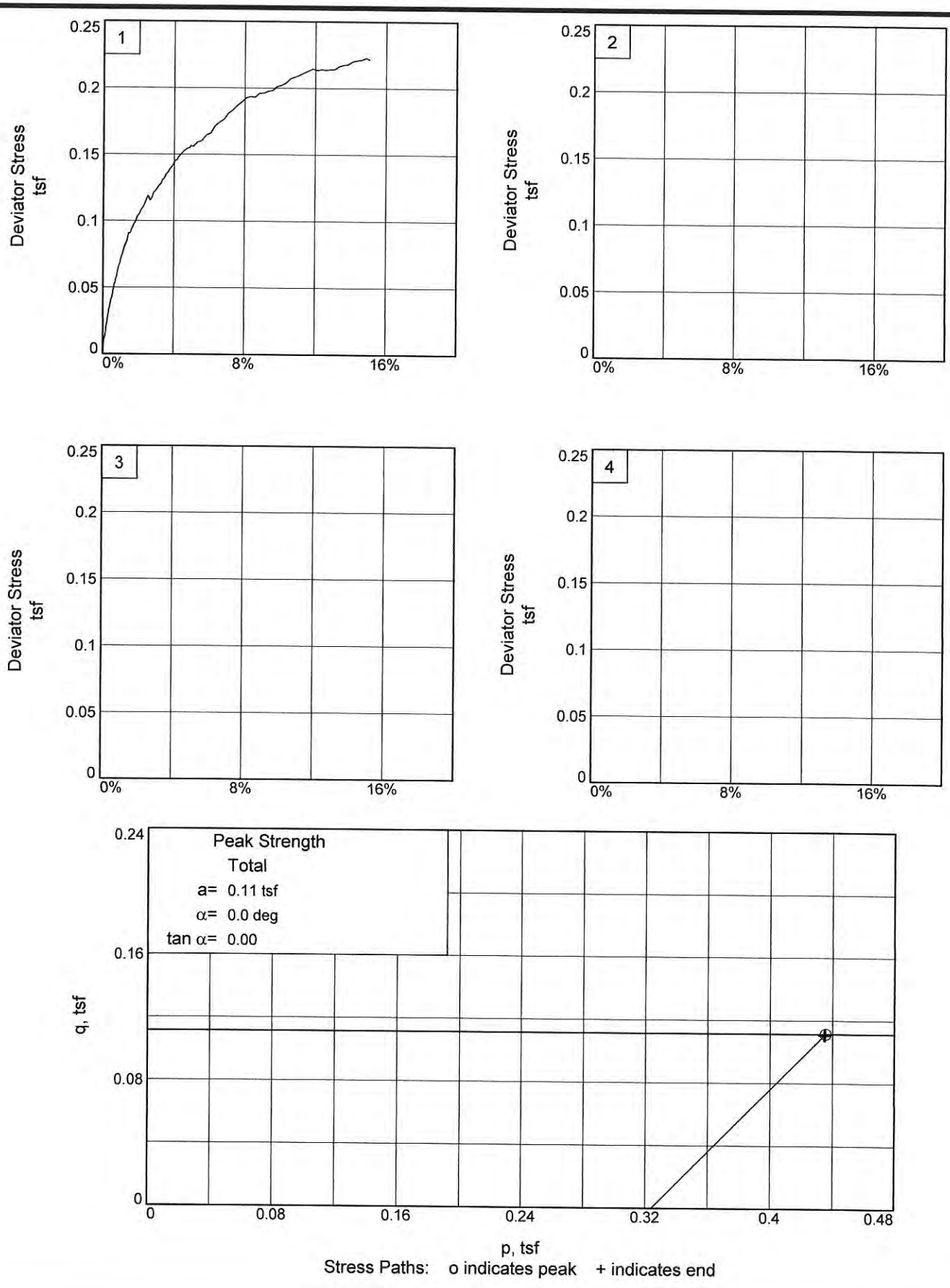
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 12-14

Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



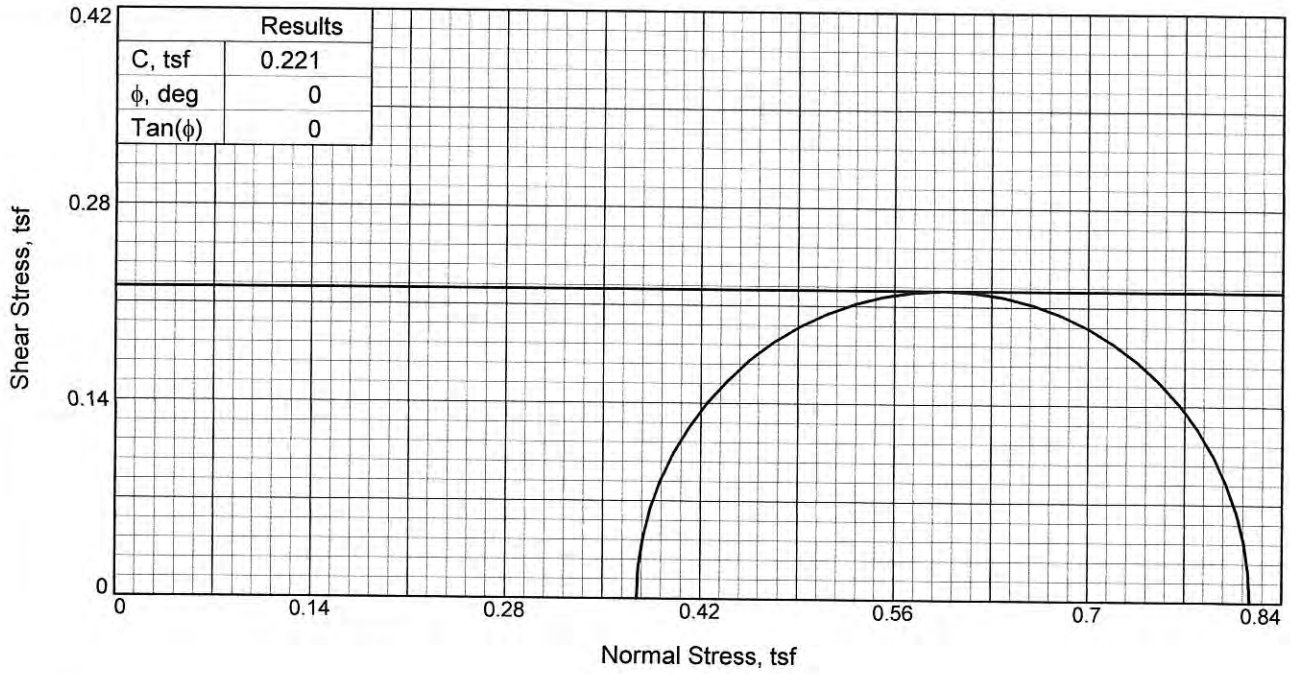
Client:

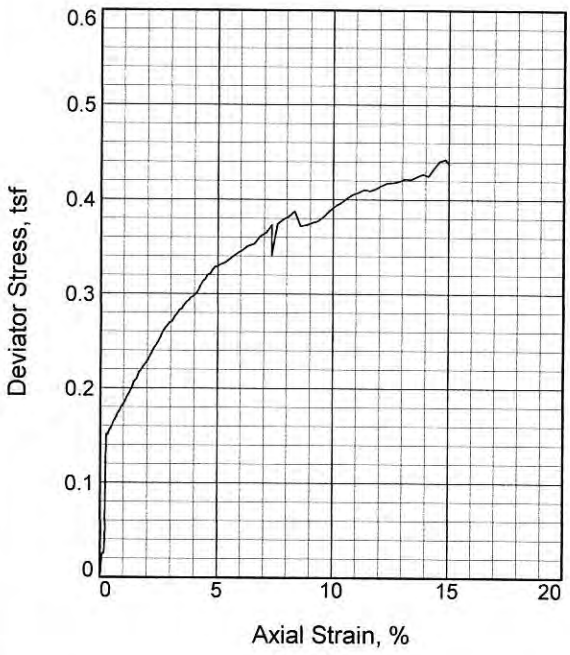
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 12-14

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	26.5
	Dry Density, pcf	91.7
	Saturation, %	85.5
	Void Ratio	0.8375
	Diameter, in.	2.87
	Height, in.	5.77
At Test	Water Content, %	29.7
	Dry Density, pcf	91.7
	Saturation, %	95.9
	Void Ratio	0.8375
	Diameter, in.	2.87
	Height, in.	5.77
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		5.20
Fail. Stress, tsf		0.44
Strain, %		14.9
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.82
σ_3 Failure, tsf		0.37

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown CLAYEY SAND

LL= 32 **PL=** 19 **PI=** 13

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

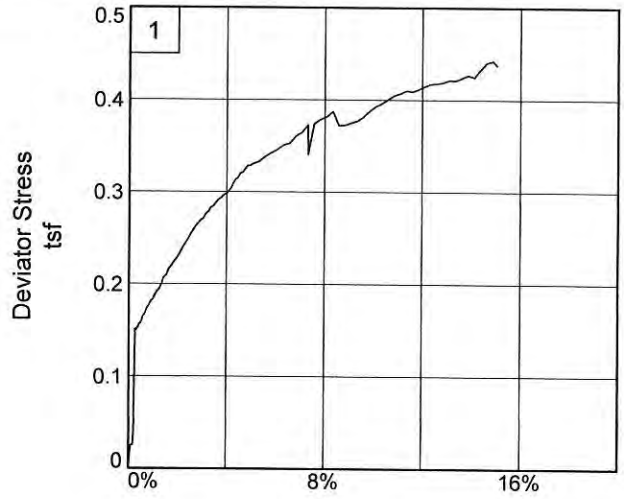
Client:

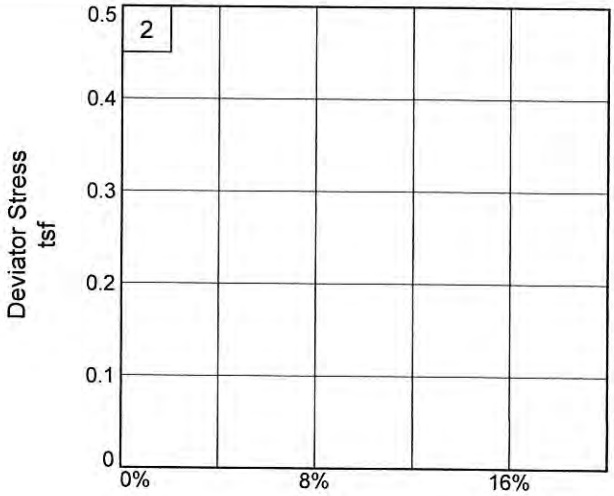
Project: San Jacinto River Waste Pit Superfund Site

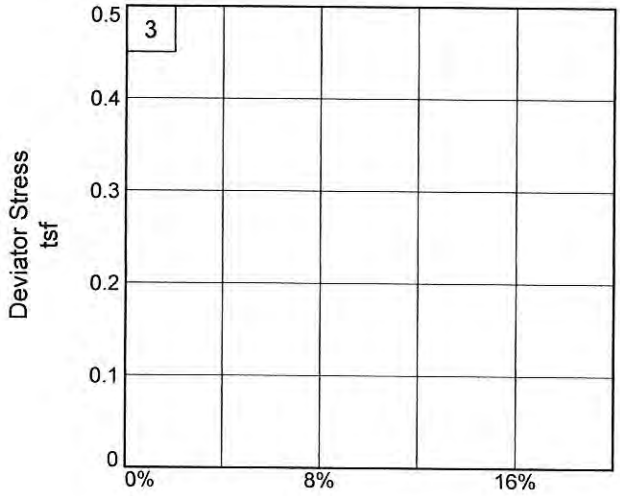
Source of Sample: SJGB024 **Depth:** 14-16

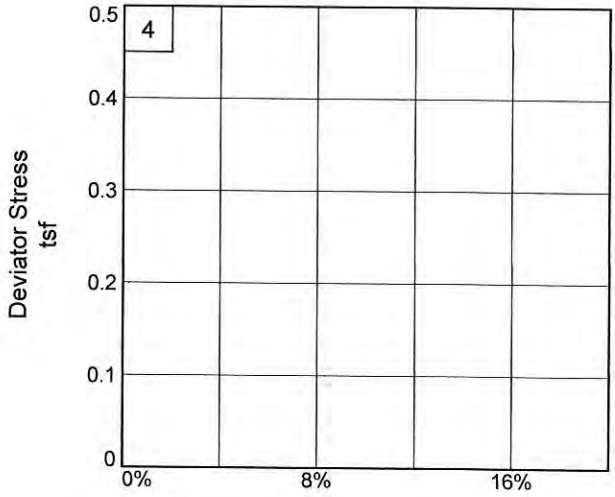
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

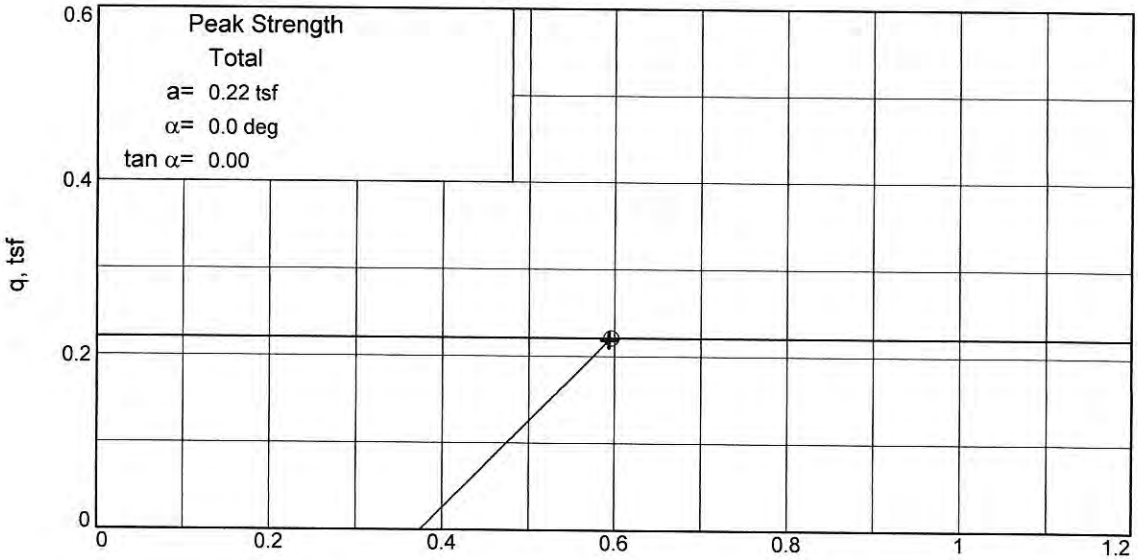
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

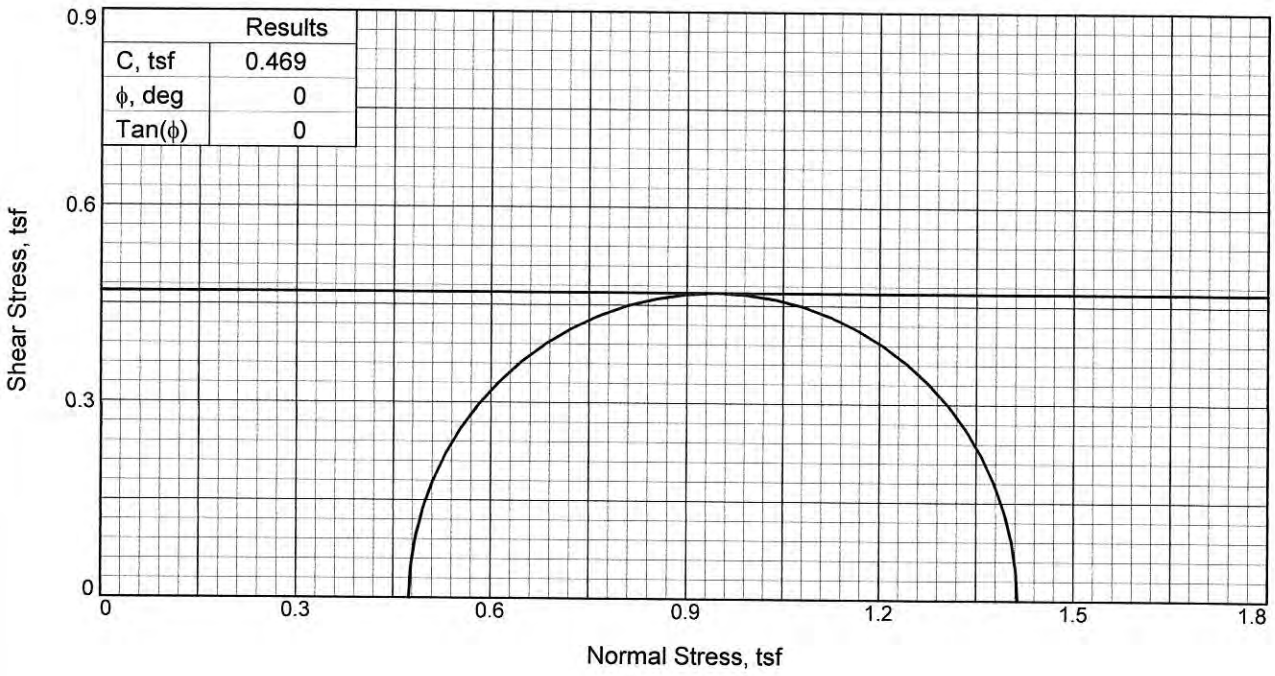
Client:

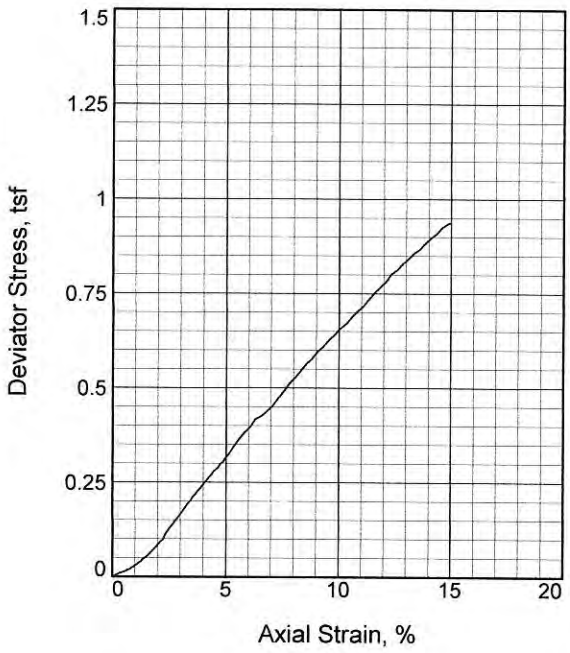
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 14-16

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	24.9
	Dry Density, pcf	98.4
	Saturation, %	94.2
	Void Ratio	0.7124
	Diameter, in.	2.81
	Height, in.	5.79
At Test	Water Content, %	24.3
	Dry Density, pcf	98.4
	Saturation, %	92.2
	Void Ratio	0.7124
	Diameter, in.	2.81
	Height, in.	5.79
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		6.60
Fail. Stress, tsf		0.94
Strain, %		15.0
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.41
σ_3 Failure, tsf		0.48

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown SILTY CLAYEY SAND

Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

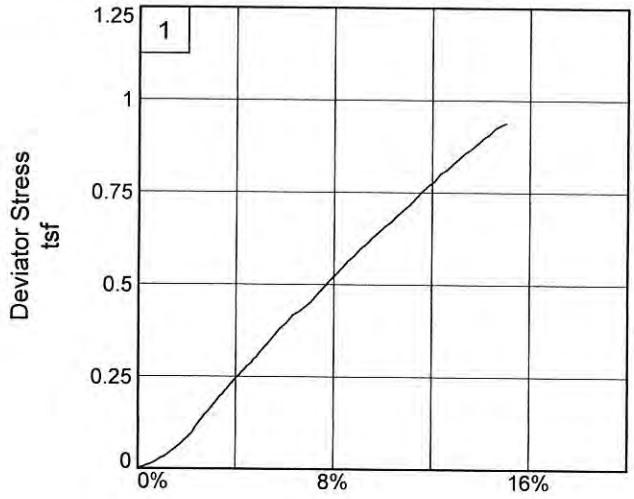
Client:

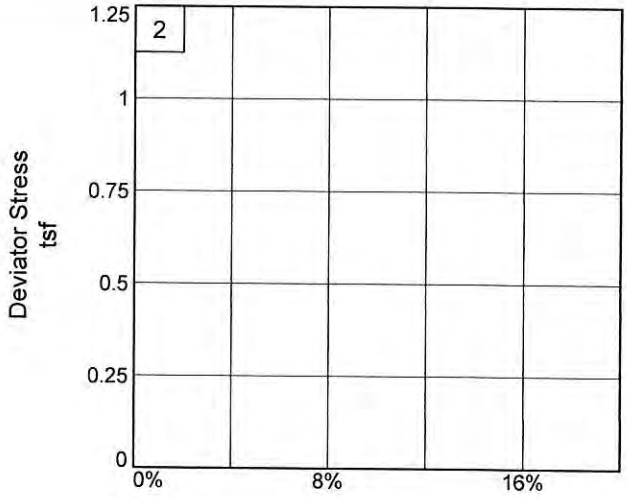
Project: San Jacinto River Waste Pit Superfund Site

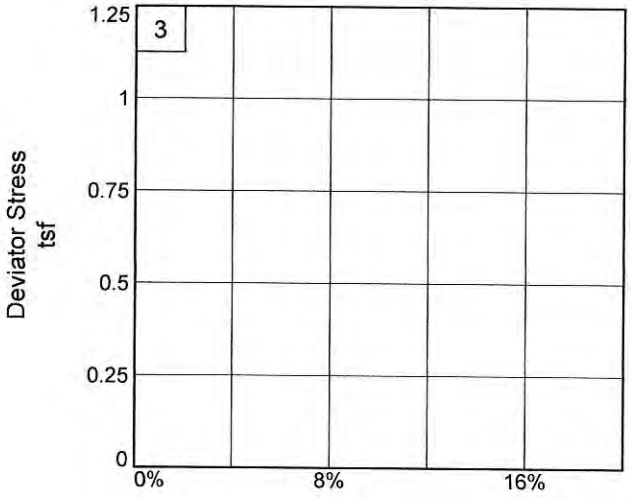
Source of Sample: SJGB024 **Depth:** 18-20

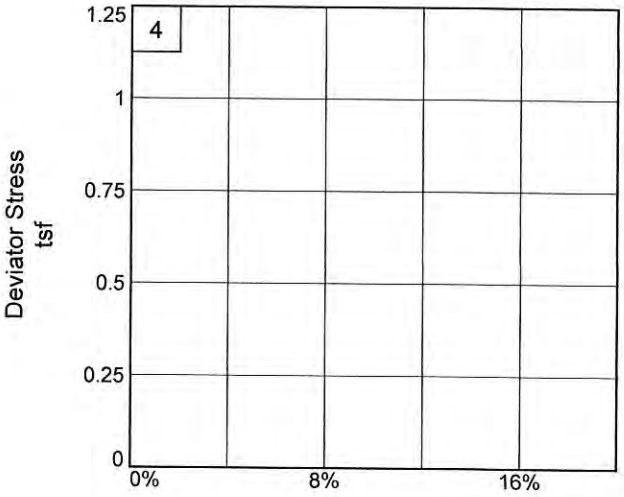
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

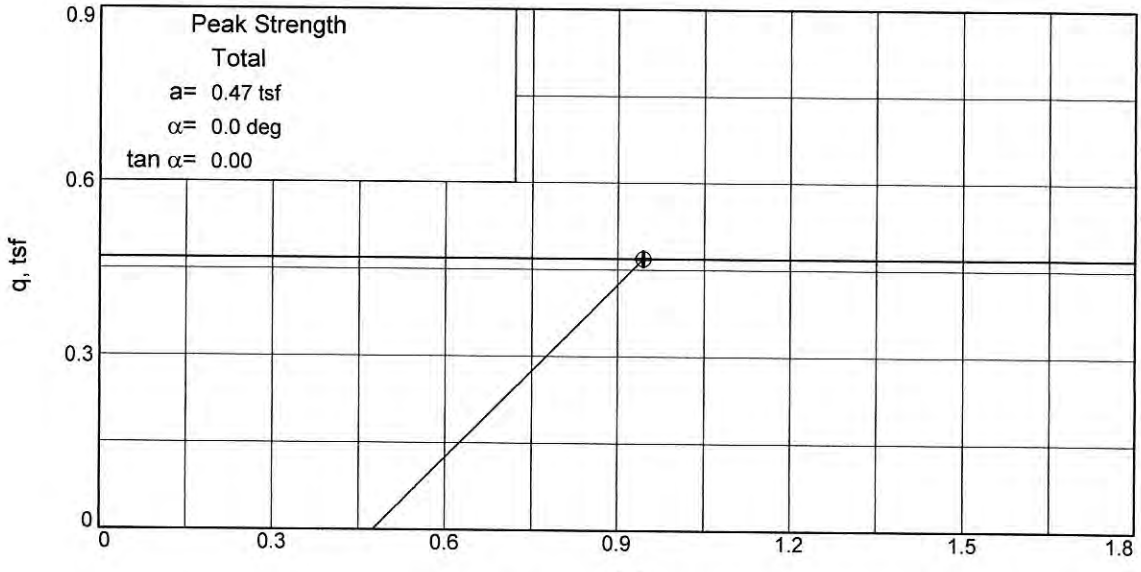
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

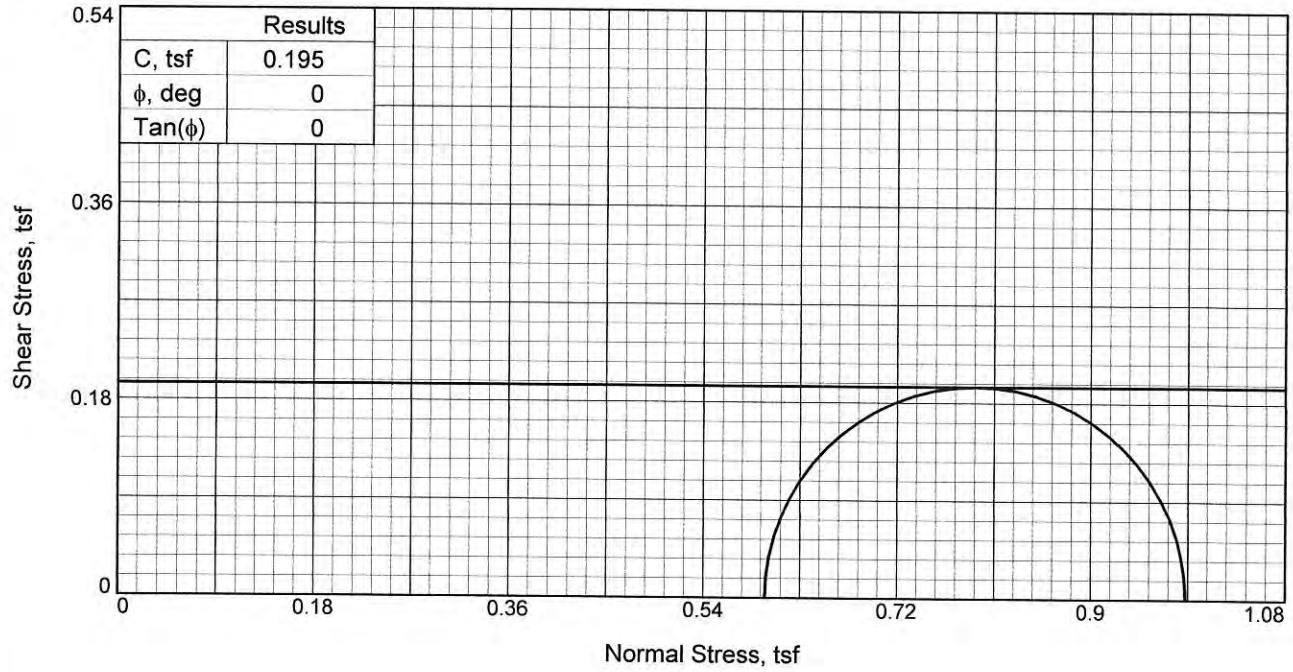
Client:

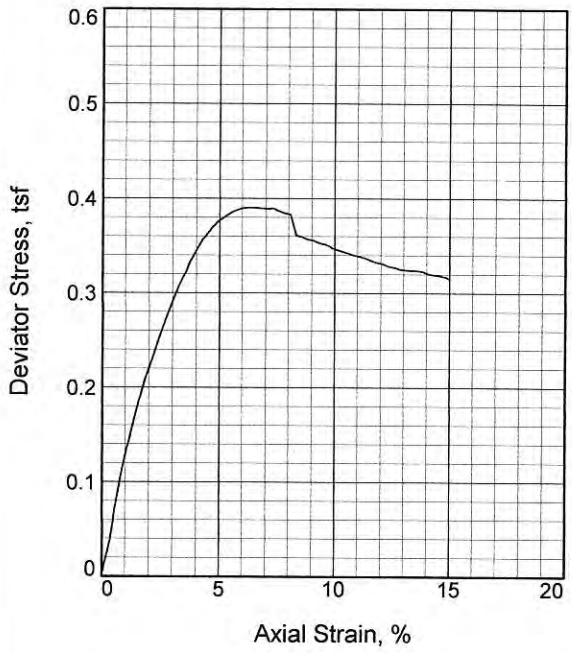
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 18-20

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	49.5
	Dry Density, pcf	66.4
	Saturation, %	86.8
	Void Ratio	1.5390
	Diameter, in.	2.85
	Height, in.	5.76
At Test	Water Content, %	52.1
	Dry Density, pcf	66.4
	Saturation, %	91.4
	Void Ratio	1.5390
	Diameter, in.	2.85
	Height, in.	5.76
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		8.30
Fail. Stress, tsf		0.39
Strain, %		6.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.99
σ_3 Failure, tsf		0.60

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown FAT CLAY

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

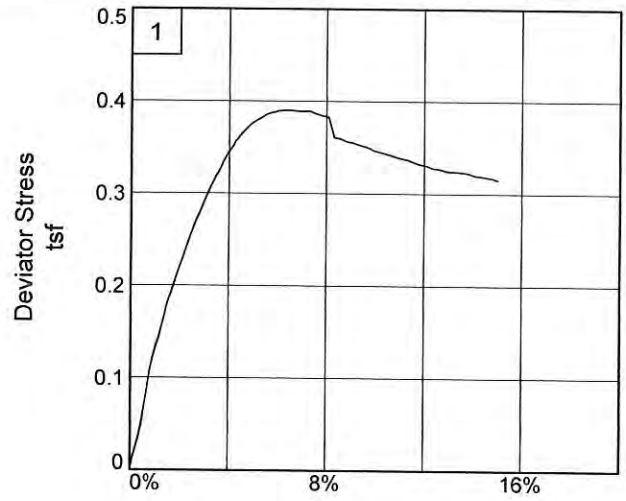
Client:

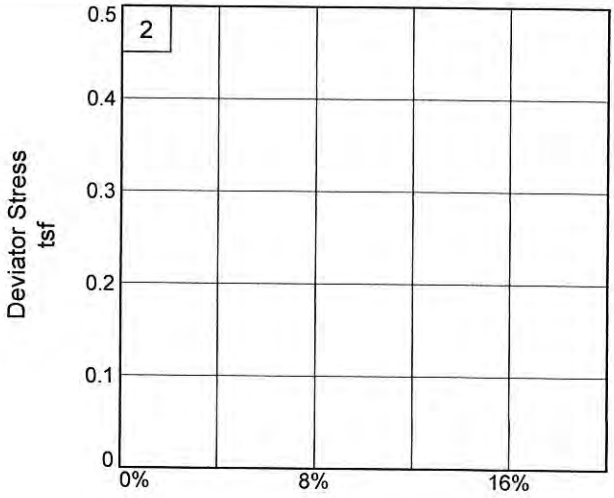
Project: San Jacinto River Waste Pit Superfund Site

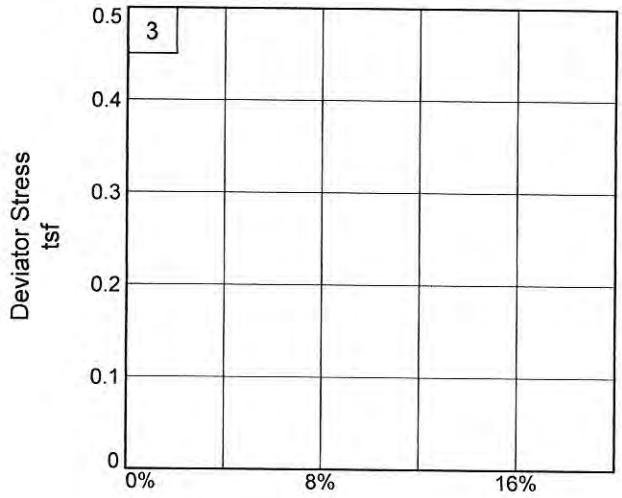
Source of Sample: SJGB024 **Depth:** 23-25

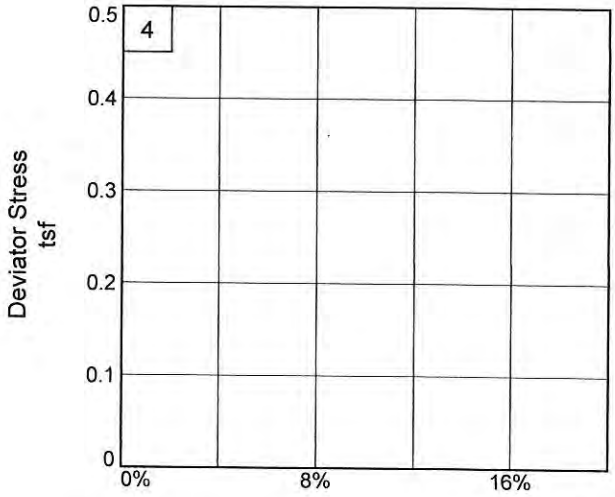
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

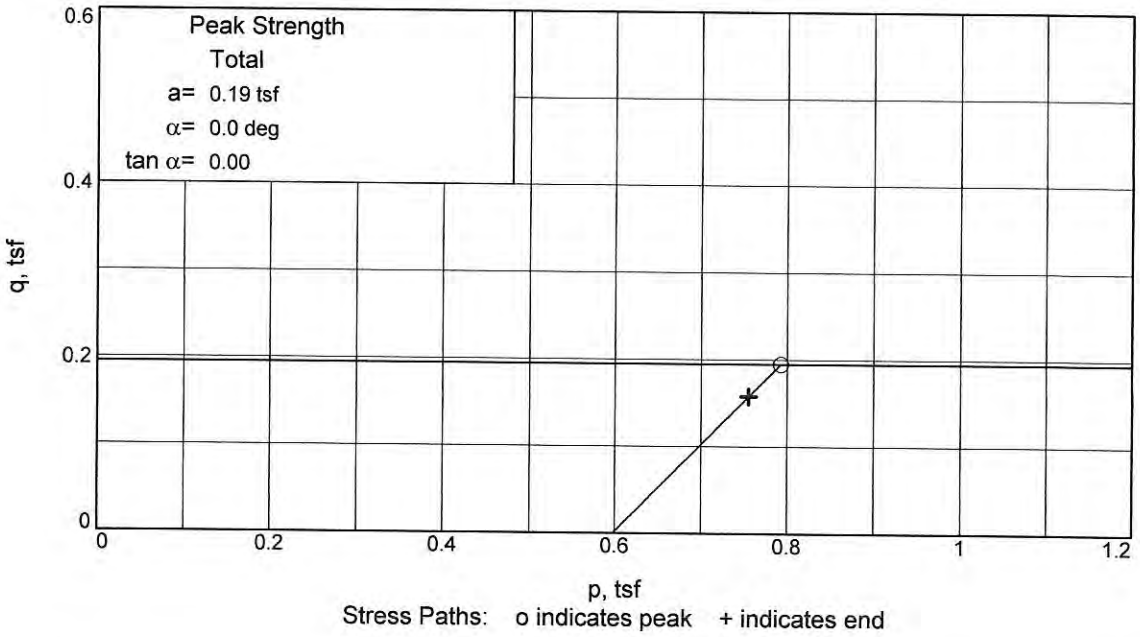
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

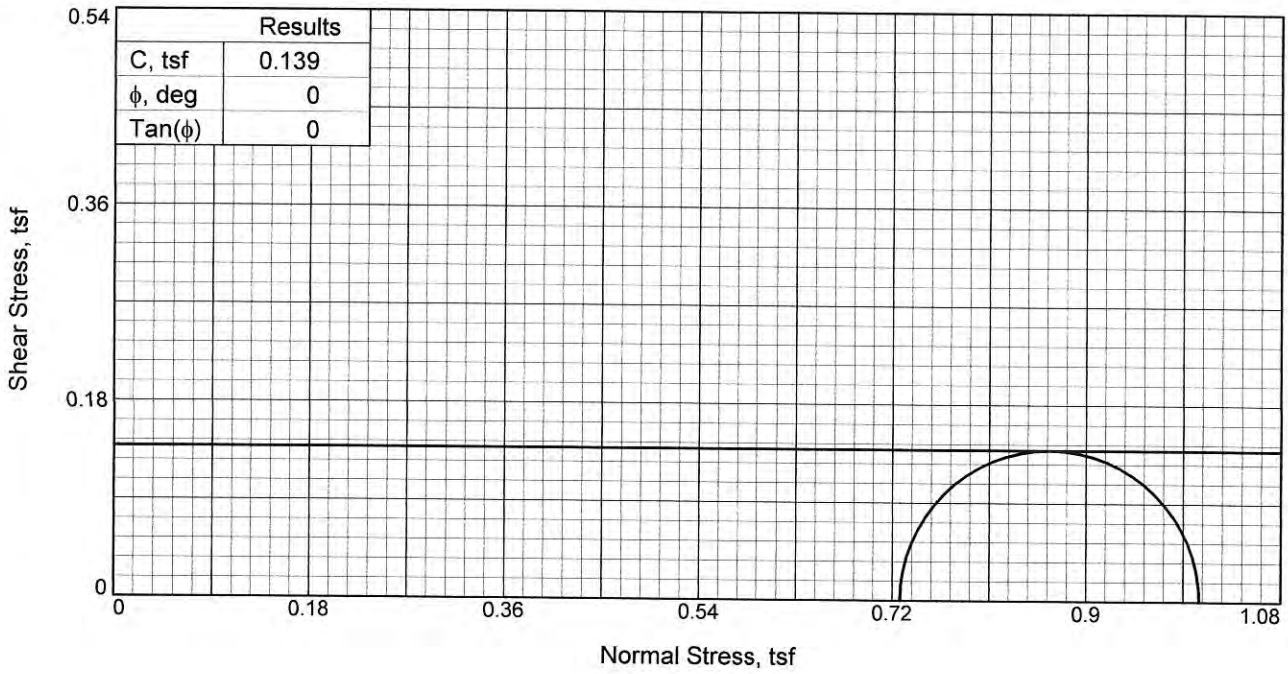
Client:

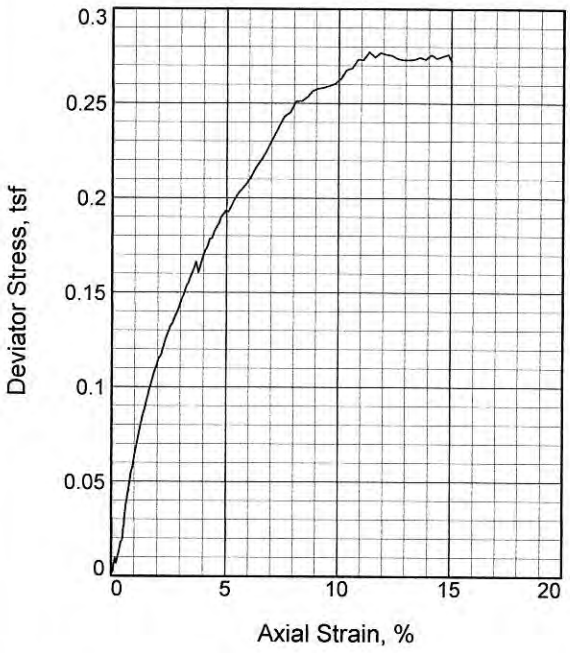
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 23-25

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	61.3
	Dry Density, pcf	59.0
	Saturation, %	89.2
	Void Ratio	1.8553
	Diameter, in.	2.93
	Height, in.	5.79
At Test	Water Content, %	47.6
	Dry Density, pcf	59.0
	Saturation, %	69.2
	Void Ratio	1.8553
	Diameter, in.	2.93
	Height, in.	5.79
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		10.10
Fail. Stress, tsf		0.28
Strain, %		11.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.00
σ_3 Failure, tsf		0.73

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown FAT CLAY

LL= 122 **PL=** 58 **PI=** 64
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

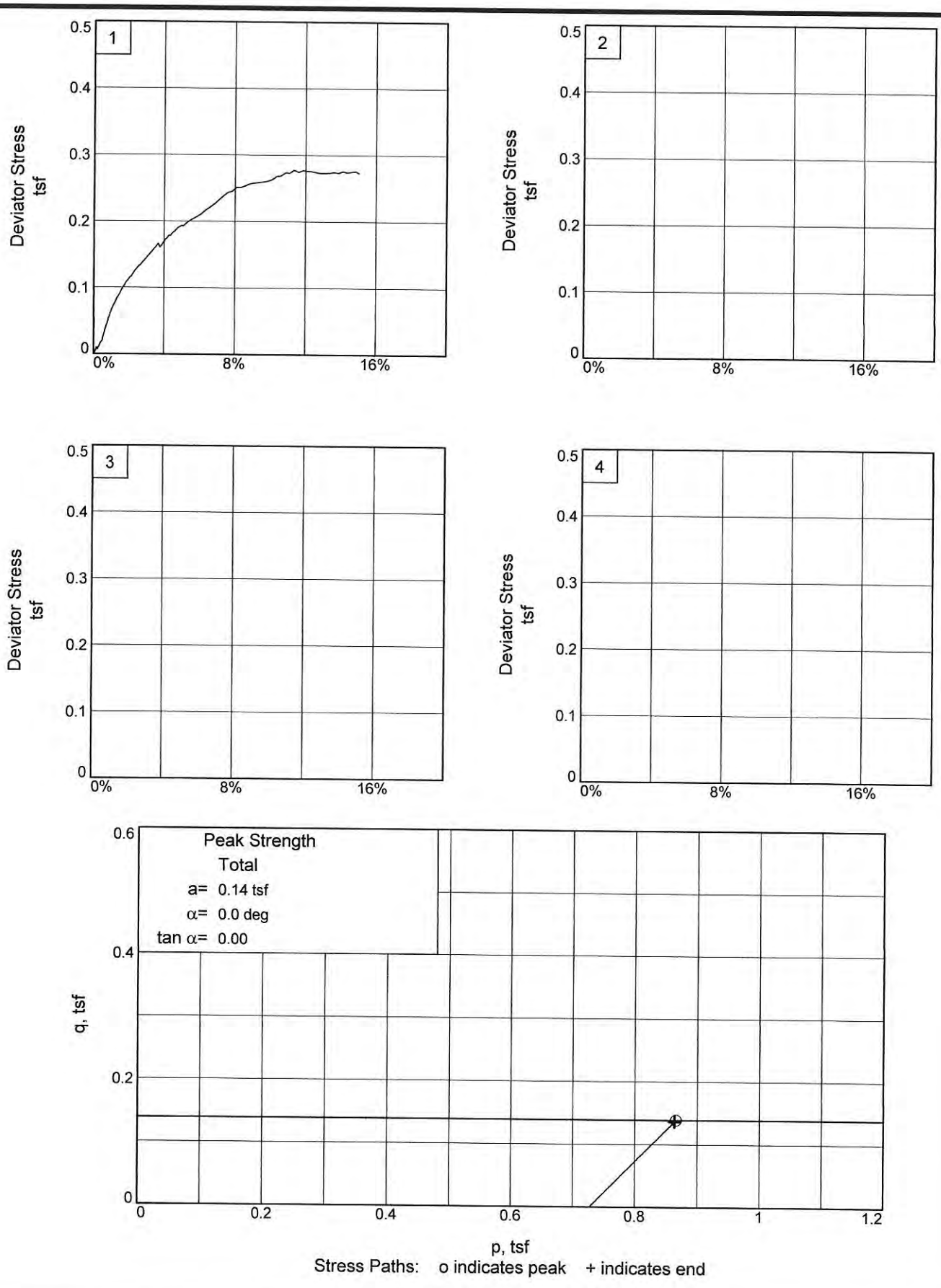
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 28-30

Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



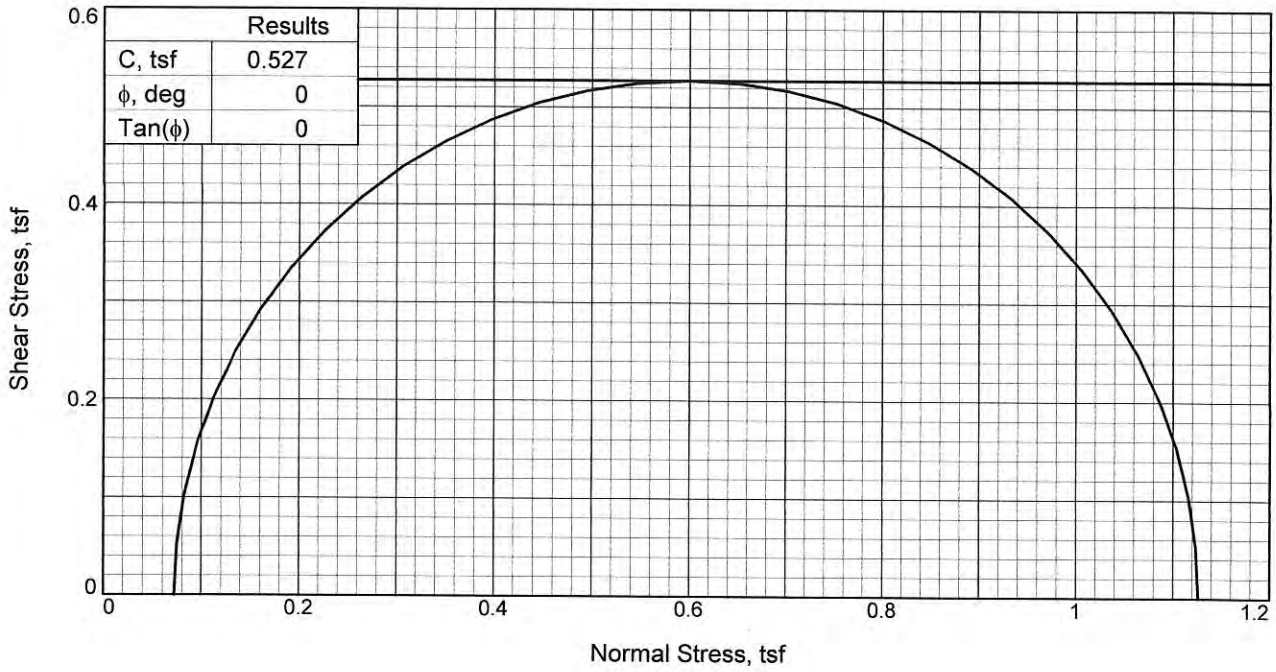
Client:

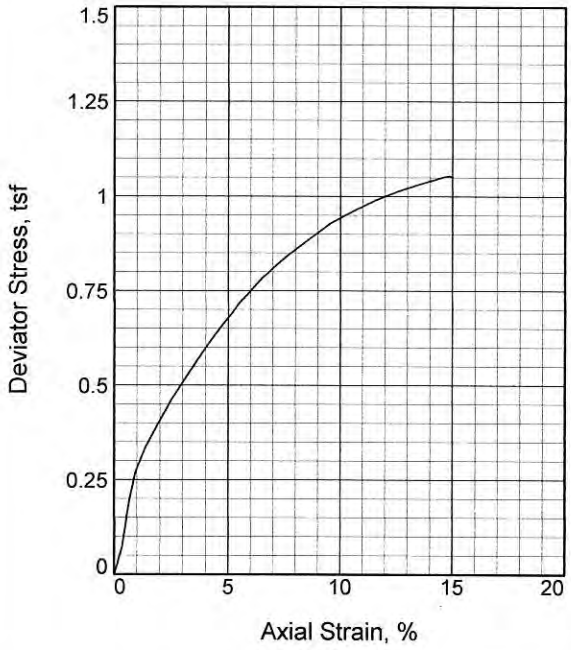
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB024 **Depth:** 28-30

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	15.5
	Dry Density, pcf	115.8
	Saturation, %	91.8
	Void Ratio	0.4558
	Diameter, in.	2.80
	Height, in.	5.70
At Test	Water Content, %	15.5
	Dry Density, pcf	115.8
	Saturation, %	91.7
	Void Ratio	0.4558
	Diameter, in.	2.80
	Height, in.	5.70
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.00
Fail. Stress, tsf		1.05
Ult. Stress, tsf		
σ_1 Failure, tsf		1.13
σ_3 Failure, tsf		0.07

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown LEAN CLAY with SAND

LL= 36 **PL=** 18 **PI=** 18

Specific Gravity= 2.7

Remarks:
Test Method: ASTM D2850
Failure Type: Bulge

Figure _____

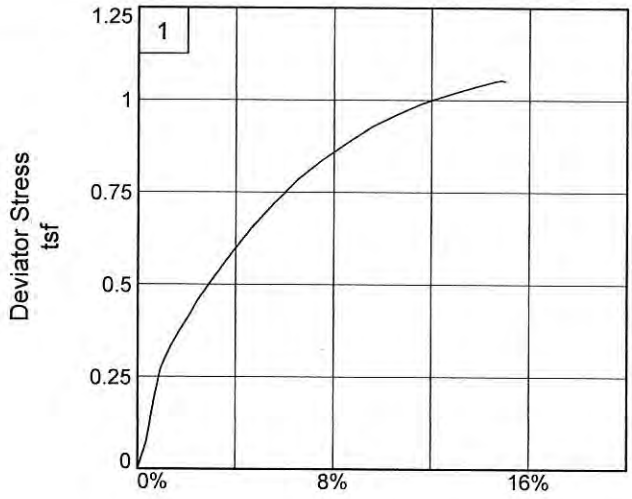
Client:

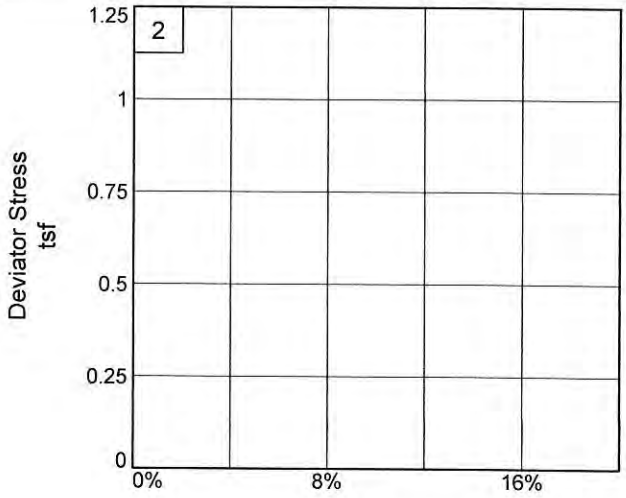
Project: San Jacinto River Waste Pit Superfund Site

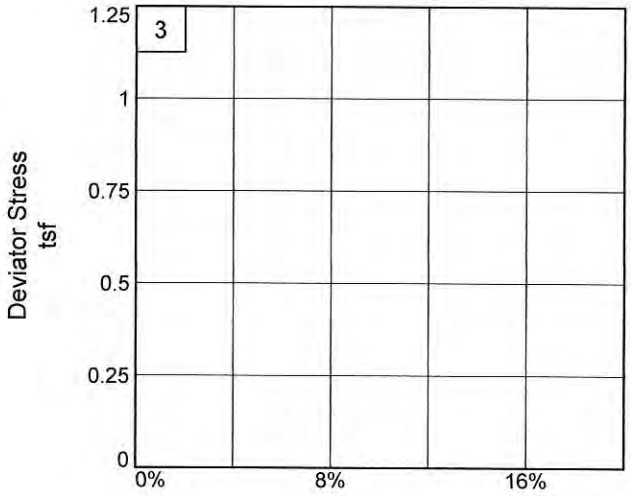
Source of Sample: SJGB025 **Depth:** 2-4

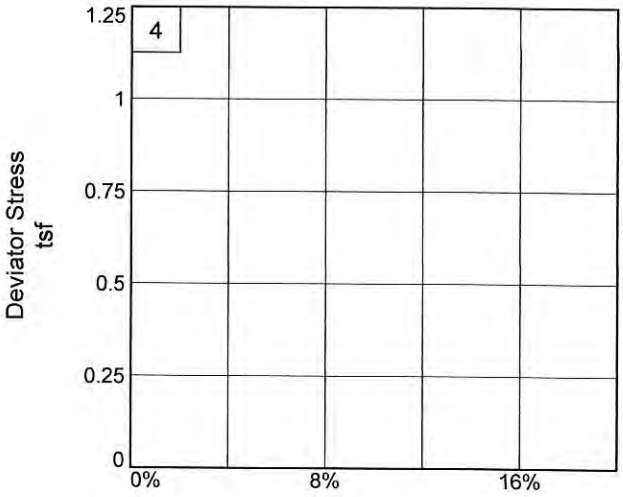
Proj. No.: 19.15.131 **Date Sampled:** 9/18/19

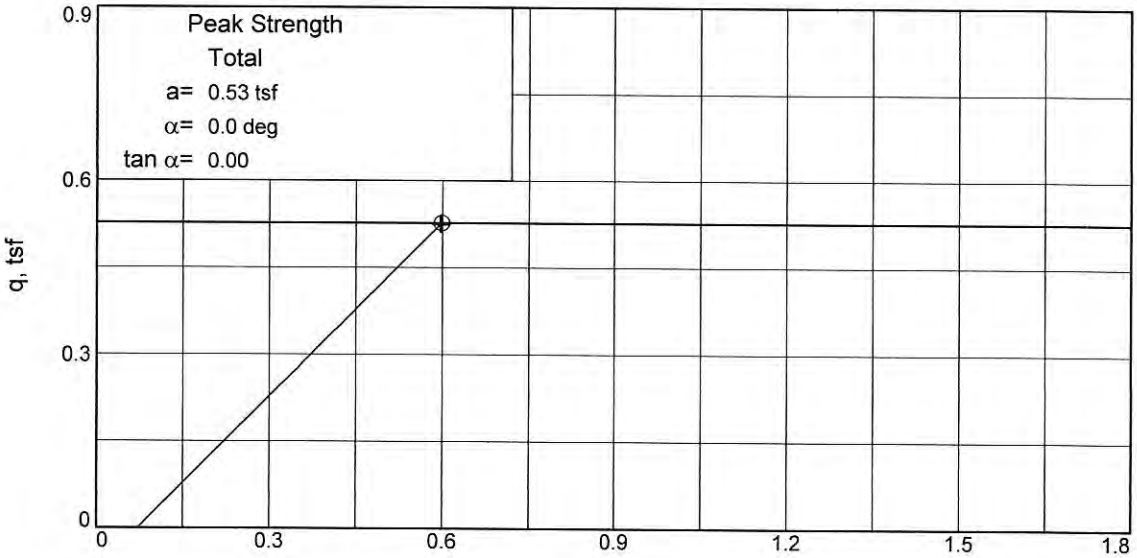
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

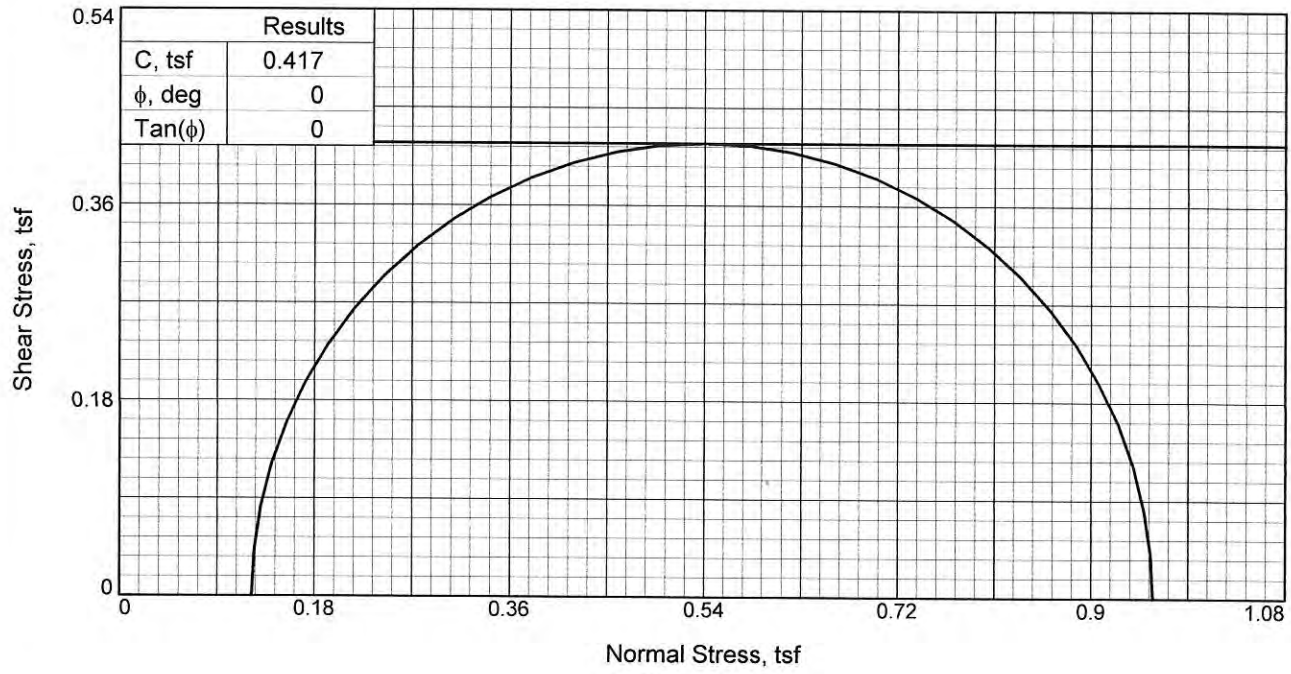
Client:

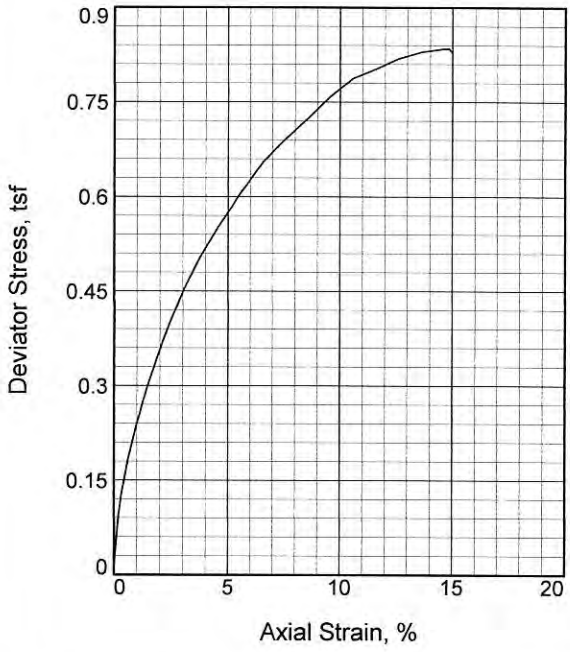
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB025 **Depth:** 2-4

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	18.8
	Dry Density, pcf	112.5
	Saturation, %	98.1
	Void Ratio	0.5258
	Diameter, in.	2.79
	Height, in.	5.72
At Test	Water Content, %	18.4
	Dry Density, pcf	112.5
	Saturation, %	96.4
	Void Ratio	0.5258
	Diameter, in.	2.79
	Height, in.	5.72
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.70
Fail. Stress, tsf		0.83
Ult. Stress, tsf		
σ_1 Failure, tsf		0.96
σ_3 Failure, tsf		0.12

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray SANDY LEAN CLAY

LL= 34 **PL=** 17 **PI=** 17

Specific Gravity= 2.75

Remarks:
Test Method: ASTM D2850
Failure Type:Multiple Shear

Figure _____

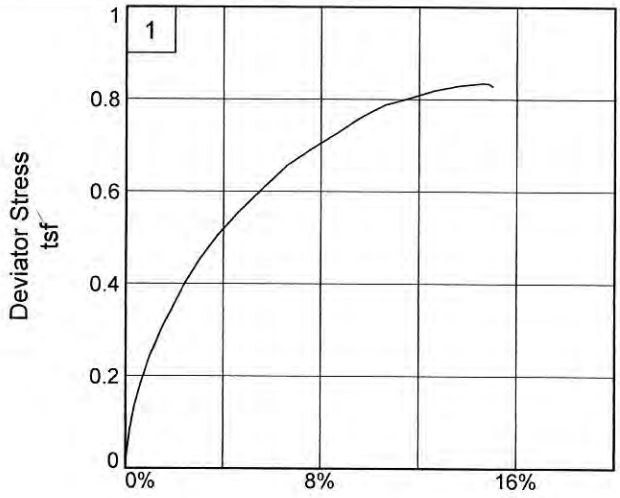
Client:

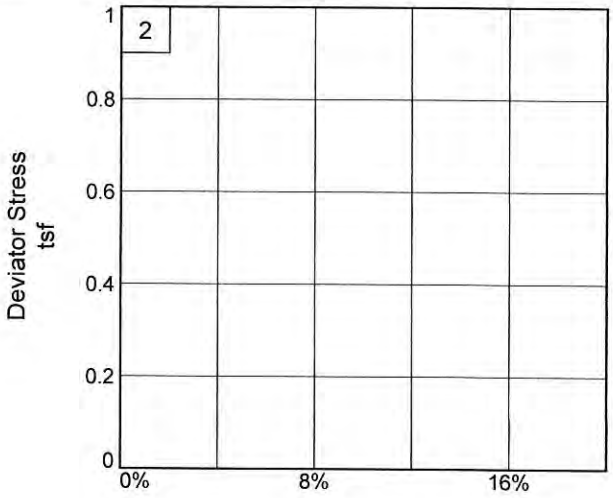
Project: San Jacinto River Waste Pit Superfund Site

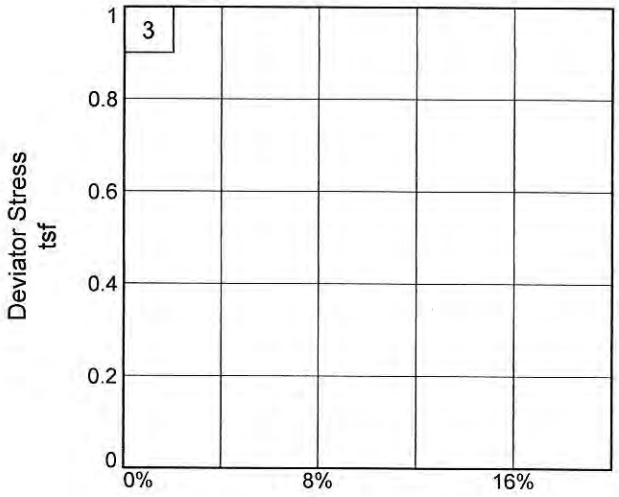
Source of Sample: SJGB025 **Depth:** 4-6

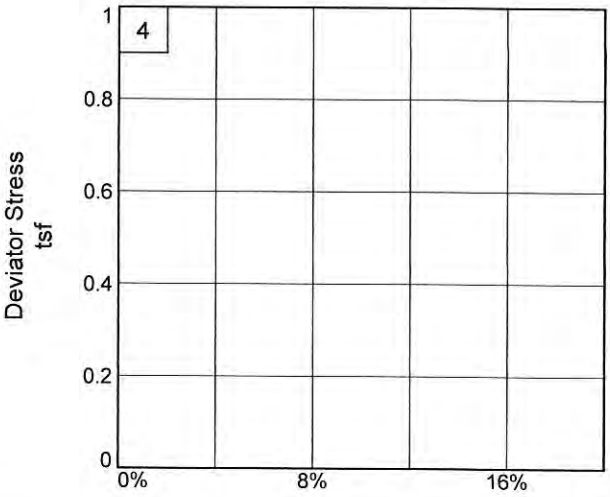
Proj. No.: 19.15.131 **Date Sampled:** 9/19/19

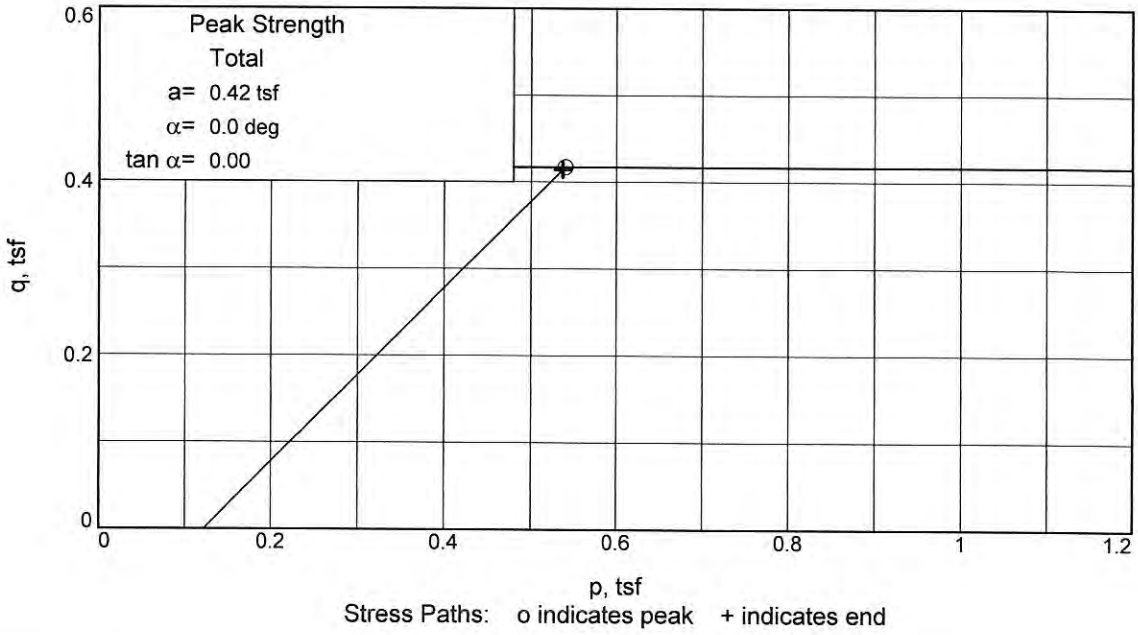
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

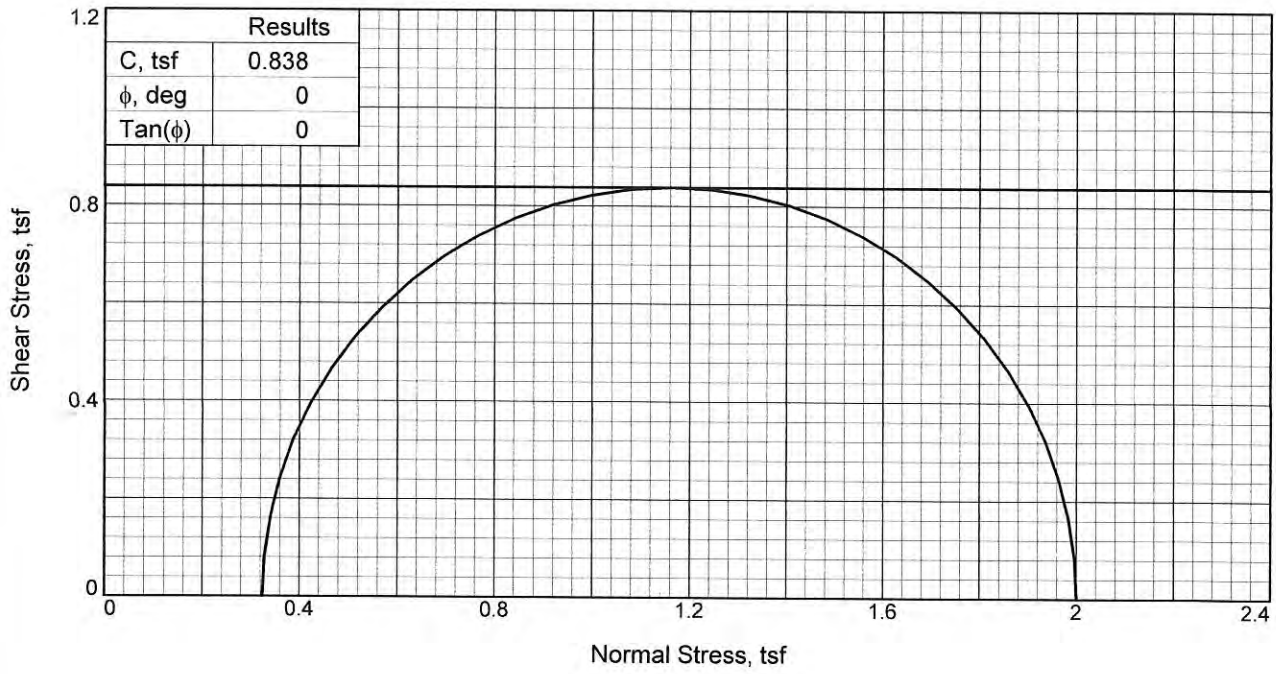
Client:

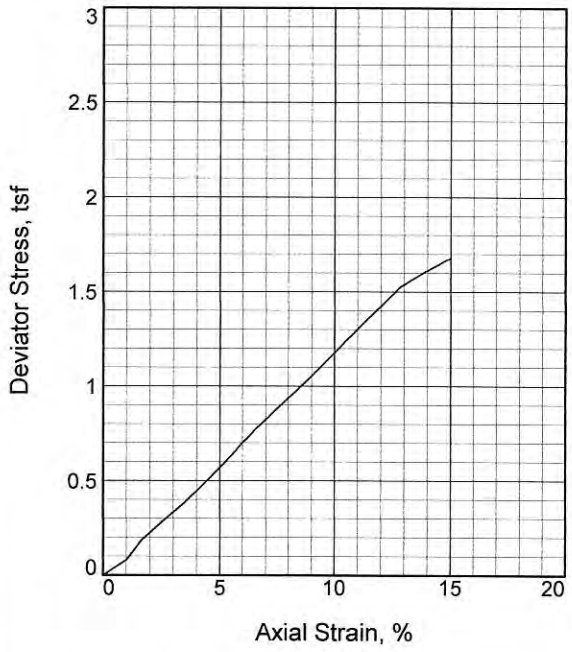
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB025 **Depth:** 4-6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	18.6
	Dry Density, pcf	114.9
	Saturation, %	99.9
	Void Ratio	0.5208
	Diameter, in.	2.77
	Height, in.	5.19
At Test	Water Content, %	20.4
	Dry Density, pcf	114.9
	Saturation, %	109.8
	Void Ratio	0.5208
	Diameter, in.	2.77
	Height, in.	5.19
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		4.50
Fail. Stress, tsf		1.68
Ult. Stress, tsf		
σ_1 Failure, tsf		2.00
σ_3 Failure, tsf		0.32

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown SANDY LEAN CLAY

LL= 33 **PL=** 17 **PI=** 16

Specific Gravity= 2.8

Remarks:
Test Method: ASTM D2850
Failure Type: Bulge

Figure _____

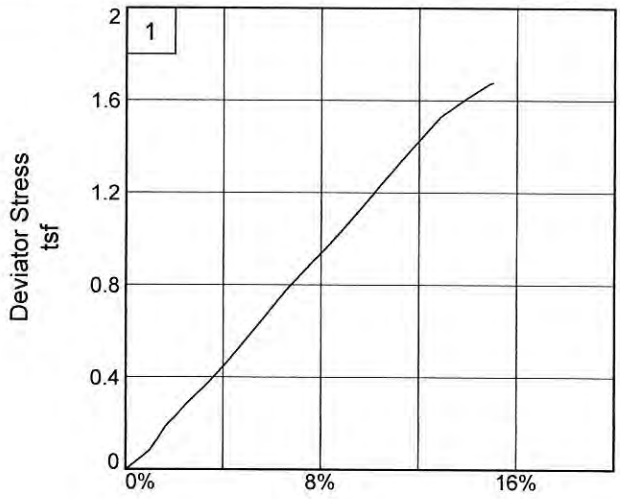
Client:

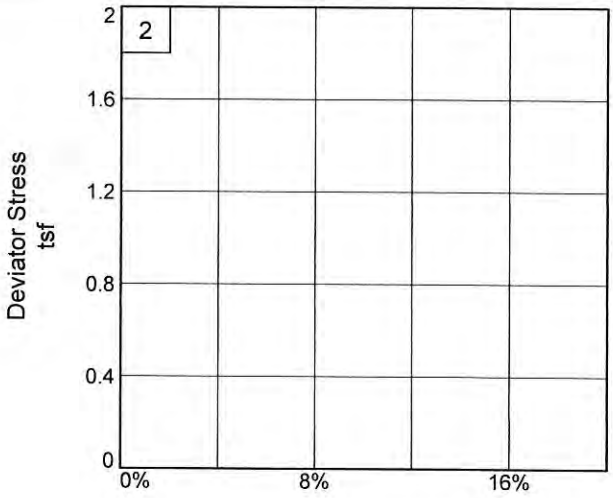
Project: San Jacinto River Waste Pit Superfund Site

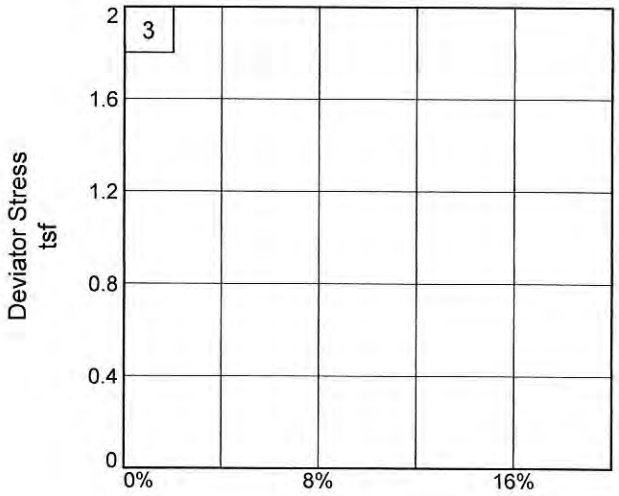
Source of Sample: SJGB025 **Depth:** 12-14

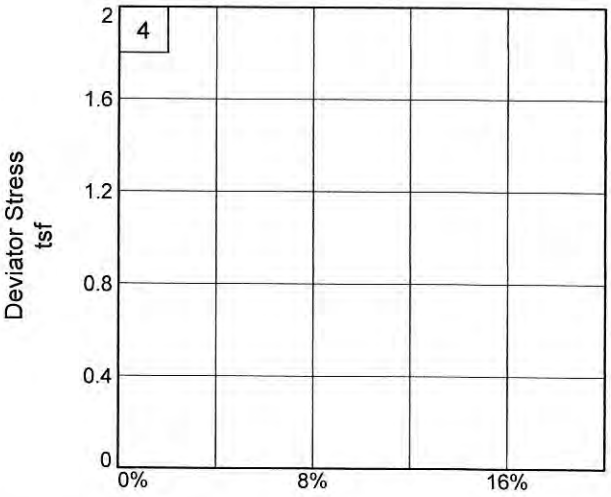
Proj. No.: 19.15.131 **Date Sampled:** 9/19/19

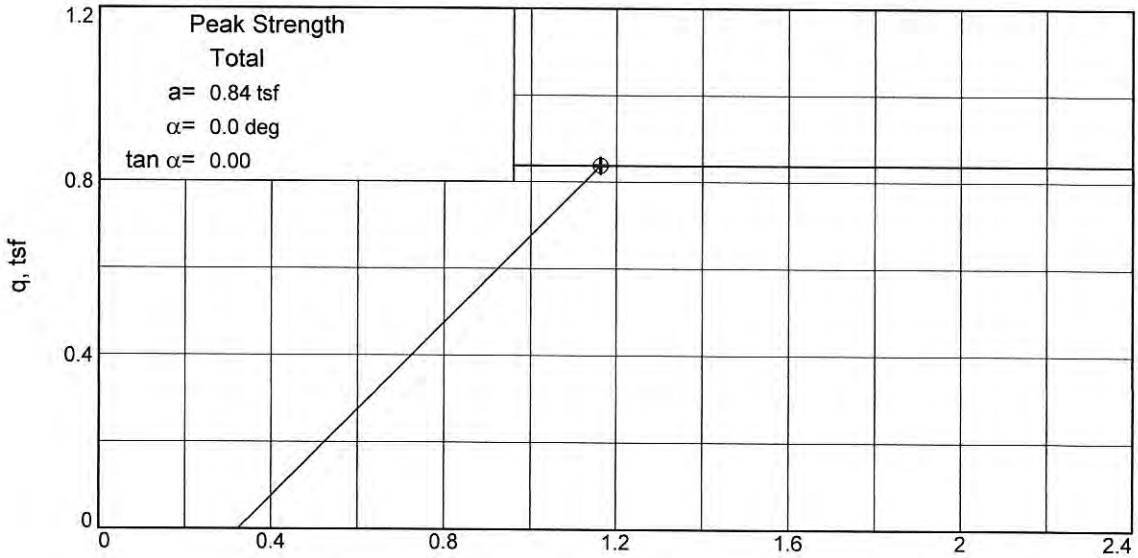
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

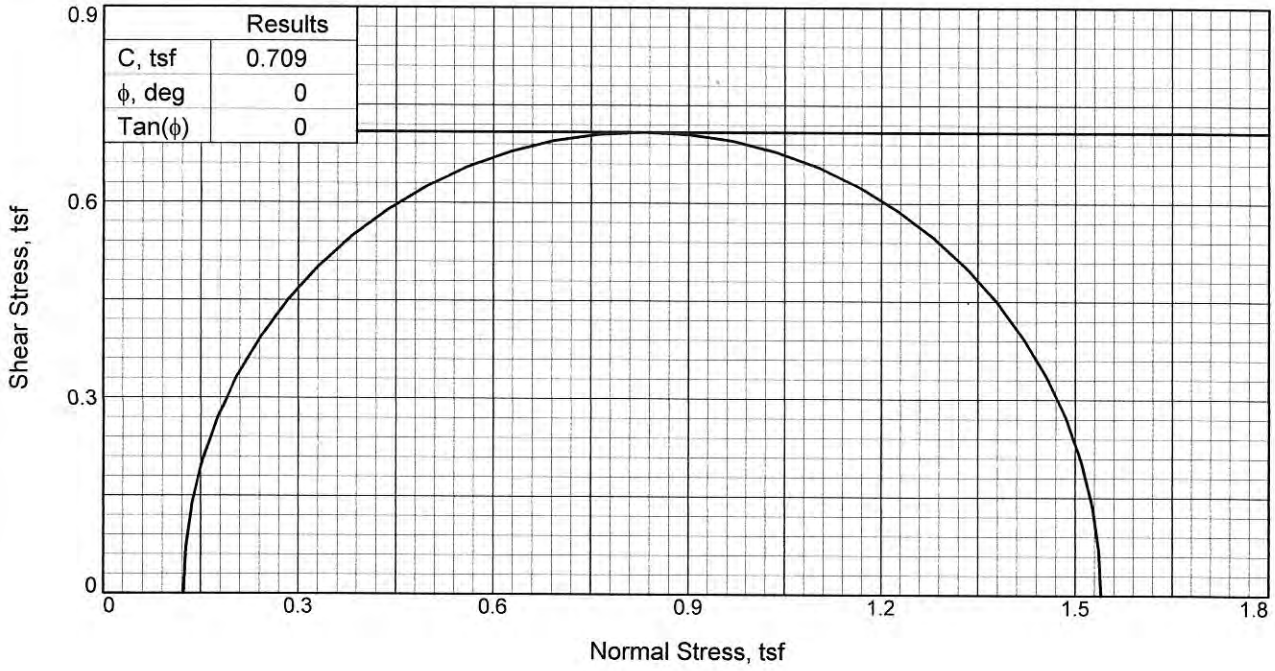
Client:

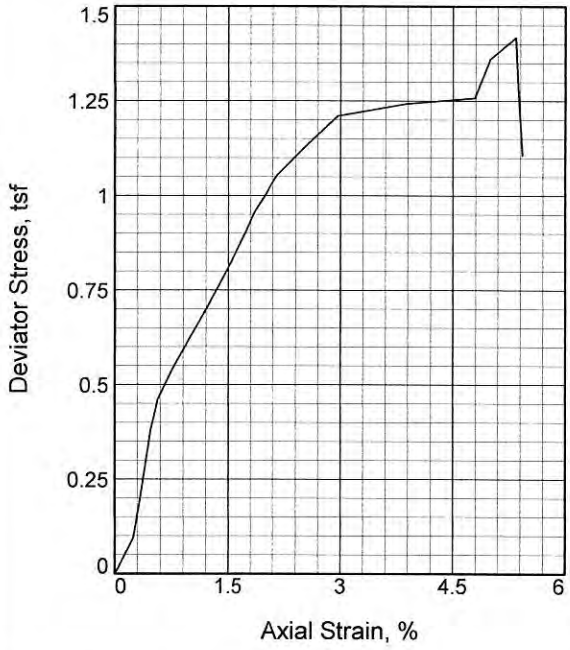
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB025 **Depth:** 12-14

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	19.1
	Dry Density, pcf	104.9
	Saturation, %	84.8
	Void Ratio	0.6074
	Diameter, in.	2.80
	Height, in.	5.66
At Test	Water Content, %	20.9
	Dry Density, pcf	104.9
	Saturation, %	93.0
	Void Ratio	0.6074
	Diameter, in.	2.80
	Height, in.	5.66
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.70
Fail. Stress, tsf		1.42
Ult. Stress, tsf		
σ_1 Failure, tsf		1.54
σ_3 Failure, tsf		0.12

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and Gray LEAN CLAY with SAND

LL= 41 **PL=** 18 **PI=** 23

Specific Gravity= 2.7

Remarks:
Test Method: ASTM D2850
Failure Type: Vertical

Figure _____

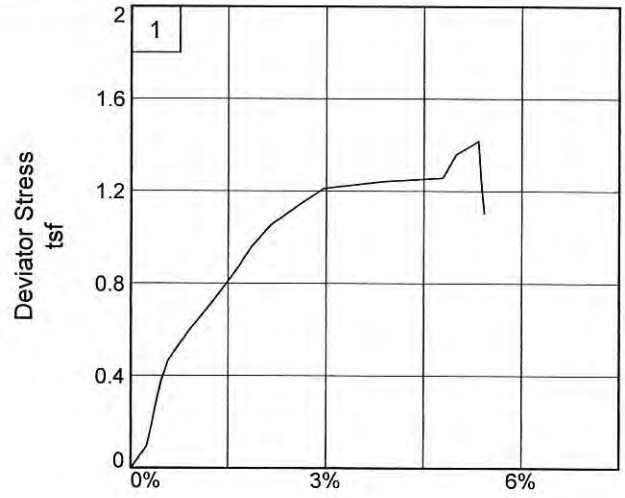
Client:

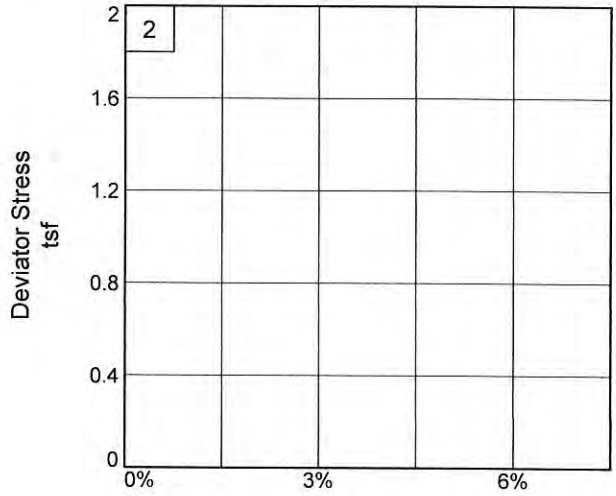
Project: San Jacinto River Waste Pit Superfund Site

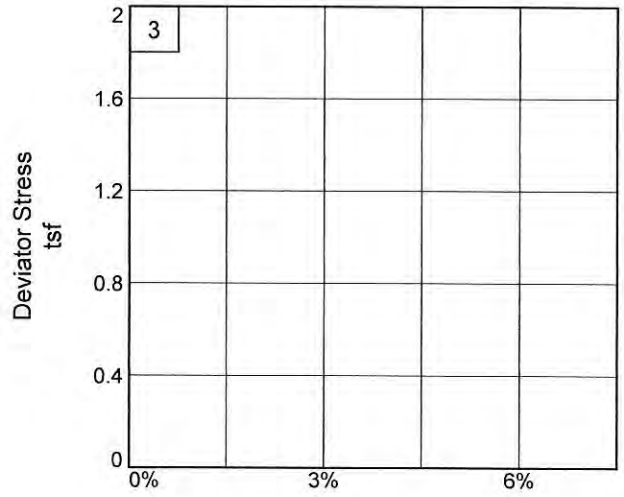
Source of Sample: SJGB026 **Depth:** 4-6

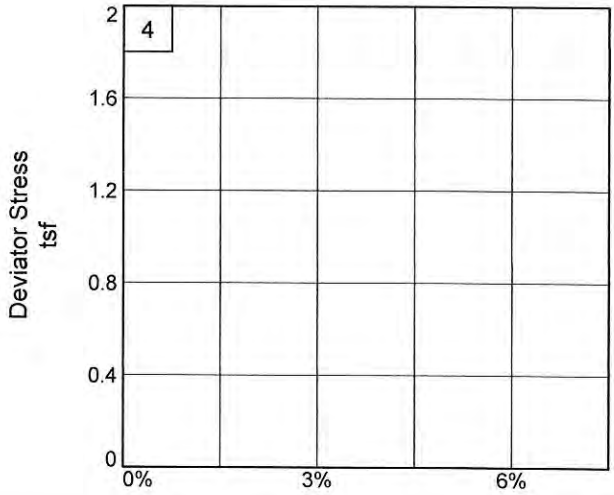
Proj. No.: 19.15.131 **Date Sampled:**

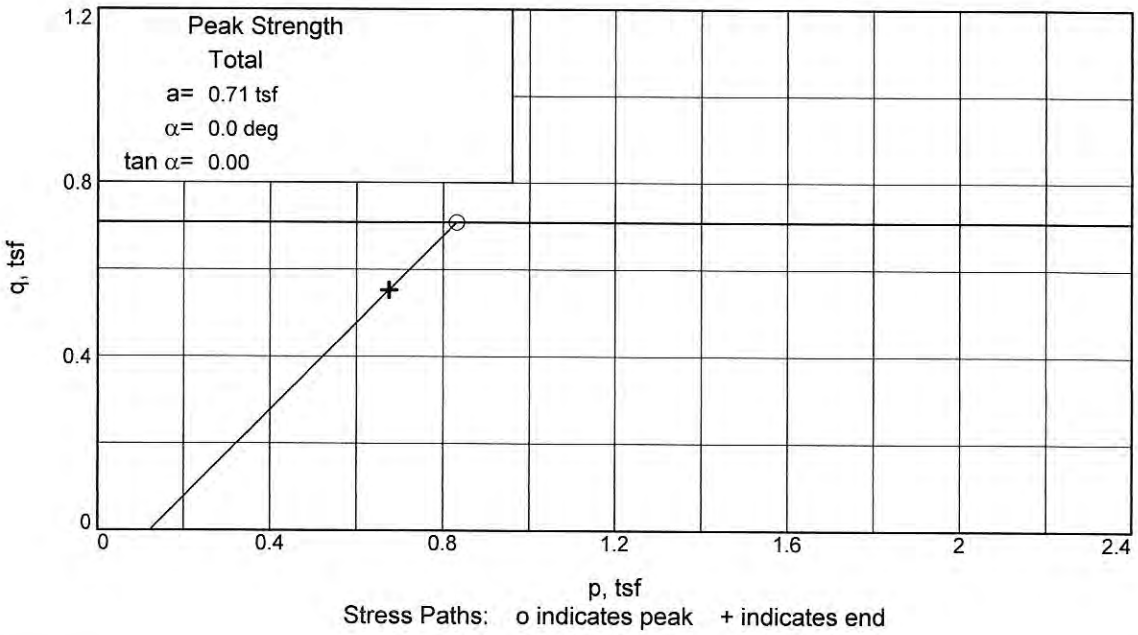
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

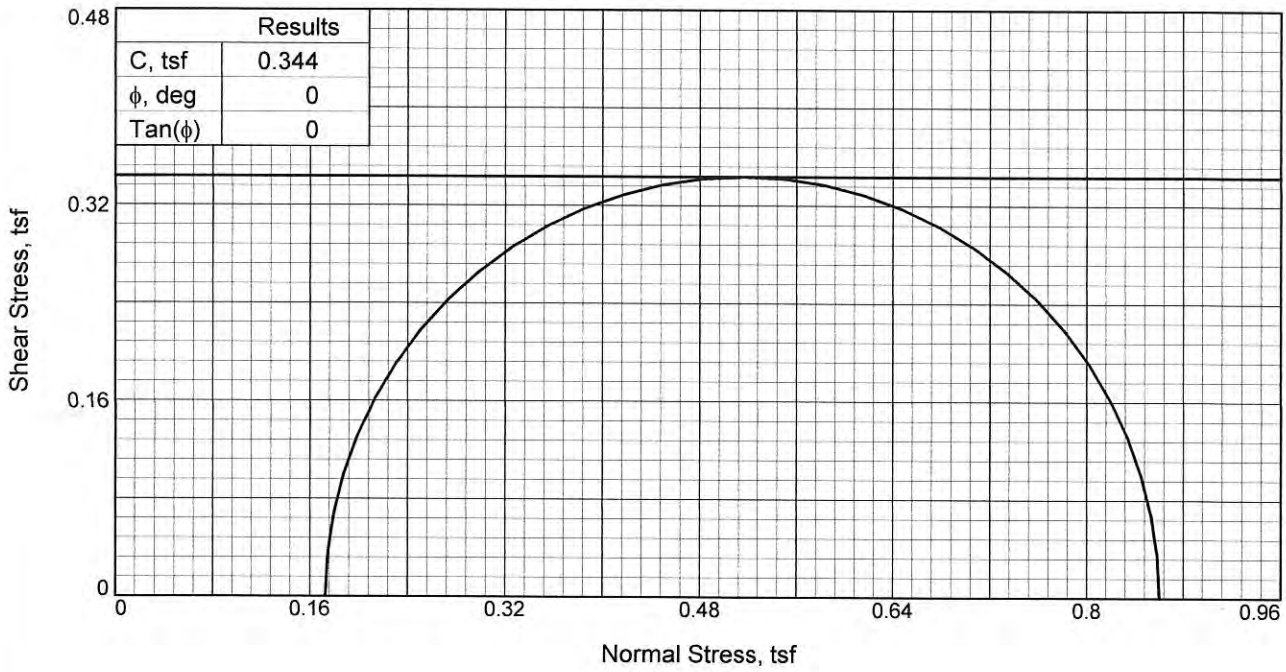
Client:

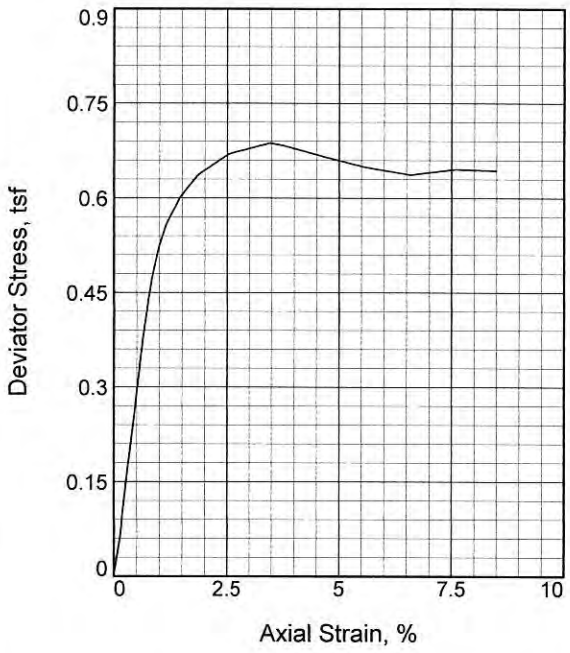
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB026 **Depth:** 4-6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	19.1
	Dry Density, pcf	104.8
	Saturation, %	84.7
	Void Ratio	0.6086
	Diameter, in.	2.79
	Height, in.	5.64
At Test	Water Content, %	20.4
	Dry Density, pcf	104.8
	Saturation, %	90.7
	Void Ratio	0.6086
	Diameter, in.	2.79
	Height, in.	5.64
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		2.40
Fail. Stress, tsf		0.69
Ult. Stress, tsf		
σ_1 Failure, tsf		0.86
σ_3 Failure, tsf		0.17

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY

Specific Gravity= 2.7

Remarks:
Test Method: ASTM D2850
Failure Type: Multiple Shear

Figure _____

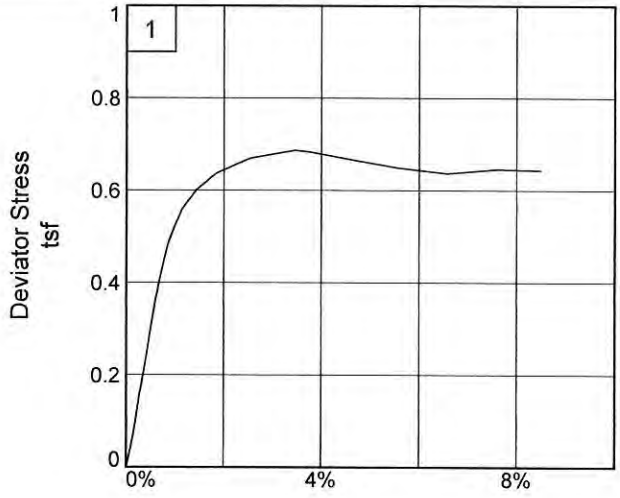
Client:

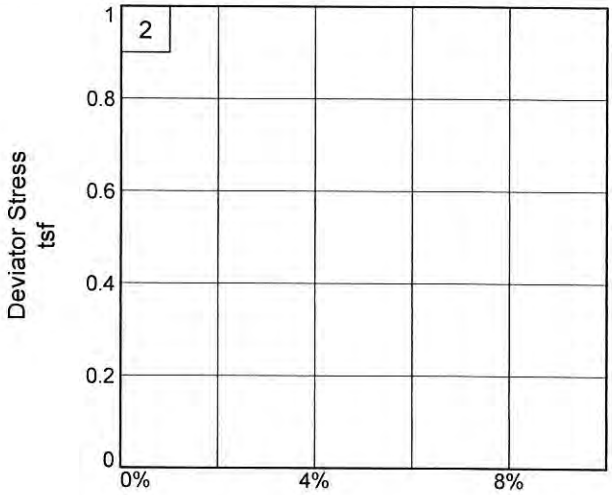
Project: San Jacinto River Waste Pit Superfund Site

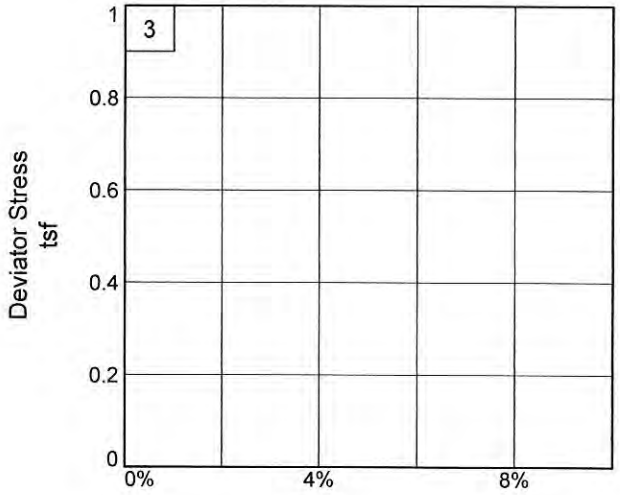
Source of Sample: SJGB026 **Depth:** 6-8

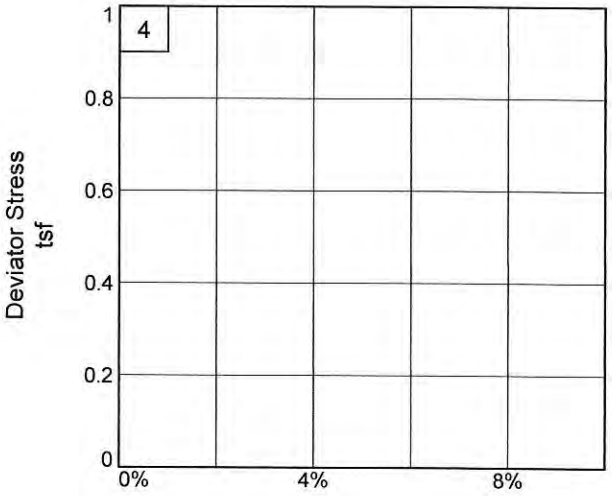
Proj. No.: 19.15.131 **Date Sampled:**

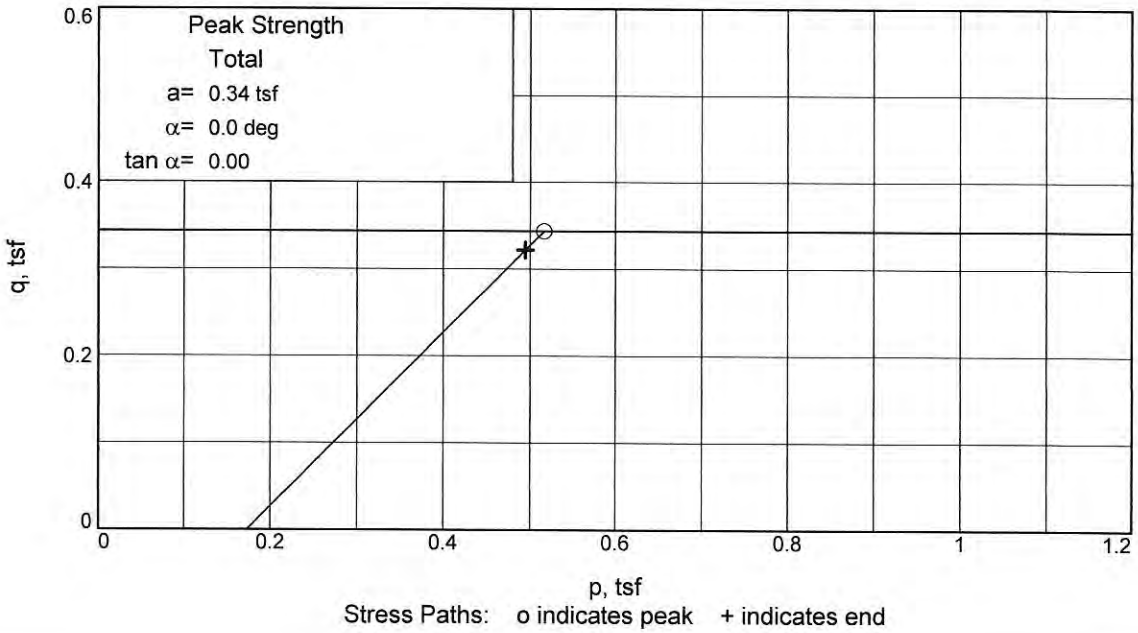
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

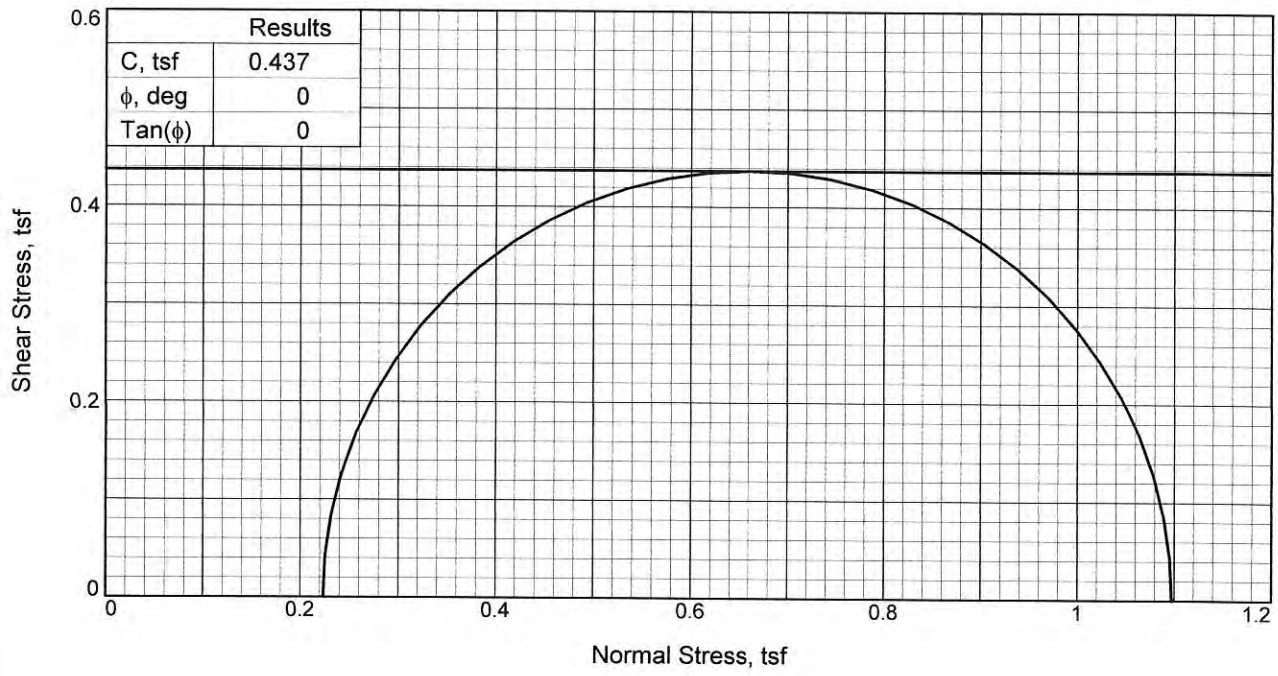
Client:

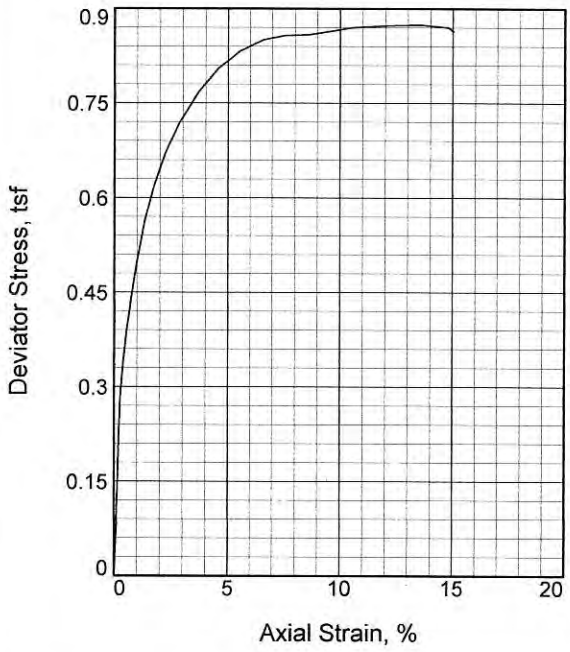
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB026 **Depth:** 6-8

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	21.4
	Dry Density, pcf	103.8
	Saturation, %	92.7
	Void Ratio	0.6242
	Diameter, in.	2.82
	Height, in.	5.70
At Test	Water Content, %	21.3
	Dry Density, pcf	103.8
	Saturation, %	92.1
	Void Ratio	0.6242
	Diameter, in.	2.82
	Height, in.	5.70
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.10
Fail. Stress, tsf		0.87
Ult. Stress, tsf		
σ_1 Failure, tsf		1.10
σ_3 Failure, tsf		0.22

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray and brown LEAN CLAY with SAND

LL= 35 **PL=** 17 **PI=** 18

Specific Gravity= 2.7

Remarks:
Test Method: ASTM D2850
Failure Type: Multiple Shear

Figure _____

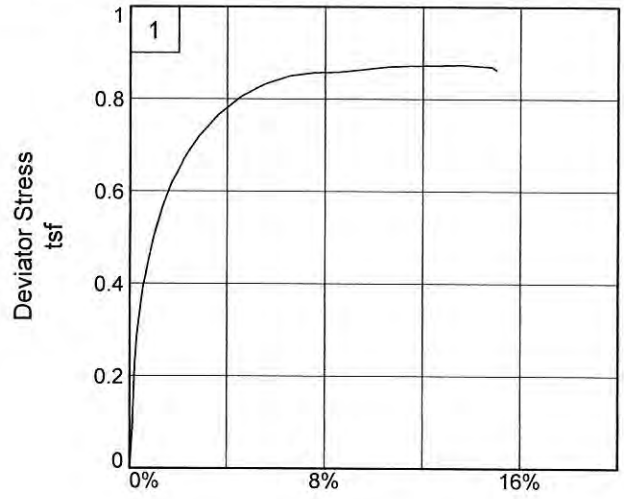
Client:

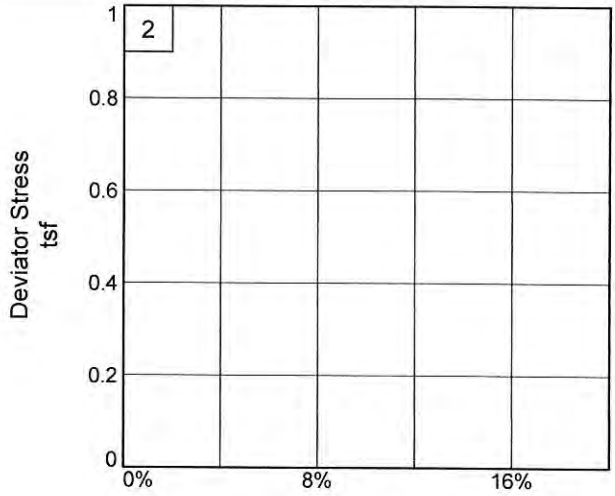
Project: San Jacinto River Waste Pit Superfund Site

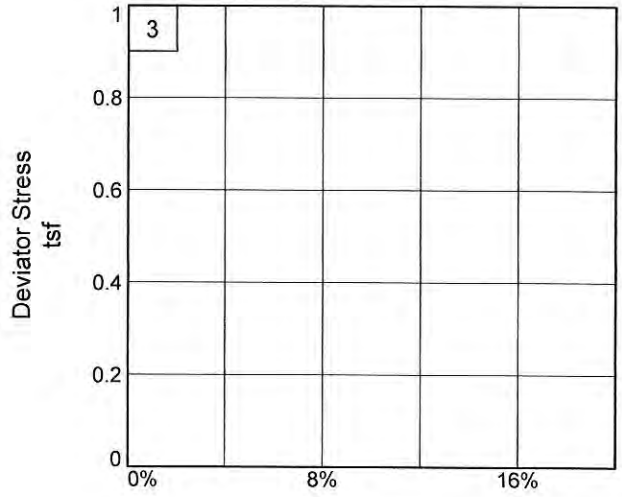
Source of Sample: SJGB026 **Depth:** 8-10

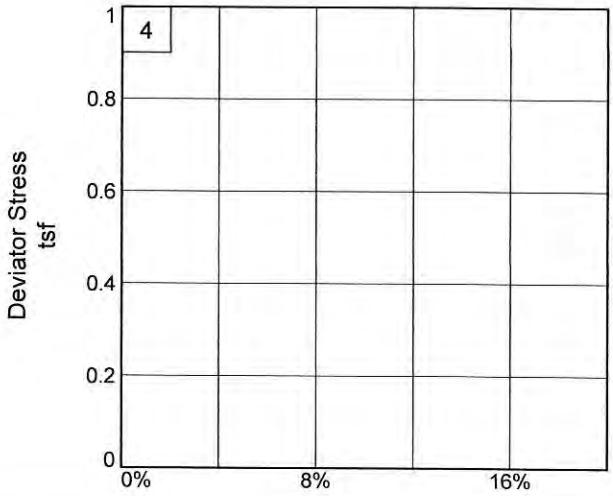
Proj. No.: 19.15.131 **Date Sampled:**

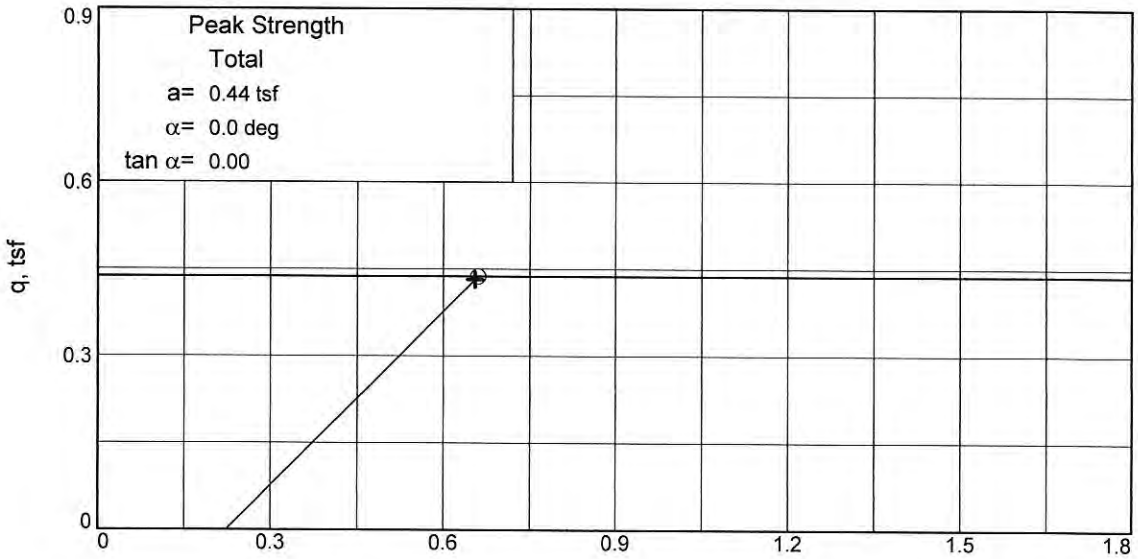
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

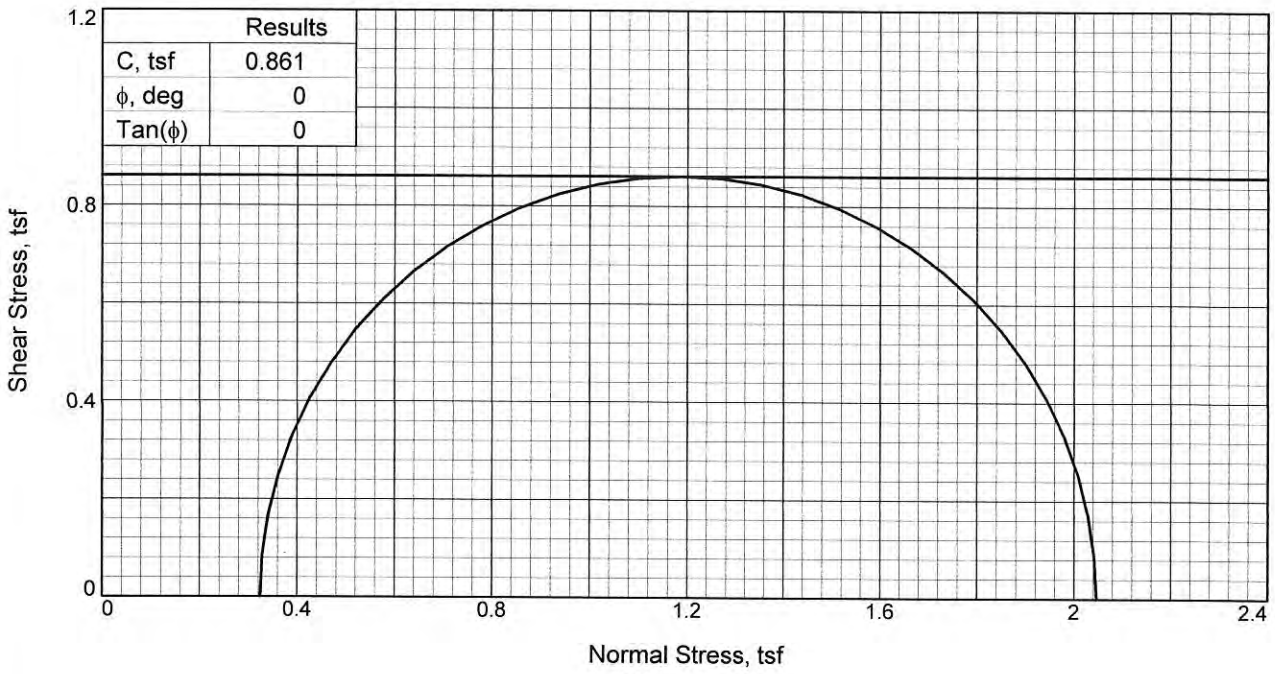
Client:

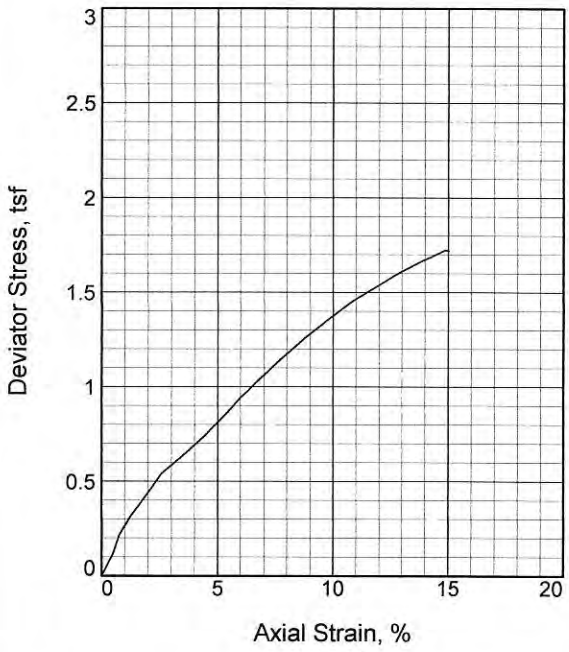
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB026 **Depth:** 8-10

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.6
	Dry Density, pcf	109.5
	Saturation, %	99.6
	Void Ratio	0.5685
	Diameter, in.	2.77
	Height, in.	5.74
At Test	Water Content, %	21.3
	Dry Density, pcf	109.5
	Saturation, %	103.1
	Void Ratio	0.5685
	Diameter, in.	2.77
	Height, in.	5.74
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		4.50
Fail. Stress, tsf		1.72
Ult. Stress, tsf		
σ_1 Failure, tsf		2.05
σ_3 Failure, tsf		0.32

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and Gray SAND

LL= NV **PI=** NP

Specific Gravity= 2.75

Remarks:
Test Method: ASTM D2850
Failure Type: Bulge

Figure _____

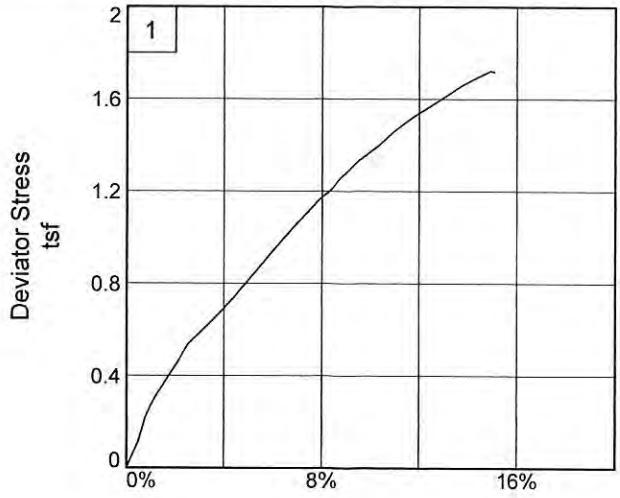
Client:

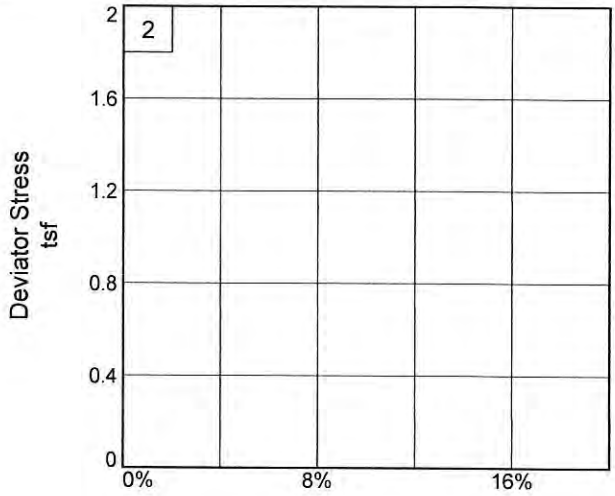
Project: San Jacinto River Waste Pit Superfund Site

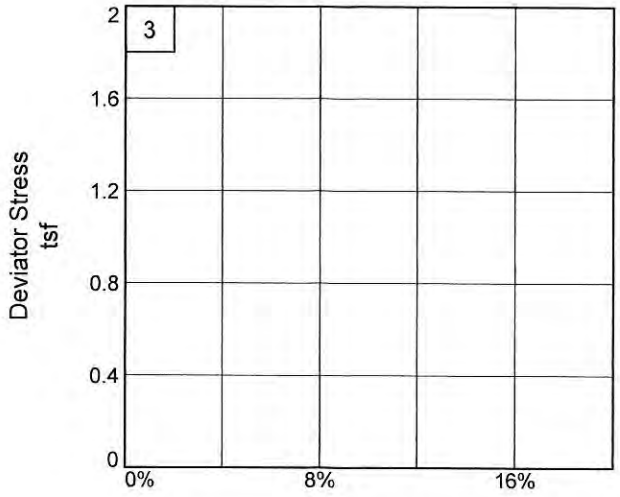
Source of Sample: SJGB026 **Depth:** 12-14

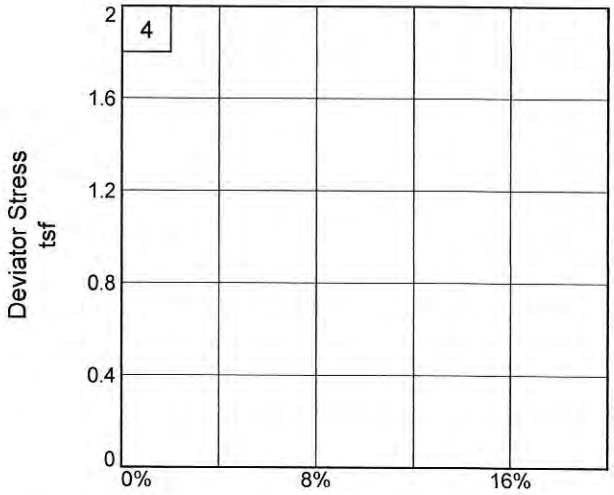
Proj. No.: 19.15.131 **Date Sampled:**

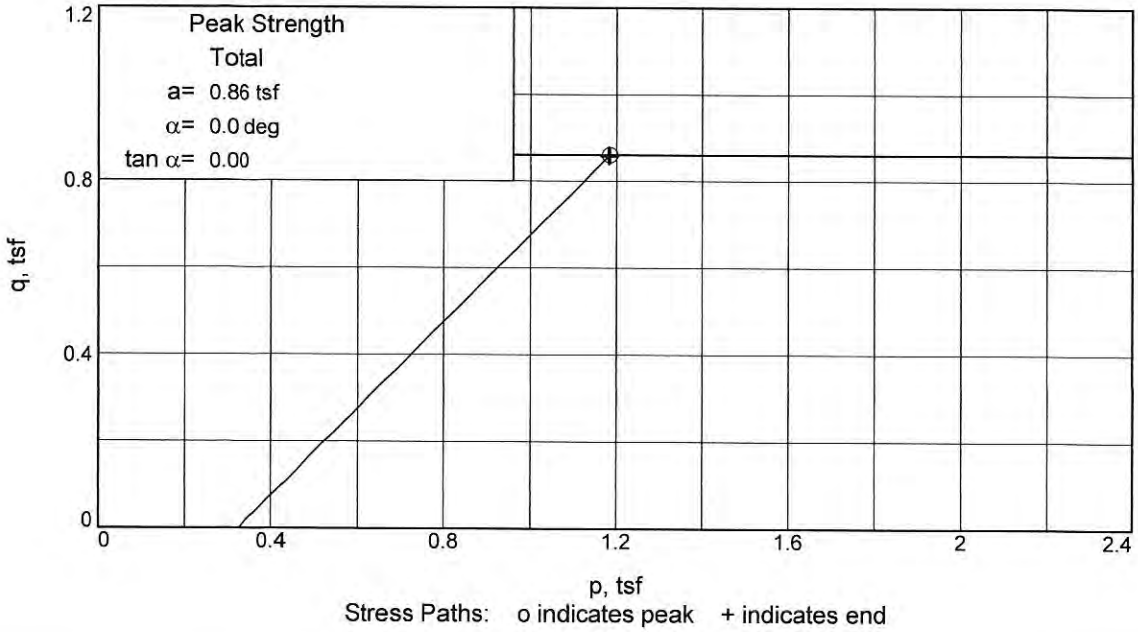
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

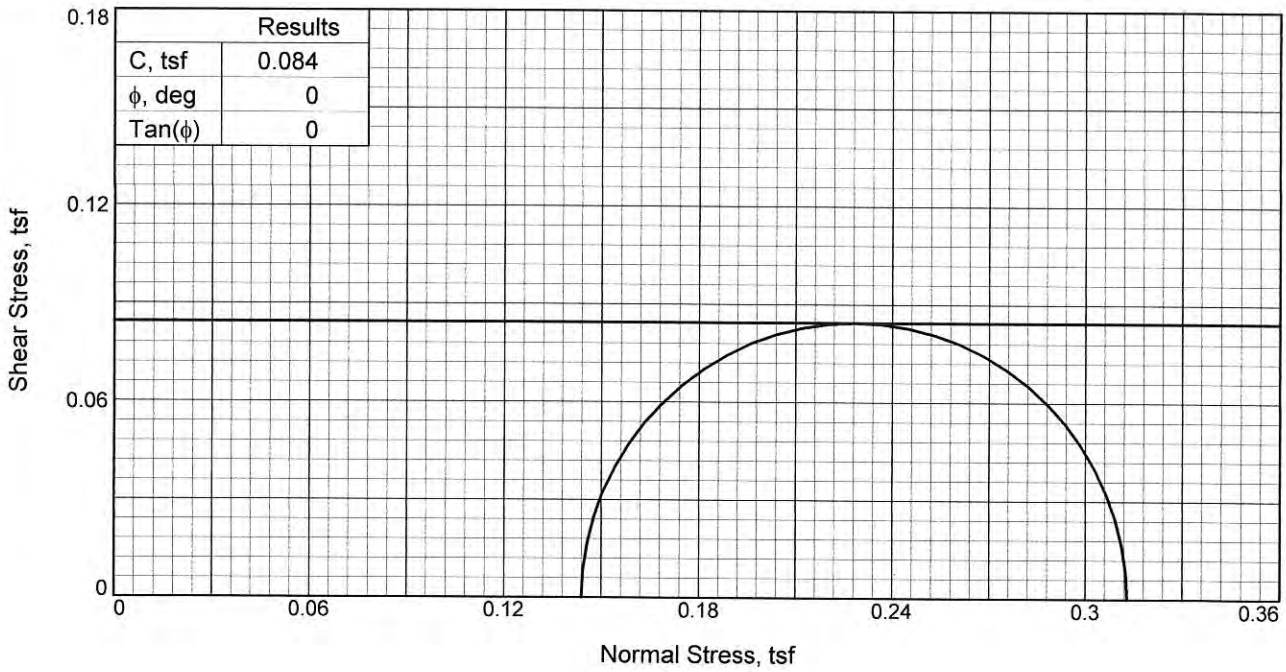
Client:

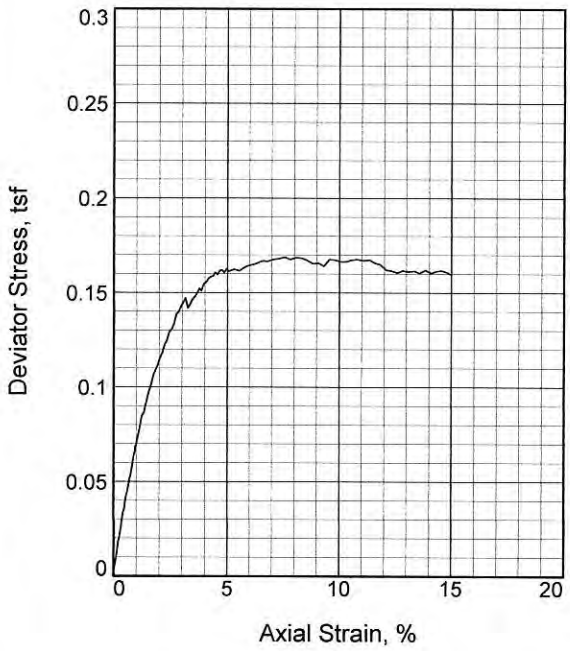
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB026 **Depth:** 12-14

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	139.7
	Dry Density, pcf	32.6
	Saturation, %	90.4
	Void Ratio	4.1710
	Diameter, in.	2.84
	Height, in.	5.84
At Test	Water Content, %	141.8
	Dry Density, pcf	32.6
	Saturation, %	91.8
	Void Ratio	4.1710
	Diameter, in.	2.84
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		2.00
Fail. Stress, tsf		0.17
Strain, %		7.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.31
σ_3 Failure, tsf		0.14

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Black FAT CLAY; Organics

LL= 151 **PL=** 44 **PI=** 107

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

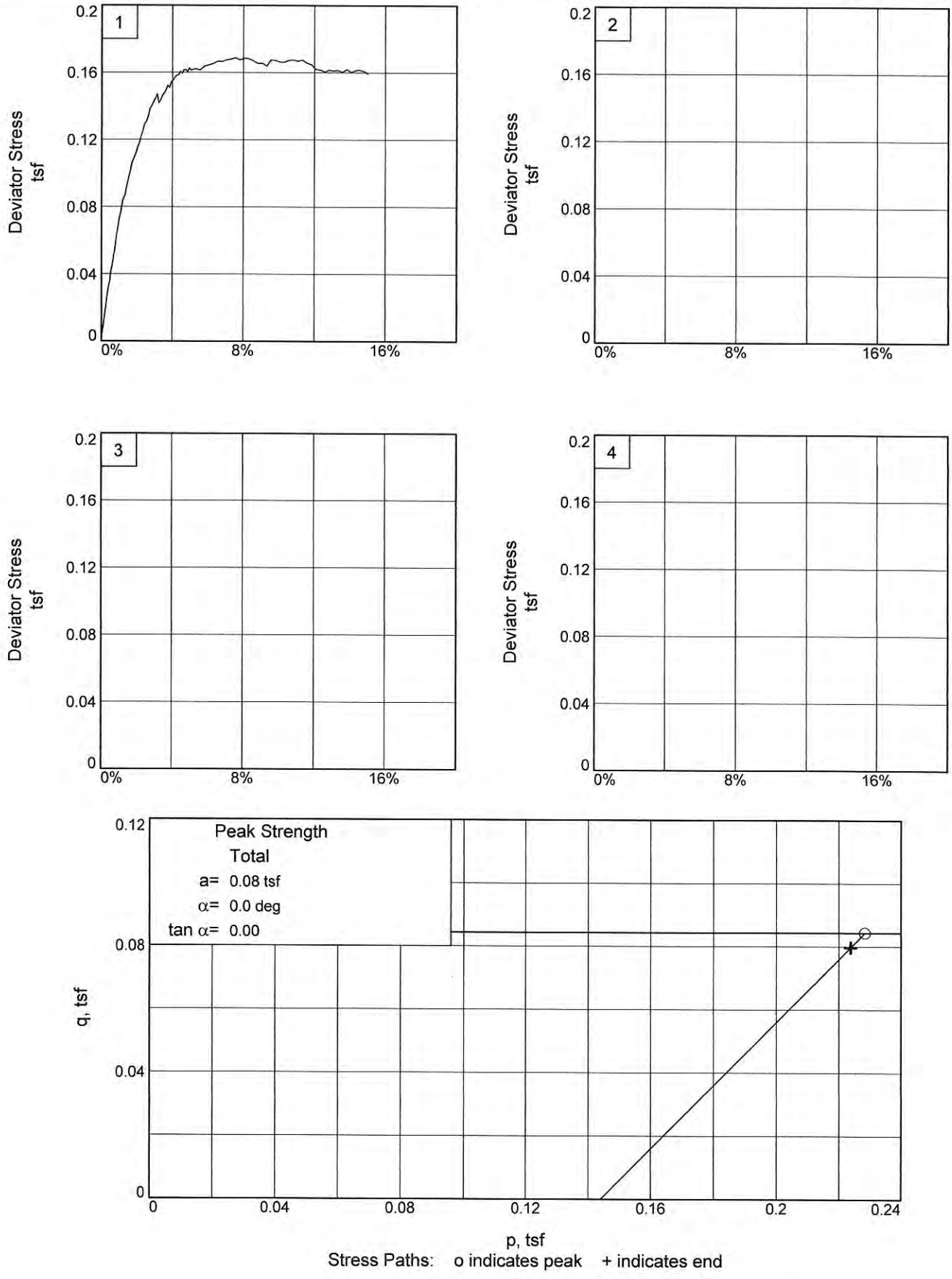
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 2

Proj. No.: 19.15.131 **Date Sampled:** 1/29/20

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



Client:

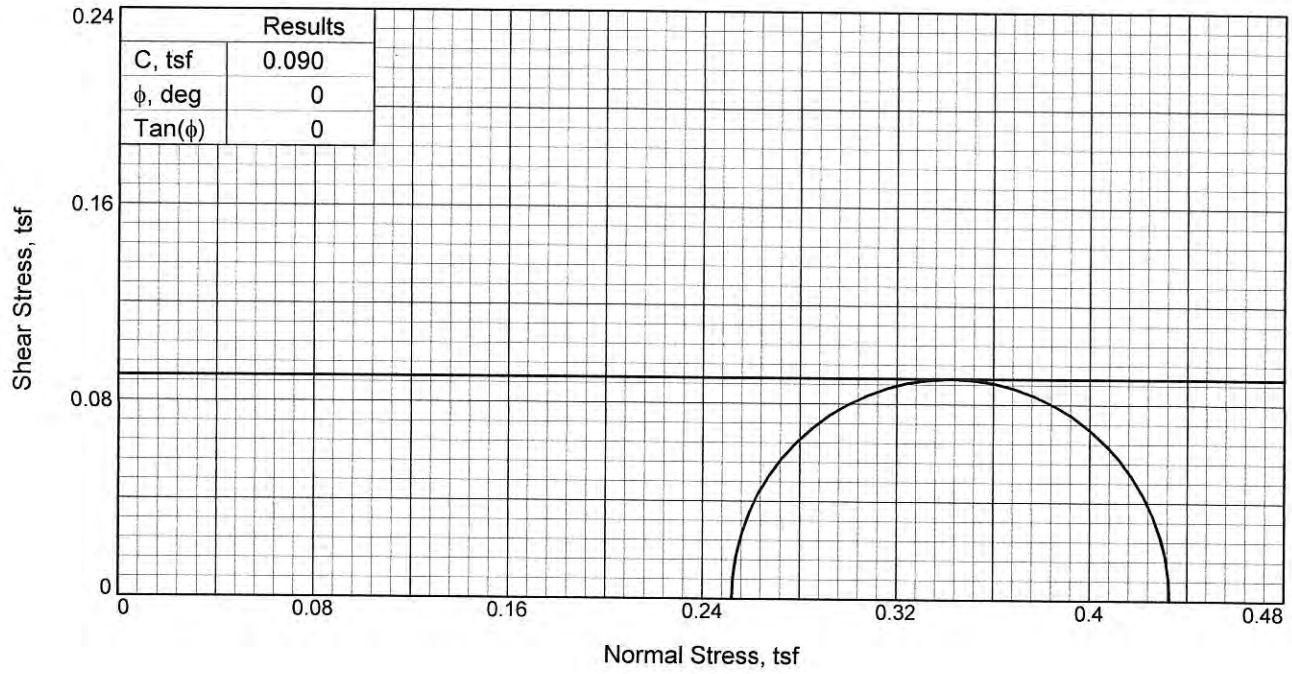
Project: San Jacinto River Waste Pit Superfund Site

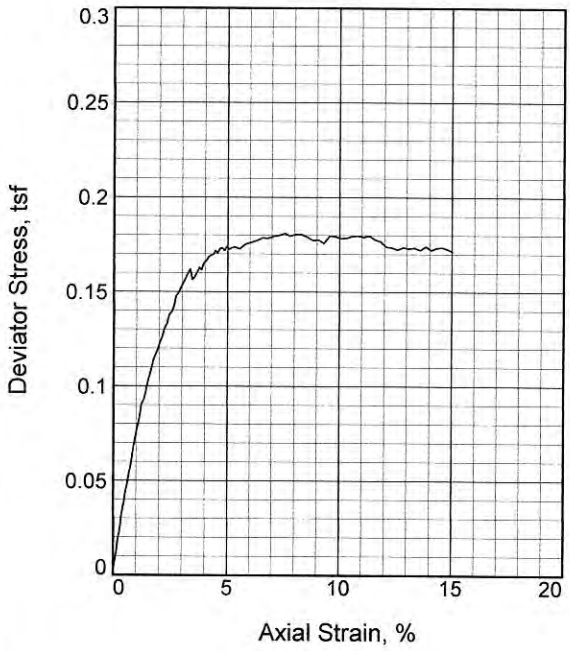
Source of Sample: SJGB027 **Depth:** 2

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.

Attachment Figure B.2-82





Sample No.		1
Initial	Water Content, %	22.4
	Dry Density, pcf	104.5
	Saturation, %	98.6
	Void Ratio	0.6123
	Diameter, in.	2.75
	Height, in.	5.84
At Test	Water Content, %	25.2
	Dry Density, pcf	104.5
	Saturation, %	111.0
	Void Ratio	0.6123
	Diameter, in.	2.75
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.50
Fail. Stress, tsf		0.18
Strain, %		7.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.43
σ_3 Failure, tsf		0.25

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray CLAYEY SAND

LL= 41 **PL=** 21 **PI=** 20
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

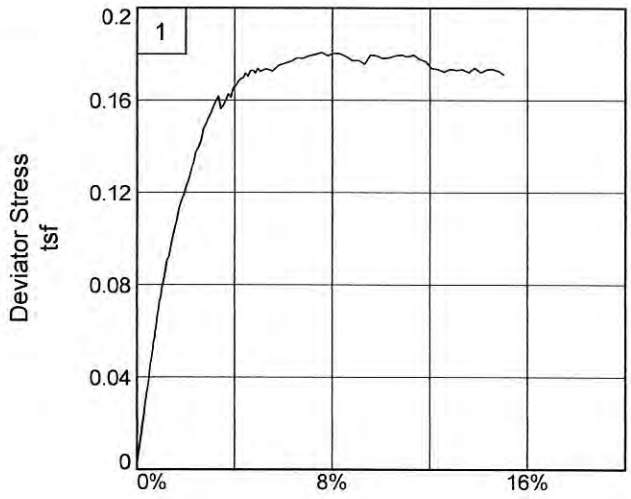
Client:

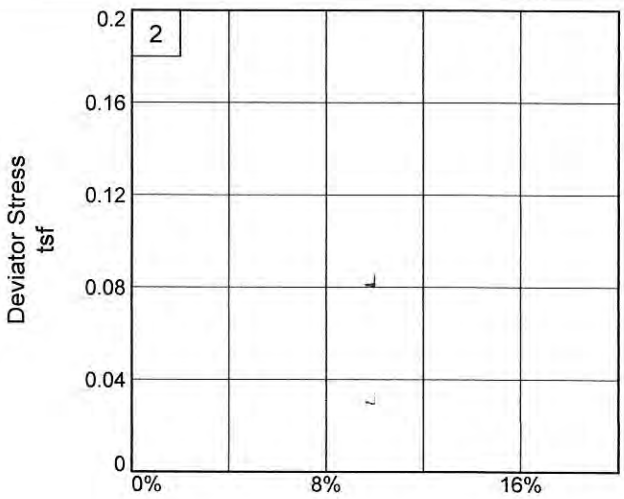
Project: San Jacinto River Waste Pit Superfund Site

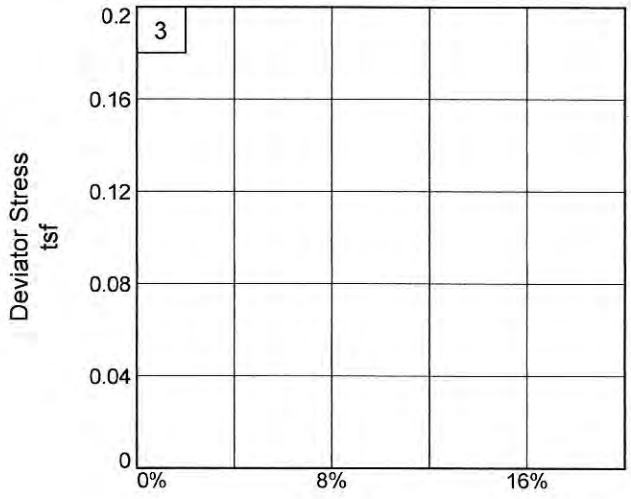
Source of Sample: SJGB027 **Depth:** 4

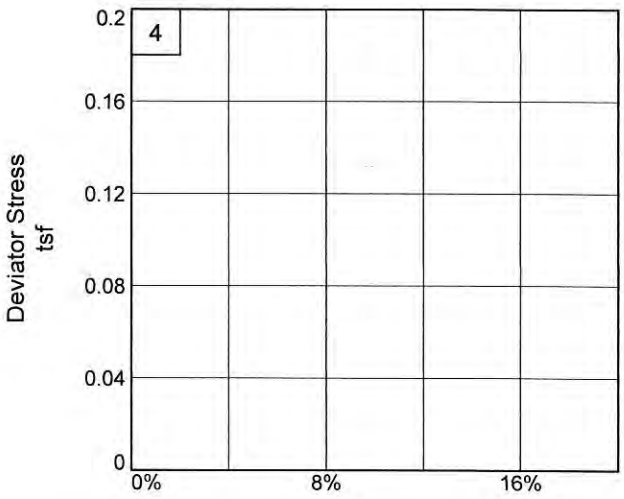
Proj. No.: 19.15.131 **Date Sampled:** 1/21/20

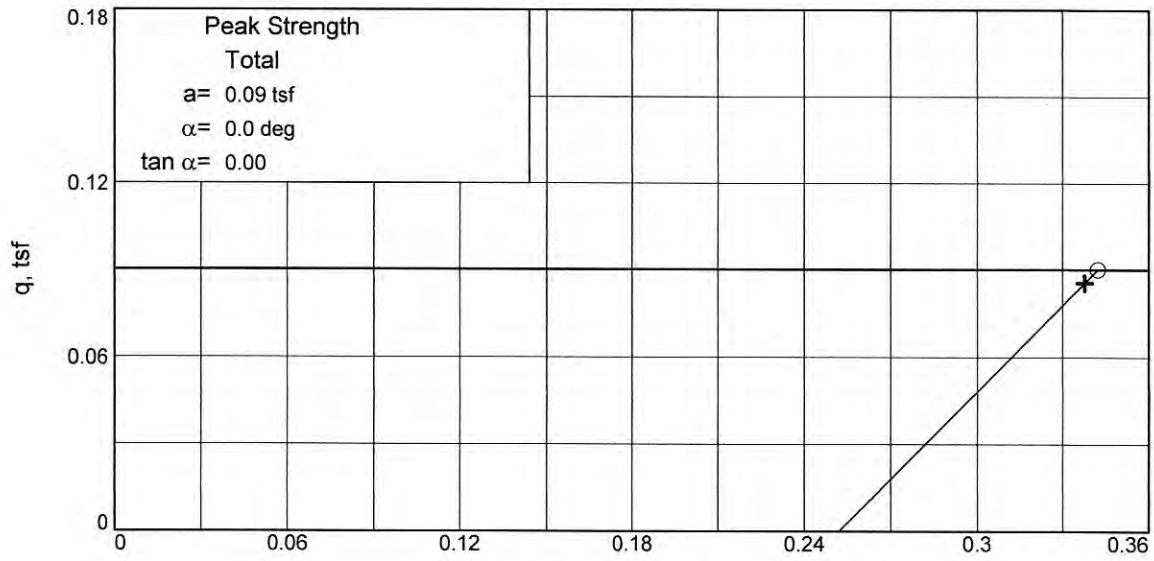
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

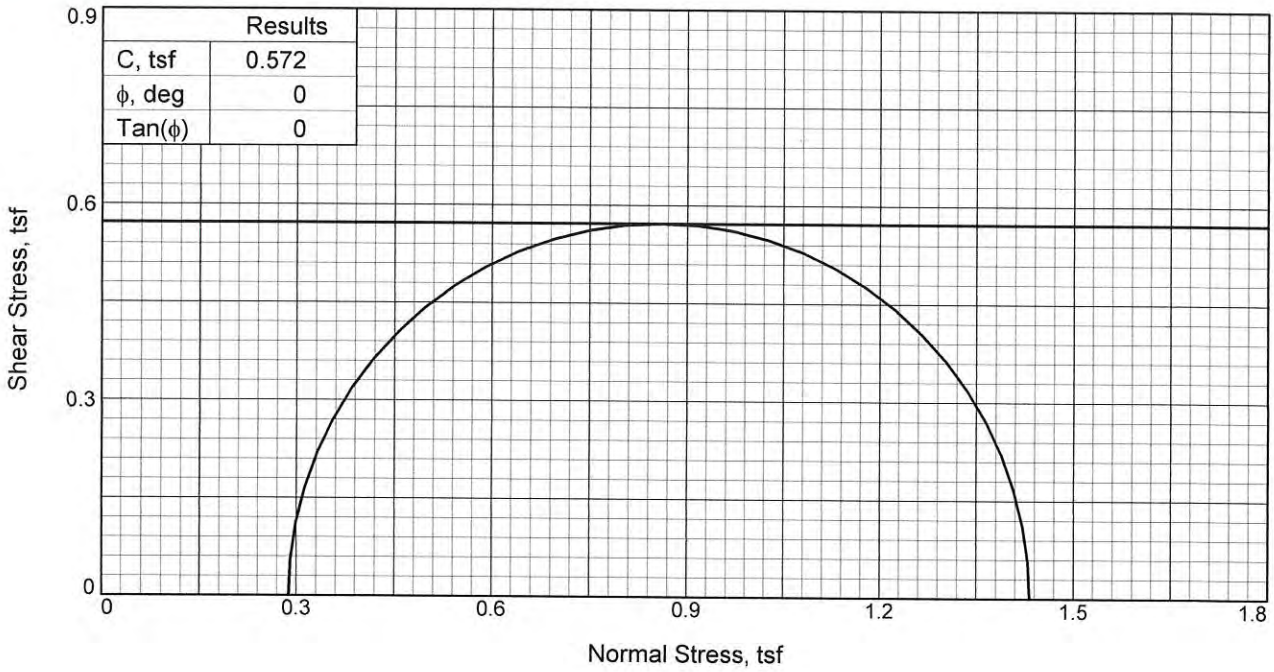
Client:

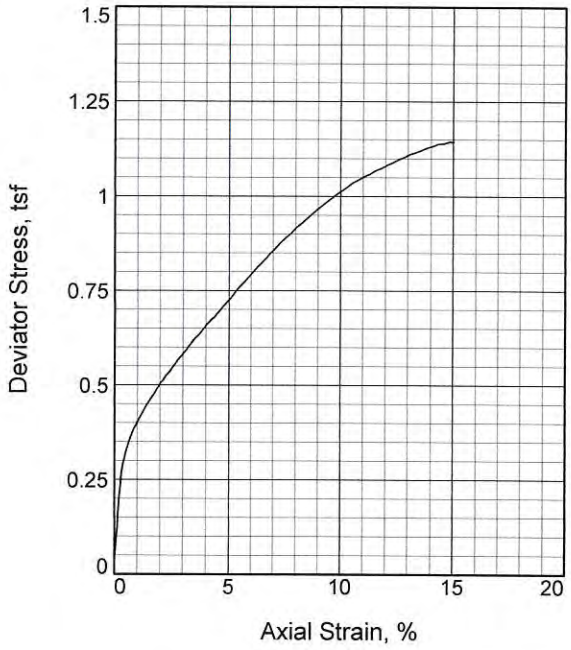
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 4

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.3
	Dry Density, pcf	107.6
	Saturation, %	96.8
	Void Ratio	0.5662
	Diameter, in.	2.76
	Height, in.	5.85
At Test	Water Content, %	18.4
	Dry Density, pcf	107.6
	Saturation, %	87.8
	Void Ratio	0.5662
	Diameter, in.	2.76
	Height, in.	5.85
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		4.00
Fail. Stress, tsf		1.14
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.43
σ_3 Failure, tsf		0.29

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray SANDY LEAN CLAY

LL= 37 **PL=** 17 **PI=** 20
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

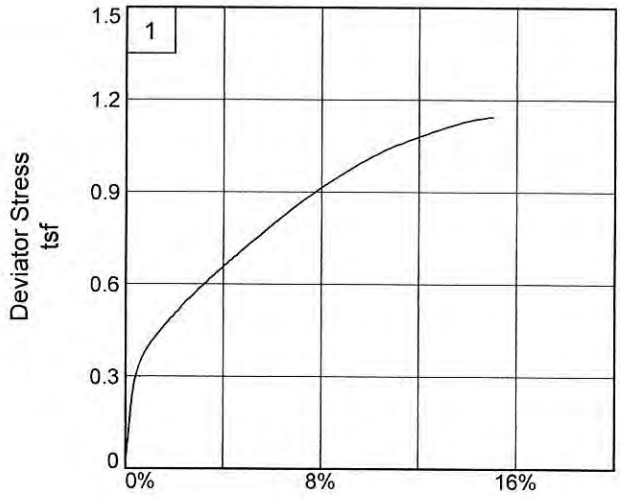
Client:

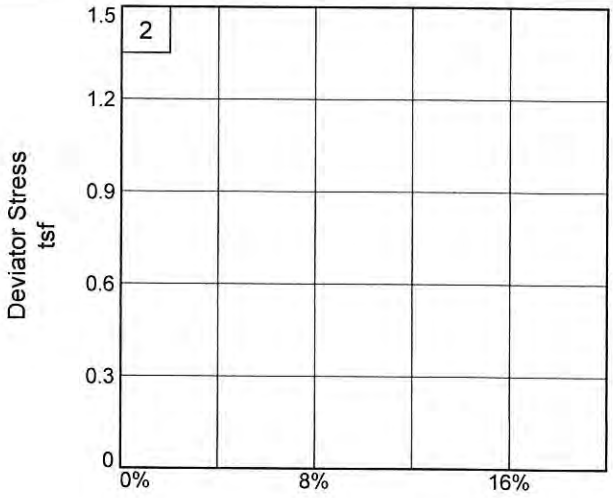
Project: San Jacinto River Waste Pit Superfund Site

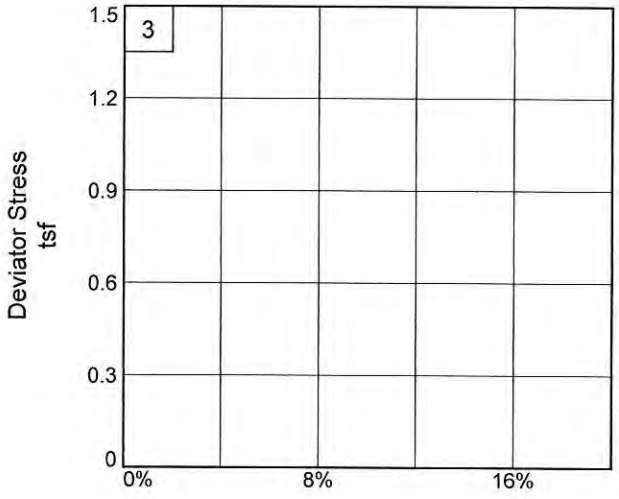
Source of Sample: SJGB027 **Depth:** 6

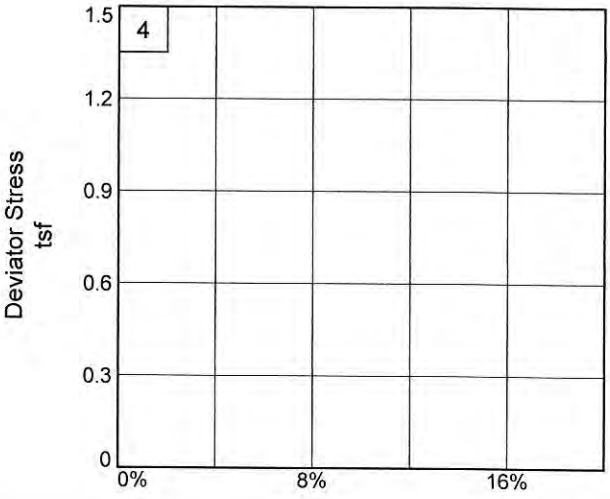
Proj. No.: 19.15.131 **Date Sampled:** 1/21/20

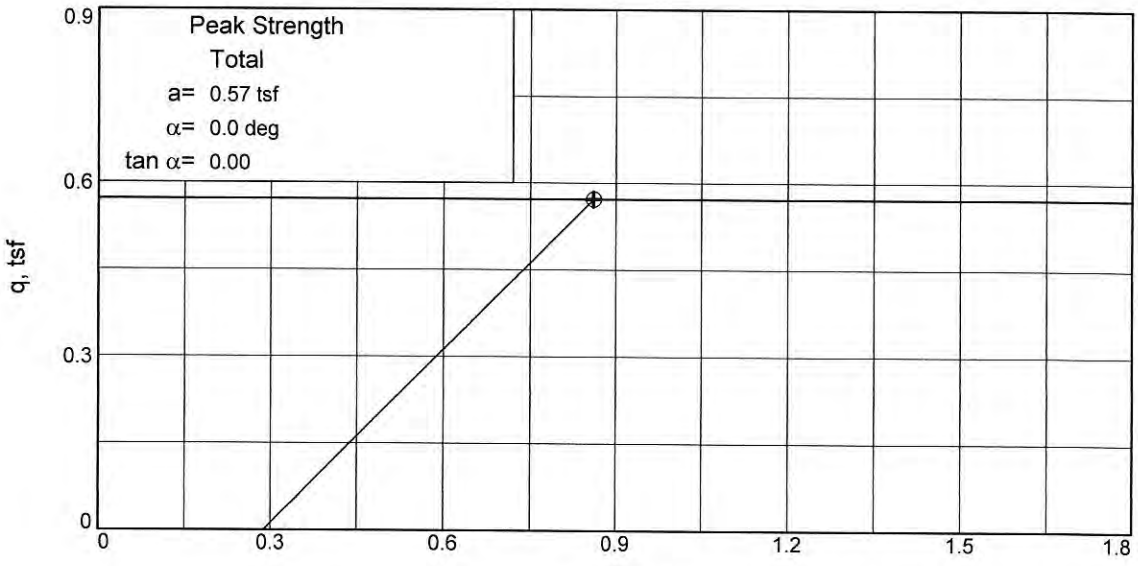
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

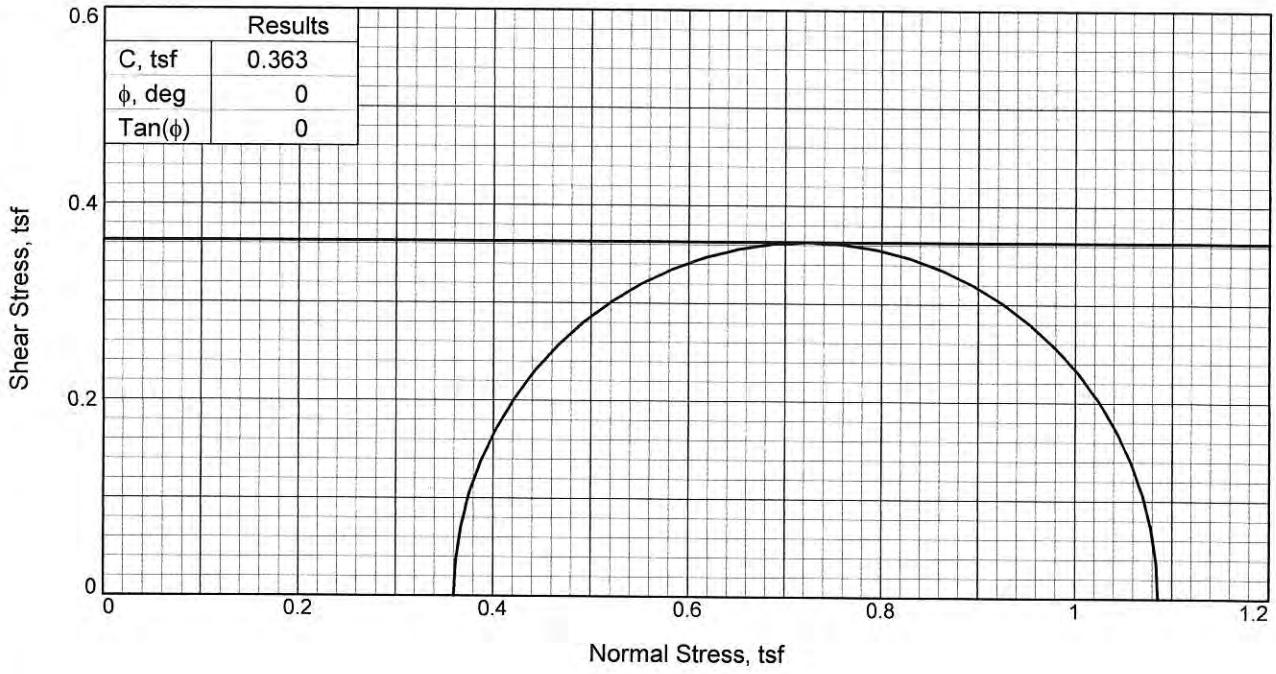
Client:

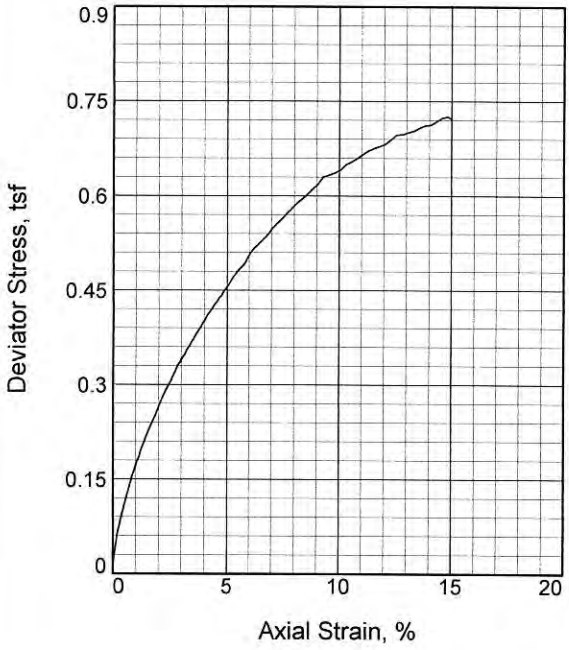
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	17.9
	Dry Density, pcf	111.3
	Saturation, %	93.9
	Void Ratio	0.5138
	Diameter, in.	2.79
	Height, in.	5.83
At Test	Water Content, %	16.7
	Dry Density, pcf	111.3
	Saturation, %	87.9
	Void Ratio	0.5138
	Diameter, in.	2.79
	Height, in.	5.83
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		5.00
Fail. Stress, tsf		0.73
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.09
σ_3 Failure, tsf		0.36

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY

LL= 39 **PL=** 18 **PI=** 21

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

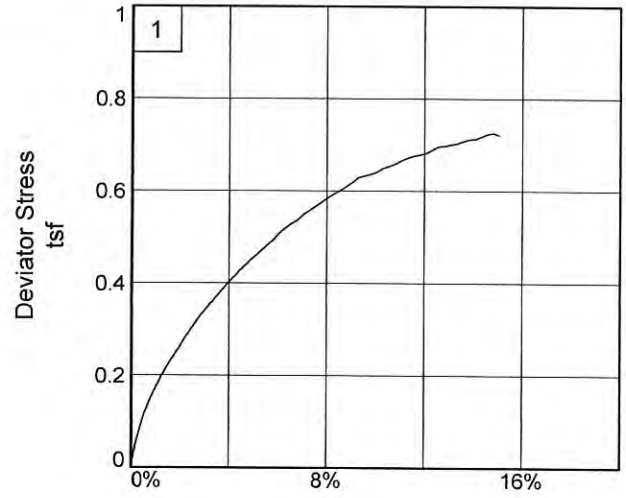
Client:

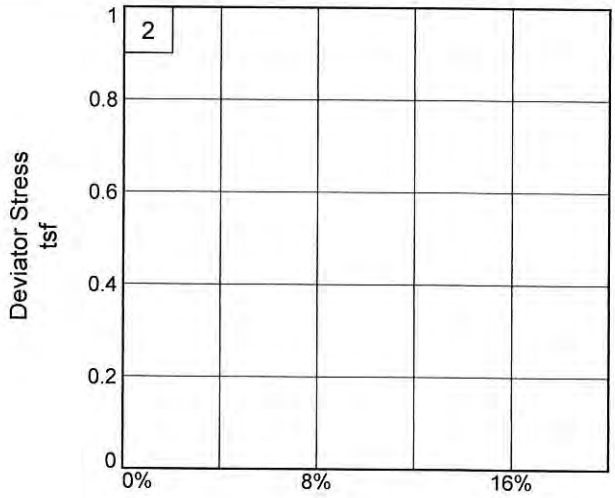
Project: San Jacinto River Waste Pit Superfund Site

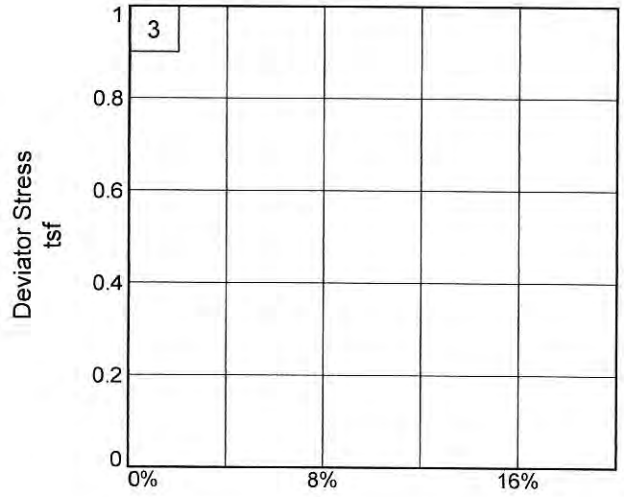
Source of Sample: SJGB027 **Depth:** 8

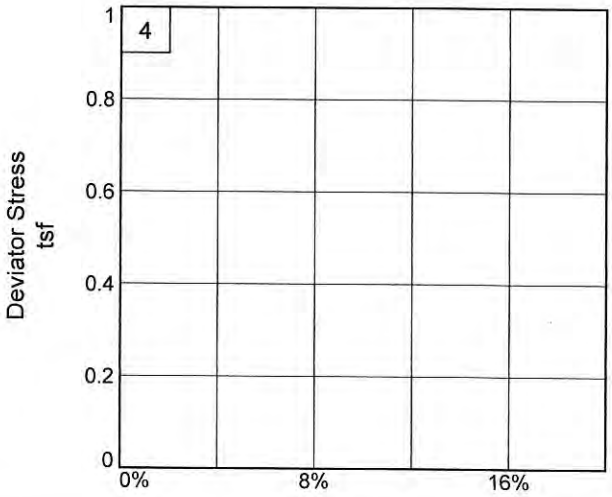
Proj. No.: 19.15.131 **Date Sampled:** 1/21/20

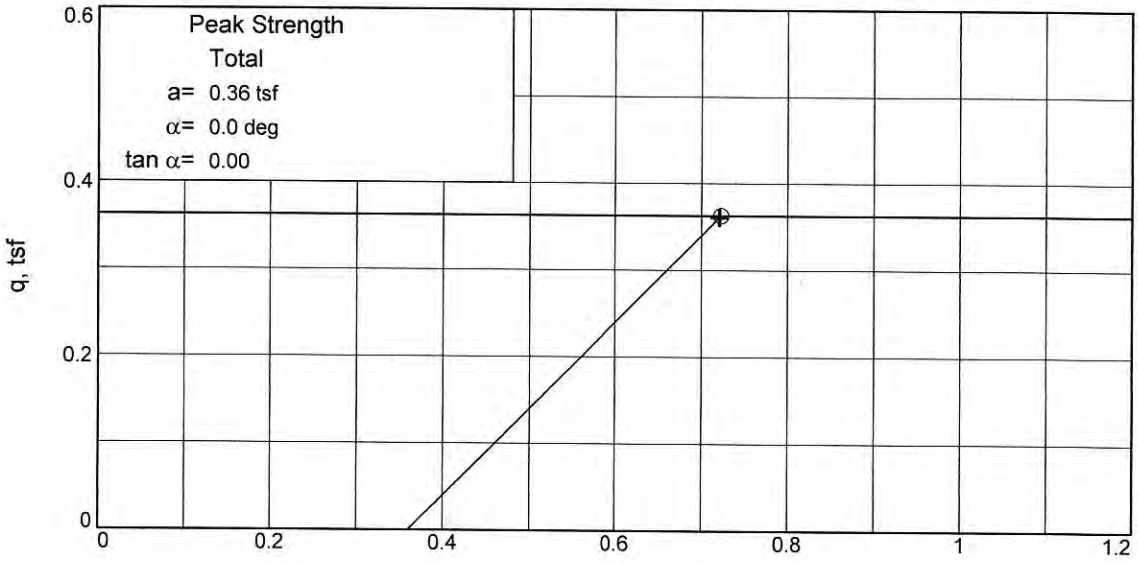
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

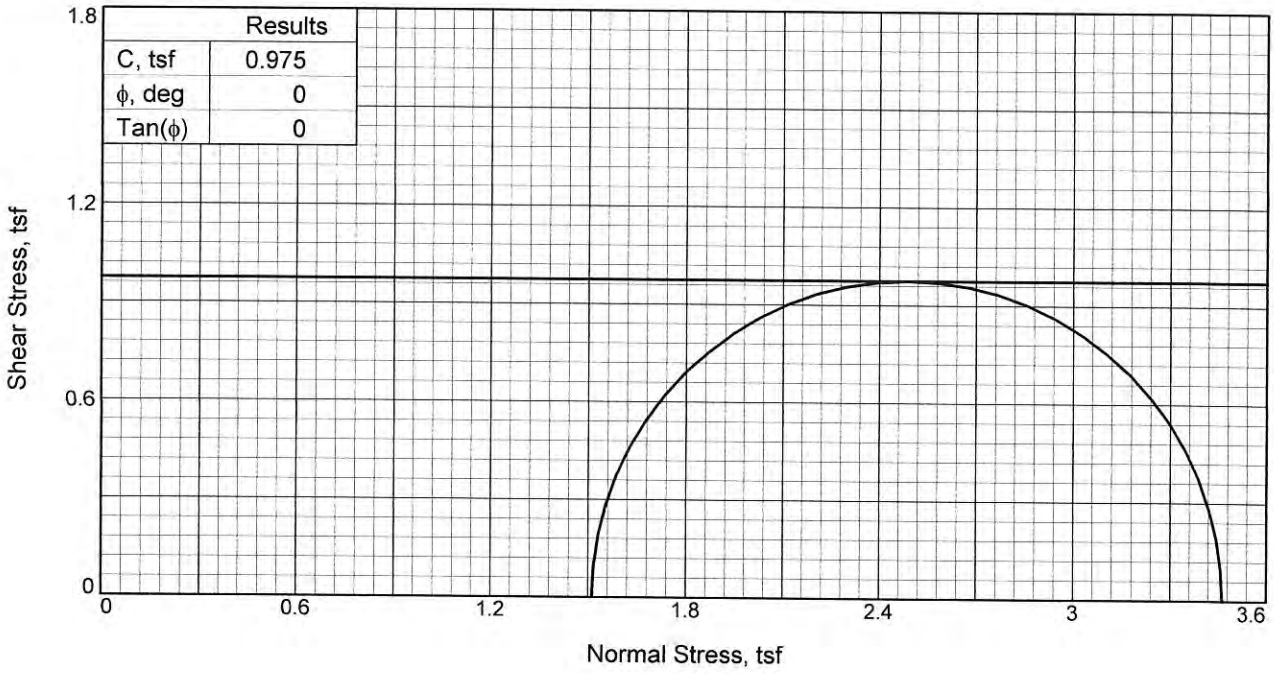
Client:

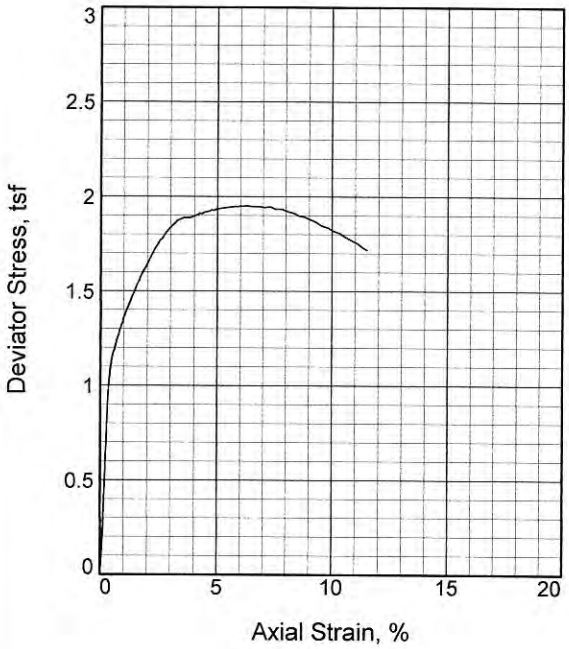
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 8

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	31.2
	Dry Density, pcf	92.1
	Saturation, %	99.4
	Void Ratio	0.8638
	Diameter, in.	2.84
	Height, in.	5.88
At Test	Water Content, %	29.1
	Dry Density, pcf	92.1
	Saturation, %	92.7
	Void Ratio	0.8638
	Diameter, in.	2.84
	Height, in.	5.88
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		21.00
Fail. Stress, tsf		1.95
Strain, %		6.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.46
σ_3 Failure, tsf		1.51

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan FAT CLAY

LL= 59 **PL=** 21 **PI=** 38

Assumed Specific Gravity= 2.75

Remarks:
Test method: ASTM D2850
Failure type: Slickensided

Figure _____

Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 48

Proj. No.: 19.15.131 **Date Sampled:** 1/16/2020

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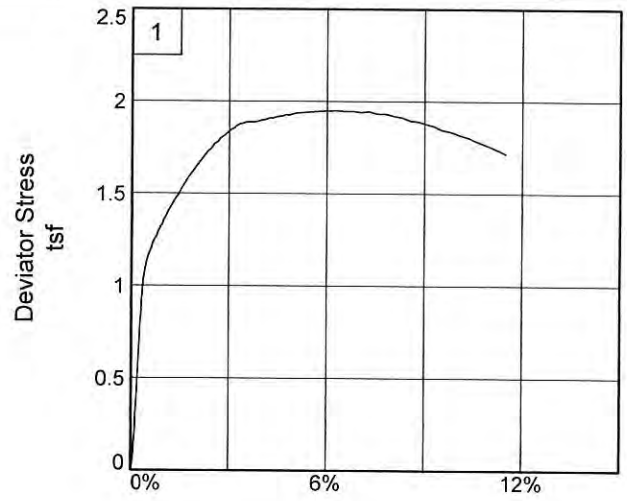
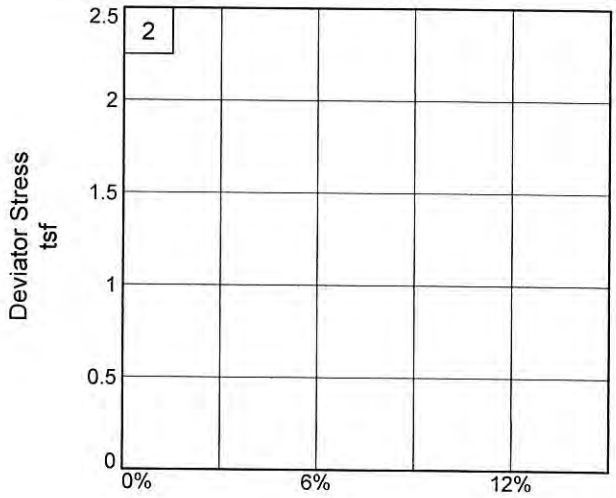
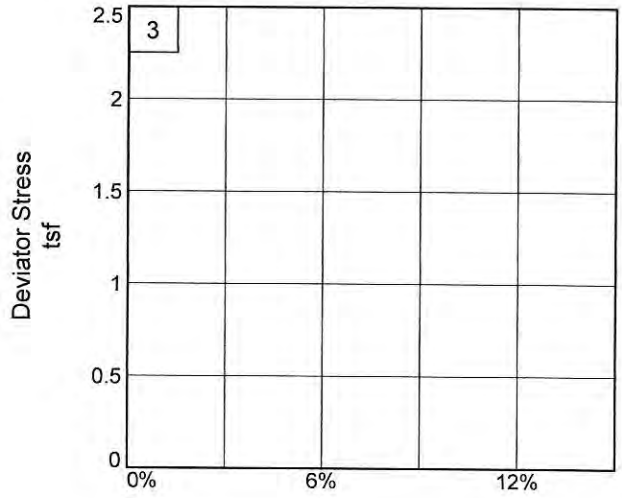
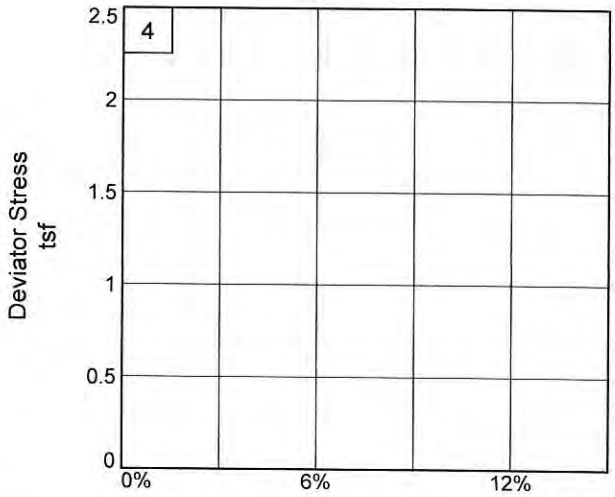
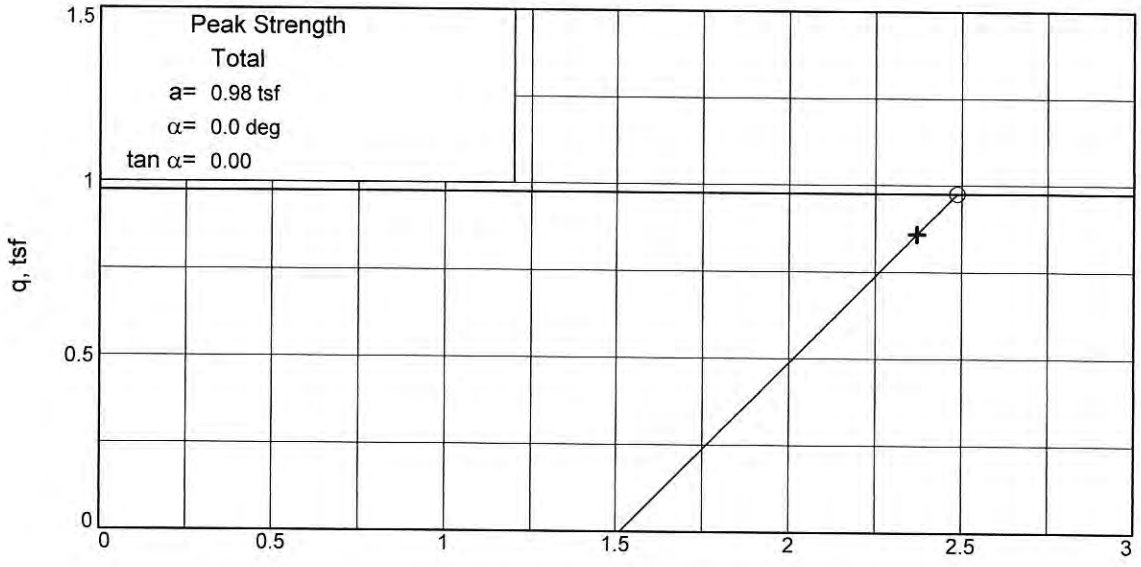
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

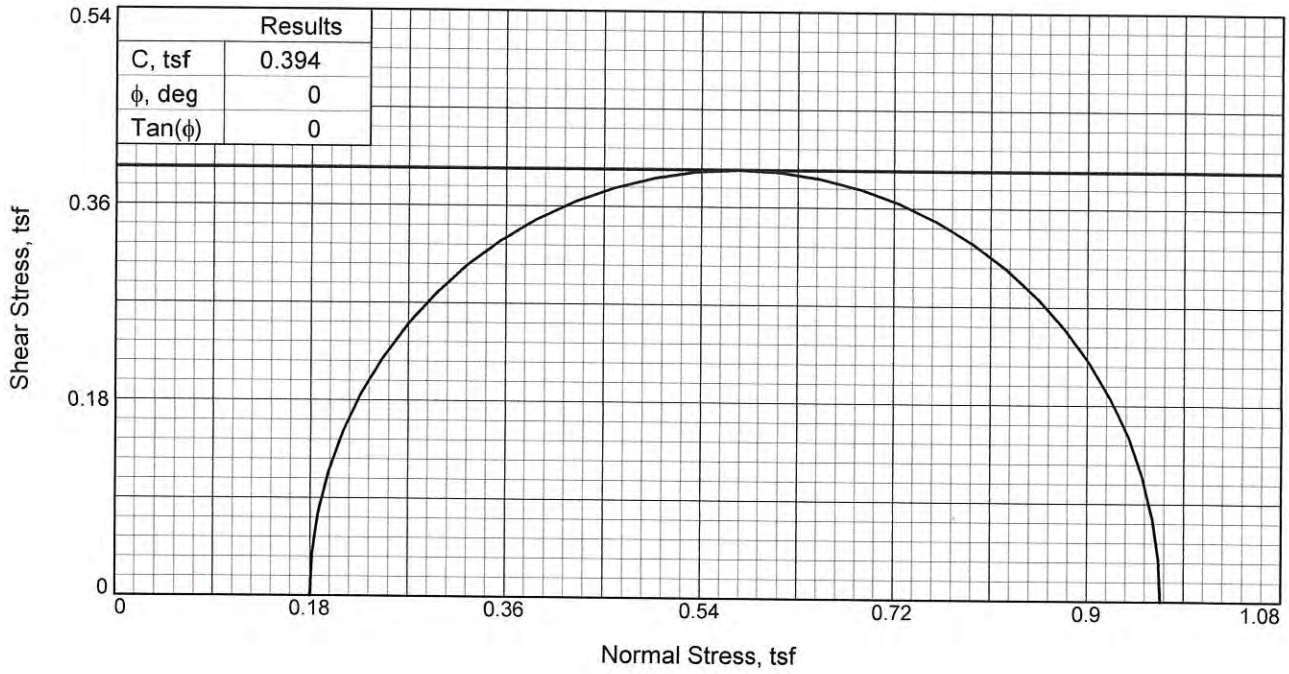
Client:

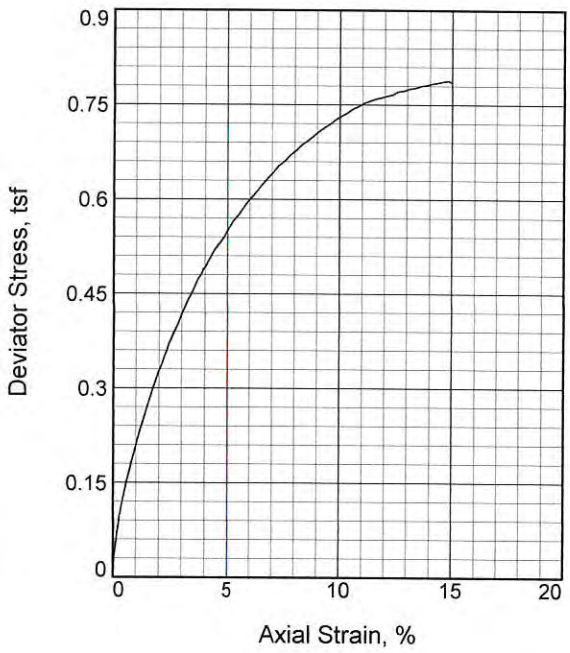
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 48

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	13.3
	Dry Density, pcf	115.5
	Saturation, %	78.3
	Void Ratio	0.4588
	Diameter, in.	2.81
	Height, in.	5.89
At Test	Water Content, %	13.2
	Dry Density, pcf	115.5
	Saturation, %	77.8
	Void Ratio	0.4588
	Diameter, in.	2.81
	Height, in.	5.89
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		2.50
Fail. Stress, tsf		0.79
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.97
σ_3 Failure, tsf		0.18

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Black LEAN CLAY with SAND; sand seams and organics

LL= 32 **PL=** 15 **PI=** 17

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

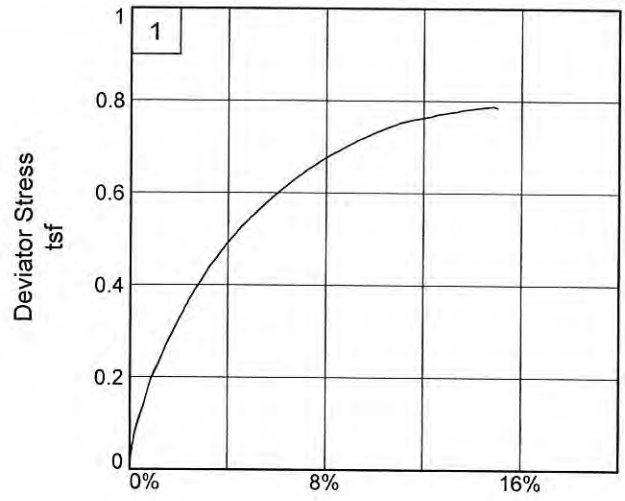
Client:

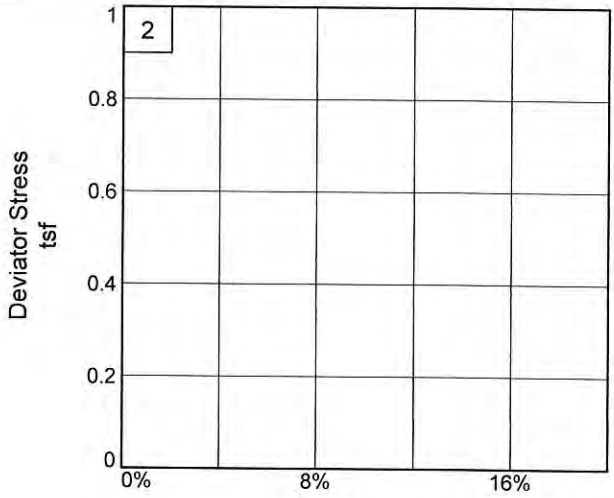
Project: San Jacinto River Waste Pit Superfund Site

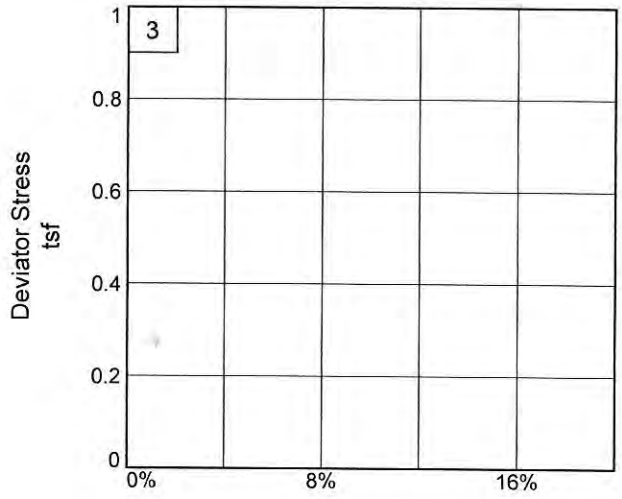
Source of Sample: SJGB028 **Depth:** 4

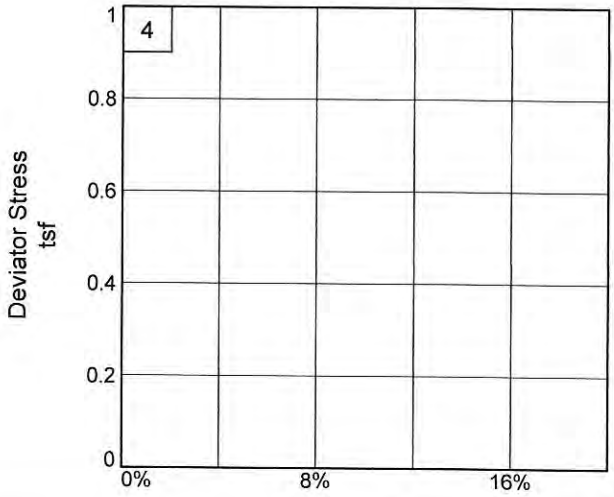
Proj. No.: 19.15.131 **Date Sampled:** 1/21/20

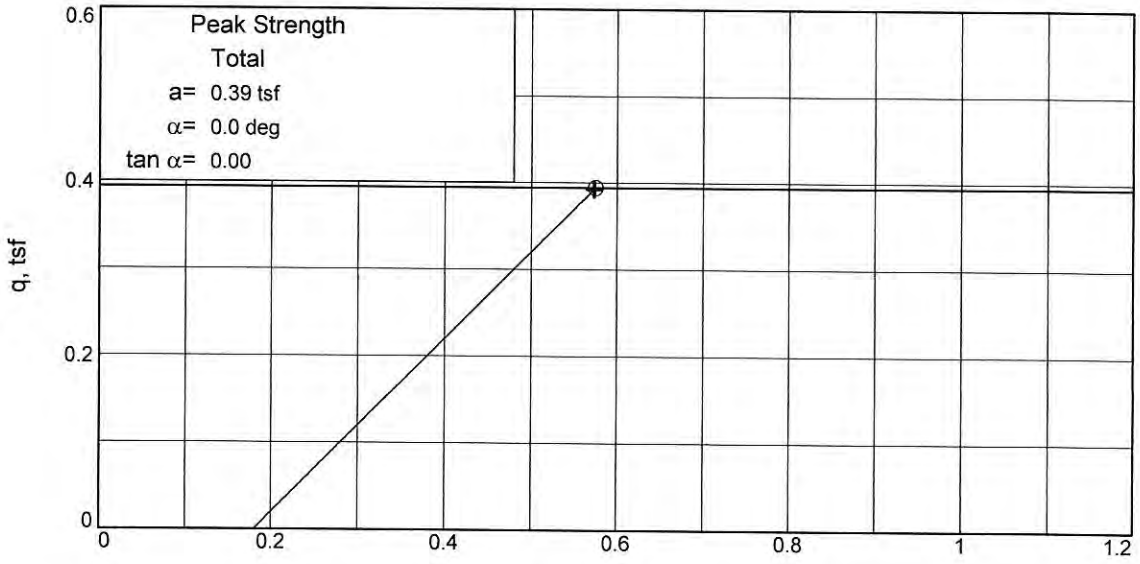
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

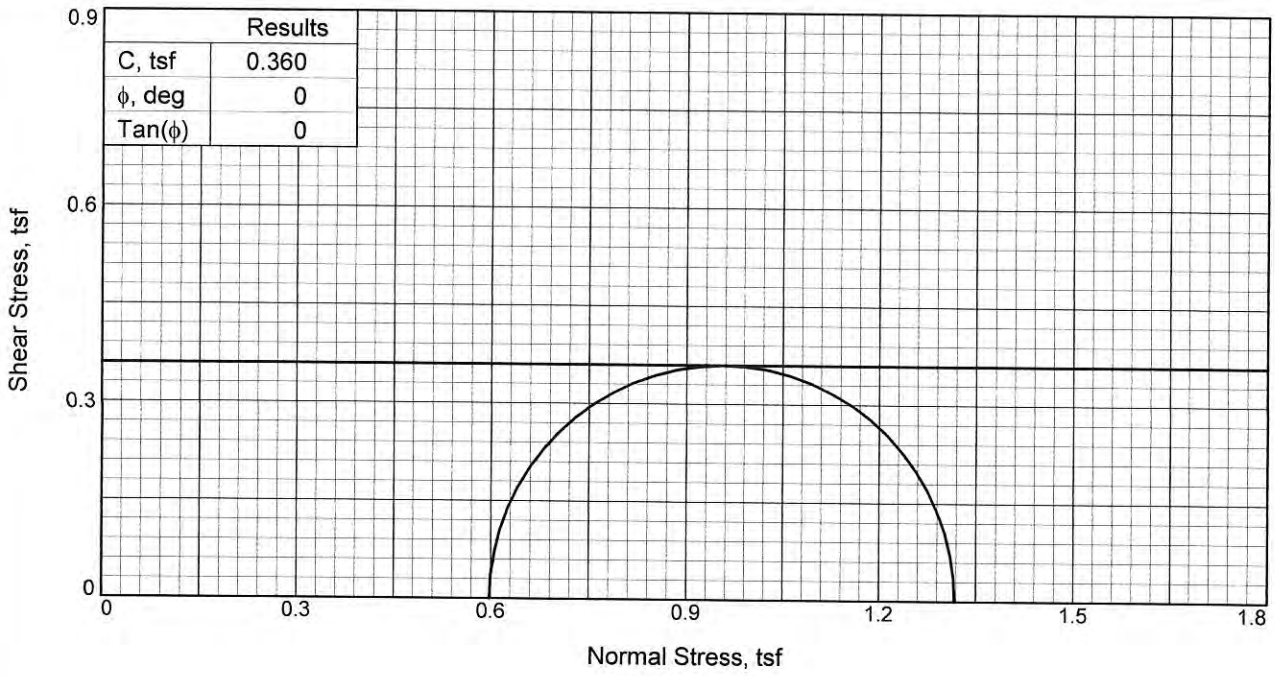
Client:

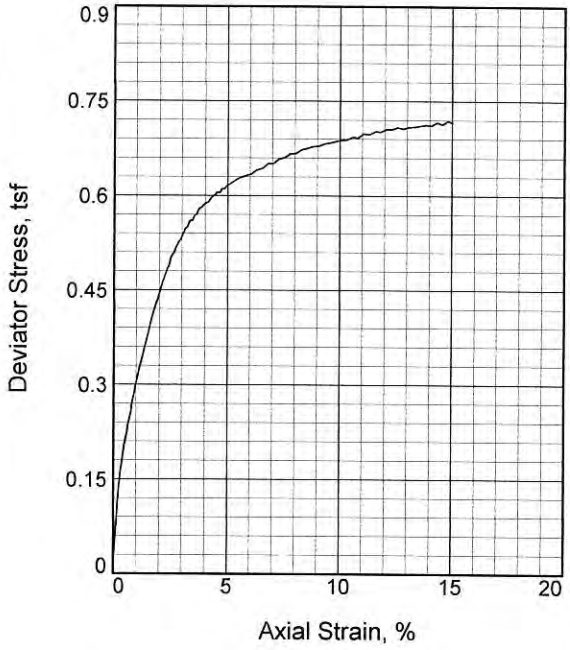
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 4

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	27.8
	Dry Density, pcf	94.3
	Saturation, %	95.4
	Void Ratio	0.7883
	Diameter, in.	2.84
	Height, in.	5.84
At Test	Water Content, %	26.0
	Dry Density, pcf	94.3
	Saturation, %	89.0
	Void Ratio	0.7883
	Diameter, in.	2.84
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		8.30
Fail. Stress, tsf		0.72
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.32
σ_3 Failure, tsf		0.60

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY with SAND

LL= 41 **PL=** 18 **PI=** 23

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D2850
Failure type: Bulge

Figure _____

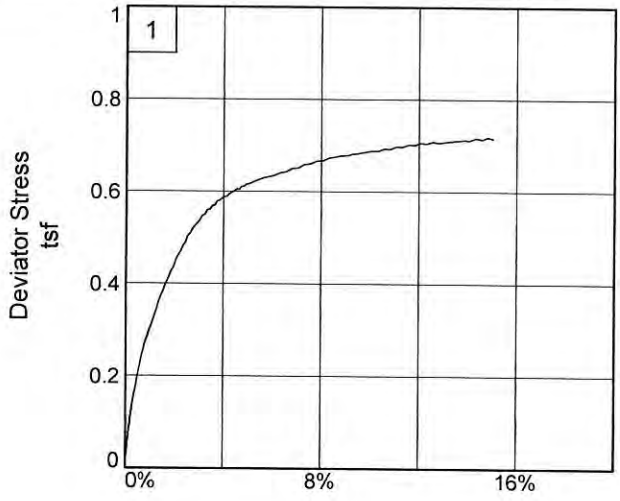
Client:

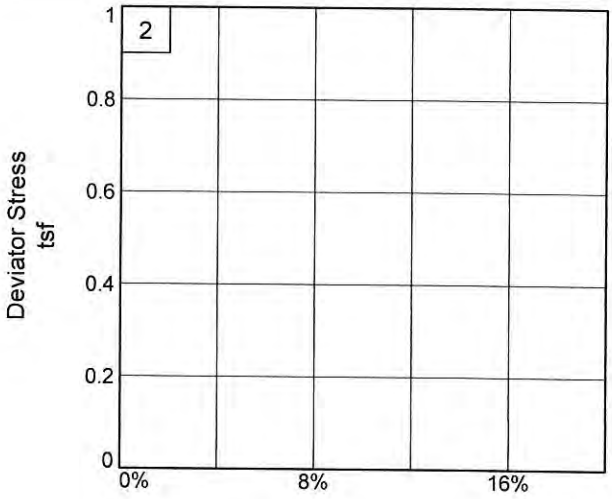
Project: San Jacinto River Waste Pit Superfund Site

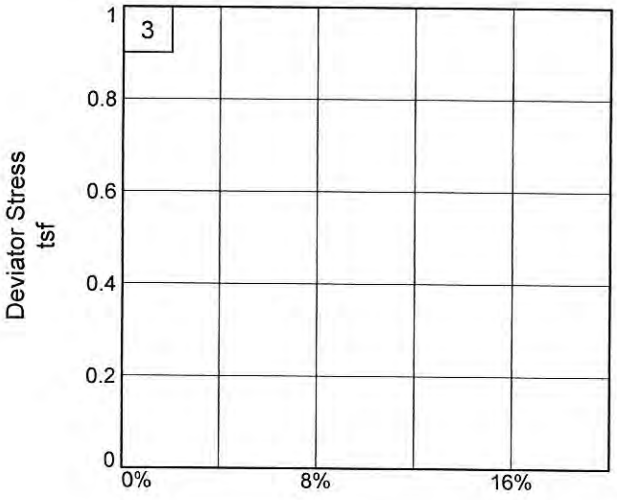
Source of Sample: SJGB028 **Depth:** 18

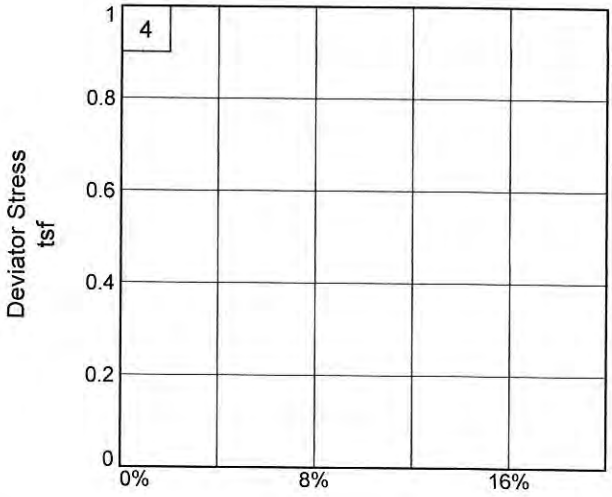
Proj. No.: 19.15.131 **Date Sampled:** 1/15/2020

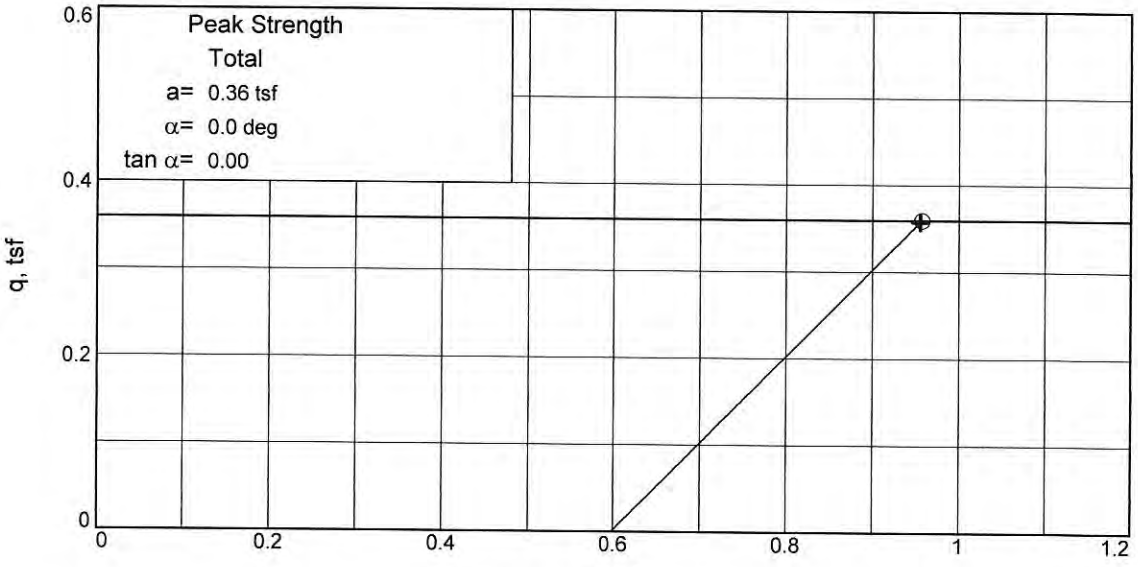
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

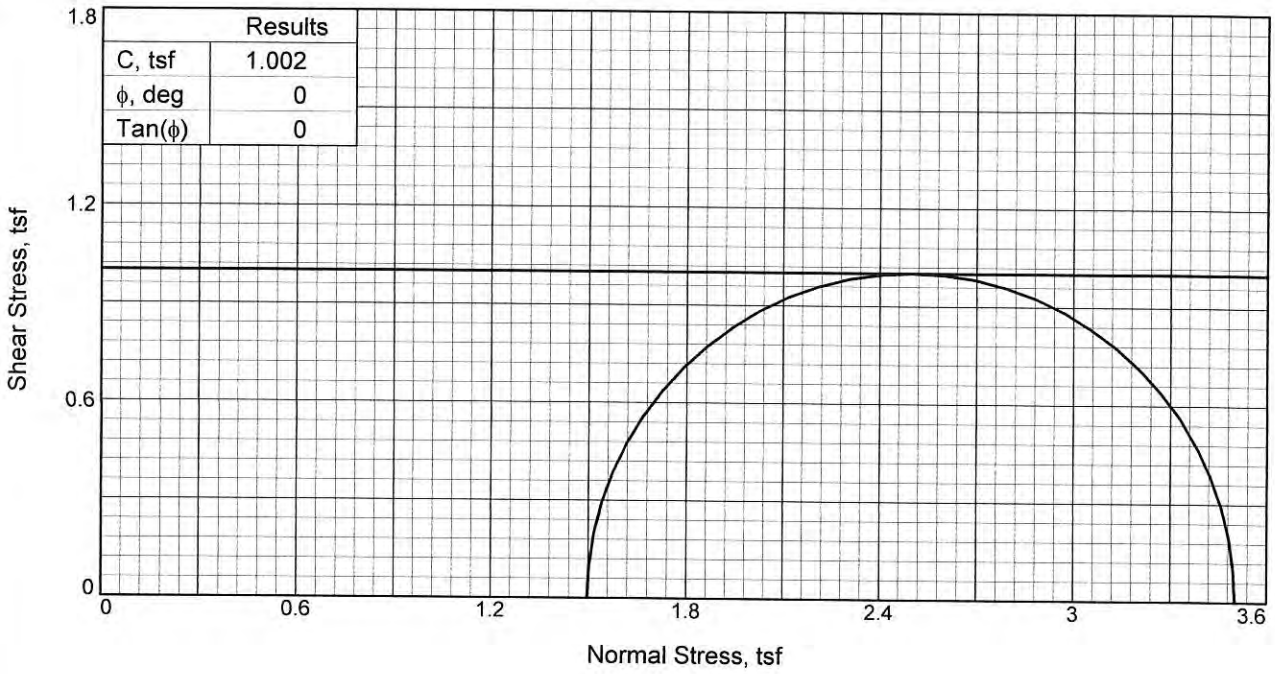
Client:

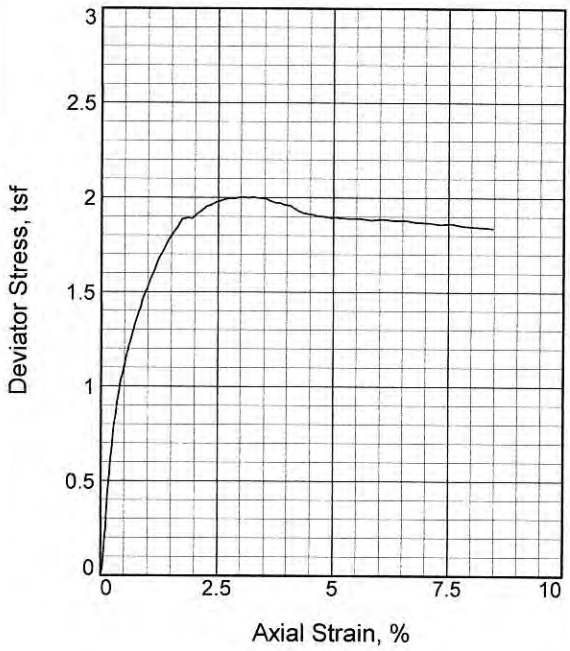
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 18

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	26.1
	Dry Density, pcf	97.8
	Saturation, %	97.4
	Void Ratio	0.7243
	Diameter, in.	2.86
	Height, in.	5.99
At Test	Water Content, %	25.5
	Dry Density, pcf	97.8
	Saturation, %	95.1
	Void Ratio	0.7243
	Diameter, in.	2.86
	Height, in.	5.99
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		20.80
Fail. Stress, tsf		2.00
Strain, %		3.2
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.50
σ_3 Failure, tsf		1.50

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish-brown FAT CLAY

LL= 70 **PL=** 23 **PI=** 47

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D2850
Failure type: Slickensided

Figure _____

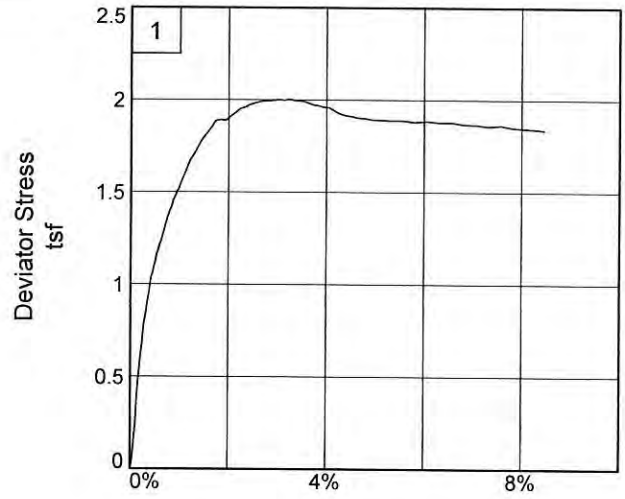
Client:

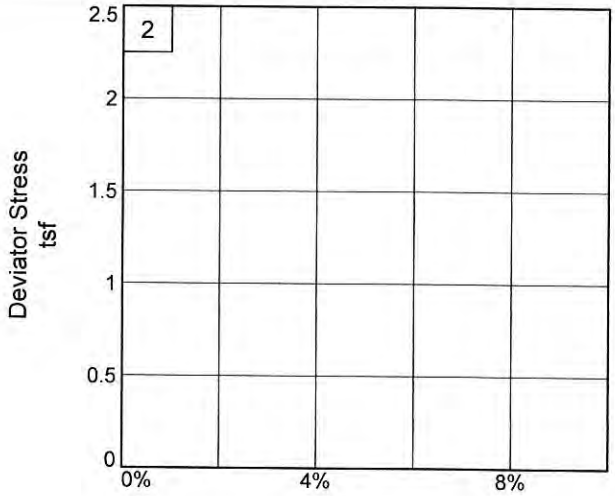
Project: San Jacinto River Waste Pit Superfund Site

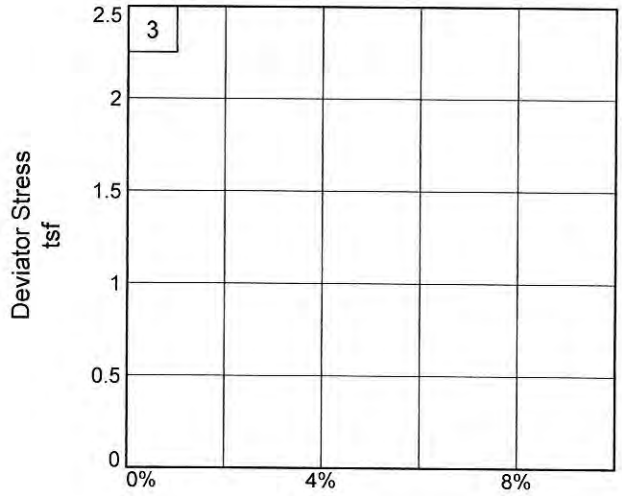
Source of Sample: SJGB028 **Depth:** 48

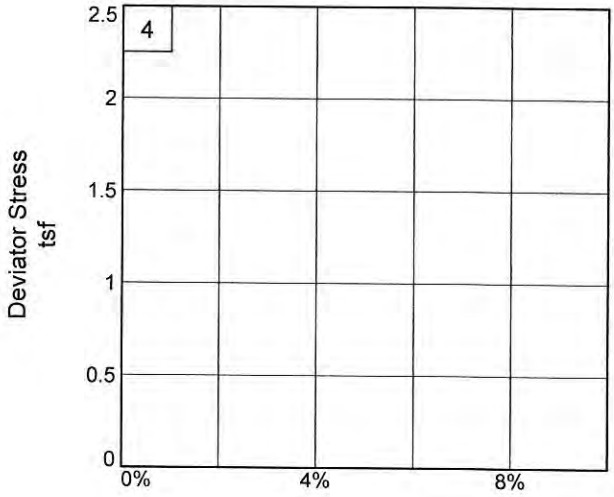
Proj. No.: 19.15.131 **Date Sampled:** 1/16/2020

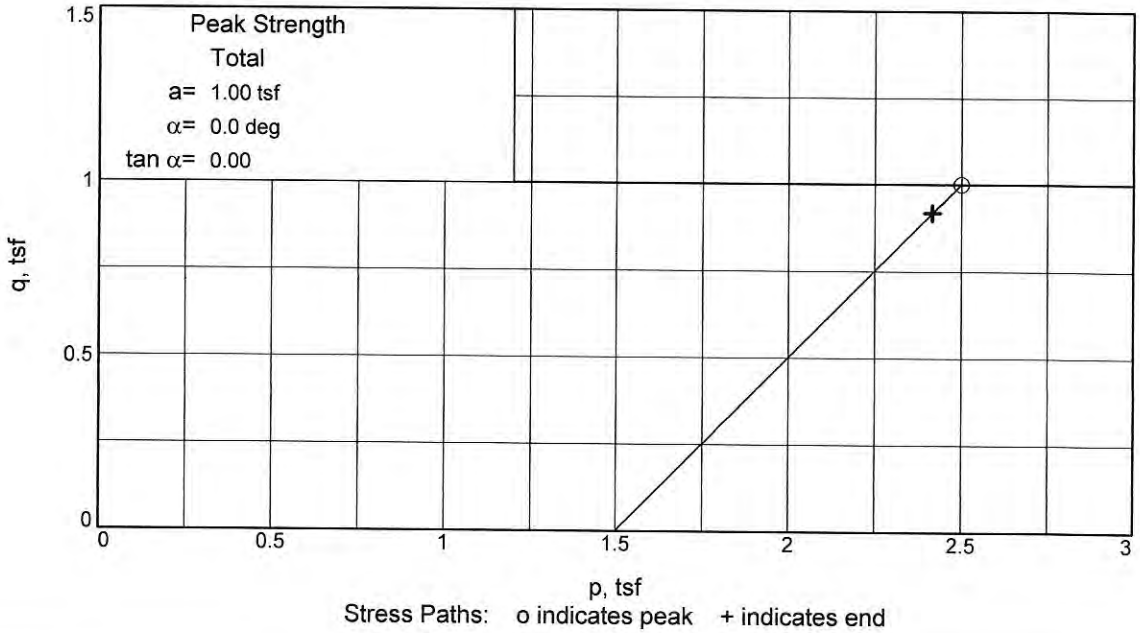
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

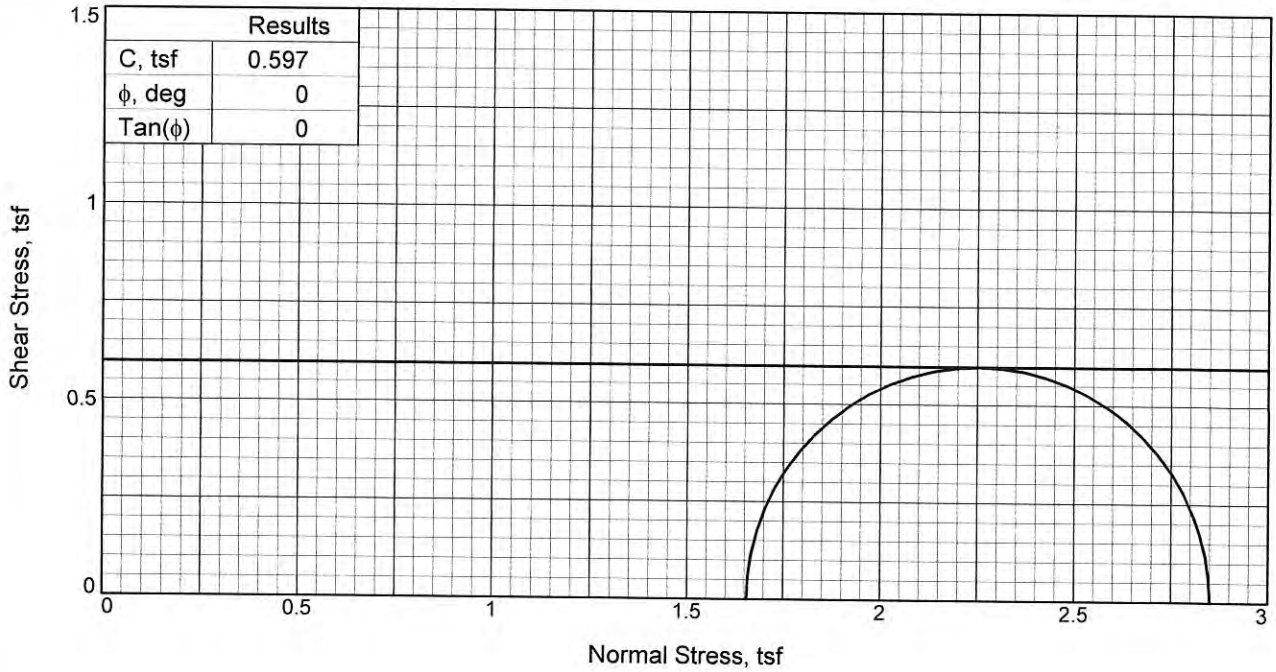
Client:

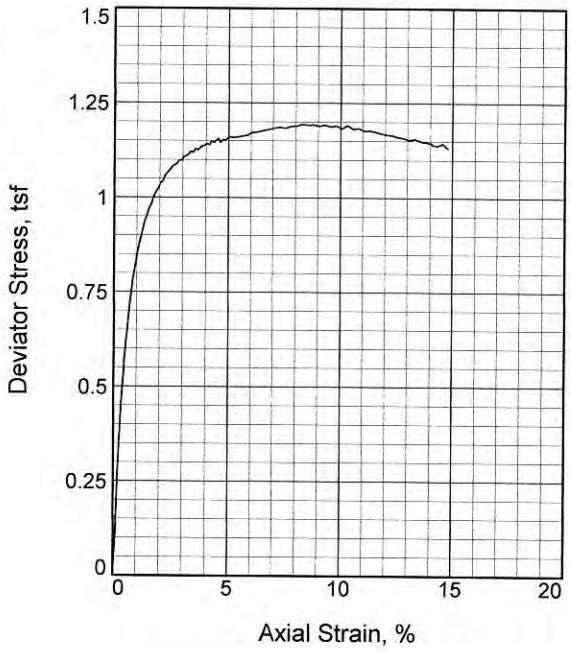
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 48

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	31.5
	Dry Density, pcf	91.0
	Saturation, %	99.7
	Void Ratio	0.8524
	Diameter, in.	2.84
	Height, in.	5.91
At Test	Water Content, %	30.5
	Dry Density, pcf	91.0
	Saturation, %	96.5
	Void Ratio	0.8524
	Diameter, in.	2.84
	Height, in.	5.91
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		23.00
Fail. Stress, tsf		1.19
Strain, %		8.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.85
σ_3 Failure, tsf		1.66

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Reddish-brown FAT CLAY

LL= 75 **PL=** 23 **PI=** 52
Assumed Specific Gravity= 2.70
Remarks:
Test method: ASTM D2850
Failure type: Slickensided

Figure _____

Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 53

Proj. No.: 19.15.131 **Date Sampled:** 1/16/2020

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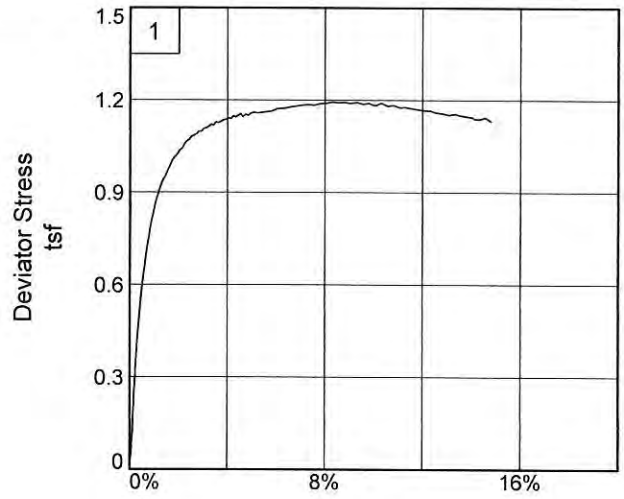
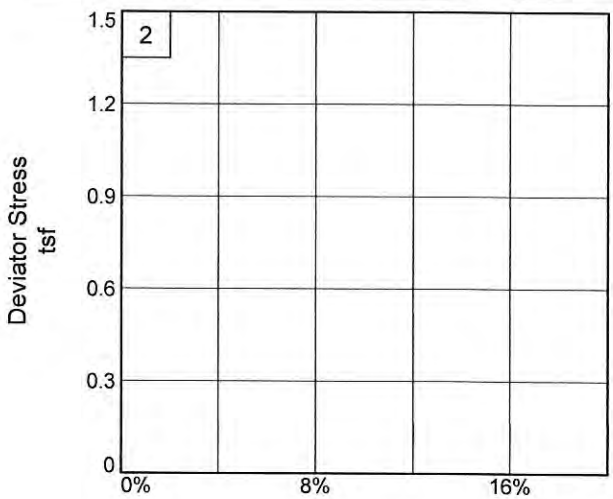
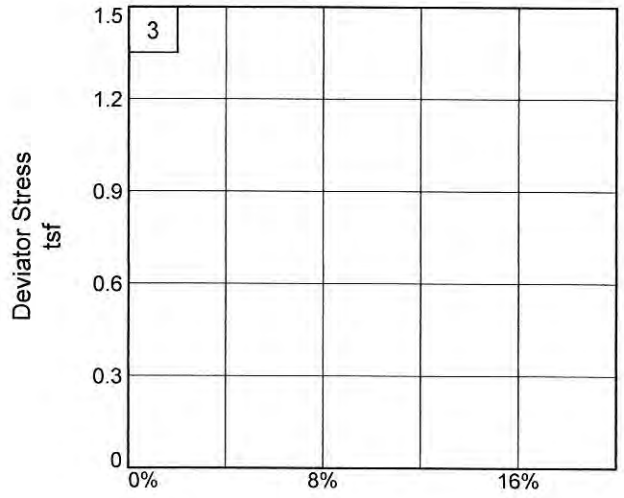
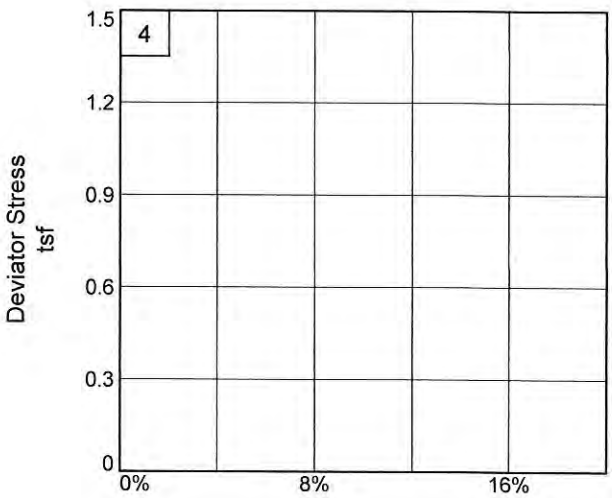
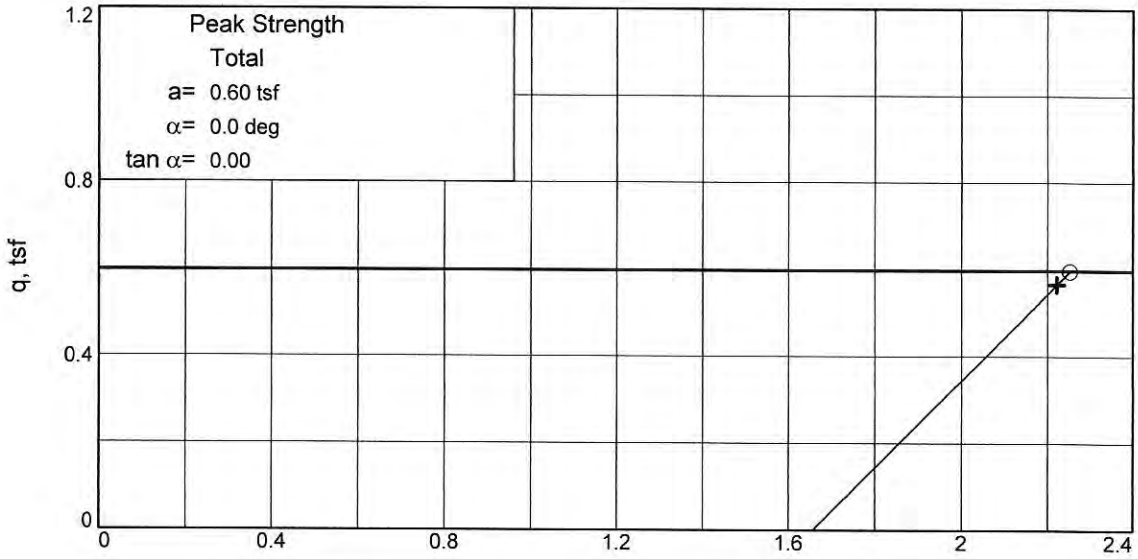
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

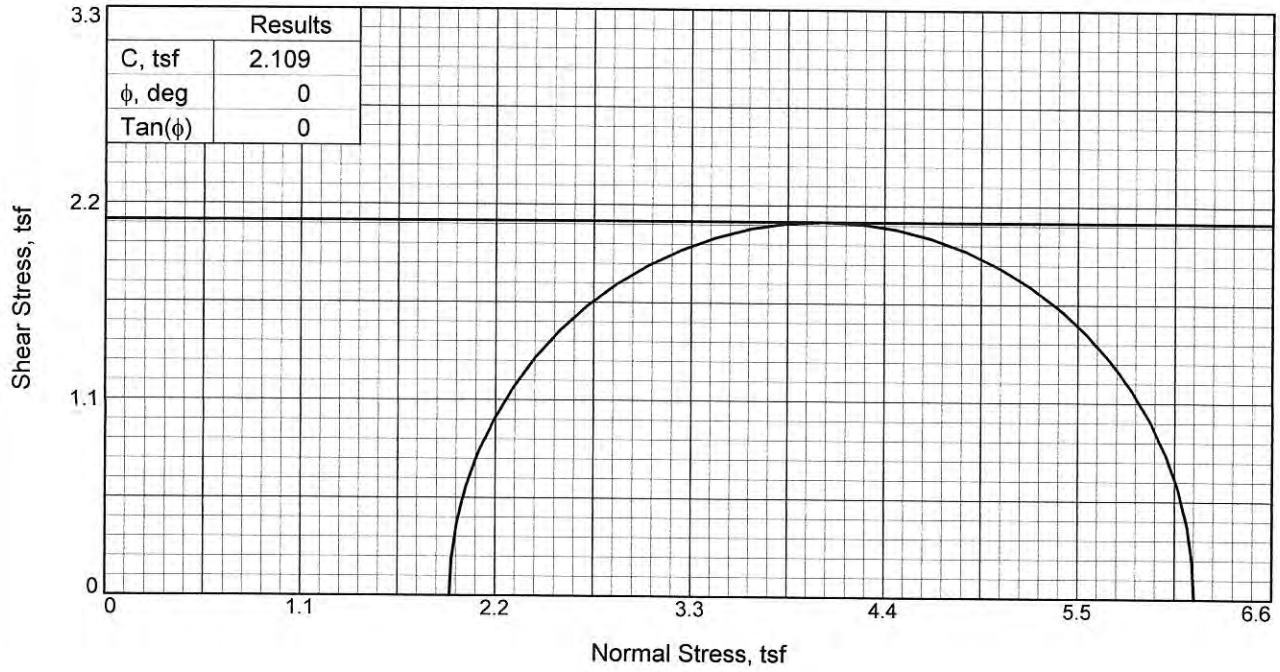
Client:

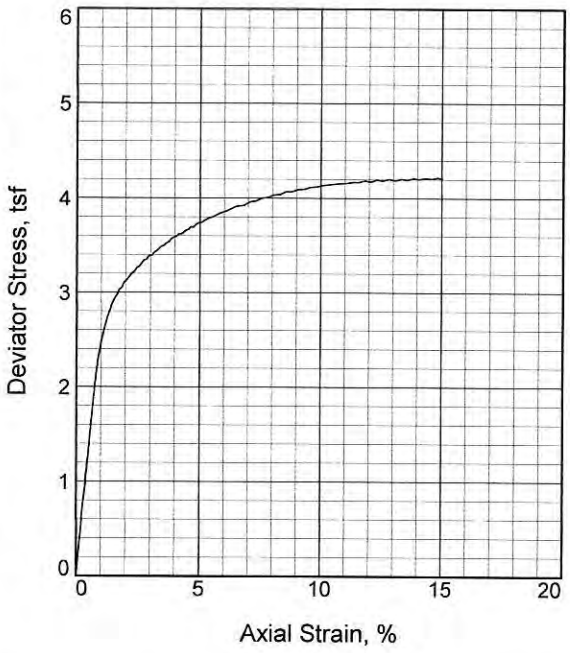
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 53

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	16.6
	Dry Density, pcf	115.4
	Saturation, %	97.2
	Void Ratio	0.4603
	Diameter, in.	2.84
	Height, in.	5.87
At Test	Water Content, %	17.0
	Dry Density, pcf	115.4
	Saturation, %	99.9
	Void Ratio	0.4603
	Diameter, in.	2.84
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		27.00
Fail. Stress, tsf		4.22
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		6.16
σ_3 Failure, tsf		1.94

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and gray LEAN CLAY with SAND

LL= 30 **PL=** 16 **PI=** 14

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D2850
Failure type: Bulge

Figure _____

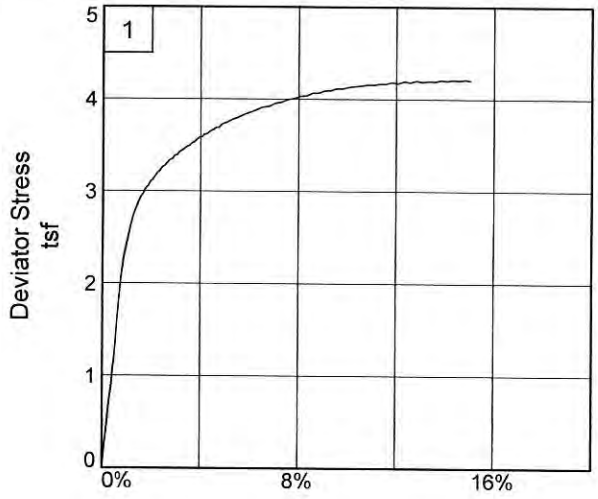
Client:

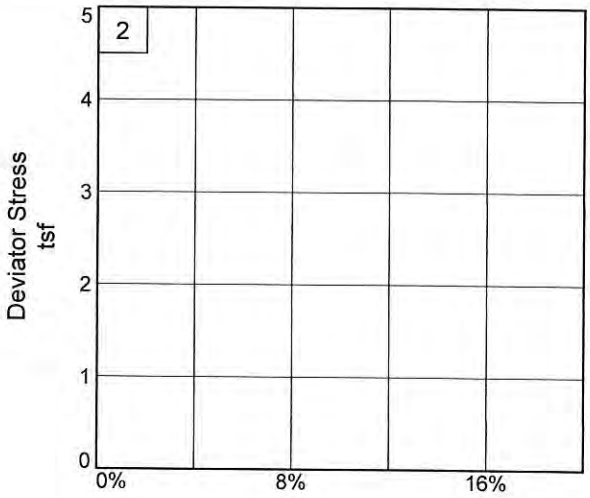
Project: San Jacinto River Waste Pit Superfund Site

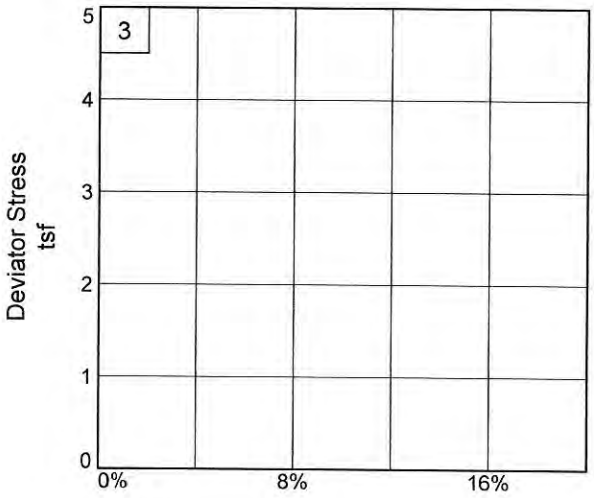
Source of Sample: SJGB028 **Depth:** 63

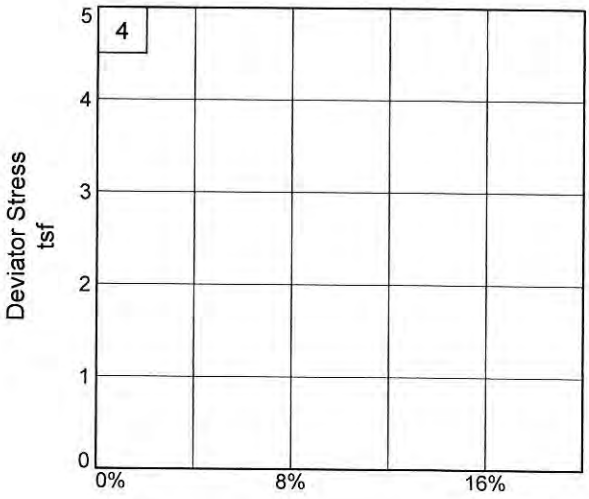
Proj. No.: 19.15.131 **Date Sampled:** 1/15/2020

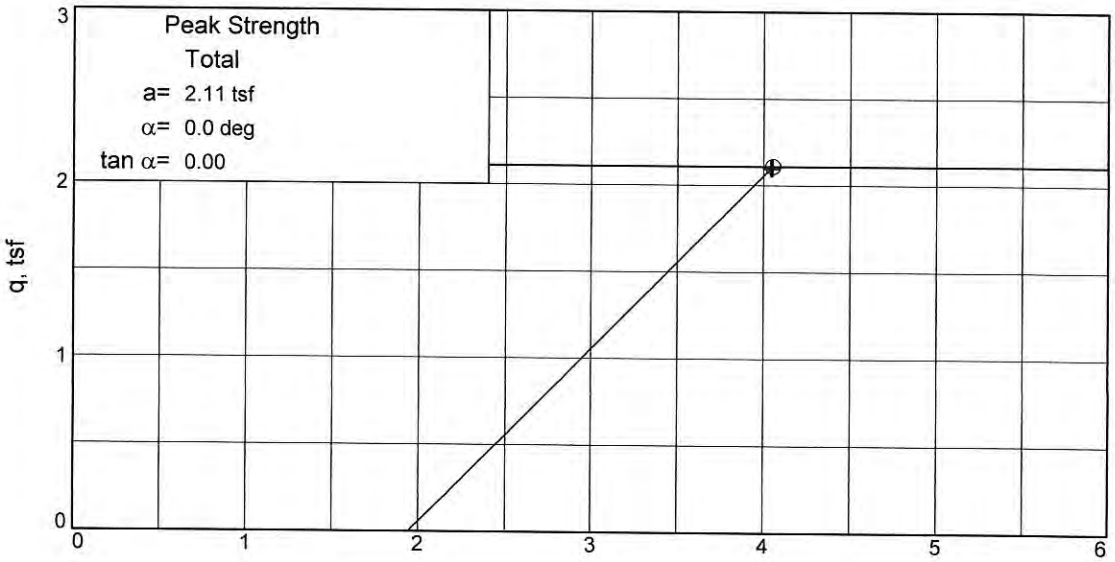
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

Client:

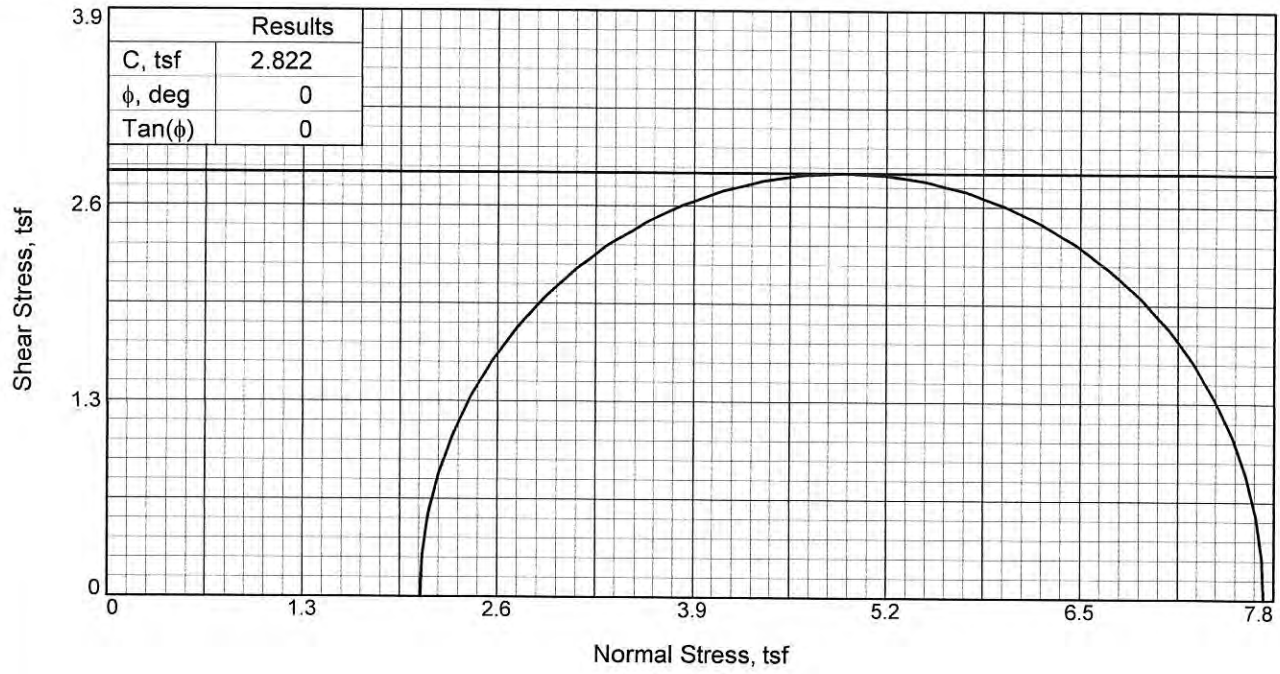
Project: San Jacinto River Waste Pit Superfund Site

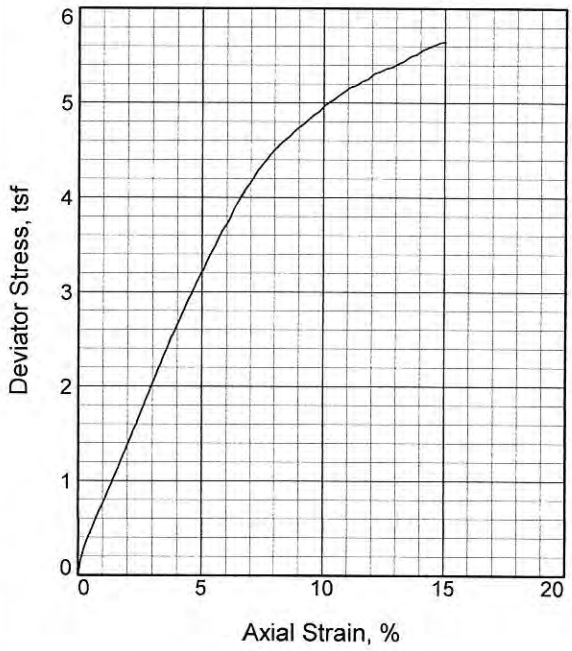
Source of Sample: SJGB028 **Depth:** 63

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.

Attachment Figure B.2-100





Sample No.		1
Initial	Water Content, %	18.0
	Dry Density, pcf	113.5
	Saturation, %	96.7
	Void Ratio	0.5122
	Diameter, in.	2.84
	Height, in.	5.87
At Test	Water Content, %	17.4
	Dry Density, pcf	113.5
	Saturation, %	93.4
	Void Ratio	0.5122
	Diameter, in.	2.84
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		29.00
Fail. Stress, tsf		5.64
Strain, %		15.0
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		7.73
σ_3 Failure, tsf		2.09

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray SANDY LEAN CLAY

LL= 28 **PL=** 16 **PI=** 12

Assumed Specific Gravity= 2.75

Remarks:
Test method: ASTM D2850
Failure type: Multiple shear

Figure _____

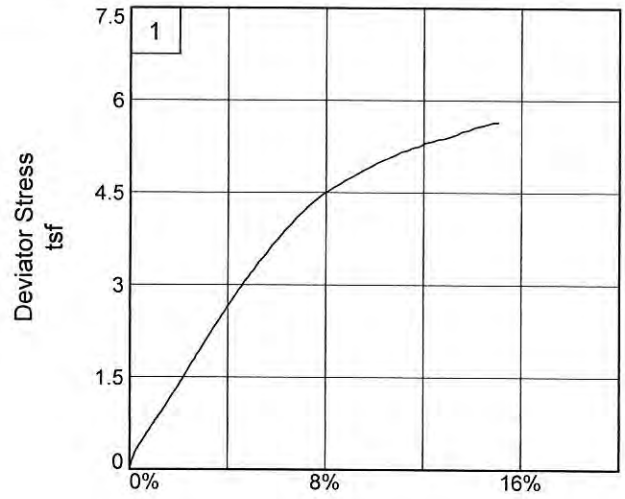
Client:

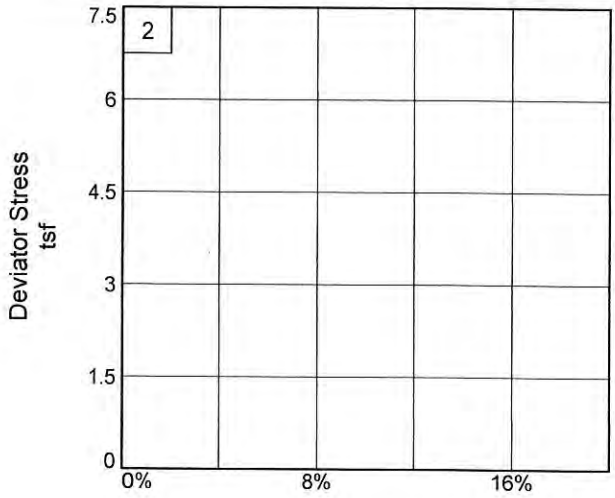
Project: San Jacinto River Waste Pit Superfund Site

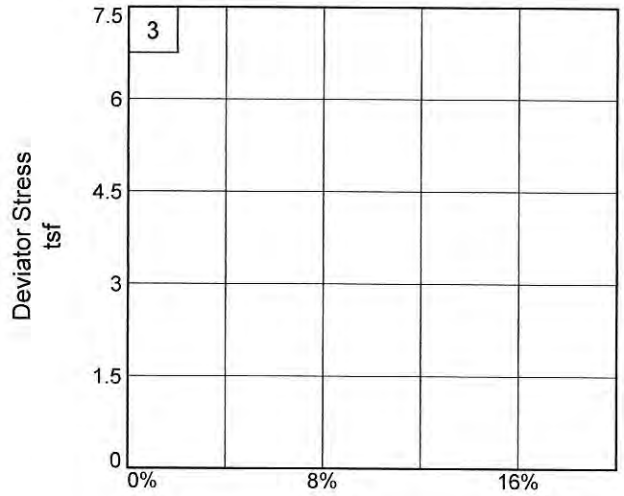
Source of Sample: SJGB028 **Depth:** 68

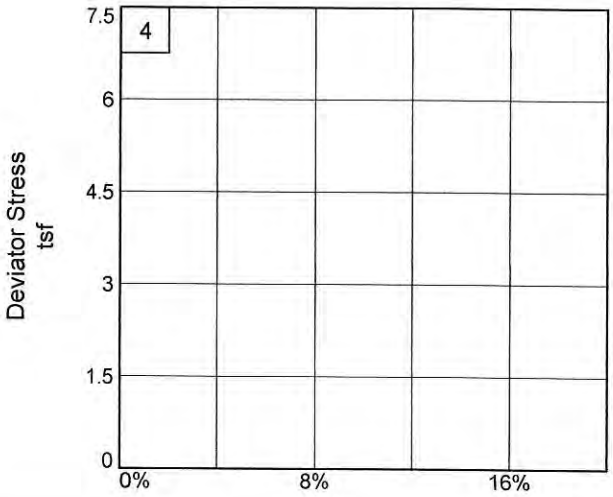
Proj. No.: 19.15.131 **Date Sampled:** 1/16/2020

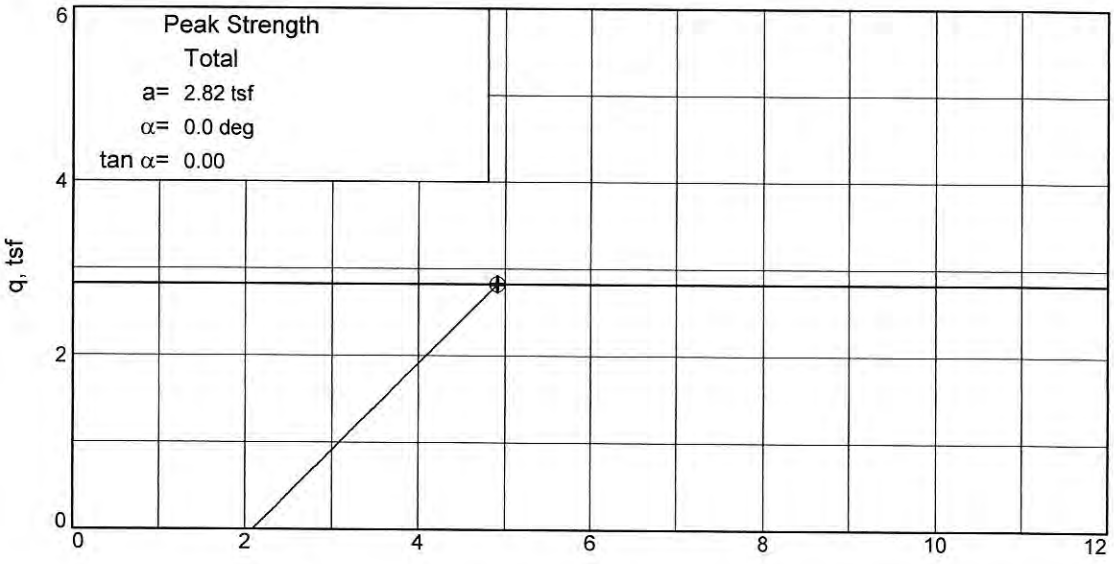
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

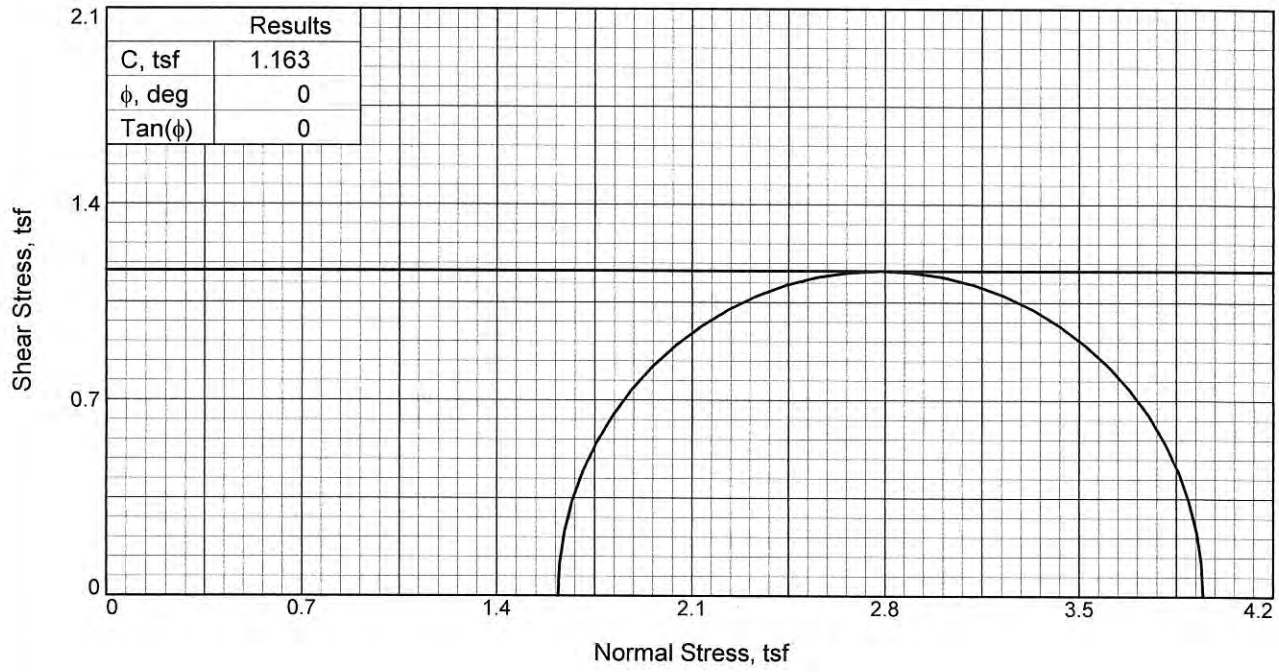
Client:

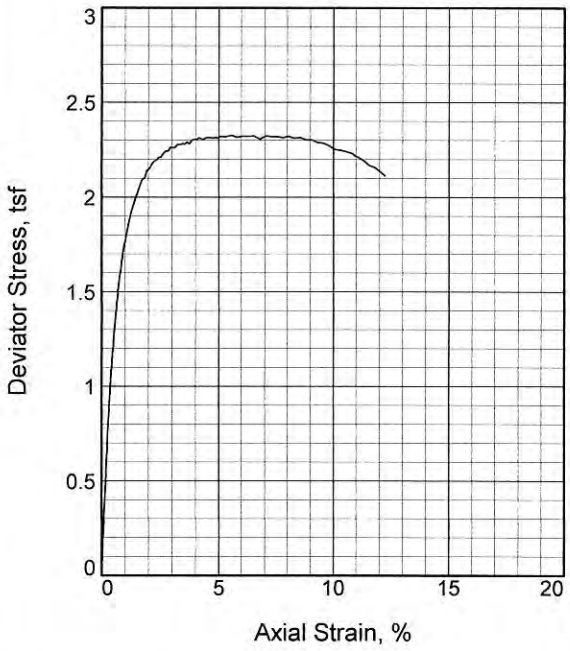
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 68

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	26.4
	Dry Density, pcf	100.0
	Saturation, %	98.7
	Void Ratio	0.7482
	Diameter, in.	2.81
	Height, in.	5.85
At Test	Water Content, %	26.6
	Dry Density, pcf	100.0
	Saturation, %	99.6
	Void Ratio	0.7482
	Diameter, in.	2.81
	Height, in.	5.85
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		22.50
Fail. Stress, tsf		2.33
Strain, %		5.5
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.95
σ_3 Failure, tsf		1.62

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray FAT CLAY

LL= 70 **PL=** 22 **PI=** 48
Assumed Specific Gravity= 2.80
Remarks:
Test method: ASTM D2850
Failure type: Multiple shear

Figure _____

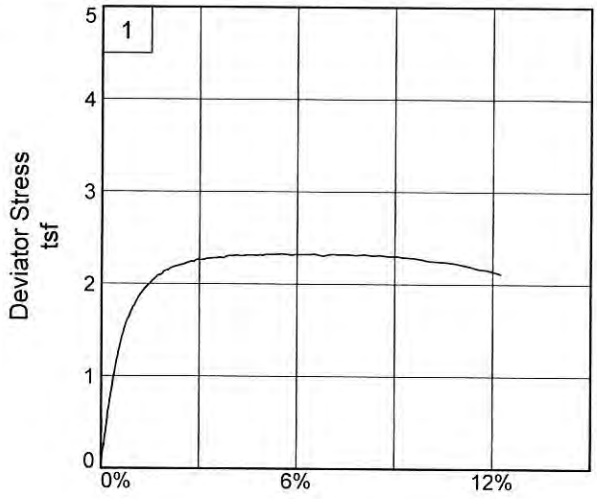
Client:

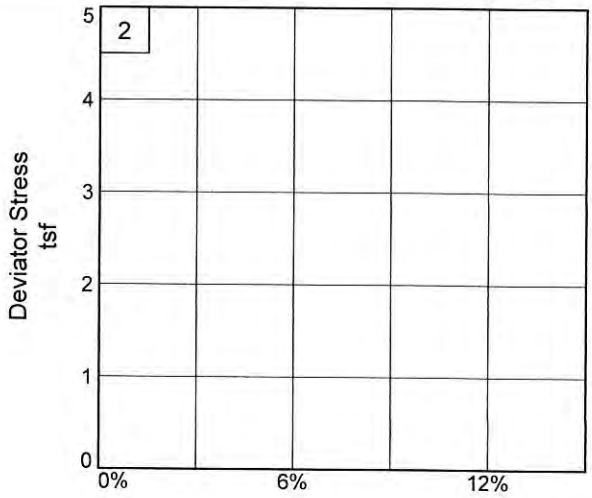
Project: San Jacinto River Waste Pit Superfund Site

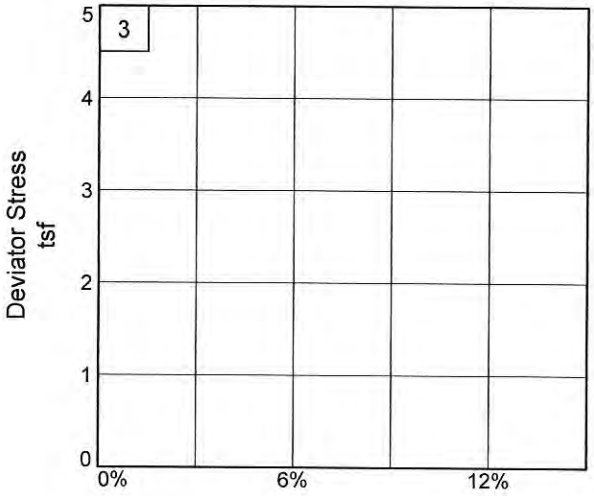
Source of Sample: SJGB029 **Depth:** 53

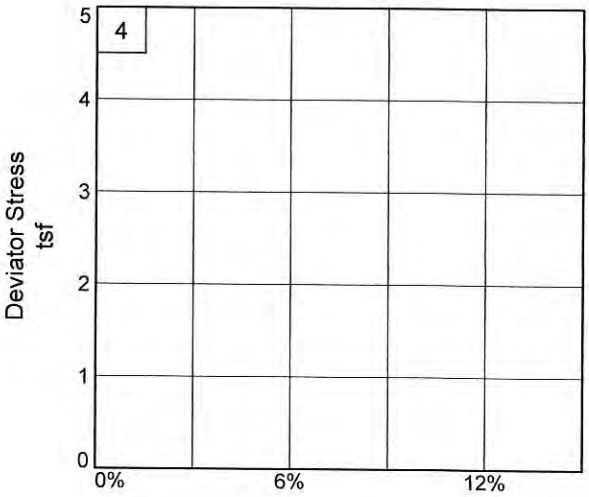
Proj. No.: 19.15.131 **Date Sampled:** 1/15/2020

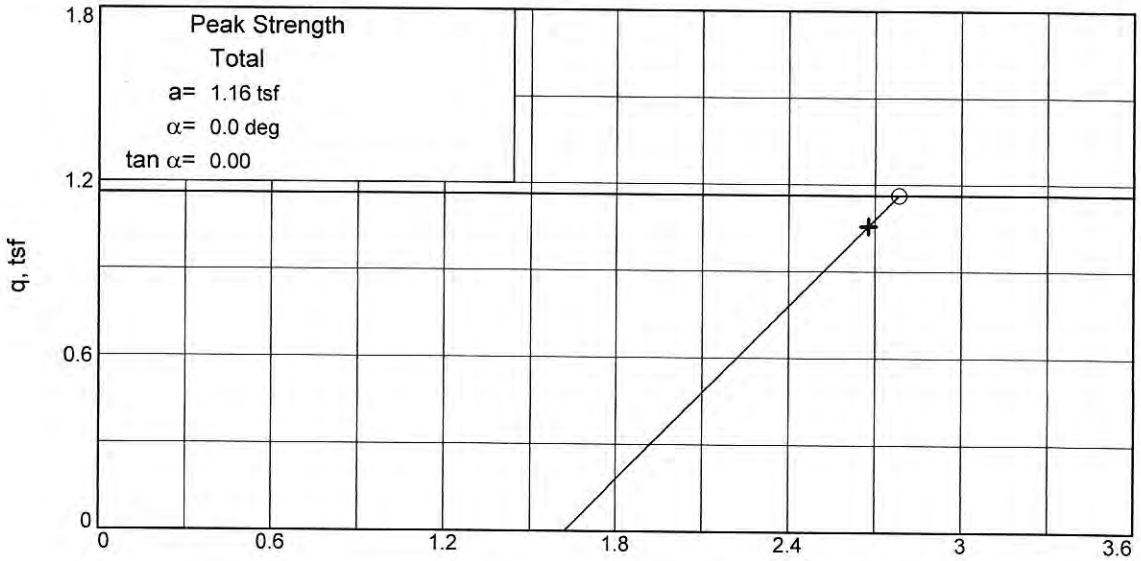
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

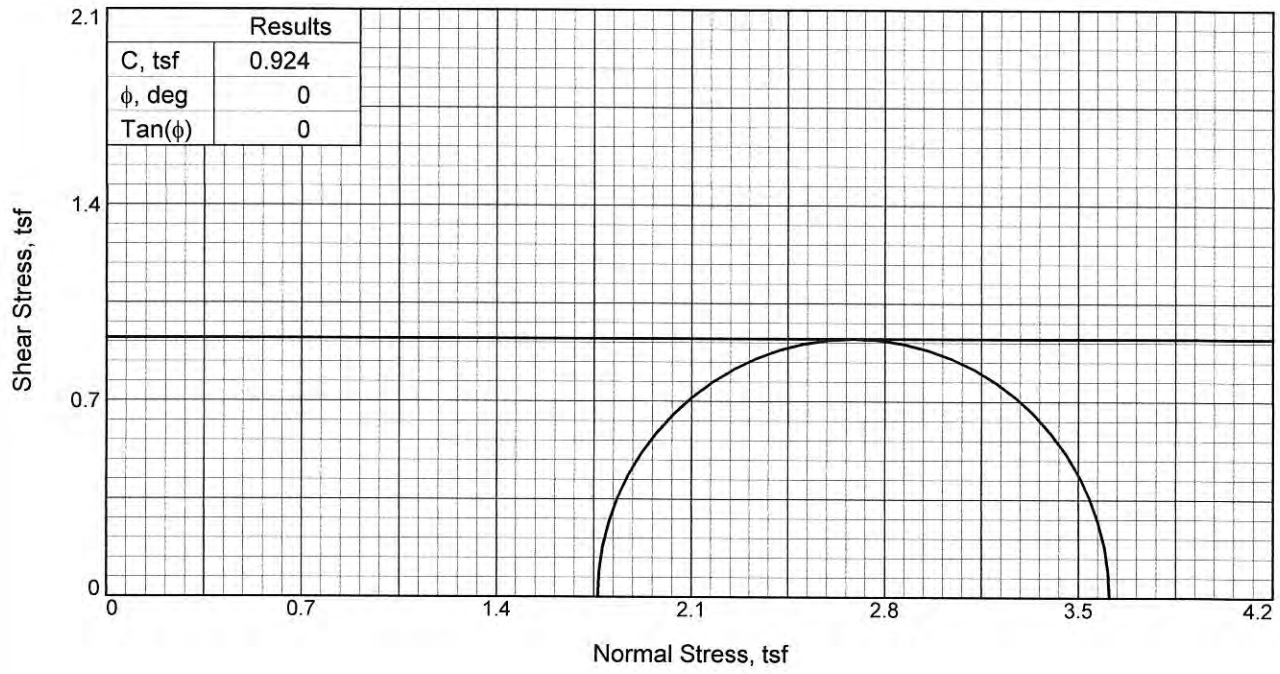
Client:

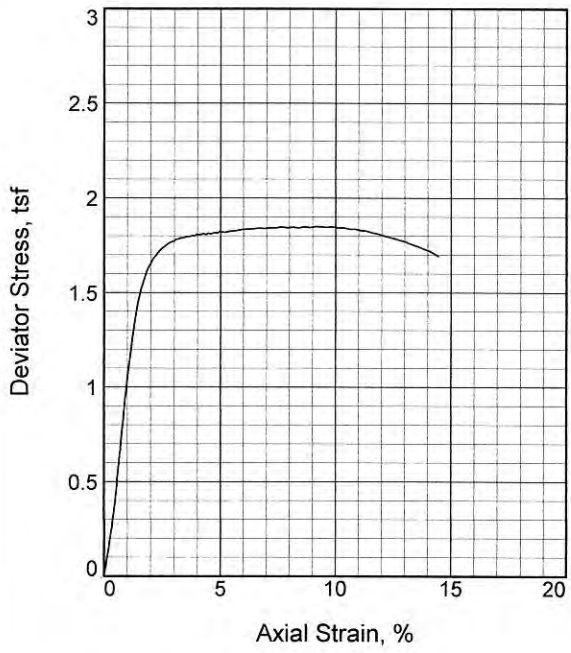
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 **Depth:** 53

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	16.8
	Dry Density, pcf	111.6
	Saturation, %	88.9
	Void Ratio	0.5109
	Diameter, in.	2.89
	Height, in.	5.92
At Test	Water Content, %	16.6
	Dry Density, pcf	111.6
	Saturation, %	87.5
	Void Ratio	0.5109
	Diameter, in.	2.89
	Height, in.	5.92
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		24.50
Fail. Stress, tsf		1.85
Strain, %		9.1
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.61
σ_3 Failure, tsf		1.76

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and gray LEAN CLAY

LL= 33 **PL=** 17 **PI=** 16

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D2850
Failure type: Bulge

Figure _____

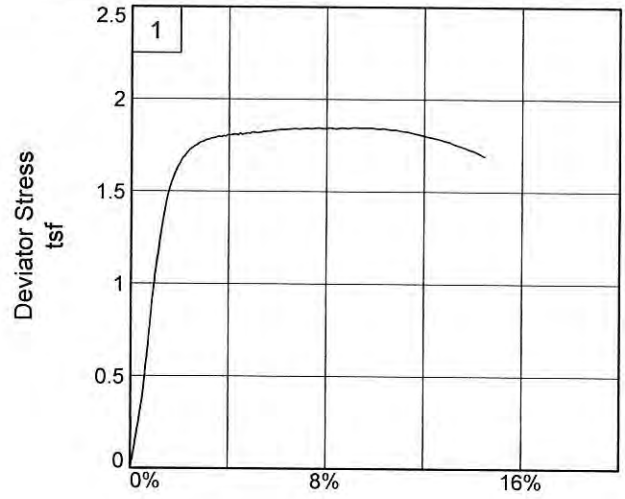
Client:

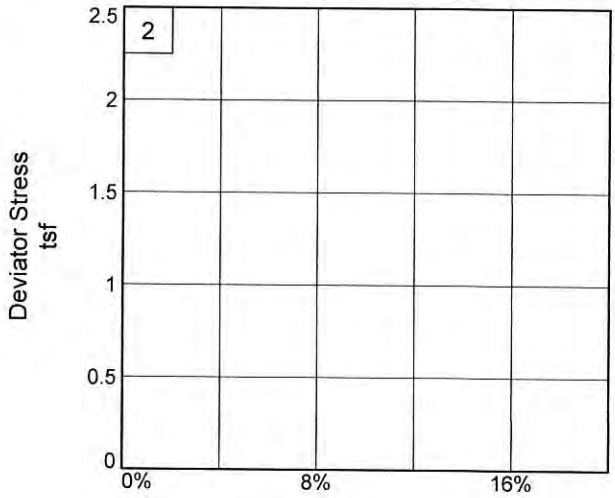
Project: San Jacinto River Waste Pit Superfund Site

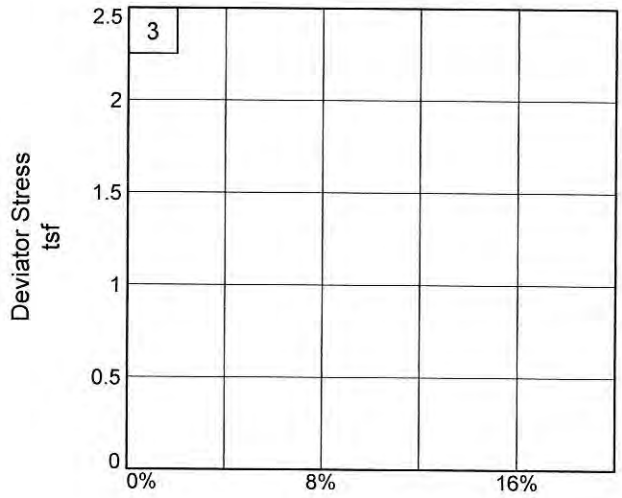
Source of Sample: SJGB029 **Depth:** 58

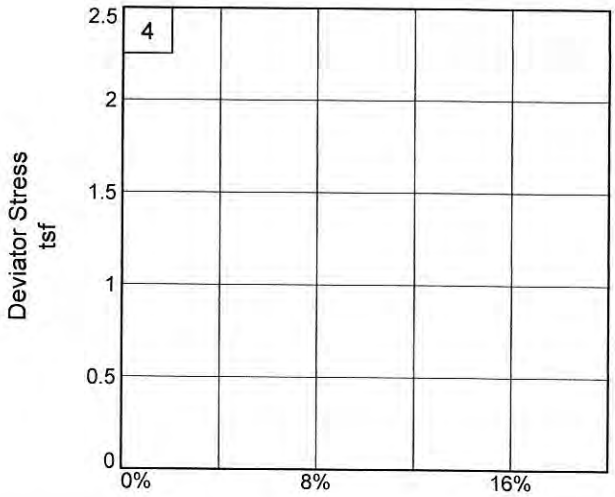
Proj. No.: 19.15.131 **Date Sampled:** 1/15/2020

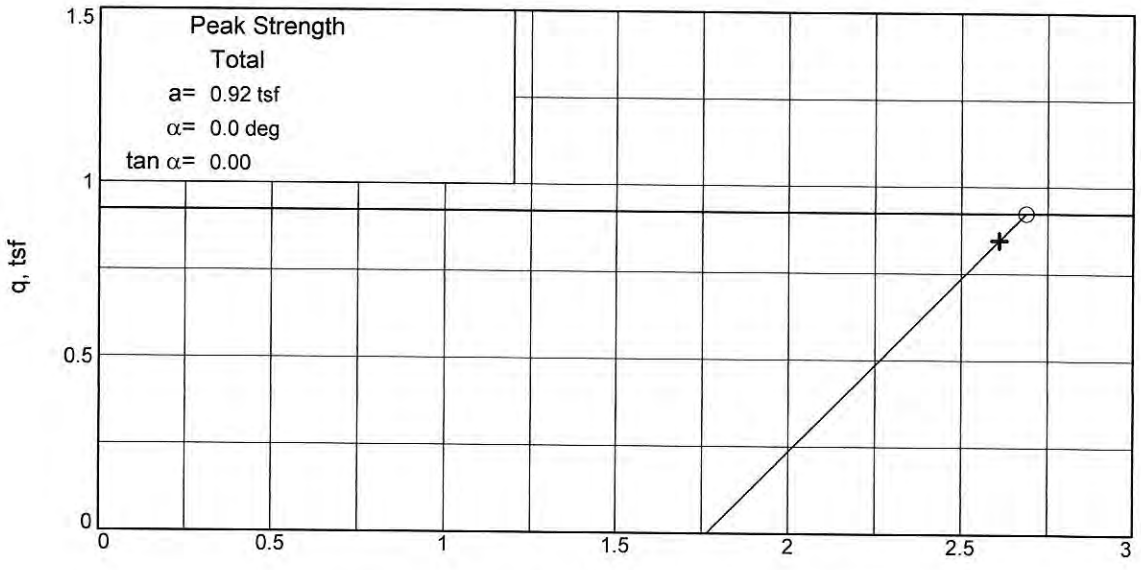
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

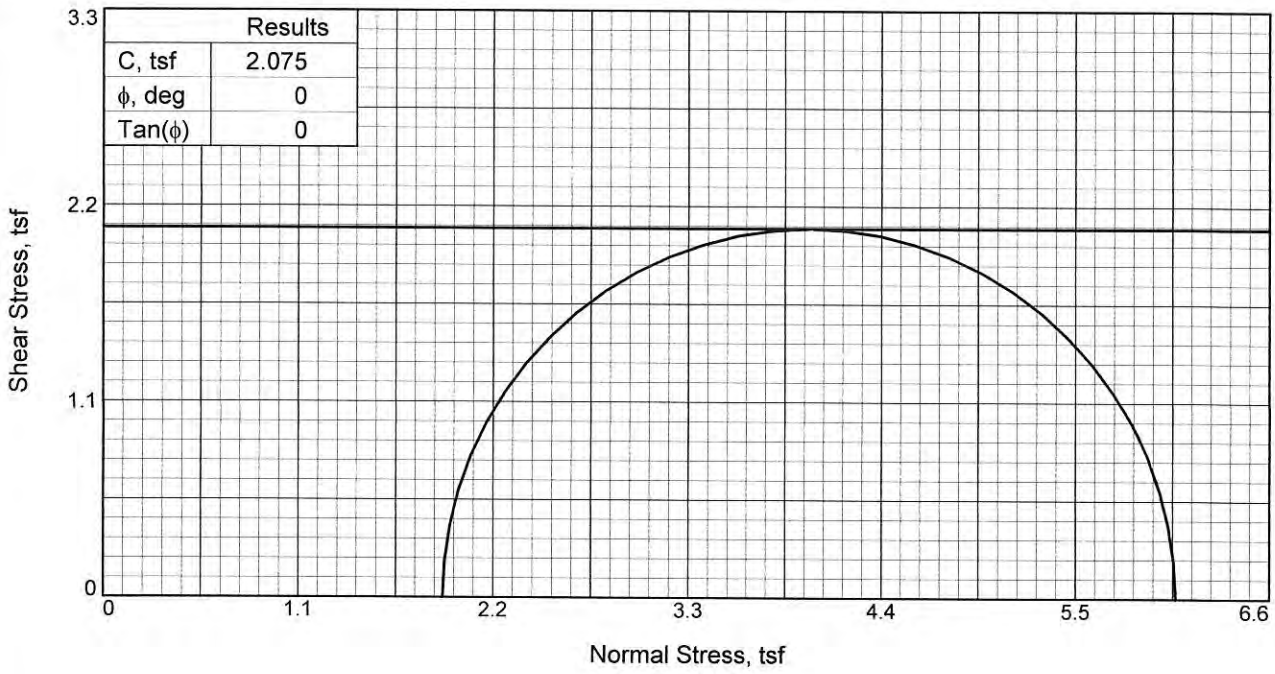
Client:

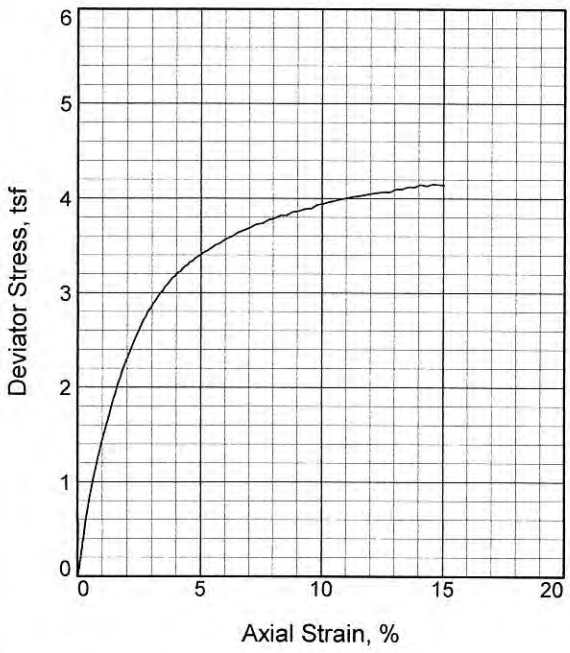
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 **Depth:** 58

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	17.7
	Dry Density, pcf	113.0
	Saturation, %	97.4
	Void Ratio	0.4919
	Diameter, in.	2.84
	Height, in.	5.87
At Test	Water Content, %	18.2
	Dry Density, pcf	113.0
	Saturation, %	99.8
	Void Ratio	0.4919
	Diameter, in.	2.84
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		26.60
Fail. Stress, tsf		4.15
Strain, %		14.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		6.07
σ_3 Failure, tsf		1.92

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray SANDY LEAN CLAY

LL= 36 **PL=** 17 **PI=** 19
Assumed Specific Gravity= 2.70
Remarks:
Test method: ASTM D2850
Failure type: Vertical shear

Figure _____

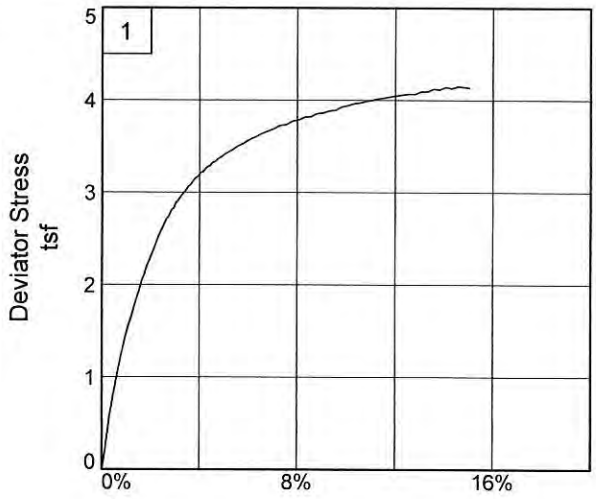
Client:

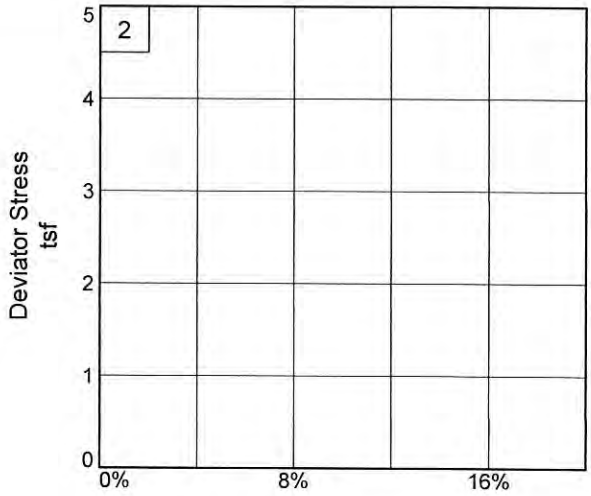
Project: San Jacinto River Waste Pit Superfund Site

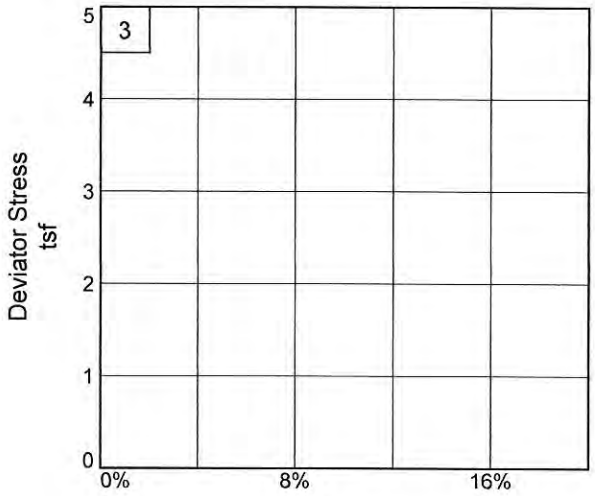
Source of Sample: SJGB029 **Depth:** 63

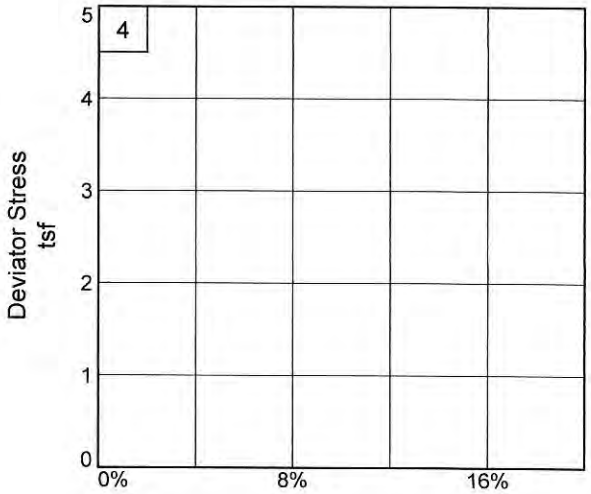
Proj. No.: 19.15.131 **Date Sampled:** 1/16/2020

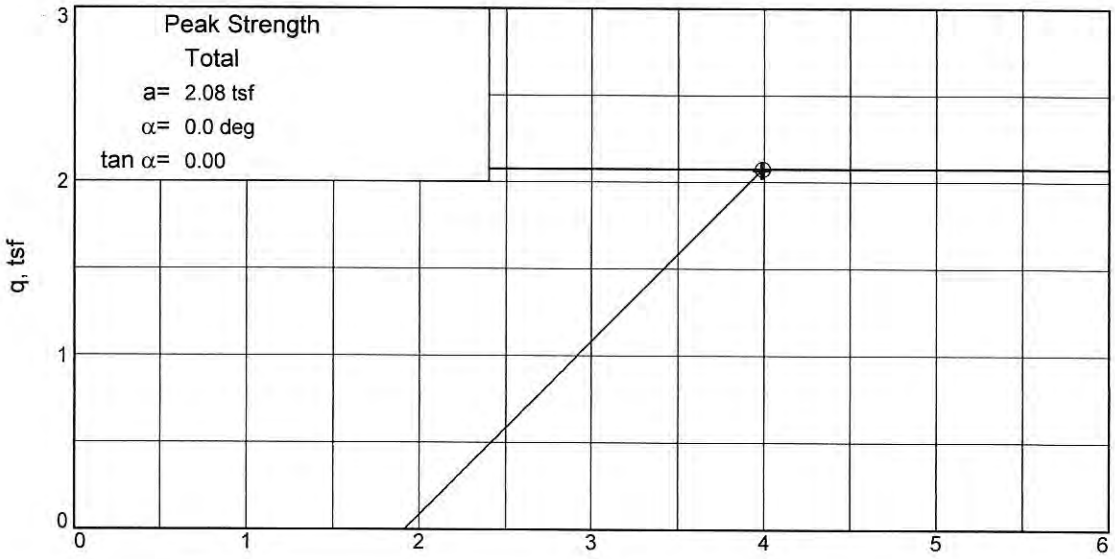
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

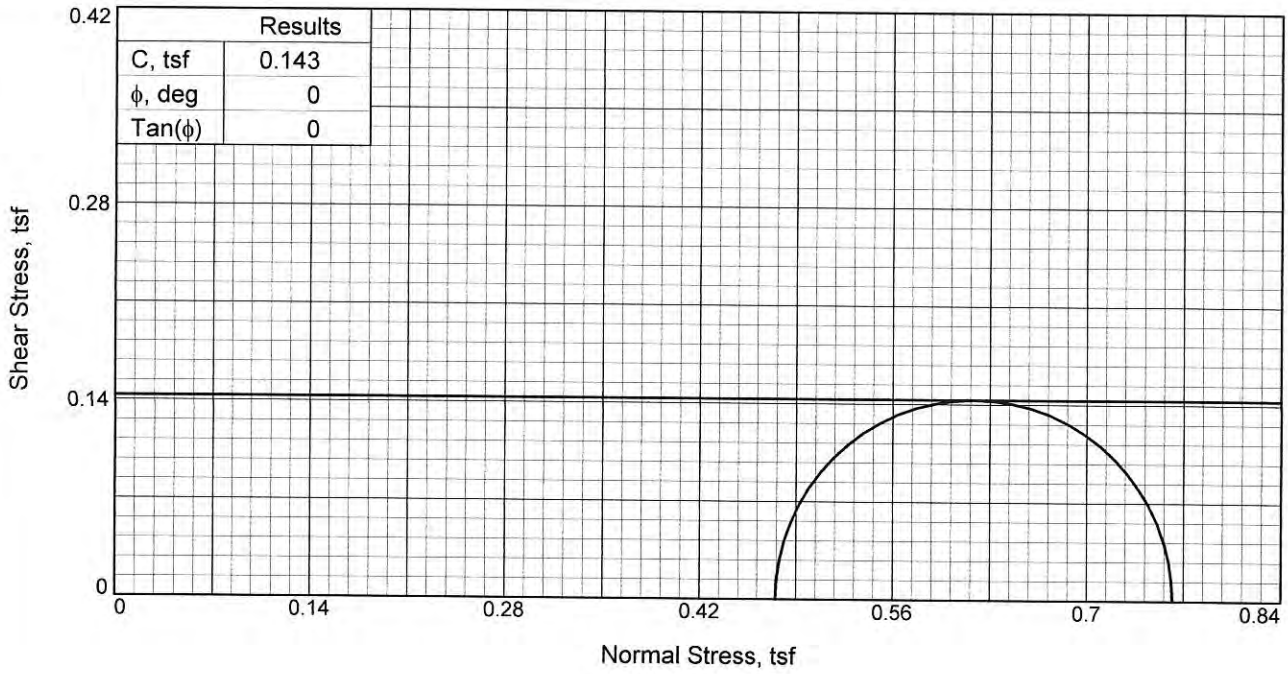
Client:

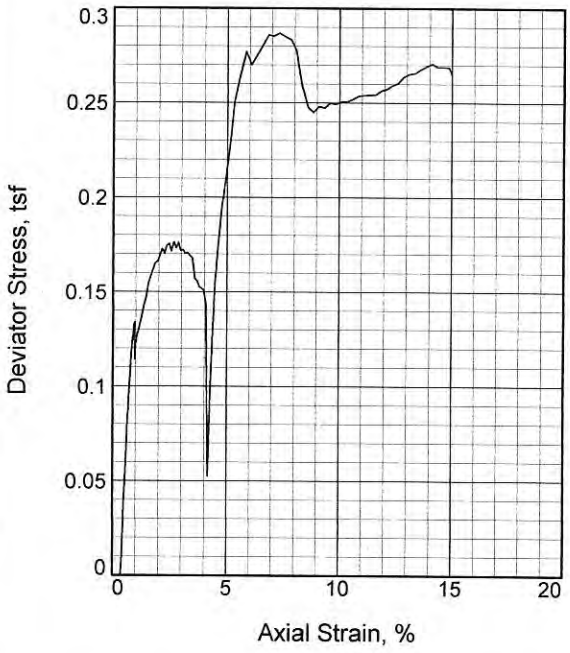
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 **Depth:** 63

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	37.6
	Dry Density, pcf	72.0
	Saturation, %	80.7
	Void Ratio	1.1664
	Diameter, in.	2.82
	Height, in.	5.77
At Test	Water Content, %	52.0
	Dry Density, pcf	72.0
	Saturation, %	111.6
	Void Ratio	1.1664
	Diameter, in.	2.82
	Height, in.	5.77
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		6.60
Fail. Stress, tsf		0.29
Strain, %		7.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.76
σ_3 Failure, tsf		0.48

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Dark gray SANDY FAT CLAY; sand pockets

LL= 79 **PL=** 24 **PI=** 55

Assumed Specific Gravity= 2.5

Remarks: Test Method: ASTM D2850
Failure Type: 60 Degree Shear

Figure _____

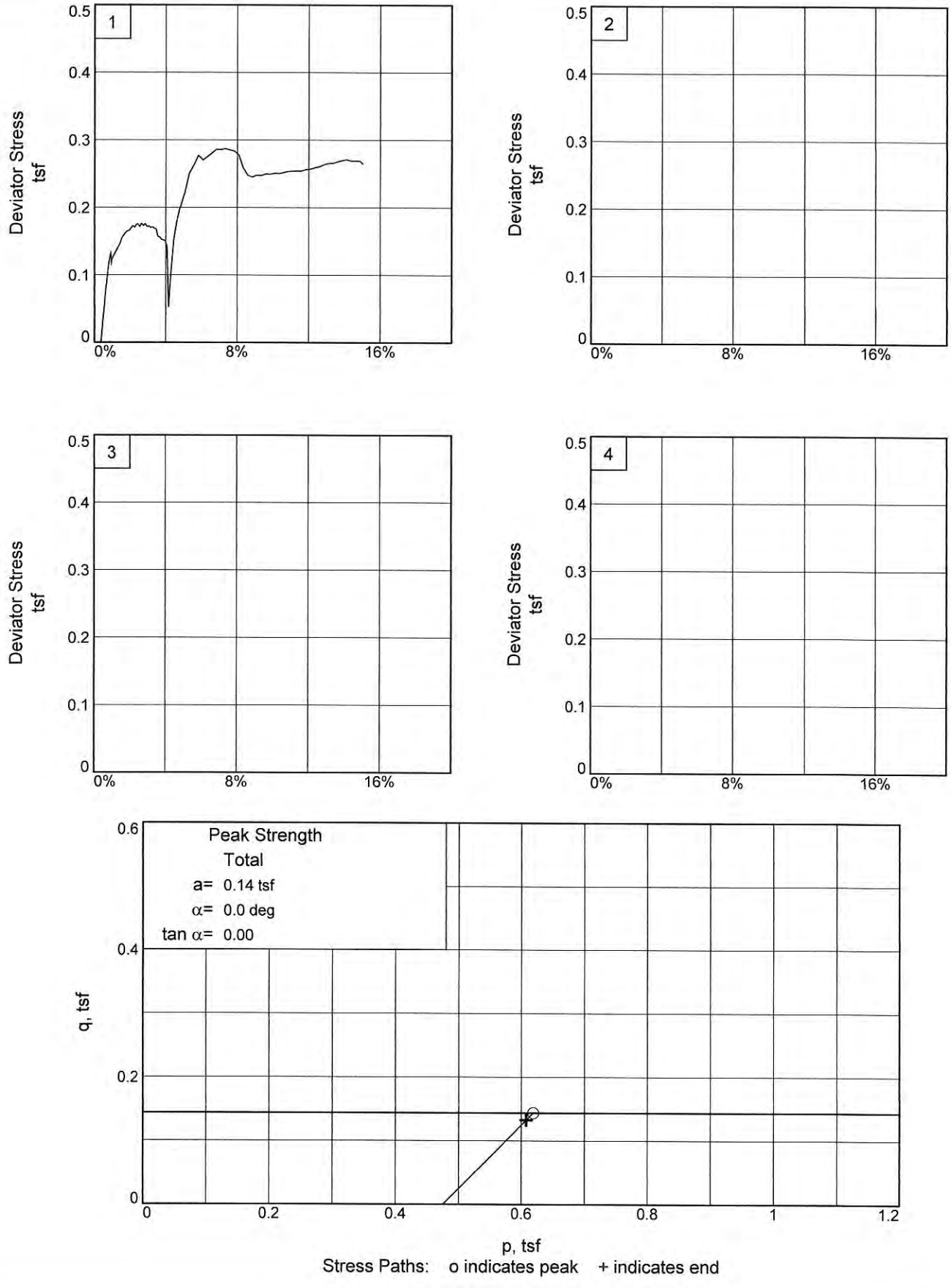
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 18

Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



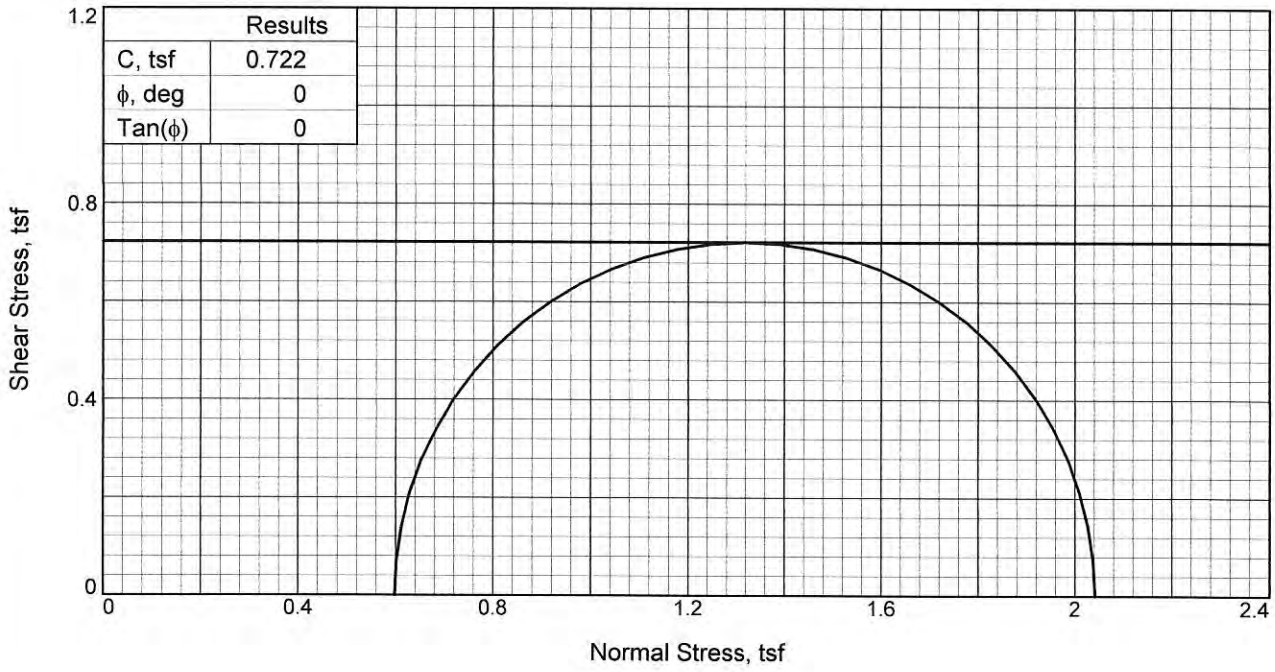
Client:

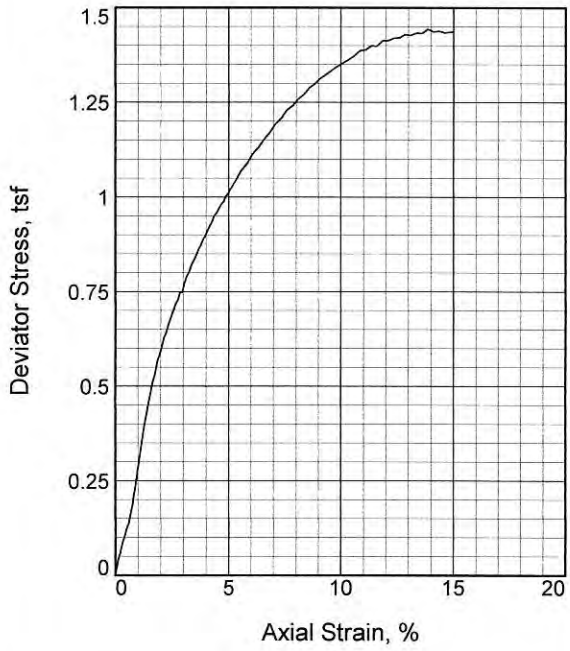
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 18

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.1
	Dry Density, pcf	113.6
	Saturation, %	100.0
	Void Ratio	0.5766
	Diameter, in.	2.76
	Height, in.	5.86
At Test	Water Content, %	17.4
	Dry Density, pcf	113.6
	Saturation, %	86.8
	Void Ratio	0.5766
	Diameter, in.	2.76
	Height, in.	5.86
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		8.30
Fail. Stress, tsf		1.44
Strain, %		13.9
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.04
σ_3 Failure, tsf		0.60

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY with SAND

LL= 42 **PL=** 18 **PI=** 24

Assumed Specific Gravity= 2.87

Remarks: Test Method: ASTM D2850
Failure type: Buldge

Figure _____

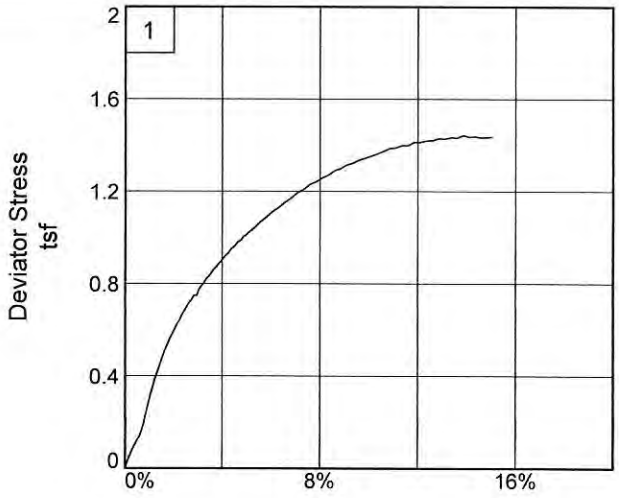
Client:

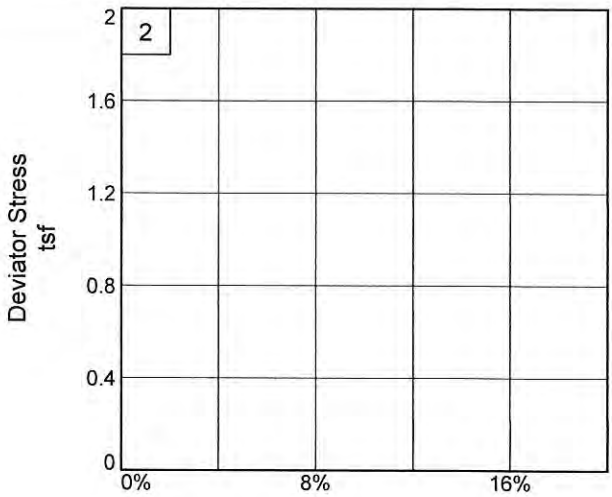
Project: San Jacinto River Waste Pit Superfund Site

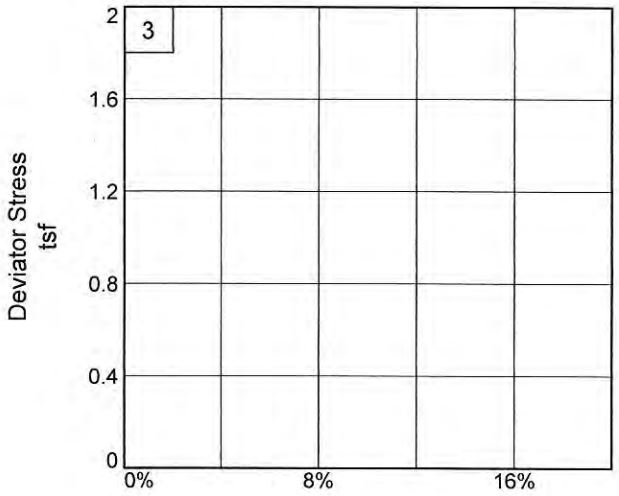
Source of Sample: SJGB047 **Depth:** 23

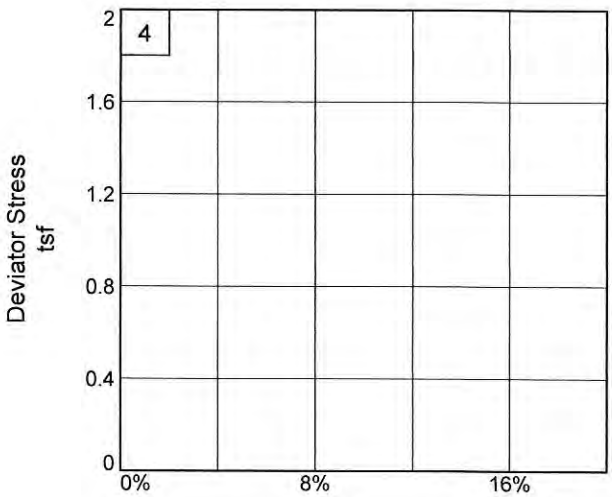
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

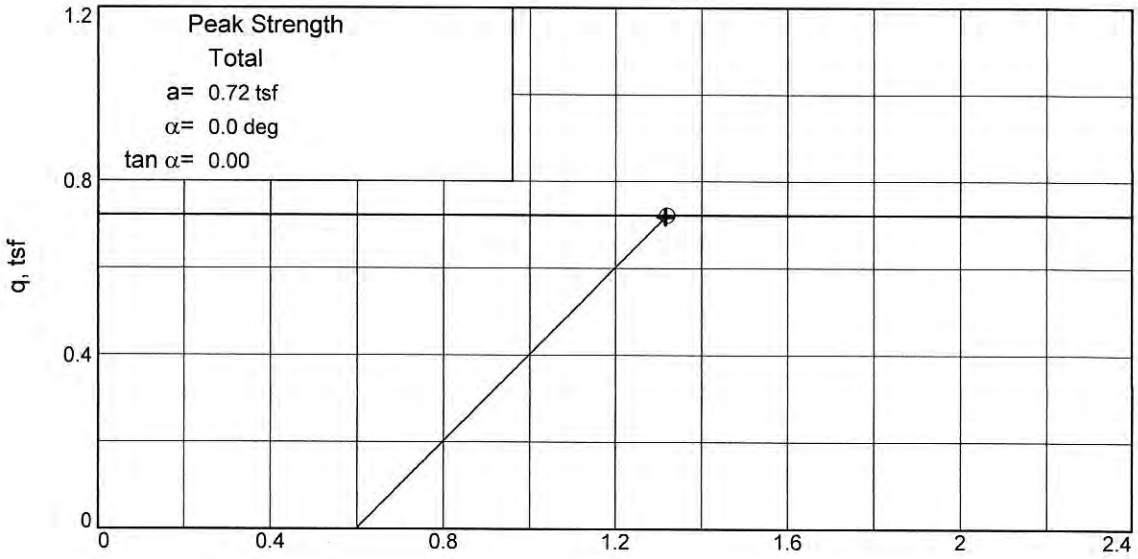
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

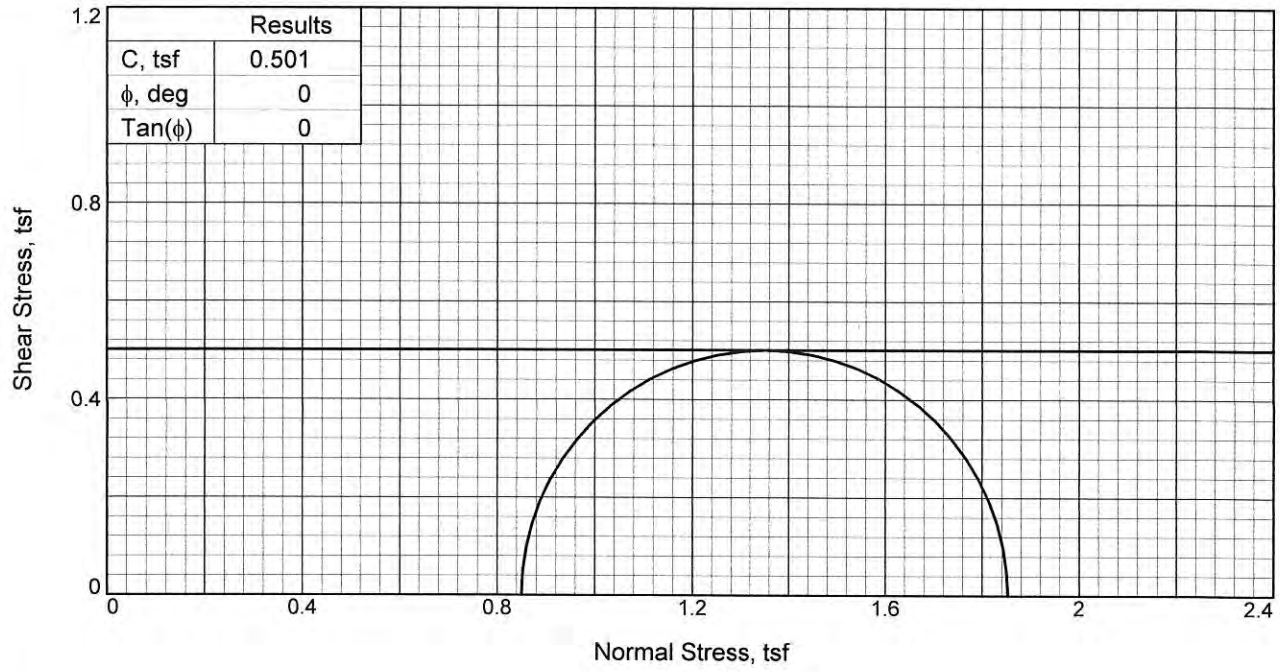
Client:

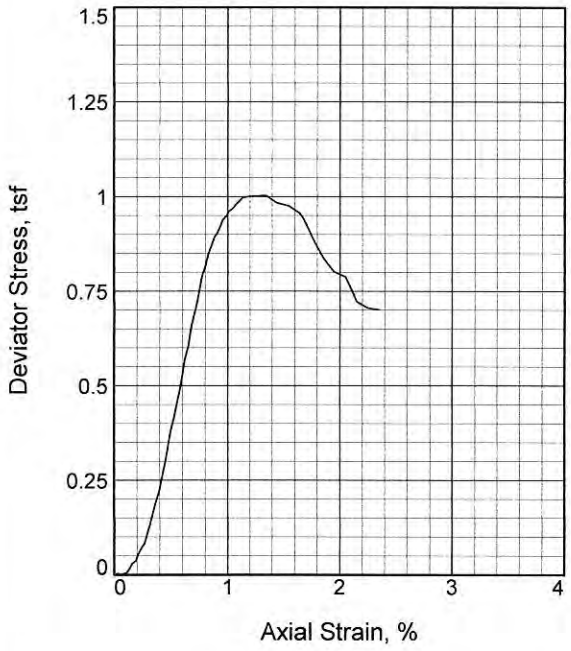
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 23

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	29.0
	Dry Density, pcf	96.5
	Saturation, %	99.6
	Void Ratio	0.8177
	Diameter, in.	2.81
	Height, in.	5.92
At Test	Water Content, %	28.8
	Dry Density, pcf	96.5
	Saturation, %	98.8
	Void Ratio	0.8177
	Diameter, in.	2.81
	Height, in.	5.92
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		11.80
Fail. Stress, tsf		1.00
Strain, %		1.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.85
σ_3 Failure, tsf		0.85

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish Brown FAT CLAY

LL= 59 **PL=** 39 **PI=** 20

Assumed Specific Gravity= 2.81

Remarks: Test Method: ASTM D2850
Failure Type: 60 degree

Figure _____

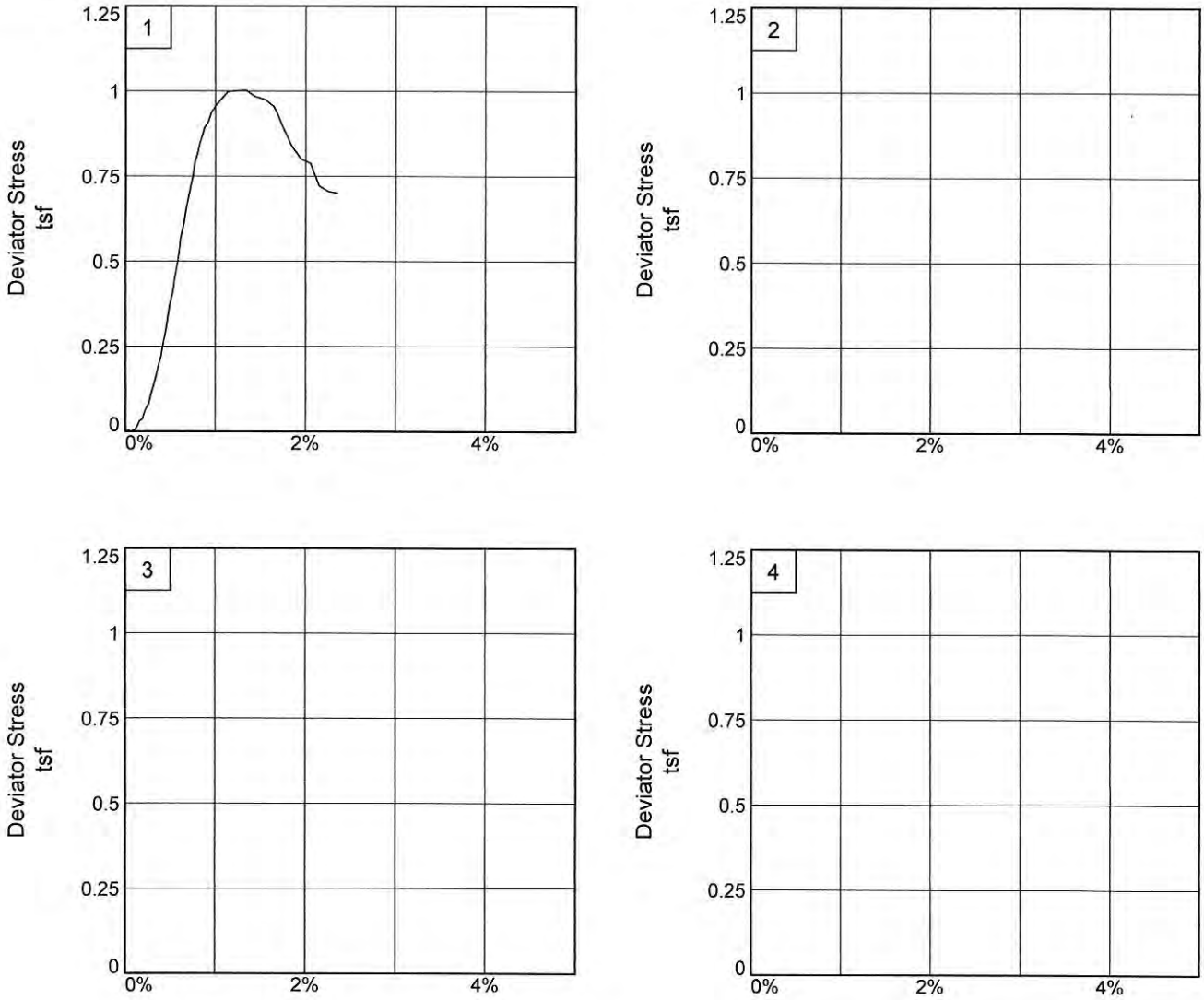
Client:

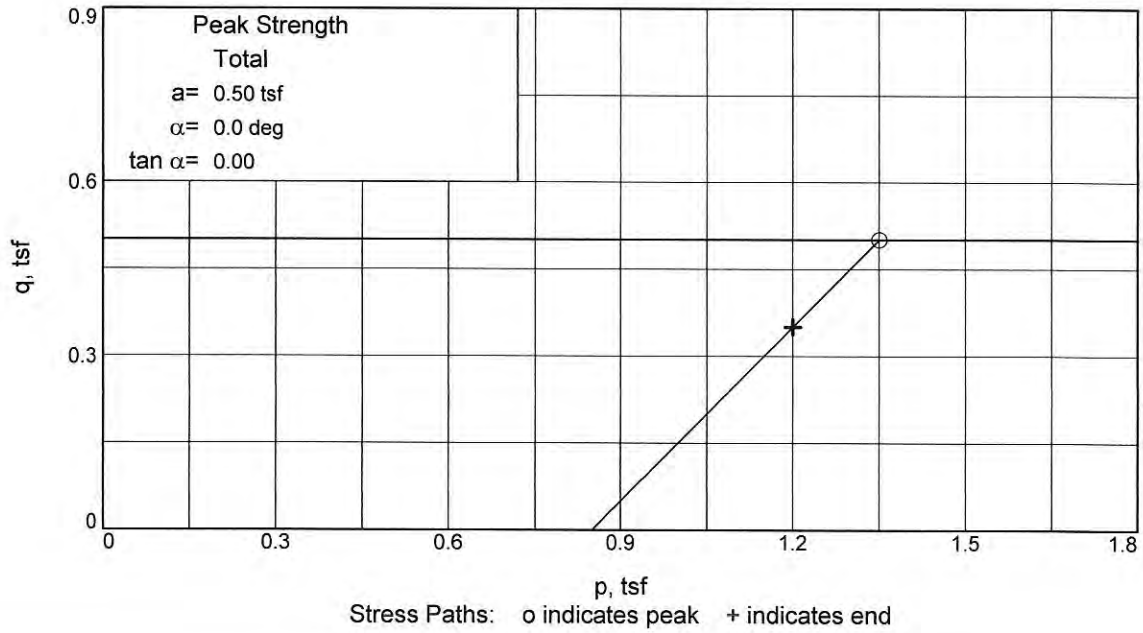
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 33

Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas





Stress Paths: o indicates peak + indicates end

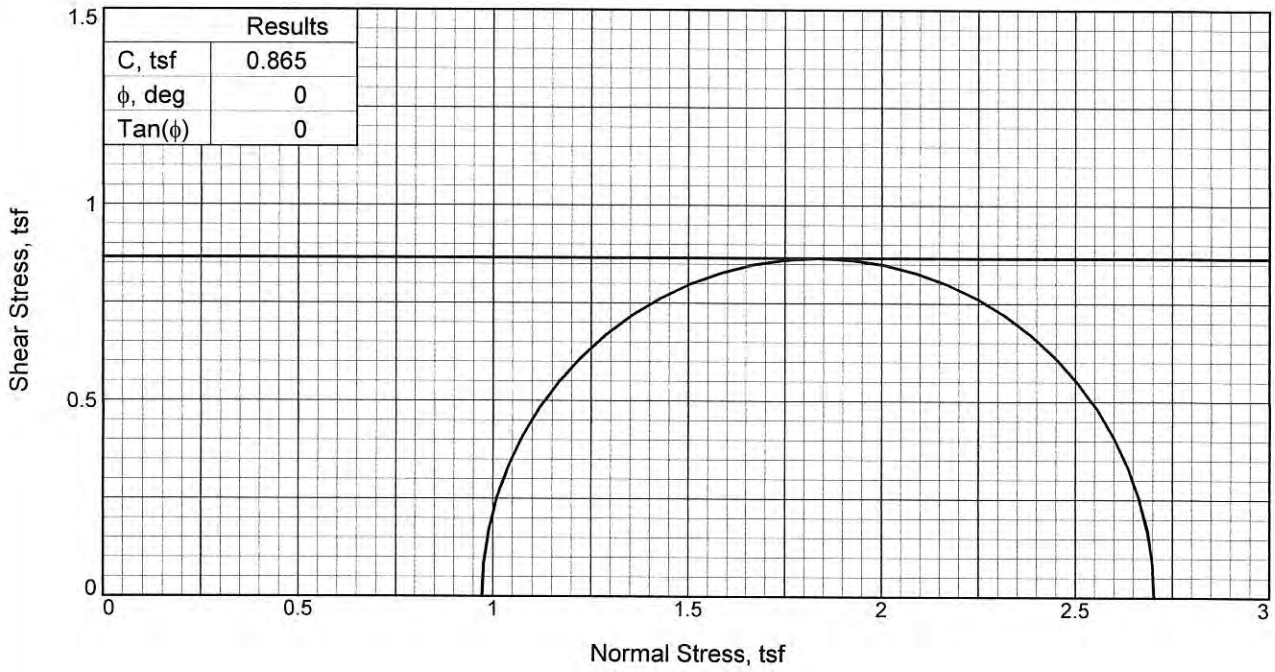
Client:

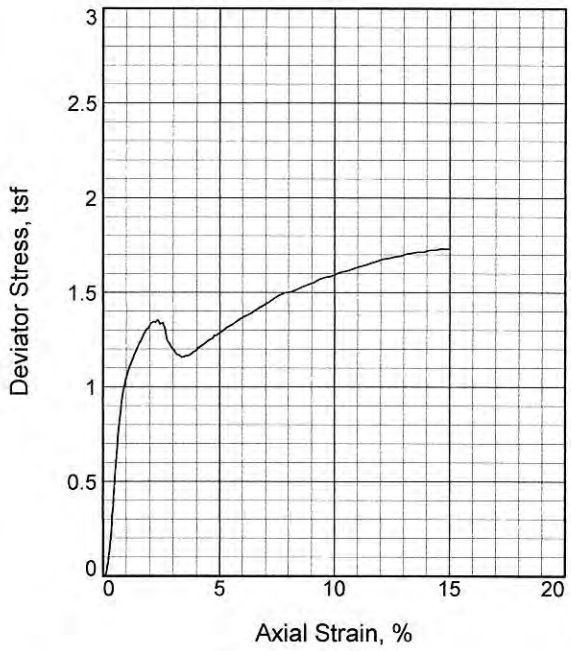
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 33

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	31.3
	Dry Density, pcf	96.0
	Saturation, %	99.9
	Void Ratio	0.9311
	Diameter, in.	2.79
	Height, in.	5.84
At Test	Water Content, %	31.4
	Dry Density, pcf	96.0
	Saturation, %	100.0
	Void Ratio	0.9311
	Diameter, in.	2.79
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		13.50
Fail. Stress, tsf		1.73
Strain, %		14.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.70
σ_3 Failure, tsf		0.97

Type of Test: Unconsolidated Undrained

Sample Type: UU

Description: Reddish Brown FAT CLAY

LL= 74 **PL=** 34 **PI=** 40

Specific Gravity= 2.97

Remarks: Test Method: ASTM D2850 Failure Type: Slickenslide

Figure _____

Client:

Project: San Jacinto River Waste Pit Superfund Site

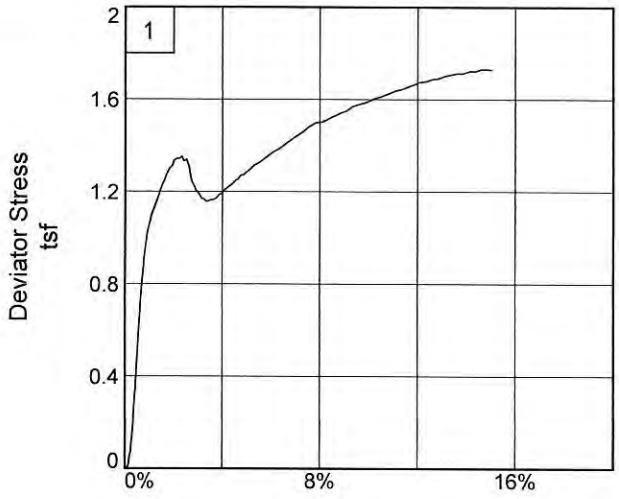
Source of Sample: SJGB047 **Depth:** 38

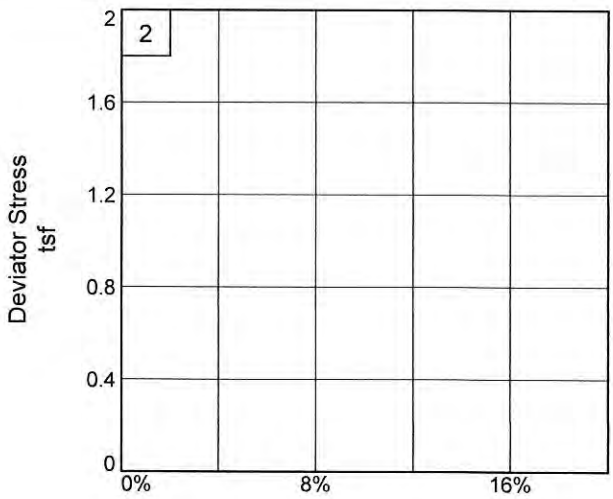
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

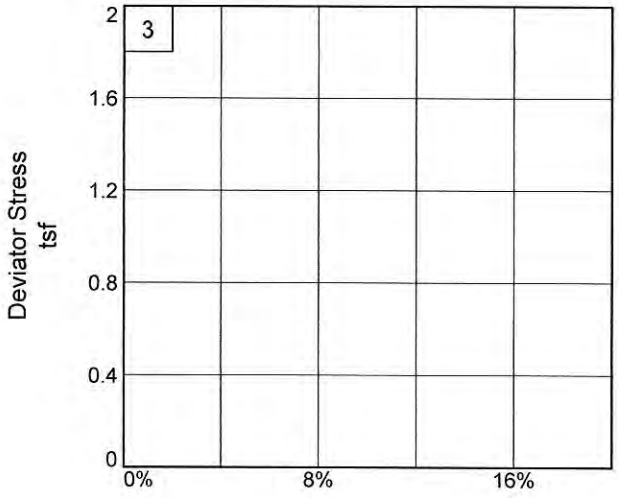
TRIAXIAL SHEAR TEST REPORT

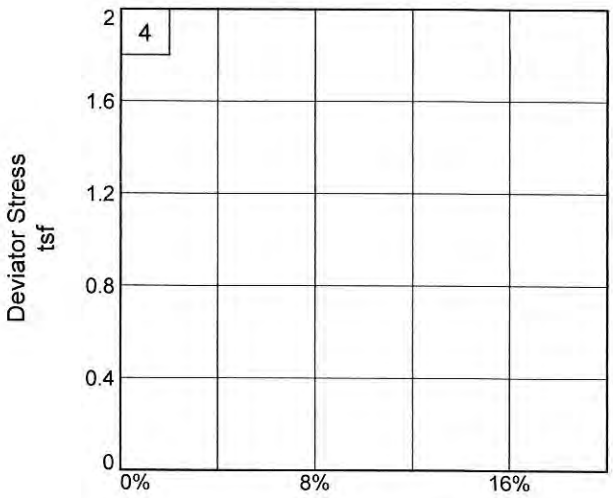
Tolunay-Wong Engineers, Inc.

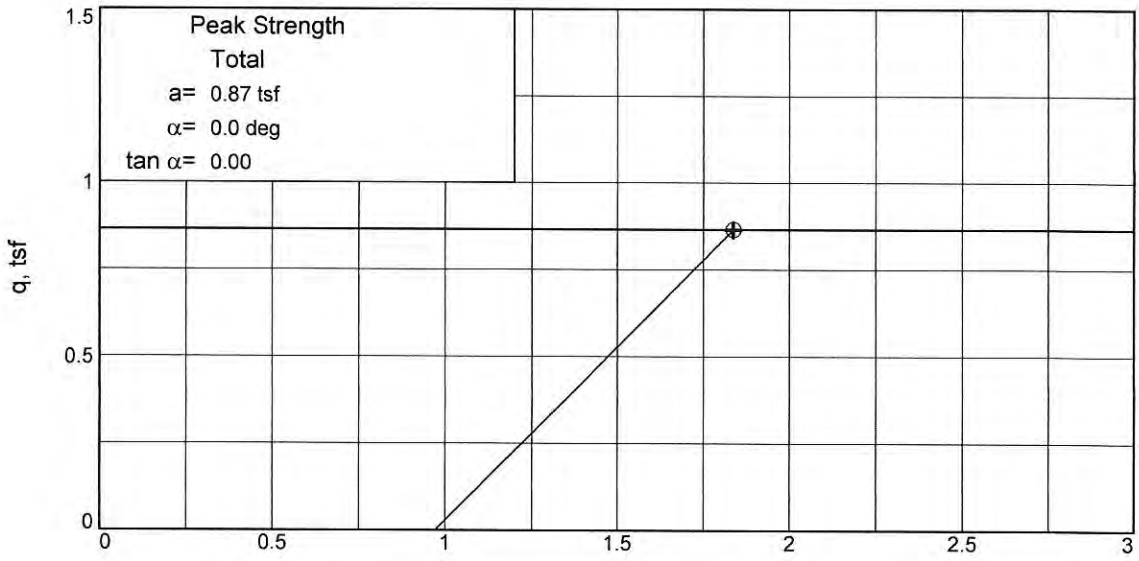
Houston, Texas











Stress Paths: o indicates peak + indicates end

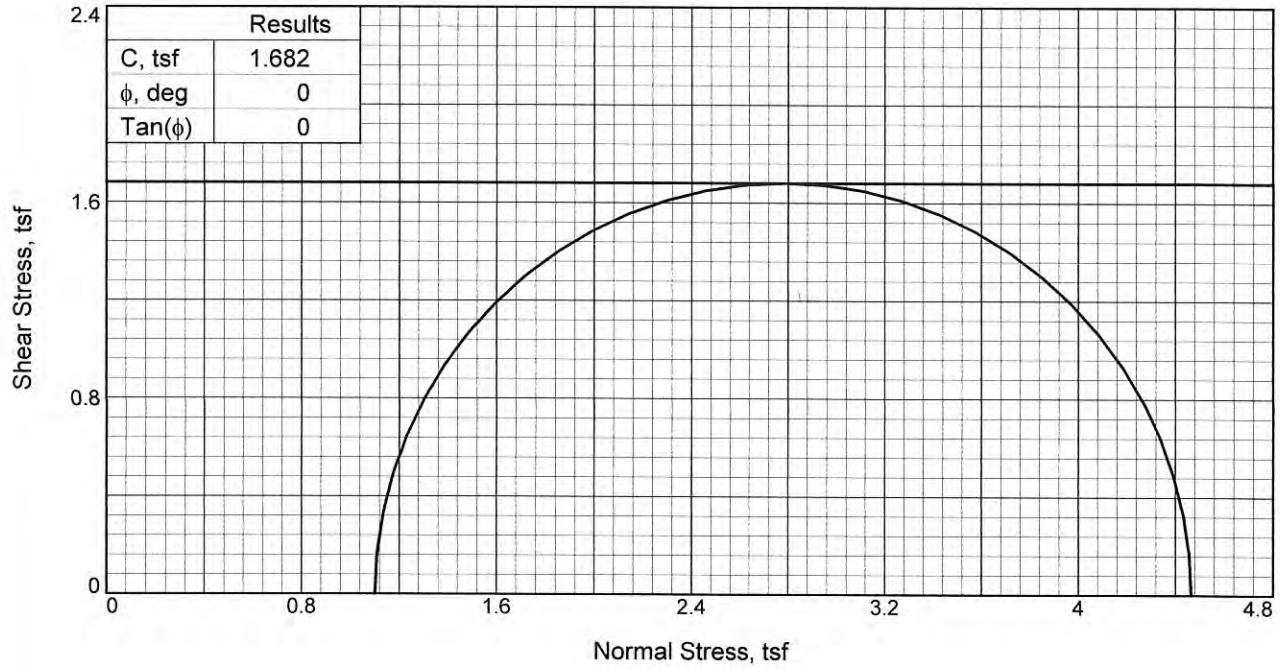
Client:

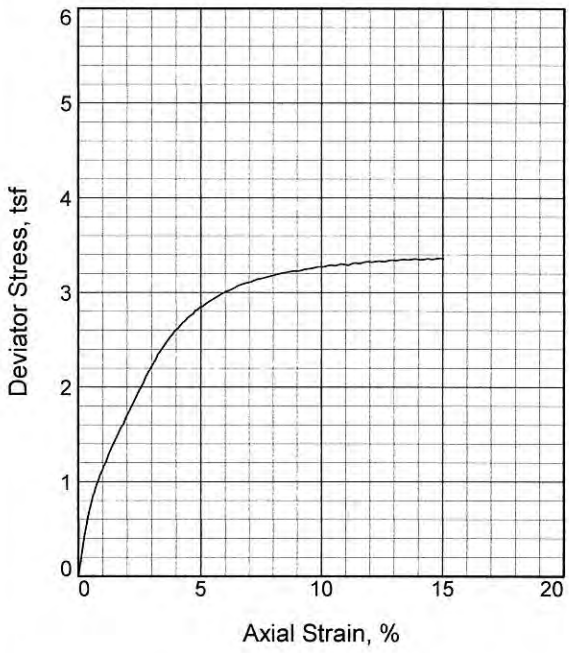
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 38

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	18.6
	Dry Density, pcf	116.0
	Saturation, %	99.5
	Void Ratio	0.5342
	Diameter, in.	2.78
	Height, in.	5.95
At Test	Water Content, %	19.0
	Dry Density, pcf	116.0
	Saturation, %	101.2
	Void Ratio	0.5342
	Diameter, in.	2.78
	Height, in.	5.95
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		15.30
Fail. Stress, tsf		3.36
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		4.46
σ_3 Failure, tsf		1.10

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY with SAND

LL= 42 **PL=** 18 **PI=** 24

Assumed Specific Gravity= 2.85

Remarks: Test Method: ASTM D2850
Failure Type: Buldge

Figure _____

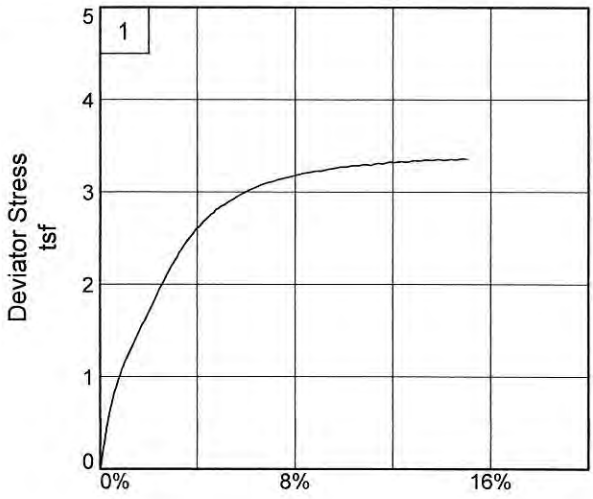
Client:

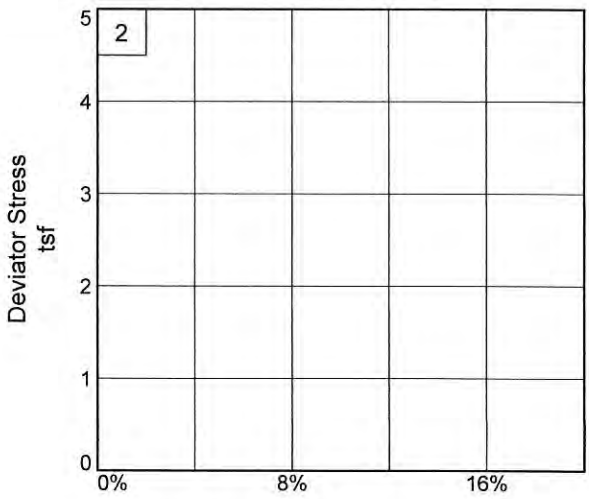
Project: San Jacinto River Waste Pit Superfund Site

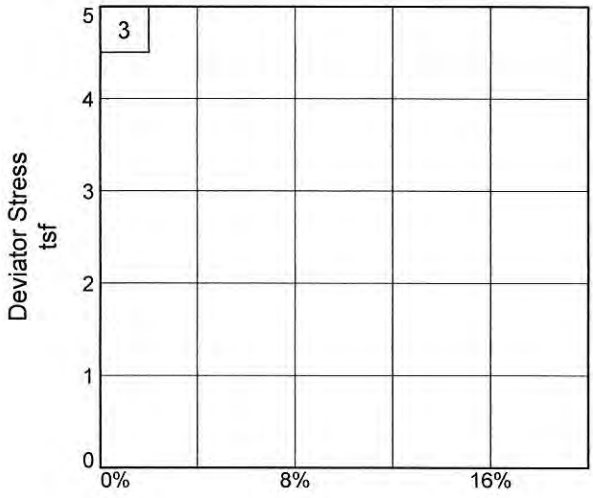
Source of Sample: SJGB047 **Depth:** 43

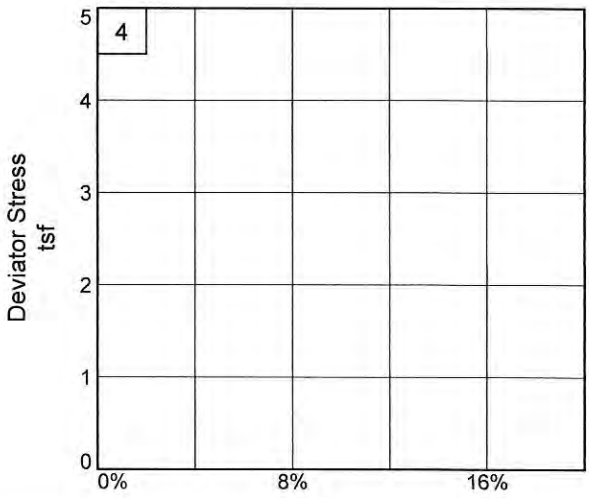
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

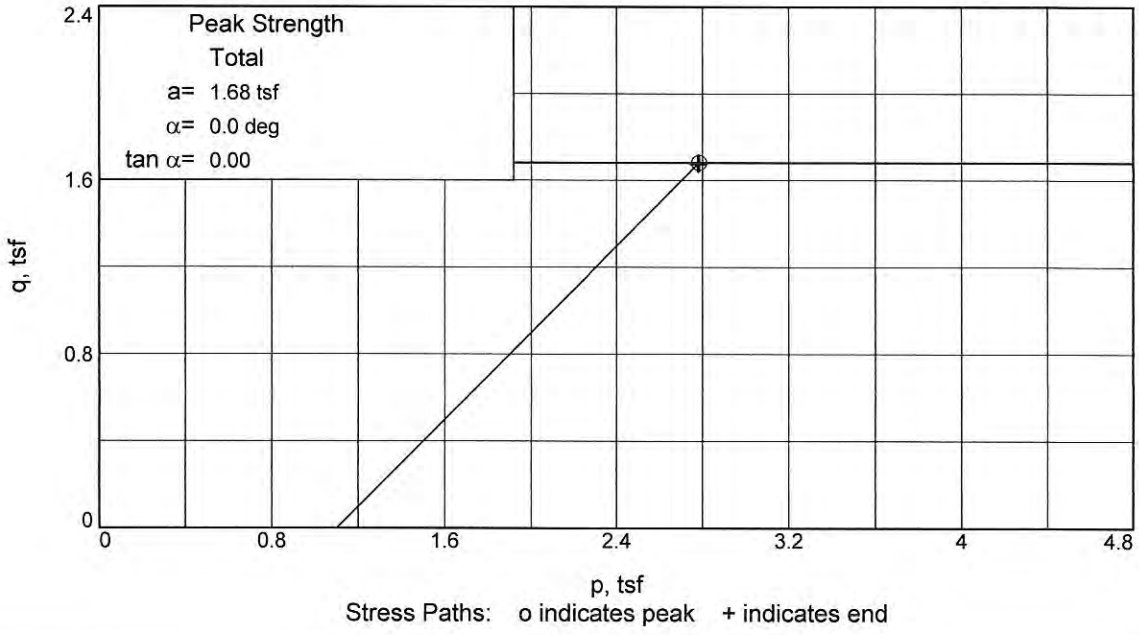
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

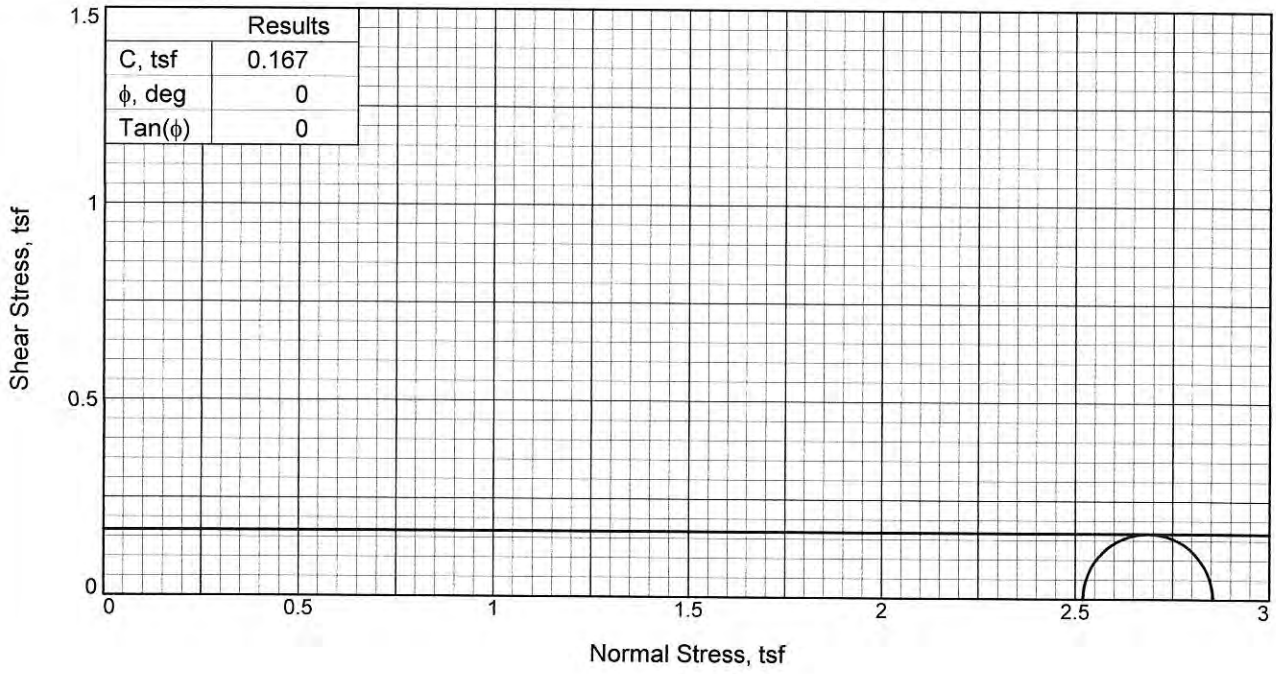
Client:

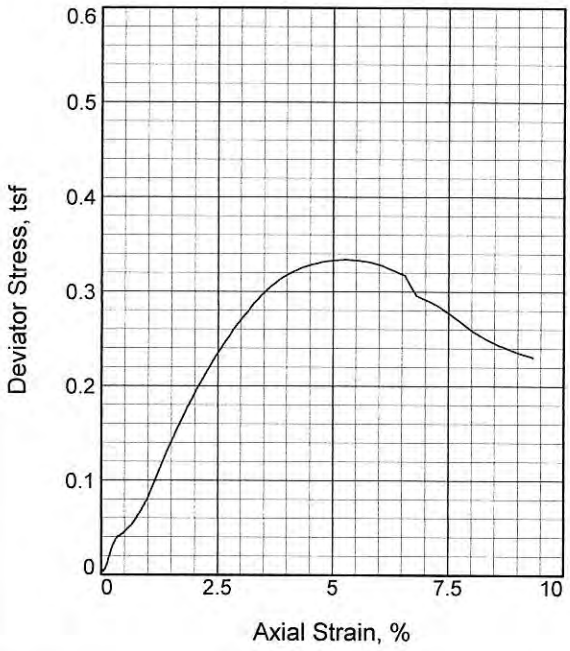
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 43

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	21.4
	Dry Density, pcf	98.0
	Saturation, %	80.4
	Void Ratio	0.7196
	Diameter, in.	2.85
	Height, in.	5.54
At Test	Water Content, %	22.5
	Dry Density, pcf	98.0
	Saturation, %	84.4
	Void Ratio	0.7196
	Diameter, in.	2.85
	Height, in.	5.54
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		35.00
Fail. Stress, tsf		0.33
Strain, %		5.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.85
σ_3 Failure, tsf		2.52

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and gray FAT CLAY

LL= 73 **PL=** 23 **PI=** 50

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Multiple shear

Figure _____

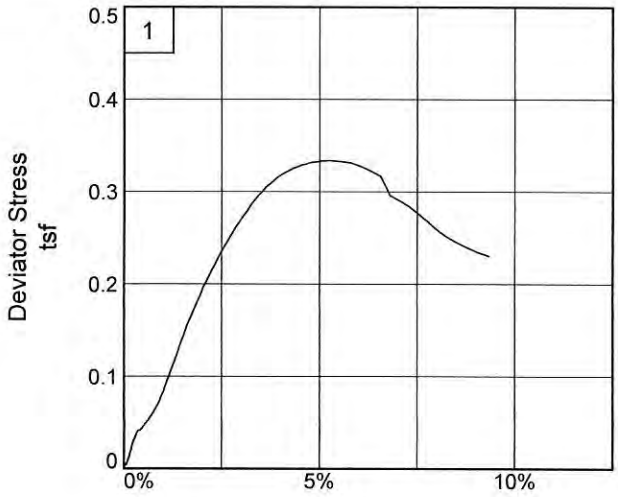
Client:

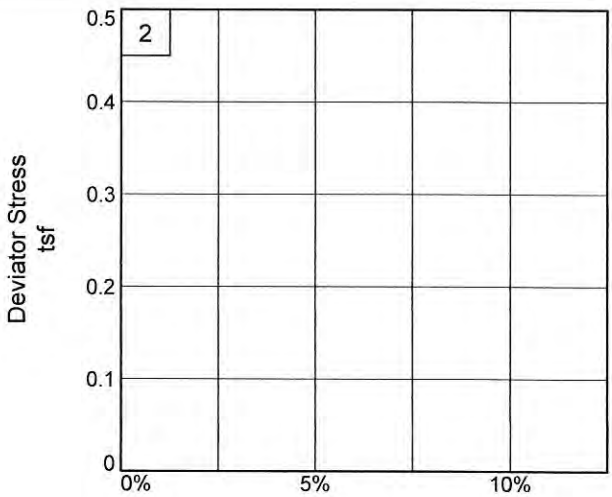
Project: San Jacinto River Waste Pit Superfund Site

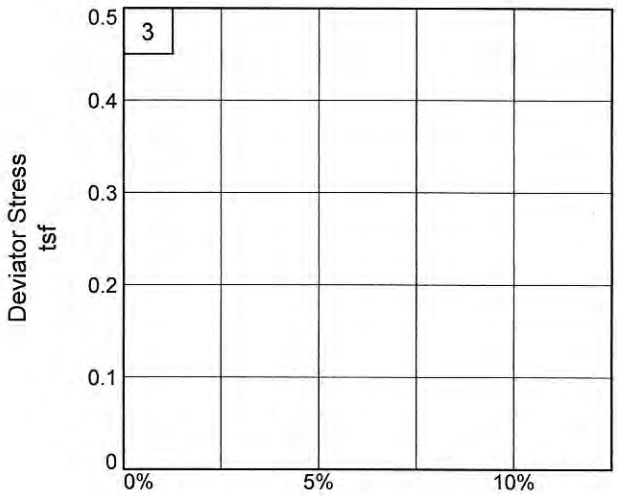
Source of Sample: SJGB047 **Depth:** 98

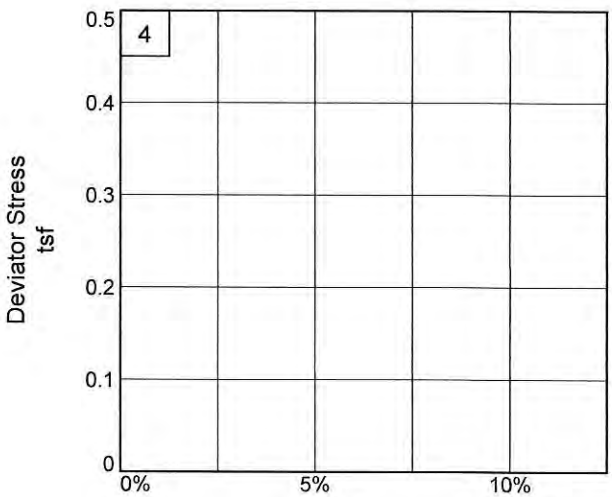
Proj. No.: 19.15.131 **Date Sampled:** 3/3/20

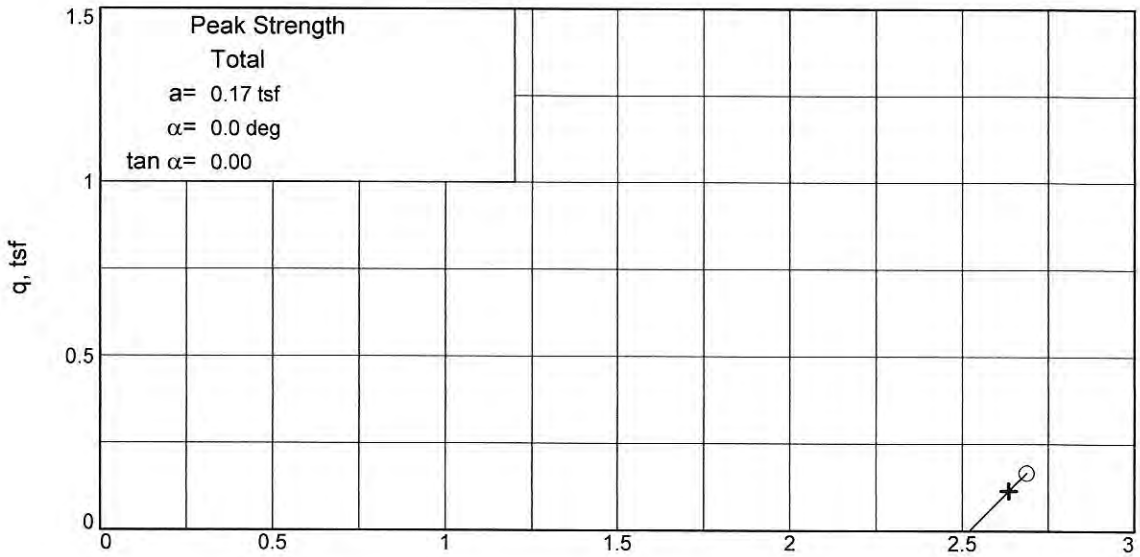
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

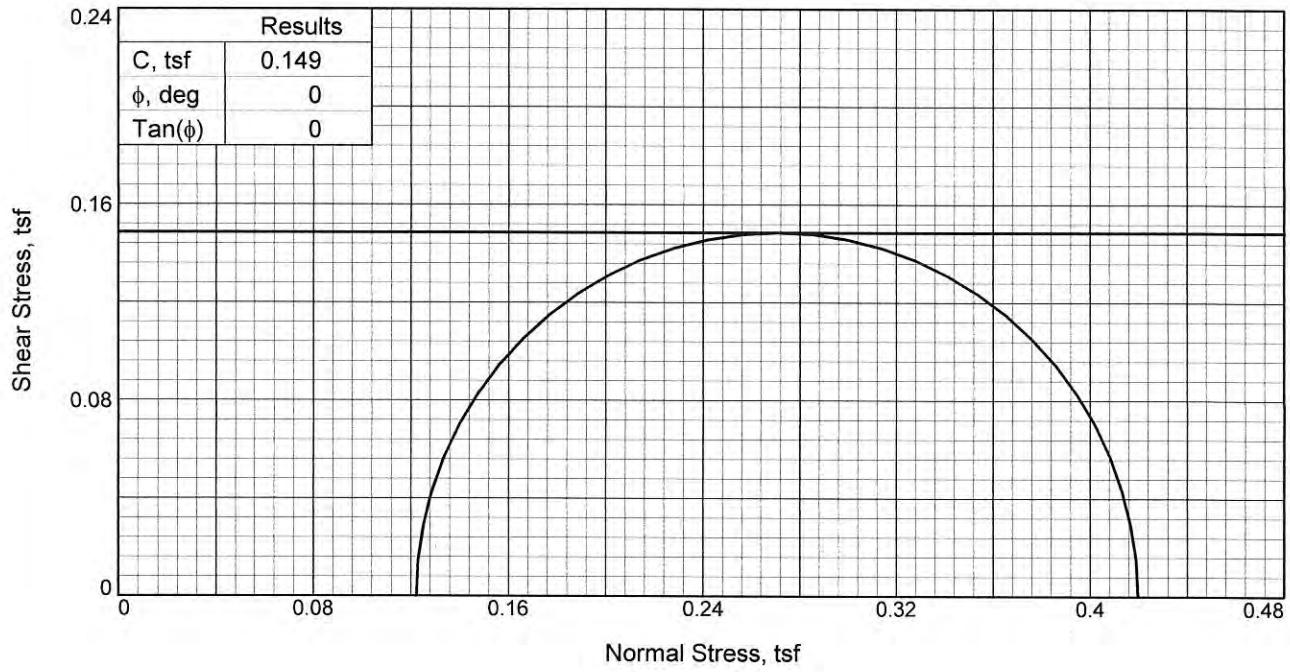
Client:

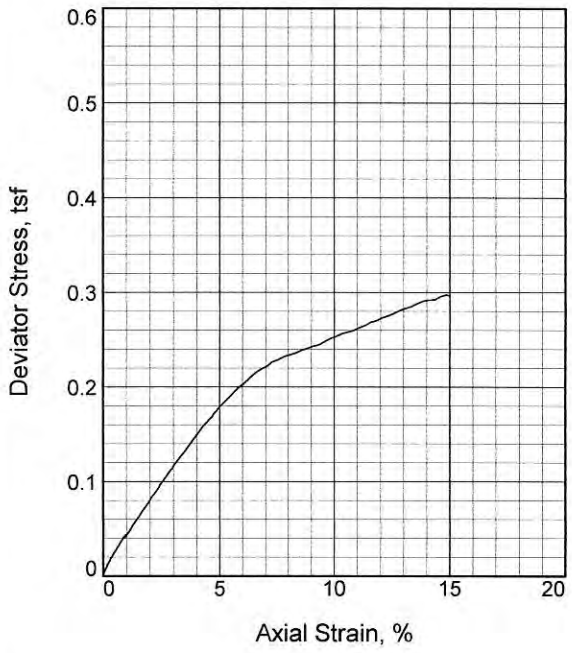
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 98

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	28.6
	Dry Density, pcf	85.0
	Saturation, %	78.6
	Void Ratio	0.9832
	Diameter, in.	2.85
	Height, in.	5.17
At Test	Water Content, %	27.8
	Dry Density, pcf	85.0
	Saturation, %	76.4
	Void Ratio	0.9832
	Diameter, in.	2.85
	Height, in.	5.17
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.70
Fail. Stress, tsf		0.30
Strain, %		14.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.42
σ_3 Failure, tsf		0.12

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Dark gray FAT CLAY

LL= 32 **PL=** 16 **PI=** 16
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

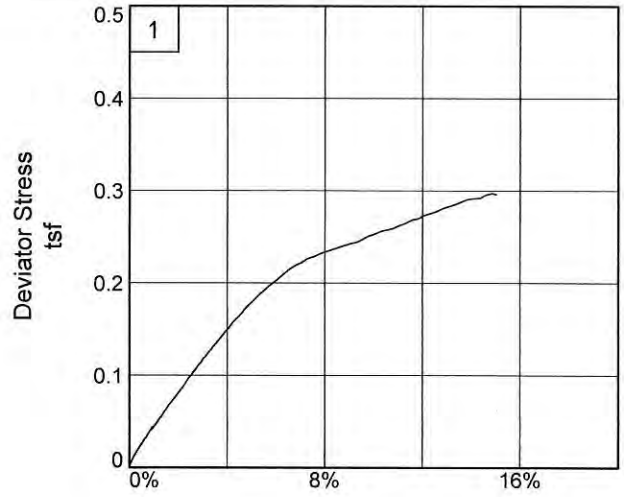
Client:

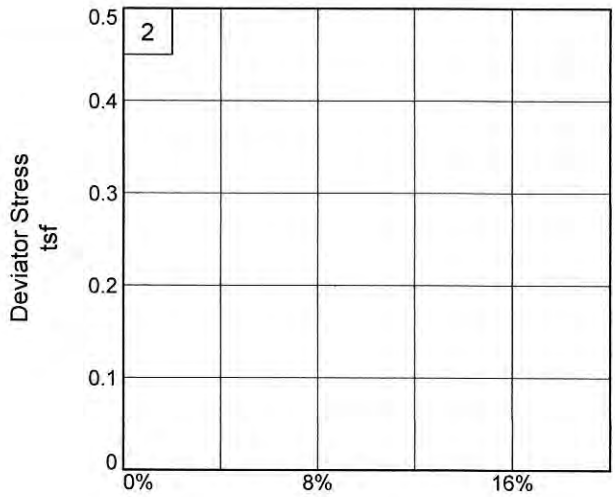
Project: San Jacinto River Waste Pit Superfund Site

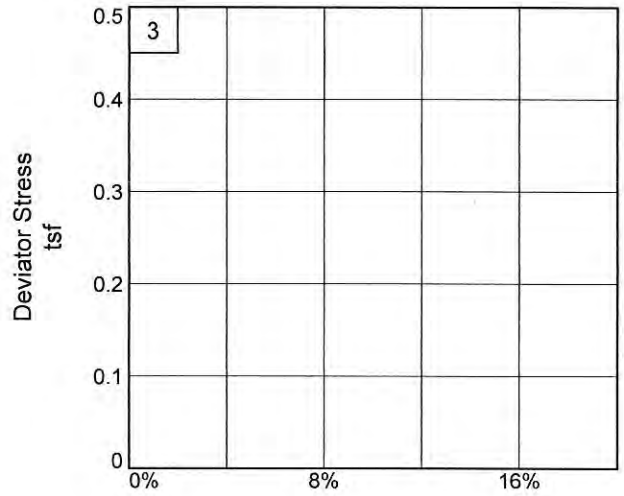
Source of Sample: SJGB050 **Depth:** 4-6

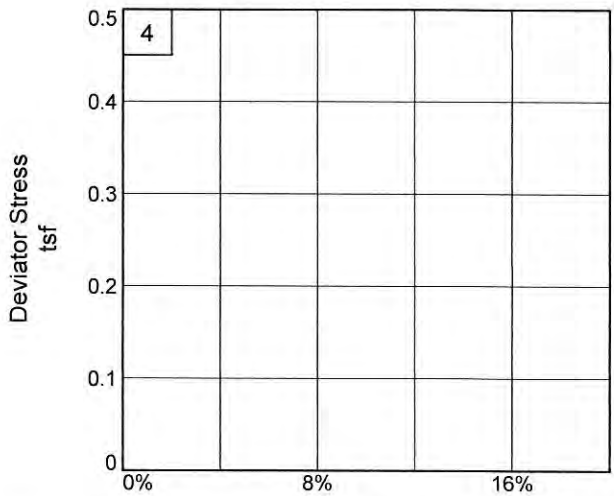
Proj. No.: 19.15.131 **Date Sampled:** 2/20/20

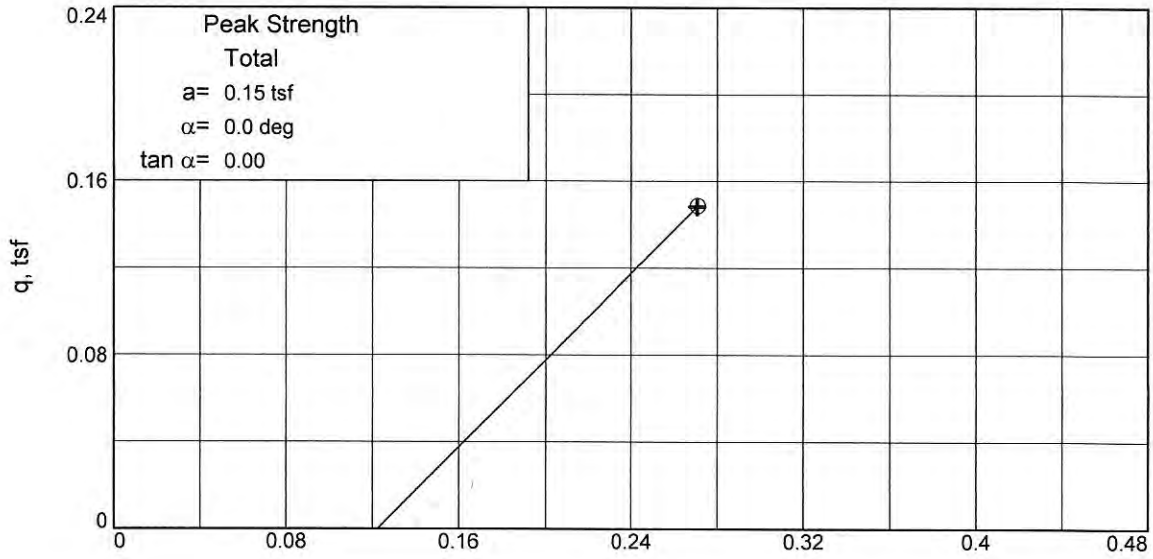
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

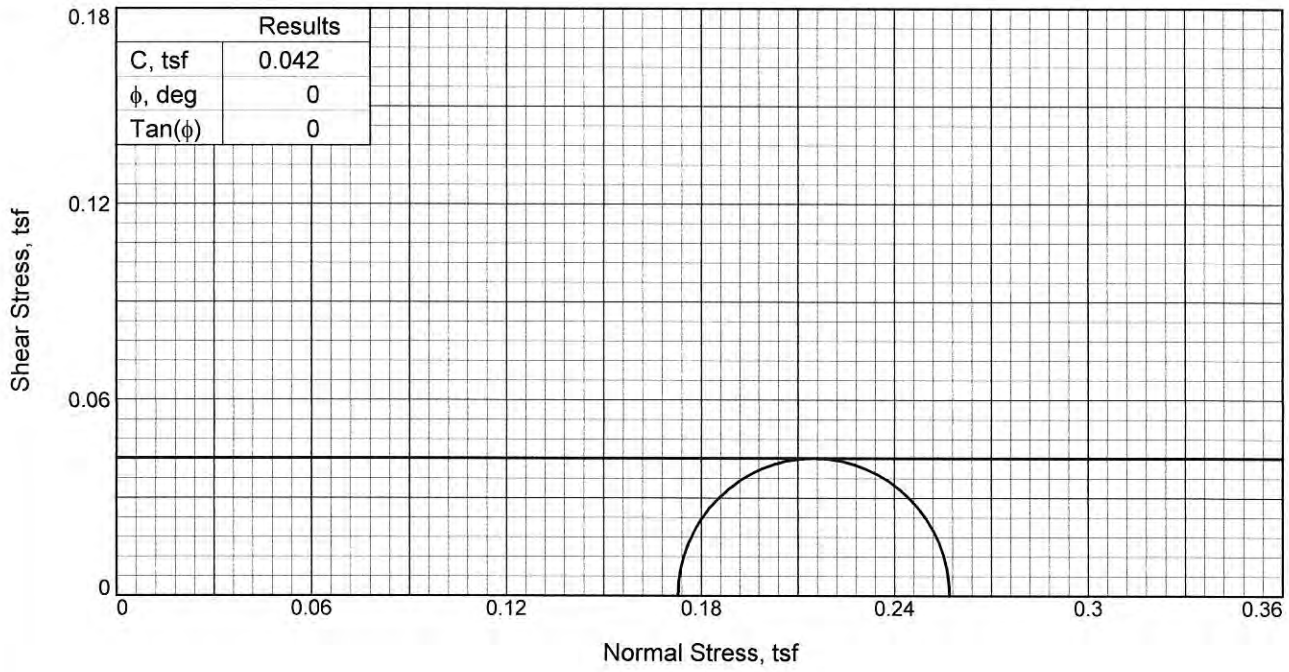
Client:

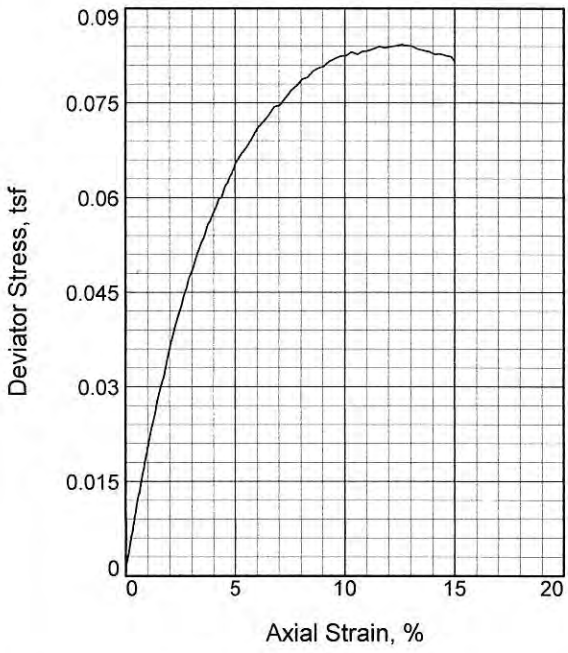
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB050 **Depth:** 4-6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	32.8
	Dry Density, pcf	85.3
	Saturation, %	90.7
	Void Ratio	0.9761
	Diameter, in.	2.73
	Height, in.	5.70
At Test	Water Content, %	34.1
	Dry Density, pcf	85.3
	Saturation, %	94.2
	Void Ratio	0.9761
	Diameter, in.	2.73
	Height, in.	5.70
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		2.40
Fail. Stress, tsf		0.08
Strain, %		12.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		0.26
σ_3 Failure, tsf		0.17

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Dark gray CLAYEY SAND

LL= 34 **PL=** 17 **PI=** 17

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

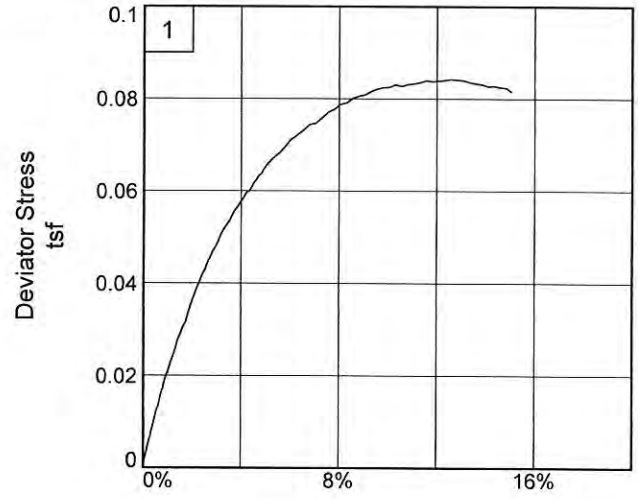
Client:

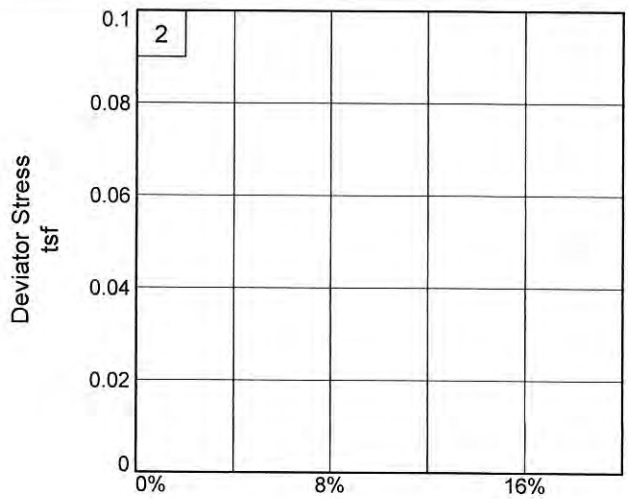
Project: San Jacinto River Waste Pit Superfund Site

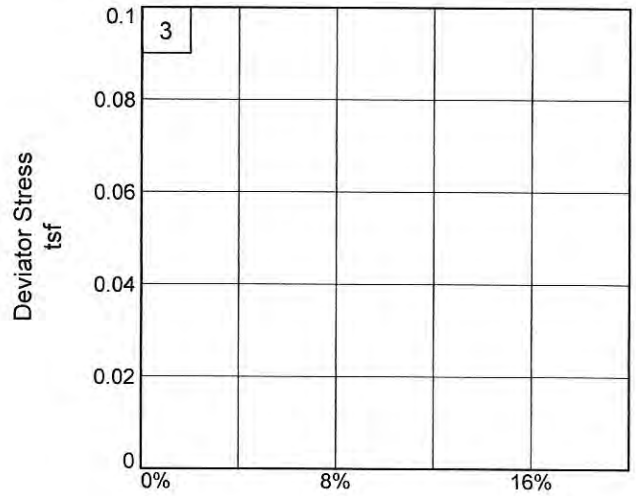
Source of Sample: SJGB050 **Depth:** 6-8

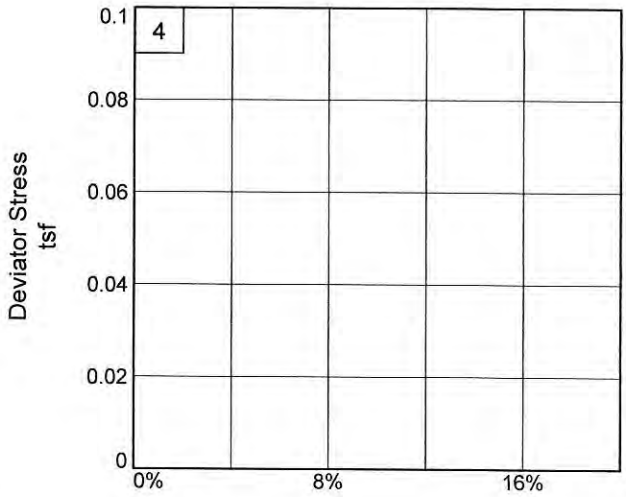
Proj. No.: 19.15.131 **Date Sampled:** 2/20/20

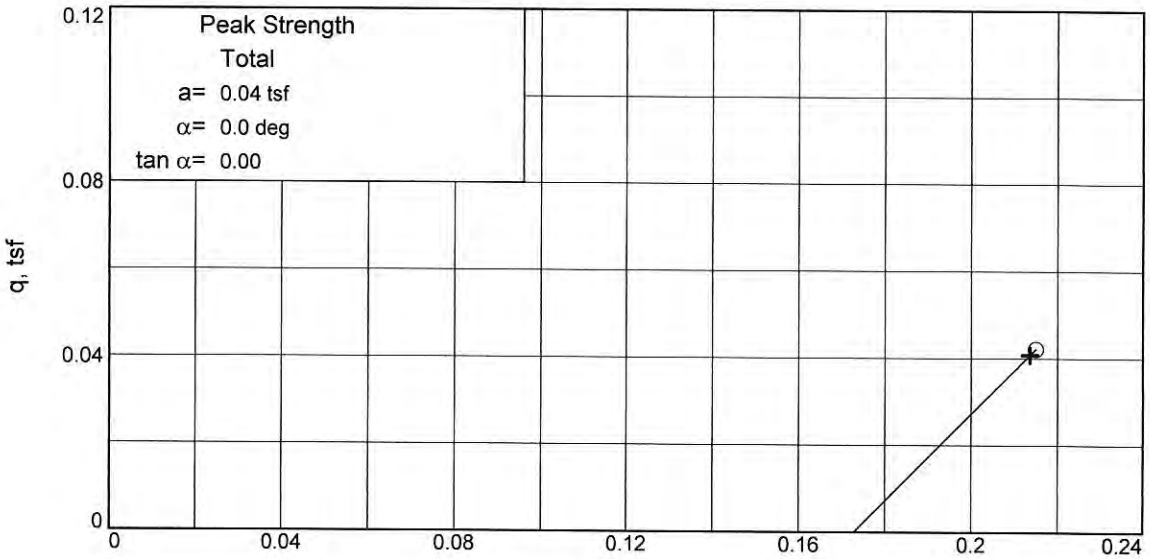
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

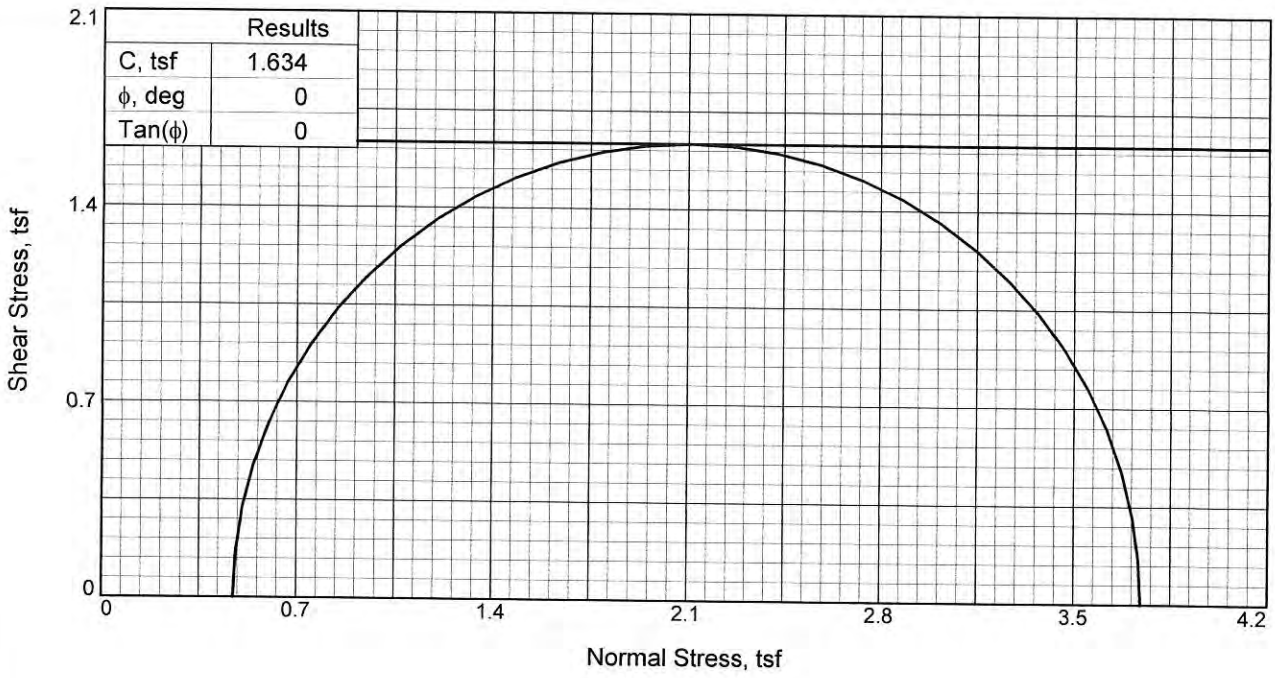
Client:

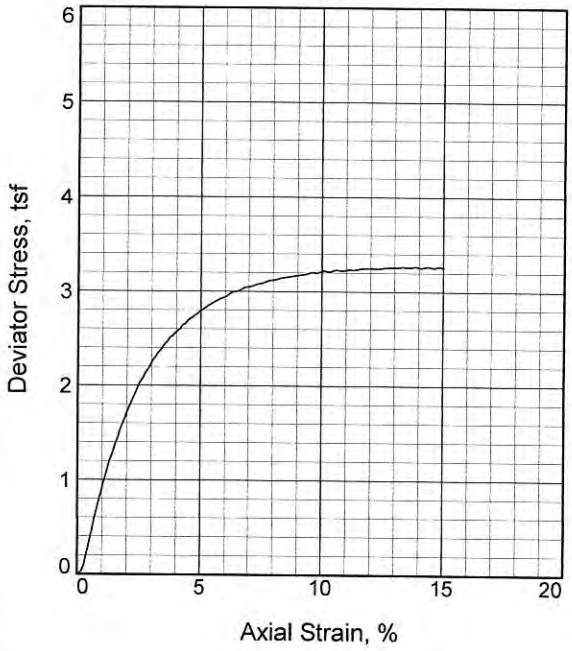
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB050 **Depth:** 6-8

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	17.3
	Dry Density, pcf	116.3
	Saturation, %	99.2
	Void Ratio	0.4816
	Diameter, in.	2.79
	Height, in.	5.84
At Test	Water Content, %	17.6
	Dry Density, pcf	116.3
	Saturation, %	101.1
	Void Ratio	0.4816
	Diameter, in.	2.79
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		6.60
Fail. Stress, tsf		3.27
Strain, %		14.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.74
σ_3 Failure, tsf		0.48

Type of Test: Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY

LL= 45 **PL=** 22 **PI=** 23

Assumed Specific Gravity= 2.76

Remarks: Test Method: ASTM D2850
Failure Type: Bulge

Figure _____

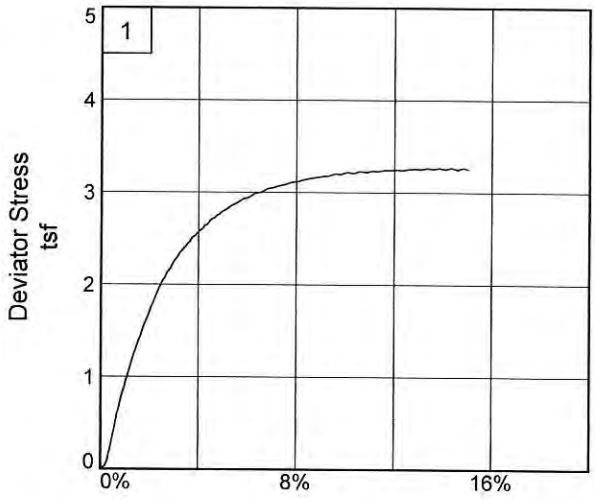
Client:

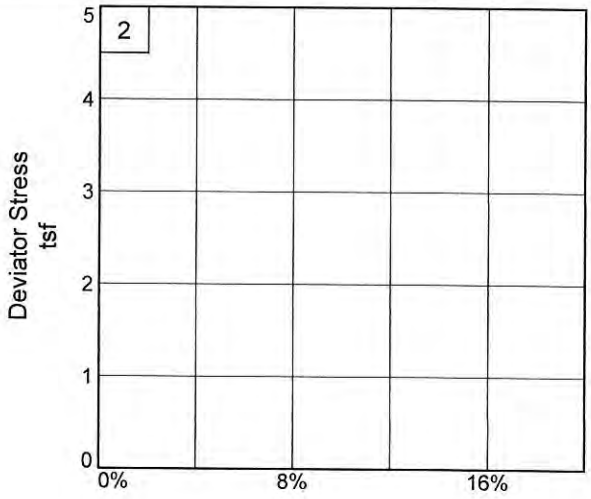
Project: San Jacinto River Waste Pit Superfund Site

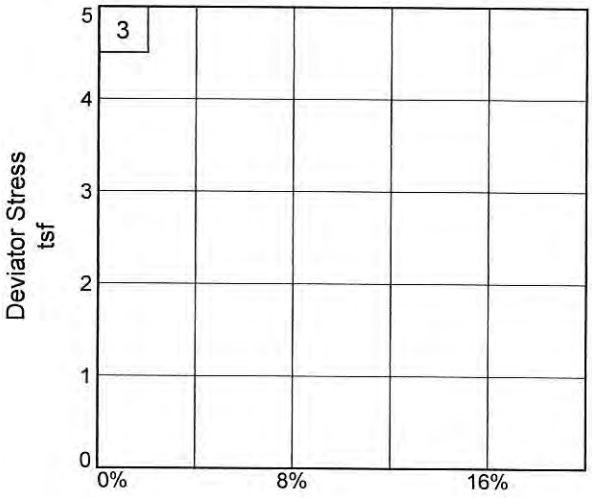
Source of Sample: SJGB053 **Depth:** 18

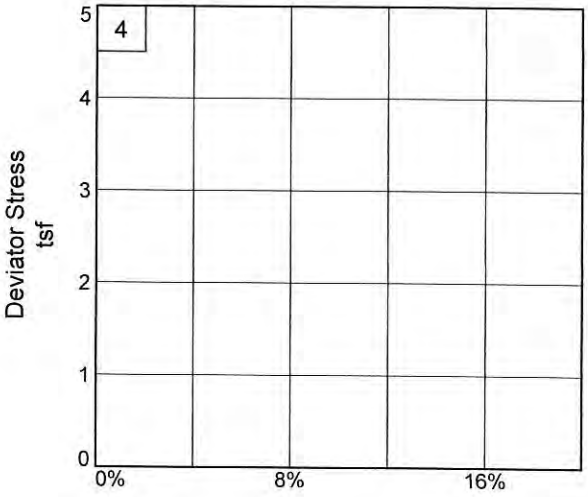
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

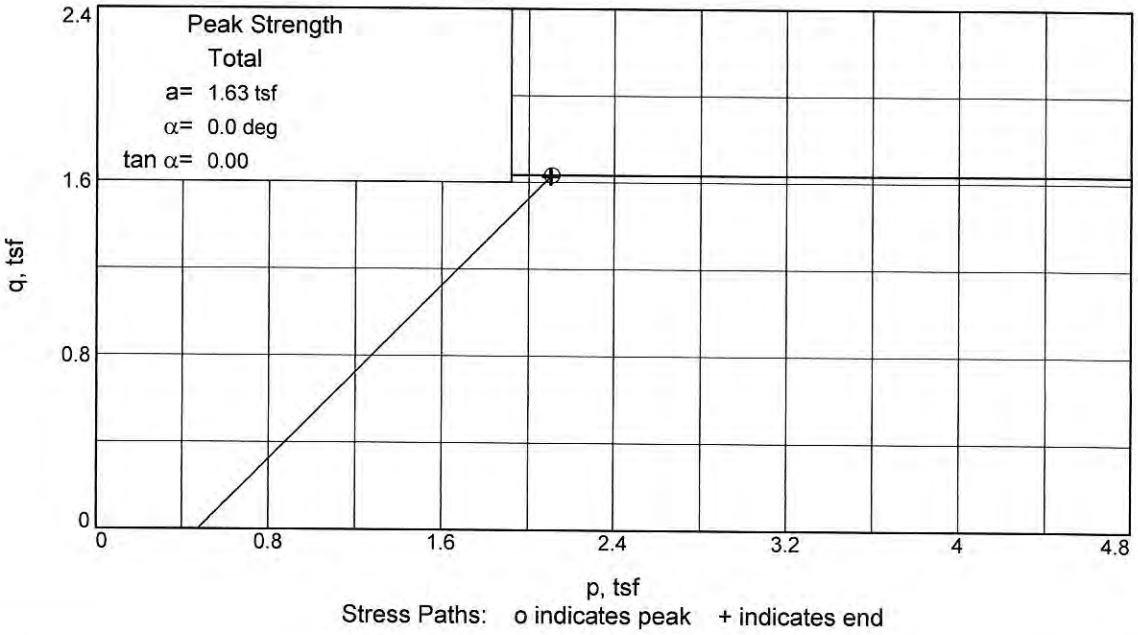
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

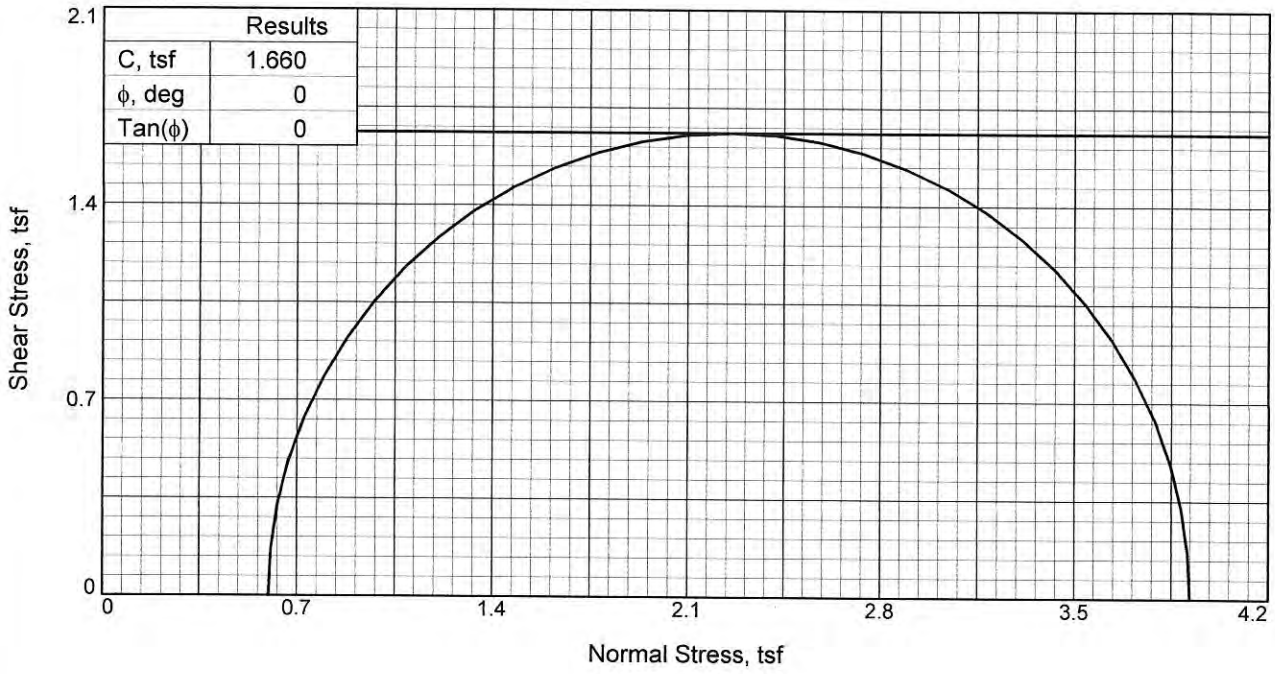
Client:

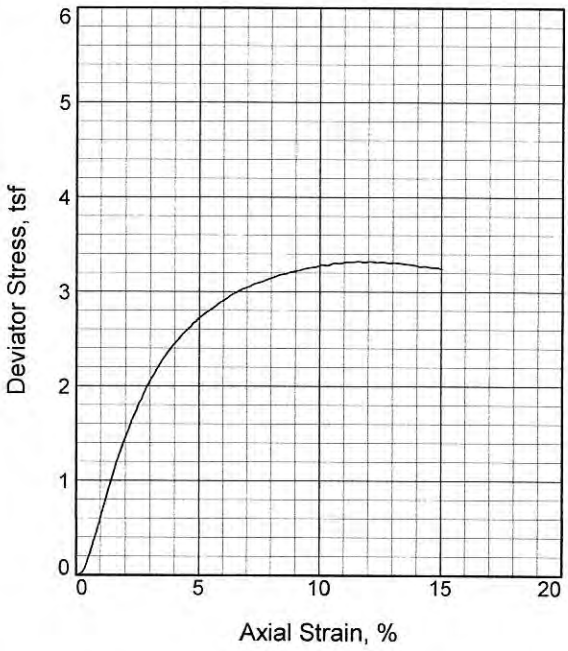
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 18

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	17.5
	Dry Density, pcf	116.0
	Saturation, %	99.5
	Void Ratio	0.4850
	Diameter, in.	2.79
	Height, in.	5.84
At Test	Water Content, %	16.9
	Dry Density, pcf	116.0
	Saturation, %	96.0
	Void Ratio	0.4850
	Diameter, in.	2.79
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		8.30
Fail. Stress, tsf		3.32
Strain, %		12.1
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.92
σ_3 Failure, tsf		0.60

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan LEAN CLAY with SAND

LL= 46 **PL=** 21 **PI=** 25

Assumed Specific Gravity= 2.76

Remarks:
Test Method: ASTM D2850
Failure Type: Buldge

Figure _____

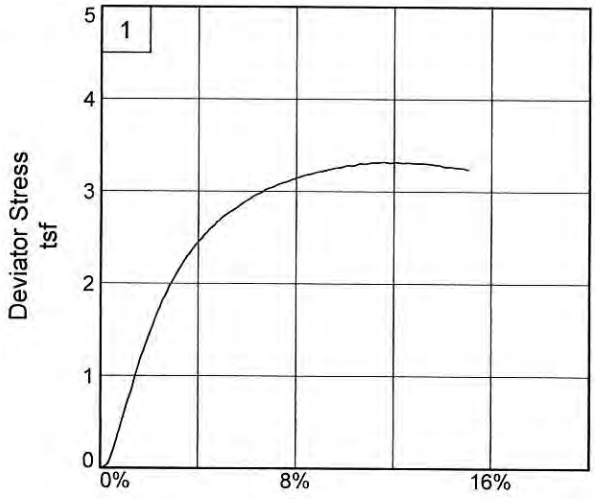
Client:

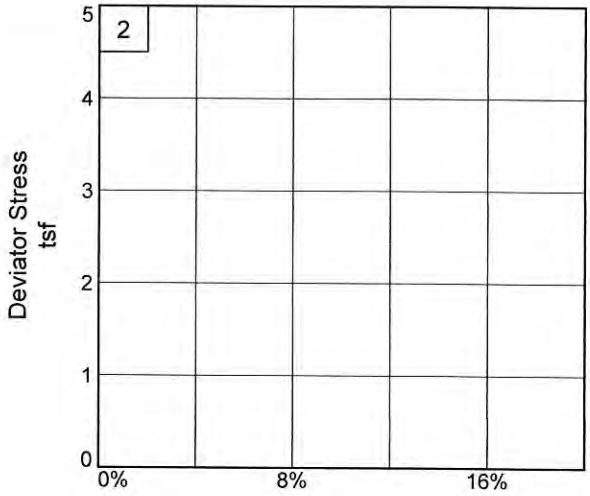
Project: San Jacinto River Waste Pit Superfund Site

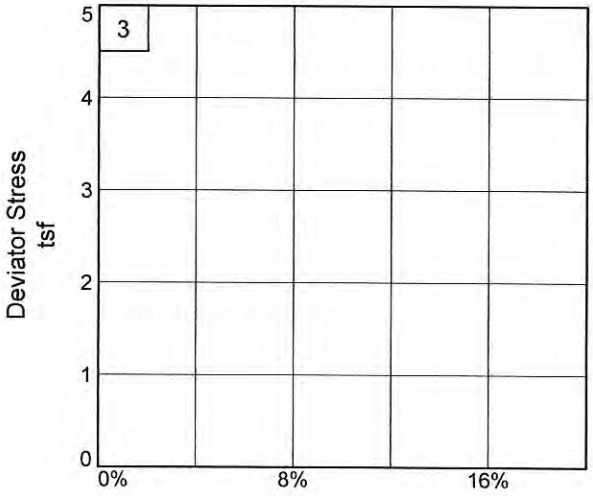
Source of Sample: SJGB053 **Depth:** 23

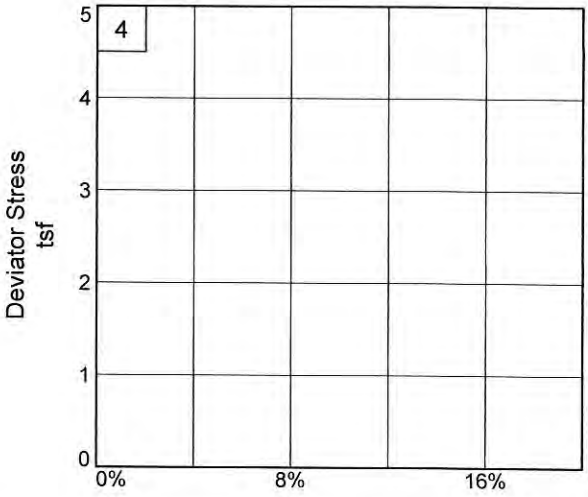
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

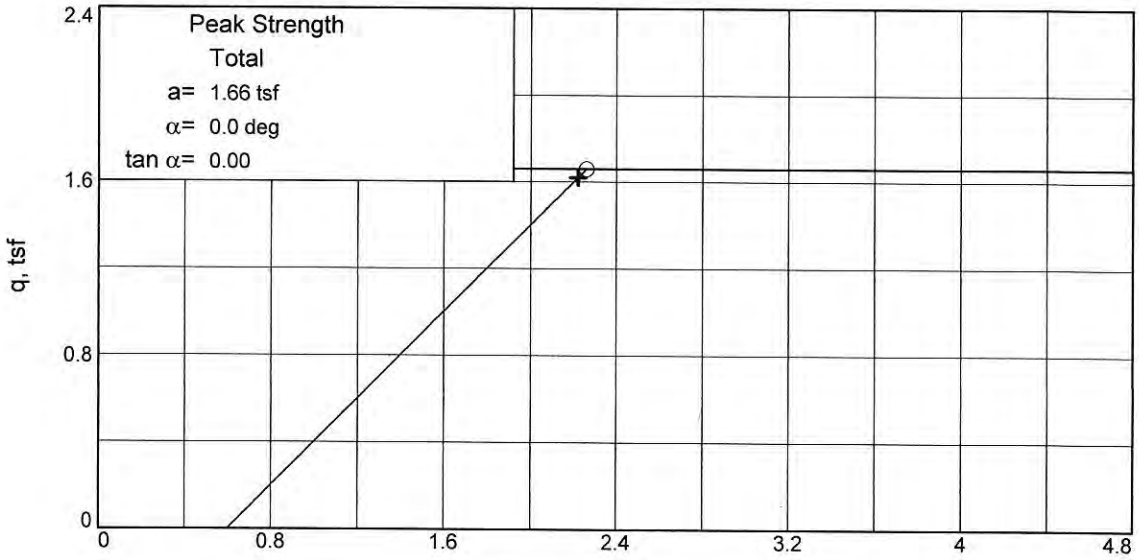
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

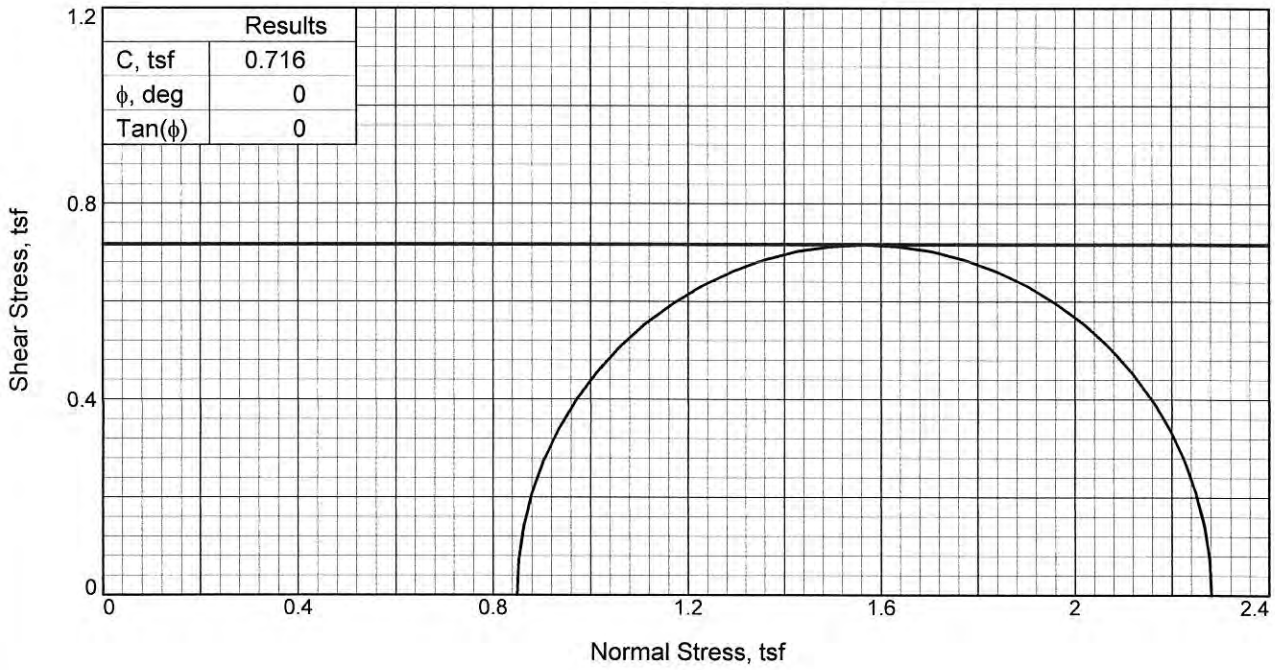
Client:

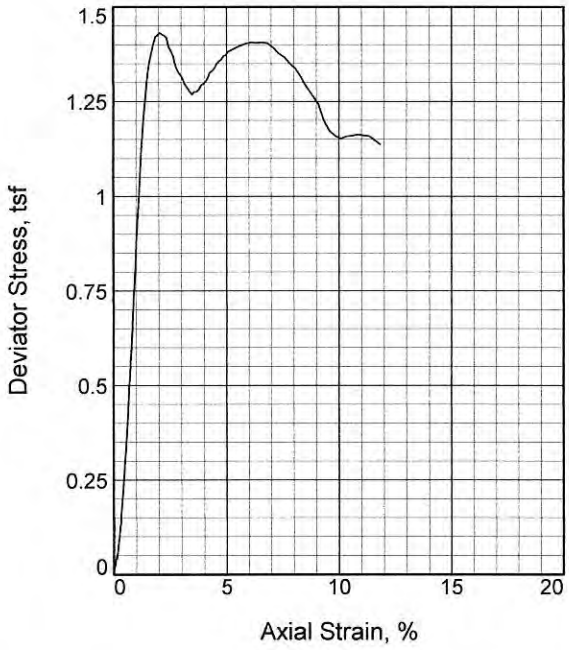
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 23

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	28.4
	Dry Density, pcf	96.0
	Saturation, %	99.9
	Void Ratio	0.7752
	Diameter, in.	2.82
	Height, in.	5.89
At Test	Water Content, %	30.8
	Dry Density, pcf	96.0
	Saturation, %	108.6
	Void Ratio	0.7752
	Diameter, in.	2.82
	Height, in.	5.89
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		11.80
Fail. Stress, tsf		1.43
Strain, %		2.0
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.28
σ_3 Failure, tsf		0.85

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish Brown FAT CLAY

LL= 70 **PL=** 37 **PI=** 33

Assumed Specific Gravity= 2.73

Remarks: Test Method: ASTM D2850
Failure type: Slickenslide

Figure _____

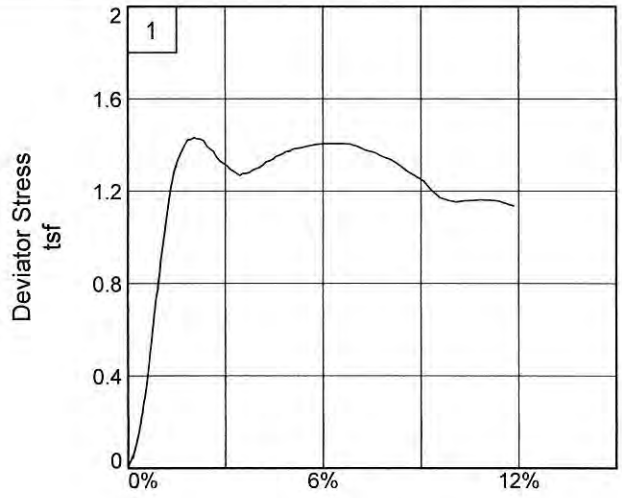
Client:

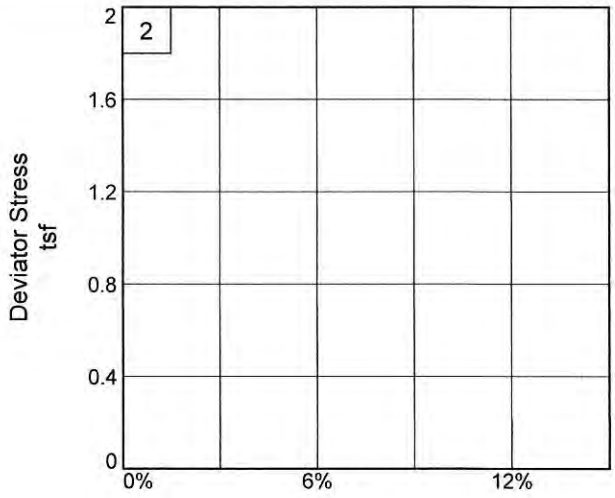
Project: San Jacinto River Waste Pit Superfund Site

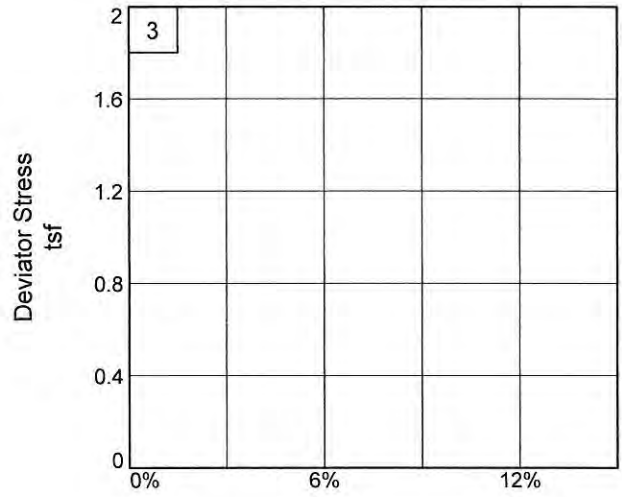
Source of Sample: SJGB053 **Depth:** 33

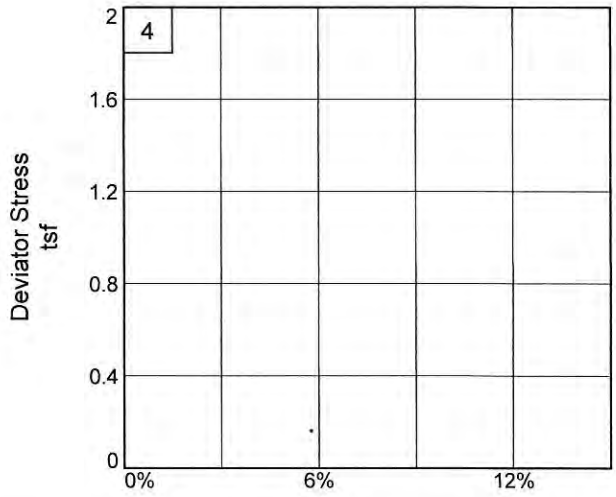
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

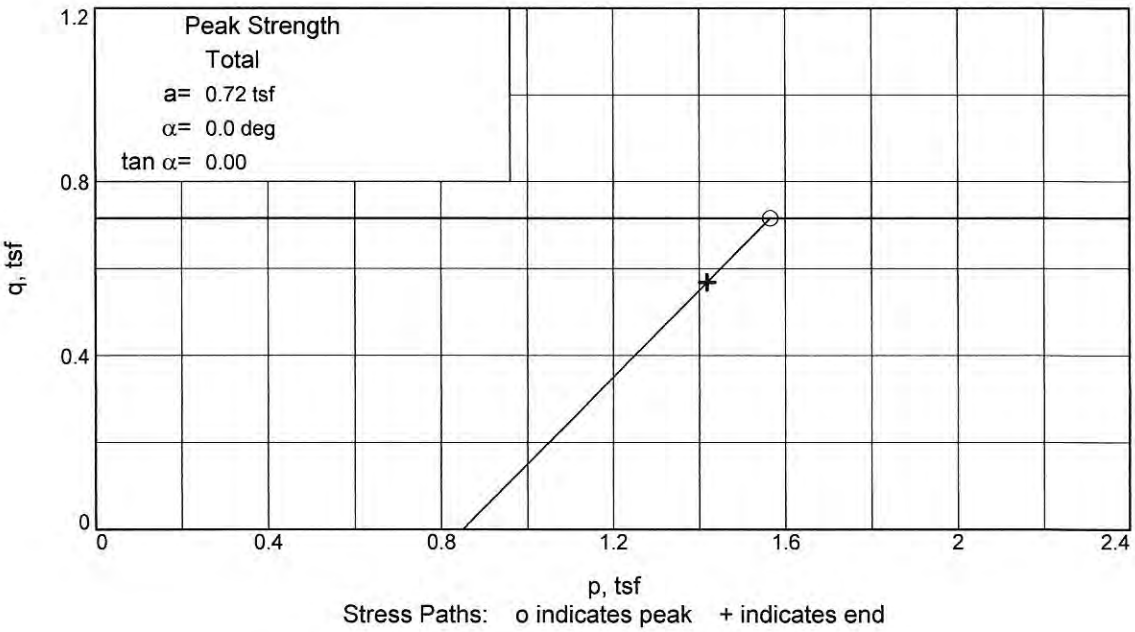
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

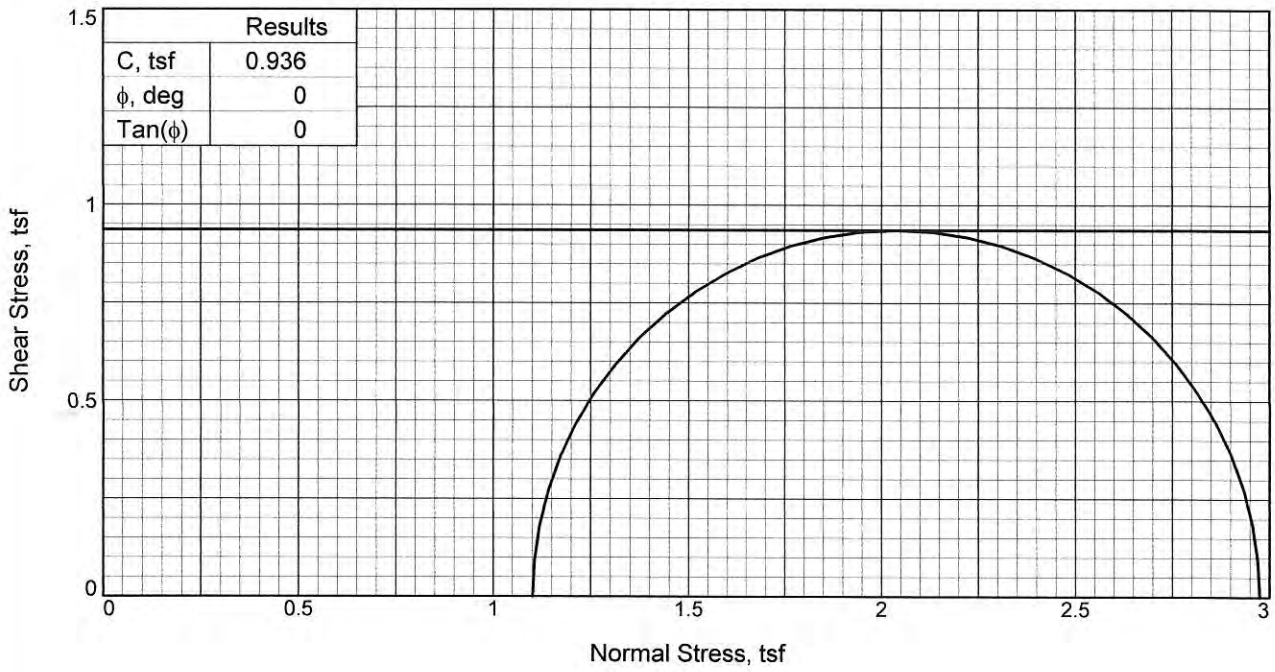
Client:

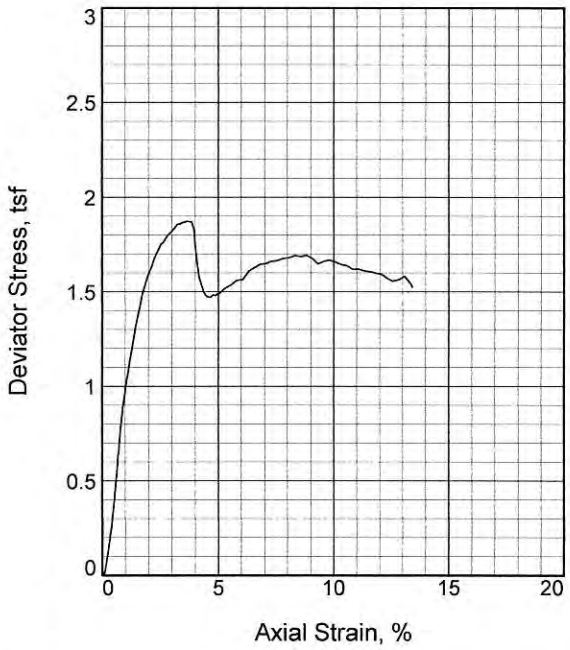
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 33

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	27.0
	Dry Density, pcf	96.9
	Saturation, %	99.6
	Void Ratio	0.7266
	Diameter, in.	2.82
	Height, in.	5.85
At Test	Water Content, %	28.3
	Dry Density, pcf	96.9
	Saturation, %	104.5
	Void Ratio	0.7266
	Diameter, in.	2.82
	Height, in.	5.85
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		15.30
Fail. Stress, tsf		1.87
Strain, %		3.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.97
σ_3 Failure, tsf		1.10

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray FAT CLAY

LL= 71 **PL=** 35 **PI=** 36

Assumed Specific Gravity= 2.68

Remarks: Test Method: ASTM D2850
Failure type: Slickenslide

Figure _____

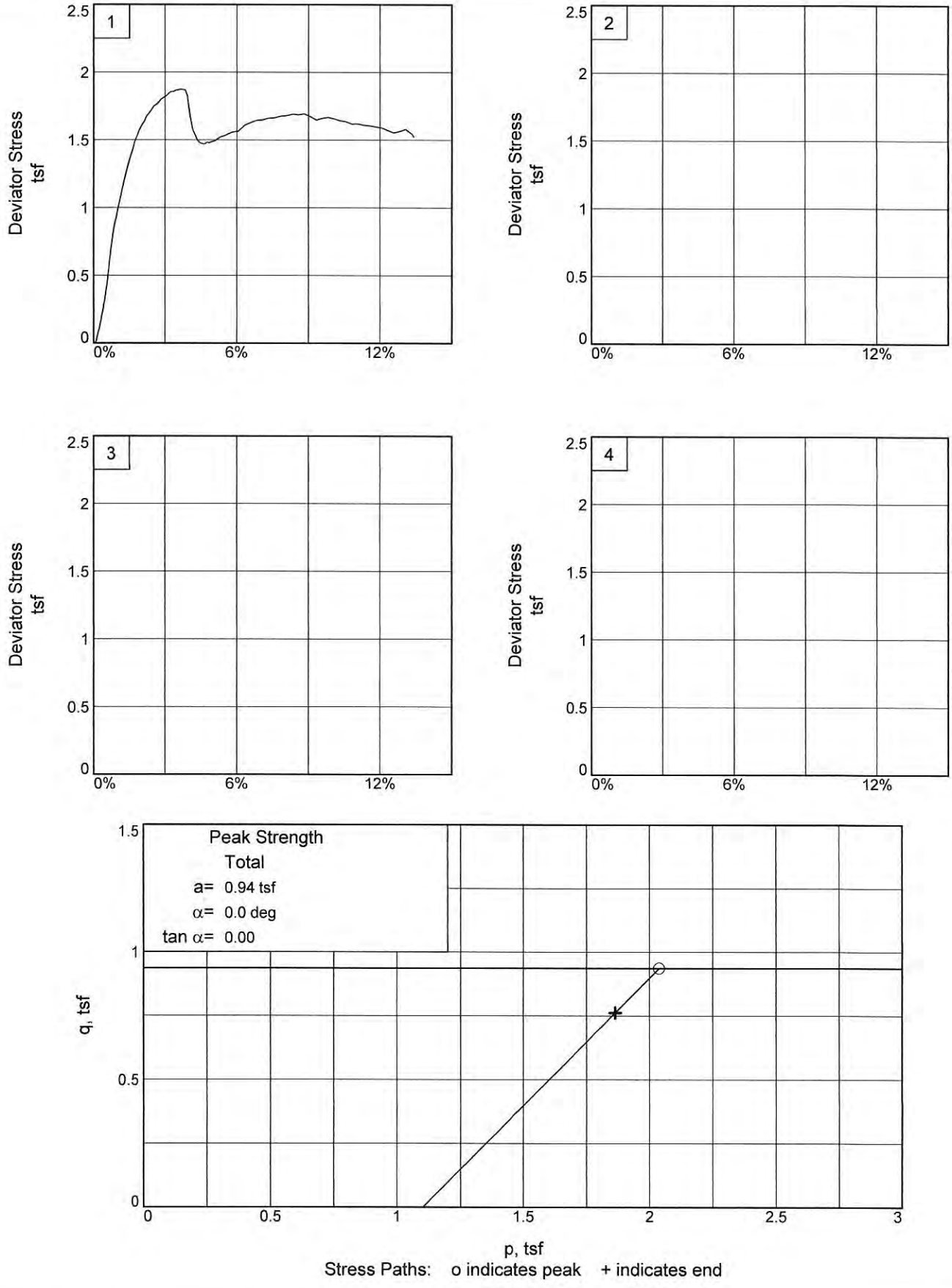
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 43

Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



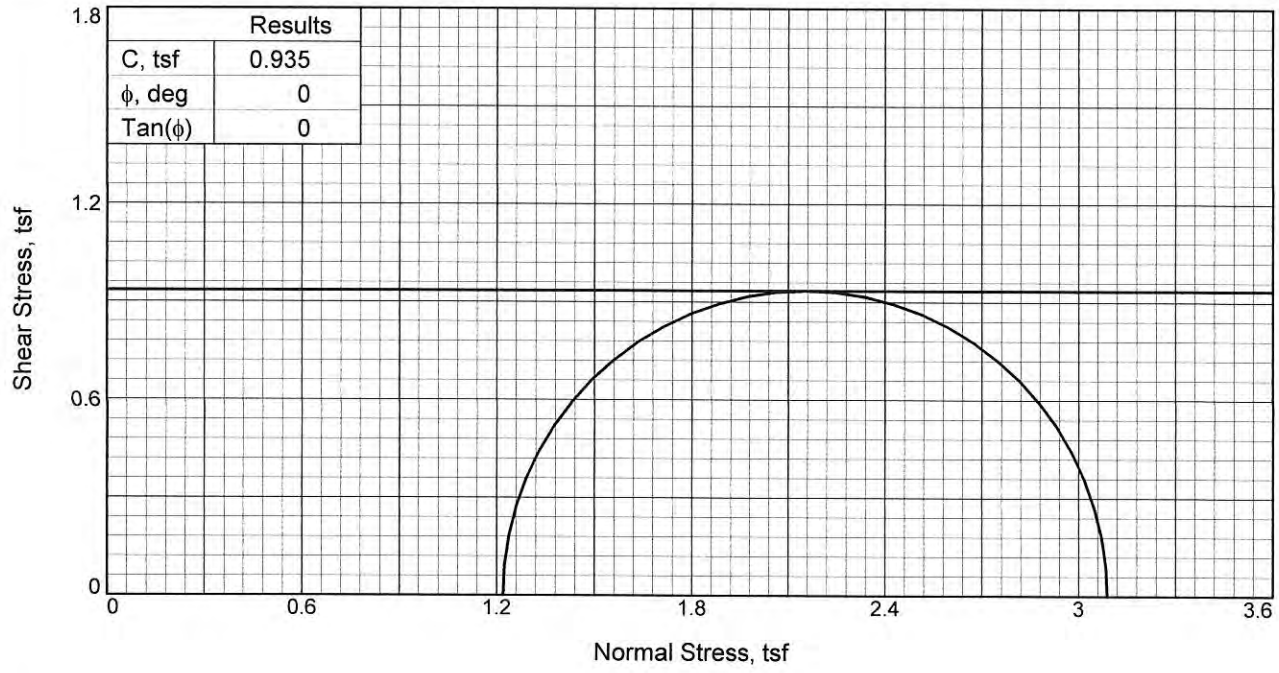
Client:

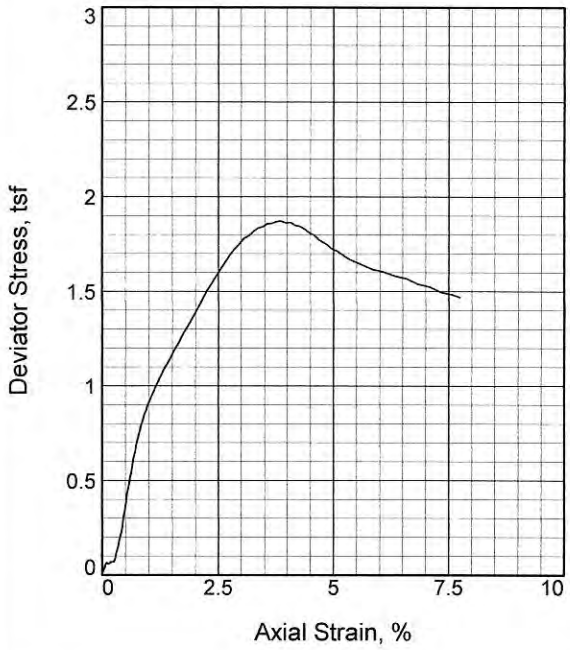
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 43

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.5
	Dry Density, pcf	106.7
	Saturation, %	99.7
	Void Ratio	0.5442
	Diameter, in.	2.82
	Height, in.	5.91
At Test	Water Content, %	21.3
	Dry Density, pcf	106.7
	Saturation, %	103.4
	Void Ratio	0.5442
	Diameter, in.	2.82
	Height, in.	5.91
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		16.93
Fail. Stress, tsf		1.87
Strain, %		3.9
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.09
σ_3 Failure, tsf		1.22

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY

LL= 47 **PL=** 21 **PI=** 26

Assumed Specific Gravity= 2.64

Remarks: Test Method: ASTM D2850
Failure type: 60 degree

Figure _____

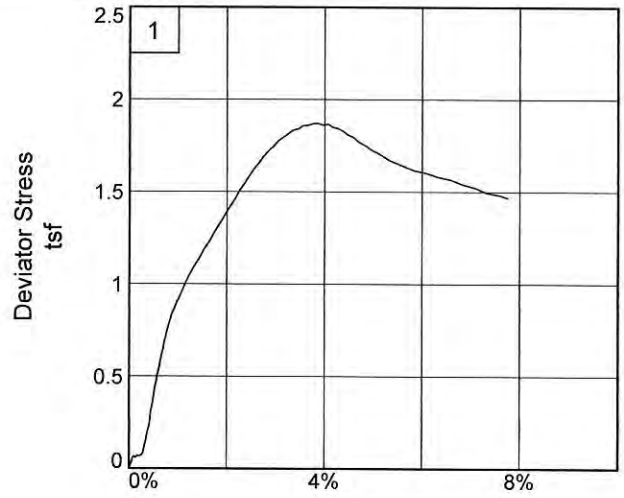
Client:

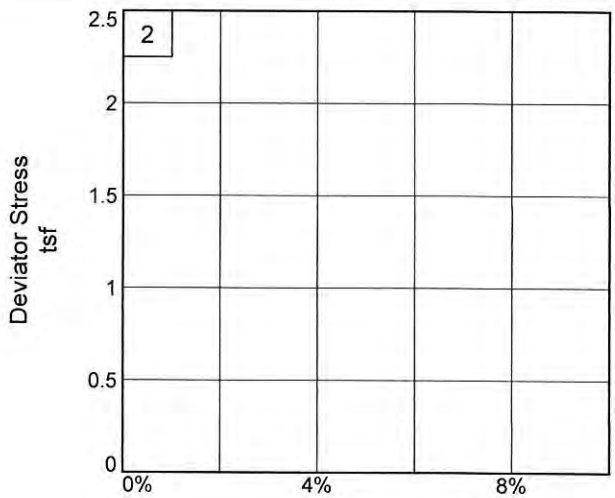
Project: San Jacinto River Waste Pit Superfund Site

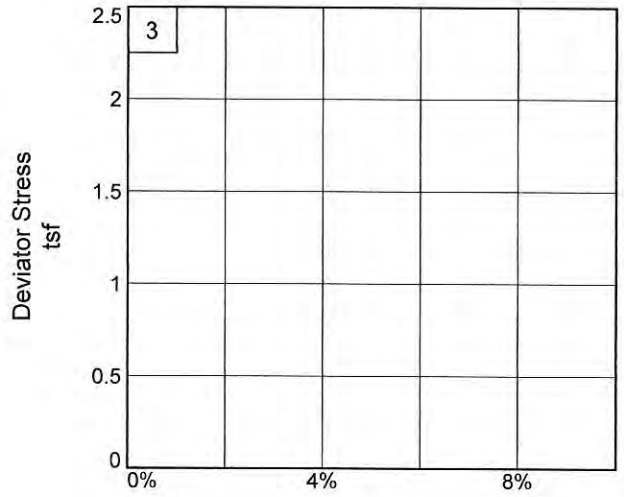
Source of Sample: SJGB053 **Depth:** 48

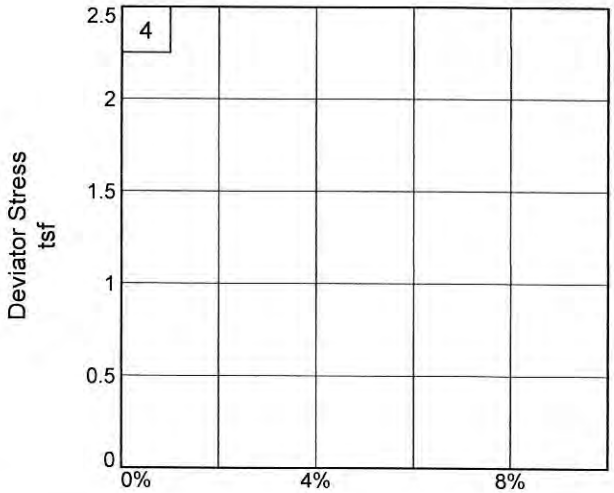
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

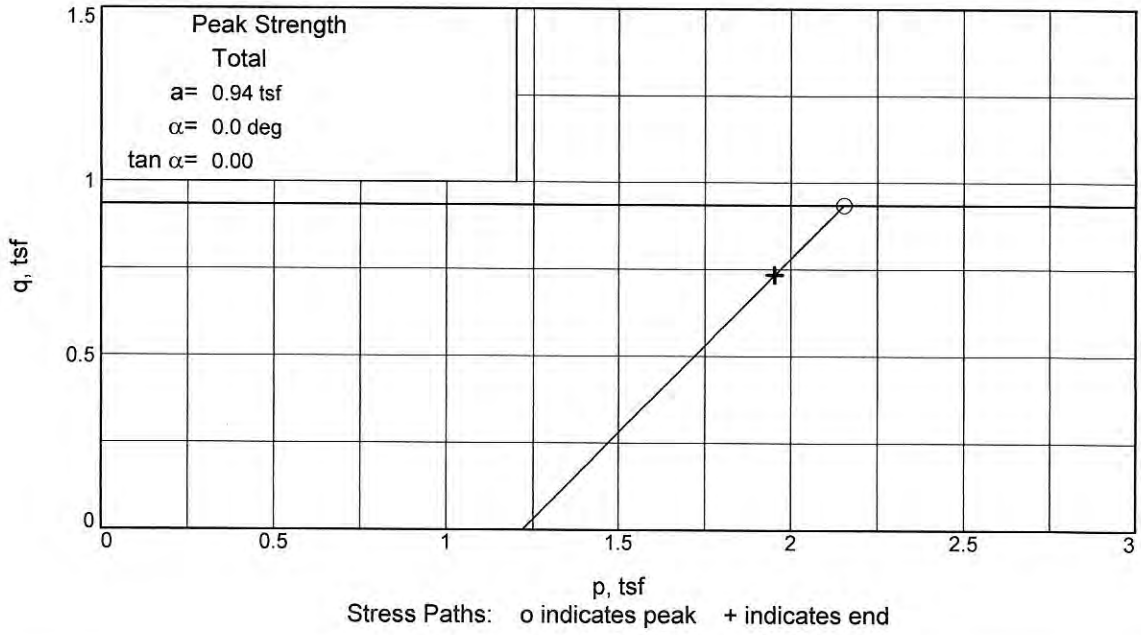
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

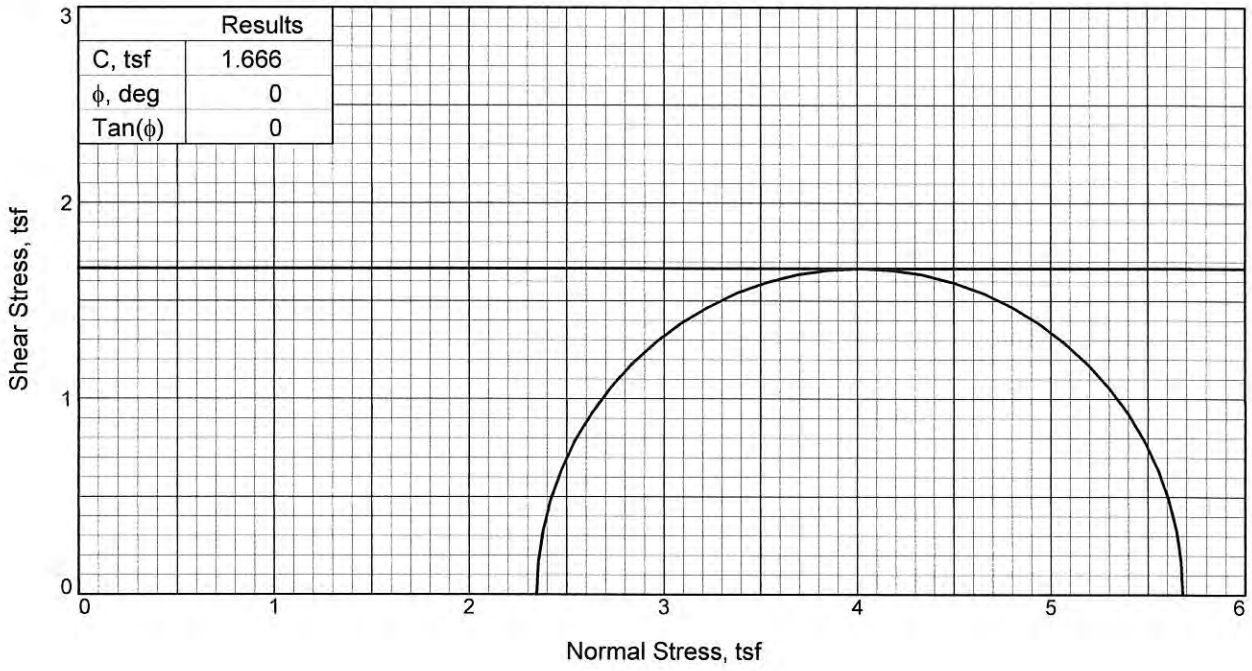
Client:

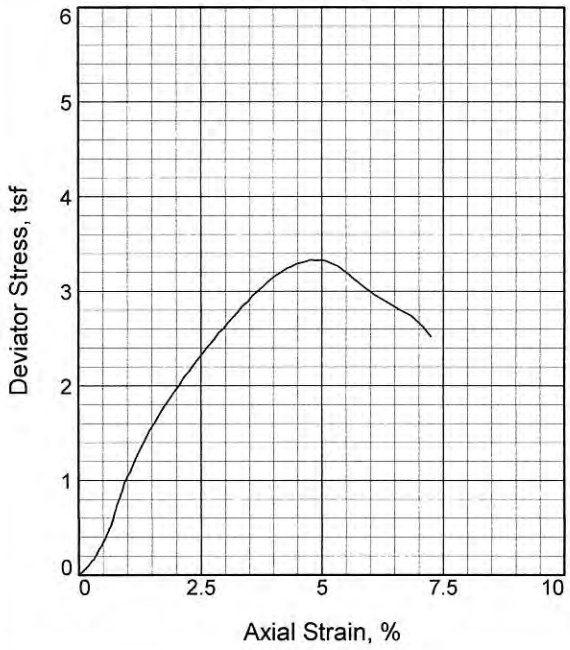
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 48

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	111.5
	Dry Density, pcf	41.7
	Saturation, %	100.0
	Void Ratio	2.9196
	Diameter, in.	2.86
	Height, in.	5.74
At Test	Water Content, %	111.2
	Dry Density, pcf	41.7
	Saturation, %	99.8
	Void Ratio	2.9196
	Diameter, in.	2.86
	Height, in.	5.74
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		32.60
Fail. Stress, tsf		3.33
Strain, %		4.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		5.68
σ_3 Failure, tsf		2.35

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Black FAT CLAY; organics

LL= 144 **PL=** 78 **PI=** 66

Assumed Specific Gravity= 2.62

Remarks: Test Method: ASTM D2850
Failure Type: Buldge

Figure _____

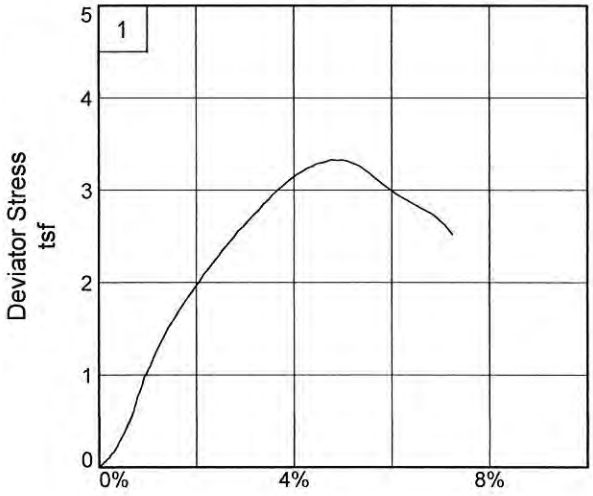
Client:

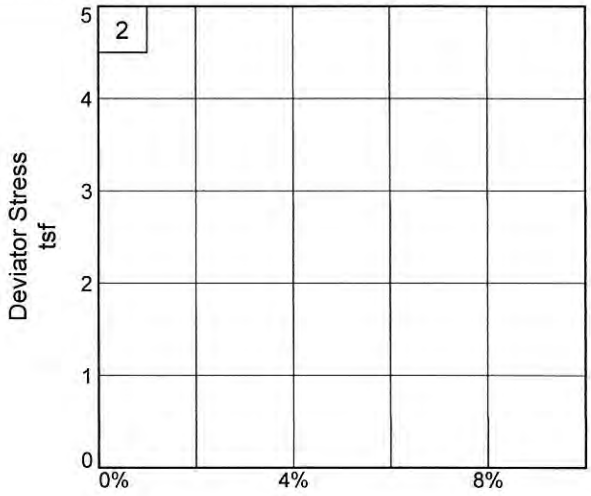
Project: San Jacinto River Waste Pit Superfund Site

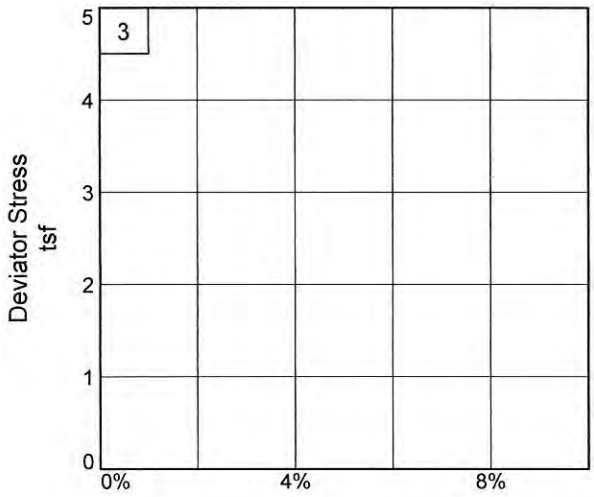
Source of Sample: SJGB053 **Depth:** 93

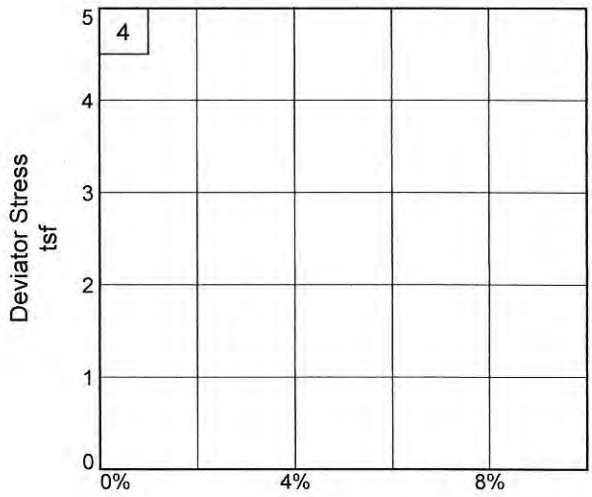
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

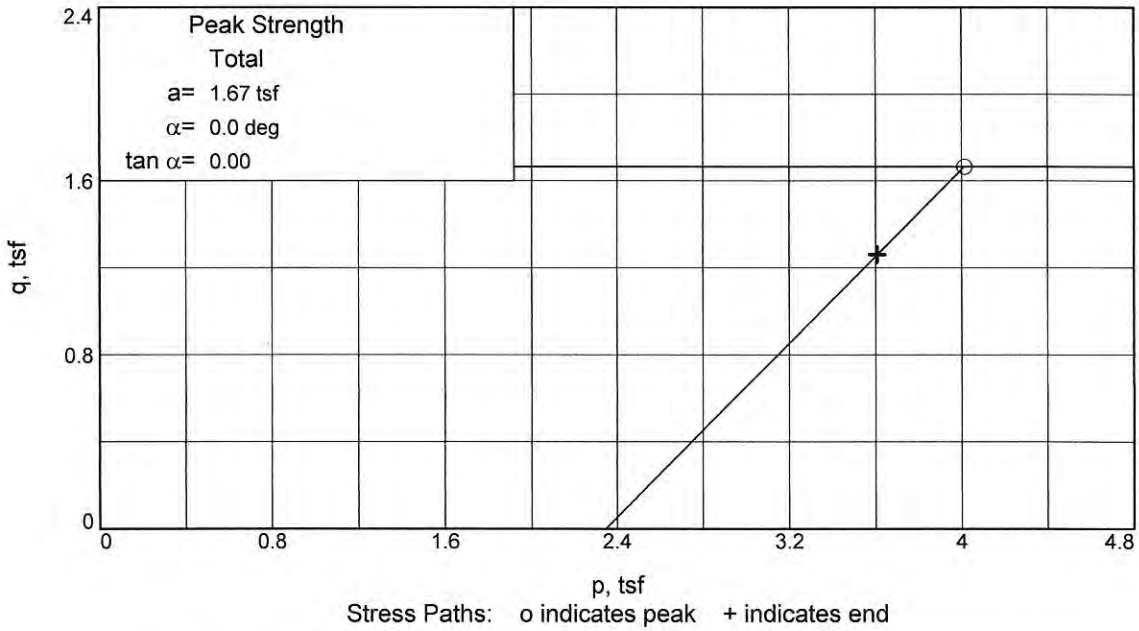
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

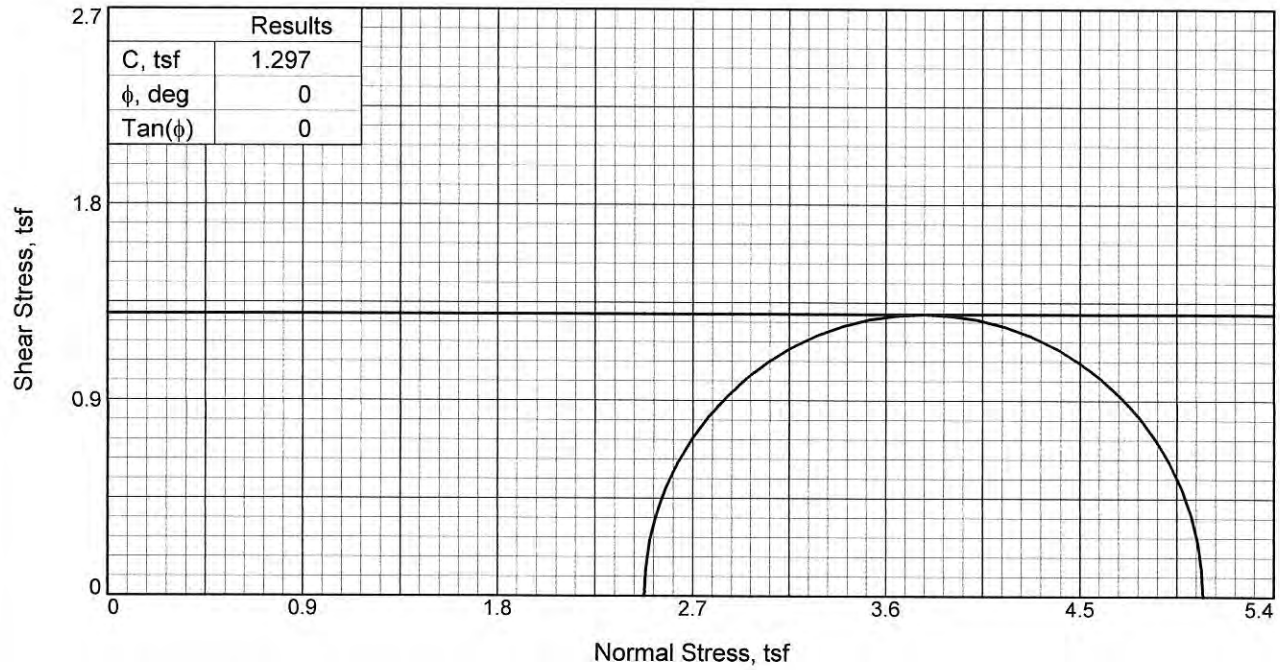
Client:

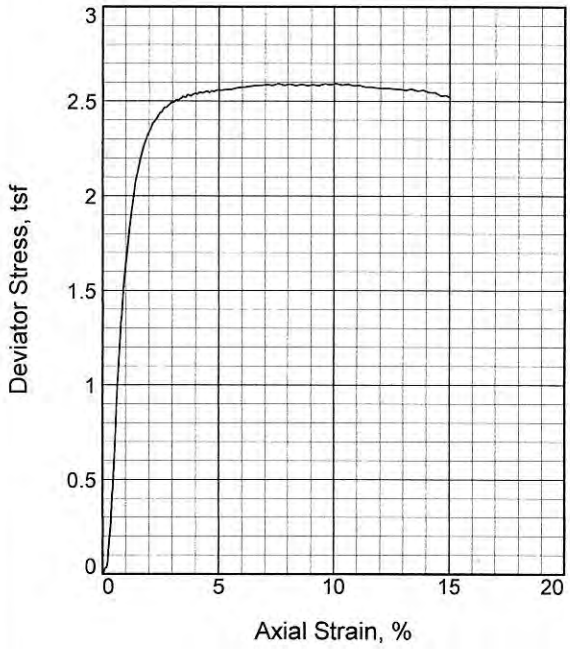
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 93

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	24.3
	Dry Density, pcf	101.6
	Saturation, %	99.7
	Void Ratio	0.6590
	Diameter, in.	2.83
	Height, in.	5.88
At Test	Water Content, %	24.7
	Dry Density, pcf	101.6
	Saturation, %	101.2
	Void Ratio	0.6590
	Diameter, in.	2.83
	Height, in.	5.88
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		34.40
Fail. Stress, tsf		2.59
Strain, %		10.1
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		5.07
σ_3 Failure, tsf		2.48

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray FAT CLAY

LL= 71 **PL=** 23 **PI=** 48
Assumed Specific Gravity= 2.7
Remarks: Test Method: ASTM D2850
Failure type: Buldge

Figure _____

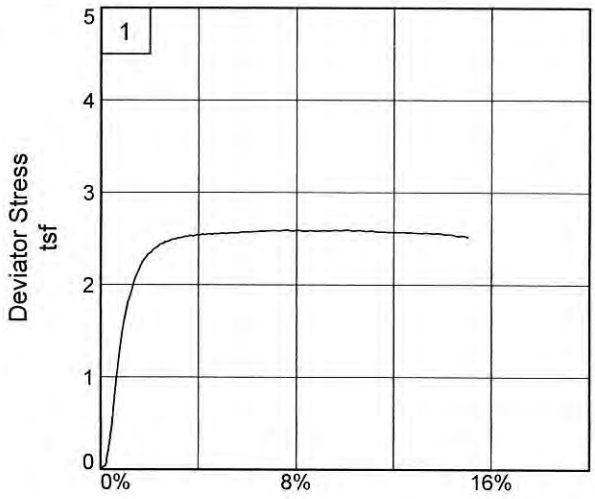
Client:

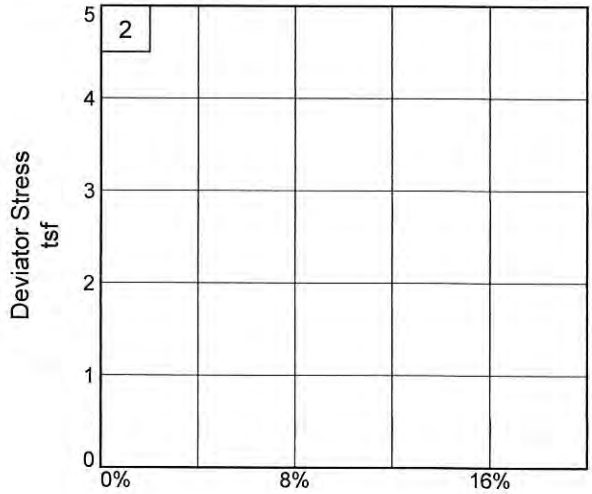
Project: San Jacinto River Waste Pit Superfund Site

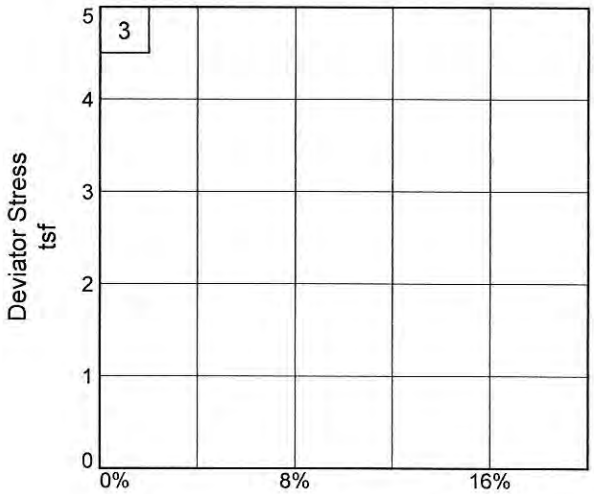
Source of Sample: SJGB053 **Depth:** 98

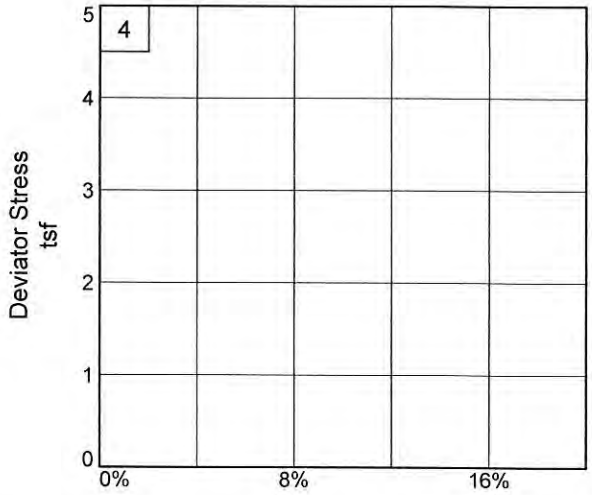
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

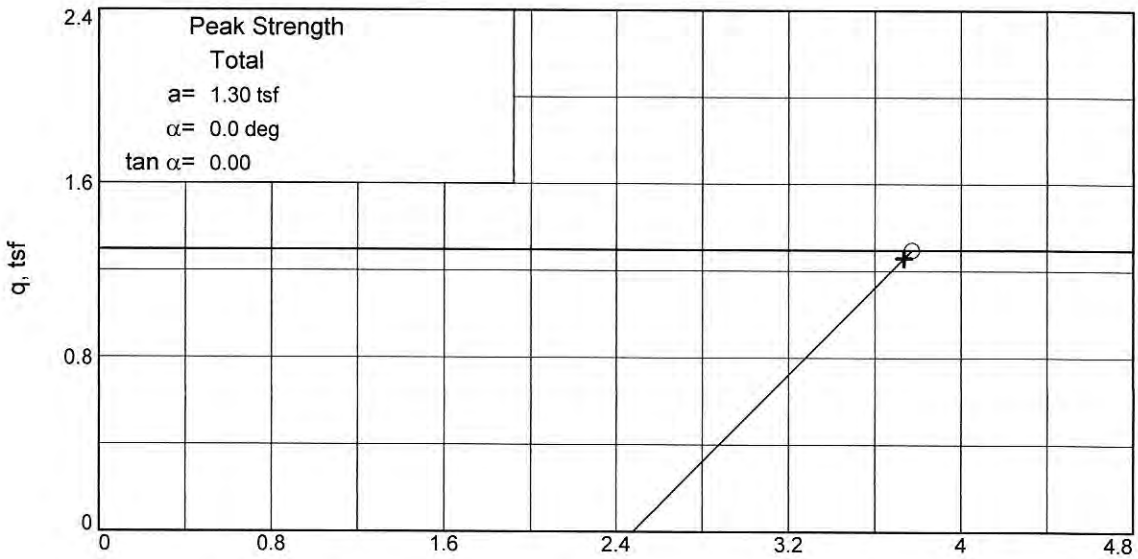
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

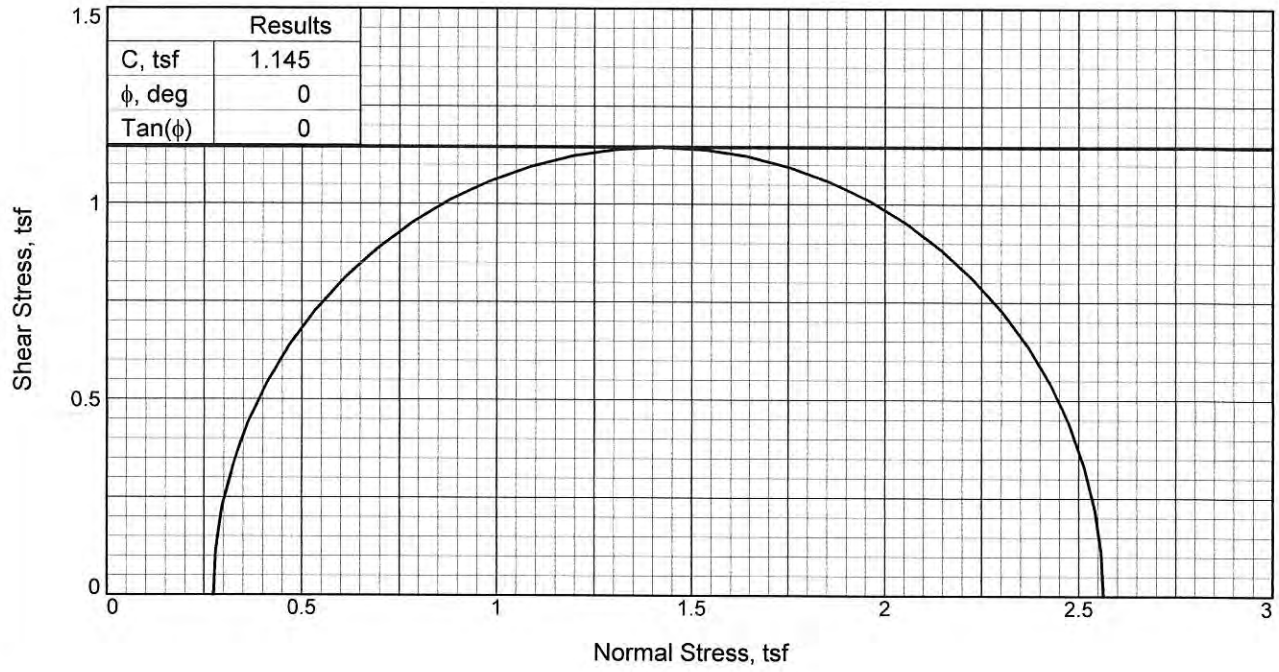
Client:

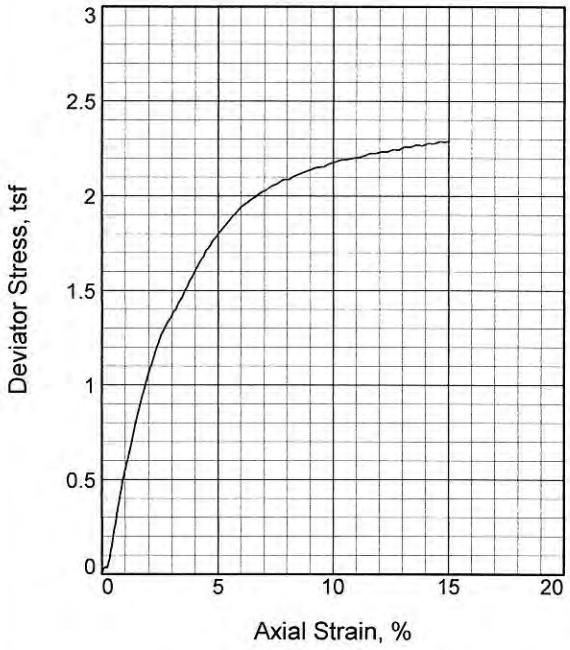
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB053 **Depth:** 98

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.4
	Dry Density, pcf	111.0
	Saturation, %	100.0
	Void Ratio	0.5692
	Diameter, in.	2.79
	Height, in.	5.88
At Test	Water Content, %	21.6
	Dry Density, pcf	111.0
	Saturation, %	105.9
	Void Ratio	0.5692
	Diameter, in.	2.79
	Height, in.	5.88
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.80
Fail. Stress, tsf		2.29
Strain, %		15.0
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.56
σ_3 Failure, tsf		0.27

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray and brown FAT CLAY

LL= 66 **PL=** 23 **PI=** 43

Assumed Specific Gravity= 2.79

Remarks: Test Method: ASTM D2850
Failure Type: Buldge

Figure _____

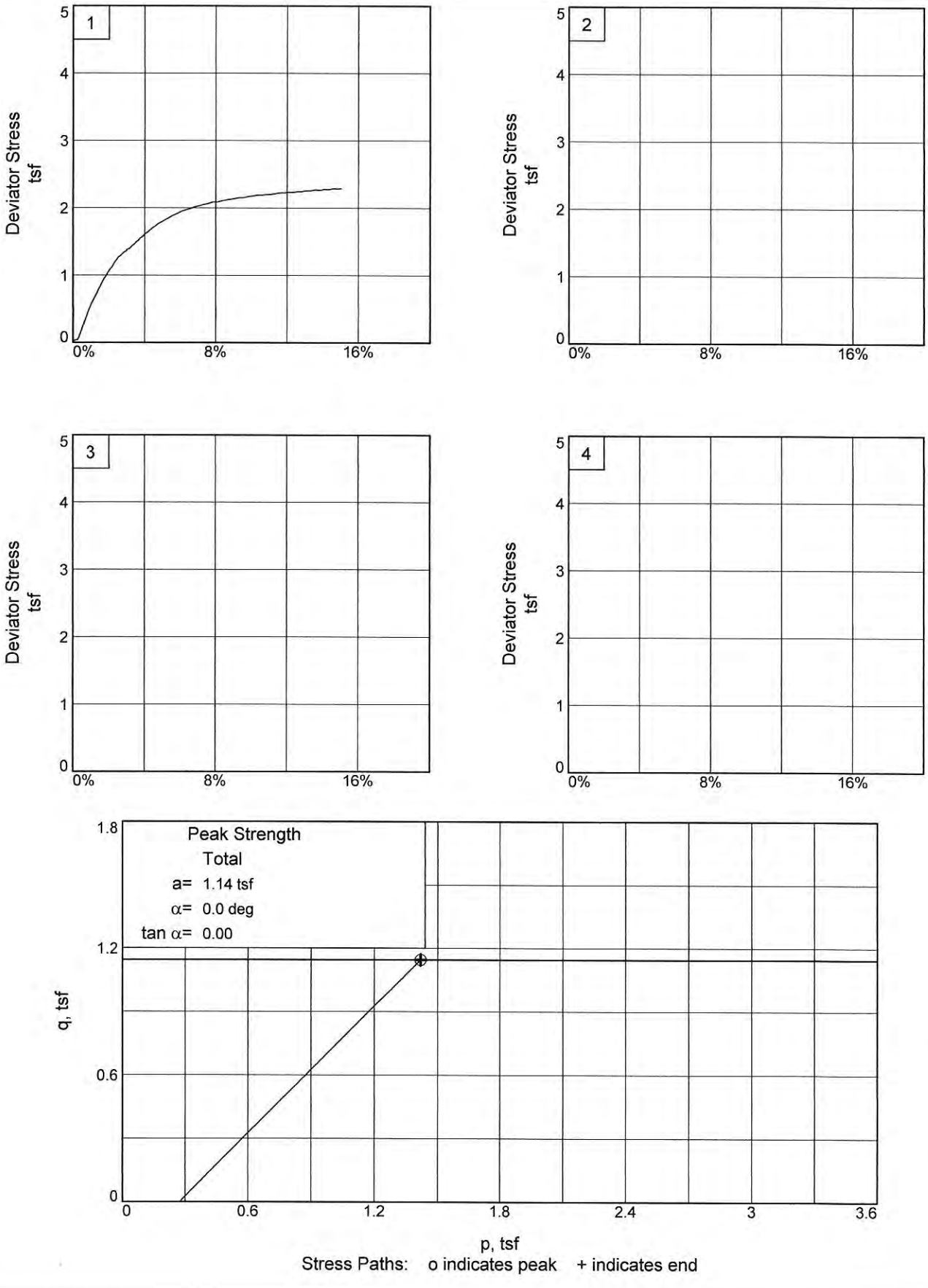
Client:

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 12

Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas



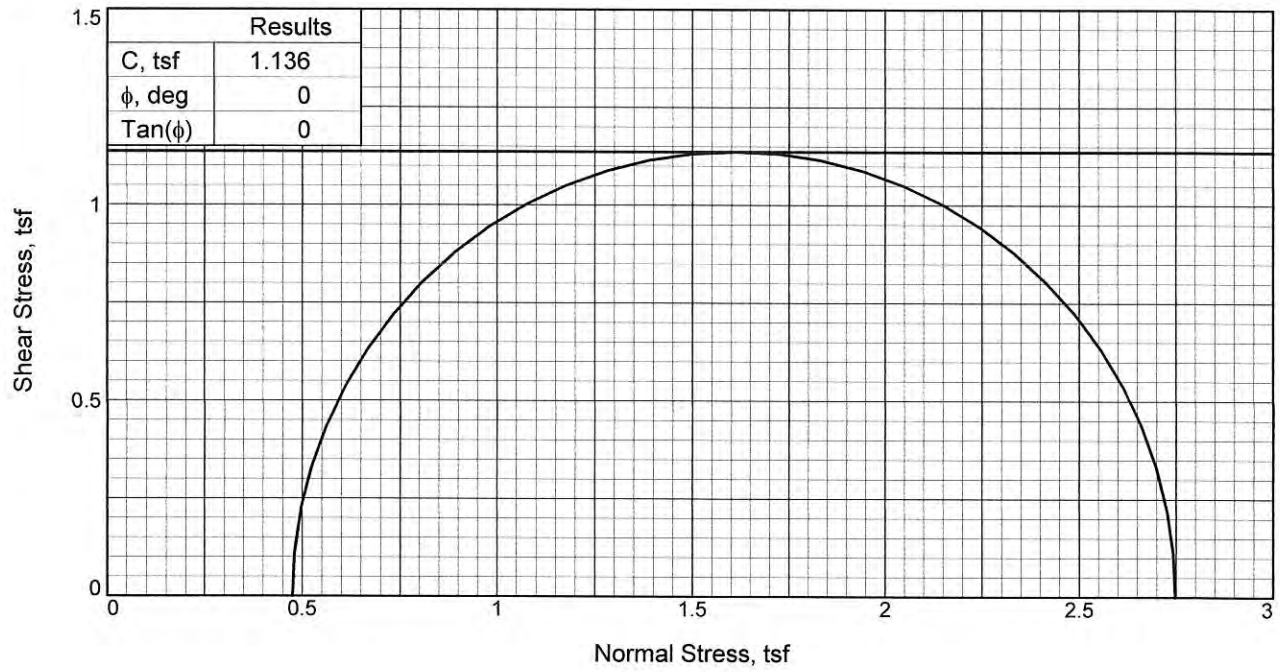
Client:

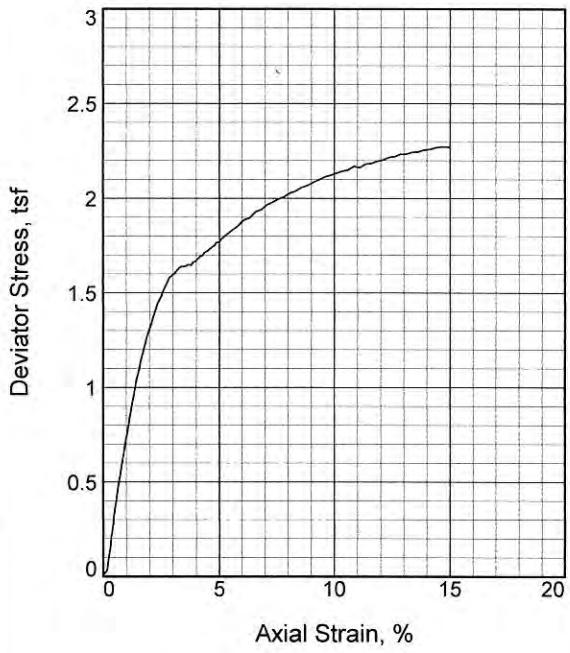
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 12

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	18.7
	Dry Density, pcf	112.7
	Saturation, %	99.1
	Void Ratio	0.5171
	Diameter, in.	2.82
	Height, in.	5.87
At Test	Water Content, %	18.8
	Dry Density, pcf	112.7
	Saturation, %	99.8
	Void Ratio	0.5171
	Diameter, in.	2.82
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		6.60
Fail. Stress, tsf		2.27
Strain, %		14.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.75
σ_3 Failure, tsf		0.48

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Tan SANDY LEAN CLAY

LL= 45 **PL=** 16 **PI=** 29
Assumed Specific Gravity= 2.74
Remarks: Test Method: ASTM D2850
Failure Type: Slickenslide

Figure _____

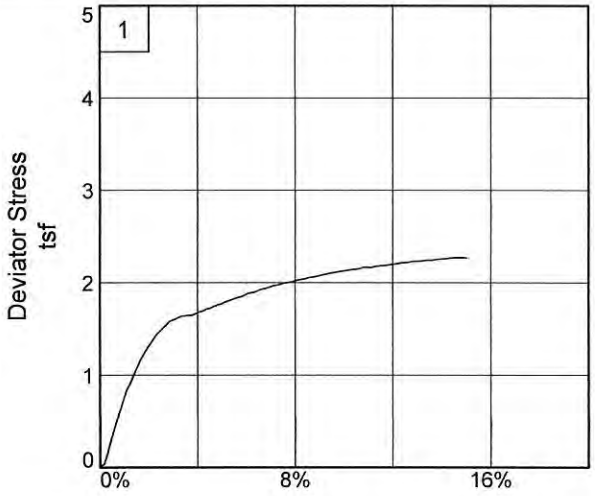
Client:

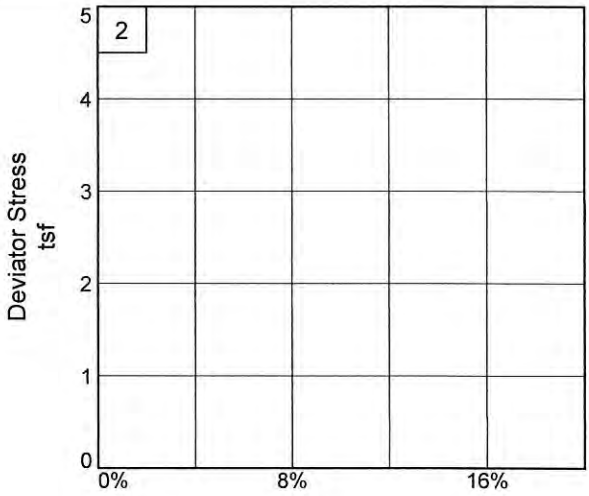
Project: San Jacinto River Waste Pit Superfund Site

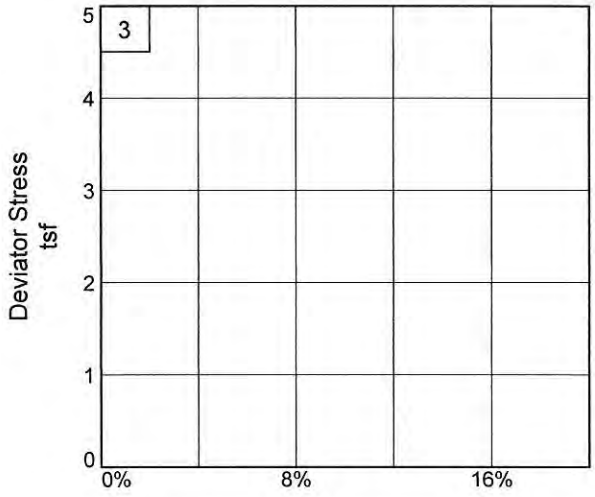
Source of Sample: SJGB057 **Depth:** 18

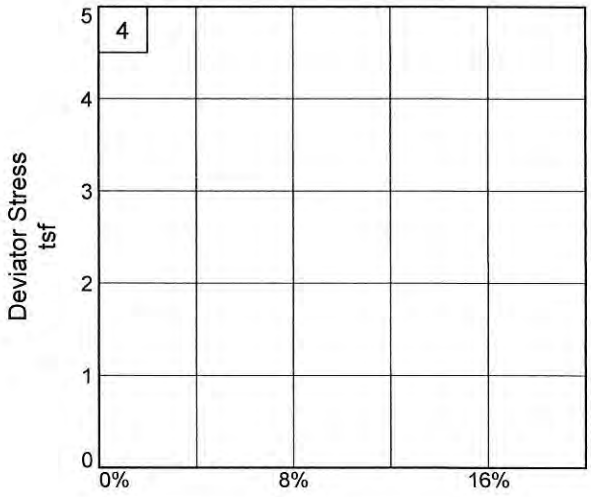
Proj. No.: 19.15.131 **Date Sampled:** 2-89-2020

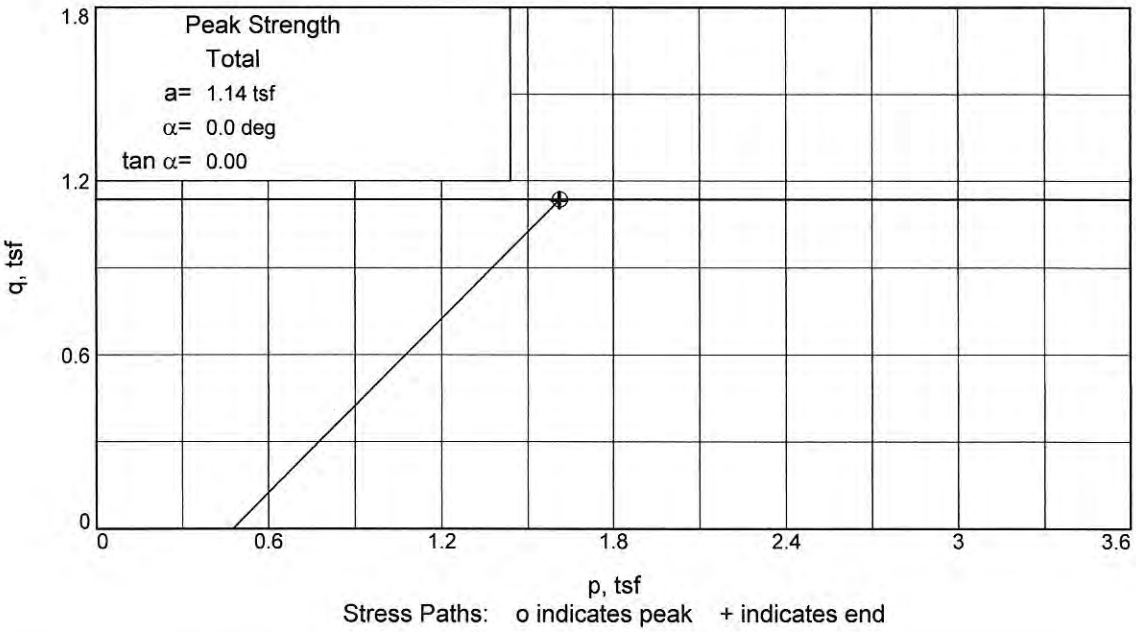
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

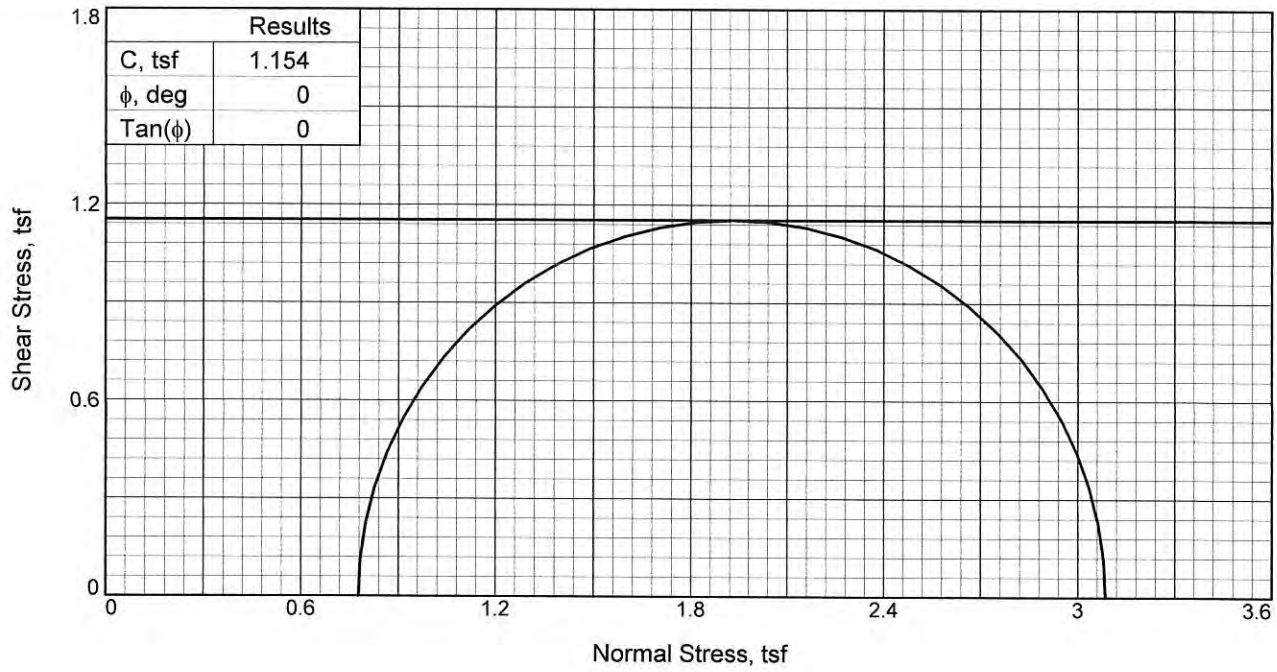
Client:

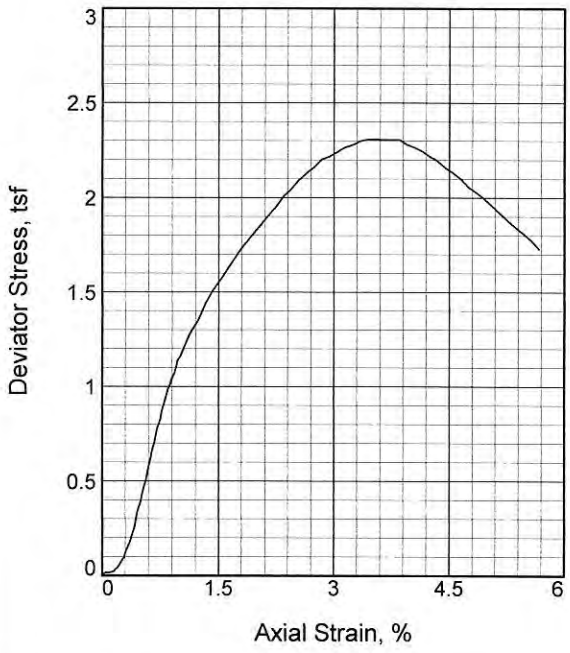
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 18

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	26.8
	Dry Density, pcf	96.2
	Saturation, %	95.4
	Void Ratio	0.7644
	Diameter, in.	2.87
	Height, in.	5.87
At Test	Water Content, %	26.7
	Dry Density, pcf	96.2
	Saturation, %	95.1
	Void Ratio	0.7644
	Diameter, in.	2.87
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		10.80
Fail. Stress, tsf		2.31
Strain, %		3.5
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		3.09
σ_3 Failure, tsf		0.78

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish-brown FAT CLAY

LL= 65 **PL=** 22 **PI=** 43

Assumed Specific Gravity= 2.72

Remarks: Test Method: ASTM D2850
Failure Type: Slickenslide

Figure _____

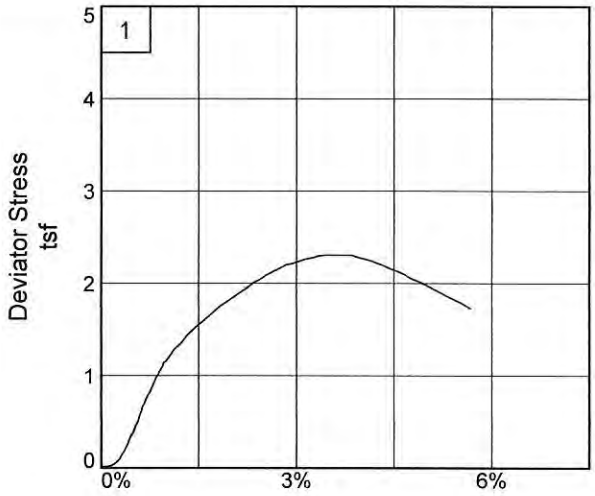
Client:

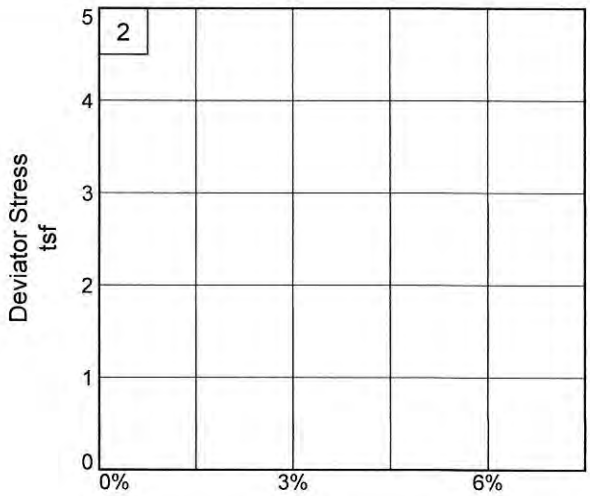
Project: San Jacinto River Waste Pit Superfund Site

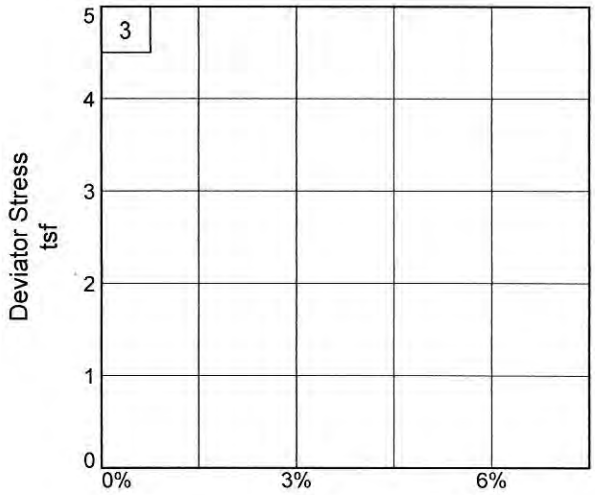
Source of Sample: SJGB057 **Depth:** 33

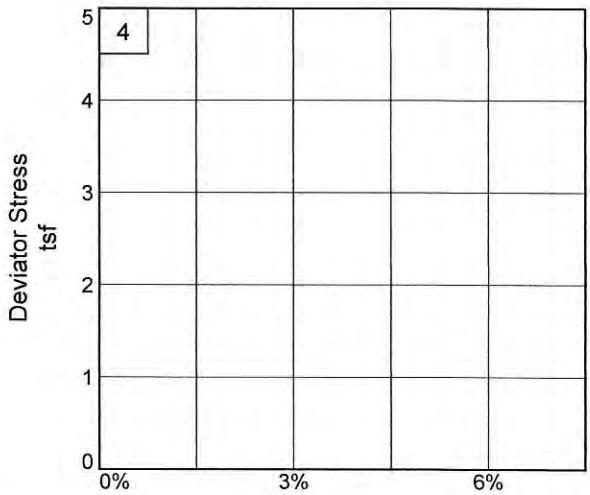
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

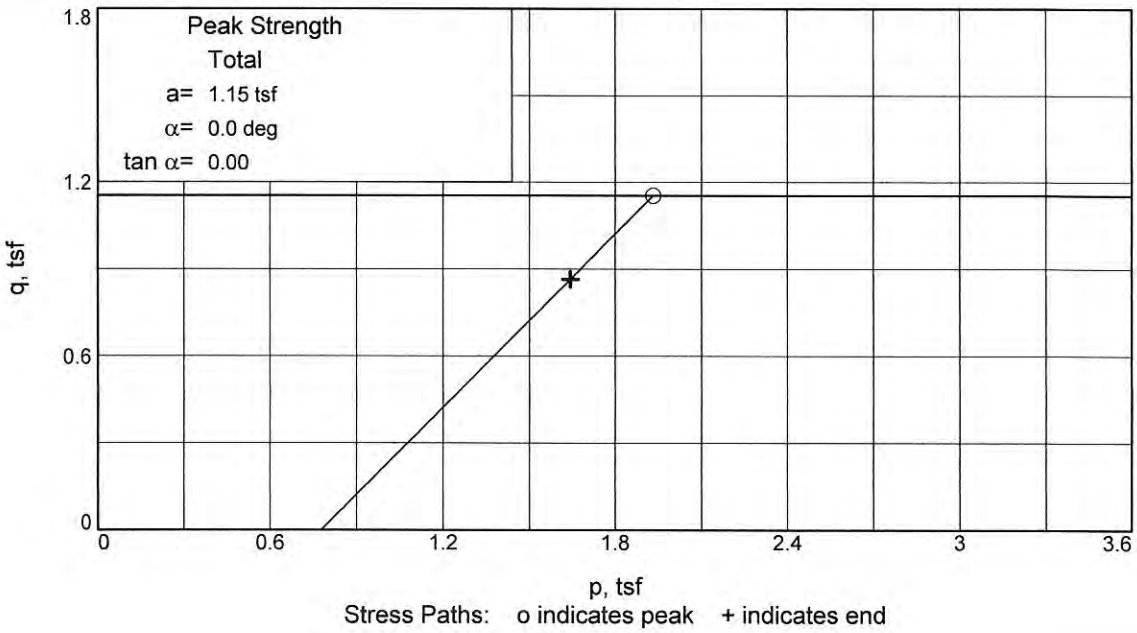
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

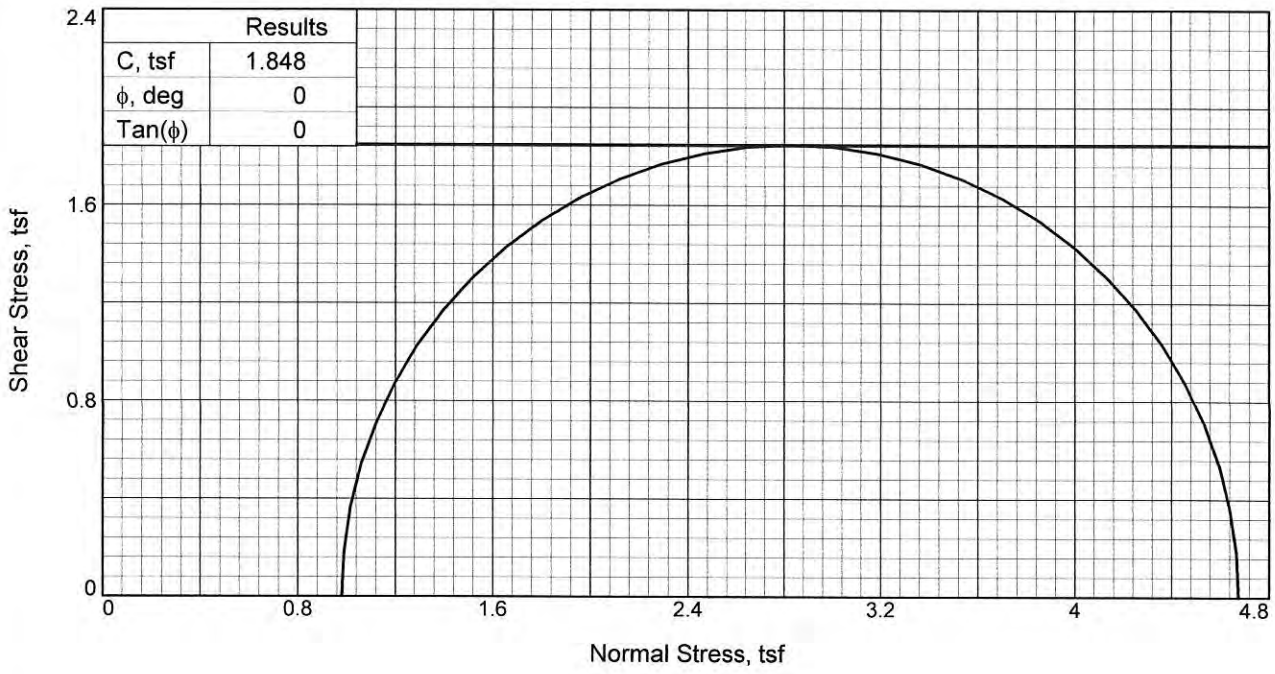
Client:

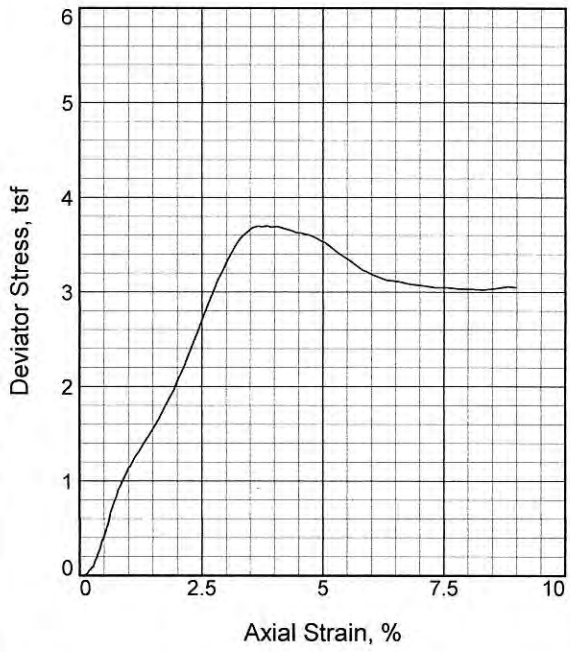
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 33

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	20.7
	Dry Density, pcf	107.8
	Saturation, %	99.0
	Void Ratio	0.5634
	Diameter, in.	2.84
	Height, in.	5.87
At Test	Water Content, %	20.5
	Dry Density, pcf	107.8
	Saturation, %	98.1
	Void Ratio	0.5634
	Diameter, in.	2.84
	Height, in.	5.87
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		13.60
Fail. Stress, tsf		3.70
Strain, %		3.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		4.68
σ_3 Failure, tsf		0.98

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray FAT CLAY

LL= 56 **PL=** 19 **PI=** 37

Assumed Specific Gravity= 2.7

Remarks: Test Method: ASTM D2850
Failure type: Slickenslide

Figure _____

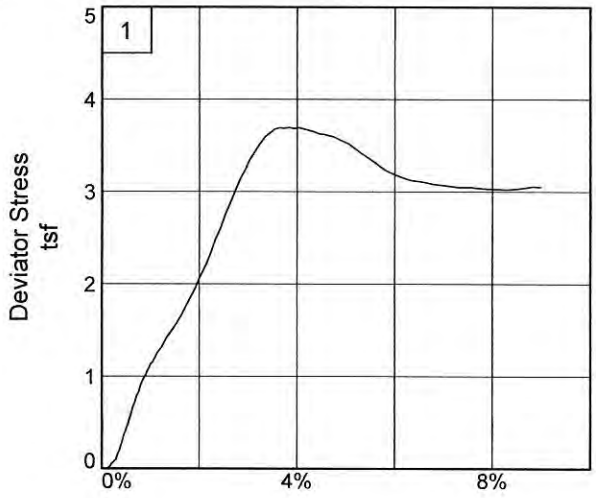
Client:

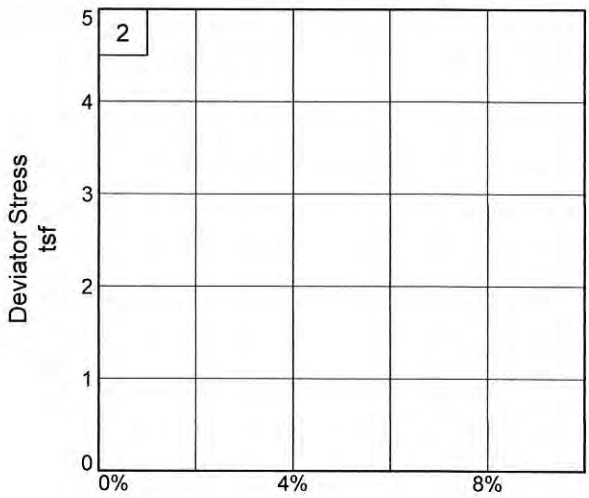
Project: San Jacinto River Waste Pit Superfund Site

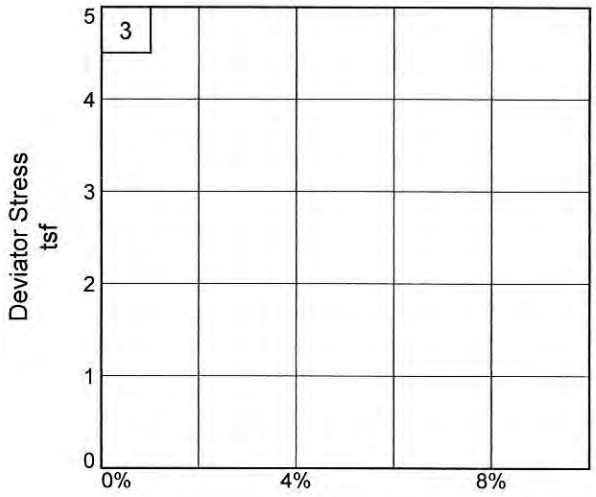
Source of Sample: SJGB057 **Depth:** 43

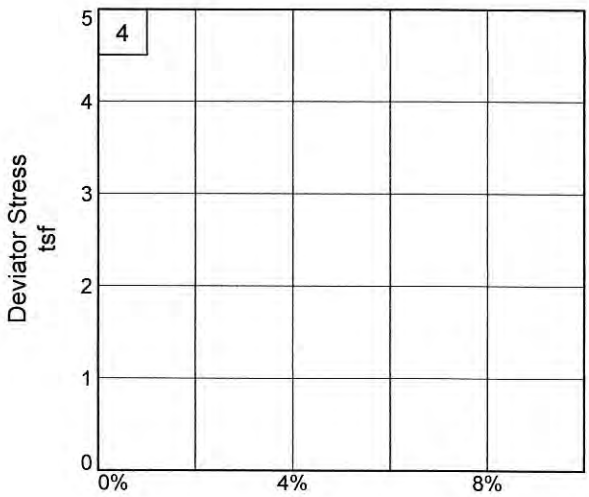
Proj. No.: 19.15.131 **Date Sampled:** 2-9-2020

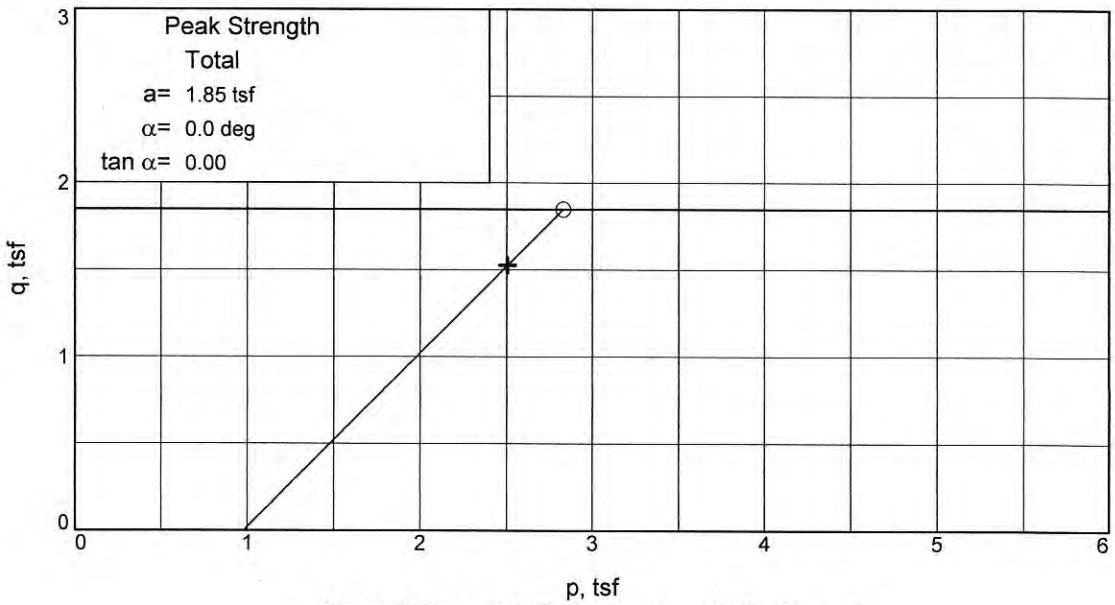
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

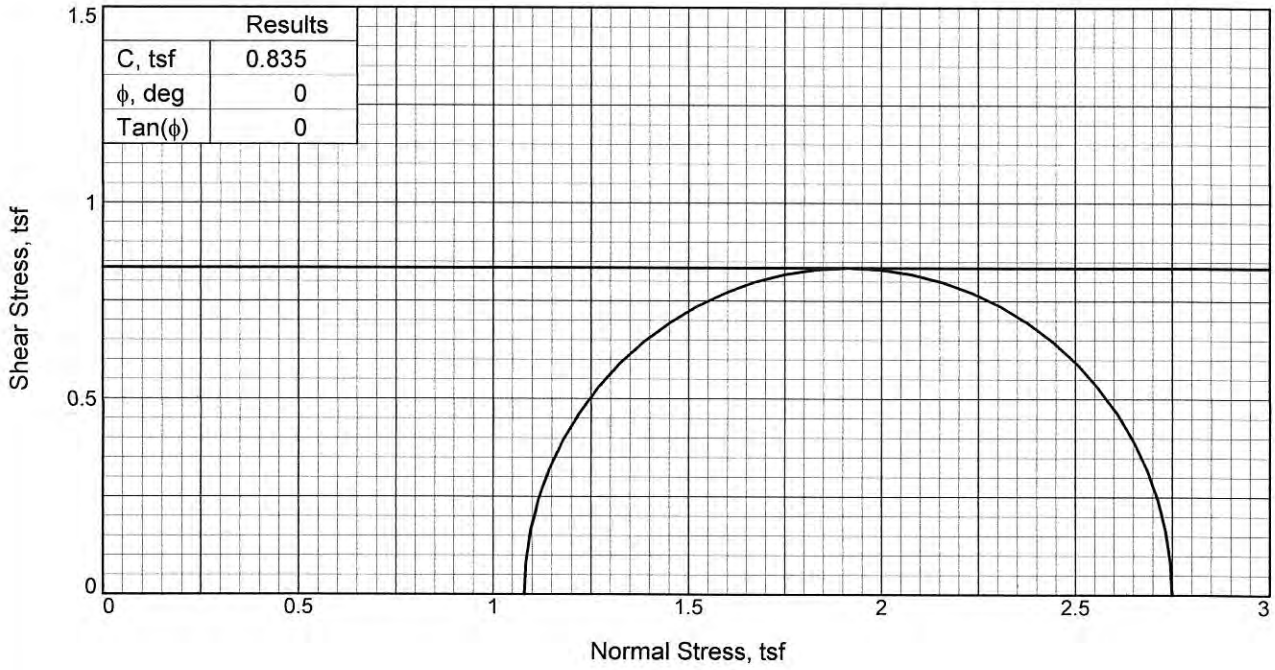
Client:

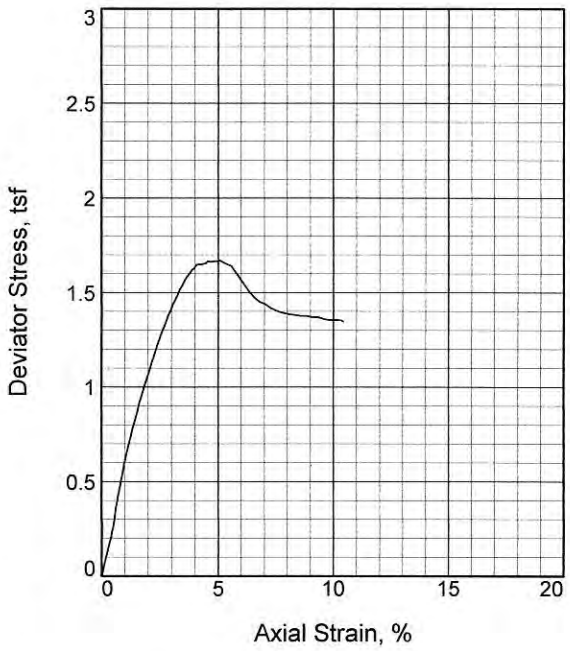
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 43

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	35.6
	Dry Density, pcf	92.5
	Saturation, %	99.9
	Void Ratio	1.1188
	Diameter, in.	2.78
	Height, in.	5.84
At Test	Water Content, %	28.9
	Dry Density, pcf	92.5
	Saturation, %	81.2
	Void Ratio	1.1188
	Diameter, in.	2.78
	Height, in.	5.84
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		15.00
Fail. Stress, tsf		1.67
Strain, %		5.1
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.75
σ_3 Failure, tsf		1.08

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Gray FAT CLAY

LL= 52 **PL=** 19 **PI=** 33
Assumed Specific Gravity= 3.14
Remarks: Test Method: ASTM D2850
Failure type: Slickenslide

Figure _____

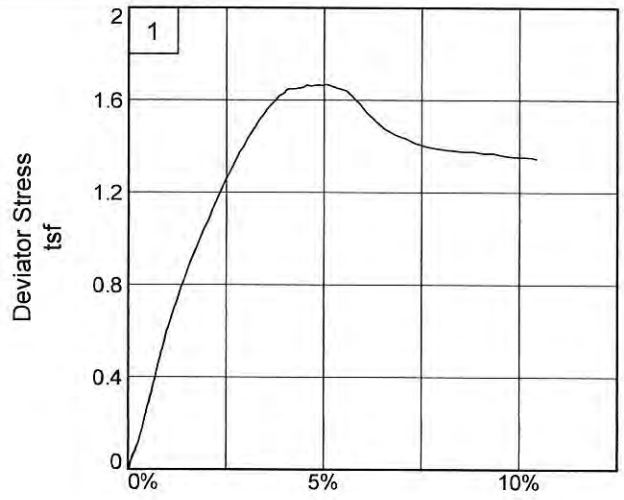
Client:

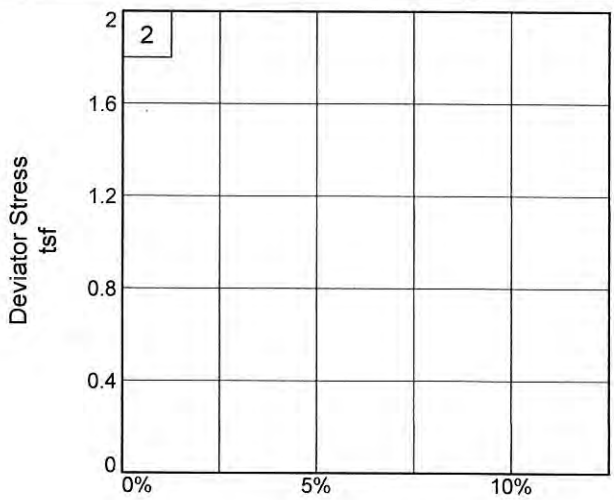
Project: San Jacinto River Waste Pit Superfund Site

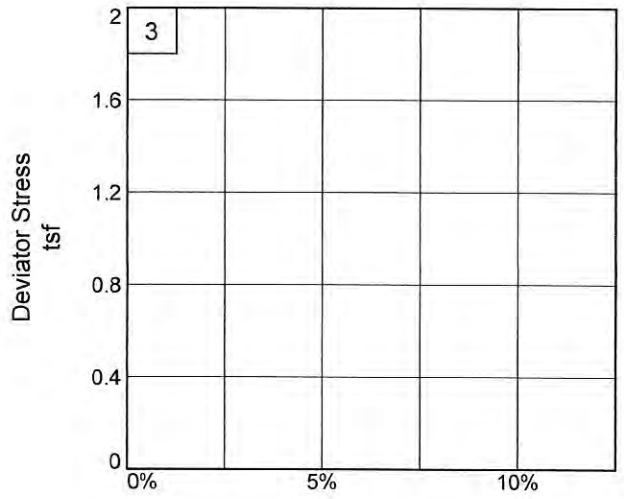
Source of Sample: SJGB057 **Depth:** 48

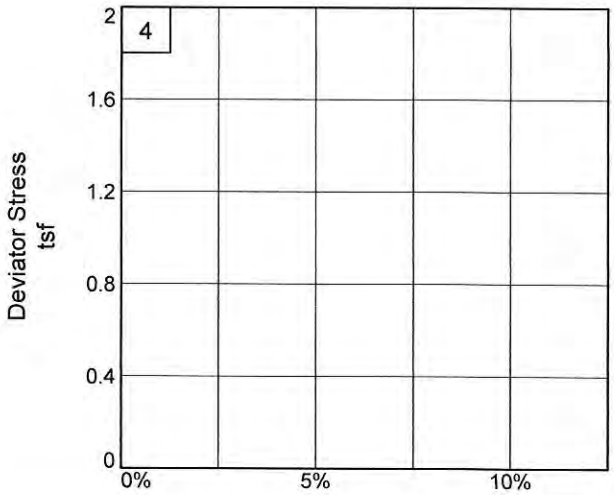
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

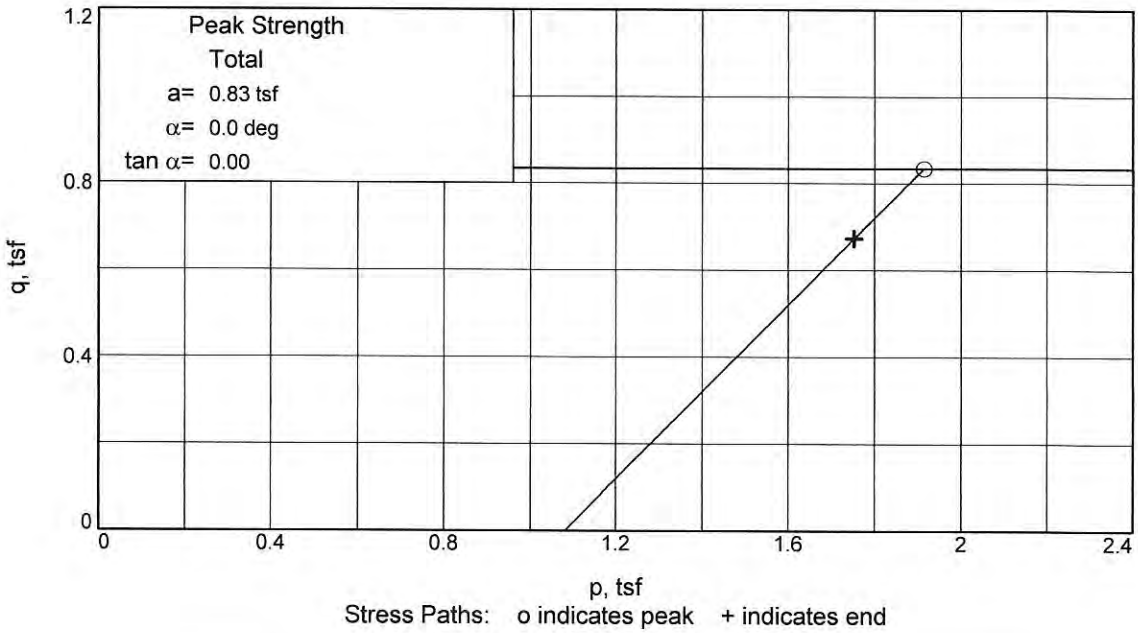
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

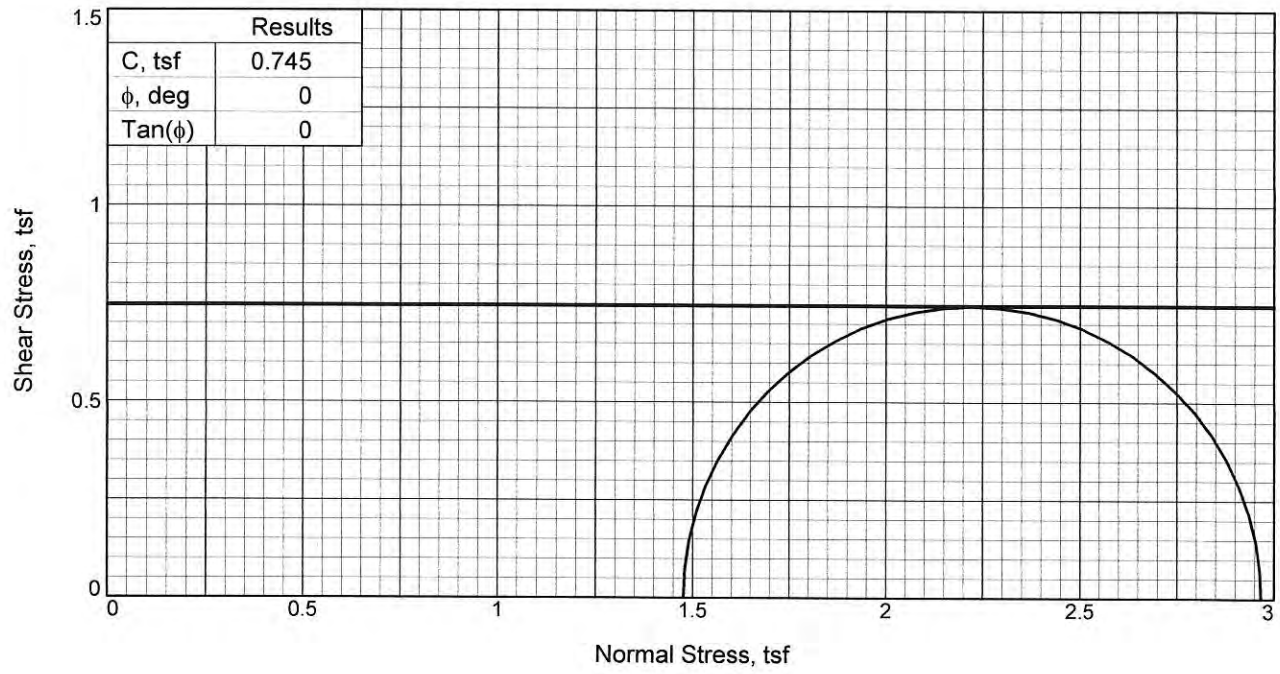
Client:

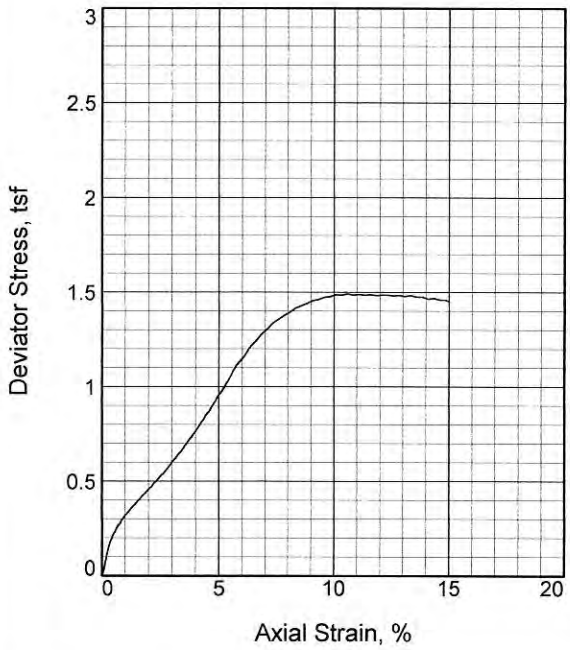
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 48

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	24.4
	Dry Density, pcf	106.0
	Saturation, %	99.6
	Void Ratio	0.7141
	Diameter, in.	2.80
	Height, in.	5.83
At Test	Water Content, %	23.5
	Dry Density, pcf	106.0
	Saturation, %	96.0
	Void Ratio	0.7141
	Diameter, in.	2.80
	Height, in.	5.83
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		20.50
Fail. Stress, tsf		1.49
Strain, %		10.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		2.97
σ_3 Failure, tsf		1.48

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray FAT CLAY with SAND

LL= 52 **PL=** 20 **PI=** 32

Assumed Specific Gravity= 2.91

Remarks: Test Method: ASTM D2850
Failure type: Buldge

Figure _____

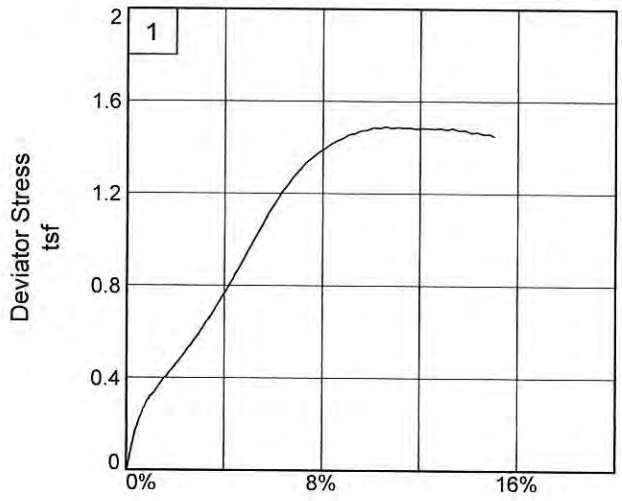
Client:

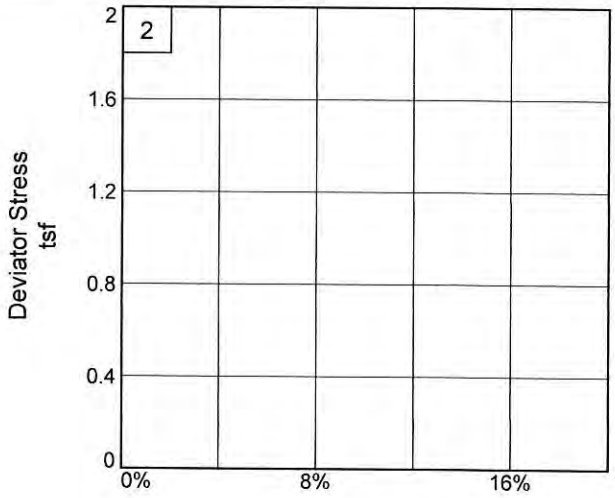
Project: San Jacinto River Waste Pit Superfund Site

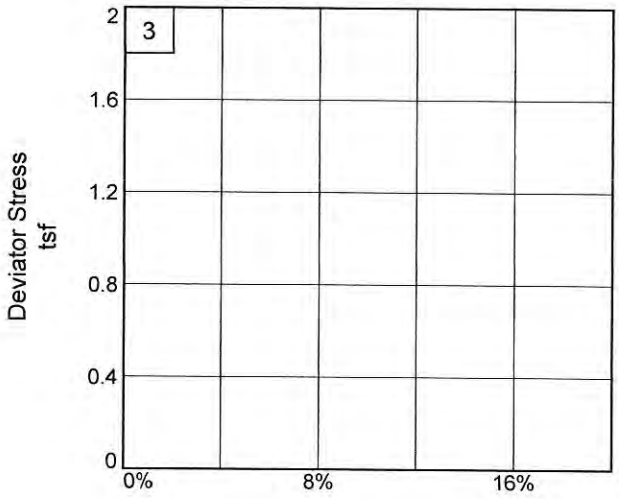
Source of Sample: SJGB057 **Depth:** 58

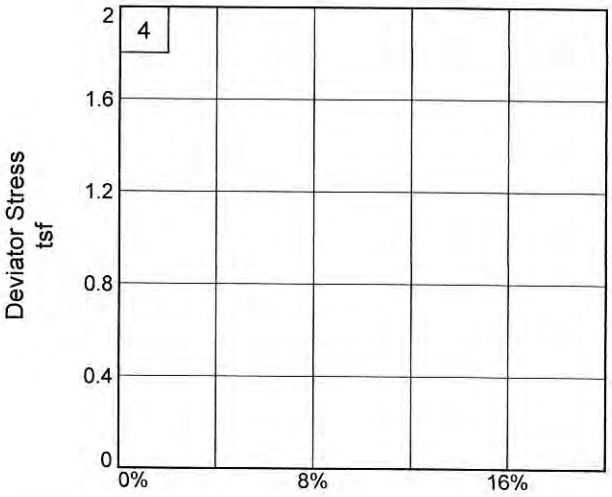
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

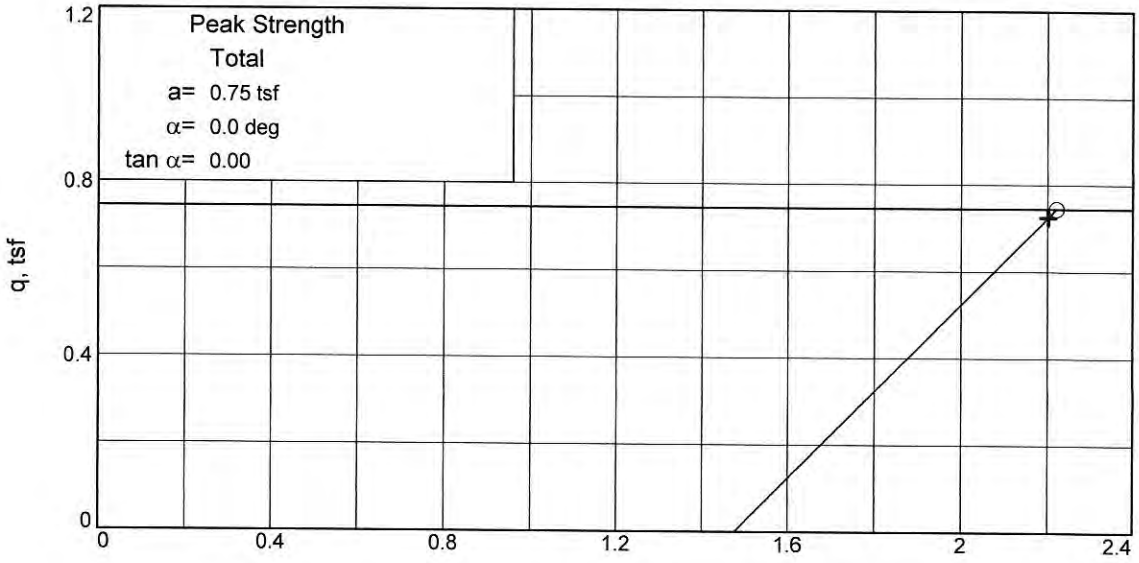
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

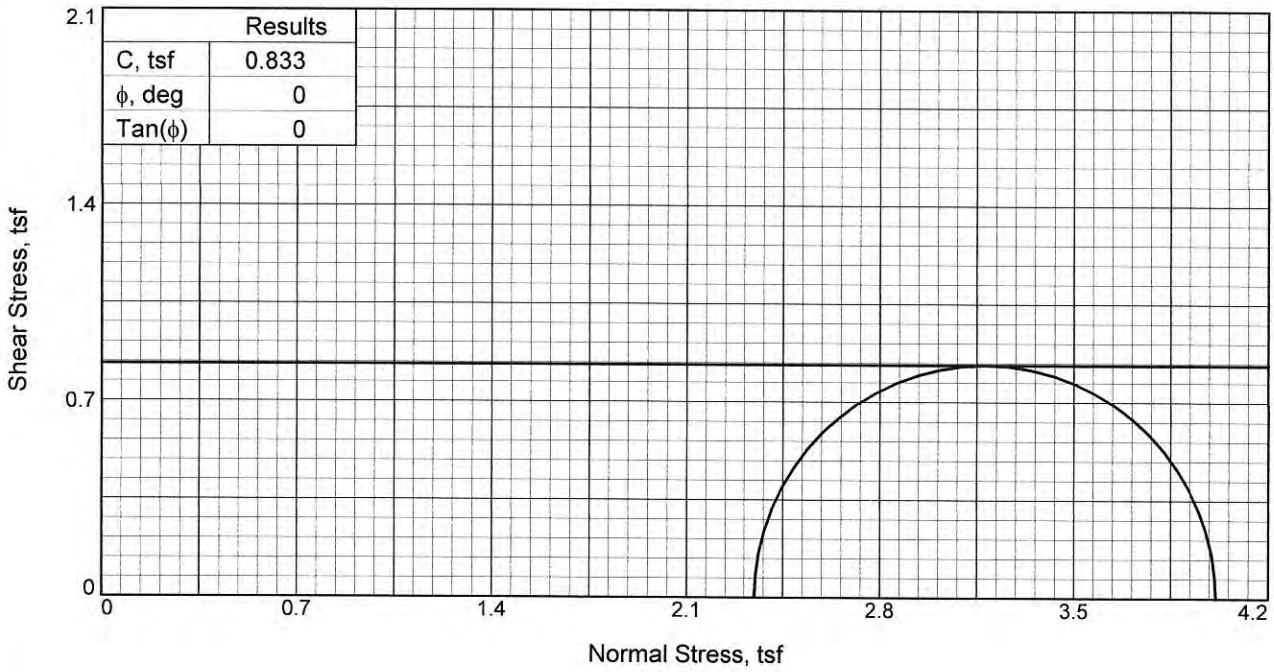
Client:

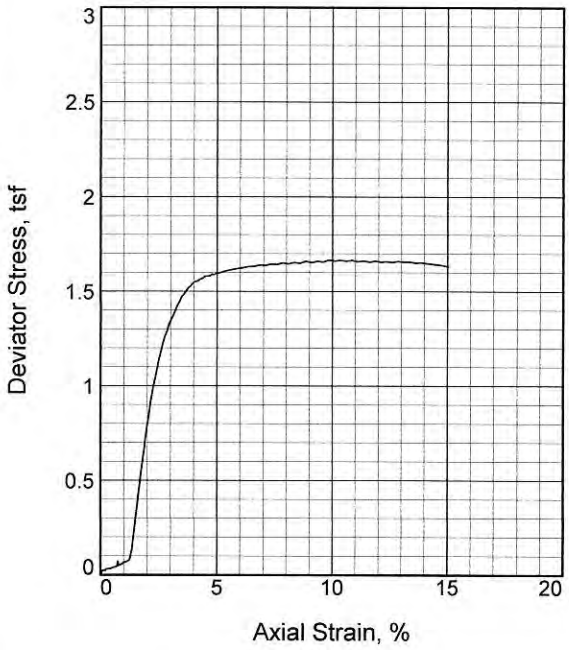
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 58

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	25.2
	Dry Density, pcf	101.1
	Saturation, %	99.1
	Void Ratio	0.6987
	Diameter, in.	2.82
	Height, in.	5.91
At Test	Water Content, %	23.4
	Dry Density, pcf	101.1
	Saturation, %	91.9
	Void Ratio	0.6987
	Diameter, in.	2.82
	Height, in.	5.91
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		32.60
Fail. Stress, tsf		1.67
Strain, %		9.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		4.01
σ_3 Failure, tsf		2.35

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray LEAN CLAY

LL= 41 **PL=** 18 **PI=** 23

Assumed Specific Gravity= 2.75

Remarks: Test Method: ASTM D2850
Failure type: Buldge

Figure _____

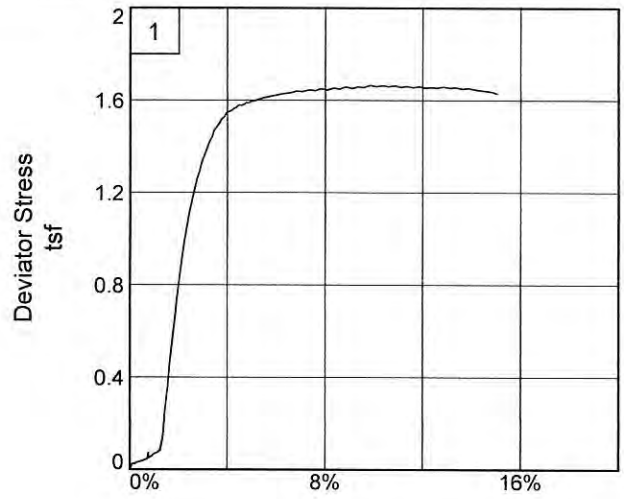
Client:

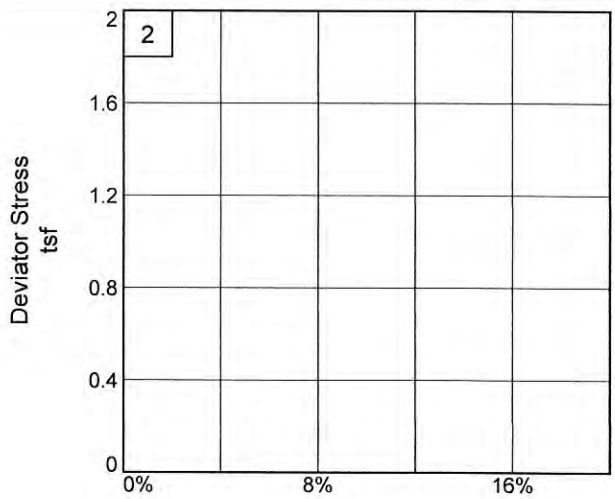
Project: San Jacinto River Waste Pit Superfund Site

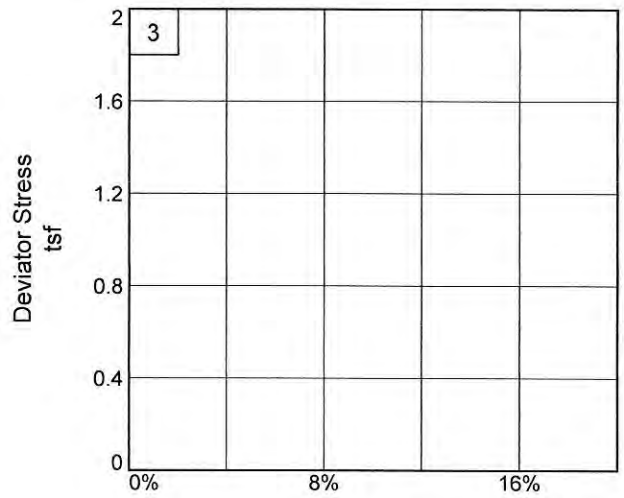
Source of Sample: SJGB057 **Depth:** 93

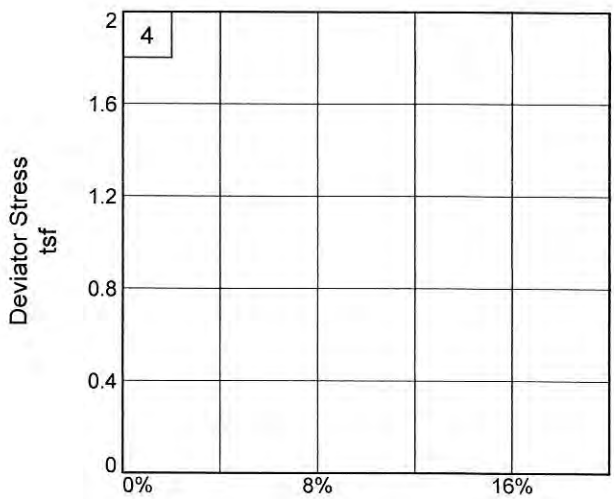
Proj. No.: 19.15.131 **Date Sampled:** 2-8-2020

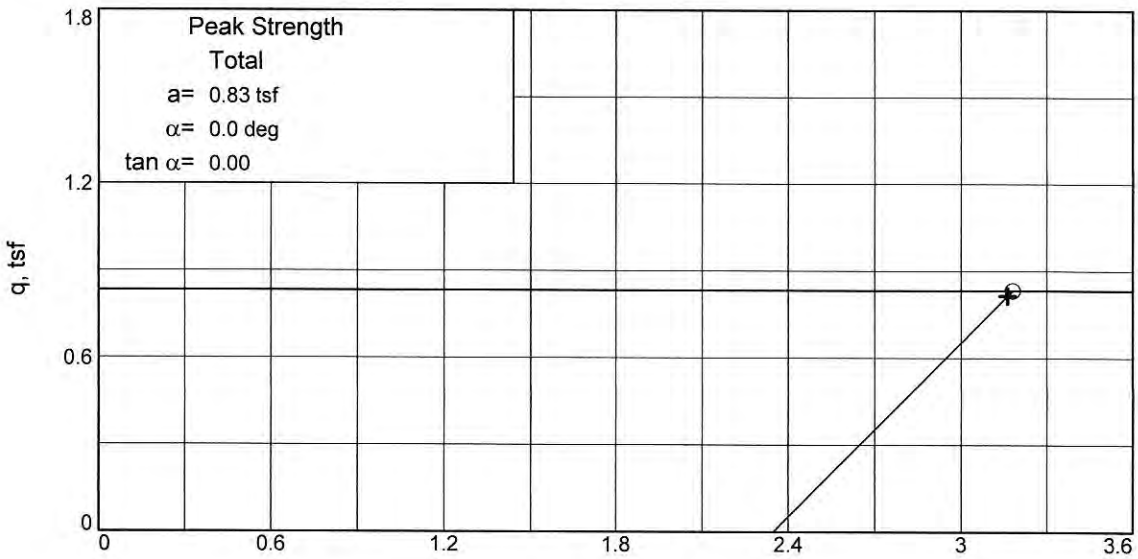
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

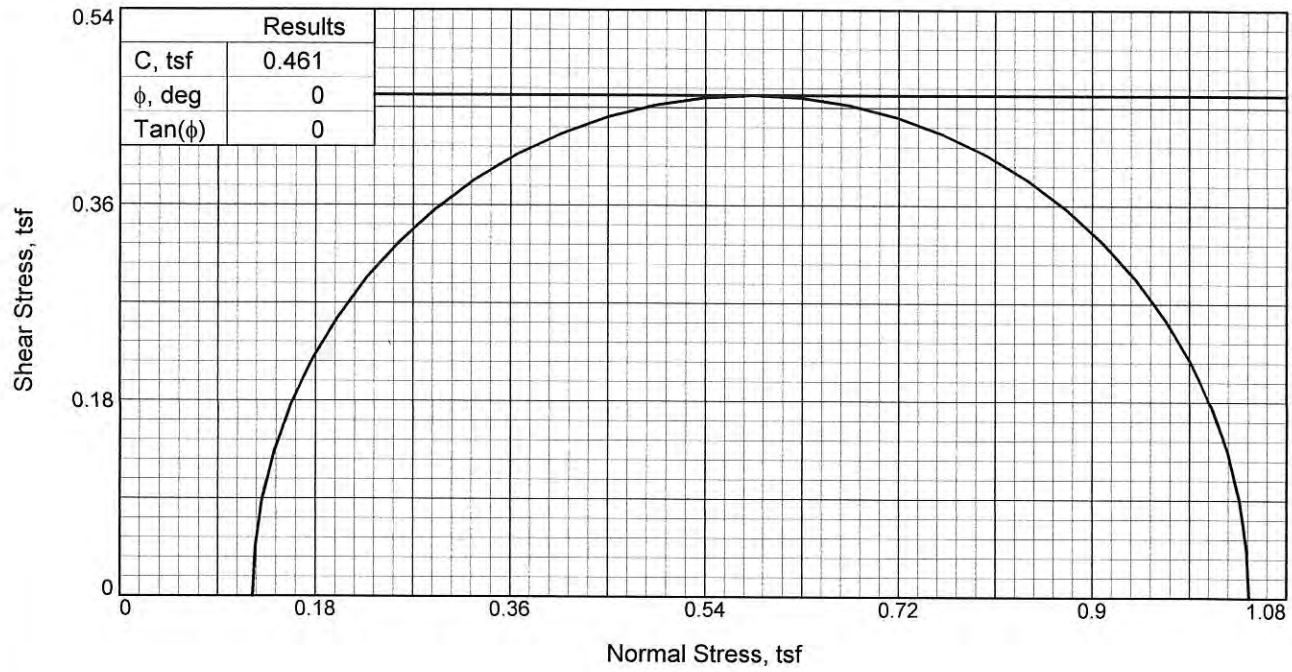
Client:

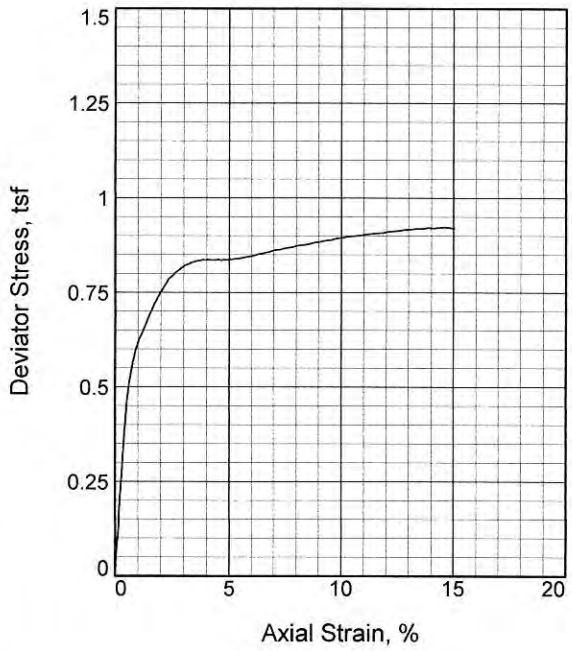
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB057 **Depth:** 93

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	25.5
	Dry Density, pcf	89.3
	Saturation, %	77.7
	Void Ratio	0.8871
	Diameter, in.	2.89
	Height, in.	5.70
At Test	Water Content, %	25.1
	Dry Density, pcf	89.3
	Saturation, %	76.3
	Void Ratio	0.8871
	Diameter, in.	2.89
	Height, in.	5.70
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		1.70
Fail. Stress, tsf		0.92
Strain, %		14.6
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.05
σ_3 Failure, tsf		0.12

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Dark brown LEAN CLAY

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

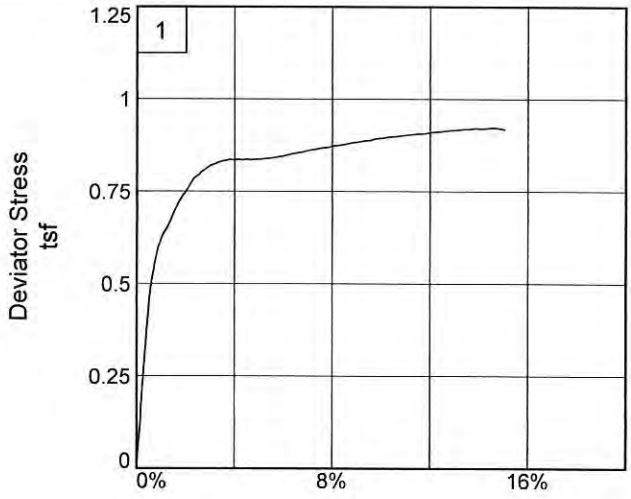
Client:

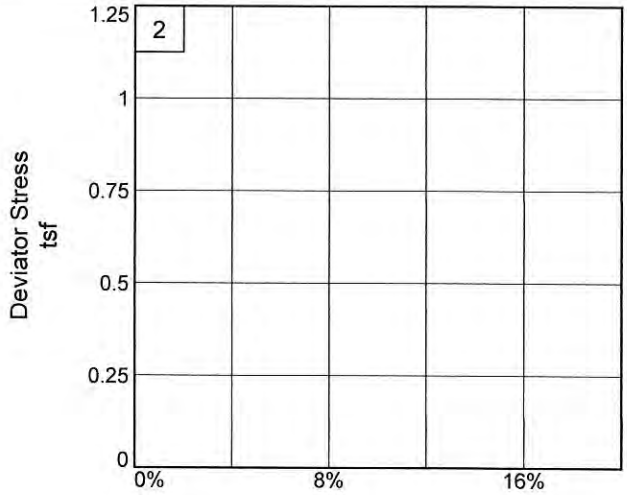
Project: San Jacinto River Waste Pit Superfund Site

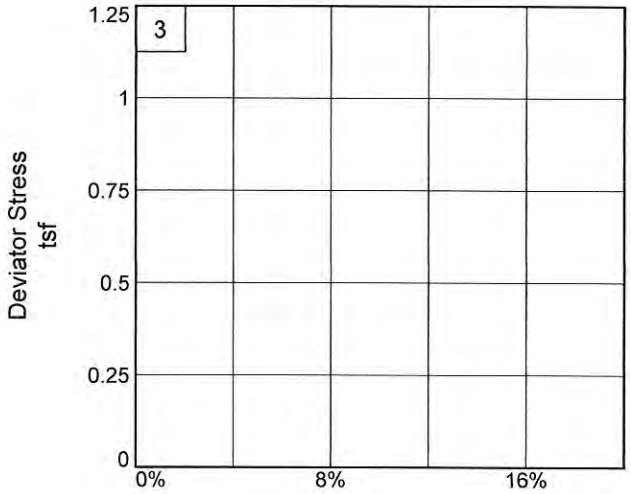
Source of Sample: SJGB058 **Depth:** 4-6

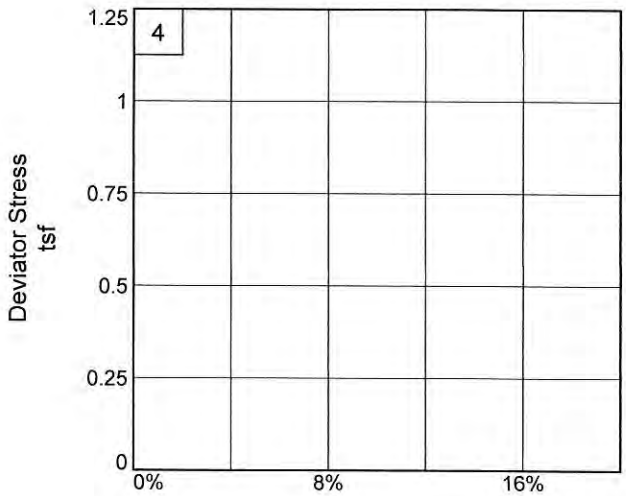
Proj. No.: 19.15.131 **Date Sampled:** 2/20/20

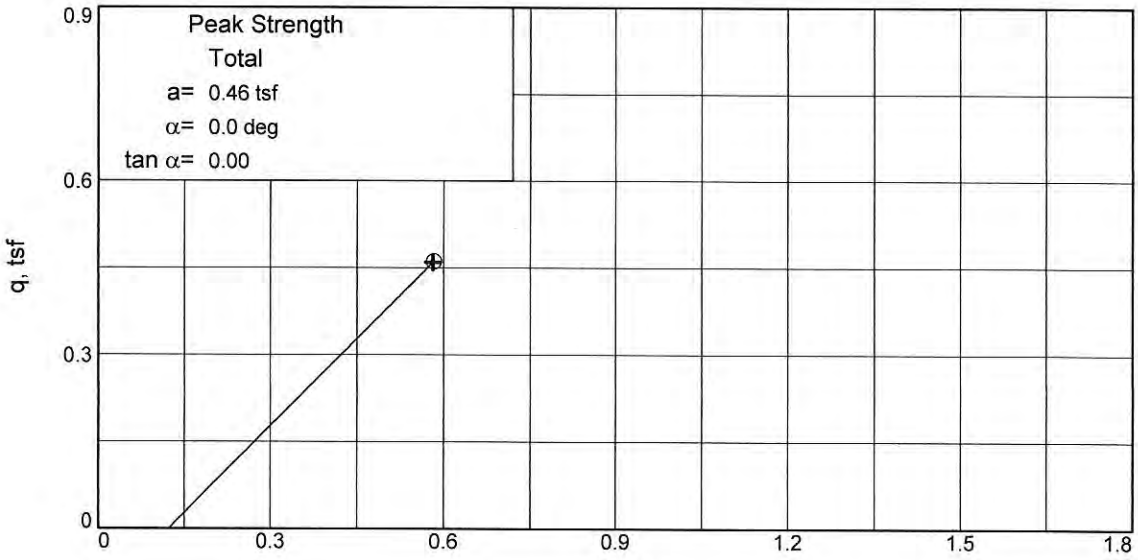
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

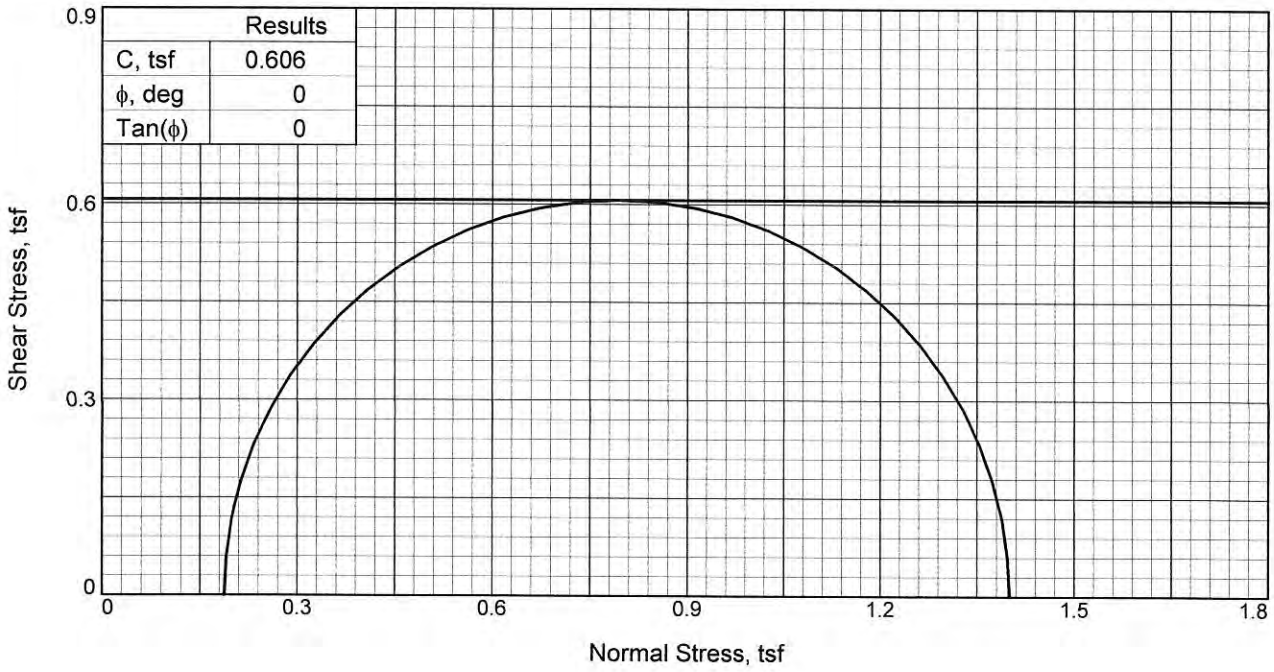
Client:

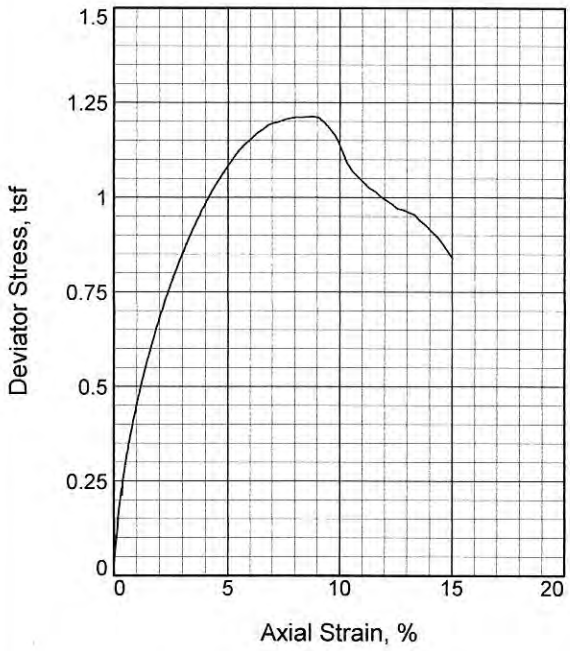
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB058 **Depth:** 4-6

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	34.9
	Dry Density, pcf	86.6
	Saturation, %	99.6
	Void Ratio	0.9459
	Diameter, in.	2.84
	Height, in.	5.68
At Test	Water Content, %	31.3
	Dry Density, pcf	86.6
	Saturation, %	89.4
	Void Ratio	0.9459
	Diameter, in.	2.84
	Height, in.	5.68
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		2.60
Fail. Stress, tsf		1.21
Strain, %		8.8
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.40
σ_3 Failure, tsf		0.19

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Dark brown LEAN CLAY

LL= 42 **PL=** 18 **PI=** 24
Assumed Specific Gravity= 2.70
Remarks: Test method: ASTM D2850
Failure type: Multiple shear

Figure _____

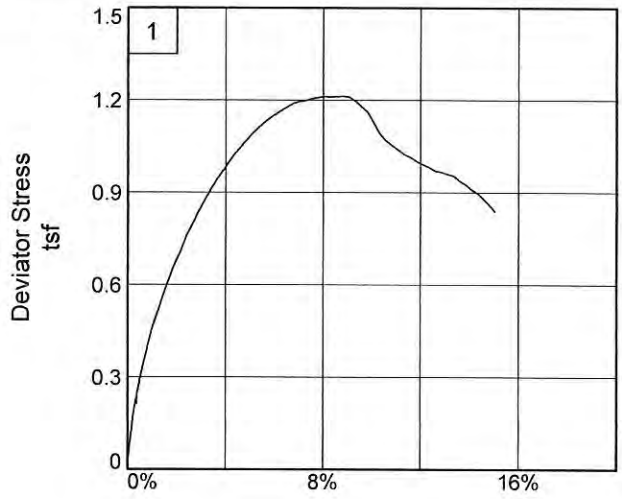
Client:

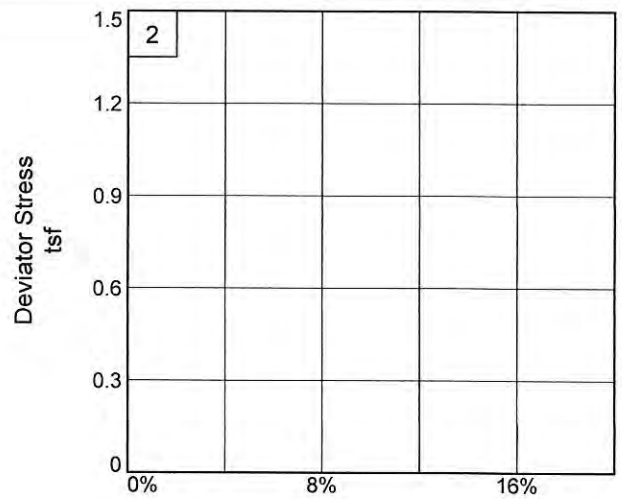
Project: San Jacinto River Waste Pit Superfund Site

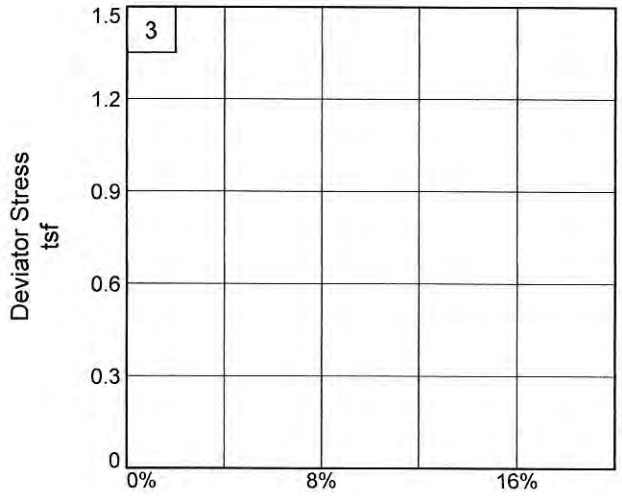
Source of Sample: SJGB058 **Depth:** 6-8

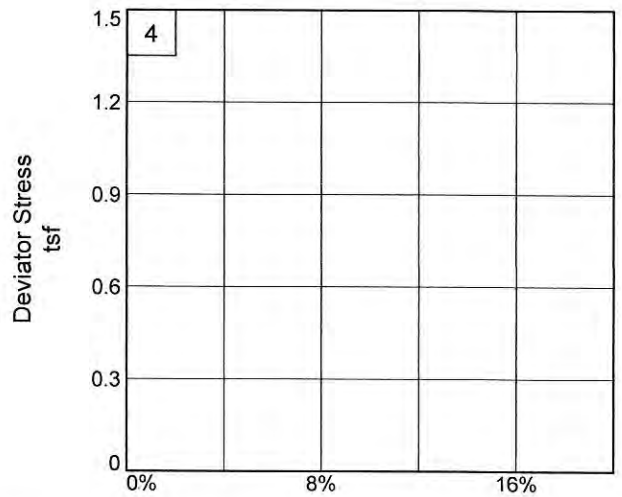
Proj. No.: 19.15.131 **Date Sampled:** 2/20/20

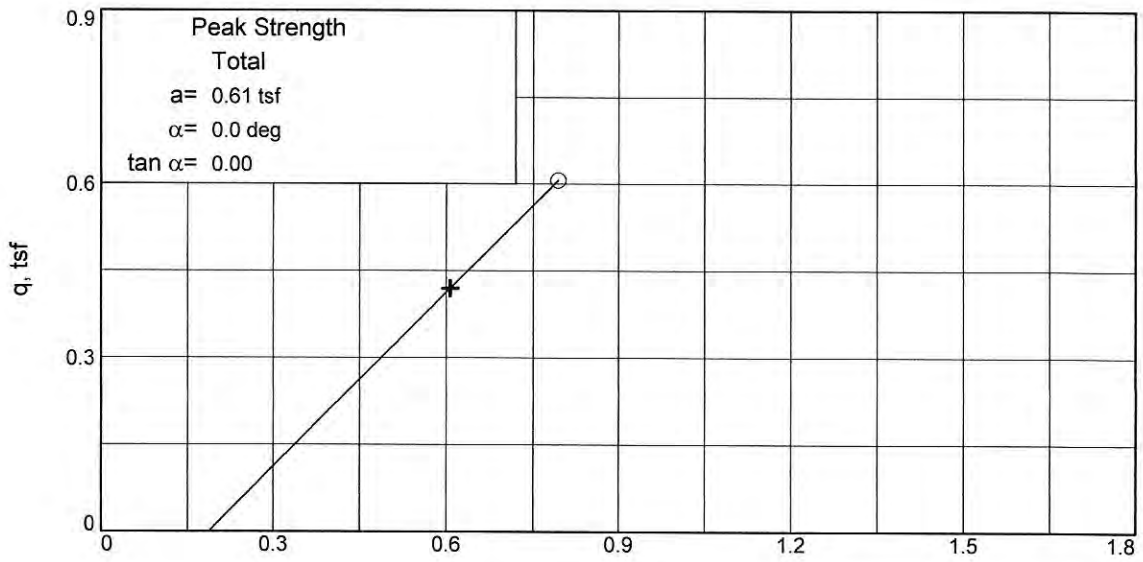
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

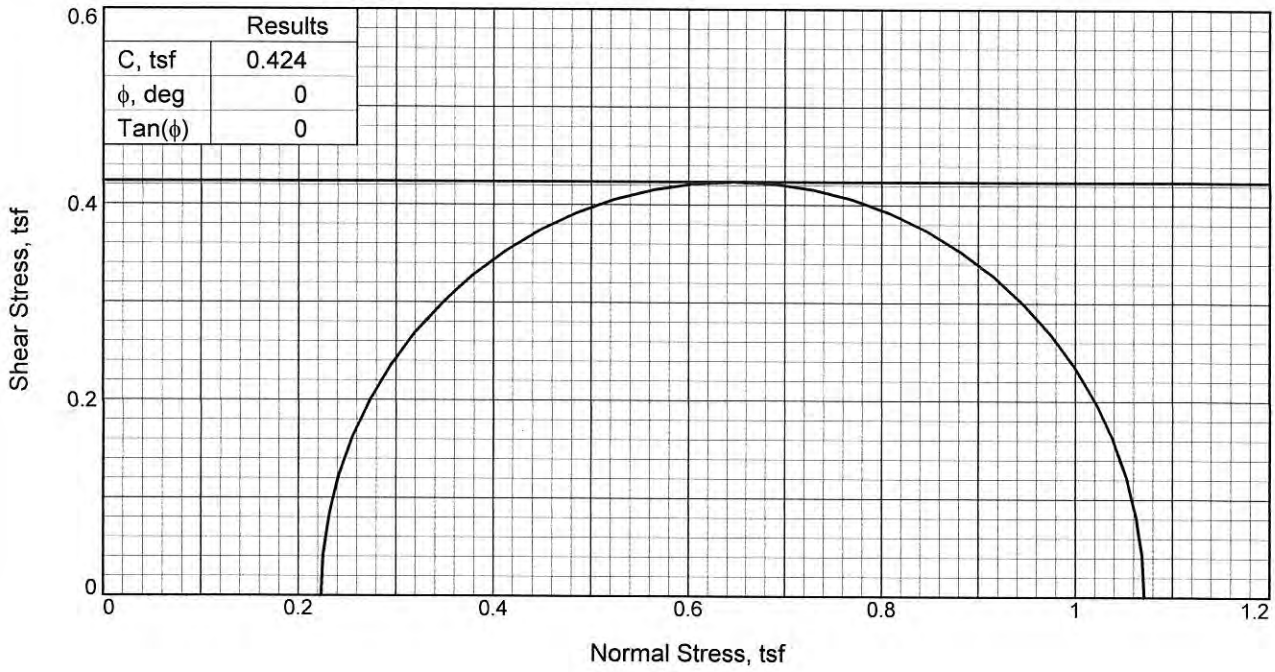
Client:

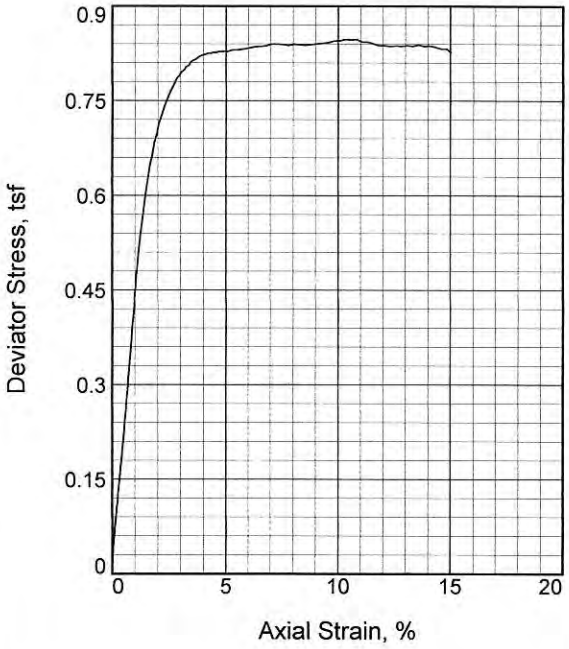
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB058 **Depth:** 6-8

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.





Sample No.		1
Initial	Water Content, %	30.5
	Dry Density, pcf	87.8
	Saturation, %	89.5
	Void Ratio	0.9190
	Diameter, in.	2.89
	Height, in.	5.77
At Test	Water Content, %	27.9
	Dry Density, pcf	87.8
	Saturation, %	81.9
	Void Ratio	0.9190
	Diameter, in.	2.89
	Height, in.	5.77
Strain rate, %/min.		1.00
Back Pressure, psi		0.00
Cell Pressure, psi		3.10
Fail. Stress, tsf		0.85
Strain, %		10.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.07
σ_3 Failure, tsf		0.22

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Dark brown FAT CLAY

Assumed Specific Gravity= 2.70

Remarks: Test method: ASTM D2850
Failure type: Bulge

Figure _____

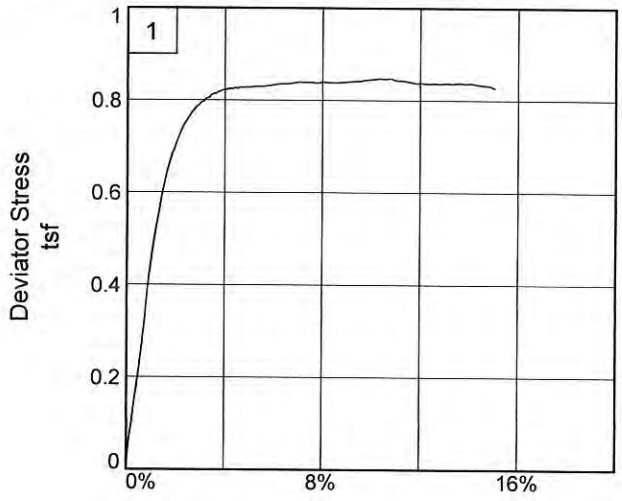
Client:

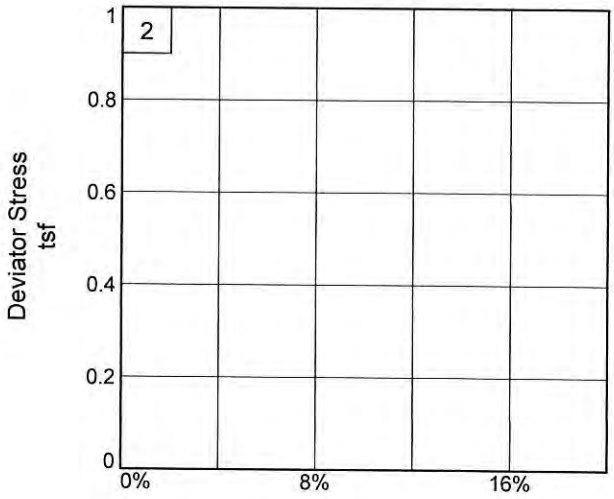
Project: San Jacinto River Waste Pit Superfund Site

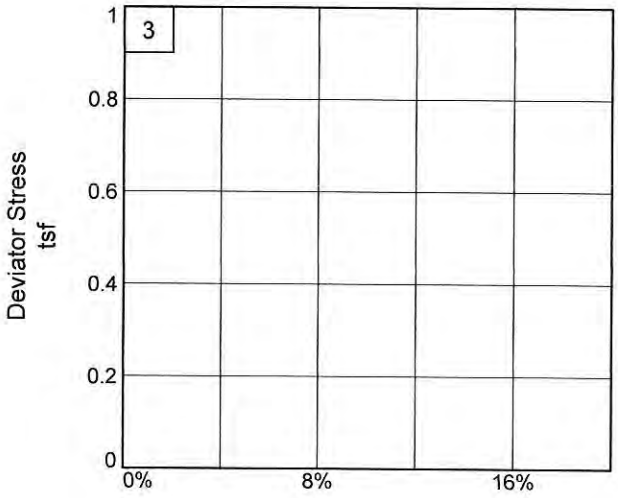
Source of Sample: SJGB058 **Depth:** 8-10

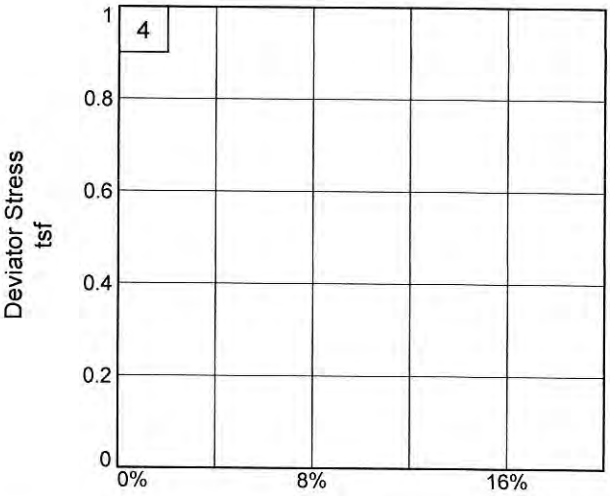
Proj. No.: 19.15.131 **Date Sampled:** 2/20/20

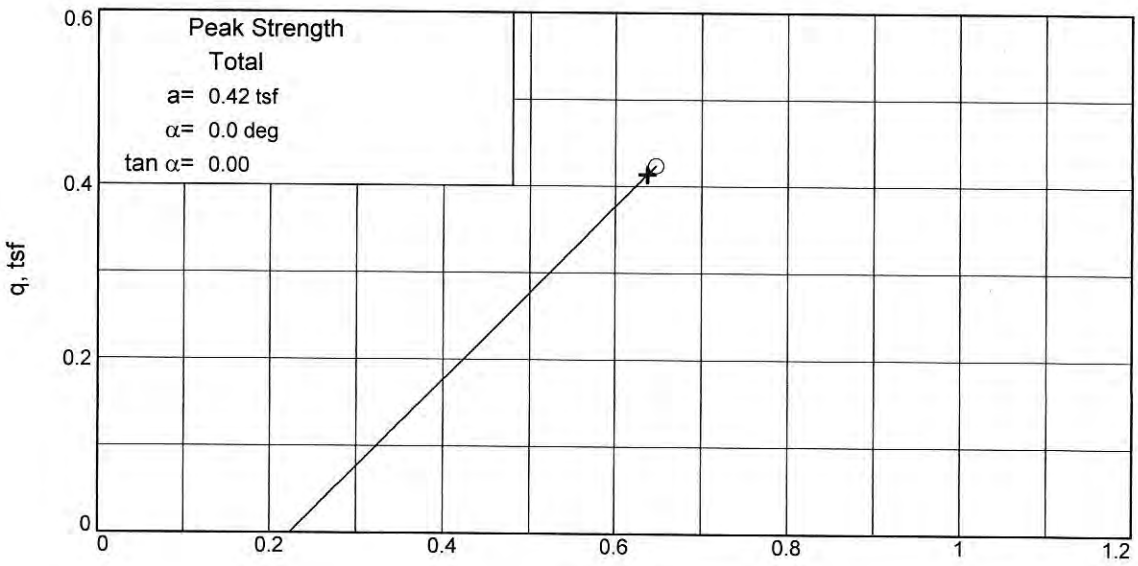
TRIAXIAL SHEAR TEST REPORT
Tolunay-Wong Engineers, Inc.
Houston, Texas











Stress Paths: o indicates peak + indicates end

Client:

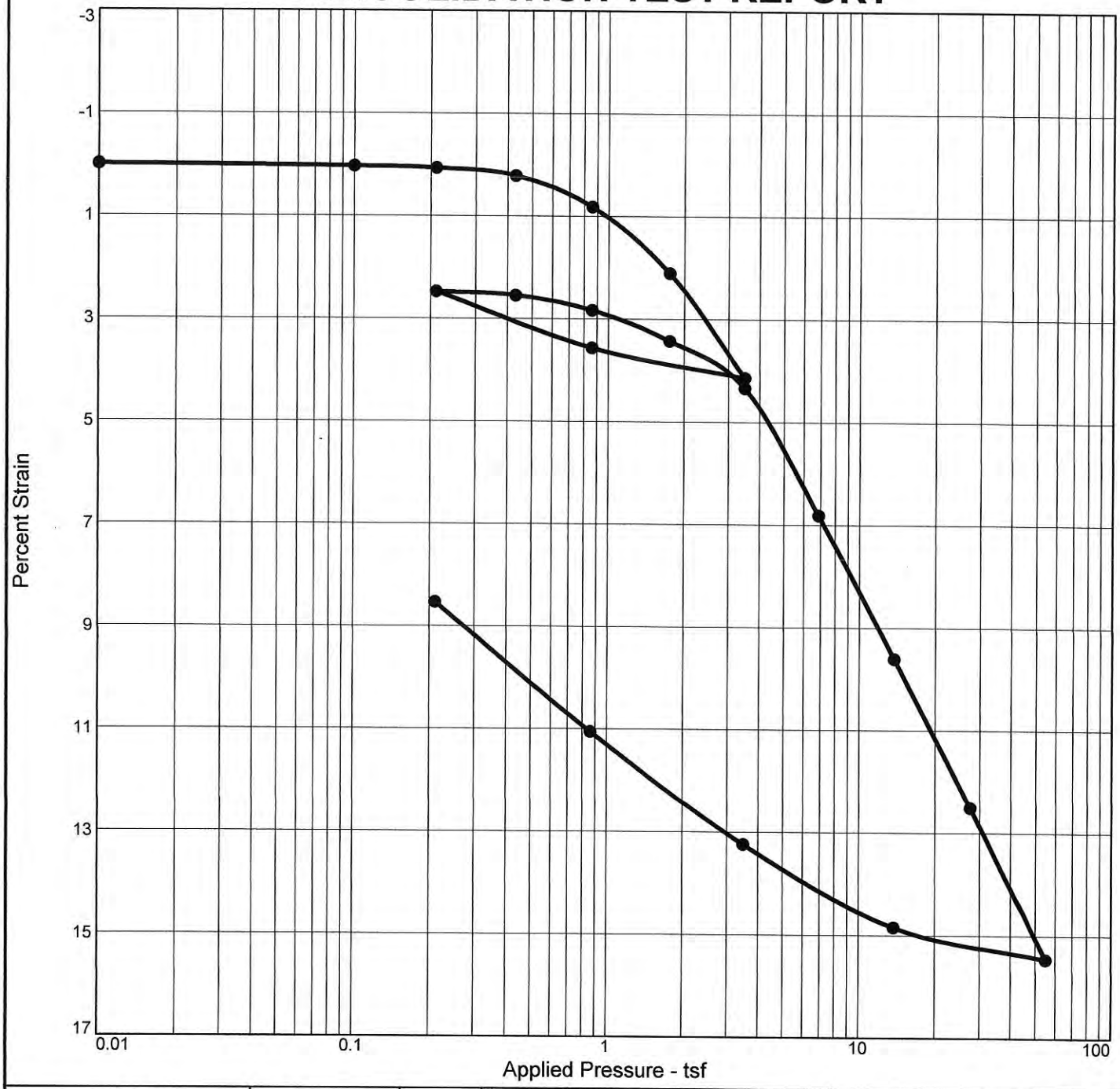
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB058 **Depth:** 8-10

Project No.: 19.15.131 **Figure** _____

TOLUNAY-WONG ENGINEERS, INC.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
98.0 %	20.6 %	107.5	37	20	2.70	CL		0.567

MATERIAL DESCRIPTION

Gray SANDY LEAN CLAY

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 6

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

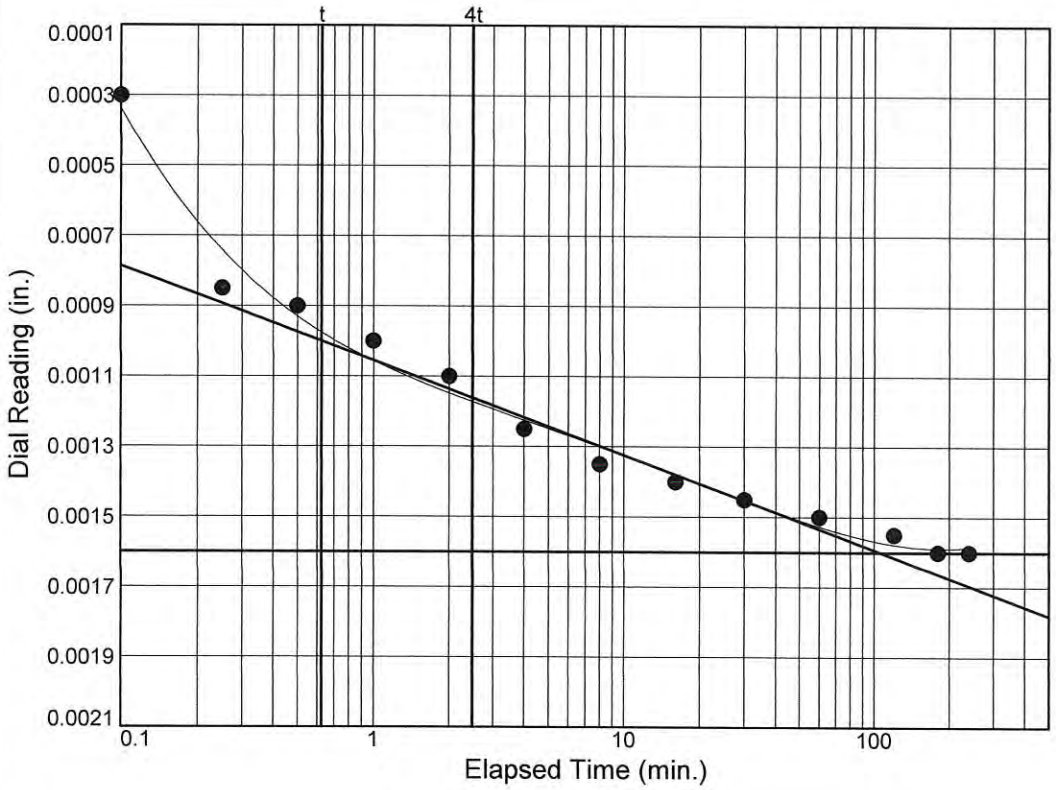
Figure

Attachment Figure B.2-159

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

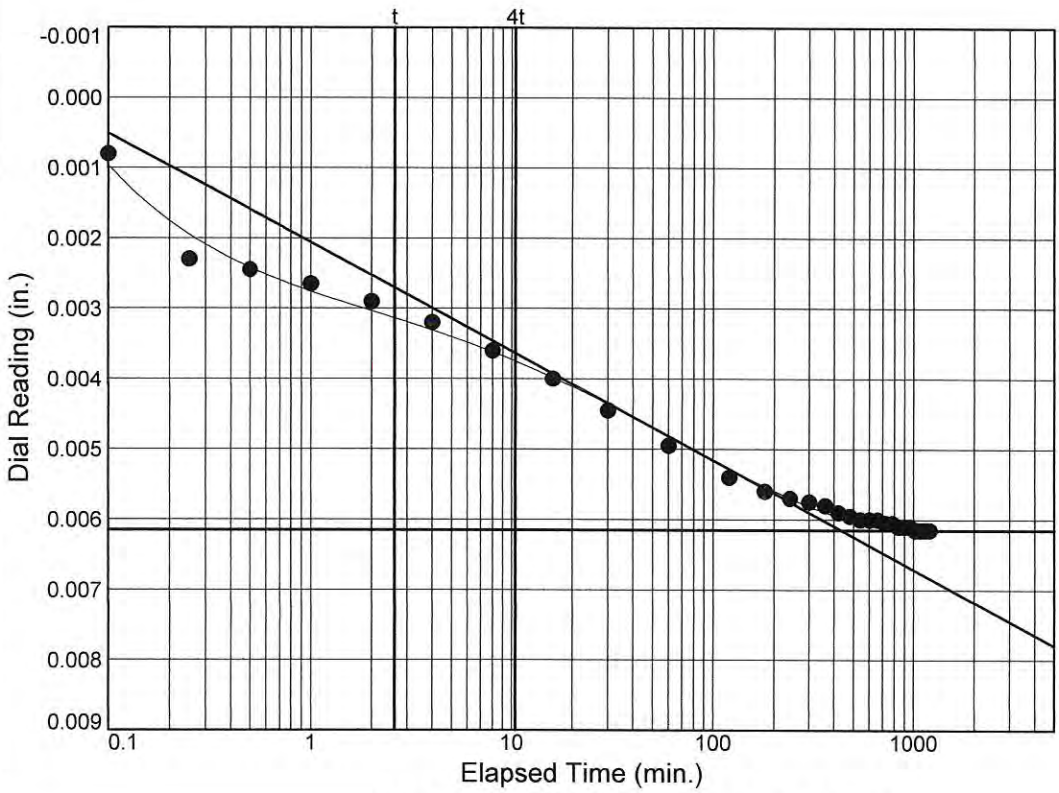
Source of Sample: SJGB027 Depth: 6



Load No.= 4
Load= 0.43 tsf
D_0 = 0.0008
D_{50} = 0.0012
D_{100} = 0.0016
T_{50} = 2.86 min.

C_v @ T_{50}
35.3 ft.^{2}/yr.

C_α = 0.000



Load No.= 5
Load= 0.86 tsf
D_0 = 0.0025
D_{50} = 0.0043
D_{100} = 0.0062
T_{50} = 28.88 min.

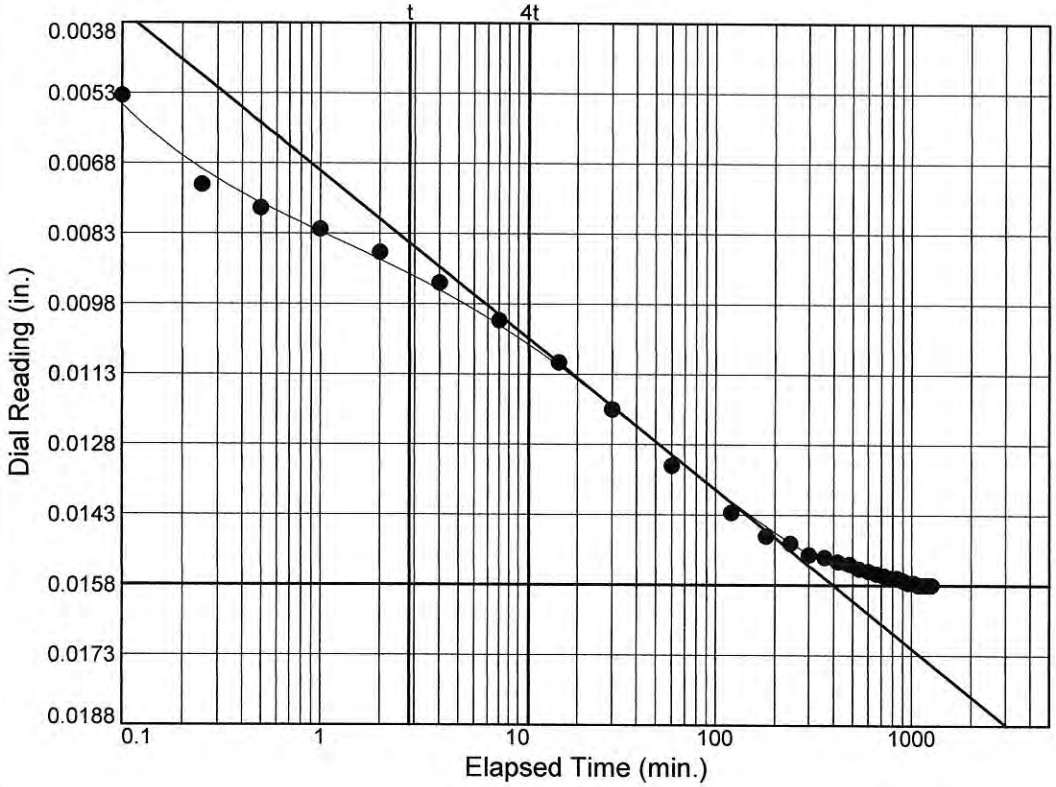
C_v @ T_{50}
3.5 ft.^{2}/yr.

C_α = 0.000

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

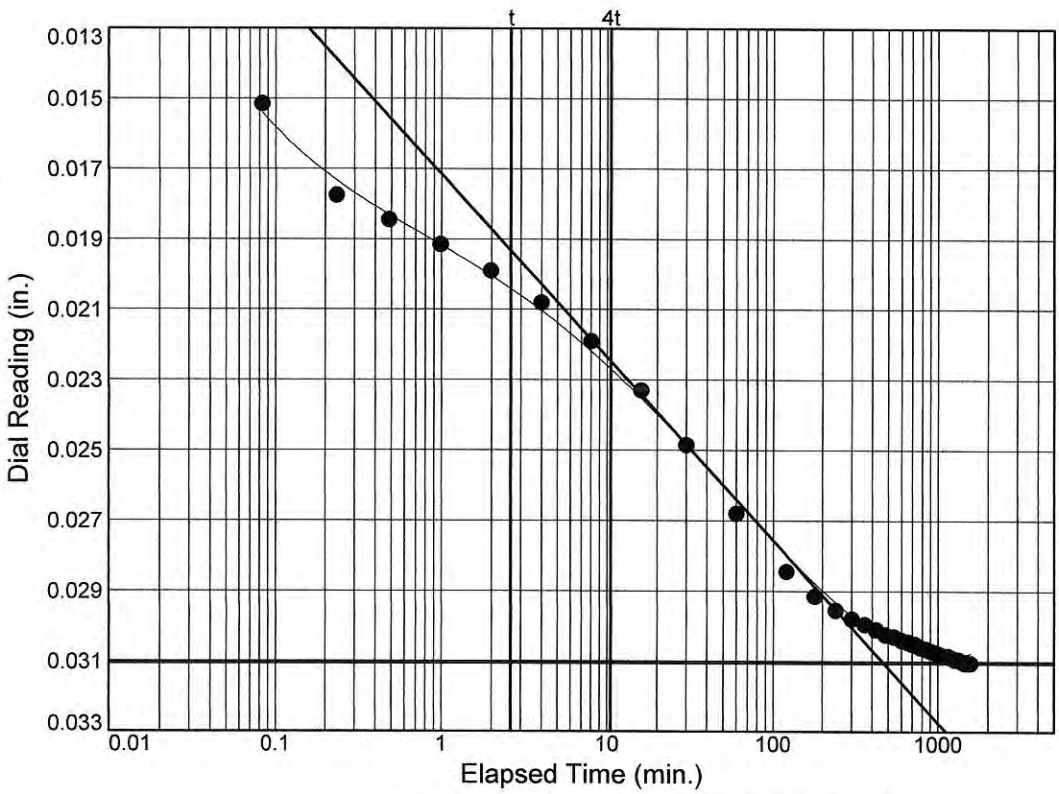
Source of Sample: SJGB027 Depth: 6



Load No.= 6
Load= 1.75 tsf
D_0 = 0.0077
D_{50} = 0.0117
D_{100} = 0.0158
T_{50} = 24.96 min.

C_v @ T_{50}
3.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 7
Load= 3.49 tsf
D_0 = 0.0181
D_{50} = 0.0246
D_{100} = 0.0311
T_{50} = 26.63 min.

C_v @ T_{50}
3.6 ft.^{2}/yr.

C_α = 0.000

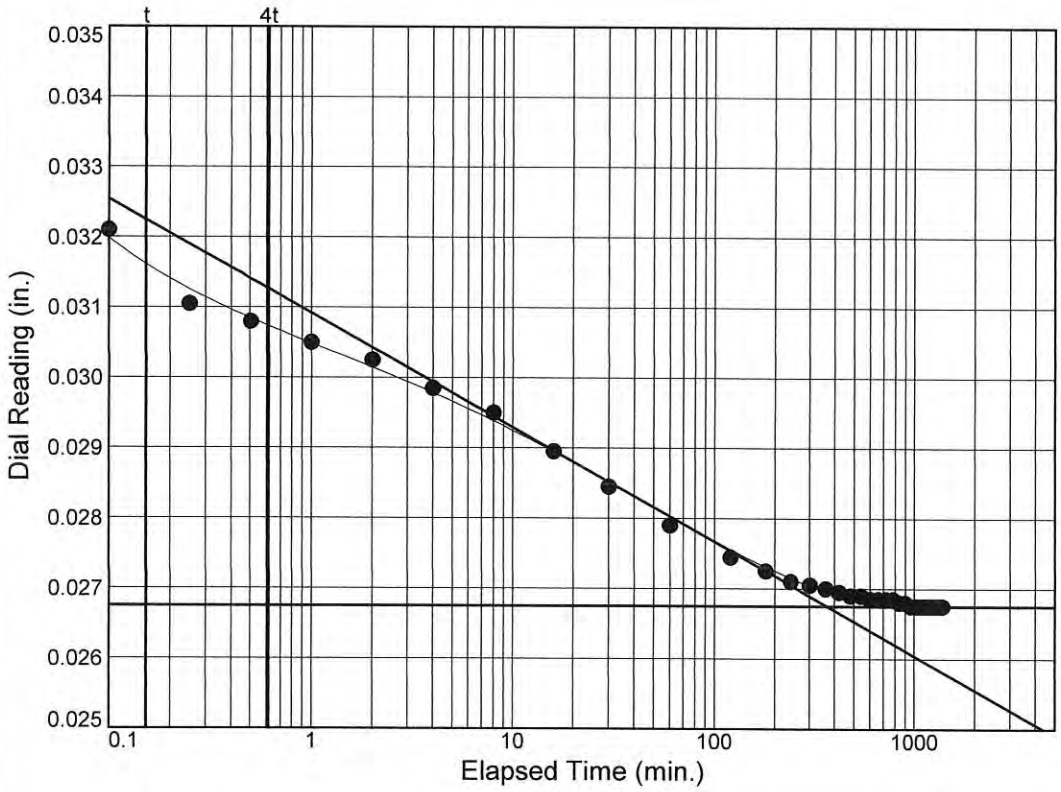
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-161

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

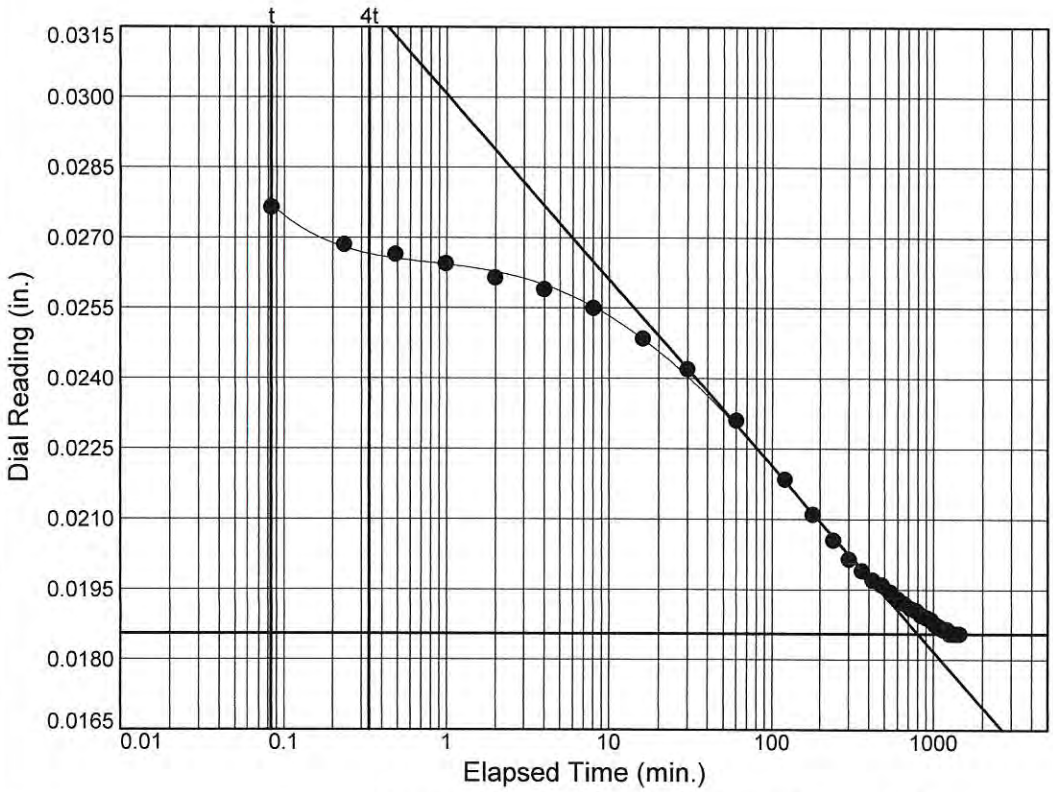
Source of Sample: SJGB027 Depth: 6



Load No.= 8
Load= 0.86 tsf
D_0 = 0.0325
D_{50} = 0.0296
D_{100} = 0.0267
T_{50} = 5.38 min.

C_v @ T_{50}
17.3 ft.^{2}/yr.

C_α = 0.000



Load No.= 9
Load= 0.21 tsf
D_0 = 0.0287
D_{50} = 0.0236
D_{100} = 0.0186
T_{50} = 39.47 min.

C_v @ T_{50}
2.4 ft.^{2}/yr.

C_α = 0.000

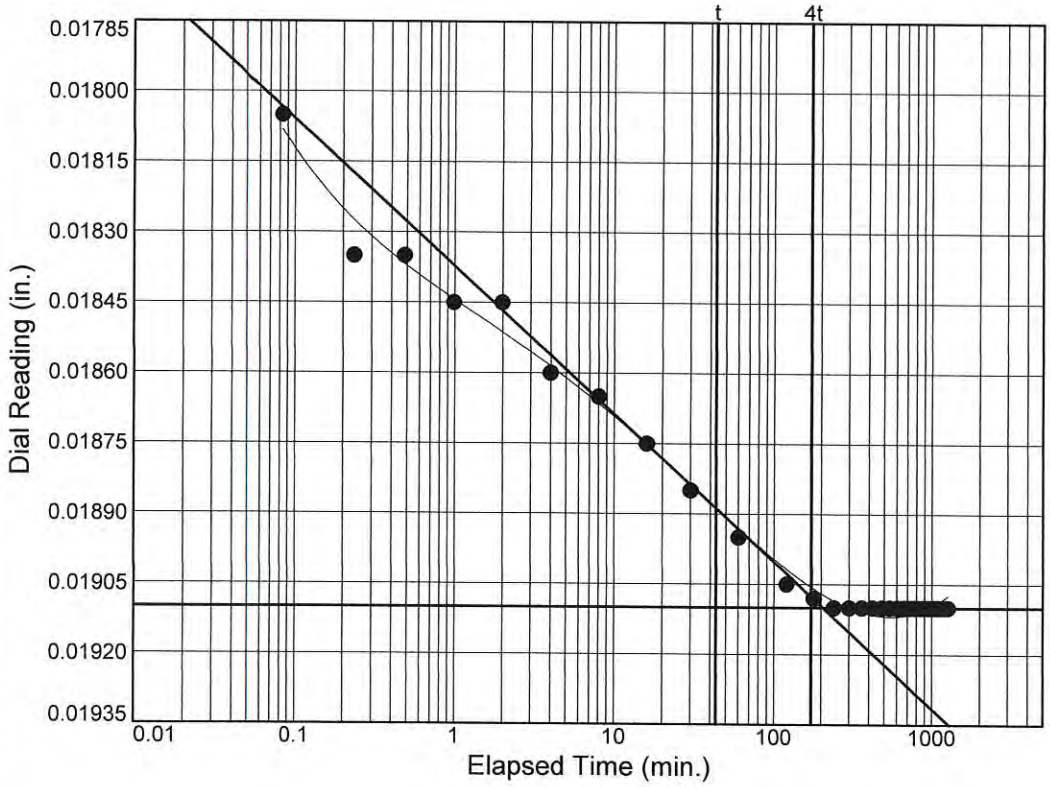
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-162

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

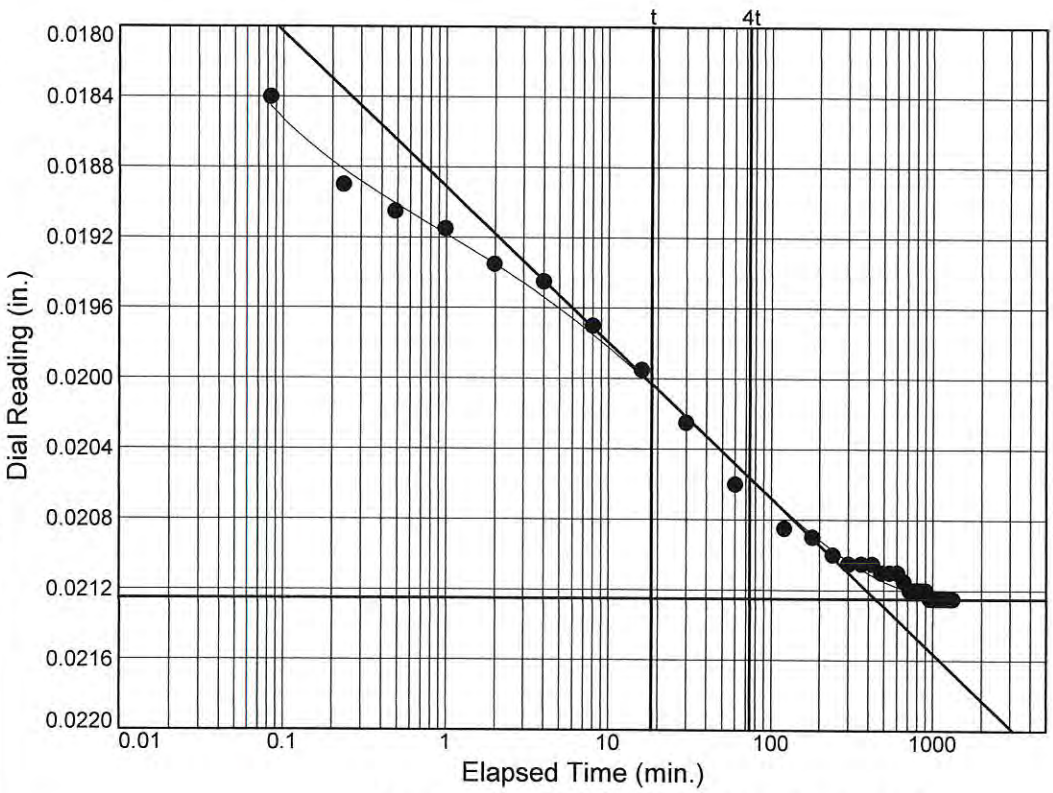
Source of Sample: SJGB027 Depth: 6



Load No.= 10
Load= 0.43 tsf
D_0 = 0.0187
D_{50} = 0.0189
D_{100} = 0.0191
T_{50} = 50.94 min.

C_v @ T_{50}
1.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 11
Load= 0.86 tsf
D_0 = 0.0195
D_{50} = 0.0204
D_{100} = 0.0212
T_{50} = 45.95 min.

C_v @ T_{50}
2.1 ft.^{2}/yr.

C_α = 0.000

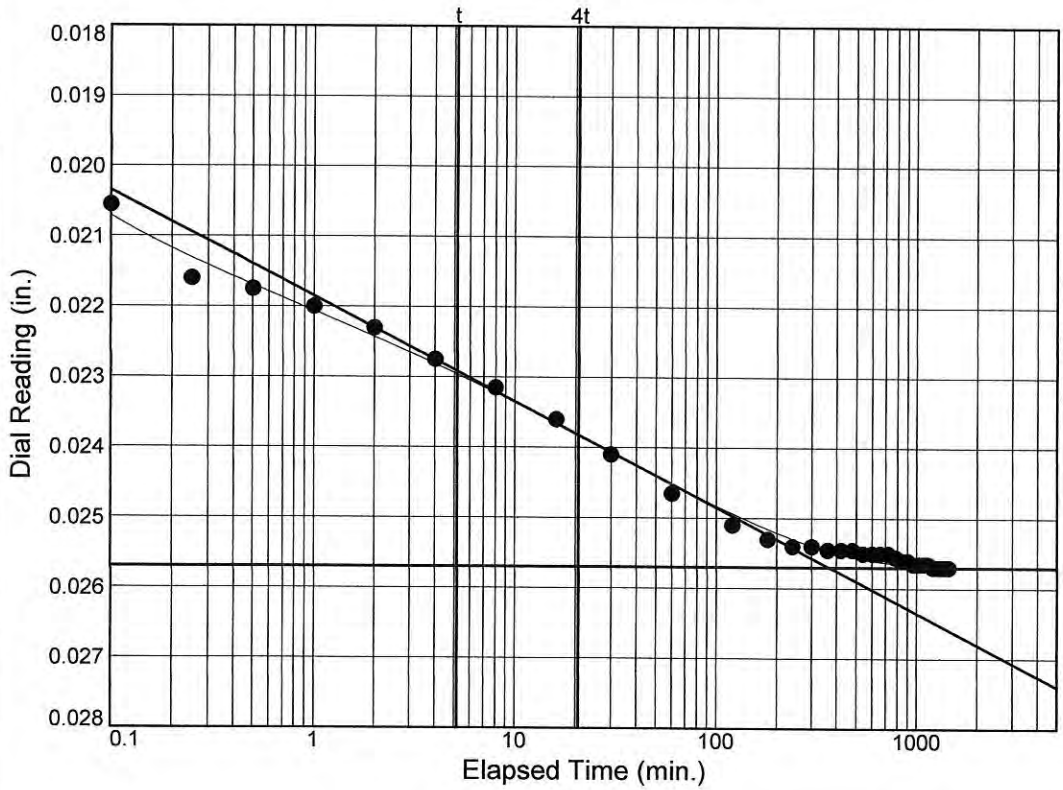
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-163

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

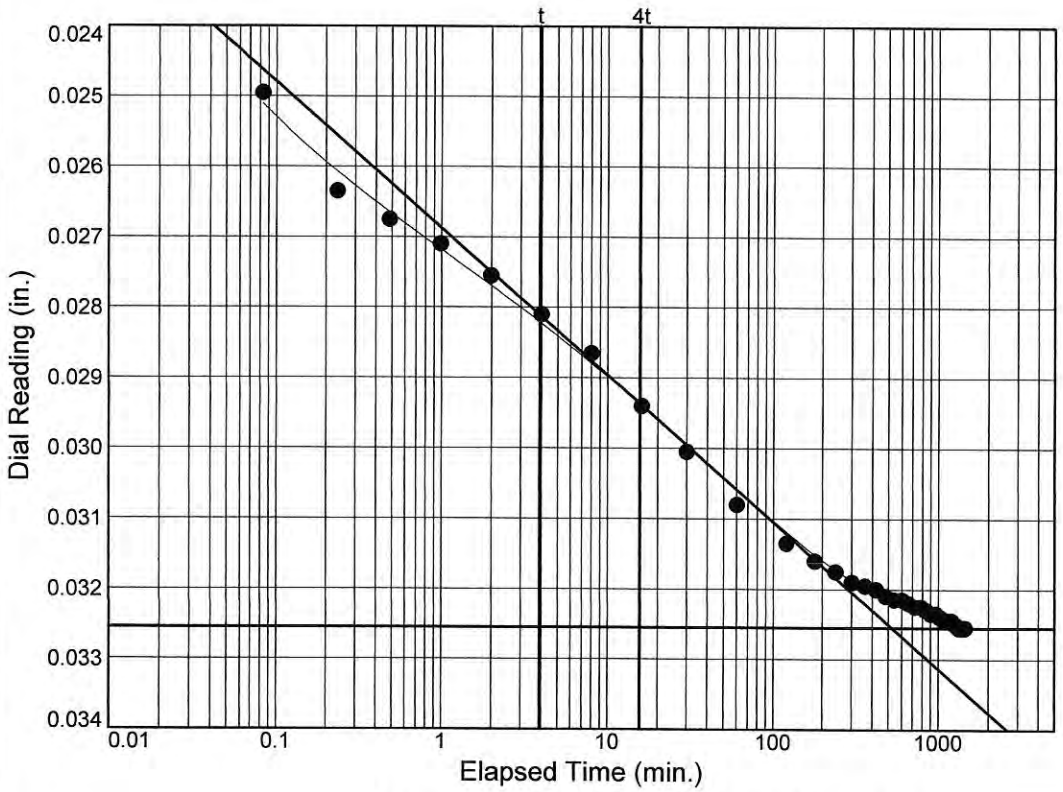
Source of Sample: SJGB027 Depth: 6



Load No.= 12
Load= 1.75 tsf
D_0 = 0.0221
D_{50} = 0.0239
D_{100} = 0.0257
T_{50} = 23.24 min.

C_v @ T_{50}
4.1 ft.^{2}/yr.

C_α = 0.000



Load No.= 13
Load= 3.49 tsf
D_0 = 0.0270
D_{50} = 0.0298
D_{100} = 0.0325
T_{50} = 25.16 min.

C_v @ T_{50}
3.7 ft.^{2}/yr.

C_α = 0.000

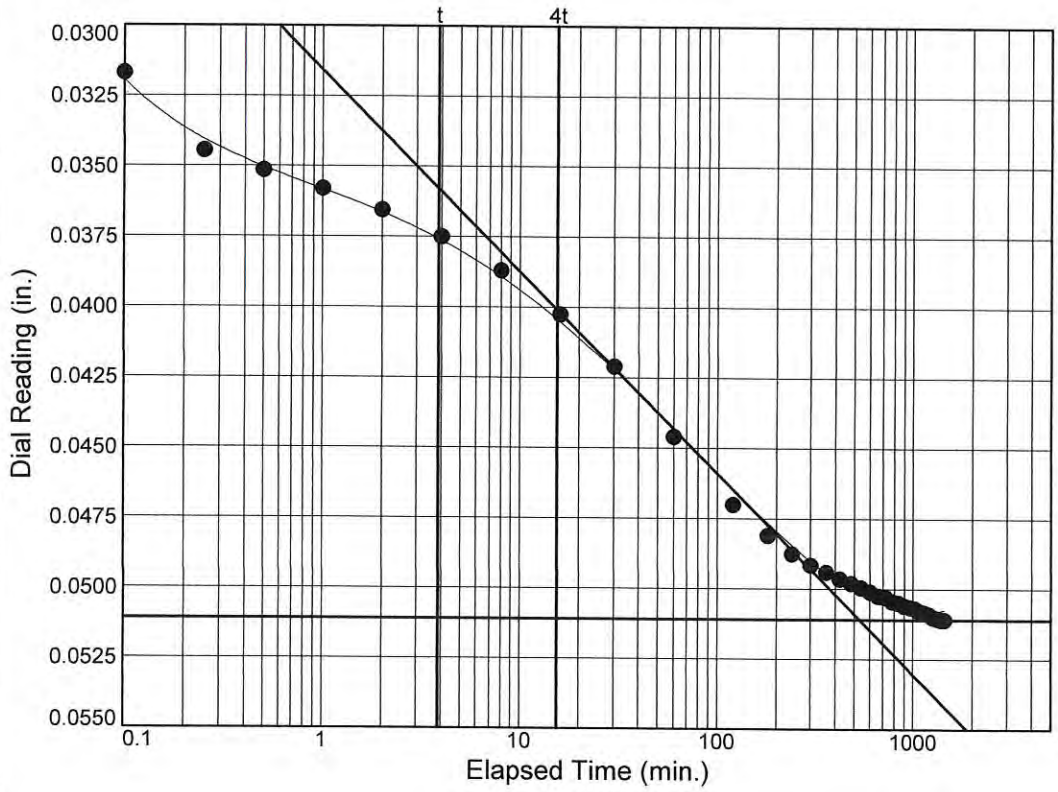
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-164

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

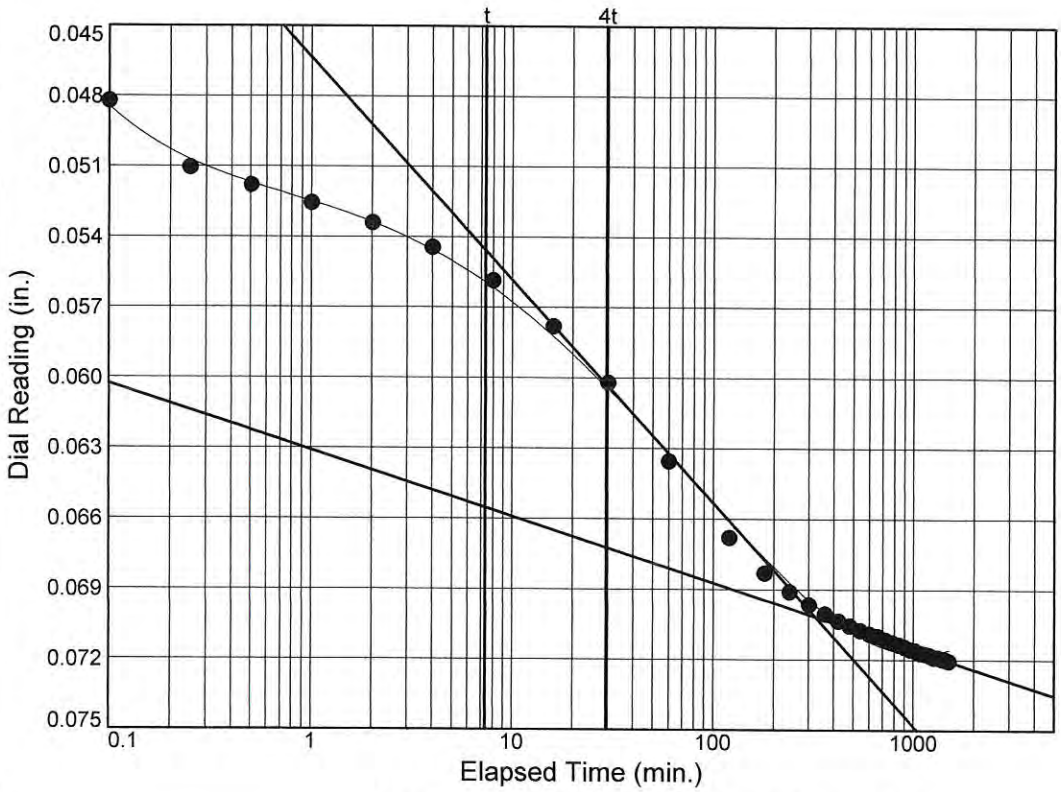
Source of Sample: SJGB027 Depth: 6



Load No.= 14
Load= 6.87 tsf
D_0 = 0.0347
D_{50} = 0.0429
D_{100} = 0.0511
T_{50} = 37.82 min.

C_v @ T_{50}
2.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 15
Load= 13.75 tsf
D_0 = 0.0515
D_{50} = 0.0608
D_{100} = 0.0702
T_{50} = 32.86 min.

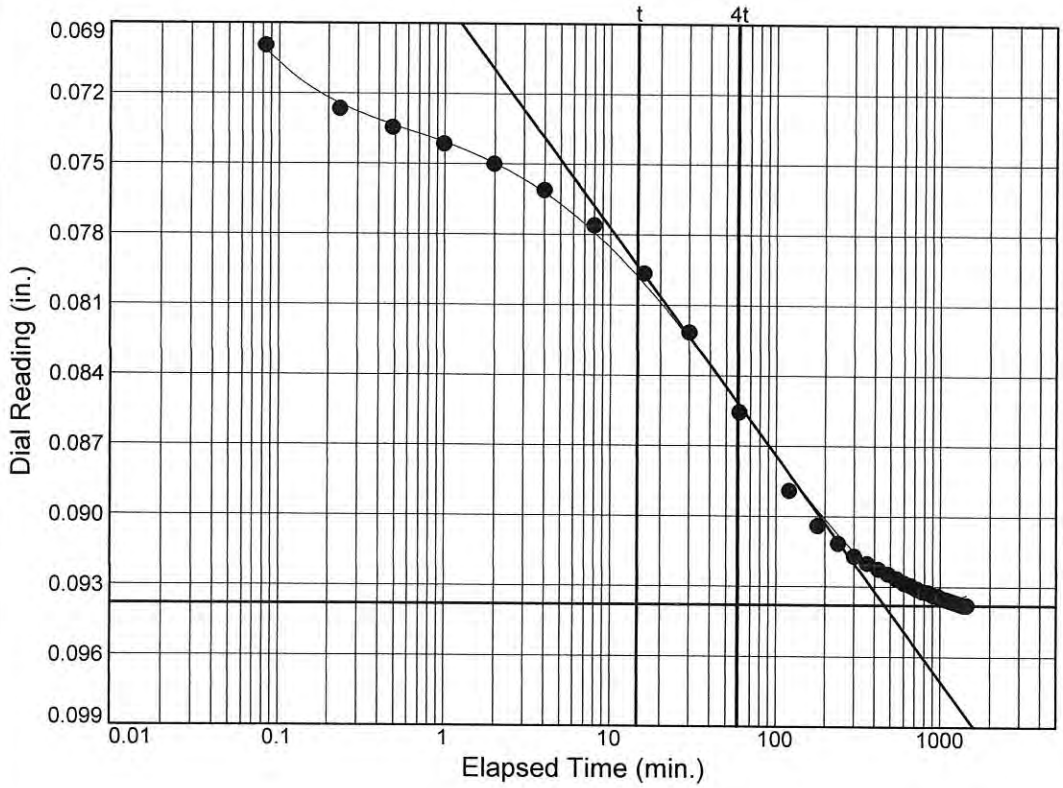
C_v @ T_{50}
2.6 ft.^{2}/yr.

C_α = 0.006

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

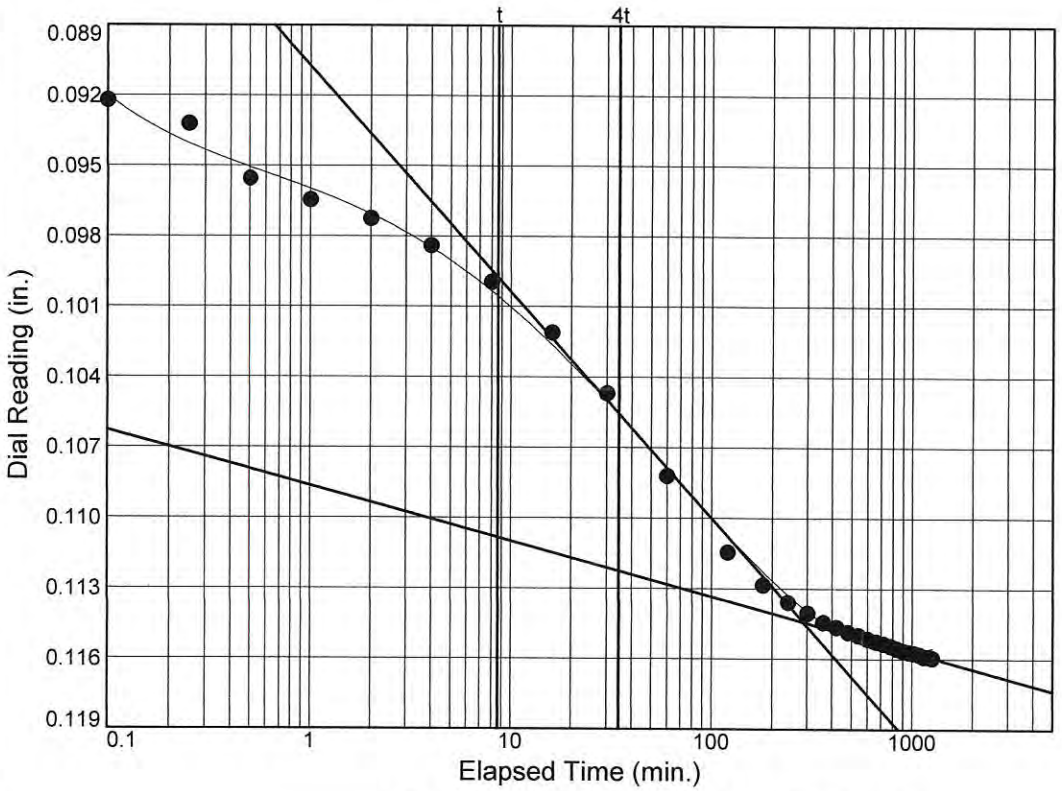
Source of Sample: SJGB027 Depth: 6



Load No.= 16
Load= 27.50 tsf
D_0 = 0.0744
D_{50} = 0.0841
D_{100} = 0.0938
T_{50} = 45.65 min.

C_v @ T_{50}
1.8 ft.^{2}/yr.

C_α = 0.000



Load No.= 17
Load= 54.99 tsf
D_0 = 0.0955
D_{50} = 0.1050
D_{100} = 0.1144
T_{50} = 29.67 min.

C_v @ T_{50}
2.5 ft.^{2}/yr.

C_α = 0.005

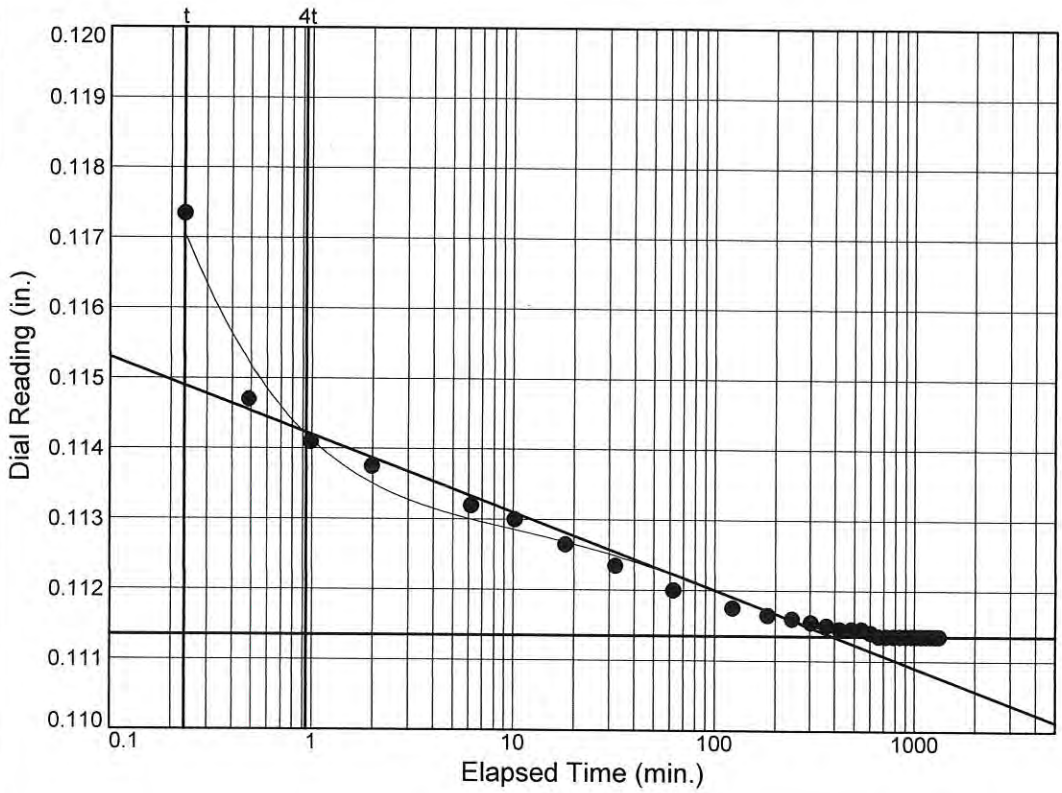
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-166

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

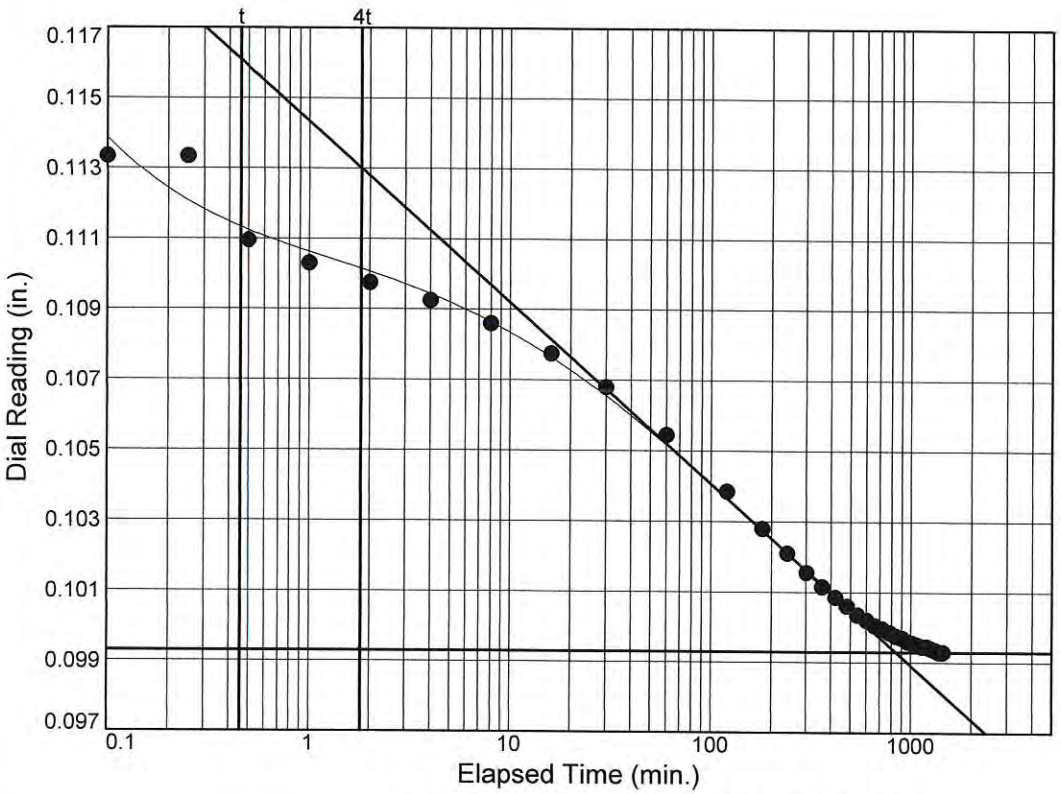
Source of Sample: SJGB027 Depth: 6



Load No.= 18
Load= 13.75 tsf
D_0 = 0.1199
D_{50} = 0.1156
D_{100} = 0.1114
T_{50} = 0.40 min.

C_v @ T_{50}
181.8 ft.^{2}/yr.

C_α = 0.000



Load No.= 19
Load= 3.49 tsf
D_0 = 0.1125
D_{50} = 0.1059
D_{100} = 0.0993
T_{50} = 41.67 min.

C_v @ T_{50}
1.8 ft.^{2}/yr.

C_α = 0.000

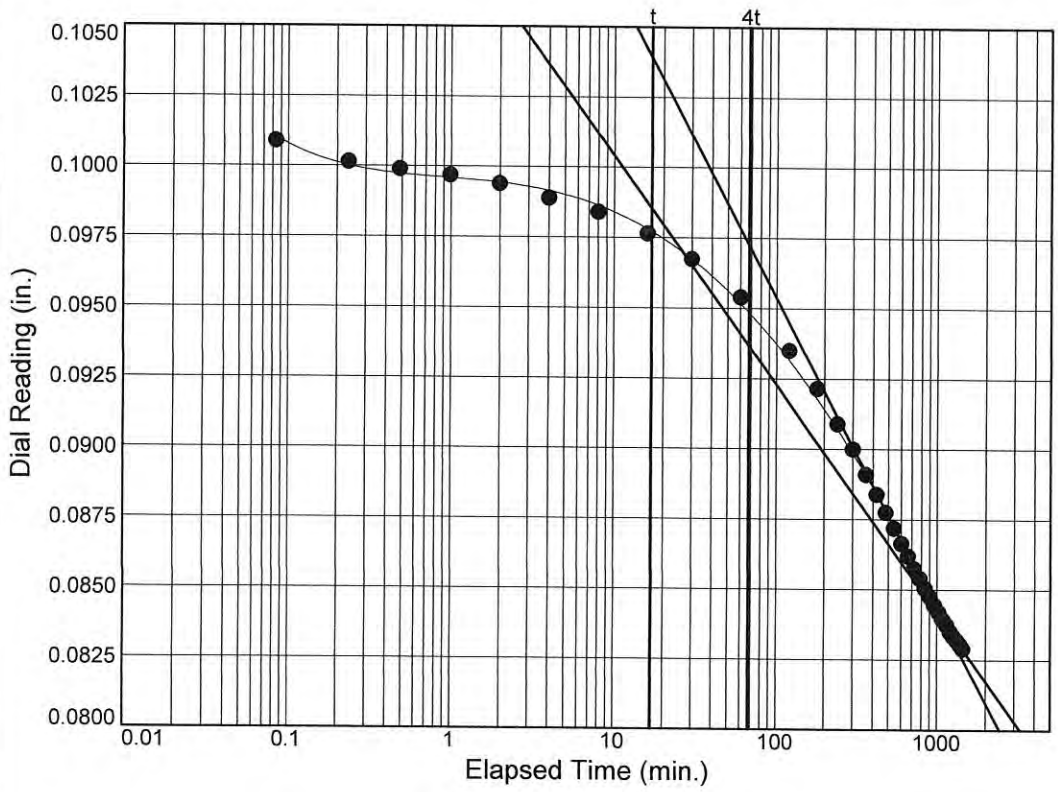
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-167

Dial Reading vs. Time

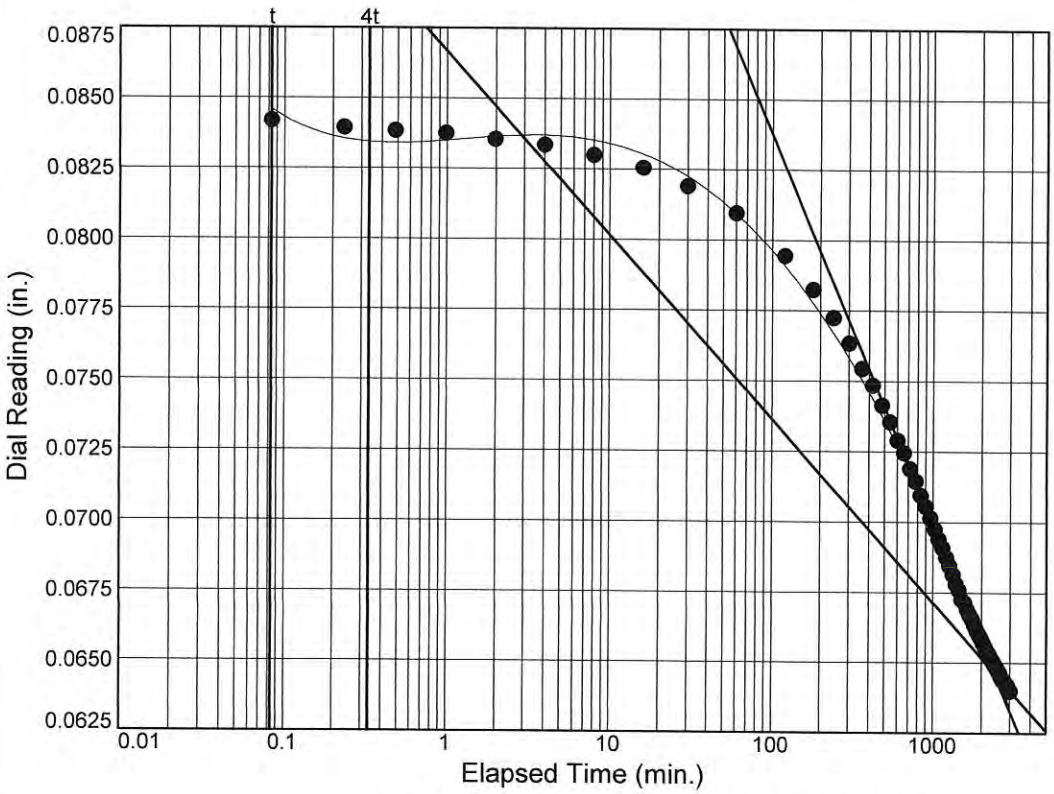
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 Depth: 6



Load No.= 20
Load= 0.86 tsf
D_0 = 0.1006
D_{50} = 0.0922
D_{100} = 0.0839
T_{50} = 158.06 min.

C_v @ T_{50}
0.5 ft.^{2}/yr.



Load No.= 21
Load= 0.21 tsf
D_0 = 0.0858
D_{50} = 0.0752
D_{100} = 0.0647
T_{50} = 346.90 min.

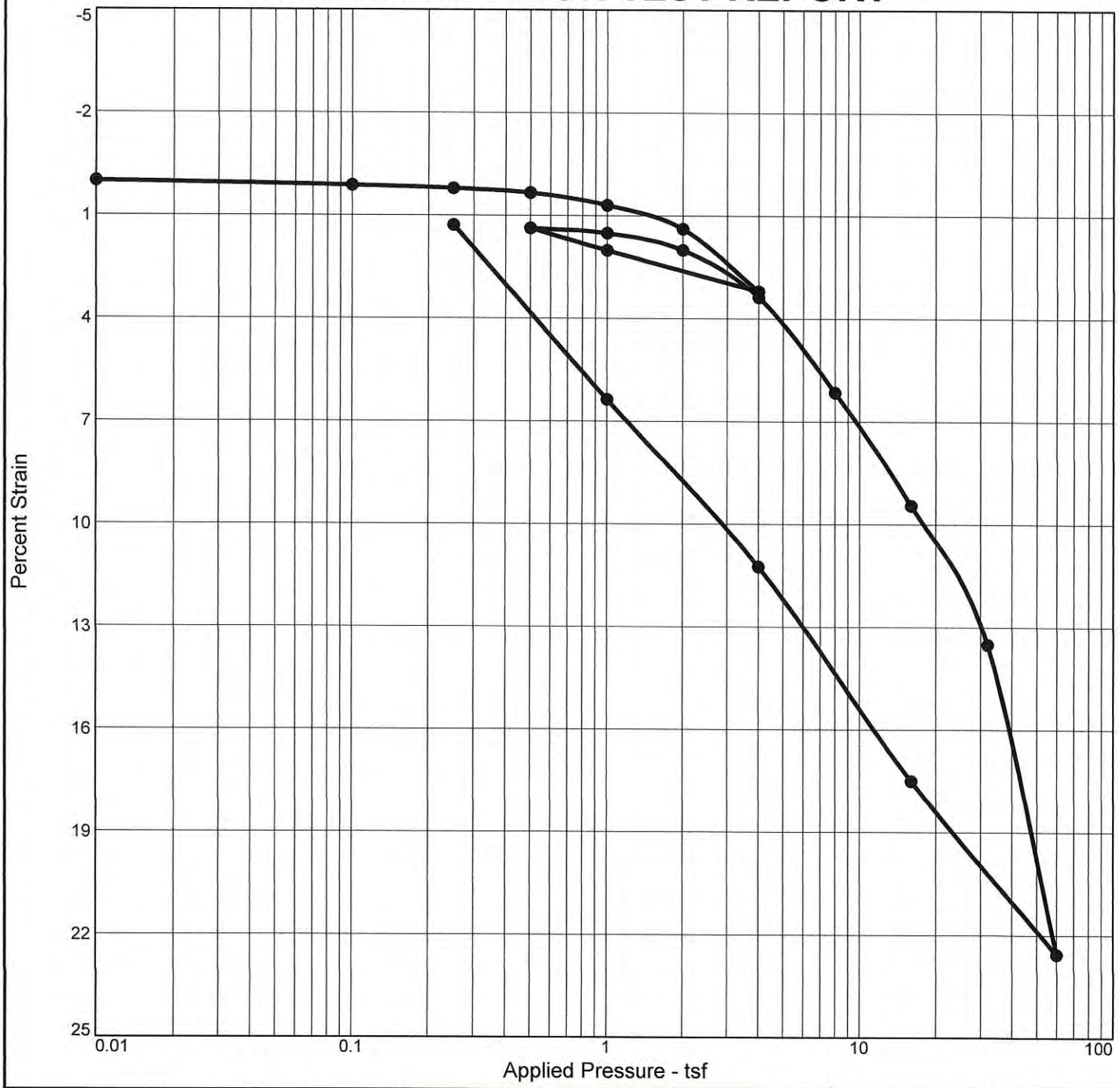
C_v @ T_{50}
0.2 ft.^{2}/yr.

TOLUNAY-WONG ENGINEERS, INC.

Figure

Attachment Figure B.2-168

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
98.6 %	32.3 %	89.5	49	30	2.70	CL		0.884

MATERIAL DESCRIPTION

Reddish-brown LEAN CLAY; calcareous

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 **Depth:** 43

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

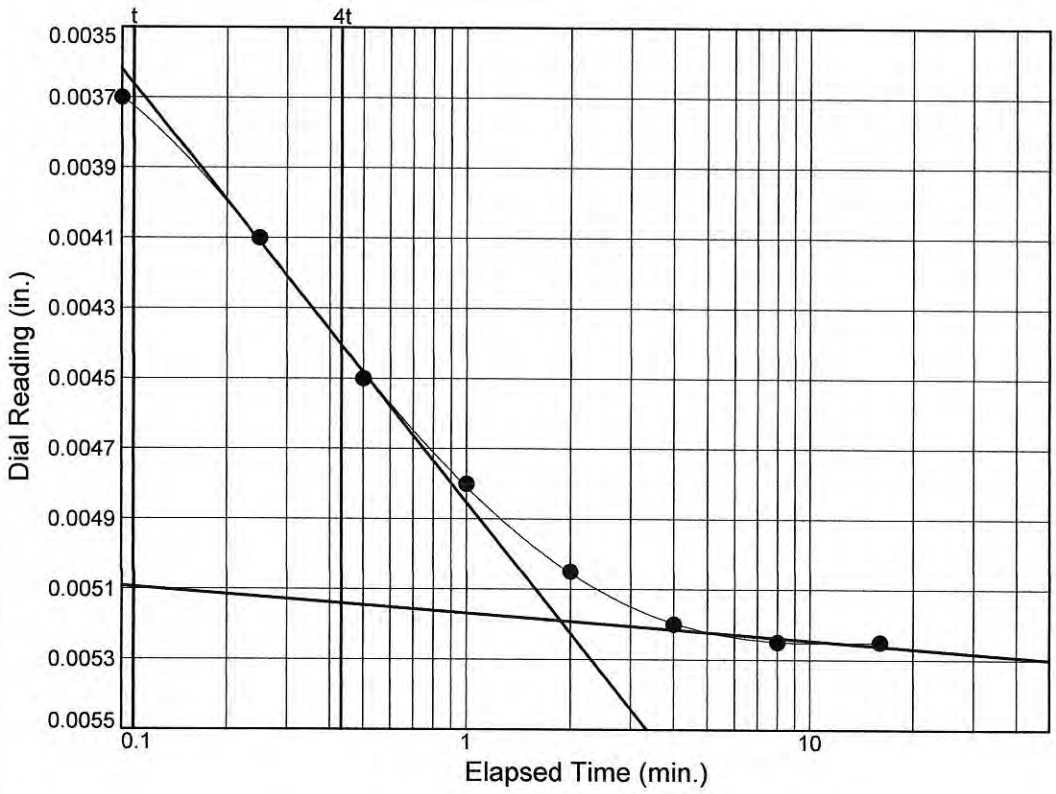
Figure

Attachment Figure B.2-169

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

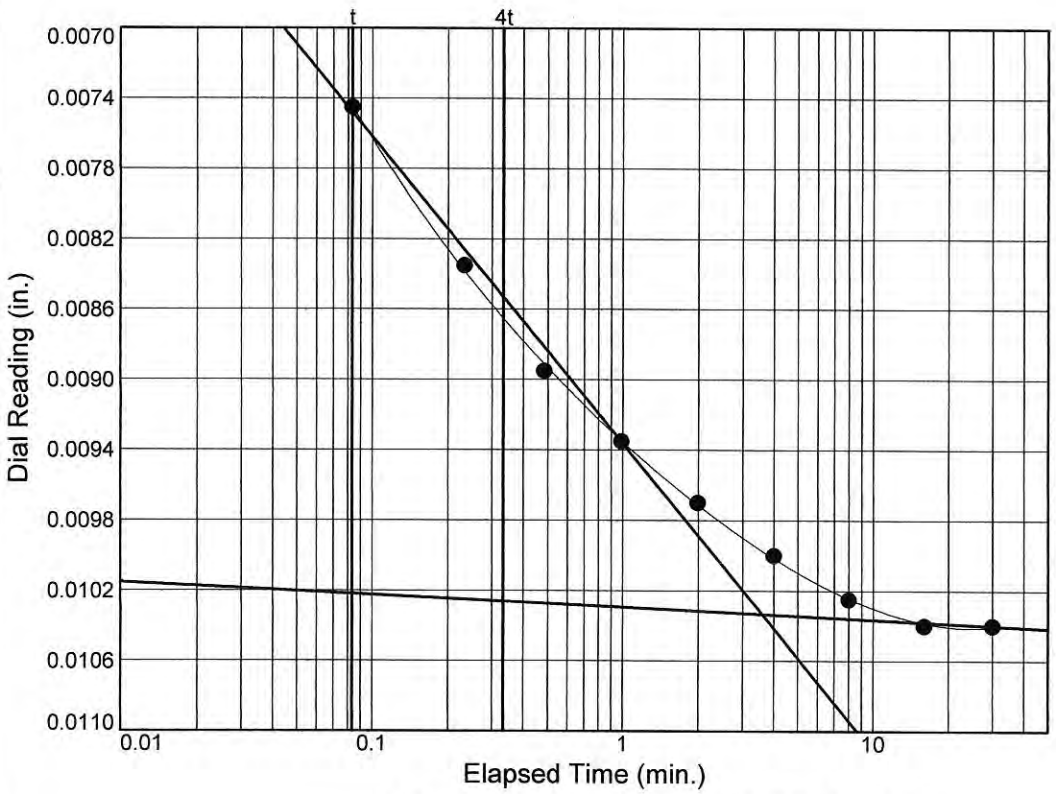
Source of Sample: SJGB027 Depth: 43



Load No.= 5
Load= 1.00 tsf
D_0 = 0.0030
D_{50} = 0.0041
D_{100} = 0.0052
T_{50} = 0.25 min.

C_v @ T_{50}
395.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 6
Load= 2.00 tsf
D_0 = 0.0062
D_{50} = 0.0083
D_{100} = 0.0103
T_{50} = 0.21 min.

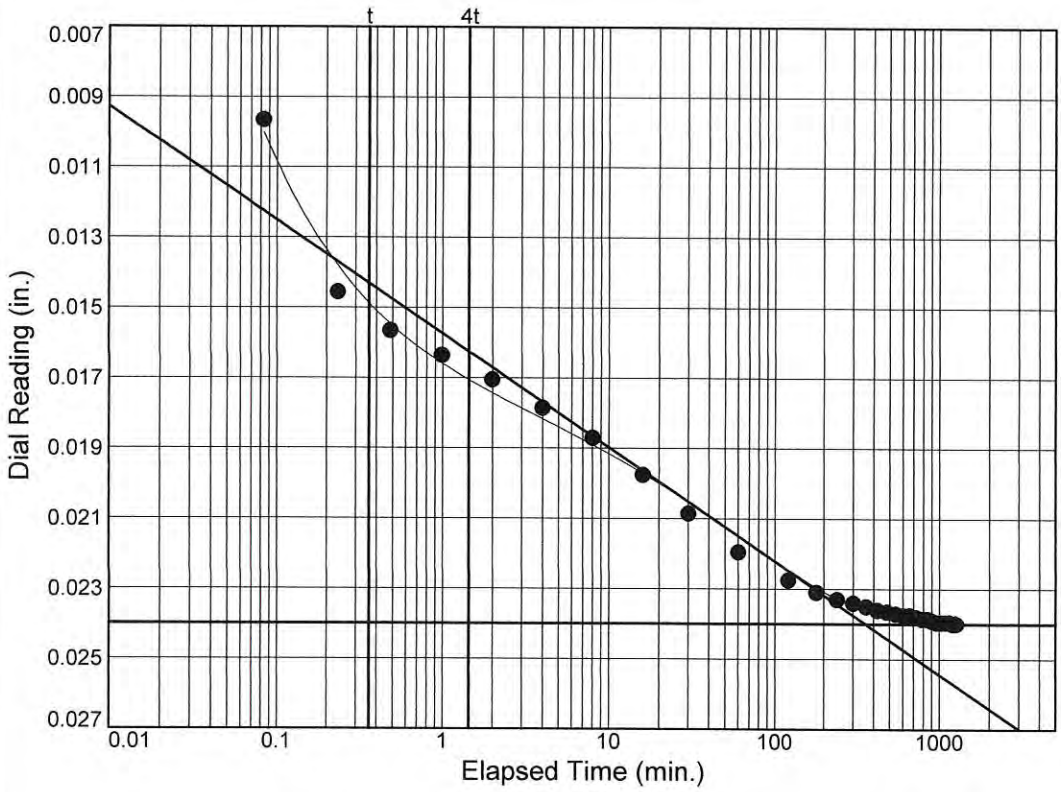
C_v @ T_{50}
480.8 ft.^{2}/yr.

C_α = 0.000

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

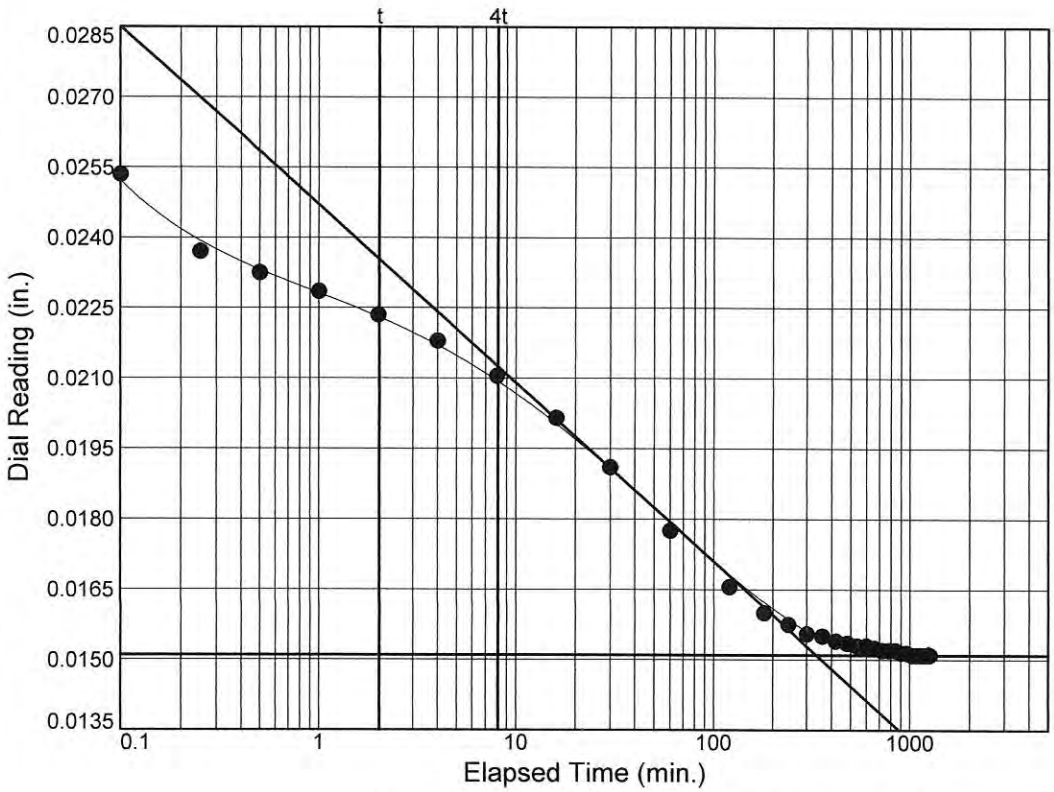
Source of Sample: SJGB027 Depth: 43



Load No.= 7
Load= 4.00 tsf
D_0 = 0.0127
D_{50} = 0.0183
D_{100} = 0.0240
T_{50} = 4.76 min.

C_v @ T_{50}
20.3 ft.^{2}/yr.

C_α = 0.000



Load No.= 8
Load= 1.00 tsf
D_0 = 0.0237
D_{50} = 0.0194
D_{100} = 0.0151
T_{50} = 24.57 min.

C_v @ T_{50}
3.9 ft.^{2}/yr.

C_α = 0.000

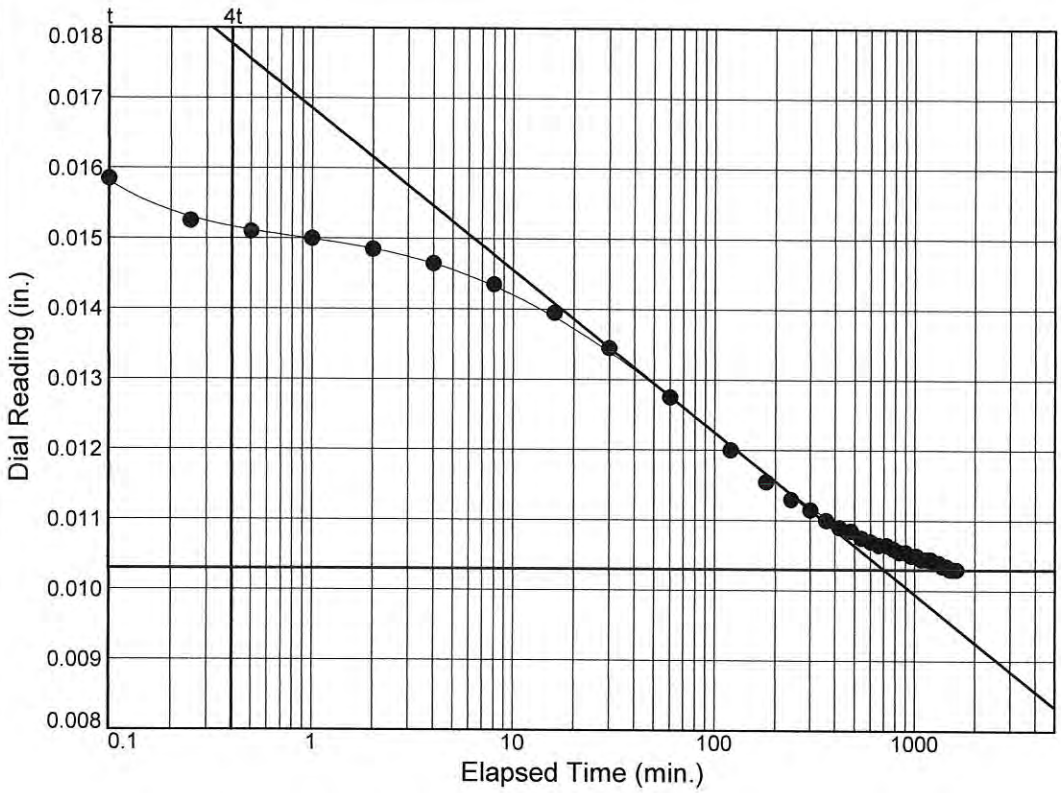
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-171

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

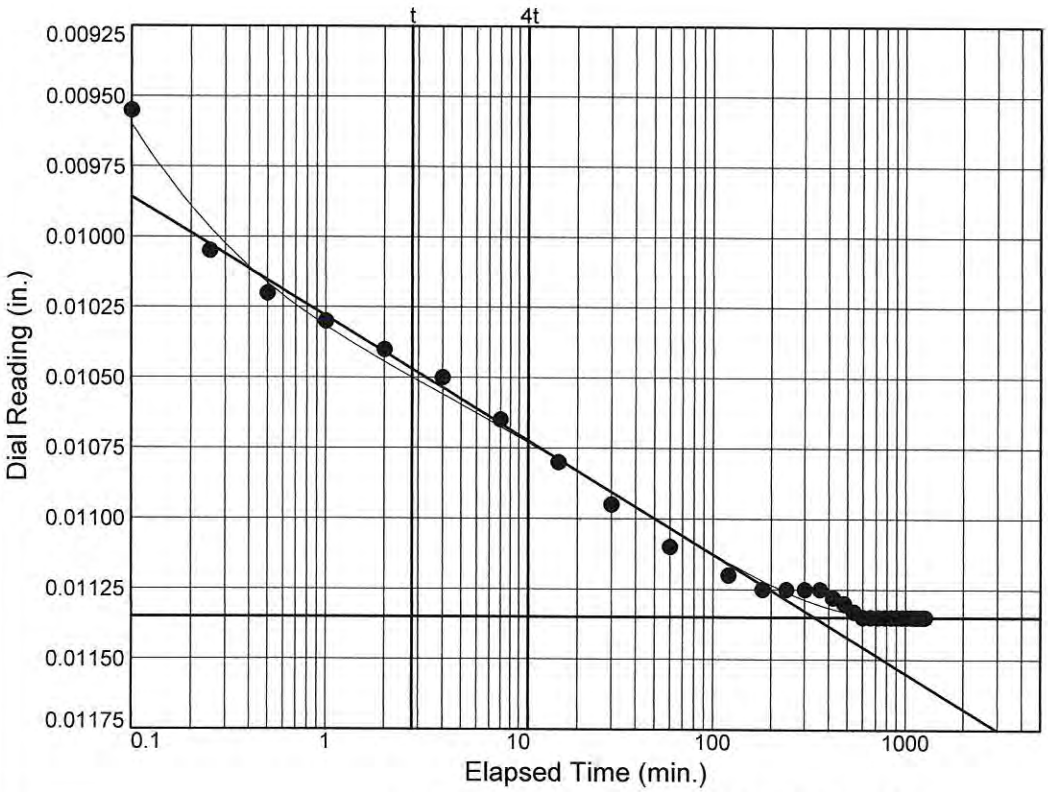
Source of Sample: SJGB027 Depth: 43



Load No.= 9
Load= 0.50 tsf
D_0 = 0.0165
D_{50} = 0.0134
D_{100} = 0.0103
T_{50} = 30.43 min.

C_v @ T_{50}
3.2 ft.^{2}/yr.

C_α = 0.000



Load No.= 10
Load= 1.00 tsf
D_0 = 0.0103
D_{50} = 0.0108
D_{100} = 0.0114
T_{50} = 17.52 min.

C_v @ T_{50}
5.6 ft.^{2}/yr.

C_α = 0.000

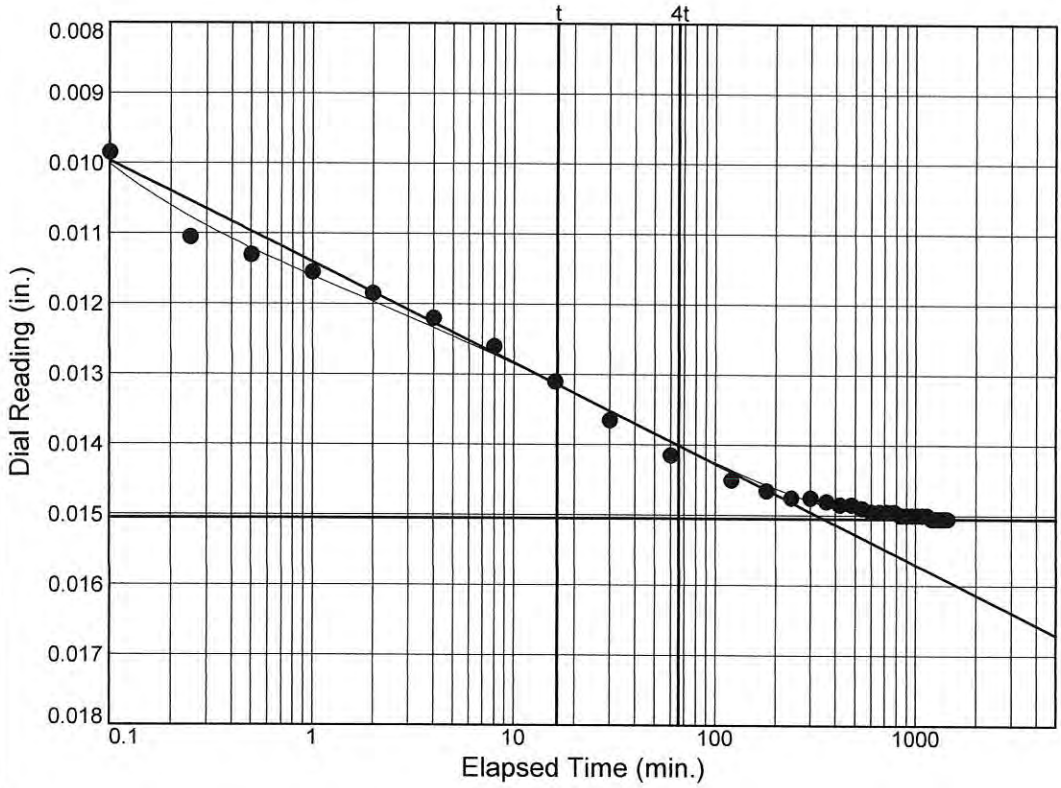
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-172

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

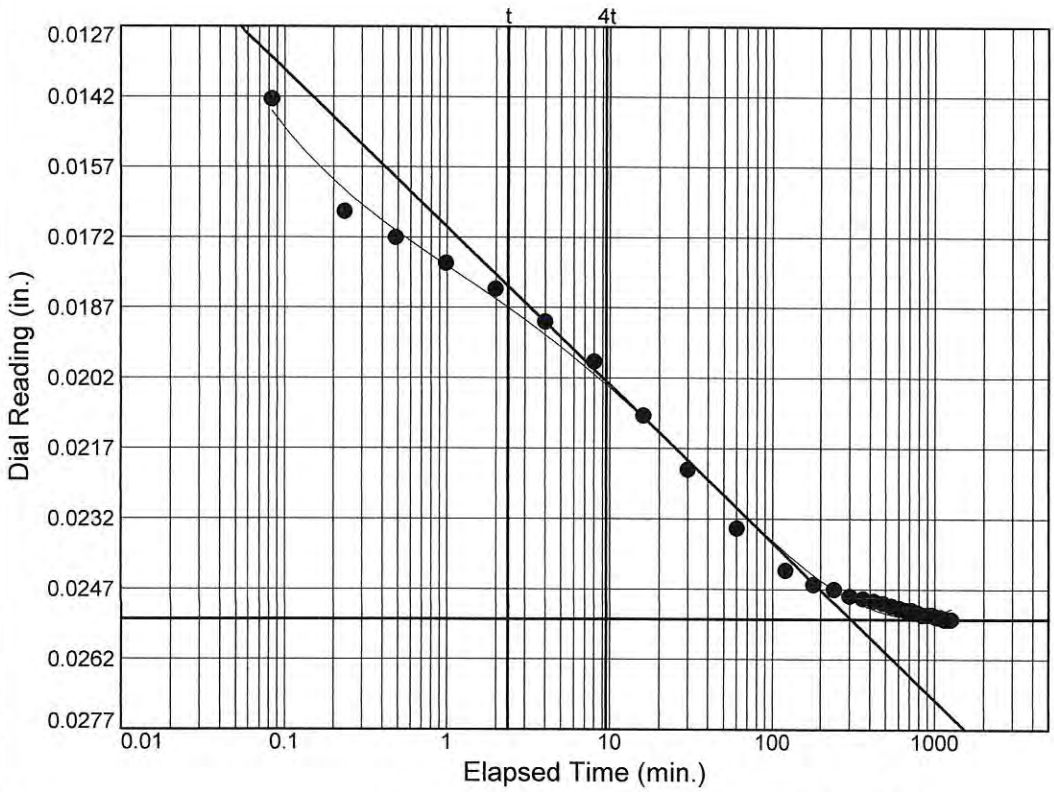
Source of Sample: SJGB027 Depth: 43



Load No.= 11
Load= 2.00 tsf
D_0 = 0.0123
D_{50} = 0.0137
D_{100} = 0.0151
T_{50} = 38.22 min.

C_v @ T_{50}
2.6 ft.^{2}/yr.

C_α = 0.000



Load No.= 12
Load= 4.00 tsf
D_0 = 0.0171
D_{50} = 0.0212
D_{100} = 0.0253
T_{50} = 17.82 min.

C_v @ T_{50}
5.4 ft.^{2}/yr.

C_α = 0.000

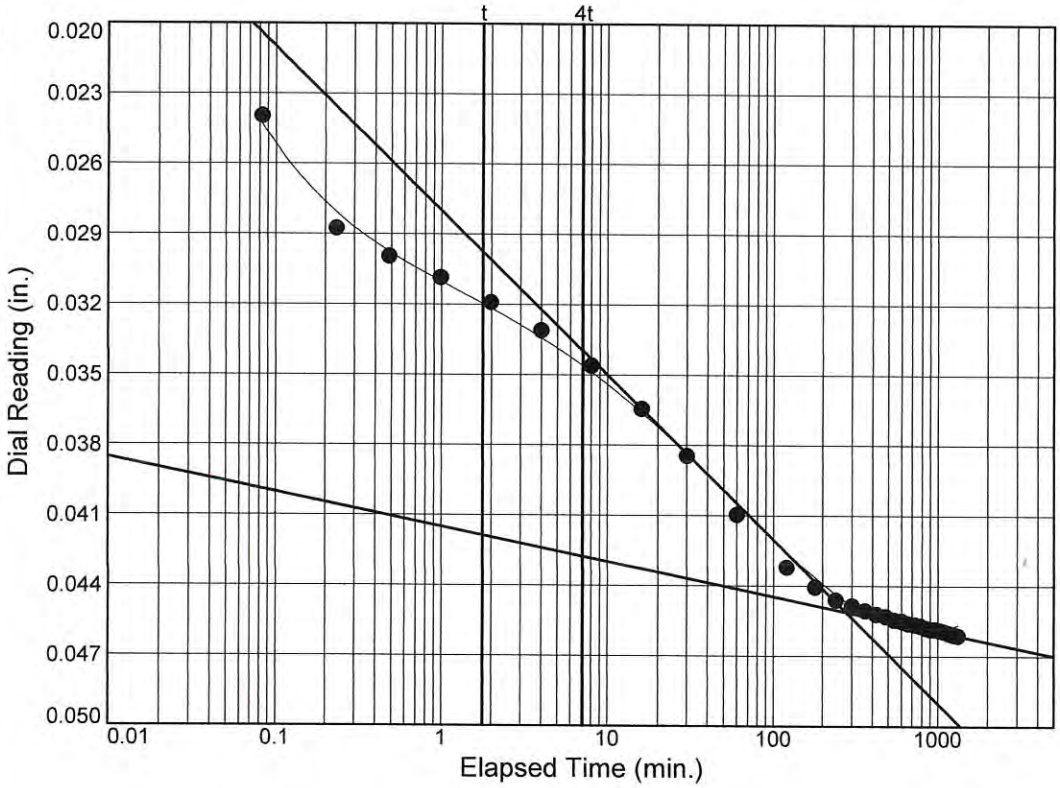
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-173

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

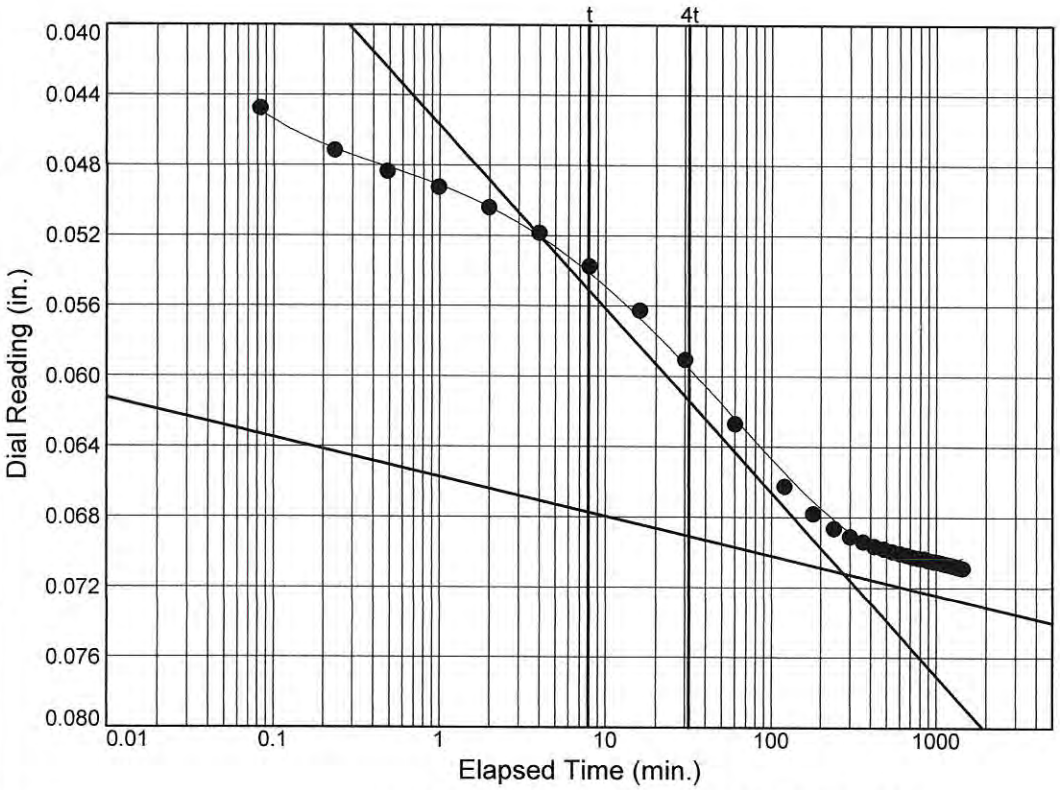
Source of Sample: SJGB027 Depth: 43



Load No.= 13
Load= 8.00 tsf
D_0 = 0.0293
D_{50} = 0.0372
D_{100} = 0.0451
T_{50} = 20.04 min.

C_v @ T_{50}
4.6 ft.^{2}/yr.

C_α = 0.004



Load No.= 14
Load= 16.00 tsf
D_0 = 0.0486
D_{50} = 0.0599
D_{100} = 0.0712
T_{50} = 34.35 min.

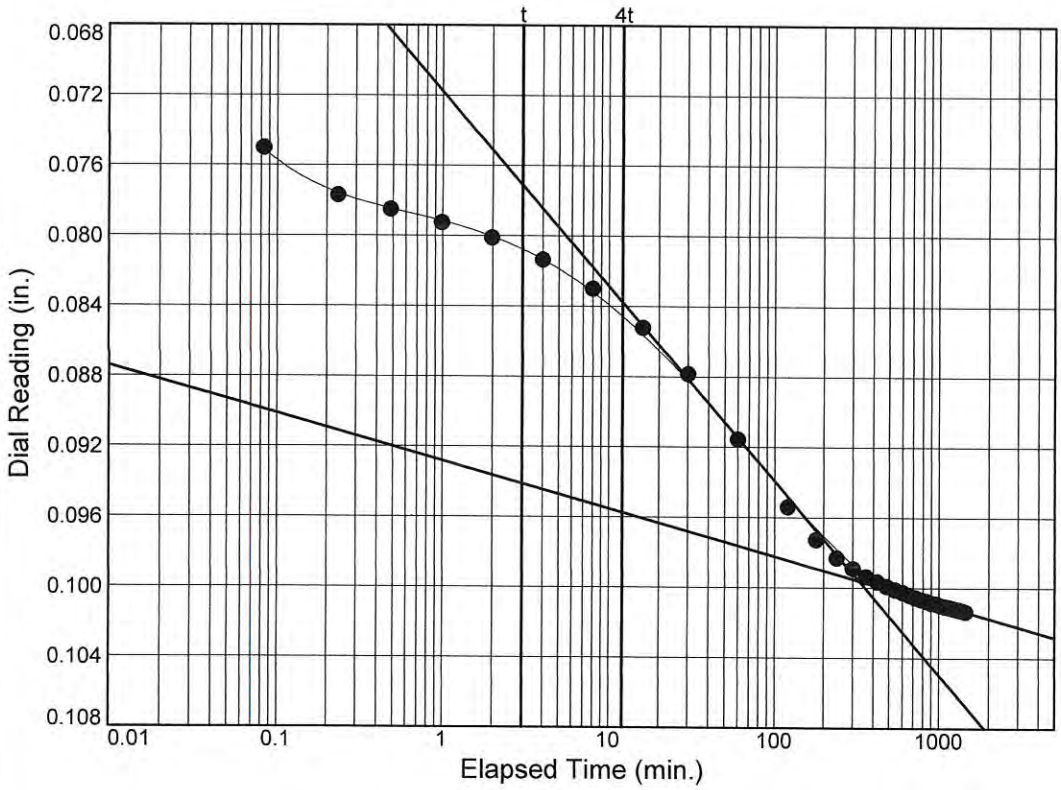
C_v @ T_{50}
2.5 ft.^{2}/yr.

C_α = 0.006

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

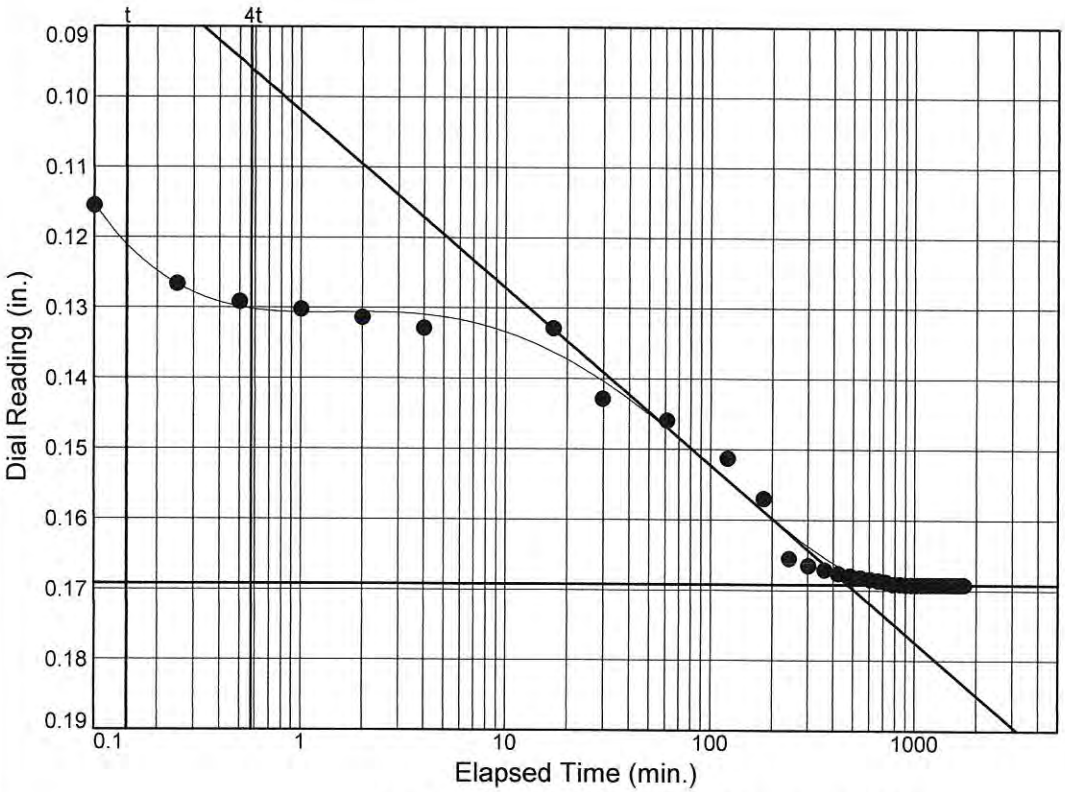
Source of Sample: SJGB027 Depth: 43



Load No.= 15
Load= 32.00 tsf
D_0 = 0.0770
D_{50} = 0.0883
D_{100} = 0.0996
T_{50} = 30.32 min.

C_v @ T_{50}
2.6 ft.^{2}/yr.

C_α = 0.007



Load No.= 16
Load= 60.00 tsf
D_0 = 0.1119
D_{50} = 0.1406
D_{100} = 0.1692
T_{50} = 30.67 min.

C_v @ T_{50}
2.2 ft.^{2}/yr.

C_α = 0.000

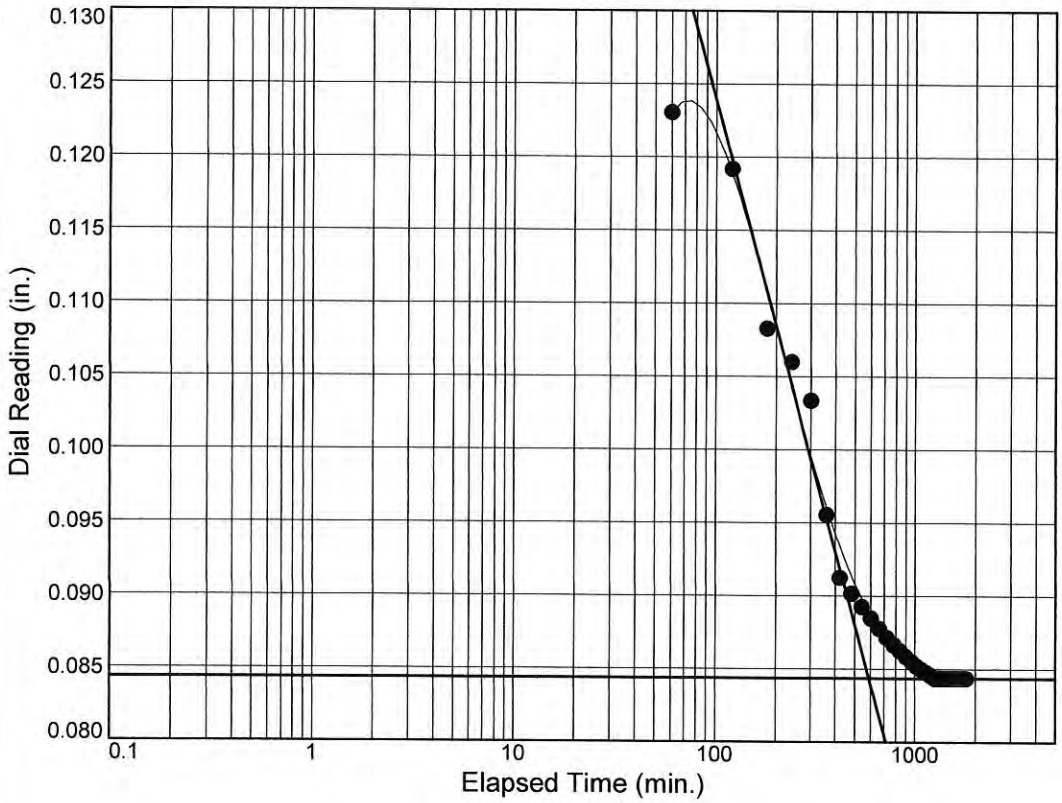
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-175

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB027 Depth: 43



Load No.= 18
Load= 4.00 tsf
D_0 = 0.1313
D_{50} = 0.1078
D_{100} = 0.0844
T_{50} = 205.70 min.

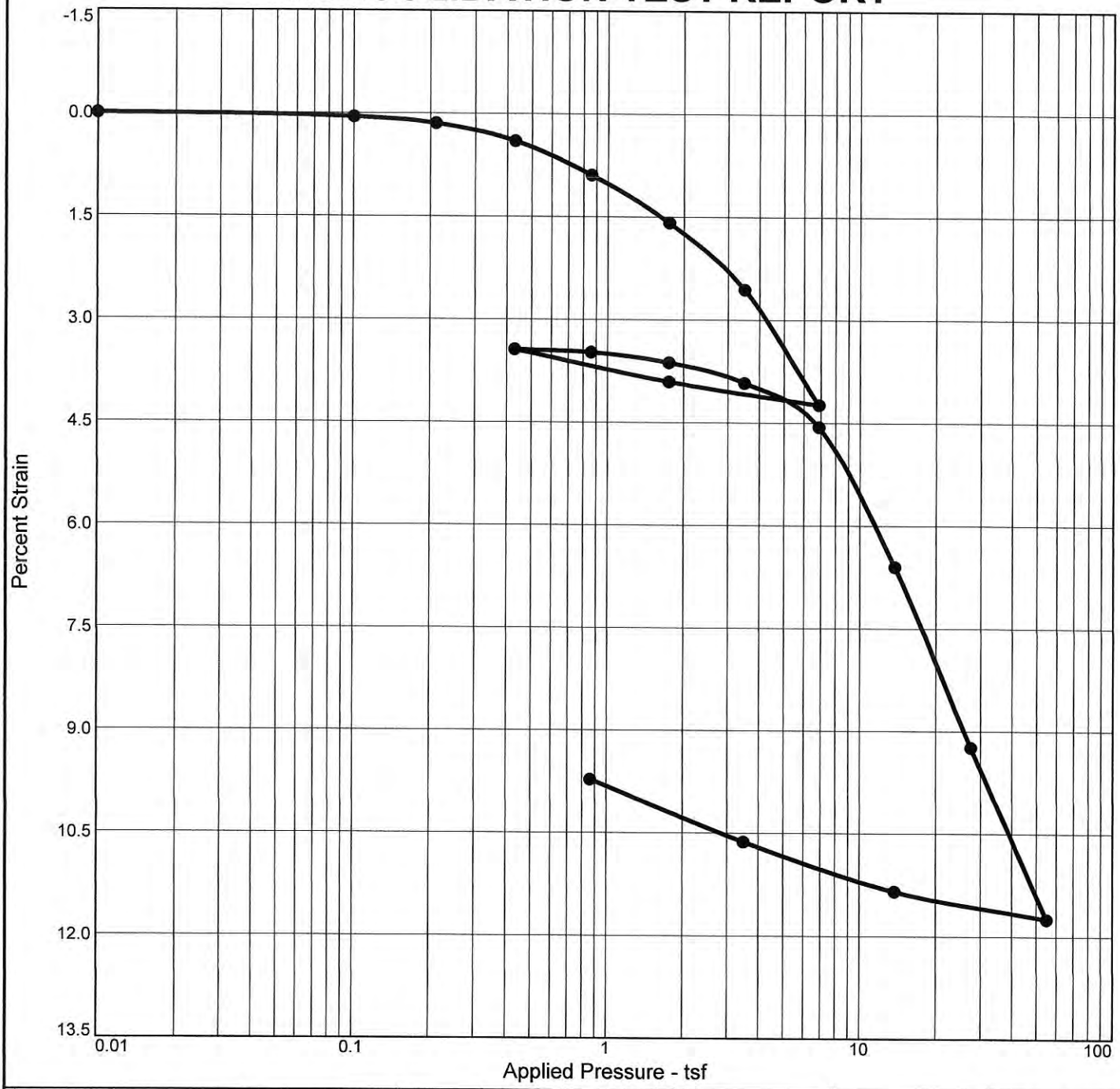
C_v @ T_{50}
0.4 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-176

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
89.3 %	19.4 %	106.4	26	10	2.70	CL		0.585

MATERIAL DESCRIPTION

Light gray and tan LEAN CLAY

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 **Depth:** 58

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

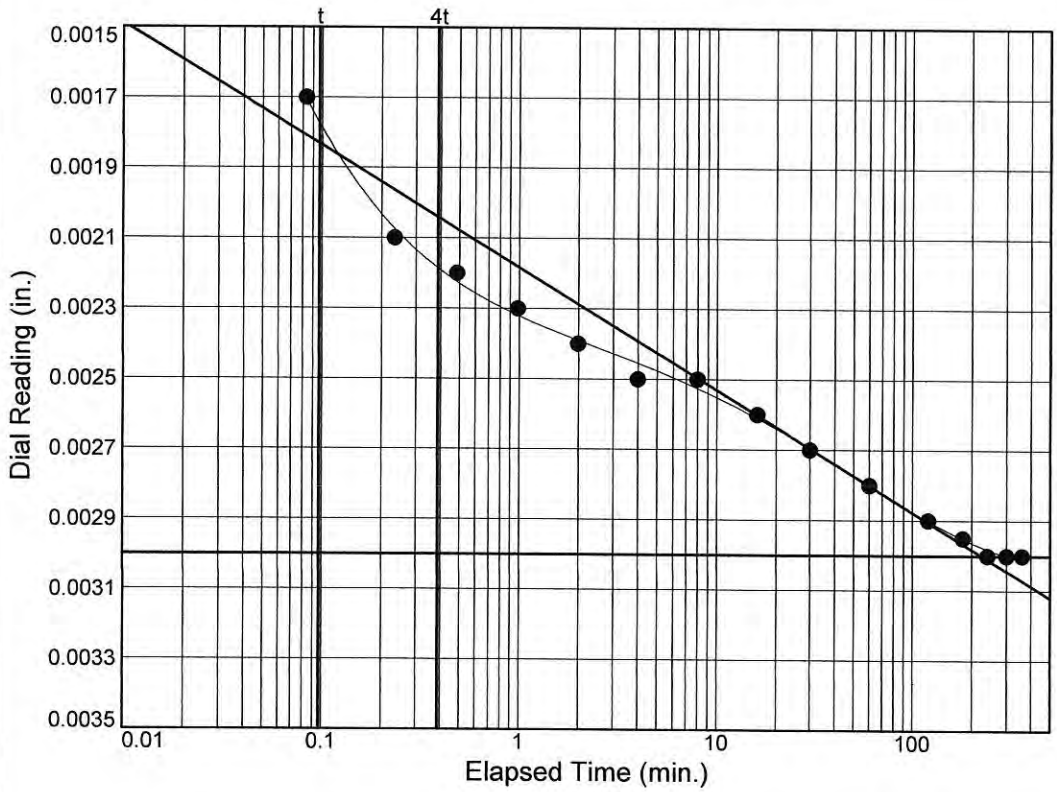
Figure

Attachment Figure B.2-177

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

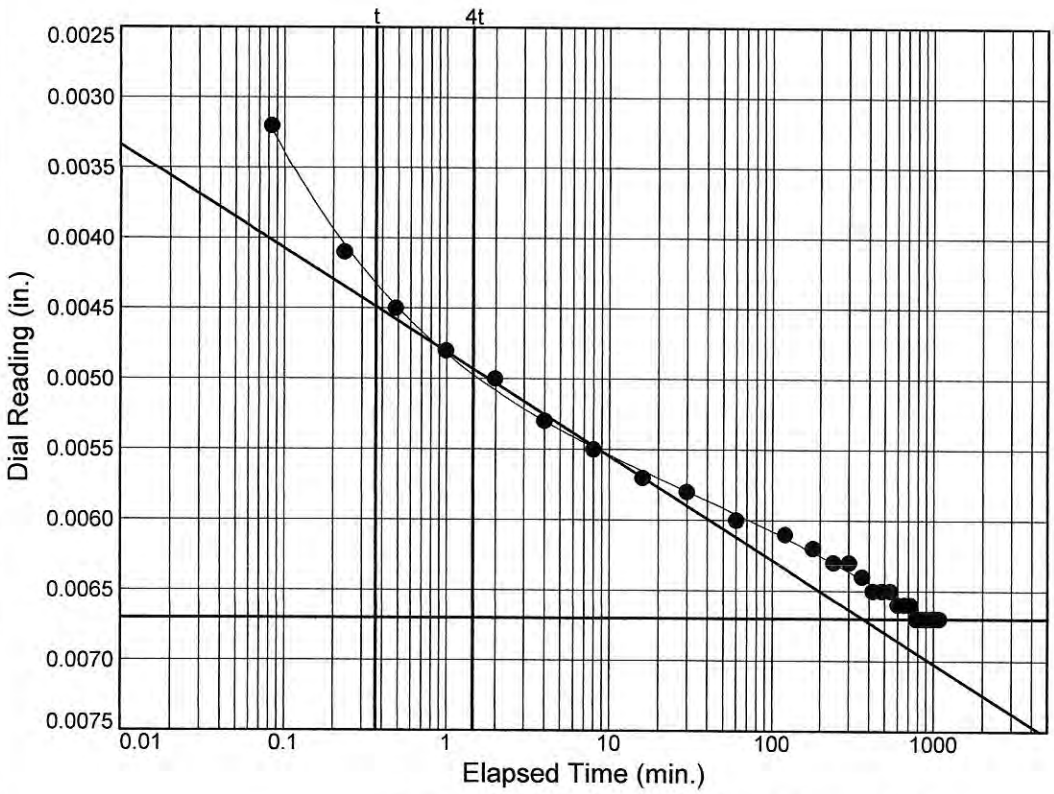
Source of Sample: SJGB028 Depth: 58



Load No.= 4
Load= 0.43 tsf
D_0 = 0.0014
D_{50} = 0.0022
D_{100} = 0.0030
T_{50} = 0.38 min.

C_v @ T_{50}
265.2 ft.^{2}/yr.

C_α = 0.000



Load No.= 5
Load= 0.86 tsf
D_0 = 0.0037
D_{50} = 0.0052
D_{100} = 0.0067
T_{50} = 2.75 min.

C_v @ T_{50}
36.3 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

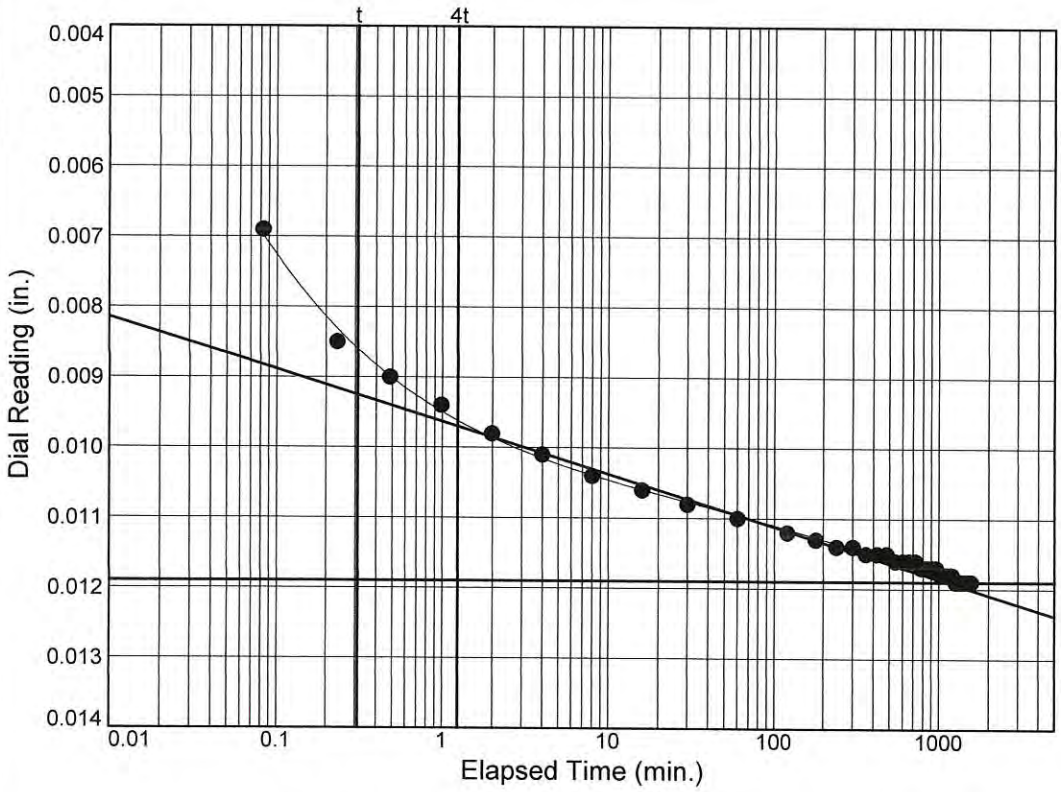
Figure

Attachment Figure B.2-178

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

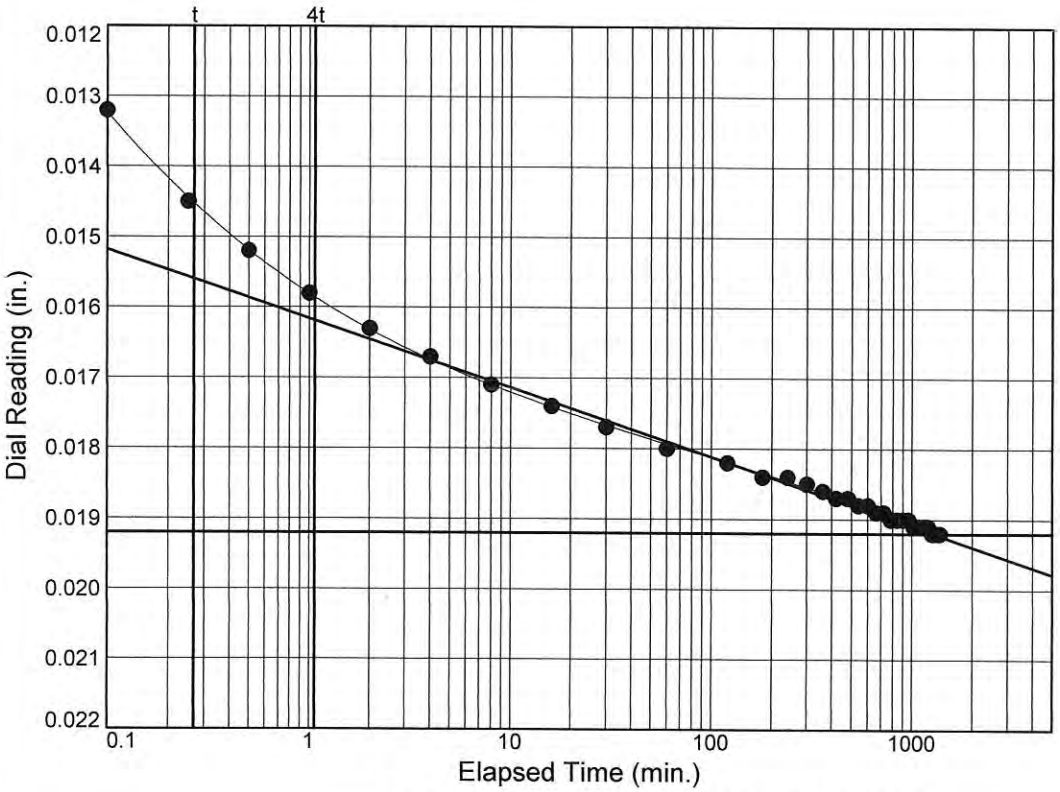
Source of Sample: SJGB028 Depth: 58



Load No.= 6
Load= 1.75 tsf
D_0 = 0.0076
D_{50} = 0.0097
D_{100} = 0.0119
T_{50} = 1.55 min.

C_v @ T_{50}
63.5 ft.^{2}/yr.

C_α = 0.000



Load No.= 7
Load= 3.49 tsf
D_0 = 0.0132
D_{50} = 0.0162
D_{100} = 0.0192
T_{50} = 1.68 min.

C_v @ T_{50}
57.8 ft.^{2}/yr.

C_α = 0.000

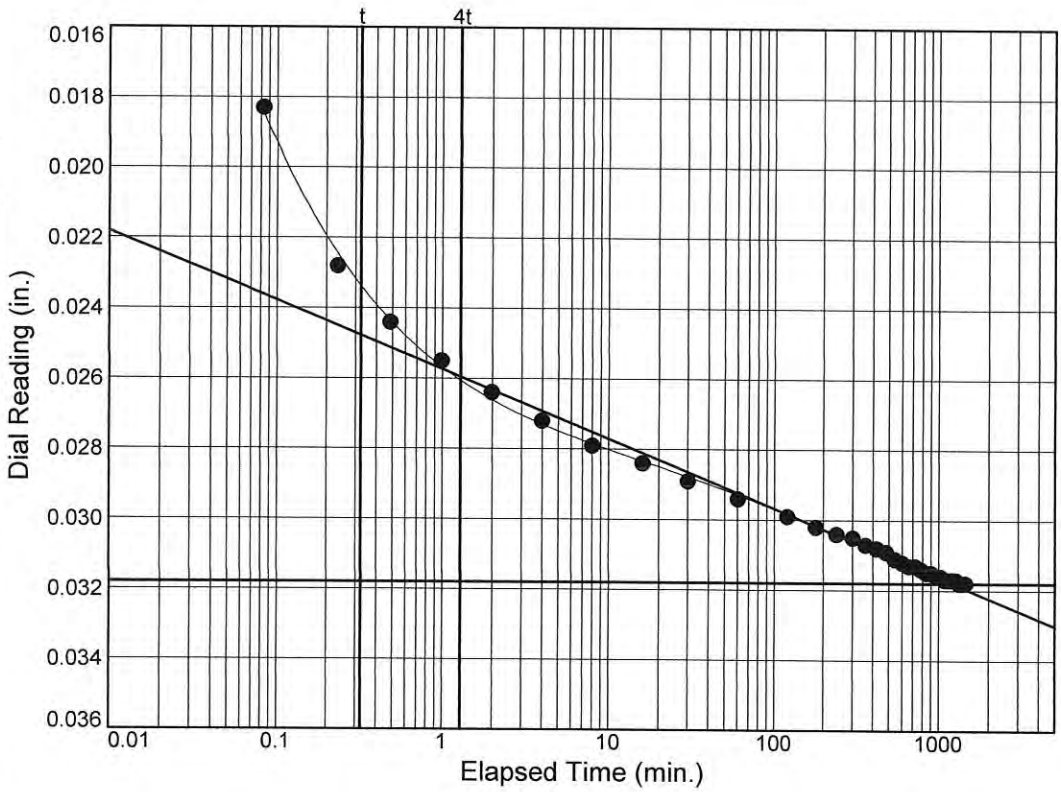
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-179

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

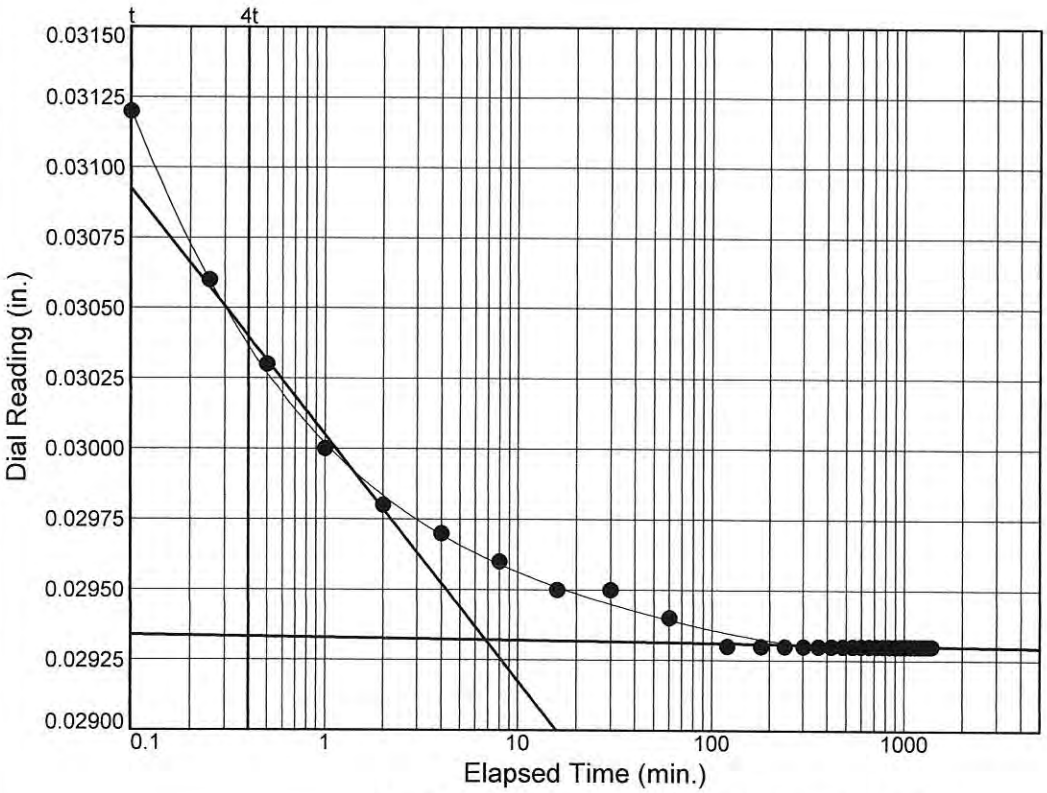
Source of Sample: SJGB028 Depth: 58



Load No.= 8
Load= 6.87 tsf
D_0 = 0.0207
D_{50} = 0.0262
D_{100} = 0.0318
T_{50} = 1.47 min.

C_v @ T_{50}
64.0 ft.^{2}/yr.

C_α = 0.000



Load No.= 9
Load= 1.75 tsf
D_0 = 0.0320
D_{50} = 0.0307
D_{100} = 0.0293
T_{50} = 0.21 min.

C_v @ T_{50}
433.0 ft.^{2}/yr.

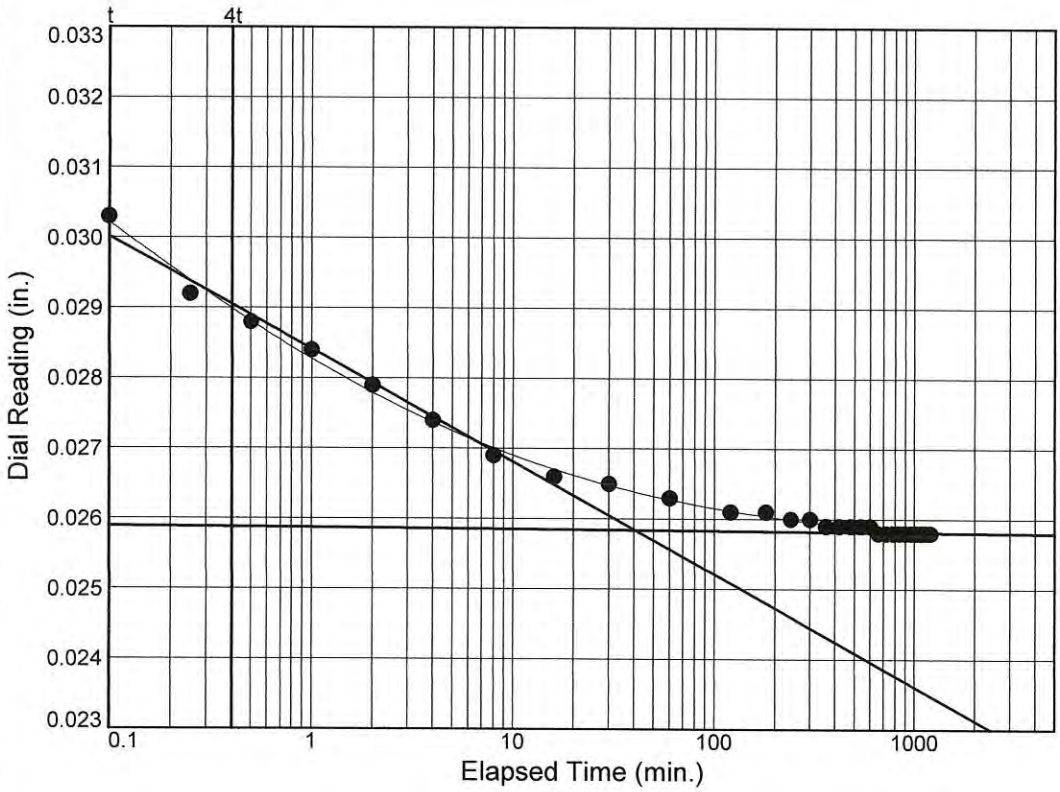
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-180

Dial Reading vs. Time

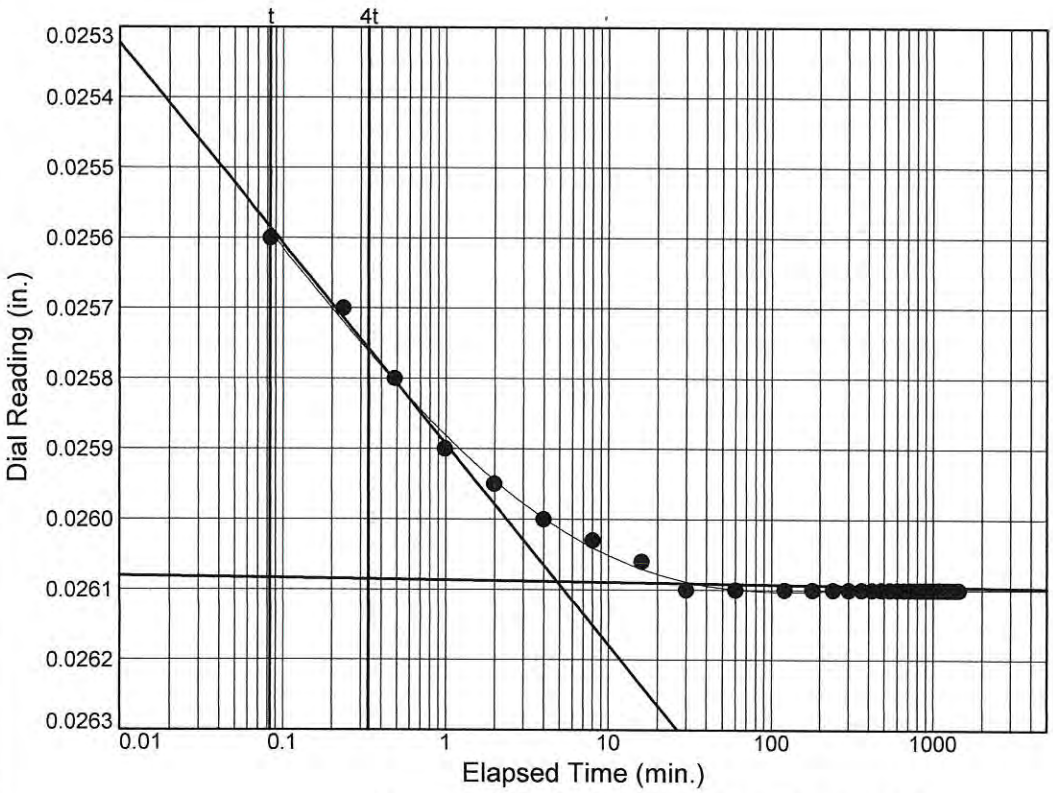
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58



Load No.= 10
Load= 0.43 tsf
D_0 = 0.0314
D_{50} = 0.0286
D_{100} = 0.0258
T_{50} = 0.62 min.

C_v @ T_{50}
152.2 ft.^{2}/yr.



Load No.= 11
Load= 0.86 tsf
D_0 = 0.0254
D_{50} = 0.0258
D_{100} = 0.0261
T_{50} = 0.32 min.

C_v @ T_{50}
297.0 ft.^{2}/yr.

C_α = 0.000

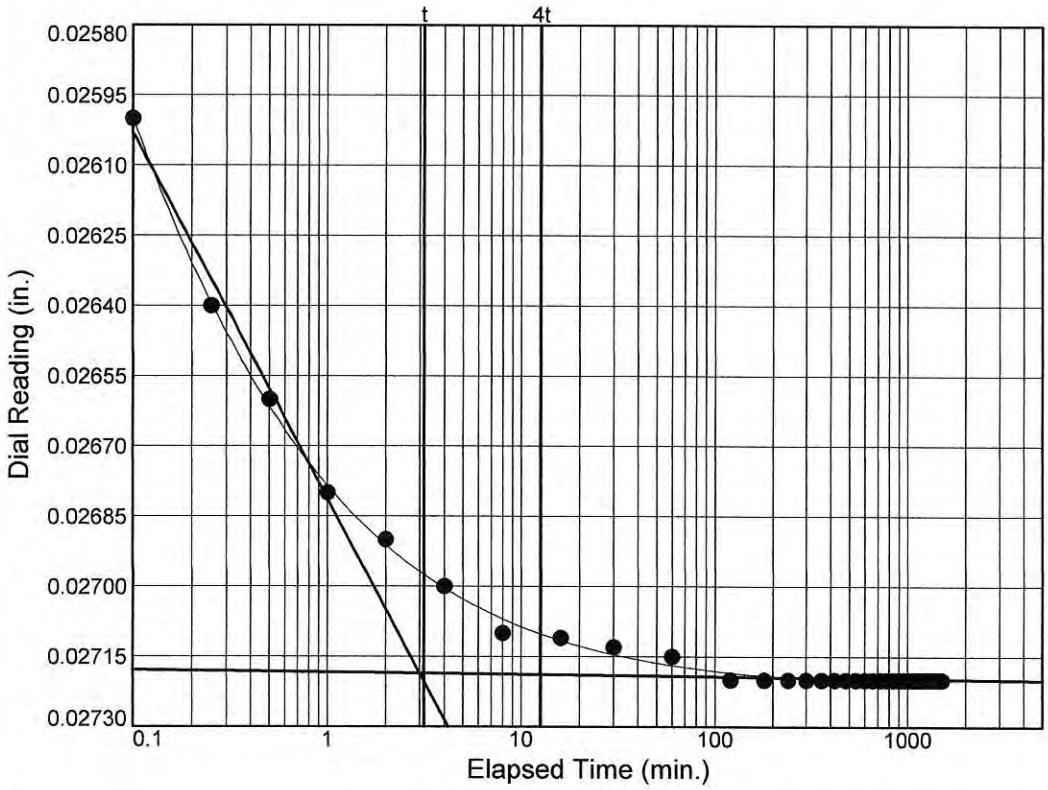
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-181

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

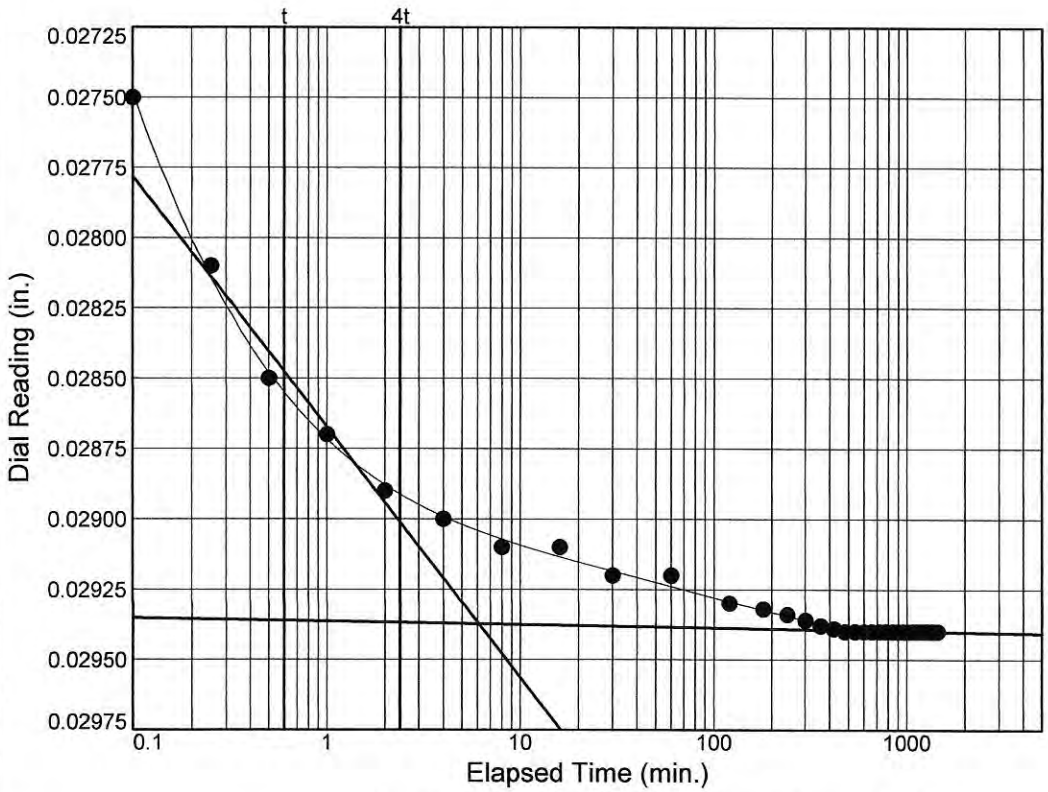
Source of Sample: SJGB028 Depth: 58



Load No.= 12
Load= 1.75 tsf
D_0 = 0.0268
D_{50} = 0.0270
D_{100} = 0.0272
T_{50} = 4.52 min.

C_v @ T_{50}
20.8 ft.^{2}/yr.

C_α = 0.000



Load No.= 13
Load= 3.49 tsf
D_0 = 0.0282
D_{50} = 0.0288
D_{100} = 0.0294
T_{50} = 1.27 min.

C_v @ T_{50}
73.6 ft.^{2}/yr.

C_α = 0.000

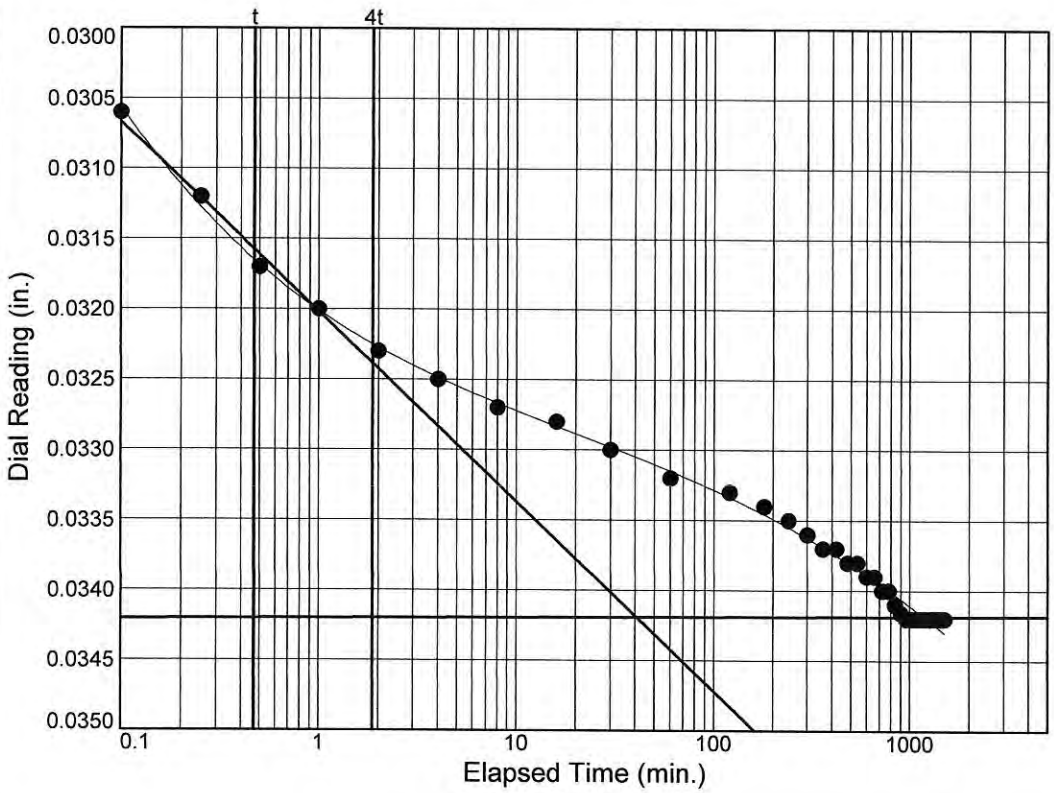
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-182

Dial Reading vs. Time

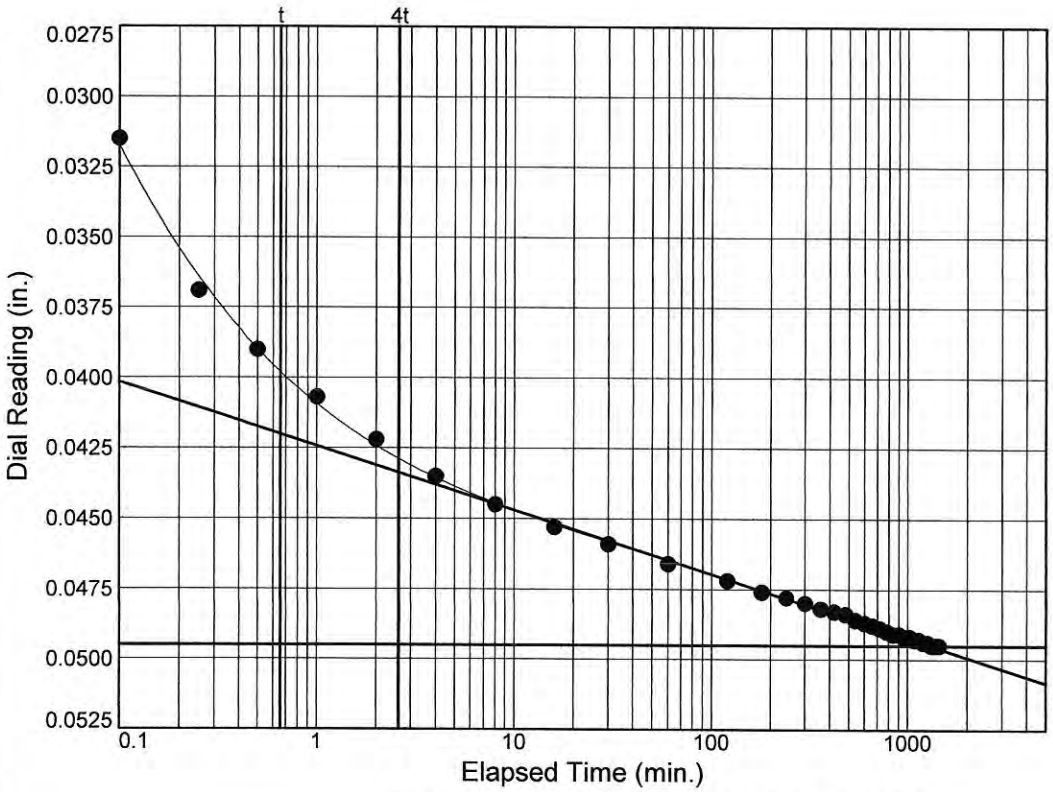
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58



Load No.= 14
Load= 6.87 tsf
D_0 = 0.0310
D_{50} = 0.0326
D_{100} = 0.0342
T_{50} = 6.60 min.

C_v @ T_{50}
14.0 ft.^{2}/yr.



Load No.= 15
Load= 13.75 tsf
D_0 = 0.0367
D_{50} = 0.0431
D_{100} = 0.0495
T_{50} = 2.99 min.

C_v @ T_{50}
30.2 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

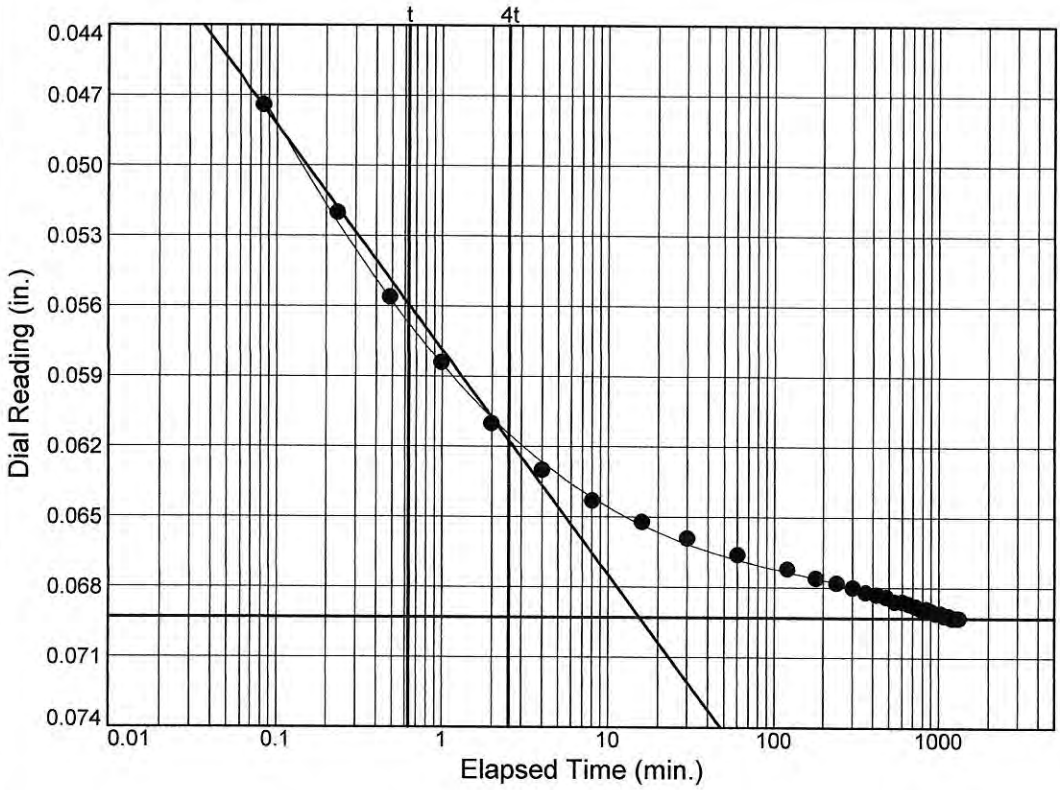
Figure

Attachment Figure B.2-183

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

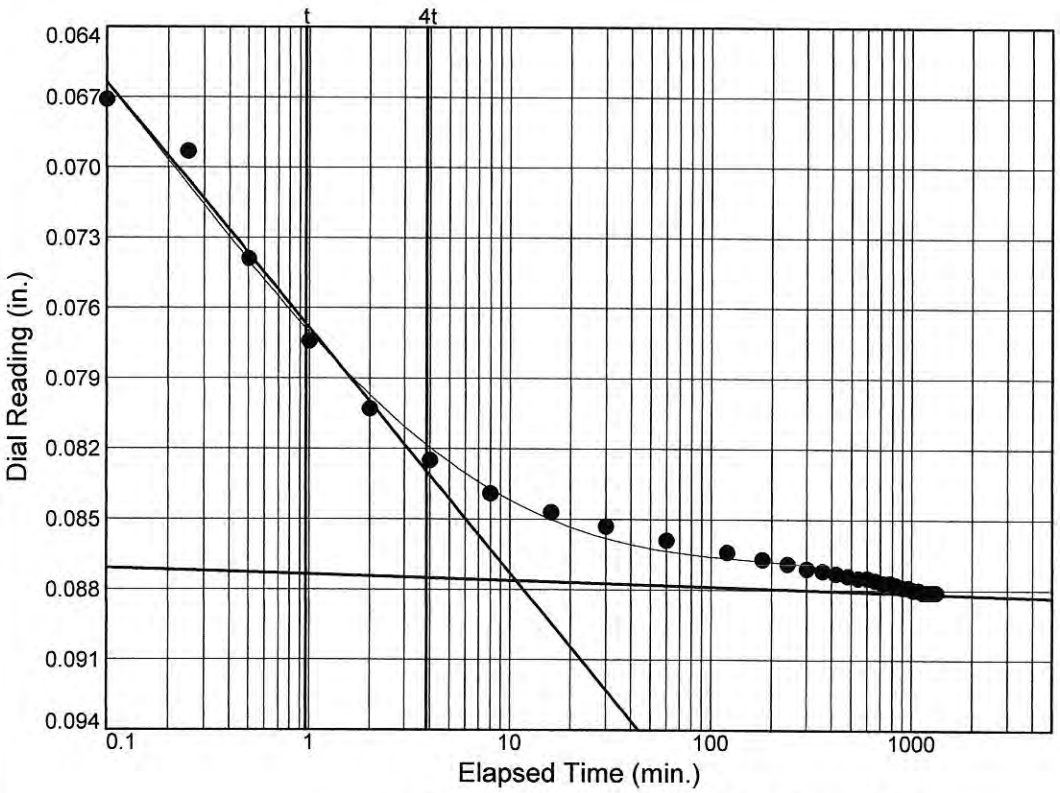
Source of Sample: SJGB028 Depth: 58



Load No.= 16
Load= 27.50 tsf
D_0 = 0.0521
D_{50} = 0.0607
D_{100} = 0.0693
T_{50} = 1.94 min.

C_v @ T_{50}
44.2 ft.^{2}/yr.

C_α = 0.000



Load No.= 17
Load= 54.99 tsf
D_0 = 0.0719
D_{50} = 0.0798
D_{100} = 0.0876
T_{50} = 2.04 min.

C_v @ T_{50}
39.8 ft.^{2}/yr.

C_α = 0.001

TOLUNAY-WONG ENGINEERS, INC.

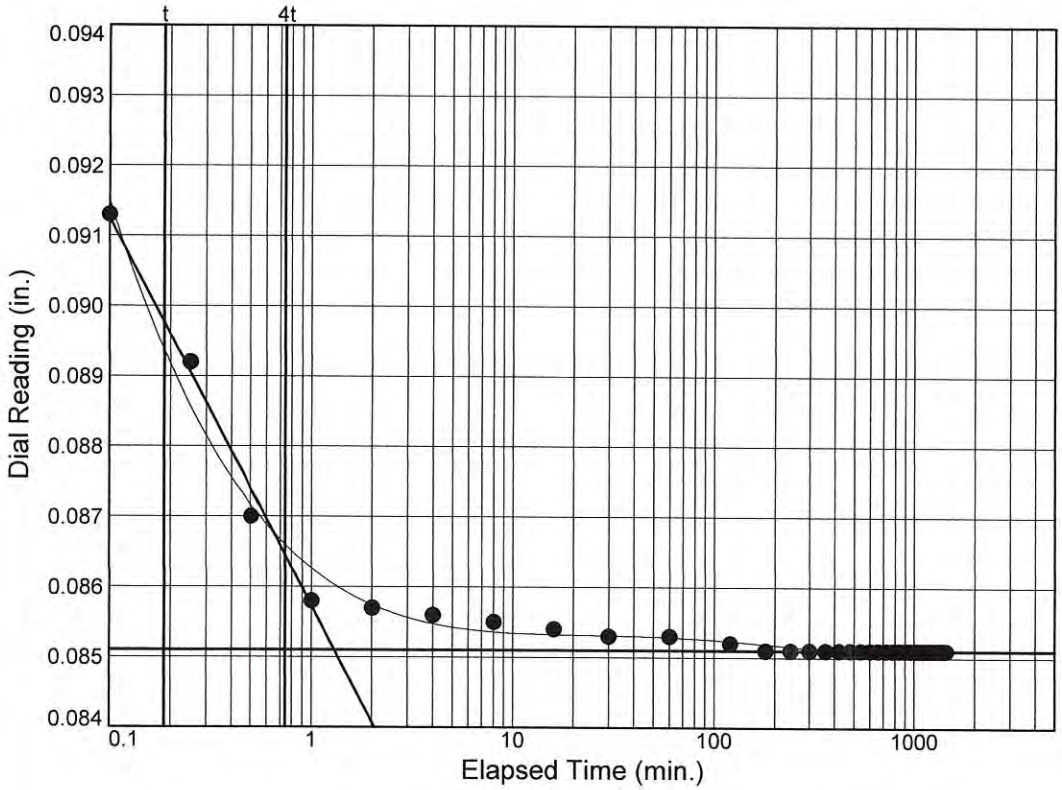
Figure

Attachment Figure B.2-184

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

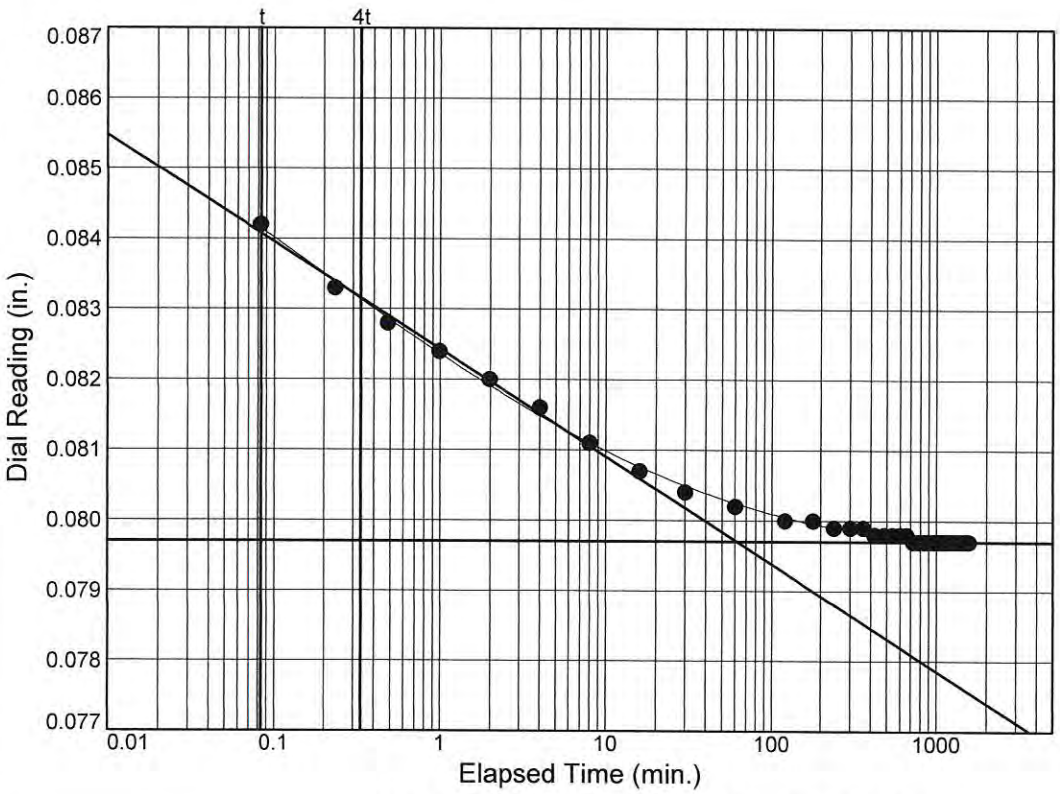
Source of Sample: SJGB028 Depth: 58



Load No.= 18
Load= 13.75 tsf
D_0 = 0.0922
D_{50} = 0.0886
D_{100} = 0.0851
T_{50} = 0.24 min.

C_v @ T_{50}
323.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 19
Load= 3.49 tsf
D_0 = 0.0852
D_{50} = 0.0824
D_{100} = 0.0797
T_{50} = 0.91 min.

C_v @ T_{50}
88.0 ft.^{2}/yr.

C_α = 0.000

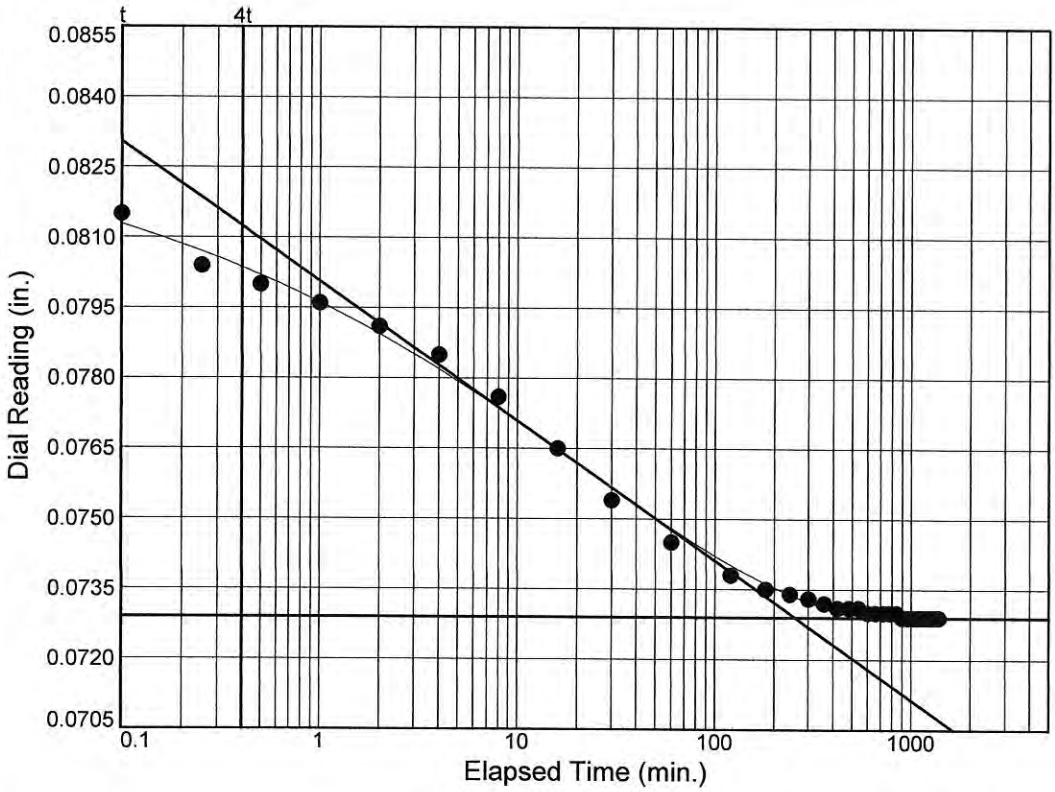
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-185

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB028 Depth: 58



Load No.= 20

Load= 0.86 tsf

D_0 = 0.0822

D_{50} = 0.0776

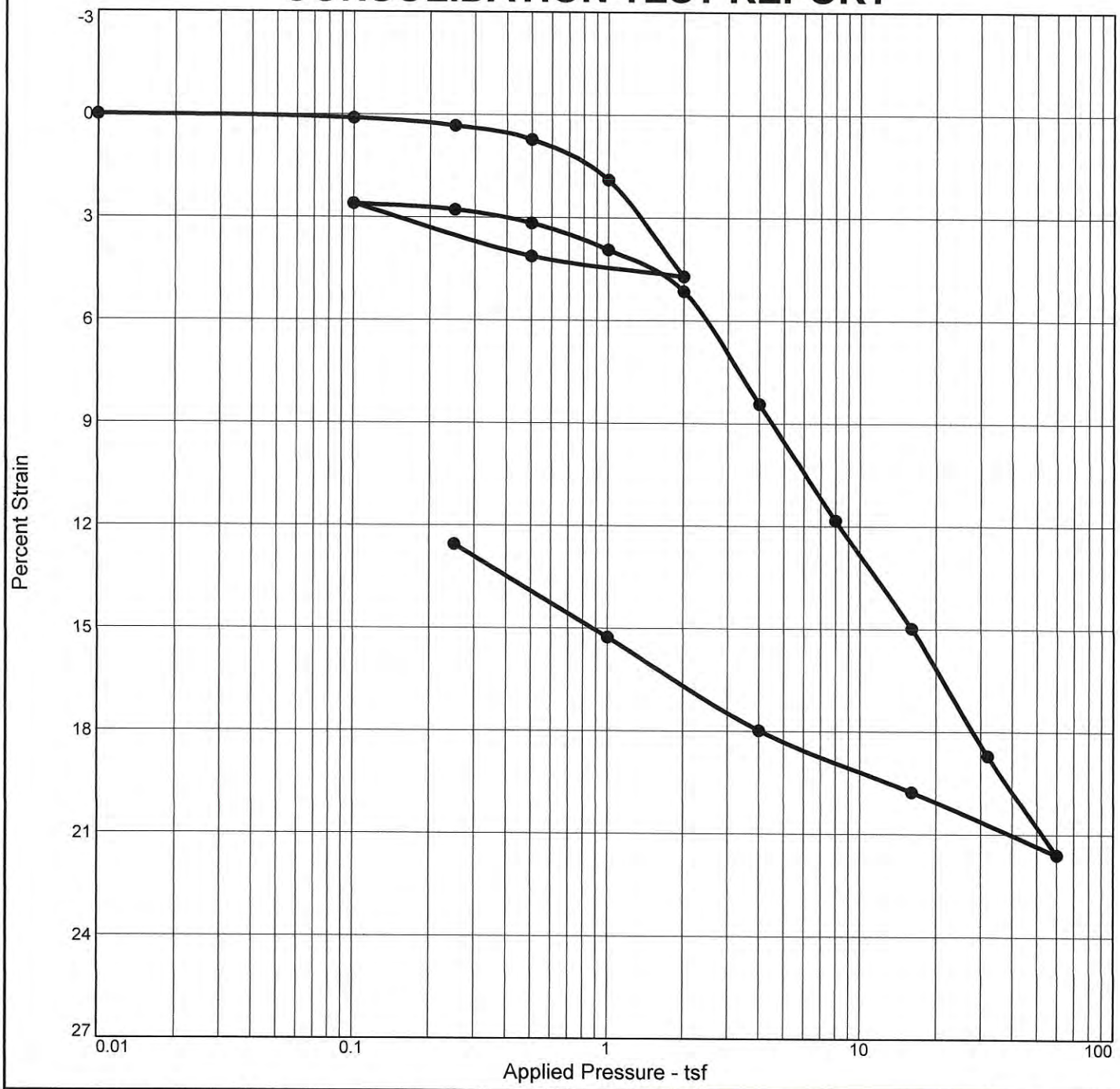
D_{100} = 0.0729

T_{50} = 6.81 min.

C_v @ T_{50}
12.0 ft.^{2}/yr.

C_α = 0.000

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
96.0 %	24.1 %	100.4	62	41	2.70	CH		0.679

MATERIAL DESCRIPTION

Gray and tan FAT CLAY; organics

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 **Depth:** 14

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

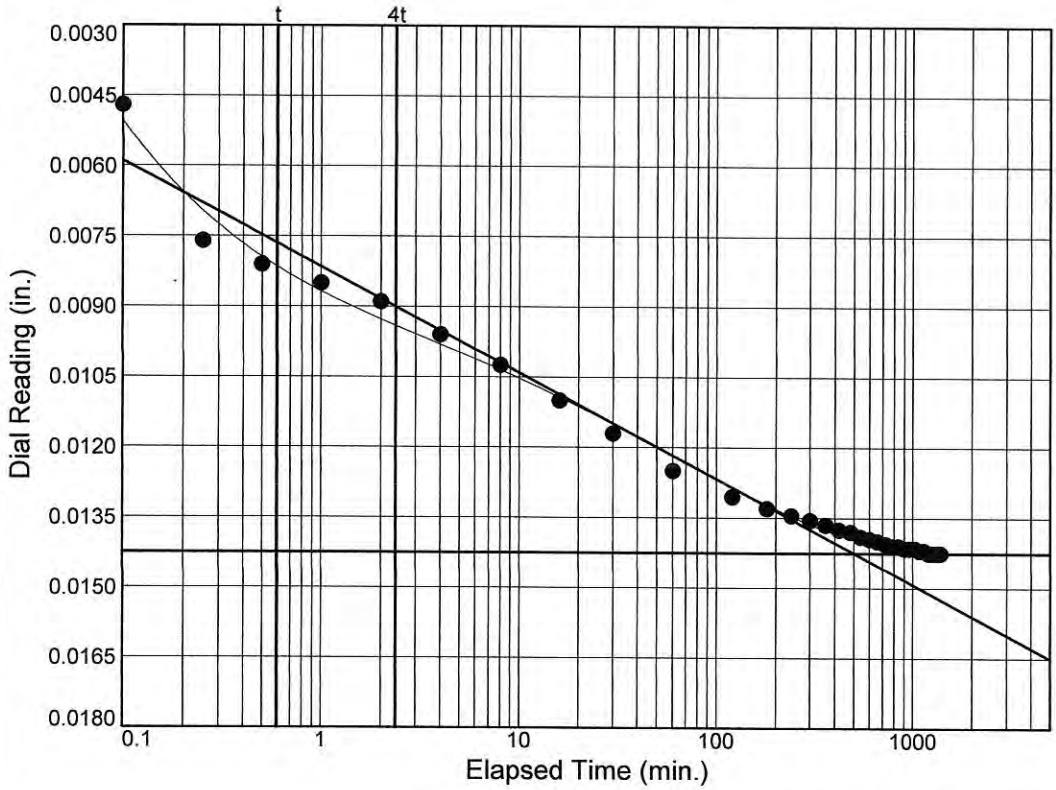
Figure

Attachment Figure B.2-187

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

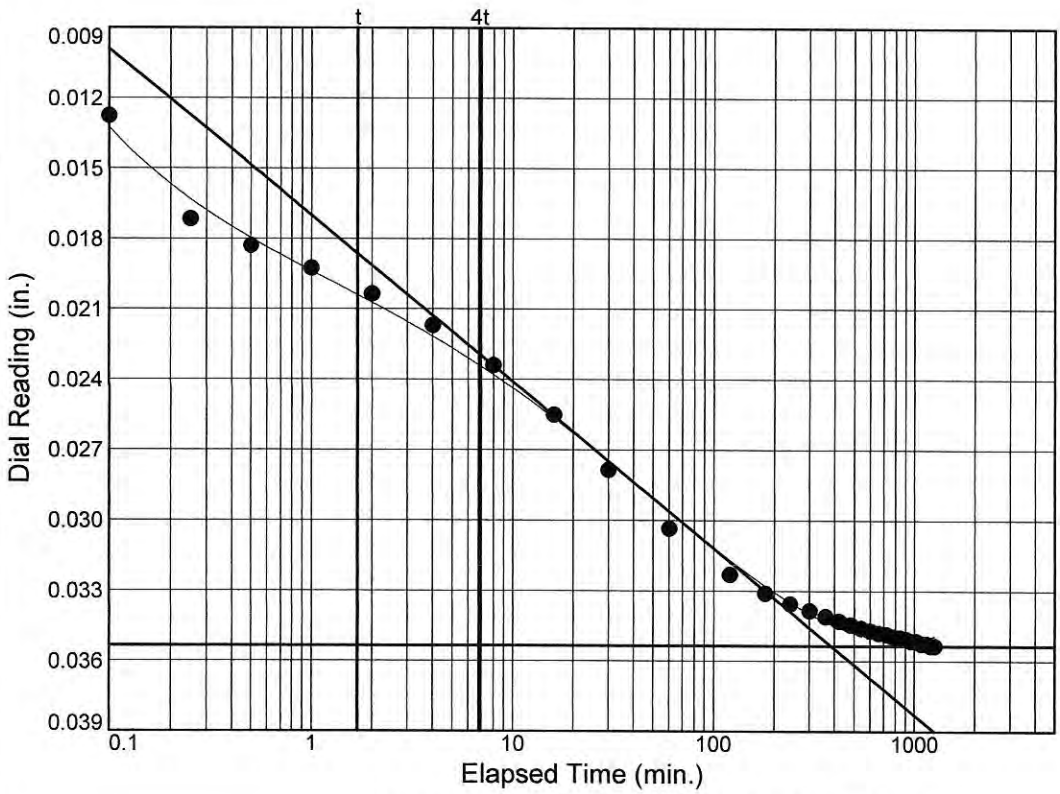
Source of Sample: SJGB029 Depth: 14



Load No.= 5
Load= 1.00 tsf
D_0 = 0.0069
D_{50} = 0.0106
D_{100} = 0.0143
T_{50} = 10.49 min.

C_v @ T_{50}
9.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 6
Load= 2.00 tsf
D_0 = 0.0174
D_{50} = 0.0264
D_{100} = 0.0353
T_{50} = 20.59 min.

C_v @ T_{50}
4.6 ft.^{2}/yr.

C_α = 0.000

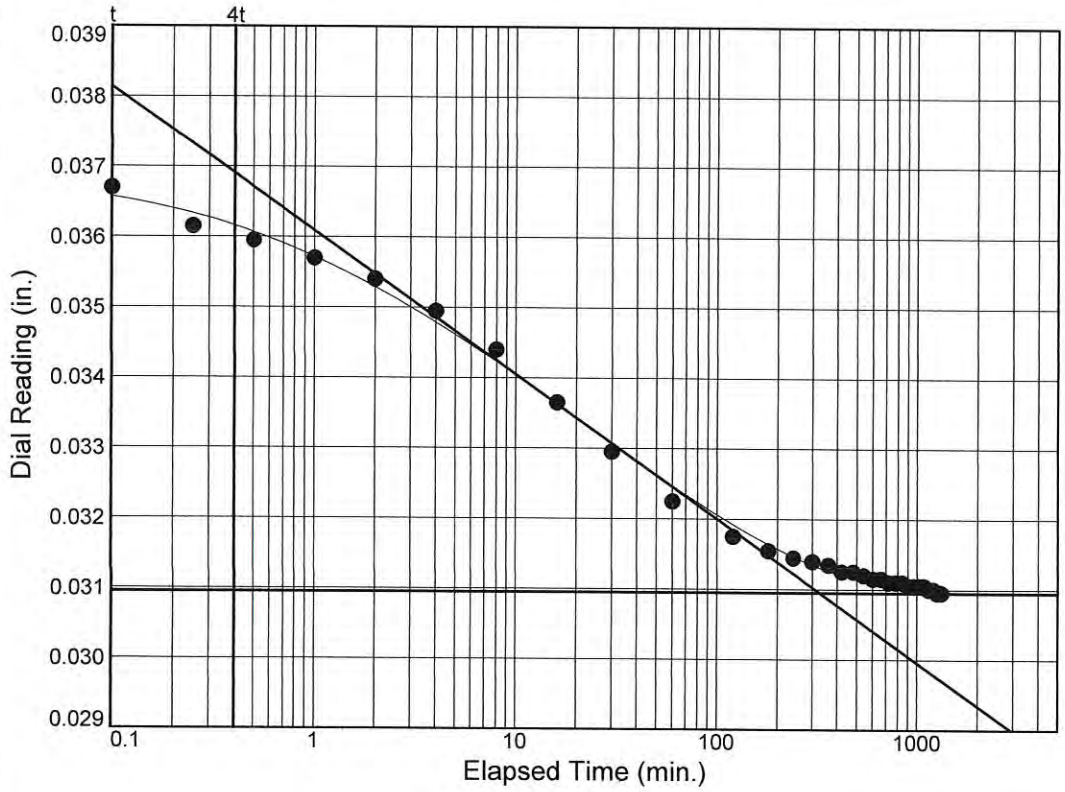
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-188

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

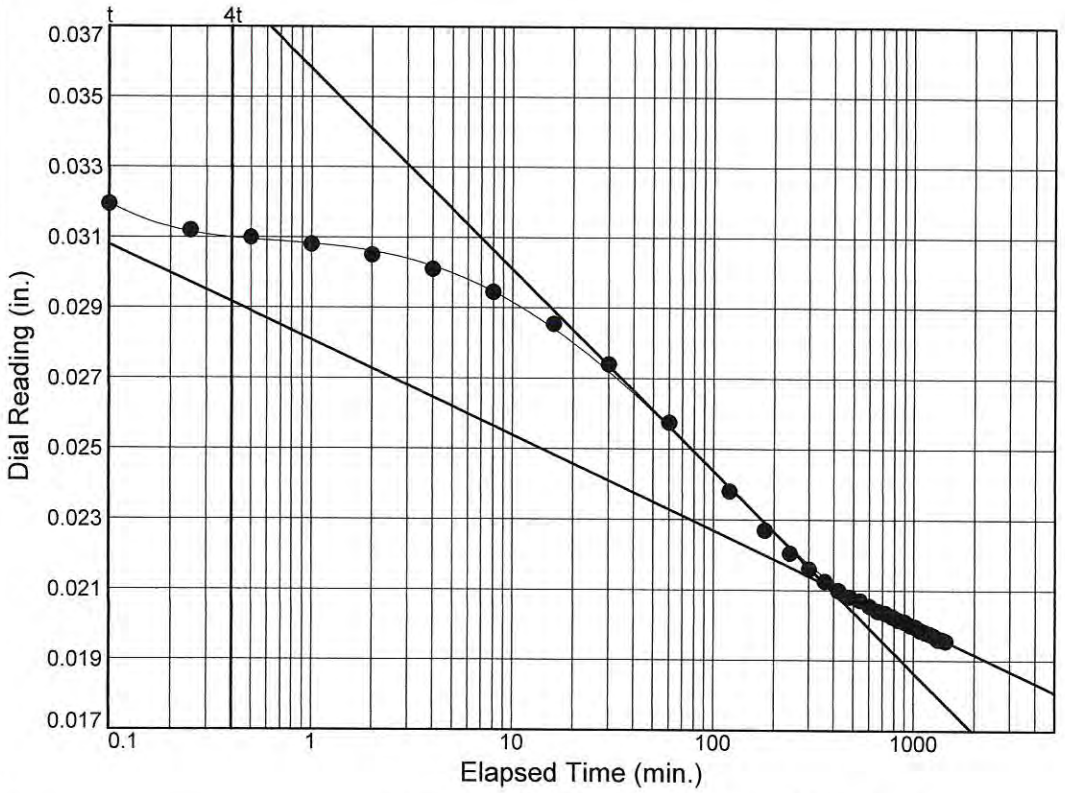
Source of Sample: SJGB029 Depth: 14



Load No.= 7
Load= 0.50 tsf
D_0 = 0.0370
D_{50} = 0.0340
D_{100} = 0.0310
T_{50} = 10.92 min.

C_v @ T_{50}
8.5 ft.^{2}/yr.

C_α = 0.000



Load No.= 8
Load= 0.10 tsf
D_0 = 0.0330
D_{50} = 0.0271
D_{100} = 0.0212
T_{50} = 31.91 min.

C_v @ T_{50}
3.0 ft.^{2}/yr.

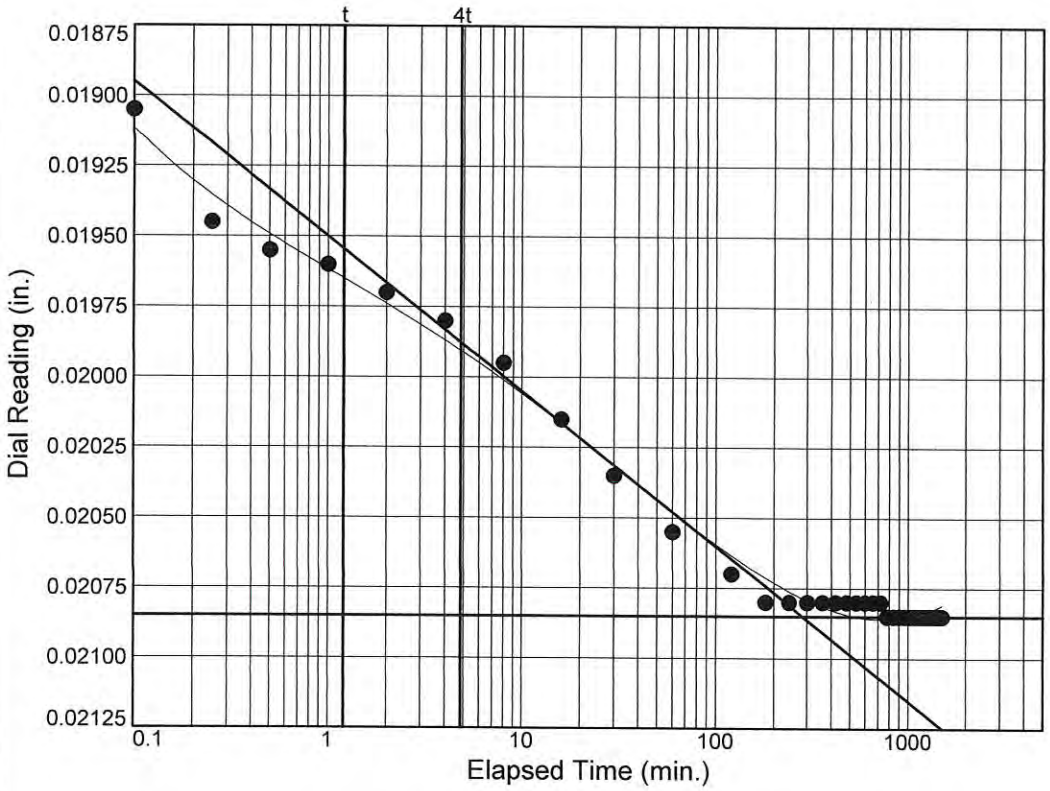
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-189

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

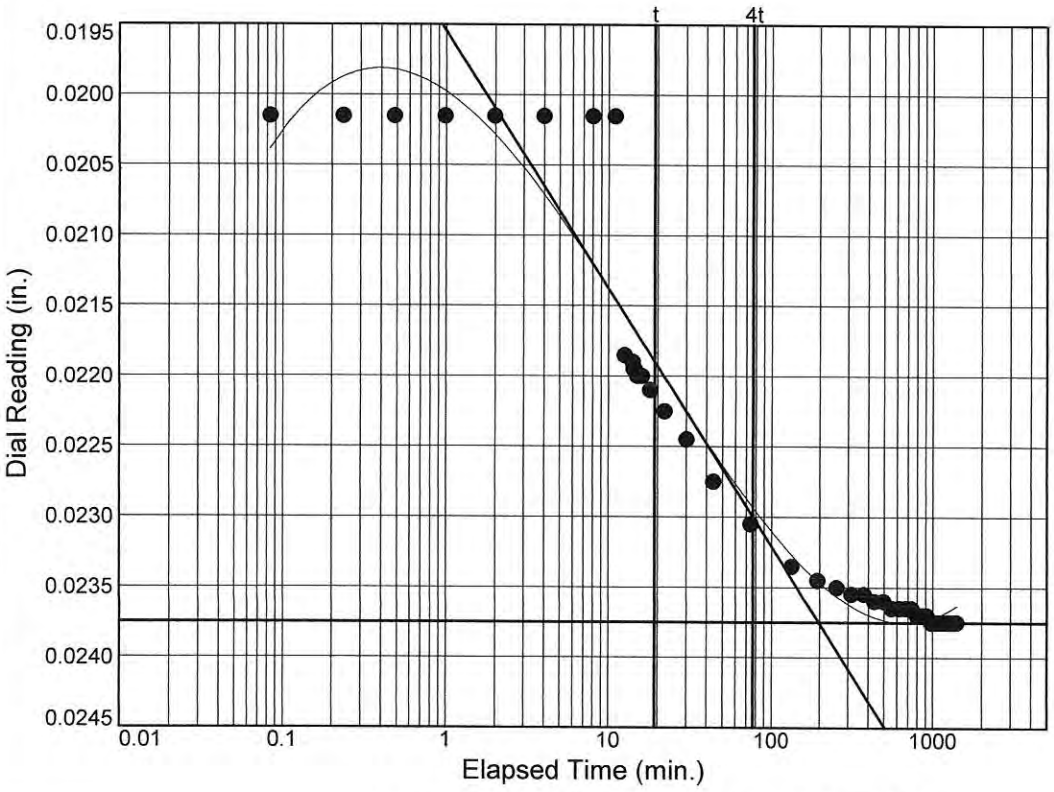
Source of Sample: SJGB029 Depth: 14



Load No.= 9
Load= 0.25 tsf
D_0 = 0.0194
D_{50} = 0.0201
D_{100} = 0.0209
T_{50} = 13.24 min.

C_v @ T_{50}
7.2 ft.^{2}/yr.

C_α = 0.000



Load No.= 10
Load= 0.50 tsf
D_0 = 0.0209
D_{50} = 0.0223
D_{100} = 0.0238
T_{50} = 32.32 min.

C_v @ T_{50}
2.9 ft.^{2}/yr.

C_α = 0.000

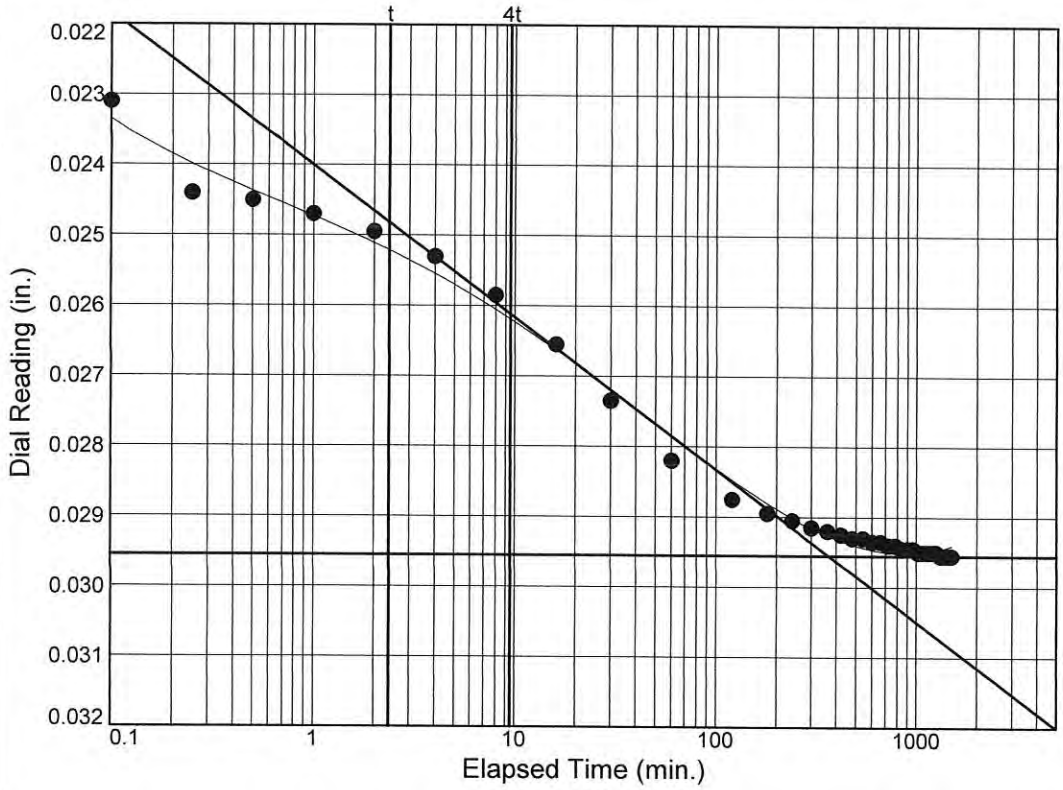
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-190

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

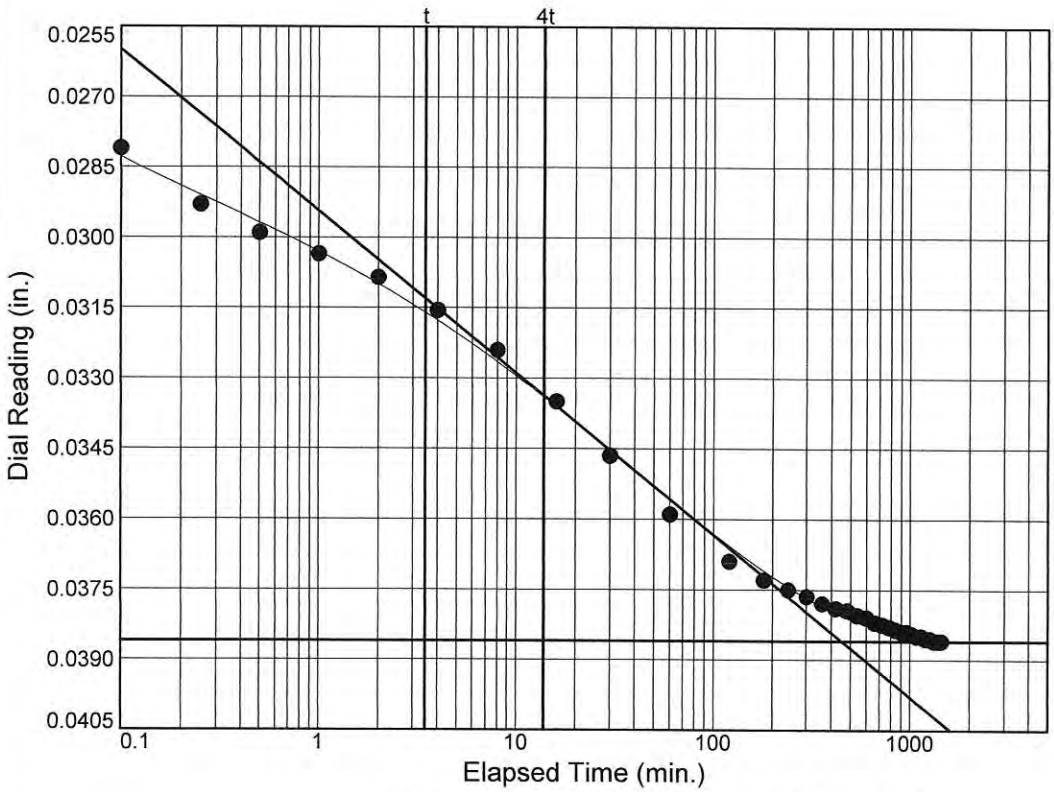
Source of Sample: SJGB029 Depth: 14



Load No.= 11
Load= 1.00 tsf
D_0 = 0.0242
D_{50} = 0.0269
D_{100} = 0.0295
T_{50} = 21.47 min.

C_v @ T_{50}
4.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 12
Load= 2.00 tsf
D_0 = 0.0298
D_{50} = 0.0342
D_{100} = 0.0386
T_{50} = 23.92 min.

C_v @ T_{50}
3.9 ft.^{2}/yr.

C_α = 0.000

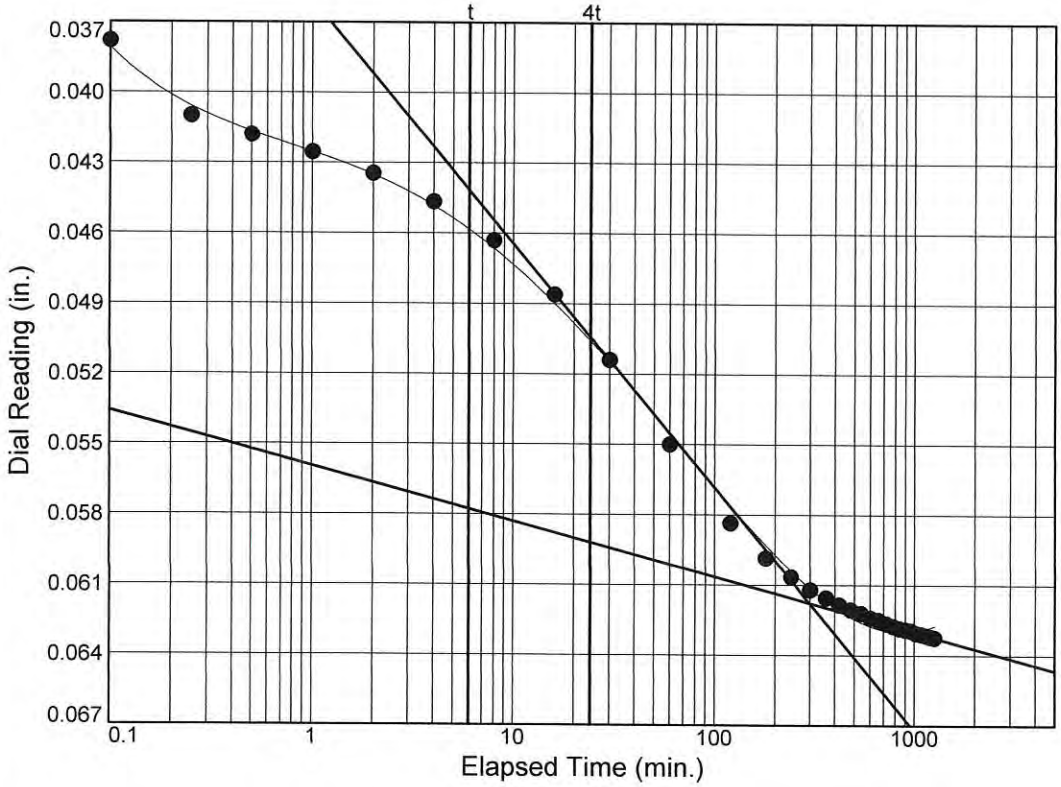
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-191

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

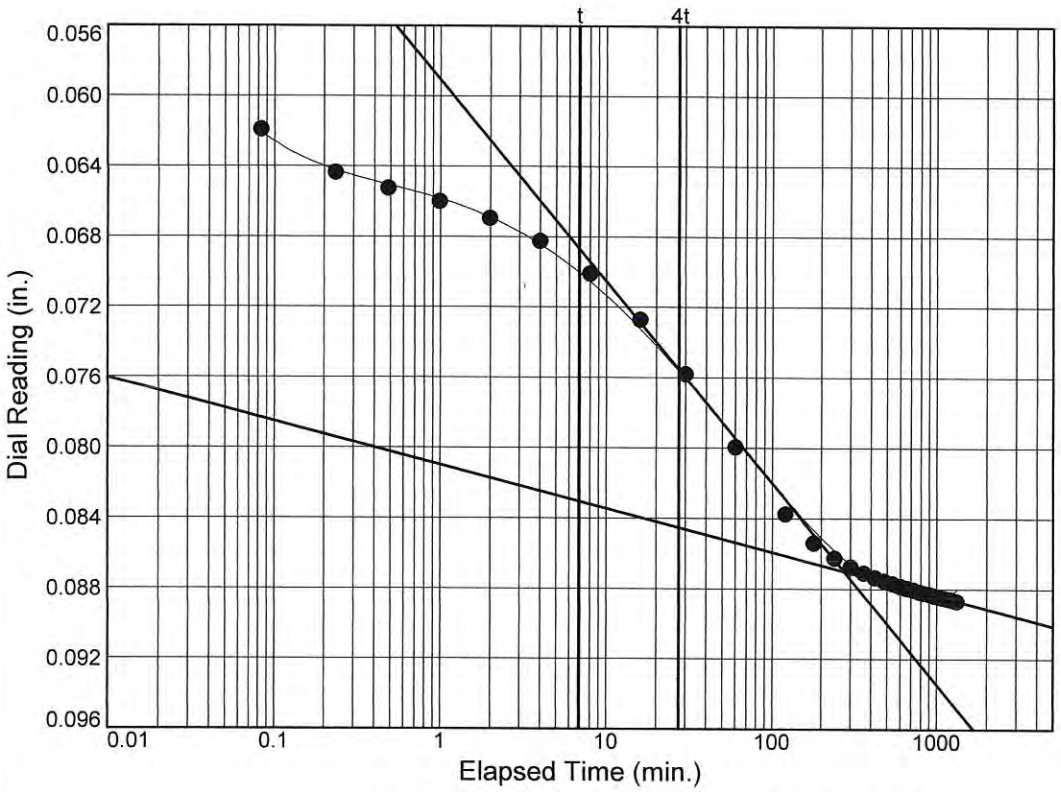
Source of Sample: SJGB029 Depth: 14



Load No.= 13
Load= 4.00 tsf
D_0 = 0.0411
D_{50} = 0.0514
D_{100} = 0.0618
T_{50} = 29.70 min.

C_v @ T_{50}
3.0 ft.^{2}/yr.

C_α = 0.005



Load No.= 14
Load= 8.00 tsf
D_0 = 0.0644
D_{50} = 0.0757
D_{100} = 0.0870
T_{50} = 27.88 min.

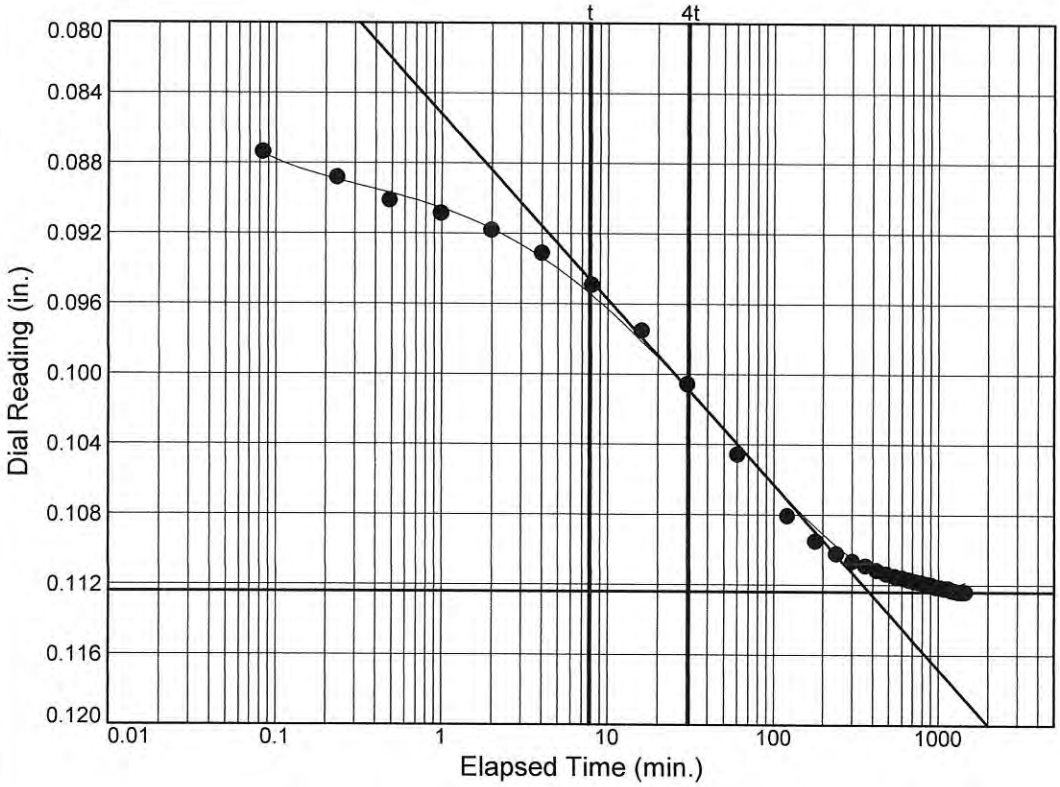
C_v @ T_{50}
2.9 ft.^{2}/yr.

C_α = 0.006

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

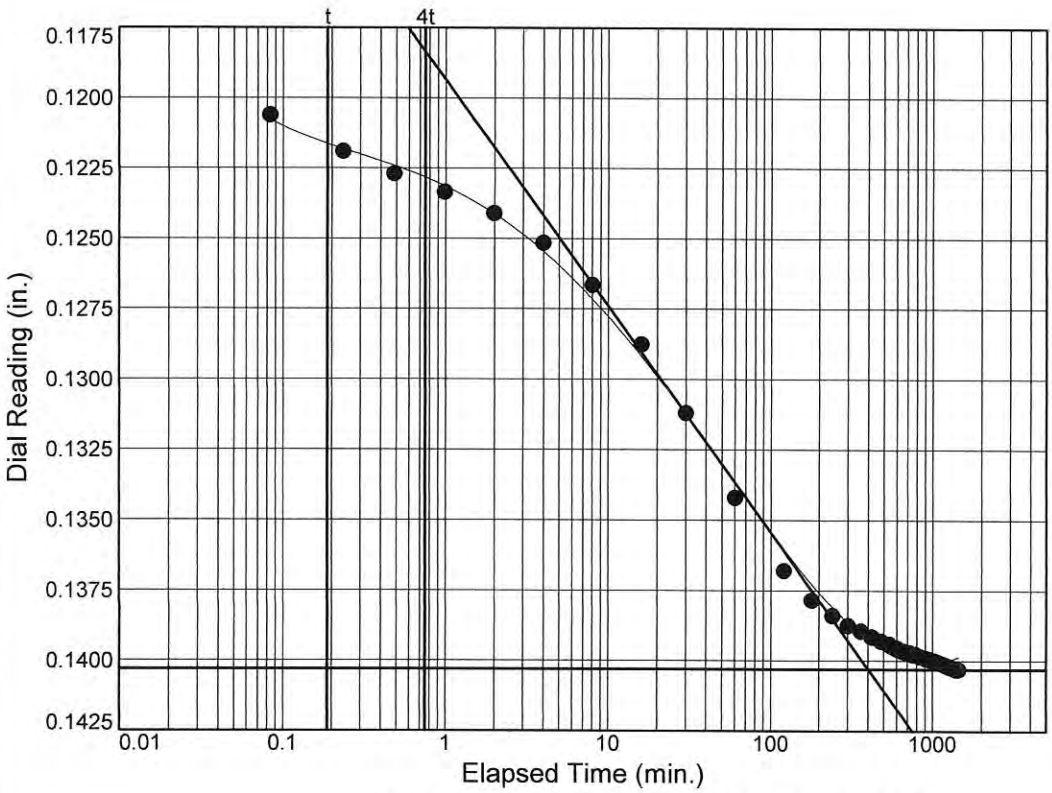
Source of Sample: SJGB029 Depth: 14



Load No.= 15
Load= 16.00 tsf
D_0 = 0.0898
D_{50} = 0.1011
D_{100} = 0.1124
T_{50} = 32.22 min.

C_v @ T_{50}
2.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 16
Load= 32.00 tsf
D_0 = 0.1204
D_{50} = 0.1304
D_{100} = 0.1403
T_{50} = 23.02 min.

C_v @ T_{50}
3.0 ft.^{2}/yr.

C_α = 0.000

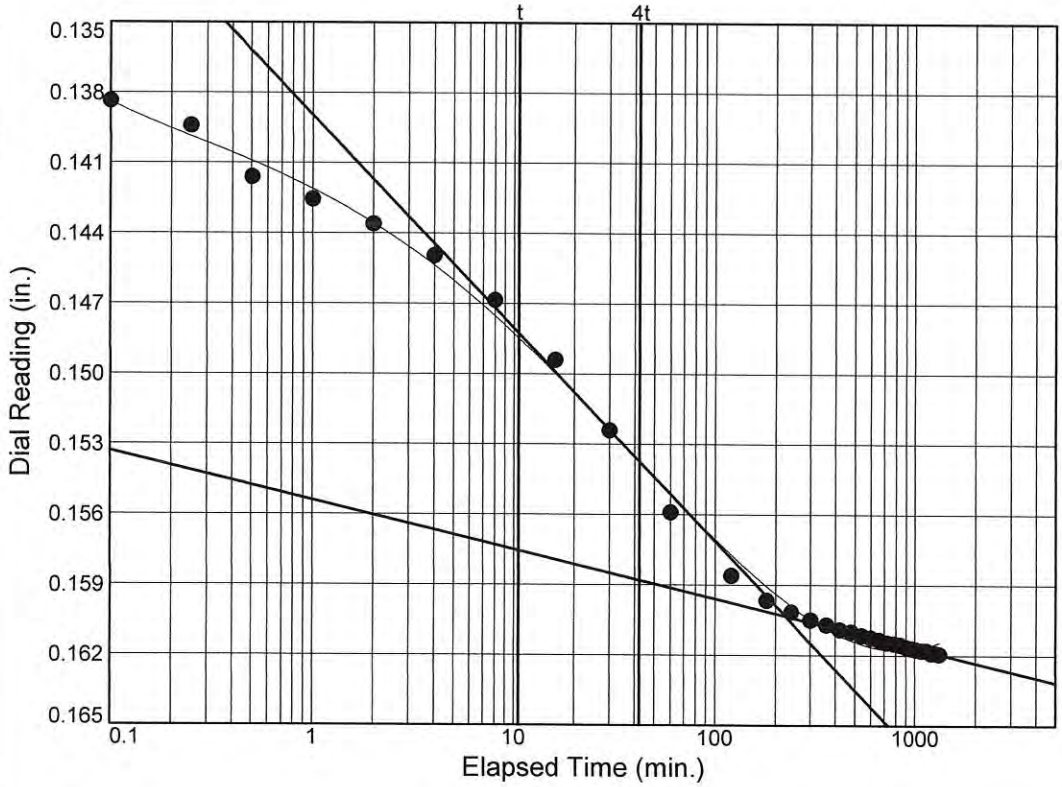
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-193

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

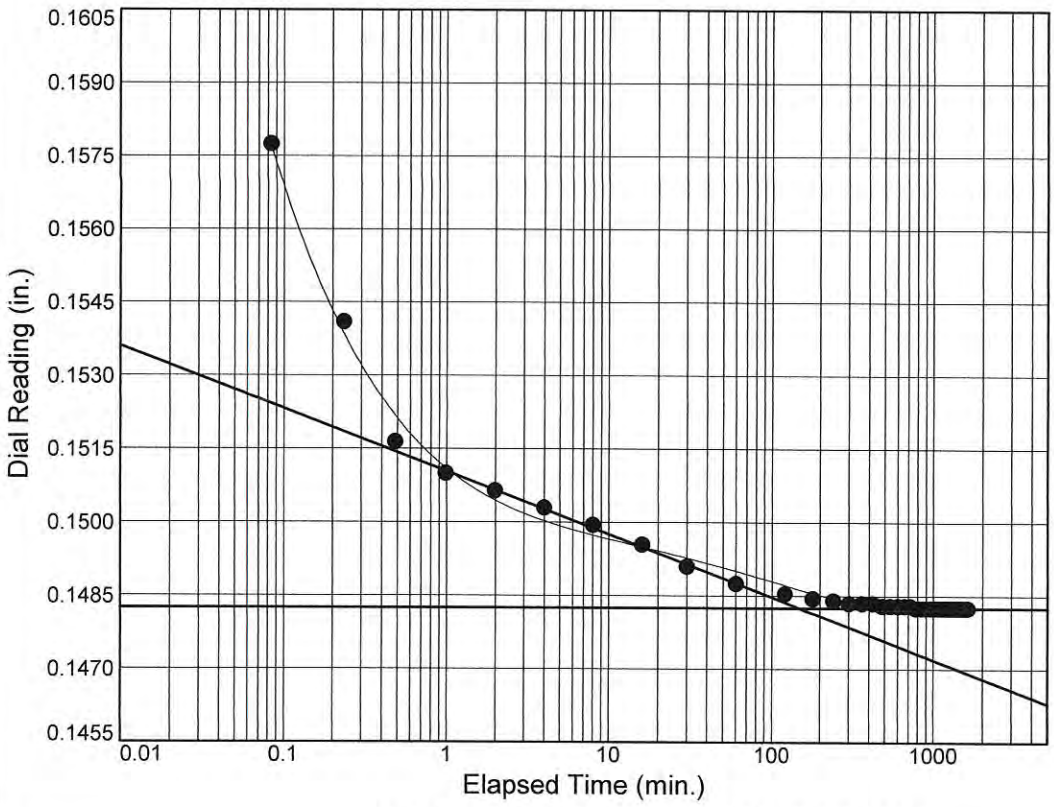
Source of Sample: SJGB029 Depth: 14



Load No.= 17
Load= 60.00 tsf
D_0 = 0.1432
D_{50} = 0.1518
D_{100} = 0.1603
T_{50} = 25.54 min.

C_v @ T_{50}
2.5 ft.^{2}/yr.

C_α = 0.005



Load No.= 18
Load= 16.00 tsf
D_0 = 0.1619
D_{50} = 0.1551
D_{100} = 0.1482
T_{50} = 0.16 min.

C_v @ T_{50}
404.0 ft.^{2}/yr.

C_α = 0.000

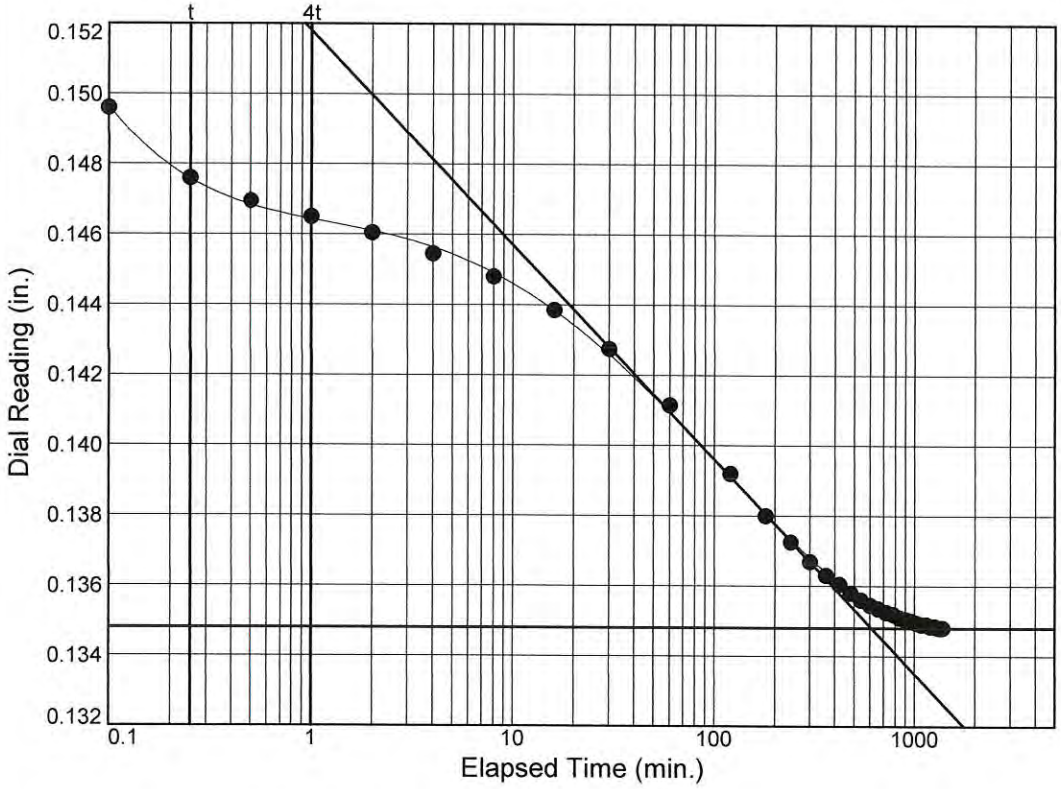
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-194

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

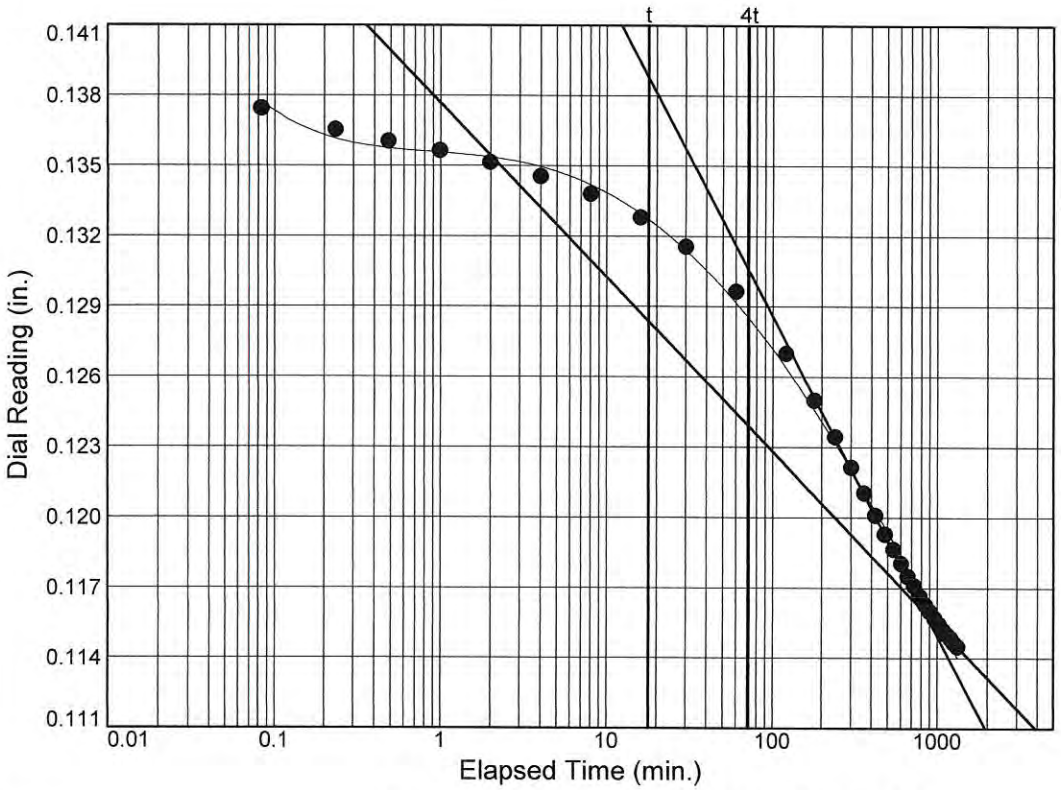
Source of Sample: SJGB029 Depth: 14



Load No.= 19
Load= 4.00 tsf
D_0 = 0.1487
D_{50} = 0.1418
D_{100} = 0.1348
T_{50} = 43.00 min.

C_v @ T_{50}
1.5 ft.^{2}/yr.

C_α = 0.000



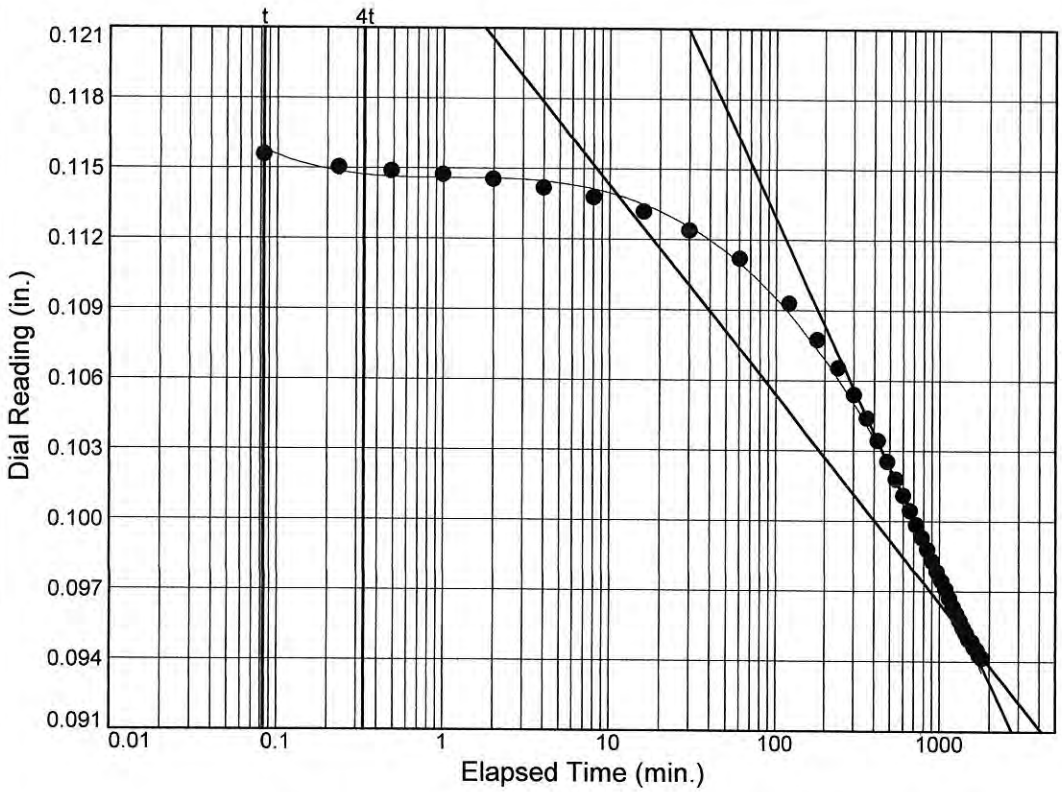
Load No.= 20
Load= 1.00 tsf
D_0 = 0.1369
D_{50} = 0.1264
D_{100} = 0.1160
T_{50} = 119.20 min.

C_v @ T_{50}
0.6 ft.^{2}/yr.

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB029 Depth: 14



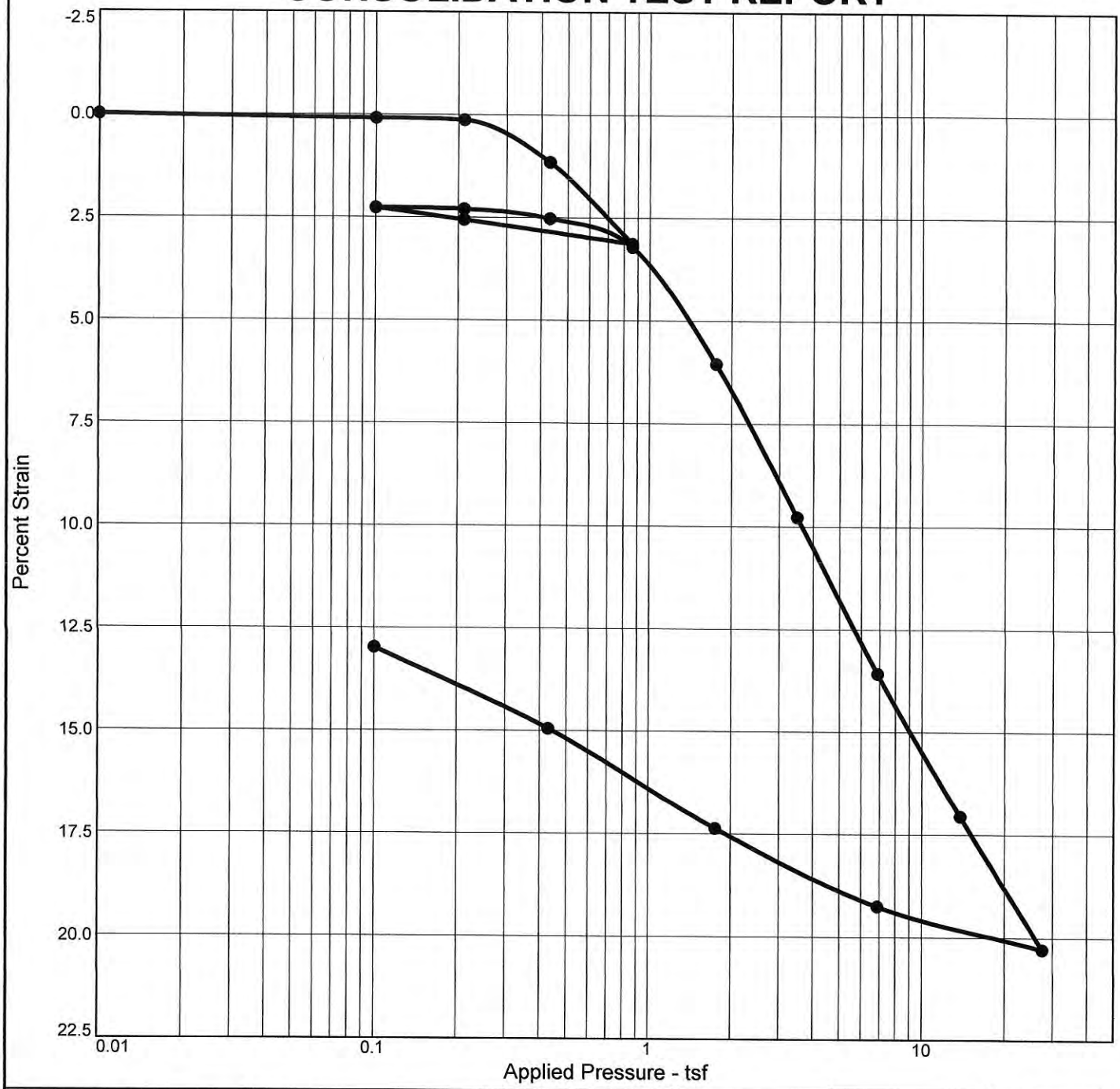
Load No.= 21
Load= 0.25 tsf
D_0 = 0.1169
D_{50} = 0.1059
D_{100} = 0.0948
T_{50} = 252.37 min.

C_v @ T_{50}
0.3 ft.^{2}/yr.

TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-196

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
98.8 %	28.9 %	96.1	27	6	2.80	CL-ML		0.819

MATERIAL DESCRIPTION

Reddish Brown SANDY SILTY CLAY

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 28

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

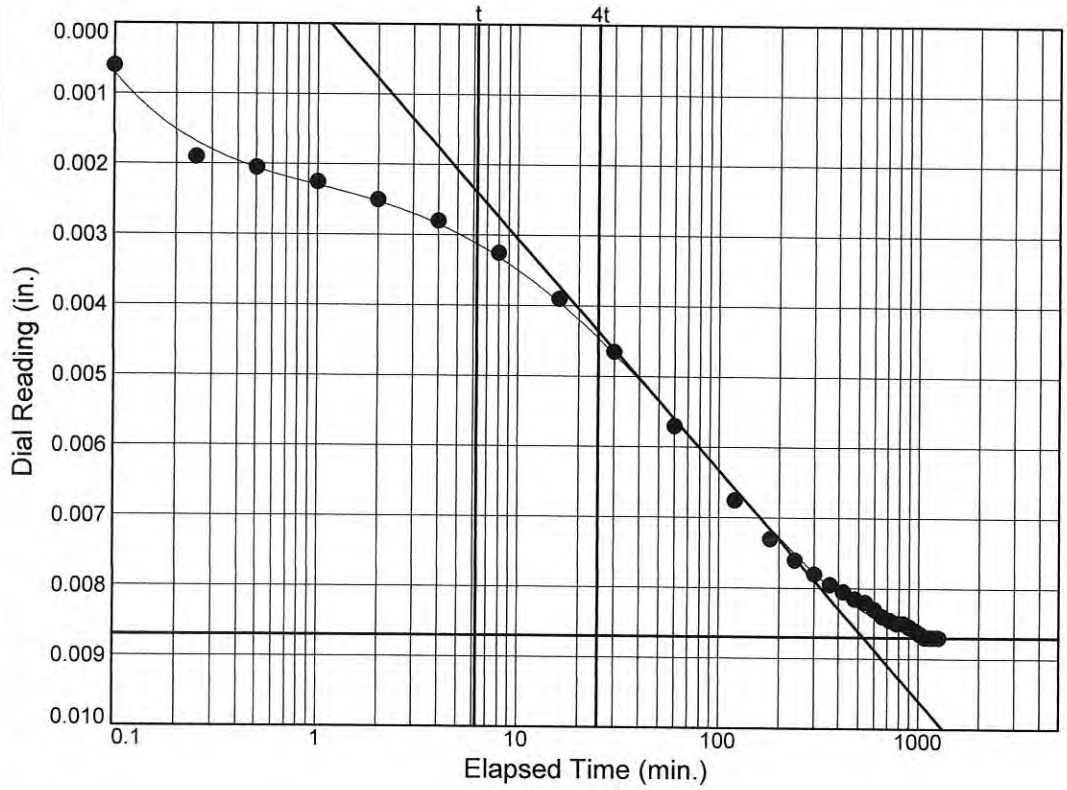
Figure

Attachment Figure B.2-197

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

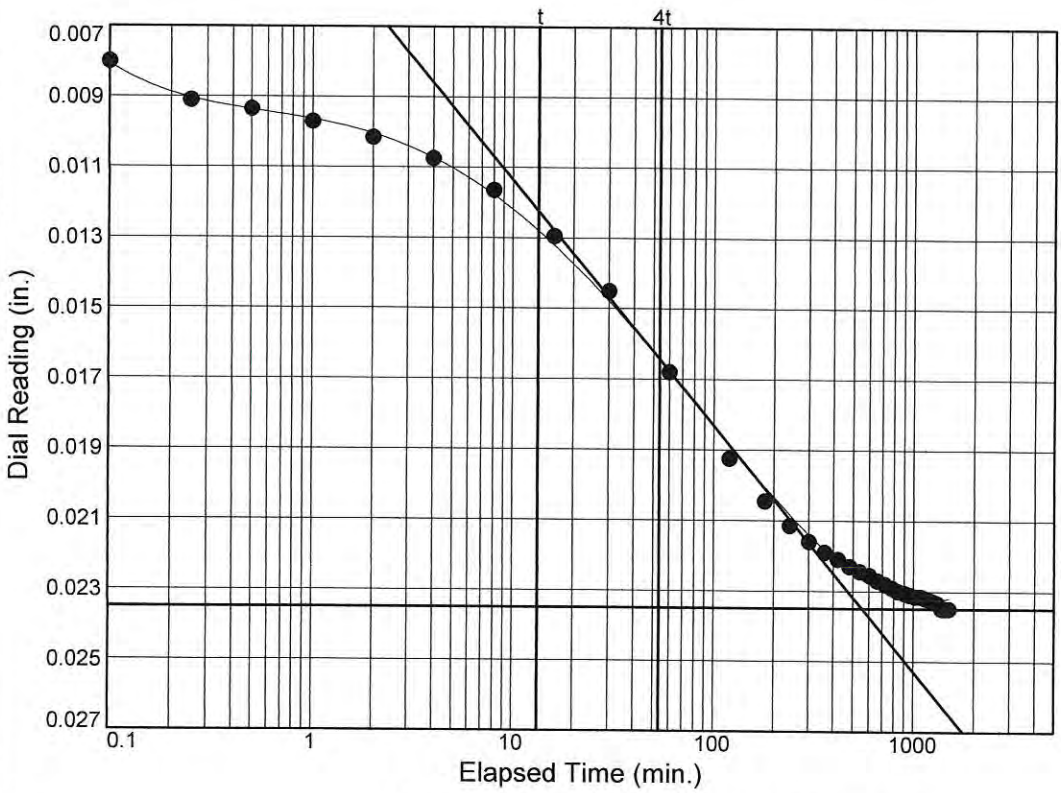
Source of Sample: SJGB047 Depth: 28



Load No.= 4
Load= 0.43 tsf
D_0 = 0.0018
D_{50} = 0.0052
D_{100} = 0.0087
T_{50} = 46.27 min.

C_v @ T_{50}
2.2 ft.^{2}/yr.

C_α = 0.000



Load No.= 5
Load= 0.86 tsf
D_0 = 0.0092
D_{50} = 0.0163
D_{100} = 0.0235
T_{50} = 51.48 min.

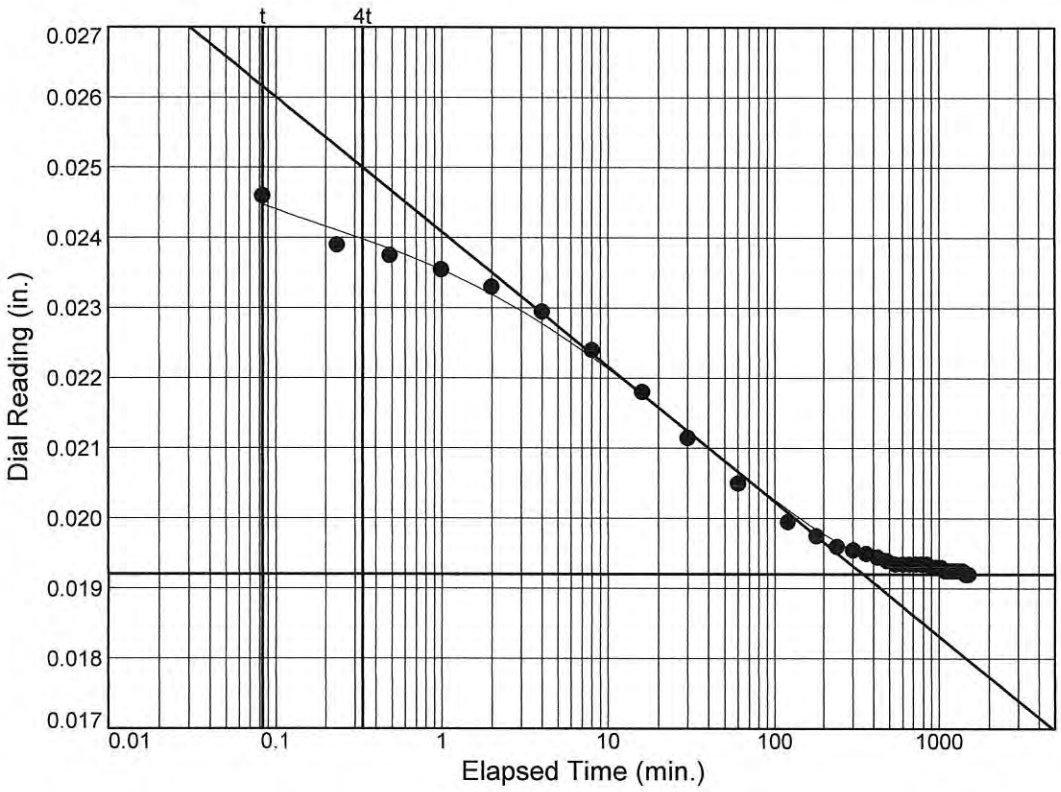
C_v @ T_{50}
1.9 ft.^{2}/yr.

C_α = 0.000

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

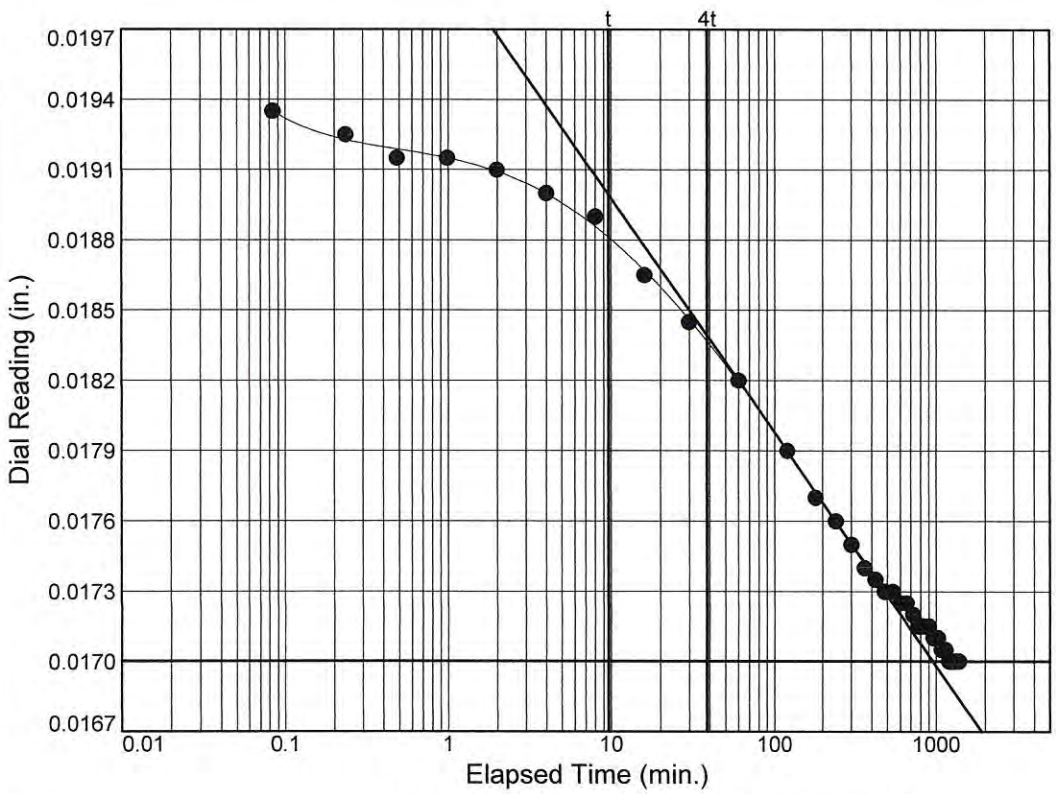
Source of Sample: SJGB047 Depth: 28



Load No.= 6
Load= 0.21 tsf
D_0 = 0.0250
D_{50} = 0.0221
D_{100} = 0.0192
T_{50} = 10.56 min.

C_v @ T_{50}
9.0 ft.^{2}/yr.

C_α = 0.000



Load No.= 7
Load= 0.10 tsf
D_0 = 0.0193
D_{50} = 0.0181
D_{100} = 0.0170
T_{50} = 69.80 min.

C_v @ T_{50}
1.4 ft.^{2}/yr.

C_α = 0.000

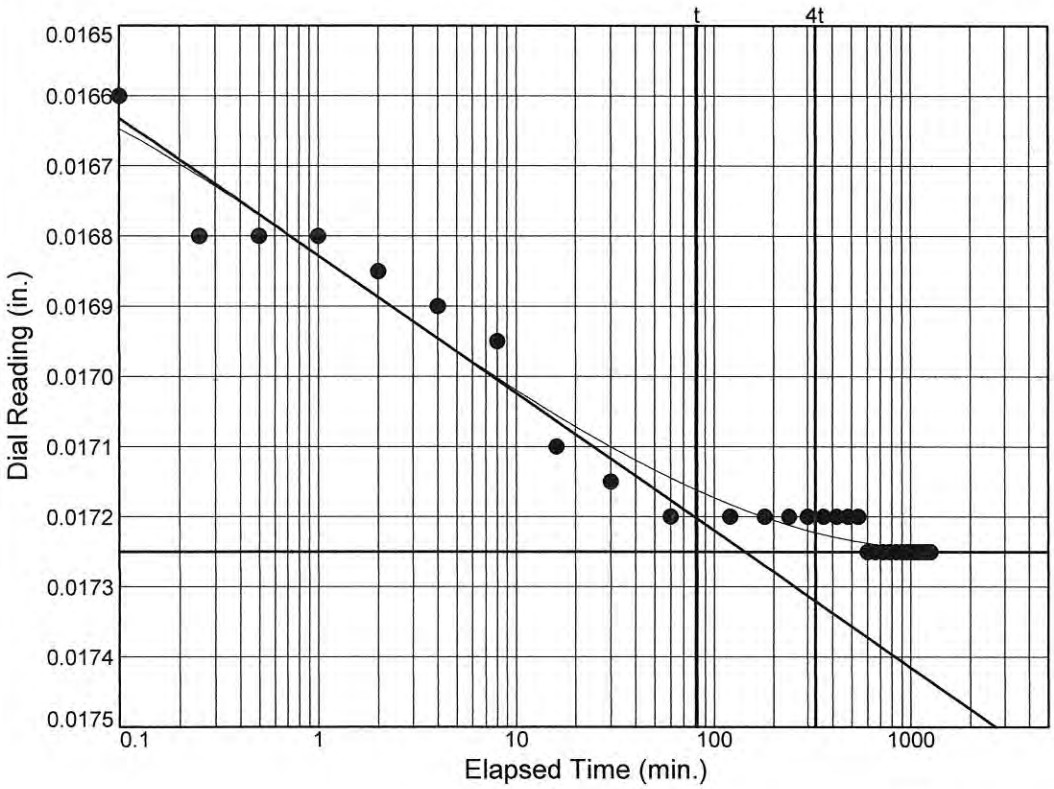
Figure

TOLUNAY-WONG ENGINEERS, INC.

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

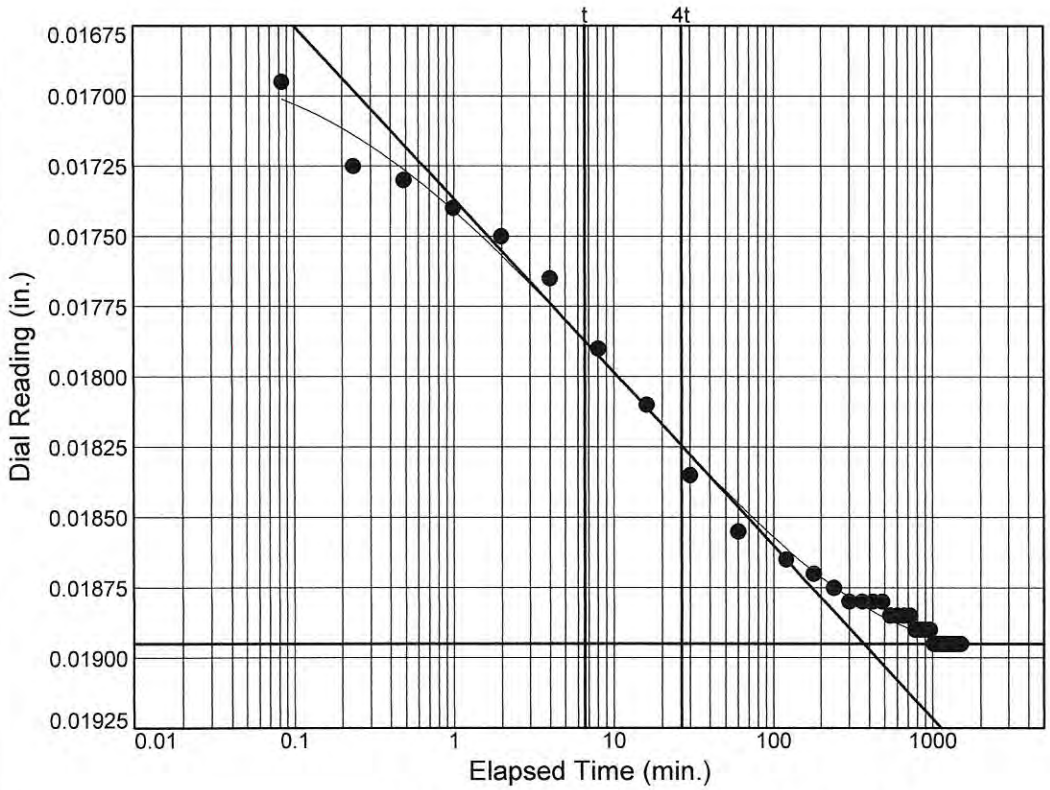
Source of Sample: SJGB047 Depth: 28



Load No.= 8
Load= 0.21 tsf
D_0 = 0.0171
D_{50} = 0.0172
D_{100} = 0.0172
T_{50} = 105.96 min.

C_v @ T_{50}
0.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 9
Load= 0.43 tsf
D_0 = 0.0175
D_{50} = 0.0182
D_{100} = 0.0190
T_{50} = 24.96 min.

C_v @ T_{50}
3.9 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

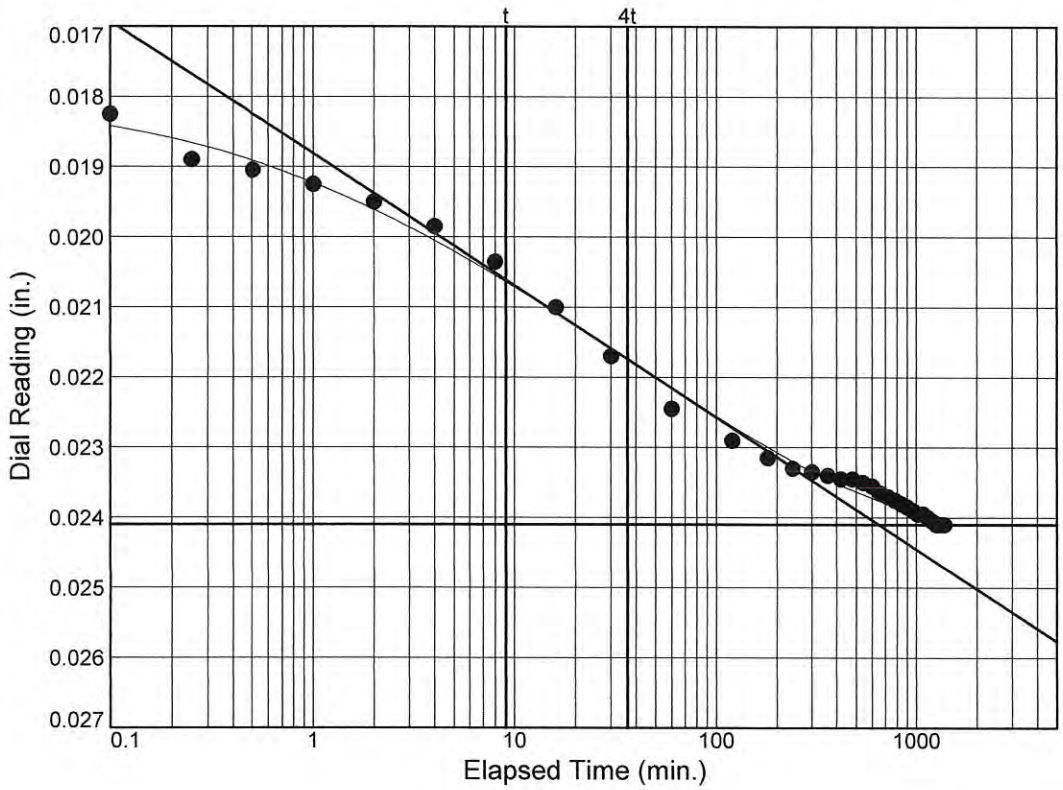
Figure

Attachment Figure B.2-200

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

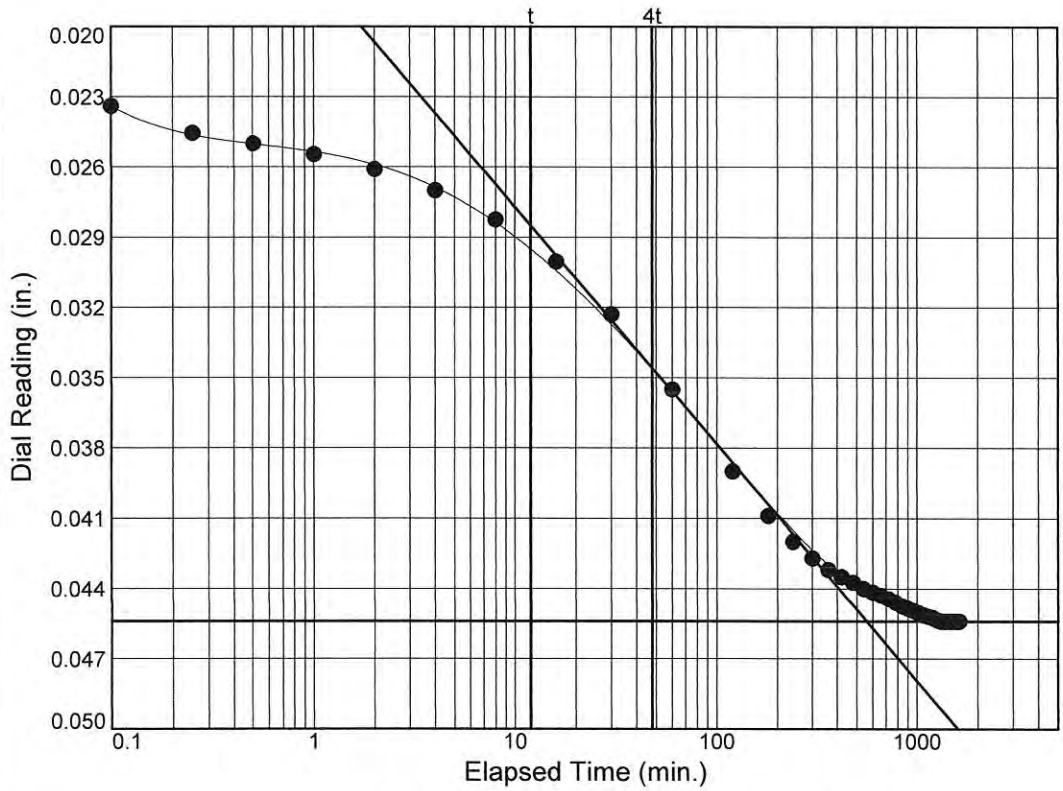
Source of Sample: SJGB047 Depth: 28



Load No.= 10
Load= 0.86 tsf
D_0 = 0.0195
D_{50} = 0.0218
D_{100} = 0.0241
T_{50} = 39.71 min.

C_v @ T_{50}
2.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 11
Load= 1.75 tsf
D_0 = 0.0244
D_{50} = 0.0349
D_{100} = 0.0454
T_{50} = 50.73 min.

C_v @ T_{50}
1.8 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

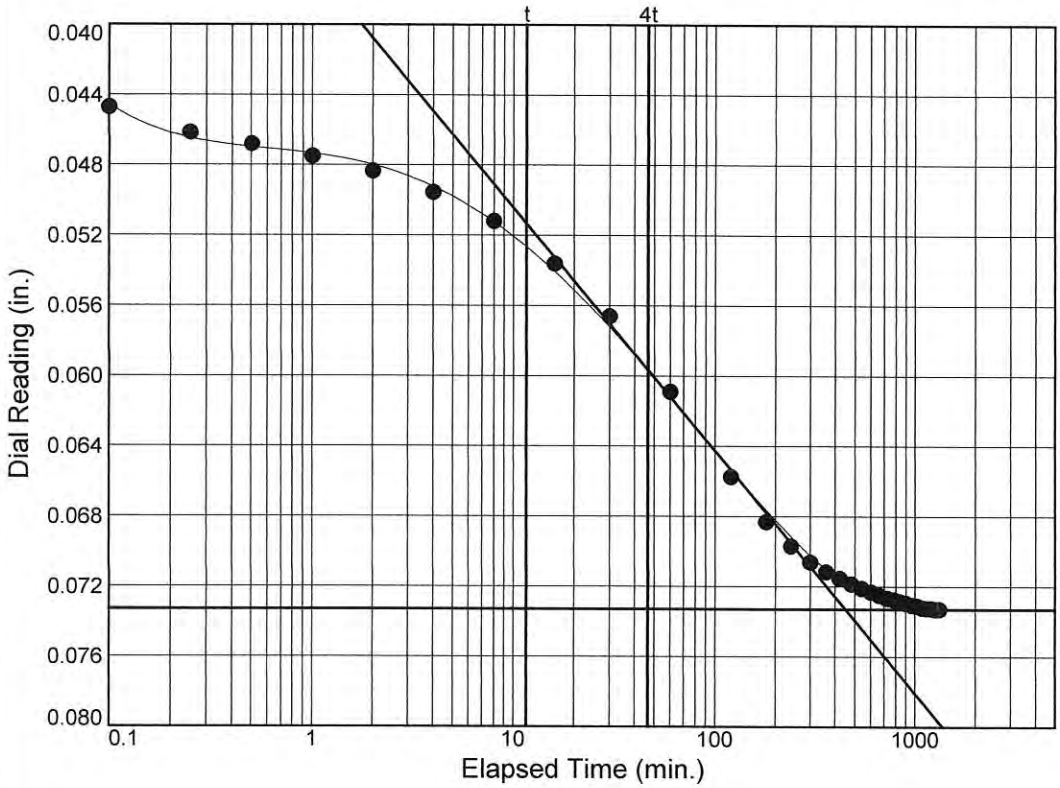
Figure

Attachment Figure B.2-201

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

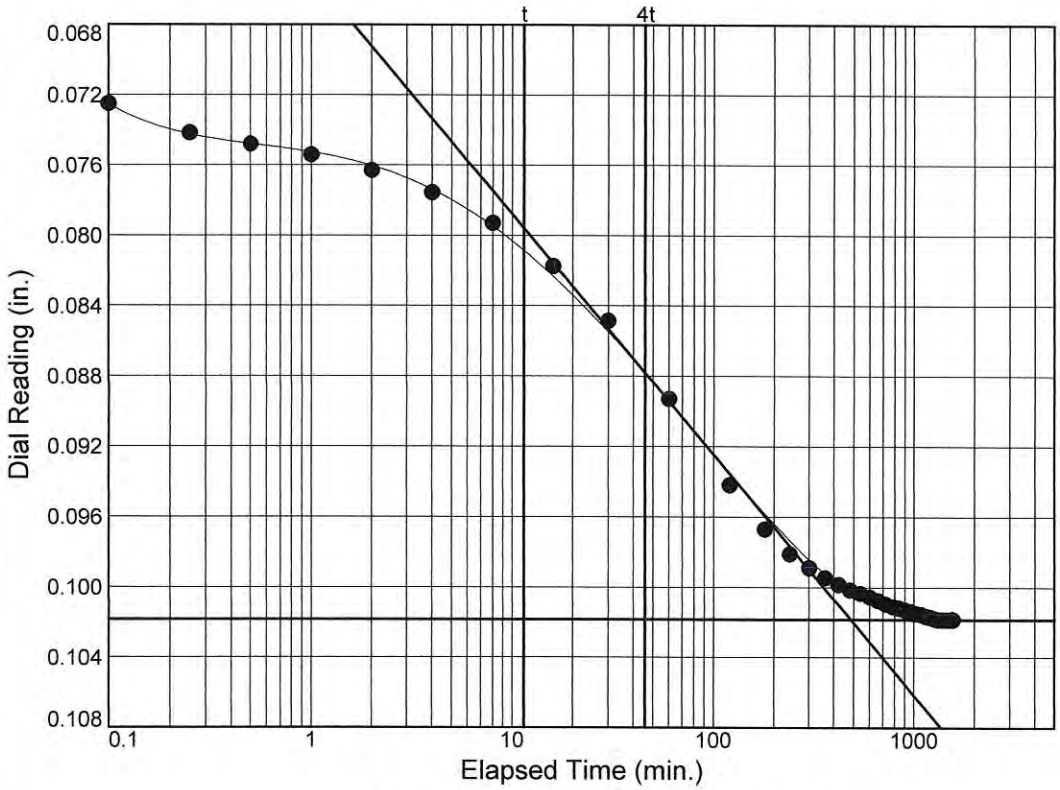
Source of Sample: SJGB047 Depth: 28



Load No.= 12
Load= 3.49 tsf
D_0 = 0.0456
D_{50} = 0.0595
D_{100} = 0.0733
T_{50} = 44.60 min.

C_v @ T_{50}
1.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 13
Load= 6.87 tsf
D_0 = 0.0739
D_{50} = 0.0879
D_{100} = 0.1018
T_{50} = 45.75 min.

C_v @ T_{50}
1.7 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

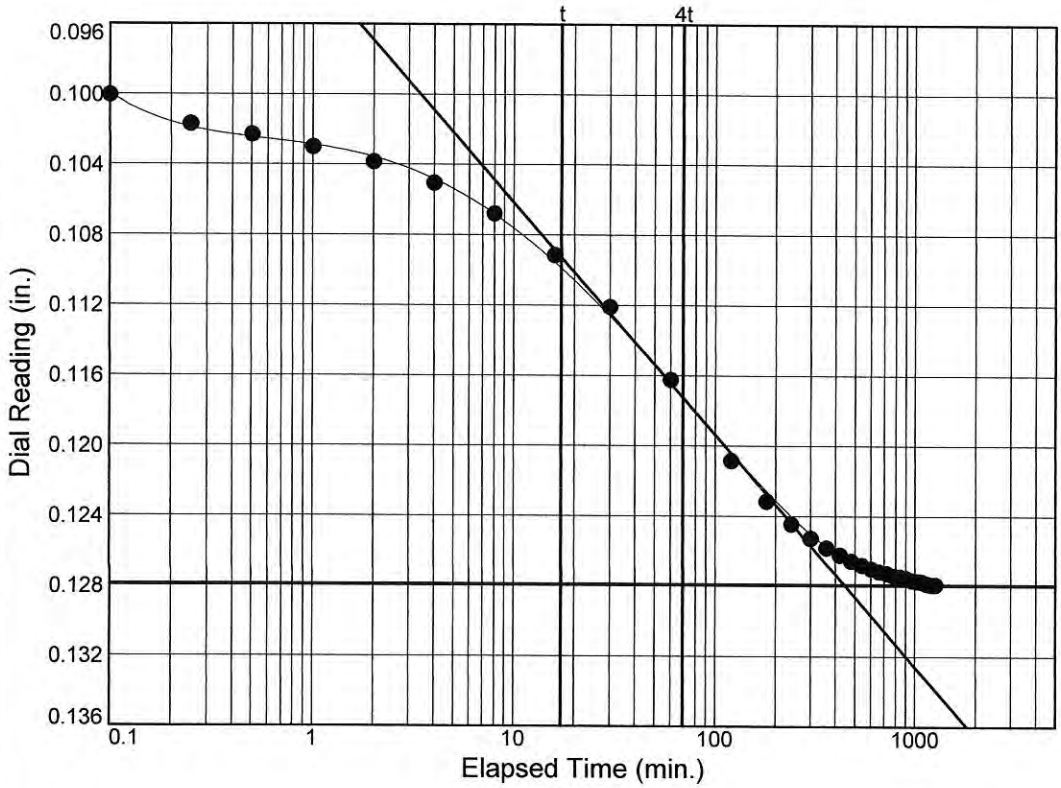
Figure

Attachment Figure B.2-202

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

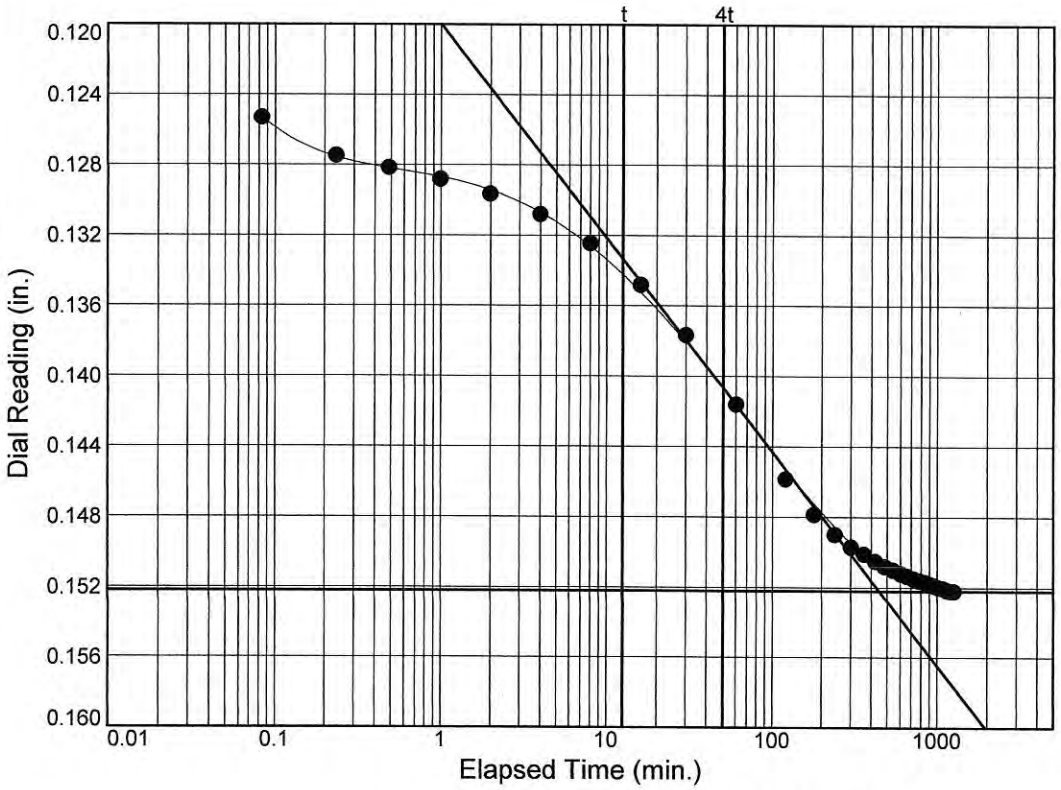
Source of Sample: SJGB047 Depth: 28



Load No.= 14
Load= 13.75 tsf
D_0 = 0.1025
D_{50} = 0.1152
D_{100} = 0.1279
T_{50} = 48.41 min.

C_v @ T_{50}
1.5 ft.^{2}/yr.

C_α = 0.000



Load No.= 15
Load= 27.50 tsf
D_0 = 0.1278
D_{50} = 0.1400
D_{100} = 0.1522
T_{50} = 43.98 min.

C_v @ T_{50}
1.5 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

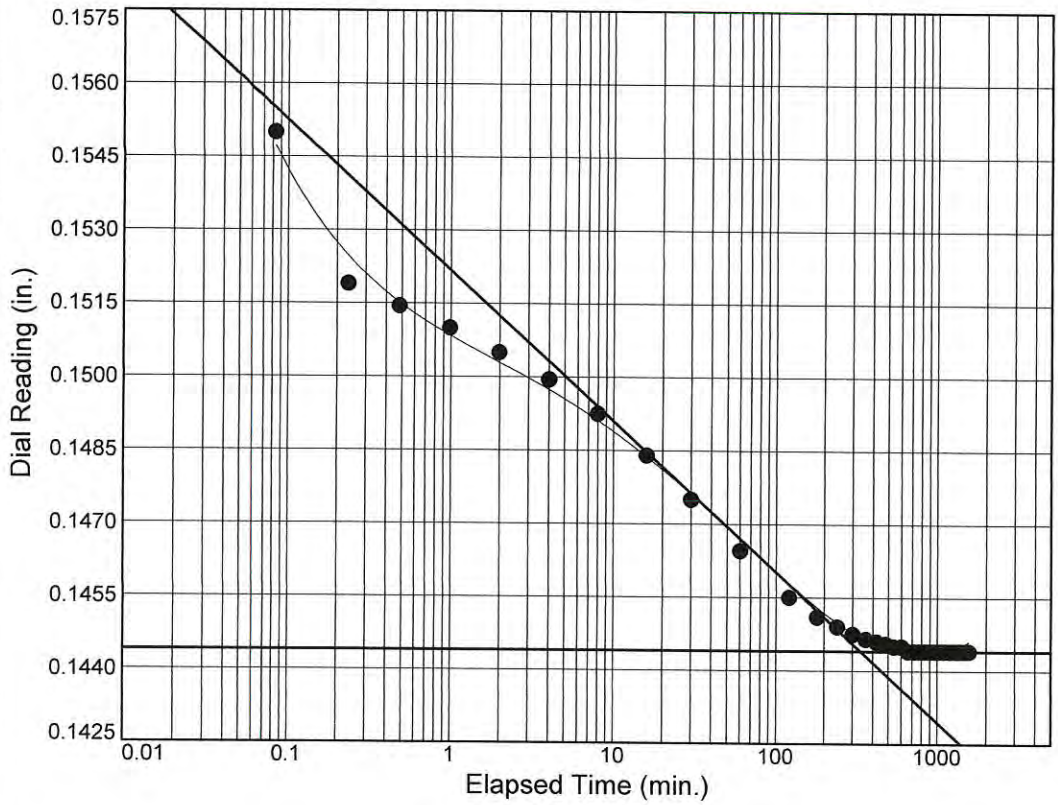
Figure

Attachment Figure B.2-203

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

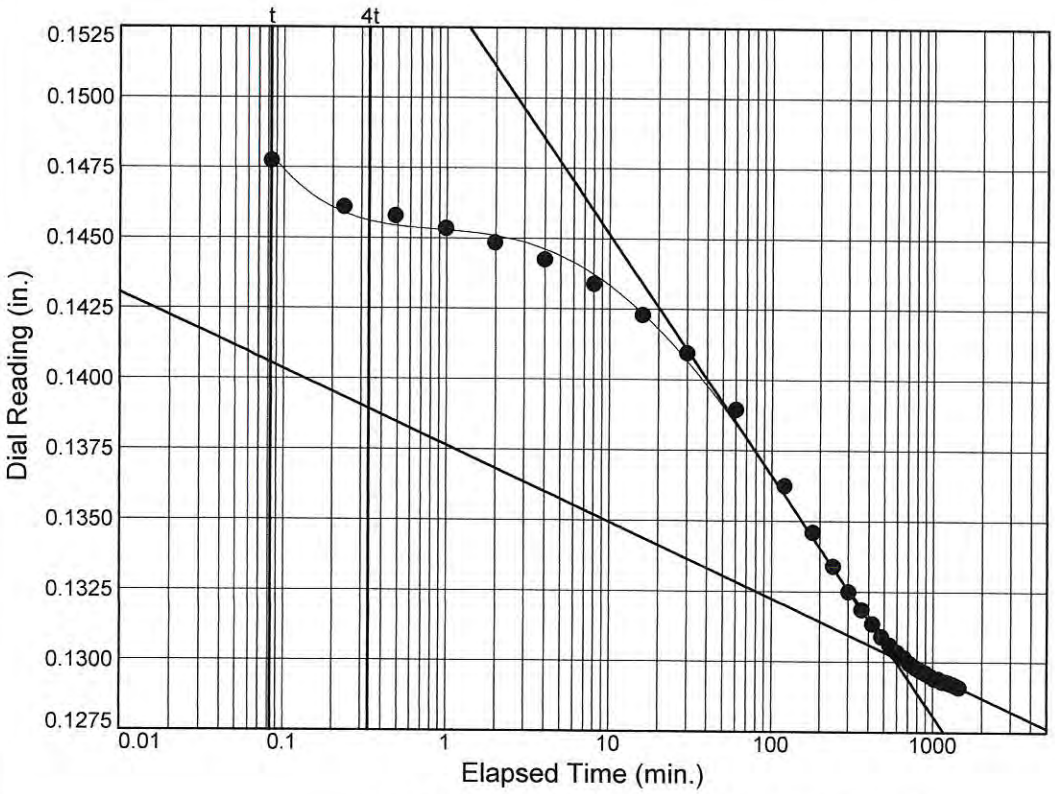
Source of Sample: SJGB047 Depth: 28



Load No.= 16
Load= 6.87 tsf
D_0 = 0.1550
D_{50} = 0.1497
D_{100} = 0.1444
T_{50} = 4.20 min.

C_v @ T_{50}
15.4 ft.^{2}/yr.

C_α = 0.000



Load No.= 17
Load= 1.75 tsf
D_0 = 0.1503
D_{50} = 0.1402
D_{100} = 0.1302
T_{50} = 34.60 min.

C_v @ T_{50}
1.9 ft.^{2}/yr.

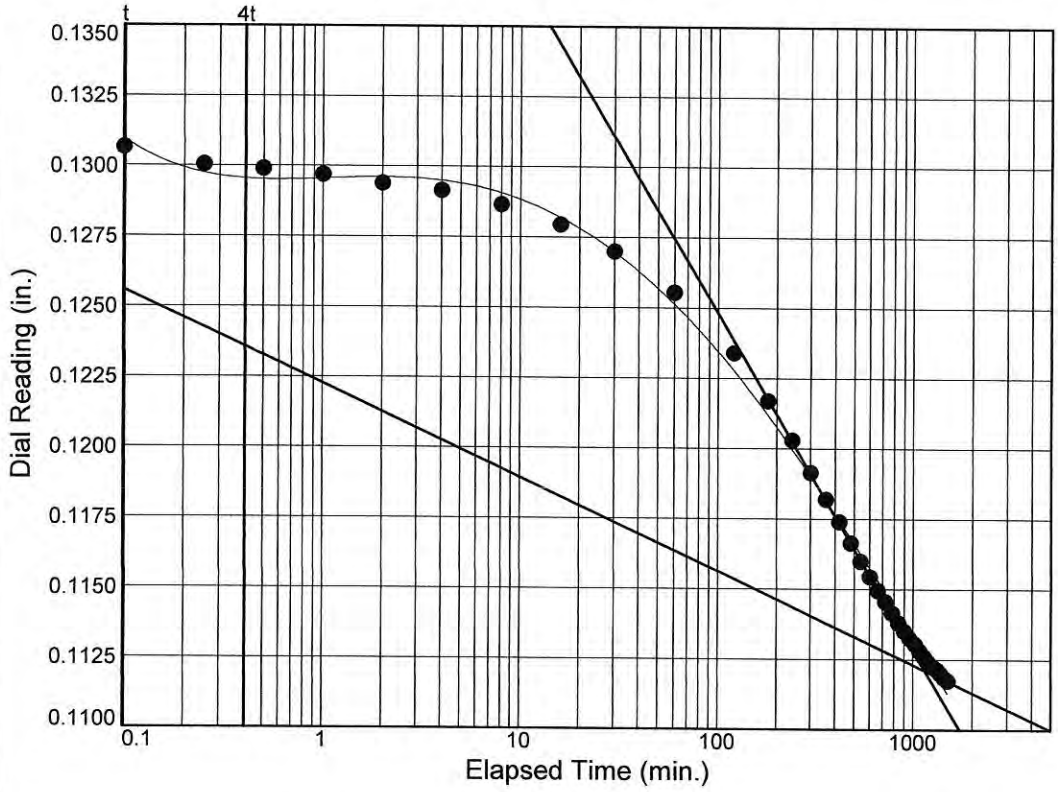
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-204

Dial Reading vs. Time

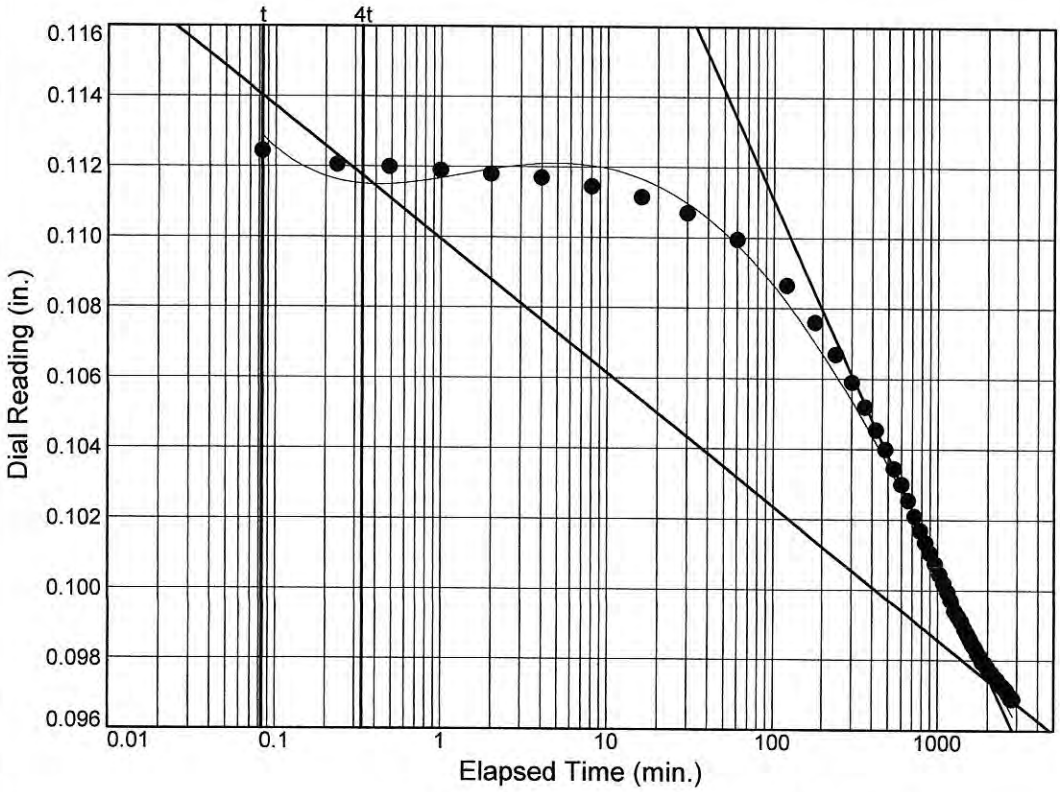
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 Depth: 28



Load No.= 18
Load= 0.43 tsf
D_0 = 0.1323
D_{50} = 0.1222
D_{100} = 0.1121
T_{50} = 139.92 min.

C_v @ T_{50}
0.5 ft.^{2}/yr.



Load No.= 19
Load= 0.10 tsf
D_0 = 0.1142
D_{50} = 0.1058
D_{100} = 0.0973
T_{50} = 265.37 min.

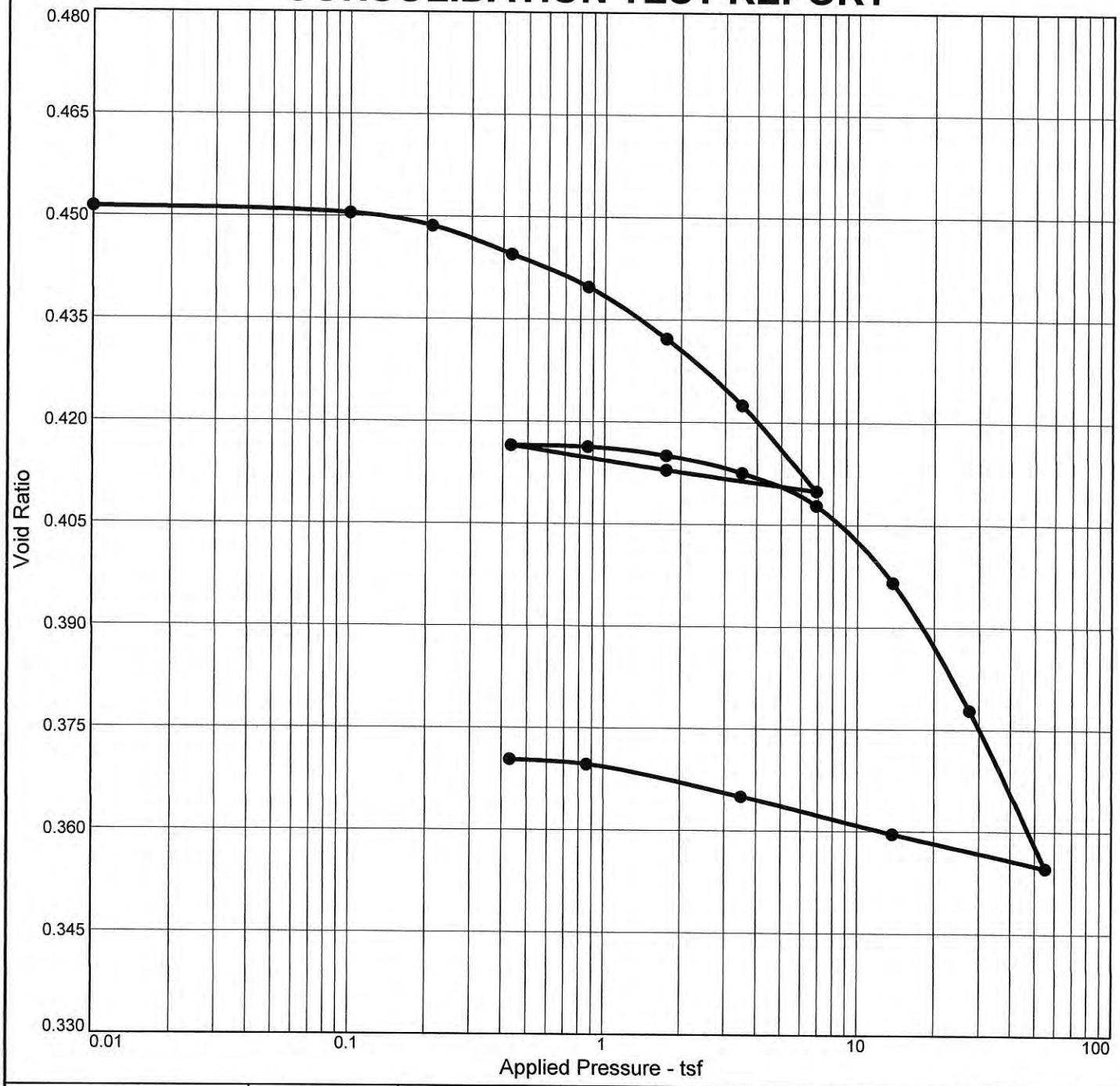
C_v @ T_{50}
0.3 ft.^{2}/yr.

TOLUNAY-WONG ENGINEERS, INC.

Figure

Attachment Figure B.2-205

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
90.9 %	15.2 %	116.1	30	11	2.70	CL		0.451

MATERIAL DESCRIPTION

Grey LEAN CLAY with SAND

Project No. 19.15.131 **Client:**

Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 **Depth:** 48

Tolunay-Wong Engineers, Inc.

Houston, Texas

Remarks:

Test method: ASTM D2435
Specific gravity: Assumed

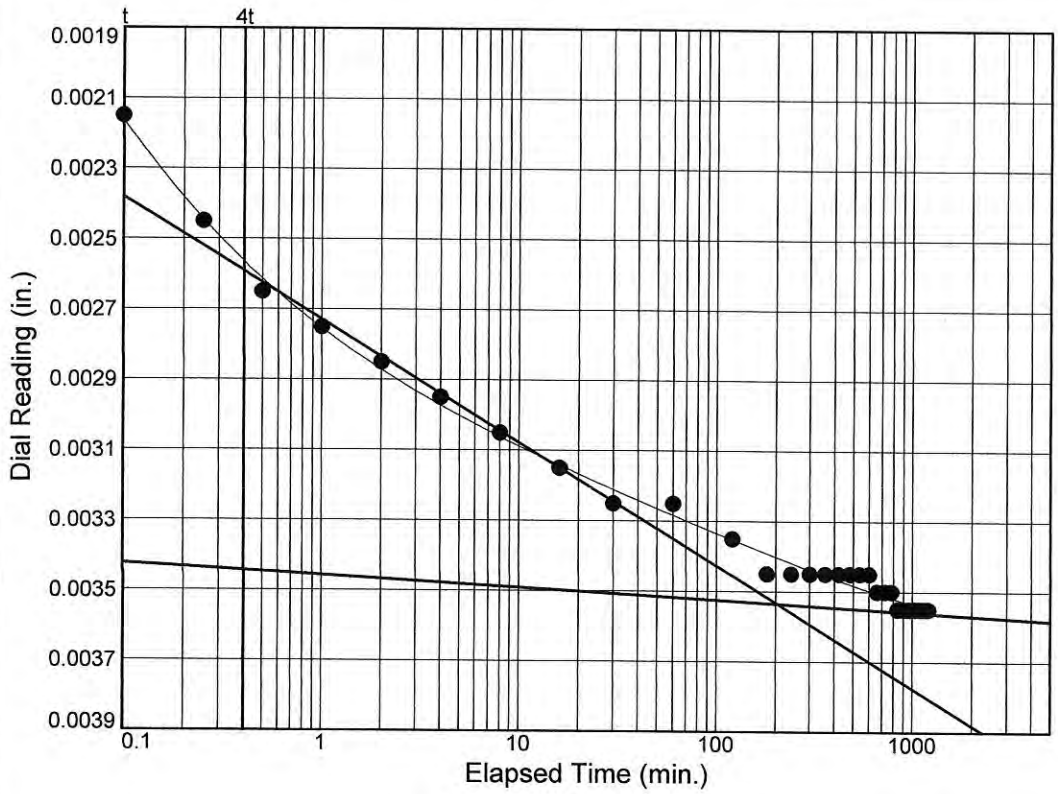
Figure

Attachment Figure B.2-206

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

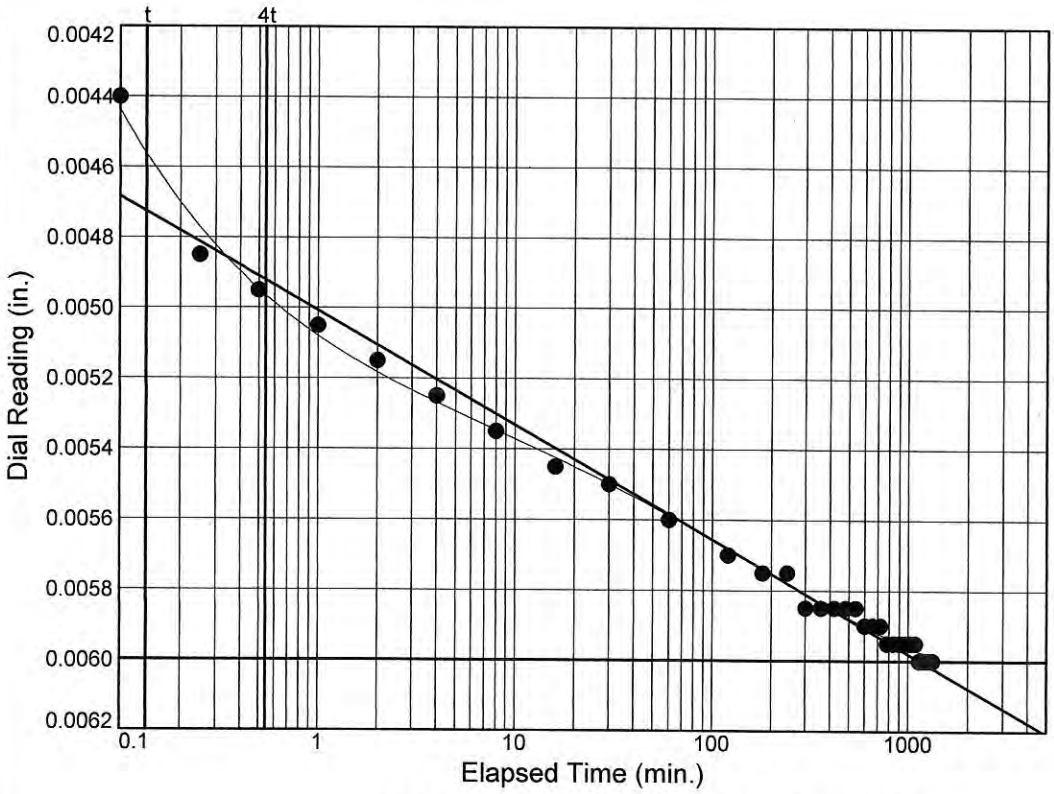
Source of Sample: SJGB047 Depth: 48



Load No.= 4
Load= 0.43 tsf
D_0 = 0.0018
D_{50} = 0.0026
D_{100} = 0.0035
T_{50} = 0.59 min.

C_v @ T_{50}
170.7 ft.^{2}/yr.

C_α = 0.000



Load No.= 5
Load= 0.86 tsf
D_0 = 0.0042
D_{50} = 0.0051
D_{100} = 0.0060
T_{50} = 1.00 min.

C_v @ T_{50}
99.9 ft.^{2}/yr.

C_α = 0.000

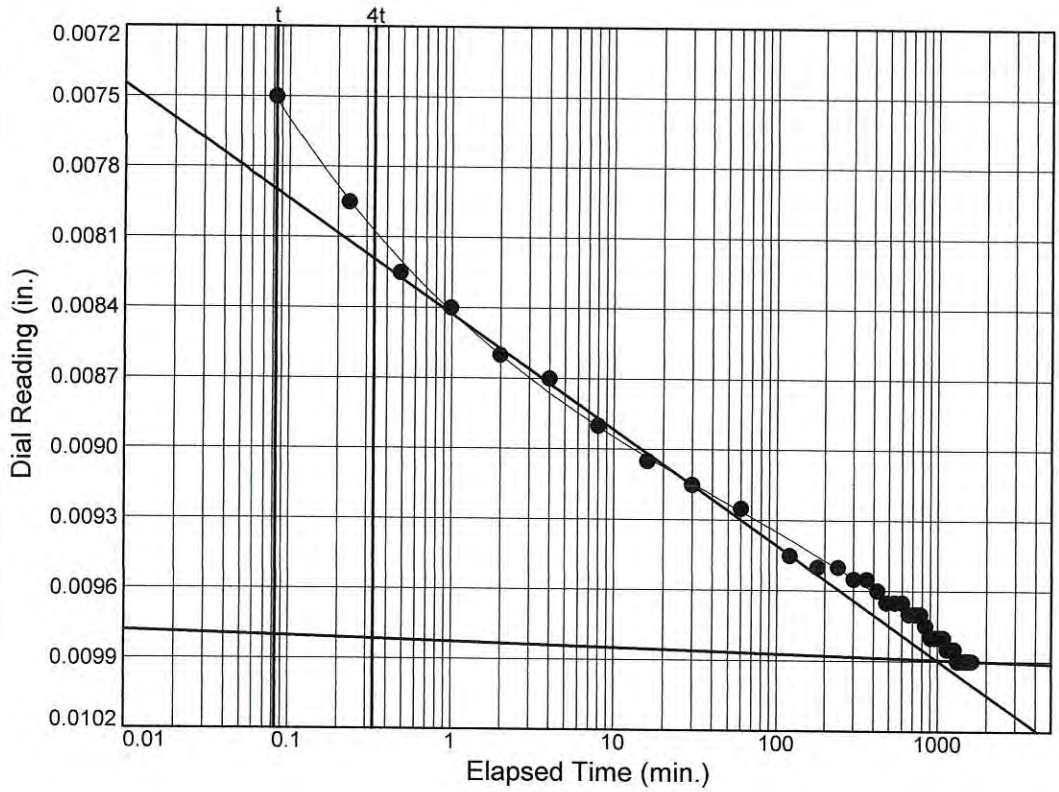
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-207

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

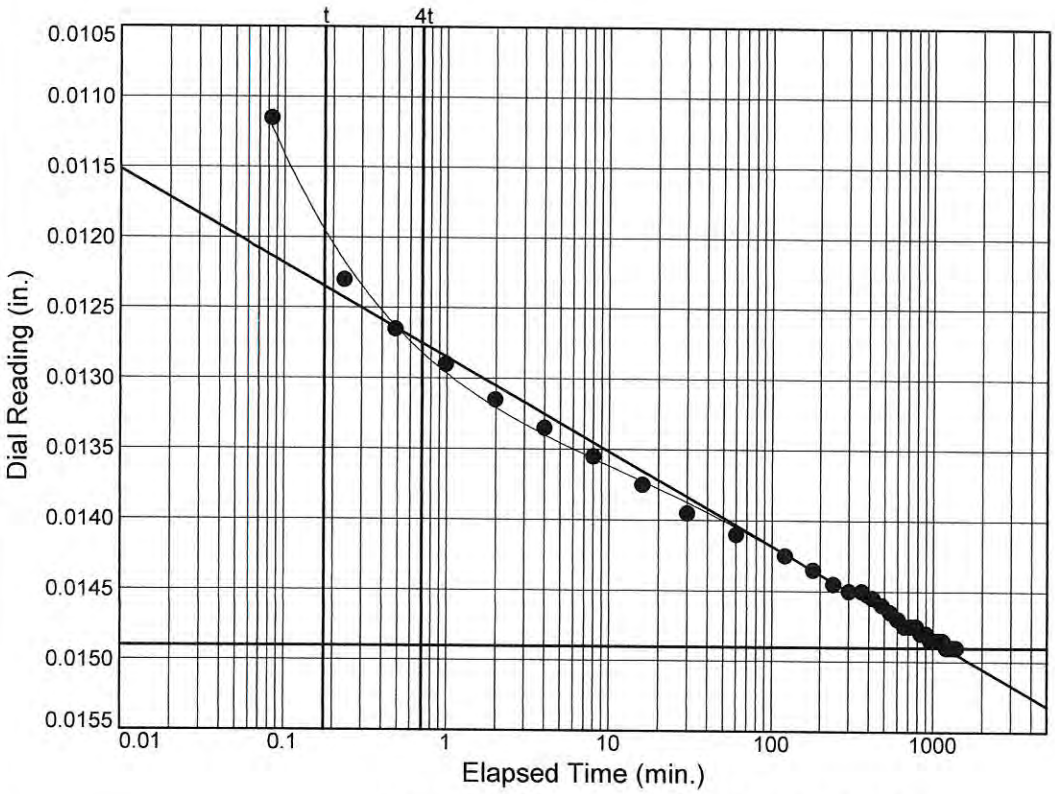
Source of Sample: SJGB047 Depth: 48



Load No.= 6
Load= 1.75 tsf
D_0 = 0.0070
D_{50} = 0.0084
D_{100} = 0.0099
T_{50} = 1.02 min.

C_v @ T_{50}
97.0 ft.^{2}/yr.

C_α = 0.000



Load No.= 7
Load= 3.49 tsf
D_0 = 0.0111
D_{50} = 0.0130
D_{100} = 0.0149
T_{50} = 1.06 min.

C_v @ T_{50}
91.8 ft.^{2}/yr.

C_α = 0.000

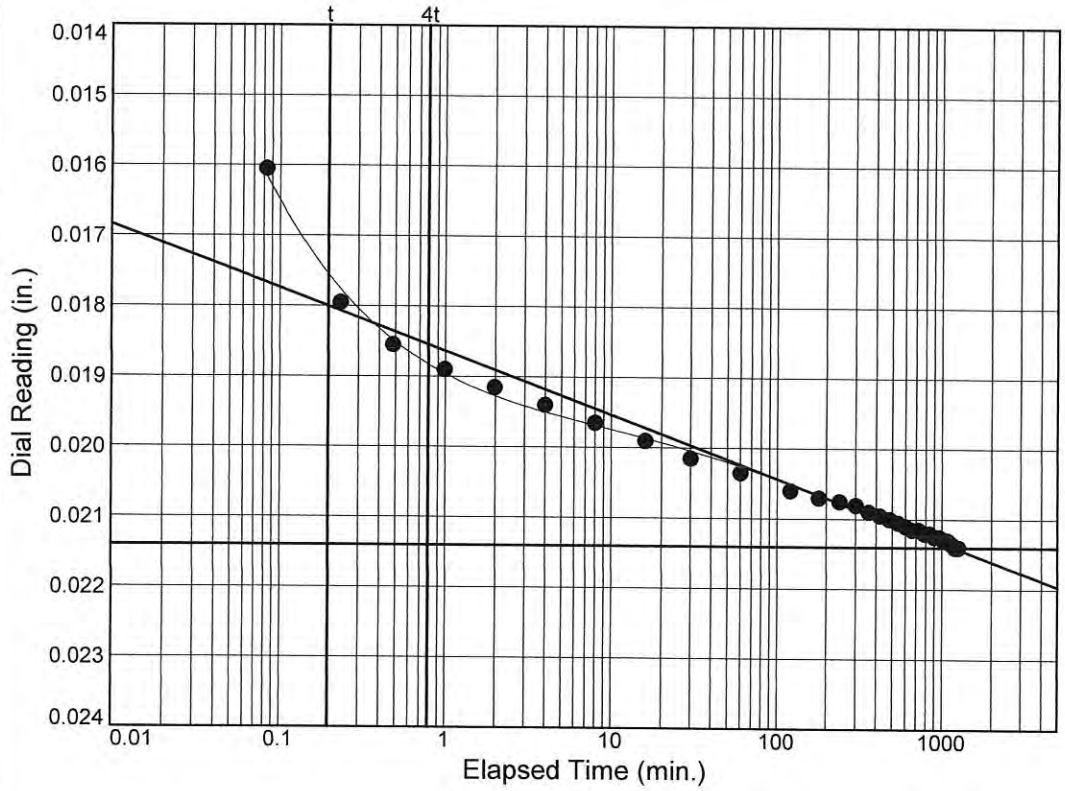
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-208

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

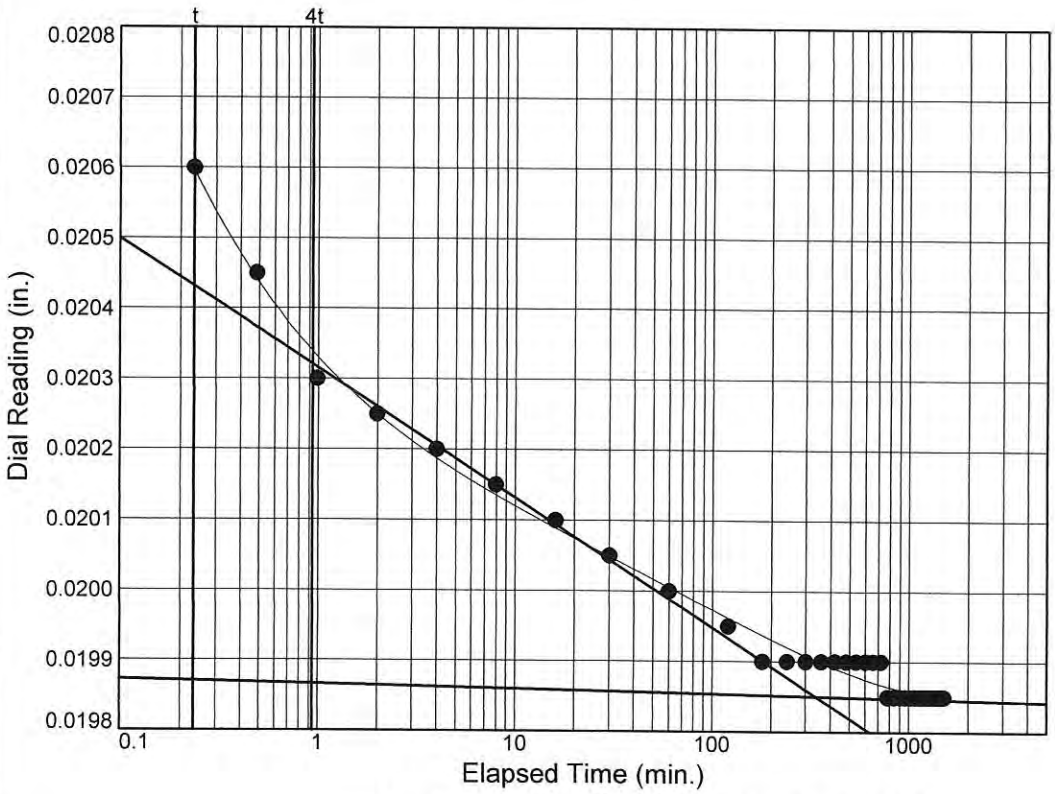
Source of Sample: SJGB047 Depth: 48



Load No.= 8
Load= 6.87 tsf
D_0 = 0.0163
D_{50} = 0.0188
D_{100} = 0.0214
T_{50} = 0.80 min.

C_v @ T_{50}
120.5 ft.^{2}/yr.

C_α = 0.000



Load No.= 9
Load= 1.75 tsf
D_0 = 0.0209
D_{50} = 0.0204
D_{100} = 0.0199
T_{50} = 0.86 min.

C_v @ T_{50}
111.7 ft.^{2}/yr.

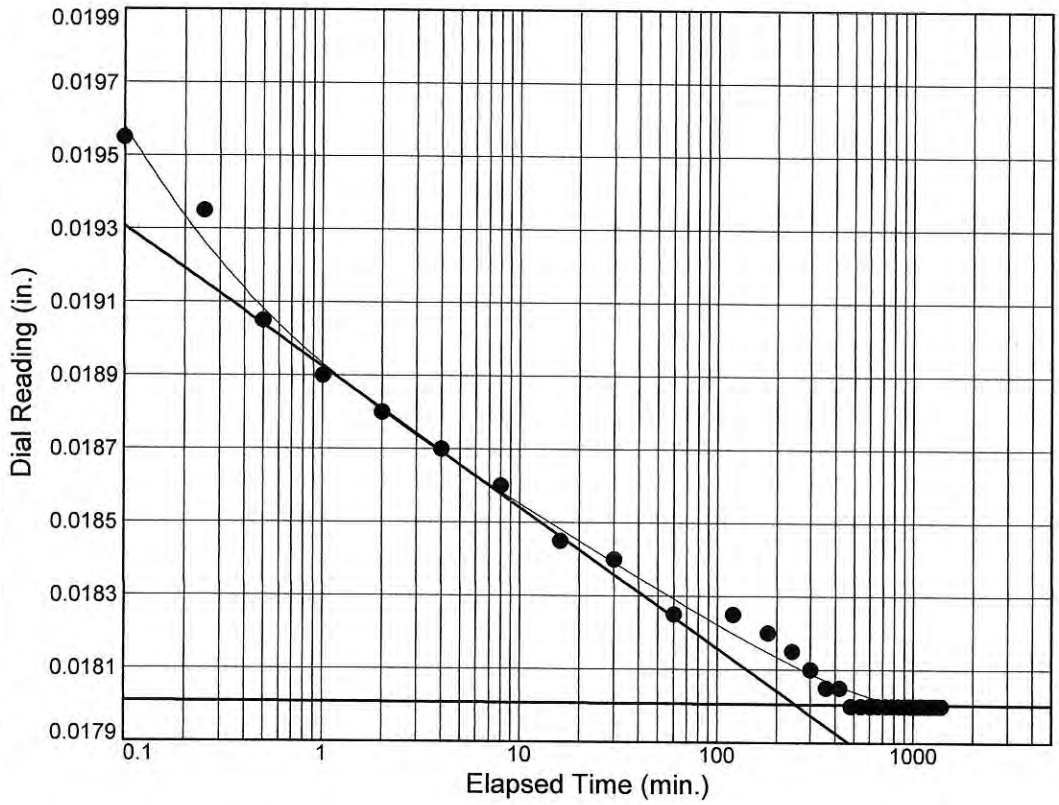
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-209

Dial Reading vs. Time

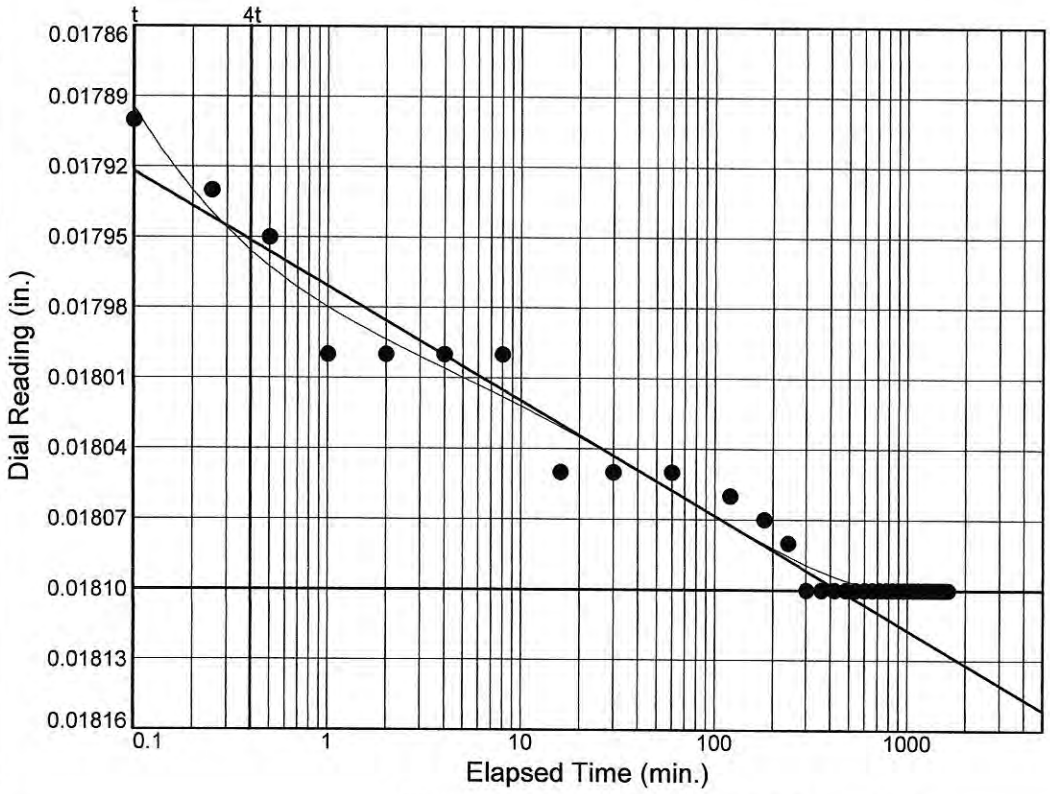
Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

Source of Sample: SJGB047 Depth: 48



Load No.= 10
Load= 0.43 tsf
D_0 = 0.0198
D_{50} = 0.0189
D_{100} = 0.0180
T_{50} = 1.02 min.

C_v @ T_{50}
94.0 ft.^{2}/yr.



Load No.= 11
Load= 0.86 tsf
D_0 = 0.0178
D_{50} = 0.0180
D_{100} = 0.0181
T_{50} = 0.58 min.

C_v @ T_{50}
167.3 ft.^{2}/yr.

C_α = 0.000

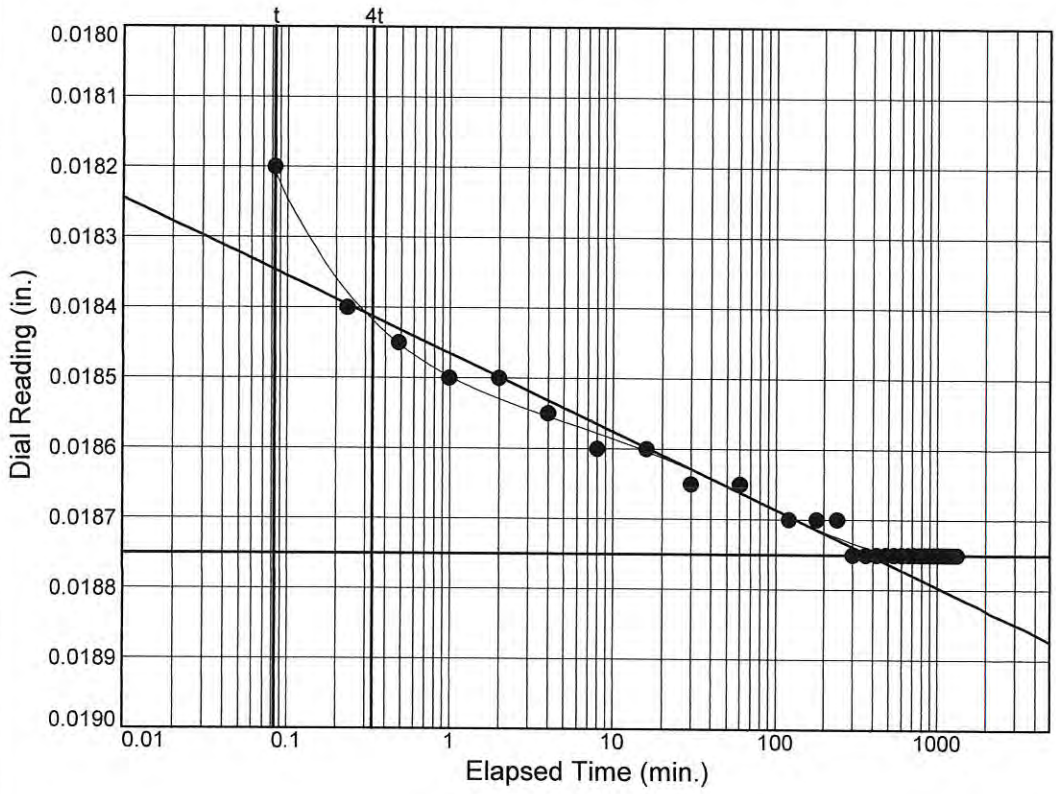
TOLUNAY-WONG ENGINEERS, INC.

Figure
Attachment Figure B.2-210

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

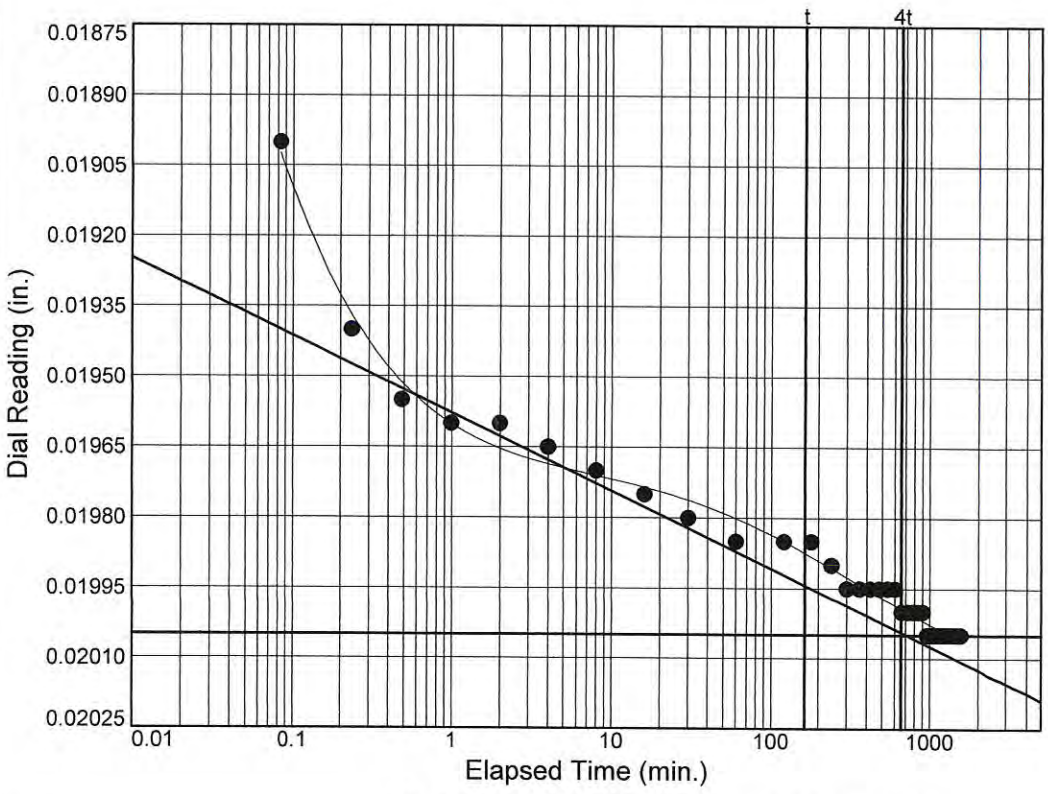
Source of Sample: SJGB047 Depth: 48



Load No.= 12
Load= 1.75 tsf
D_0 = 0.0180
D_{50} = 0.0184
D_{100} = 0.0187
T_{50} = 0.22 min.

C_v @ T_{50}
429.3 ft.^{2}/yr.

C_α = 0.000



Load No.= 13
Load= 3.49 tsf
D_0 = 0.0198
D_{50} = 0.0199
D_{100} = 0.0200
T_{50} = 229.49 min.

C_v @ T_{50}
0.4 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

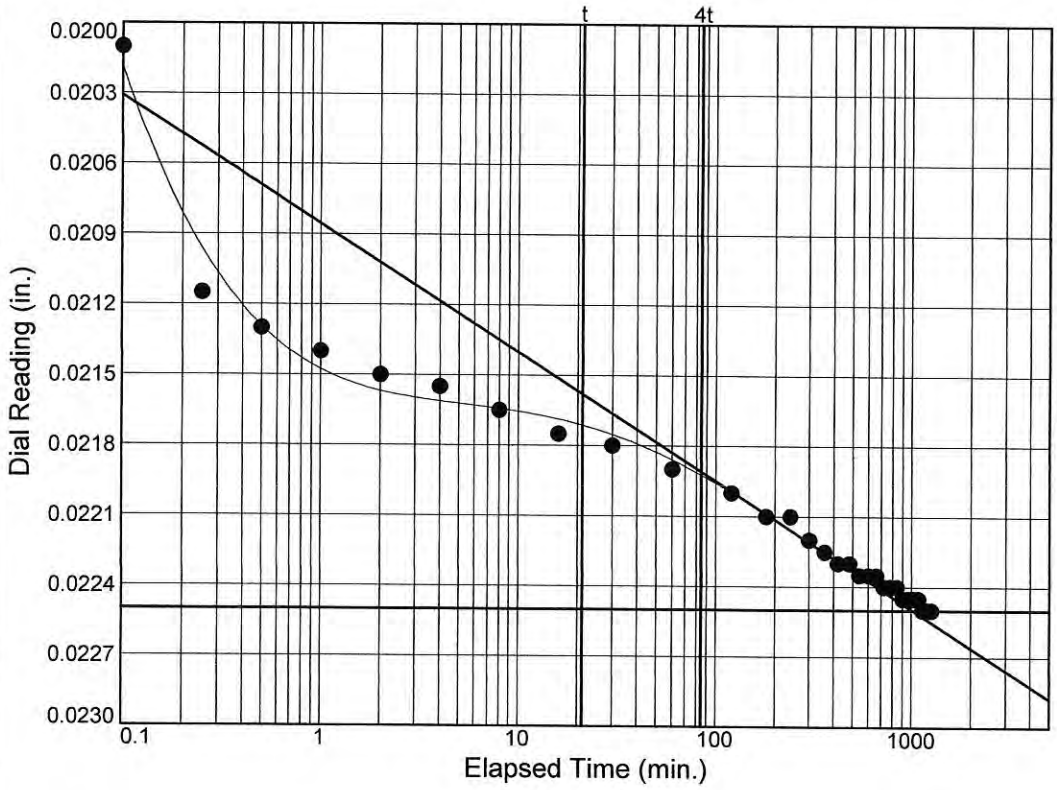
Figure

Attachment Figure B.2-211

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

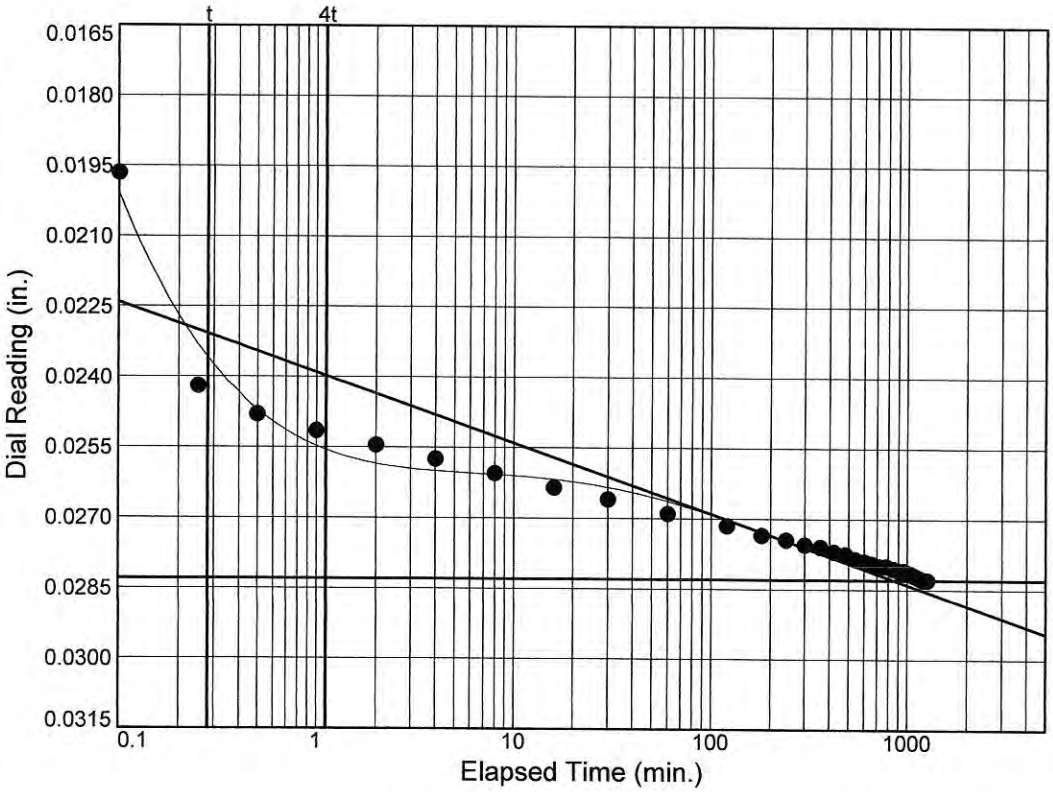
Source of Sample: SJGB047 Depth: 48



Load No.= 14
Load= 6.87 tsf
D_0 = 0.0215
D_{50} = 0.0220
D_{100} = 0.0225
T_{50} = 122.02 min.

C_v @ T_{50}
0.8 ft.^{2}/yr.

C_α = 0.000



Load No.= 15
Load= 13.75 tsf
D_0 = 0.0216
D_{50} = 0.0250
D_{100} = 0.0283
T_{50} = 0.60 min.

C_v @ T_{50}
157.4 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

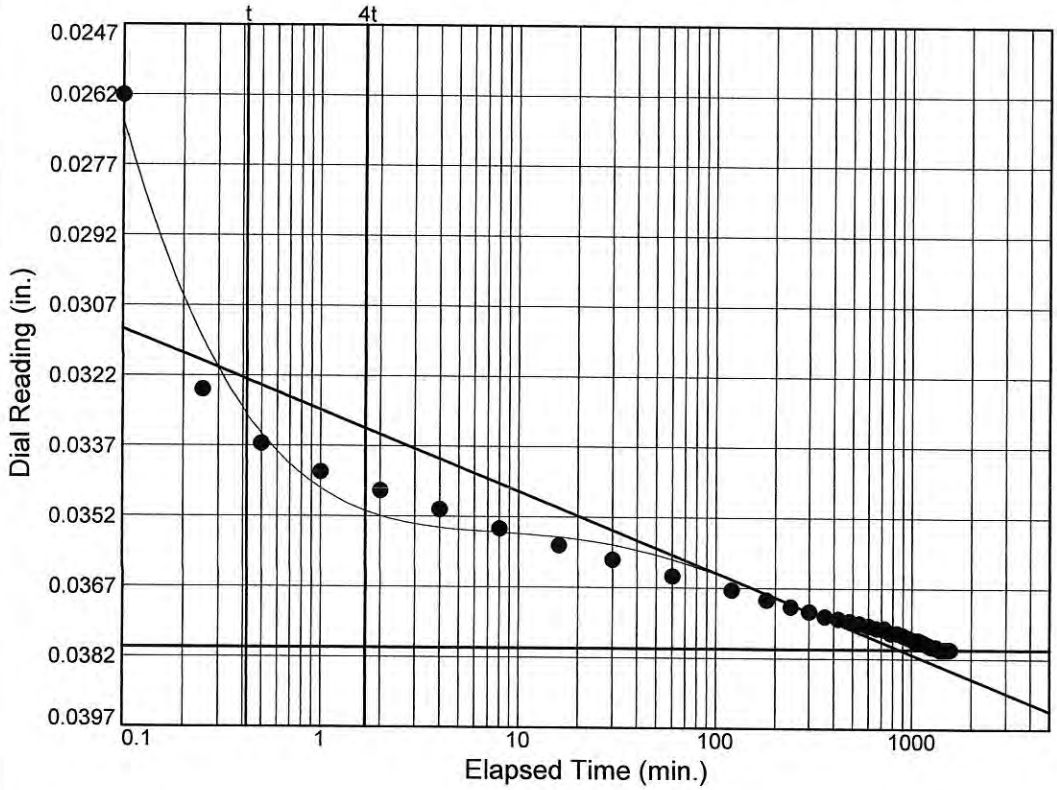
Figure

Attachment Figure B.2-212

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

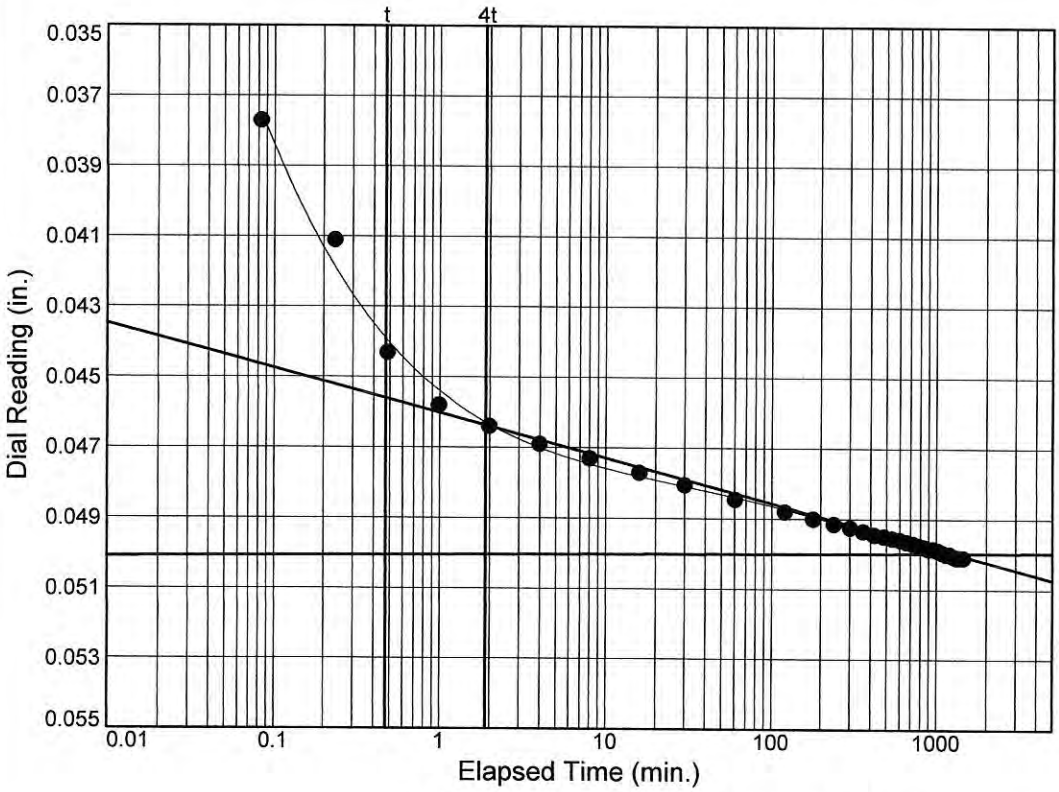
Source of Sample: SJGB047 Depth: 48



Load No.= 16
Load= 27.50 tsf
D_0 = 0.0310
D_{50} = 0.0345
D_{100} = 0.0380
T_{50} = 0.91 min.

C_v @ T_{50}
101.3 ft.^{2}/yr.

C_α = 0.000



Load No.= 17
Load= 54.99 tsf
D_0 = 0.0415
D_{50} = 0.0457
D_{100} = 0.0500
T_{50} = 1.24 min.

C_v @ T_{50}
71.9 ft.^{2}/yr.

TOLUNAY-WONG ENGINEERS, INC.

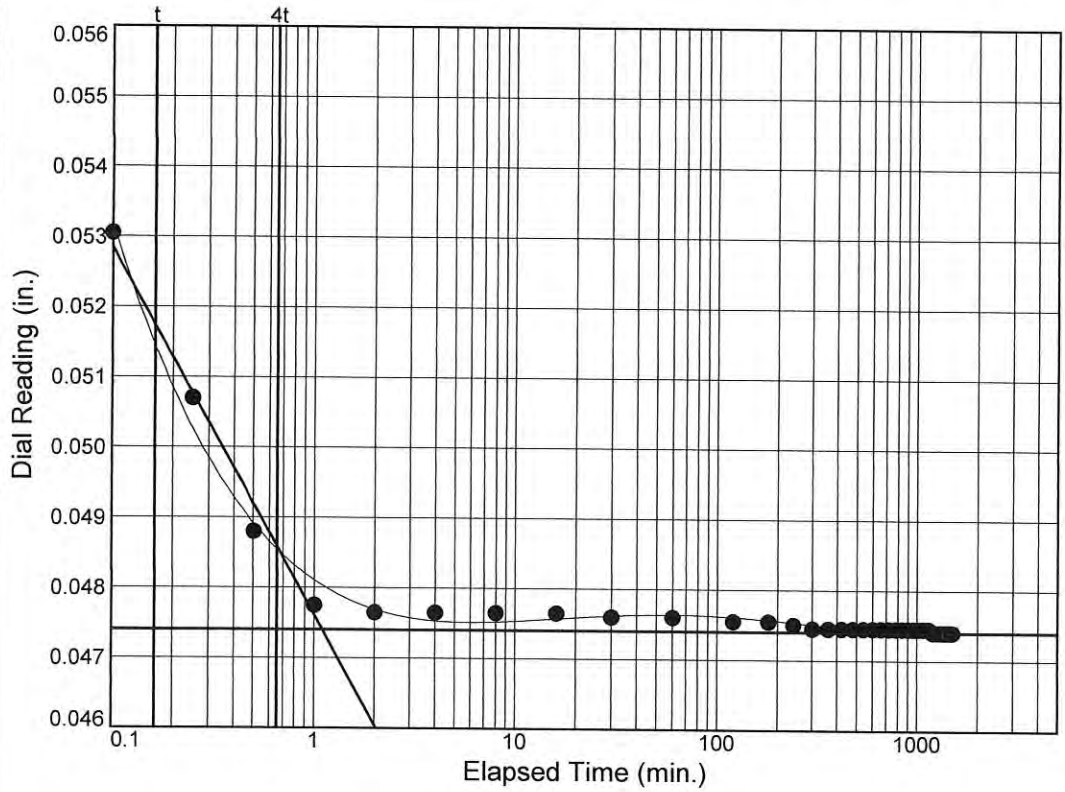
Figure

Attachment Figure B.2-213

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

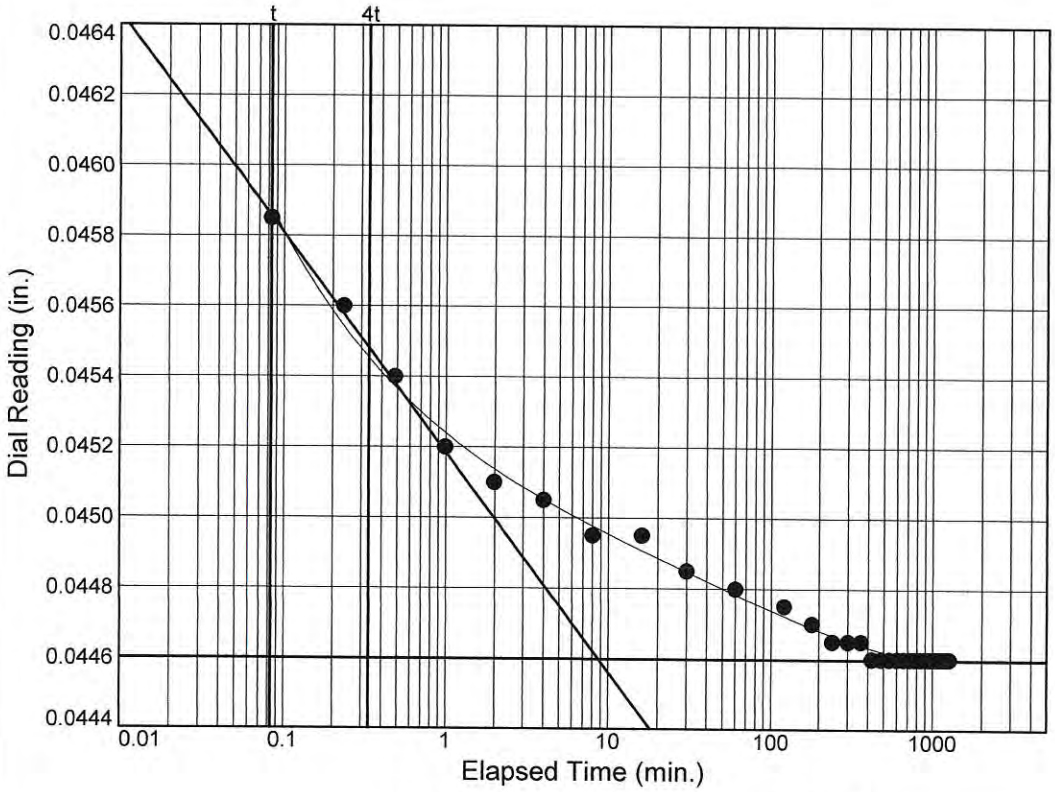
Source of Sample: SJGB047 Depth: 48



Load No.= 18
Load= 13.75 tsf
D_0 = 0.0543
D_{50} = 0.0509
D_{100} = 0.0474
T_{50} = 0.20 min.

C_v @ T_{50}
444.5 ft.^{2}/yr.

C_α = 0.000



Load No.= 19
Load= 3.49 tsf
D_0 = 0.0463
D_{50} = 0.0455
D_{100} = 0.0446
T_{50} = 0.34 min.

C_v @ T_{50}
265.7 ft.^{2}/yr.

TOLUNAY-WONG ENGINEERS, INC.

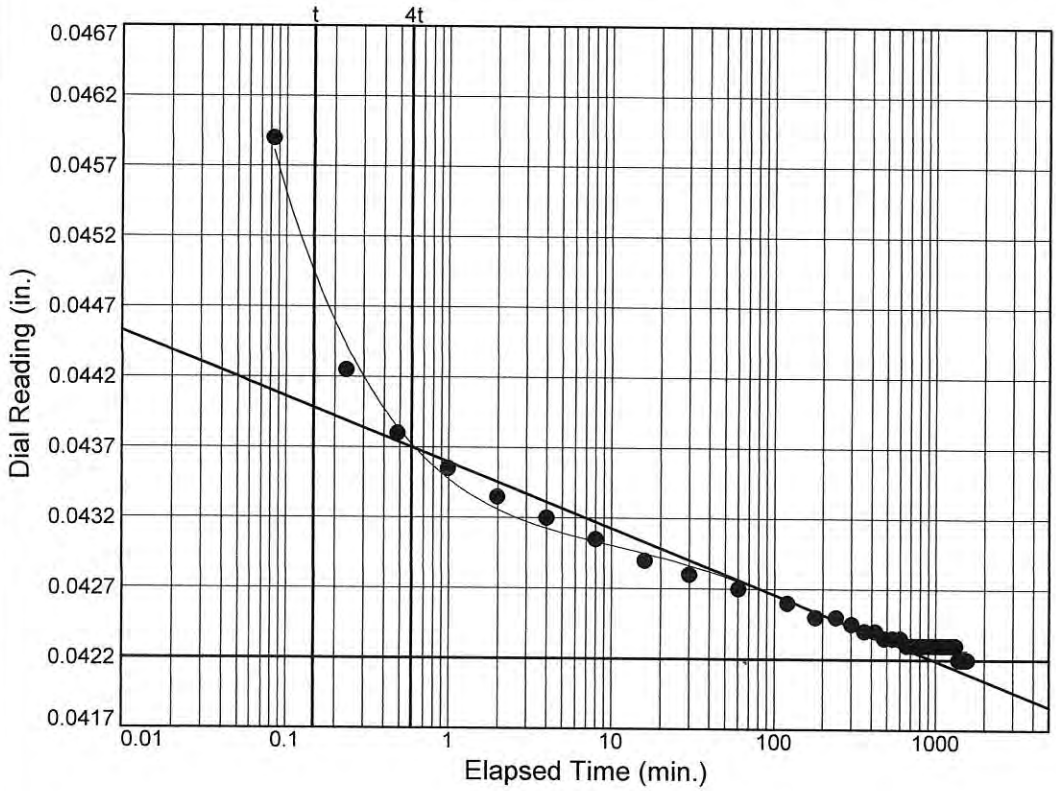
Figure

Attachment Figure B.2-214

Dial Reading vs. Time

Project No.: 19.15.131
Project: San Jacinto River Waste Pit Superfund Site

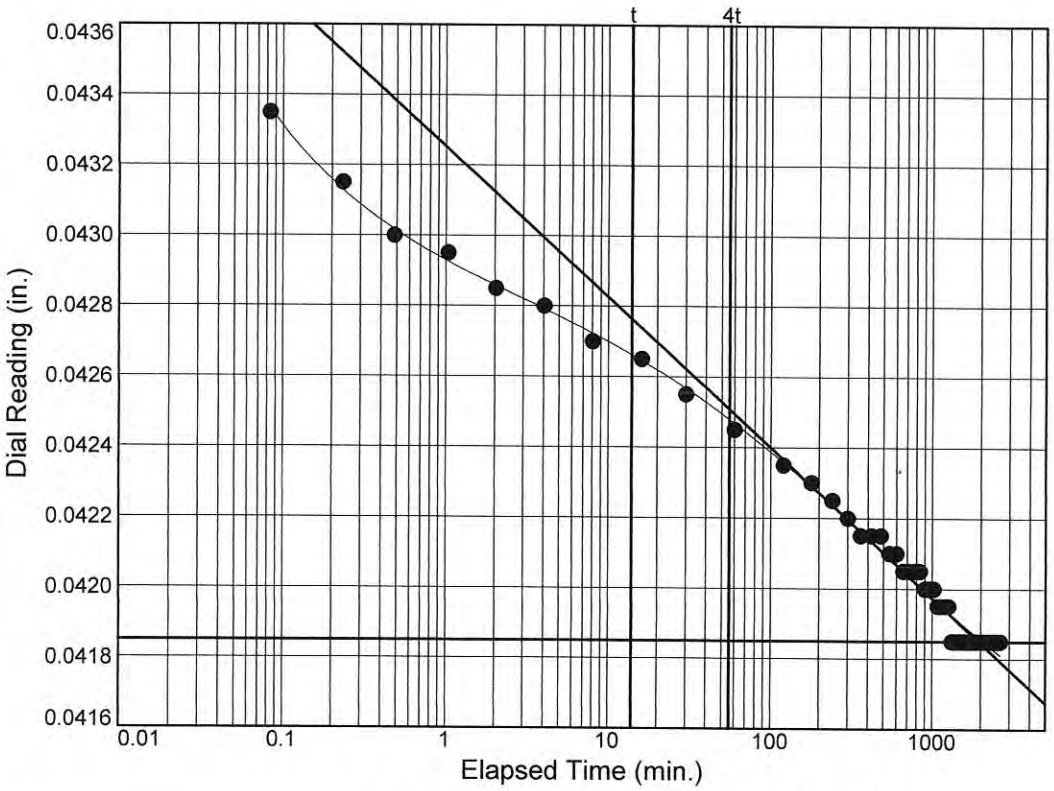
Source of Sample: SJGB047 Depth: 48



Load No.= 20
Load= 0.86 tsf
D_0 = 0.0462
D_{50} = 0.0442
D_{100} = 0.0422
T_{50} = 0.30 min.

C_v @ T_{50}
295.9 ft.^{2}/yr.

C_α = 0.000



Load No.= 21
Load= 0.43 tsf
D_0 = 0.0428
D_{50} = 0.0423
D_{100} = 0.0418
T_{50} = 126.68 min.

C_v @ T_{50}
0.7 ft.^{2}/yr.

C_α = 0.000

TOLUNAY-WONG ENGINEERS, INC.

Figure

Attachment Figure B.2-215

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJGB024

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/7/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 36.74"
Long. 95° 3' 44.65"
Ground Surface Elevation: 2.64 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒			No (P)	1.31 t=0.3	19	123					2.6		Medium Stiff to Stiff brown and black FAT CLAY (CH) w/ sand
			No (P)	0.91 t=1.0	28	114							
	5		No (P)	0.56 t=1.7	29	116	86	31	55		-2.4		
			No (P)		31		78	23	55	94			
			No (P)	0.21 t=3.1	29	115				43	-7.4		Loose gray and brown CLAYEY SAND (SC)
	10		No (P)	3.34 t=3.8	75	94	133	51	82	91			Very Stiff brown FAT CLAY (CH)
			No (P)	0.22 t=4.5	32	109				76			Very Soft black and brown LEAN CLAY (CL) w/ sand
	15		No (P)	0.44 t=5.2	27	116	32	19	13	44	-12.4		Loose gray and brown CLAYEY SAND (SC)
			No (P)	0.94 t=6.6	25	123				26			
	20										-17.4		Soft brown FAT CLAY (CH)
	25		No (P)	0.39 t=8.3	50	99				92	-22.4		
			No (P)	0.28 t=10.1	61	95	122	58	64				
	30										-27.4		Boring completed at 30 ft.
	35										-32.4		
	40										-37.4		
	45										-42.4		
	50										-47.4		

Ground Water Level Data
☒ Free Water not Reported

Boring Advancement Method
Hollowstem Auger
0 to 30 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-1

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJGB025

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/10/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 38.65"
Long. 95° 3' 48.91"
Ground Surface Elevation: 4.98 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒		X	27 b/f 30-18-9		14					25	5.0		Medium Dense gray and tan SILTY SAND (SM) w/ gravel
			No (P)	1.05 t=1.0	16	134	36	18	18	82			Stiff brown LEAN CLAY (CL) w/ sand
	5		No (P)	0.84 t=1.7	19	134	34	17	17		0.0		Medium Stiff gray LEAN CLAY (CL) w/ sand
			No (P)		20								
			No (P)		20	129	43	16	27	84			
	10		No (P)		21					47	-5.0		Loose gray CLAYEY SAND (SC)
			No (P)	1.68 t=4.5	19	136	33	17	16	56			Medium Stiff to Stiff brown SANDY LEAN CLAY (CLs)
	15		No (P)		24					62	-10.0		
		○											No Recovery
	20	X	34 b/f 6-14-20		22					22	-15.0		Dense gray SILTY SAND (SM)
		X	6 b/f 2-2-4		34					44			Loose gray SILTY SAND (SC)
	25	X	5 b/f 1-2-3		34		NP	NP	NP		-20.0		
		X	18 b/f 5-7-11		23					31			Medium Dense gray CLAYEY SAND (SC)
	30										-25.0		Boring completed at 29.5 ft.
	35										-30.0		
	40										-35.0		
	45										-40.0		
	50										-45.0		

Ground Water Level Data
☒ Free Water not Reported

Boring Advancement Method
Hollowstem Auger
0 to 30 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-2

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJGB026

Ardaman & Associates, Inc.

File: 18-2876
Date: 9/9/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 39.24"
Long. 95° 3' 49.86"
Ground Surface Elevation: 5.34 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒			No (P)		13		NP	NP	NP	81	5.3		Loose brown SILT (ML) w/ sand
			No (P)		21	129				98			Medium Stiff to Stiff tan and gray LEAN CLAY (CL)
	5		No (P)	1.42 t=1.7	19	125	41	18	23	84	0.3		
			No (P)	0.69 t=2.4	19	125				97			
			No (P)	0.87 t=3.1	21	126	35	17	18	83			w/ sand
	10		No (P)		23					50	-4.7		Loose gray CLAYEY SAND (SC)
			No (P)	1.72 t=4.5	21	132	NP	NP	NP	66			Stiff tan and gray SANDY SILT (MLs) w/ clay
	15										-9.7		No Recovery
													No Recovery
	20		6 b/f 4-3-3		26					55	-14.7		Loose gray and brown SANDY SILT (MLs)
													Boring completed at 21.5 ft.
	25										-19.7		
	30										-24.7		
	35										-29.7		
	40										-34.7		
	45										-39.7		
	50										-44.7		

Ground Water Level Data
☒ Free Water not Reported

Boring Advancement Method
Hollowstem Auger
0 to 22 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-3

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJGB027

Ardaman & Associates, Inc.

File: 18-2876
Date: 12/4/19
Logged by: Breanna North
Driller: TWE
Rig: CME Truck

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 41.34"
Long. 95° 3' 47.36"
Ground Surface Elevation: 3.92 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒					11						3.9		Loose tan SILTY GRAVEL (GM)
			0.50 (P)	0.17 t=2.0	140	78	151	44	107	81			Very Soft dark gray ORGANIC CLAY (OH) w/ sand
	5		1.75 (P)	0.18 t=3.5	23	128	41	21	20	44	-1.1		Loose gray CLAYEY SAND (SC)
			1.25 (P)	1.15 t=4.0	20	129	37	17	20	56			Medium Stiff dark gray SANDY LEAN CLAY (CLs)
			1.25 (P)	0.73 t=5.0	18	131	39	18	21				
	10				23	131	30	17	13	81	-6.1		
		☒	0 b/f		32		49	19	30	31			Very Loose dark gray CLAYEY SAND (SC)
	15	☒	0 b/f		27		24	16	8	27	-11.1		
	20	☒	4 b/f 0-2-2		28		NP	NP	NP	40	-16.1		Very Loose to Loose dark gray SILTY SAND (SM)
	25	☒	2 b/f 1-1-1		21		NP	NP	NP	8	-21.1		Very Loose gray Sand (SP-SM) w/ silt
	30	☒	9 b/f 2-3-6		22		26	16	10	11	-26.1		Loose gray SAND (SP-SC) w/ clay
	35	☒	9 b/f 3-4-5		16		32	17	15	36	-31.1		Loose gray CLAYEY SAND (SC)
	40		1.75 (P)		20	128	40	18	22	79	-36.1		Stiff reddish brown SANDY LEAN CLAY (CLs)
			2.50 (P)		41		49	19	30		-41.1		
	45												Stiff reddish brown FAT CLAY (CH)
			2.75 (P)	1.95 t=21.0	31	121	59	21	38		-46.1		Boring completed at 50 ft.
	50												
	55										-51.1		
	60										-56.1		
	65										-61.1		
	70										-66.1		
	75										-71.1		
	80										-76.1		

Ground Water Level Data
☒ No free water encountered

Boring Advancement Method
4" Nom. Dia. Short Flight Auger:
0 to 14 ft.
4" Dia. Rotary Wash:
14 to 50 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-4

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJSB047-G

Ardaman & Associates, Inc.

File: 18-2876
Date:
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 38.5"
Long. 95° 3' 41.9"
Ground Surface Elevation: -3.4 (ft., NAVD 88)

Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	PL	PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
										-3.4		
		0 b/f		31					97			Loose brown SILT (ML)
		0 b/f		37								
5		0 b/f		43					94	-8.4		
		0 b/f										Soft brown SANDY LEAN CLAY (CLs)
		0 b/f		30					70			
10		0 b/f		39		39	20	19	74	-13.4		
		0 b/f		64								Soft brown FAT CLAY (CH)
15		1 b/f 0-0-1		58					97	-18.4		
		0.25 (P)	0.29 t=6.6	38	99	79	24	55	56			Soft gray SANDY FAT CLAY (CHs)
20										-23.4		
		2.50 (P)	1.44 t=8.3	20	136	42	18	24	73			Stiff gray LEAN CLAY (CL) w/ sand
25										-28.4		
		1.75 (P)		16		27	21	6	60			Stiff reddish brown SANDY SILTY CLAY (CL-ML)
30										-33.4		
		3.25 (P)	1.00 t=11.8	29	124	59	39	20	98			Stiff reddish brown SILT (MH)
35										-38.4		
		3.00 (P)	1.73 t=13.5	31	126	74	34	40	100			Stiff reddish brown FAT CLAY (CH)
40										-43.4		
		1.50 (P)	3.36 t=15.3	19	138	42	18	24	84			Very Stiff reddish brown LEAN CLAY (CL)
45										-48.4		
		3.50 (P)		18		30	19	11	76			
50										-53.4		Medium Dense to Dense gray SILT (ML)
		14 b/f 8-8-6		20					93			
55										-58.4		
		33 b/f 12-16-17		23					92			
60										-63.4		Very Loose gray SILT (ML)
		2 b/f 3-1-1		27		NP	NP	NP	93			
65										-68.4		Medium Dense gray SILT (ML)
		29 b/f 4-8-21		26					98			
70										-73.4		Very Dense gray SILT (ML) w/ sand
		51 b/f 15-21-30		23					82			
75										-78.4		Very Dense gray SANDY SILT (MLs)
		75 b/f 25-31-44		22					68			
80										-83.4		Very Dense gray SILTY SAND (SM)
		50 b/f 17-23-27		19		NP	NP	NP	46			
85										-88.4		
		53 b/f 16-23-30		18					39			
90										-93.4		
		65 b/f 25-35-30		18		NP	NP	NP	26			
95										-98.4		Stiff tan and gray FAT CLAY (CH)
		2.00 (P)	0.33 t=35.0	21	119	73	23	50				
100										-103.4		Boring completed at 100 ft.
105										-108.4		

Ground Water Level Data

Boring Advancement Method

4" Dia. Rotary Wash:
to 100 ft.

Boring Abandonment Method

Not Reported

Notes

t = Lateral Confining Pressure (psi).

Attachment Figure B.3-5

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJSB050-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/20/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 41.36"
Long. 95° 3' 40.53"
Ground Surface Elevation: -3.6 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒			0 b/f		100					98	-3.6		Very Soft brown FAT CLAY (CH)
			0 b/f		82					41			Very Loose brown CLAYEY SAND (SC)
	5			0.30 t=1.7	29	109	32	16	16		-8.6		Very Soft to Soft brown LEAN CLAY (CL)
				0.08 t=2.4	33	113	34	17	17	43			Very Loose gray CLAYEY SAND (SC)
			0 b/f		56					86			Very Soft to Soft gray LEAN CLAY (CL)
	10		0 b/f		49		41	18	23	83	-13.6		
			1 b/f 0-0-1		47					70			Very Soft to Soft brown LEAN CLAY (CL) w/ sand
	15		10 b/f 3-5-5		23					52	-18.6		Loose gray SANDY SILTY (MLs)
			1 b/f 1-1-0		37					10			Very Loose gray SAND (SP-SM)
	20										-23.6		Boring completed at 19.5 ft.
	25										-28.6		
	30										-33.6		
	35										-38.6		
	40										-43.6		
	45										-48.6		
	50										-53.6		

Ground Water Level Data
☒ Free Water not Reported

Boring Advancement Method
4" Dia. Rotary Wash:
to 19.5 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-6

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJSB053-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/19/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 43.62"
Long. 95° 3' 42.93"
Ground Surface Elevation: -9.7 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒		☒	0 b/f		31					41	-9.7		Very Loose brown CLAYEY SAND (SC)
		☒	0 b/f		57								
	5	☒	0 b/f		66						-14.7		Very Soft brown SANDY FAT CLAY (CHs)
		☒	0 b/f		61		55	22	33	60			
		☒	12 b/f 2-6-6		44		36	20	16				
	10	☒	0 b/f 1-0-0		42						-19.7		Medium Dense gray SANDY LEAN CLAY (CLs)
		☒	1 b/f 0-0-1		71					78			Very Soft to Soft brown and gray SANDY LEAN CLAY (CLs)
	15	☒	1 b/f 0-0-1		31					47	-24.7		Very Loose brown and gray CLAYEY SAND (SC)
	20	■	3.50 (P)	3.27 t=6.6	17	136	45	22	23		-29.7		Very Stiff gray LEAN CLAY (CL) w/ sand
	25	■	3.50 (P)	3.32 t=8.3	17	136	46	21	25		-34.7		Very Stiff tan LEAN CLAY (CL) w/ sand
	30	■	2.50 (P)		16						-39.7		
	35	■	3.50 (P)	1.43 t=11.8	28	123	70	37	33		-44.7		Medium Dense reddish brown SILT (MH)
	40	■	3.50 (P)		24		69	24	45	100	-49.7		Medium Stiff reddish brown FAT CLAY (CH)
	45	■	2.00 (P)	1.87 t=15.3	27	123	71	35	36		-54.7		Medium Dense gray SILT (MH)
	50	■	1.50 (P)	1.87 t=16.9	21	129	47	21	26		-59.7		Stiff gray LEAN CLAY (CL)
	55	■	2.00 (P)		18						-64.7		
	60	☒	18 b/f 10-11-7		24					42	-69.7		Medium Dense tan CLAYEY SAND (SC)
	65	☒	65 b/f 19-18-47		24					34	-74.7		Very Dense tan CLAYEY SAND (SC)
	70	☒	67 b/f 19-28-39		21					15	-79.7		
	75	☒	27 b/f 10-11-16		24					47	-84.7		Medium Dense to Very Dense gray CLAYEY SAND (SC)
	80	☒	80 b/f 12-30-50		18					43	-89.7		
	85	☒	26 b/f 8-12-14		18					35	-94.7		
	90	☒	15 b/f 10-7-8		25		64	24	40	62	-99.7		Stiff to Very Stiff gray SANDY FAT CLAY (CHs)
	95	■	2.00 (P)	3.33 t=32.6	112	88	144	78	66	90	-104.7		Medium Dense brown and black SILT (MH) w/ wood & organics
	100	■	2.50 (P)	2.59 t=34.4	24	126	71	23	48		-109.7		Very Stiff gray FAT CLAY (CH)
													Boring completed at 100 ft.
	105										-114.7		

Ground Water Level Data

☒ Boring performed from barge in open water

Boring Advancement Method

4" Dia. Rotary Wash:
to 100 ft.

Boring Abandonment Method

Not Reported

Notes

t = Lateral Confining Pressure (psi).

- 93-95' Organic Content = 29.2%

Attachment Figure B.3-7

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJSB057-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 11/8/19
Logged by: Stephen Saller
Driller: TWE
Rig: CME Truck on Barge

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 45.29"
Long. 95° 3' 46.74"
Ground Surface Elevation: -17.1 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒		☒	0 b/f		109		102	64	38	46	-17.1		Very Loose dark brown CLAYEY SAND (SC)
		☒	2 b/f 2-1-1		94		51	24	27	28			
	5	☒	1 b/f 0-0-1		60					18	-22.1		Very Loose brown CLAYEY SAND (SC)
		☒	2 b/f 1-1-1		37		66	21	45	19			
		☒	1 b/f 0-0-1		89								
	10	☒	10 b/f 3-4-6		23					49	-27.1		Very Loose gray CLAYEY SAND (SC) w/ shell fragments
		■	0.50 (P)	2.29 t=3.8	20	134	66	23	43	85			
	15	■	1.25 (P)		12	122					-32.1		Medium Dense gray SILTY SAND (SM) w/ gravel
		■	3.00 (P)	2.27 t=6.6	19	134	45	16	29	68			
	20										-37.1		Very Stiff gray and brown FAT CLAY (CH) w/ sand
		■	2.50 (P)		18	135							
	25										-42.1		Very Stiff tan SANDY LEAN CLAY (CLs)
		■	3.50 (P)		28								
	30										-47.1		Very Stiff reddish brown FAT CLAY (CH)
		■	3.00 (P)	2.31 t=10.8	27	125	65	22	43	100			
	35										-52.1		
		■	3.00 (P)		26	127							
	40										-57.1		
		■	2.50 (P)	3.70 t=13.6	21	127	56	19	37	98			Stiff to Very Stiff gray FAT CLAY (CH)
	45										-62.1		
		■	1.50 (P)	1.67 t=15.0	36	125	52	19	33	98			
	50										-67.1		
		■	1.50 (P)		27								
	55										-72.1		
		■	1.00 (P)	1.49 t=20.5	24	132	52	20	32	84			w/ sand
	60										-77.1		
		☒	77 b/f 14-21-56		19					25			
	65										-82.1		Very Dense brown and gray SILTY SAND (SM)
		☒	65 b/f 15-21-44		23					35			Very Dense brown and gray CLAYEY SAND (SC)
	70										-87.1		
		☒	13 b/f 4-6-7		22		23	18	5	65			Stiff gray SANDY SILTY CLAY (CL-ML)
	75										-92.1		
		☒	97 b/f 15-55-42		20					54			Very Stiff to Hard gray SANDY LEAN CLAY (CLs)
	80										-97.1		
		☒	88 b/f 15-33-55		20					71			
	85										-102.1		
		☒	26 b/f 4-11-15		95		169	92	77	44			Dense gray CLAYEY SAND (SC)
	90										-107.1		
		■	1.50 (P)	1.67 t=32.6	26	126	41	18	23	98			Stiff gray LEAN CLAY (CL)
	95										-112.1		
		■	No (P)		22					99			
	100										-117.1		Boring completed at 100 ft.
	105										-122.1		

Ground Water Level Data

☒ Boring performed from barge in open water

Boring Advancement Method

4" Dia. Rotary Wash:
to 100 ft.

Boring Abandonment Method

Not Reported

Notes

t = Lateral Confining Pressure (psi).

Attachment Figure B.3-8

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

San Jacinto Waste Pits
San Jacinto, TX

LOG OF SOIL BORING SJSB058-G

Ardaman & Associates, Inc.

File: 18-2876
Date: 10/13/19
Logged by: Breanna North
Driller: TWE
Rig: Tracked Geoprobe

GHD Services, Inc.
5551 Corporate Blvd. Suite 200
Baton Rouge, LA 70808

Sheet 1 of 1

Location: Lat. 29° 47' 42.79"
Long. 95° 3' 48.02"
Ground Surface Elevation: 0.62 (ft., NAVD 88)

Ground Water Level	Depth (feet)	Samples	Field Test Results	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (ft.)	Soil Type	Description
☒			No (P)		15						0.6		Loose brown and tan SILTY SAND (SM)
			No (P)		66		30	16	14	53			Soft gray SANDY LEAN CLAY (CLs)
	5		No (P)	0.92 t=1.6	26	112				97	-4.4		Medium Stiff to Stiff gray LEAN CLAY (CL)
			No (P)	1.21 t=2.6	35	117	42	18	24	96			
			No (P)	0.85 t=3.1	31	115				96			
	10		No (P)		33		44	17	27	93	-9.4		
			7 b/f 1-1-6		24		NP	NP	NP	42			Very Loose to Loose gray SILTY SAND (SM)
	15		3 b/f 1-1-2		24		NP	NP	NP	43	-14.4		
			47 b/f 6-17-30		20					44			Dense gray SILTY SAND (SM)
	20										-19.4		Boring completed at 20 ft.
	25										-24.4		
	30										-29.4		
	35										-34.4		
	40										-39.4		

Ground Water Level Data
☒ Free Water not Reported

Boring Advancement Method
Hollowstem Auger
0 to 20 ft.

Boring Abandonment Method
Not Reported

Notes
t = Lateral Confining Pressure (psi).

Attachment Figure B.3-9

Strata Boundaries May Not Be Exact

19-2853 18-2876.GPJ LOG01.GDT 5/27/20

Attachment C. CALCULATION PACKAGE

This Attachment contains the following:
(Digital Copies Only)

C.1 Cell #1 Retaining Wall Analyses

C.2 Cell #2 Retaining Wall Analyses

C.3 Cell #3 Retaining Wall Analyses

C.4 Cell #4 Retaining Wall Analyses

C.5 Cell #5 Retaining Wall Analyses

C.6 WEAP Results (SJGB053)

C.7 WEAP Results (SJGB057)

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 0+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -92.91 ft., NAVD88

Length of Sheetting = 101.91 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-48.27	598.31	96.35	2.98
		Open excavation - degraded	9	-8	1.00	1.25	-51.04	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-45.90	495.96	88.49	2.27
		Open excavation - degraded	9	-4	1.00	1.25	-48.27	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-44.33	386.27	76.43	1.59
		Open excavation - degraded	5	-8	1.00	1.50	-48.67	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-41.95	293.47	67.06	1.09
		Open excavation - degraded	5	-4	1.00	1.50	-45.51	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-84.53	1,321.17	139.52	19.61
		Open excavation - degraded	9	-8	1.00	1.25	-92.91	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-78.08	989.14	101.22	12.70
		Open excavation - degraded	9	-4	1.00	1.25	-86.46	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-75.50	809.50	89.30	9.54
		Open excavation - degraded	5	-8	1.00	1.50	-91.62	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-68.40	544.40	67.97	5.34
		Open excavation - degraded	5	-4	1.00	1.50	-82.59	--	--	--
						Governing Value:	-92.91	1,321.17	139.52	19.61

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:09:50 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SP (GS to	115	115	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	30	0	N/A	N/A	N/A	60	3	0.33	3	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	0	0	2290	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-34 T	134	134	0	0	2290	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-44 to	126	126	0	0	2290	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-57 to	127	127	0	0	1650	0	0	626.3	3	1	1	1	1	True	Linear	
07- SP (-80 to	122	122	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	0	0	1200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-94 to	120	120	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- SP (-103 t	120	120	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	0	0	1670	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SP (GS to	0.4	-	-	0.5	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.5	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	0	0	1	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.5	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

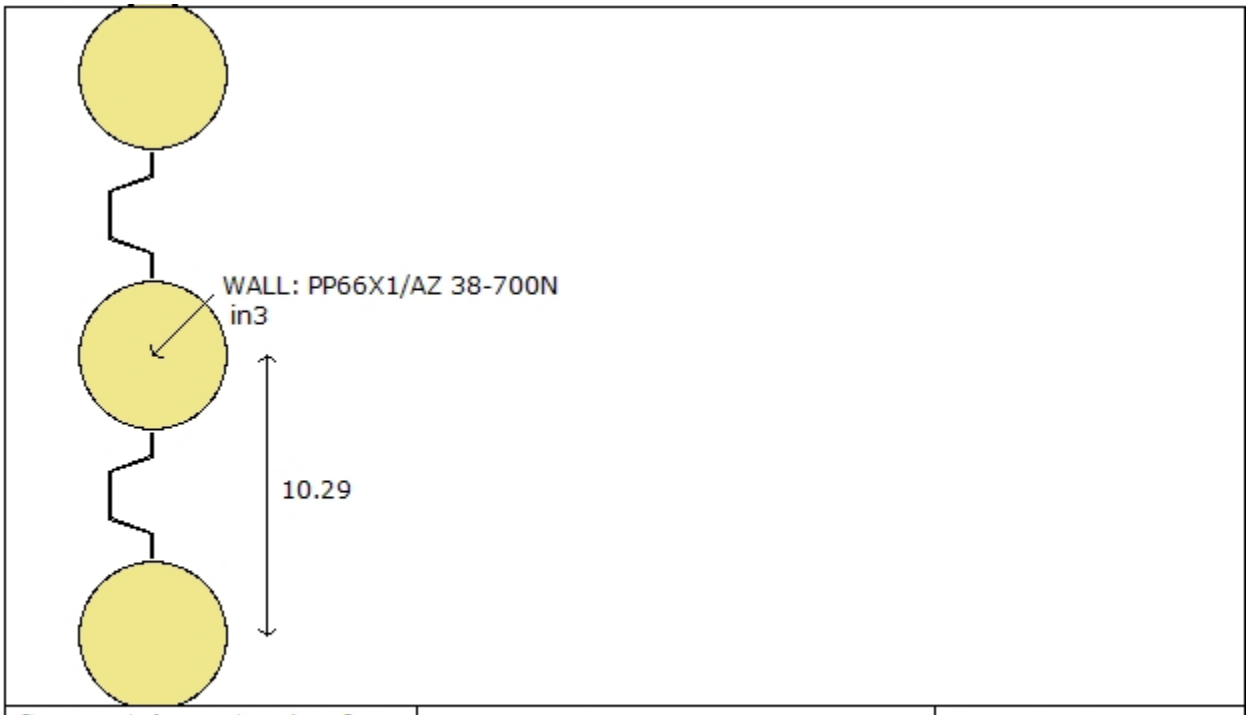
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
-17	01- SP (GS to -	1	0.5
-27	02- SP (-27 TO	1	0.5
-30	03- CH (-30 to	1	1
-34	04- CH (-34 TO	1	1
-44	05- CH (-44 to	1	0.45
-57	06- CH (-57 to	1	1
-80	07- SP (-80 to -	1	0.5
-89	08- CH (-89 to	1	1
-94	09- CH (-94 to	1	1
-103	10- SP (-103 to	1	0.5
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.072	2.153	2.924
Stage 1	Simple span	N/A	1.6	1.767	1.767	2.364
Stage 2	Simple span	N/A	1.6	2.313	2.313	3.059
Stage 3	Simple span	N/A	1.6	1.915	1.915	2.483
Stage 4	Simple span	N/A	1.6	2.572	2.69	3.389
Stage 5	Simple span	N/A	1.6	1.886	1.886	2.309
Stage 6	Simple span	N/A	1.6	2.89	2.89	3.547
Stage 7	Simple span	N/A	1.6	2.06	2.06	2.433

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

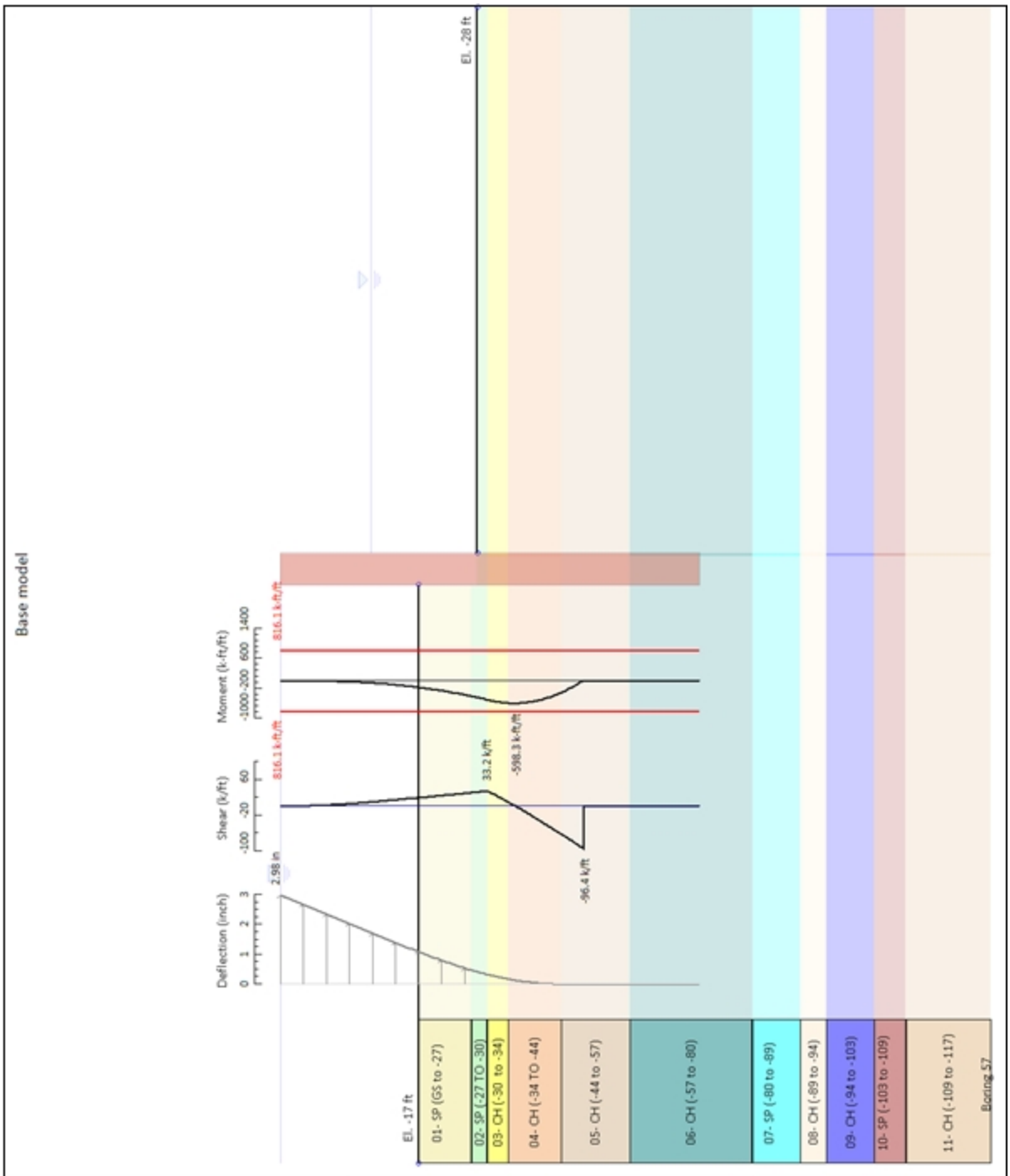
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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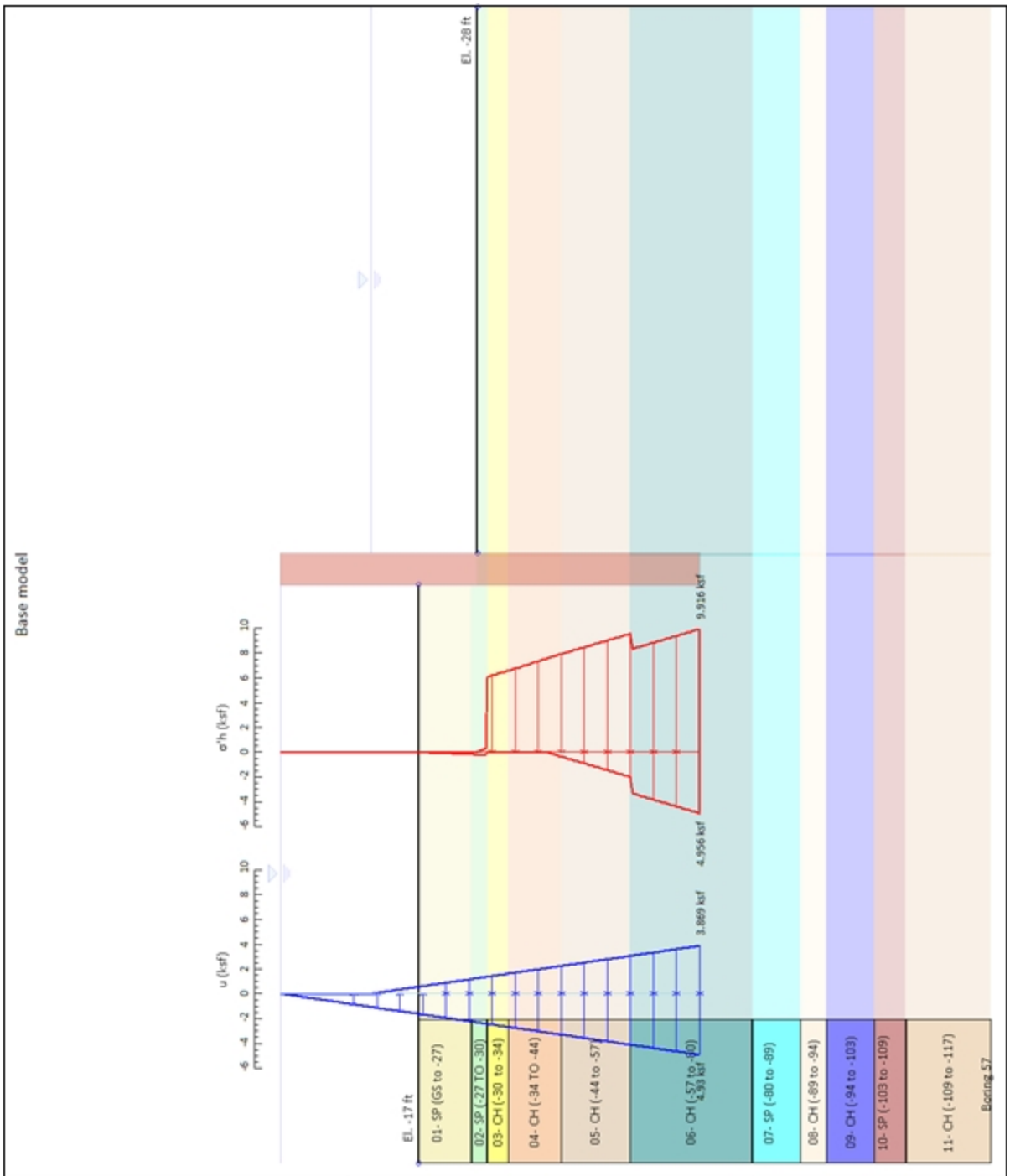

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS=1.0	Deep Excavation LCC DeepEX 2019
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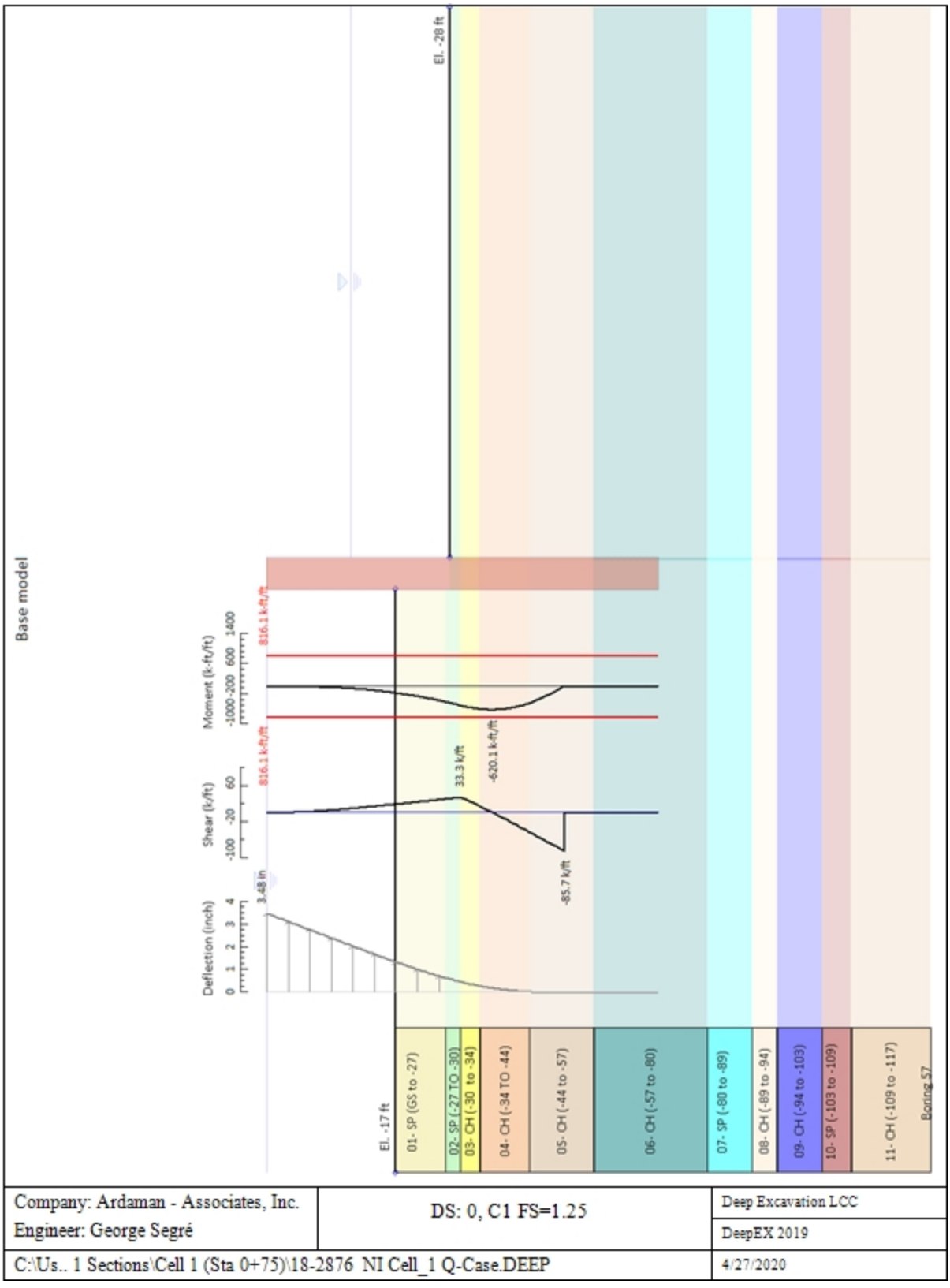

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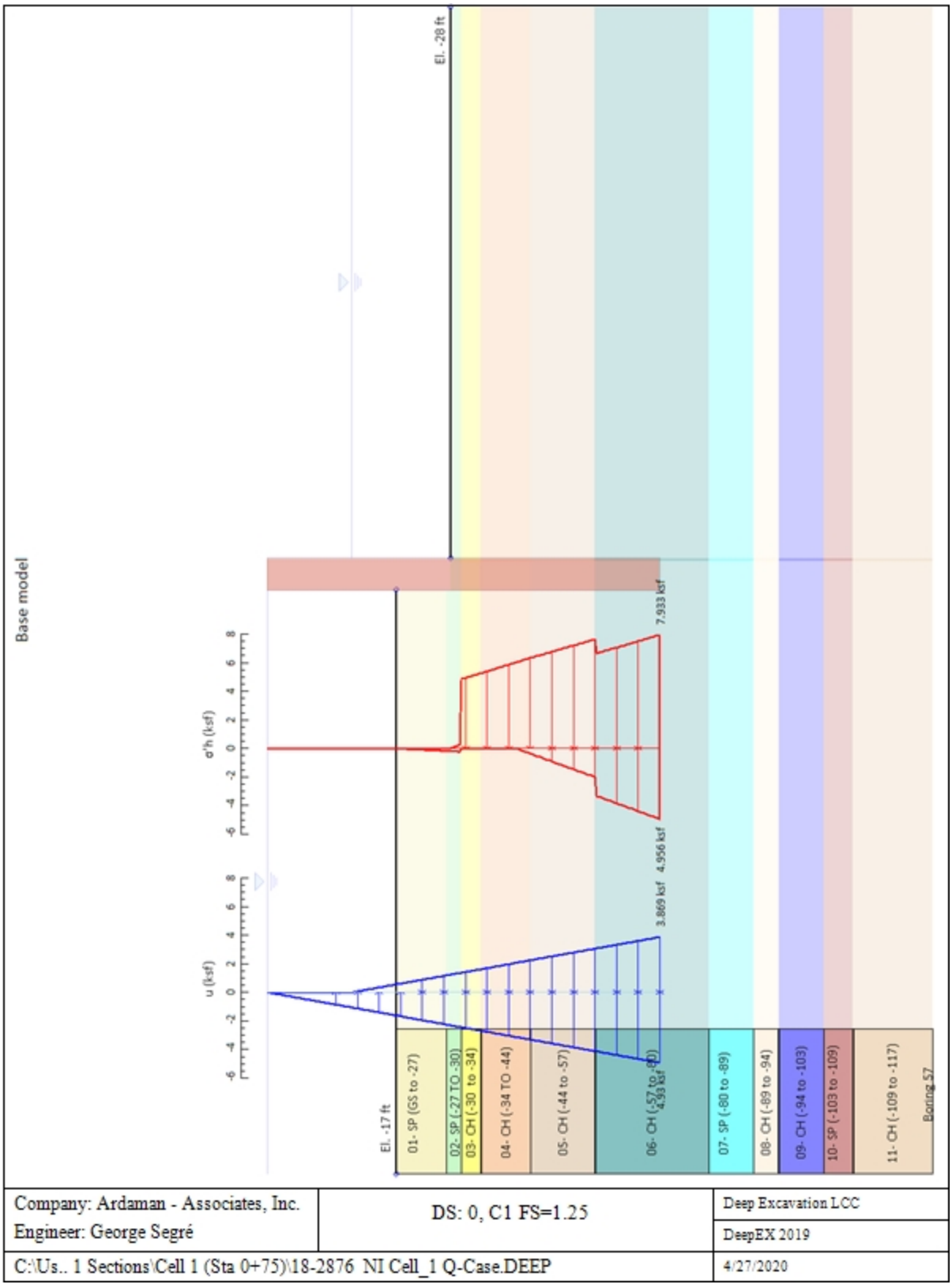
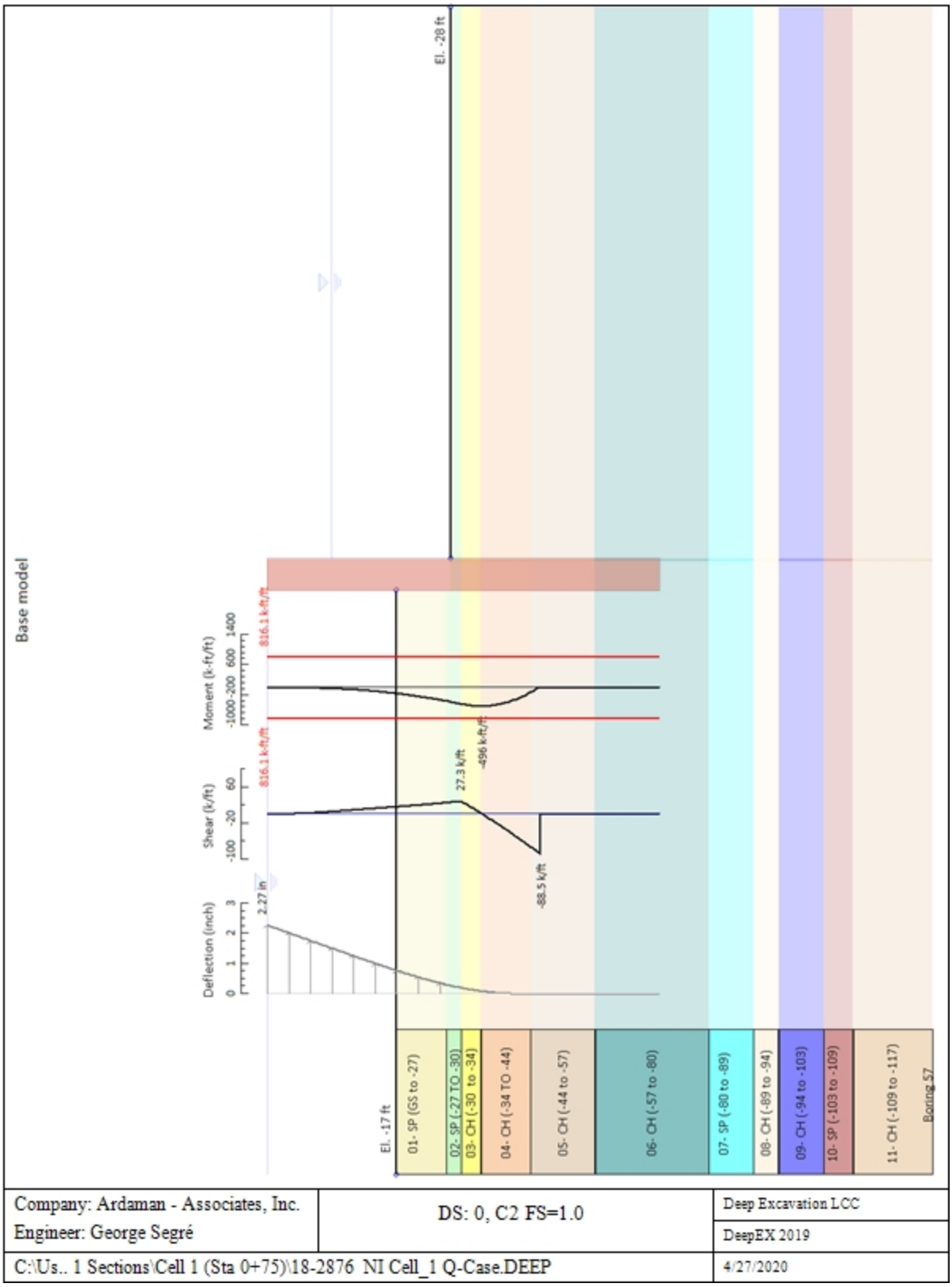

Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
7.933 ksf
4.956 ksf
3.869 ksf
4.93 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS=1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



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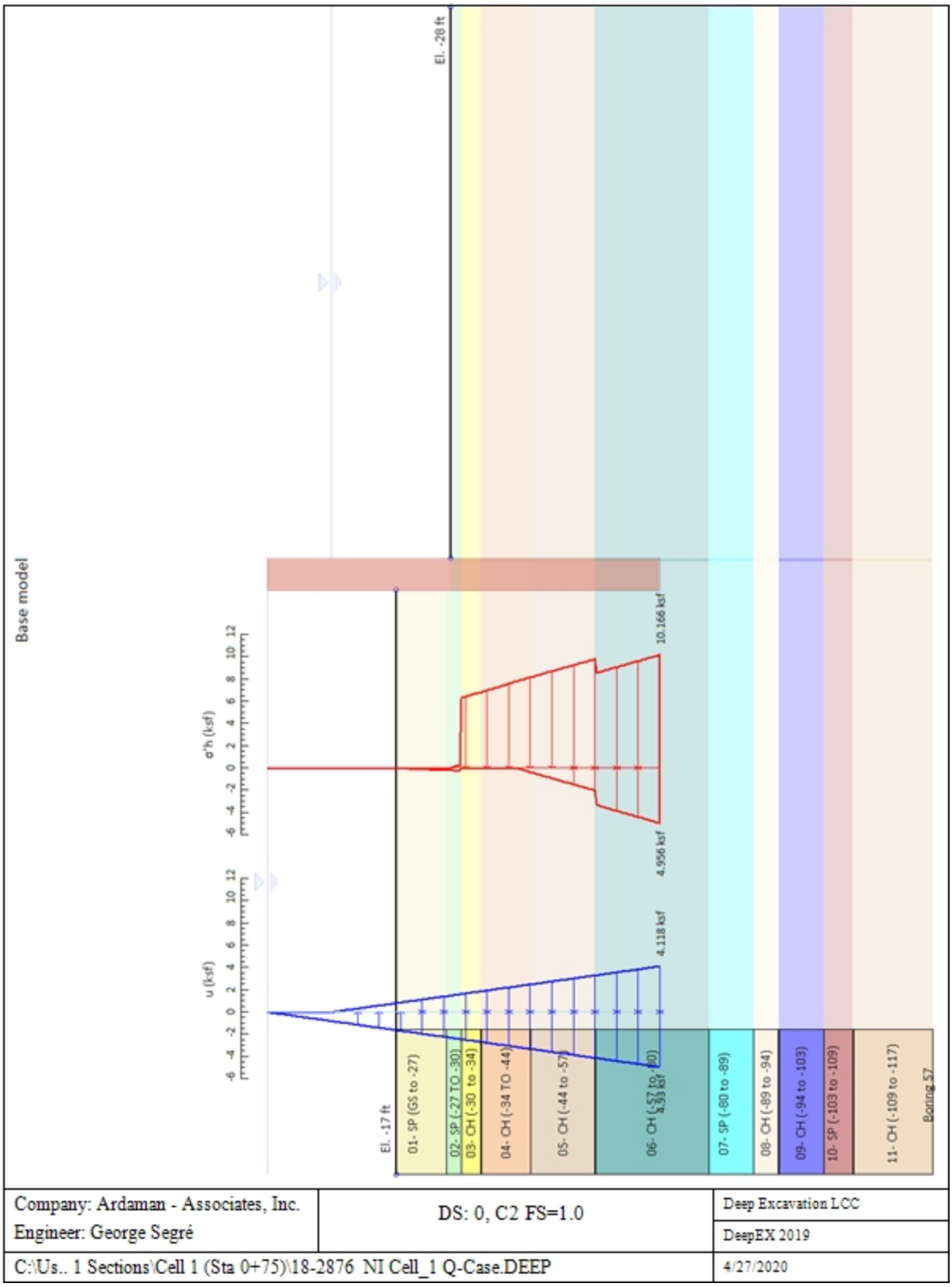
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El. -17 ft
σ'h (ksf)
u (ksf)
10.166 ksf
4.956 ksf
4.118 ksf
4.193 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS=1.0
Deep Excavation LCC
DeepEX 2019
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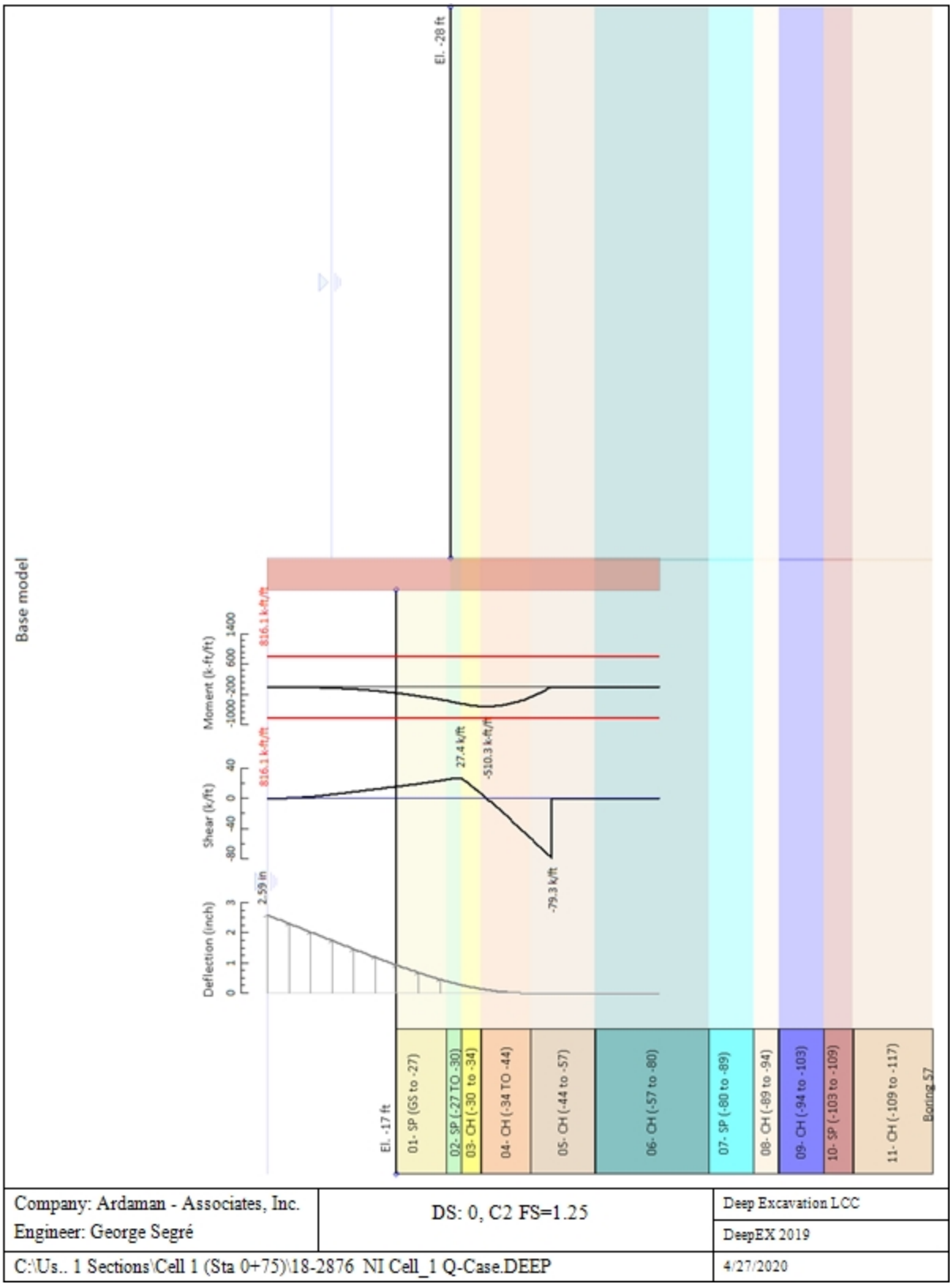
4/27/2020



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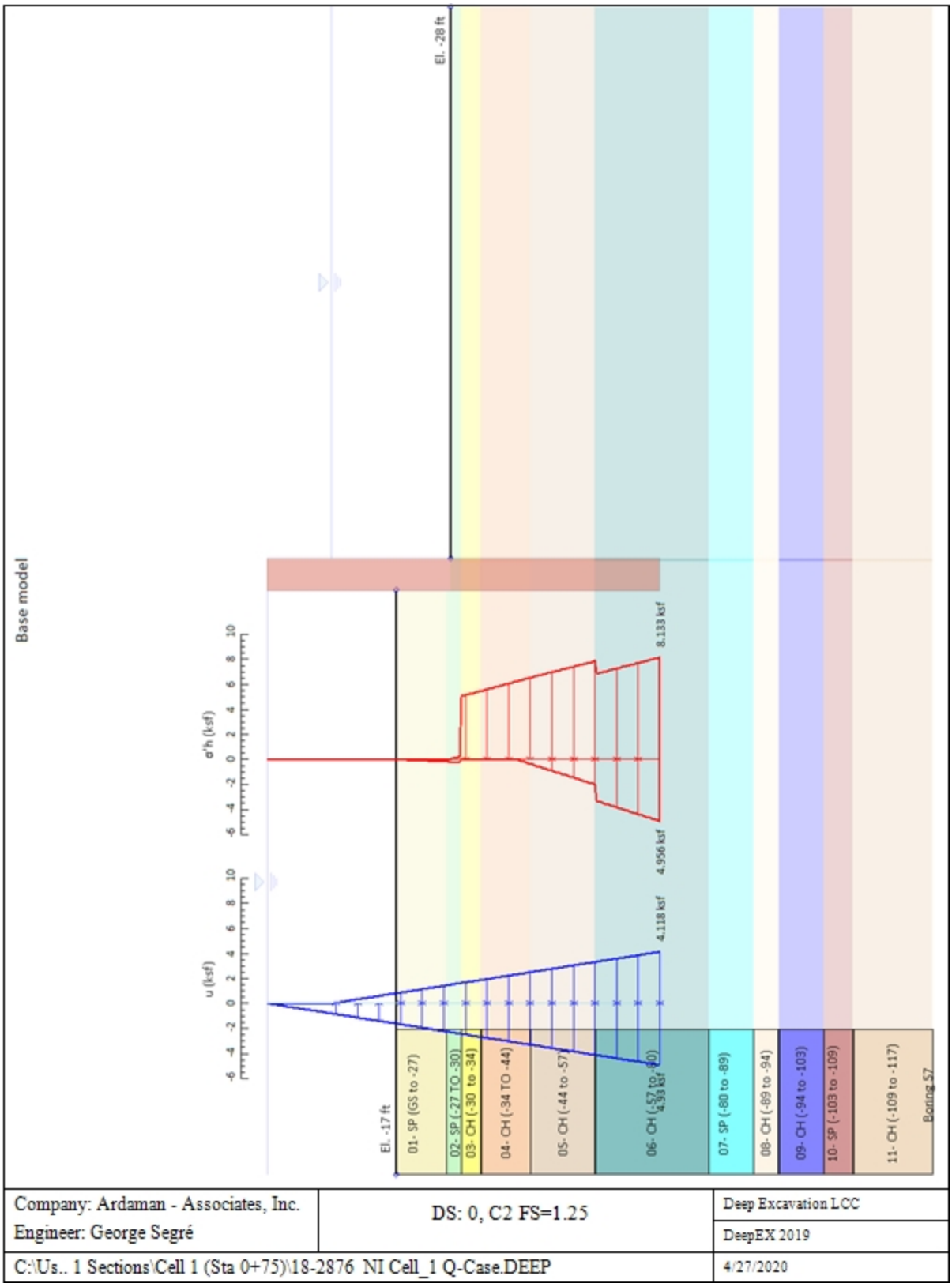
Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
8.133 ksf
4.956 ksf
4.118 ksf
4.93 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS=1.25
Deep Excavation LCC
DeepEX 2019
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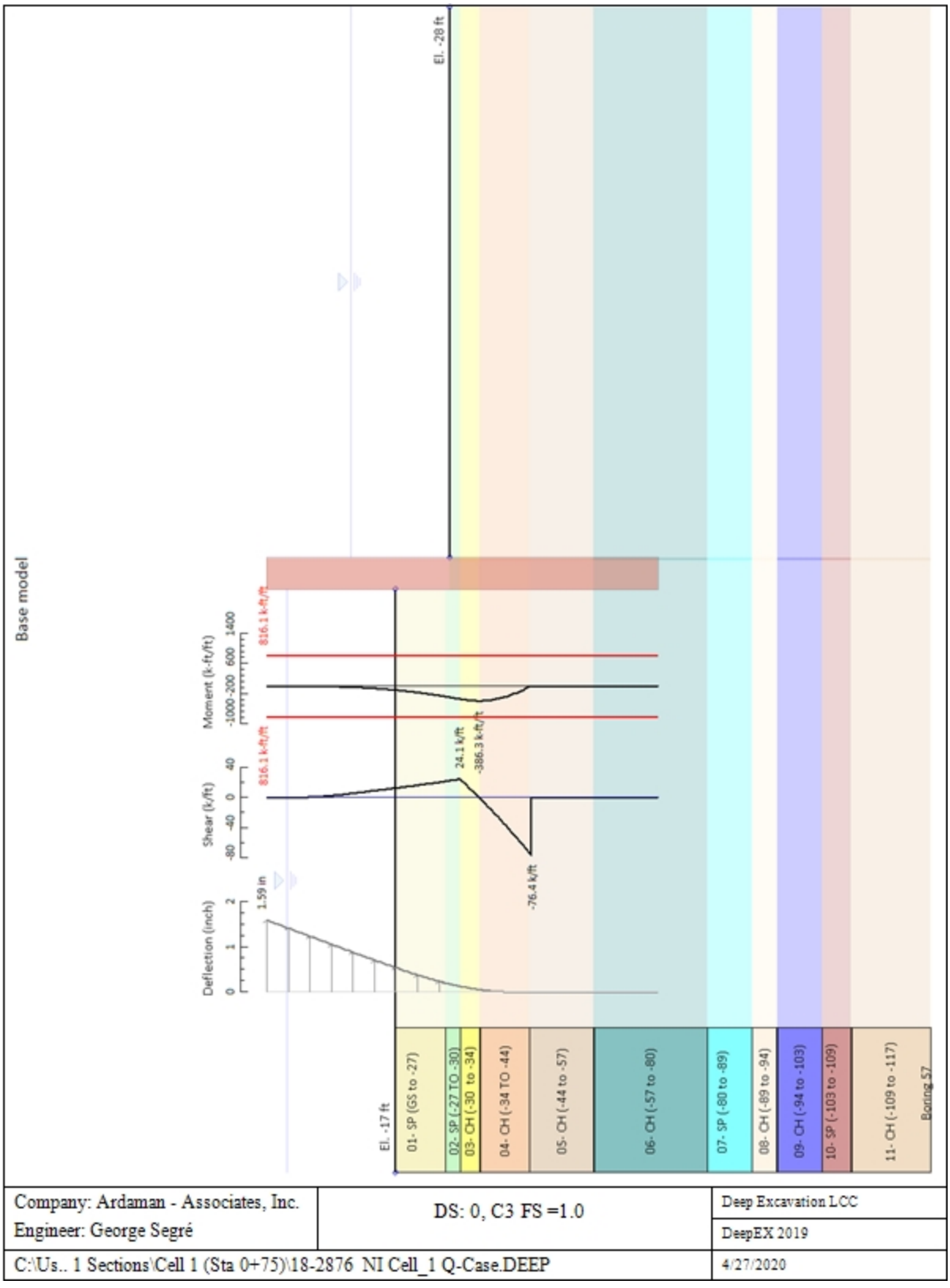
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS =1.0	Deep Excavation LCC DeepEX 2019
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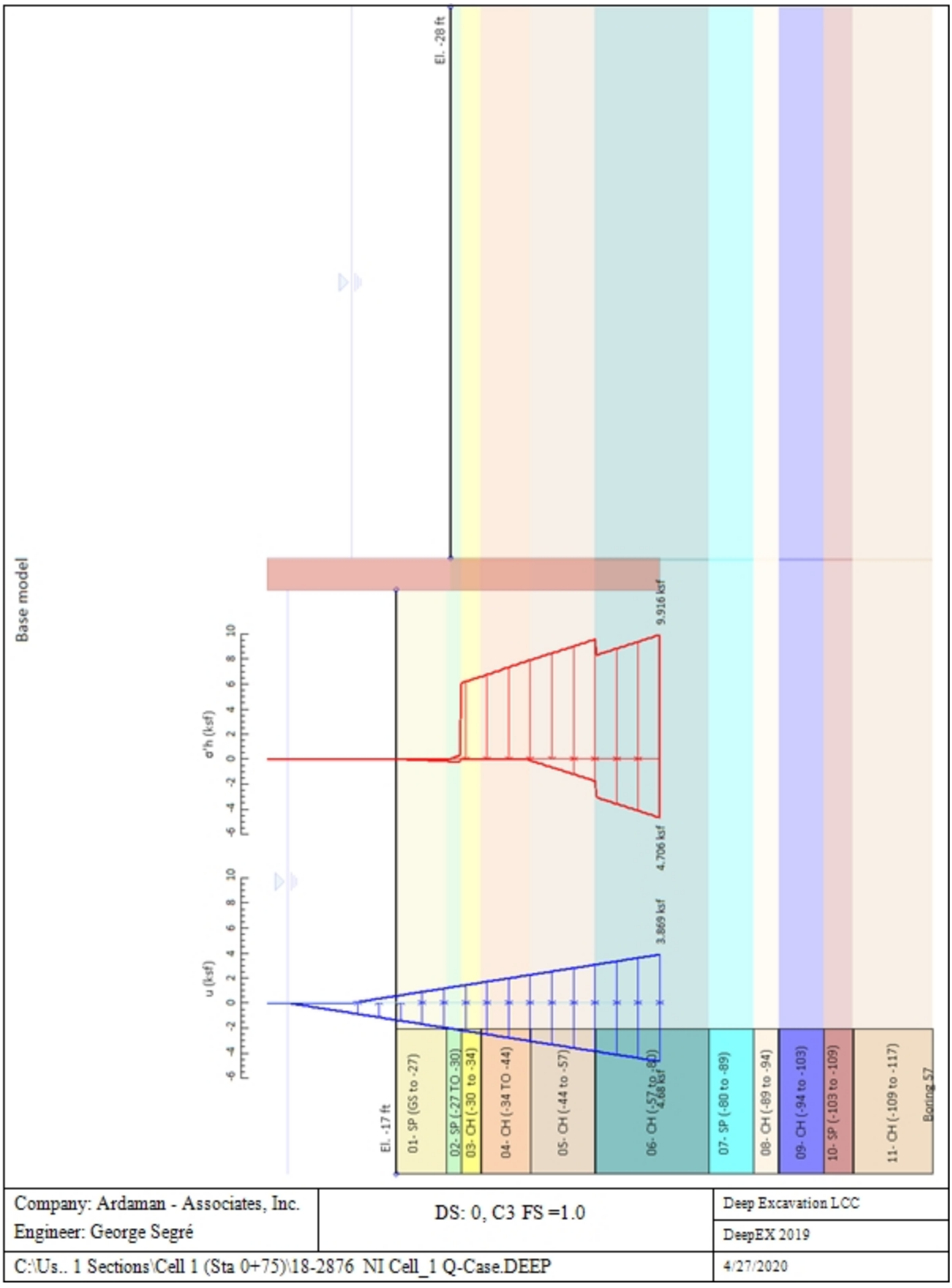
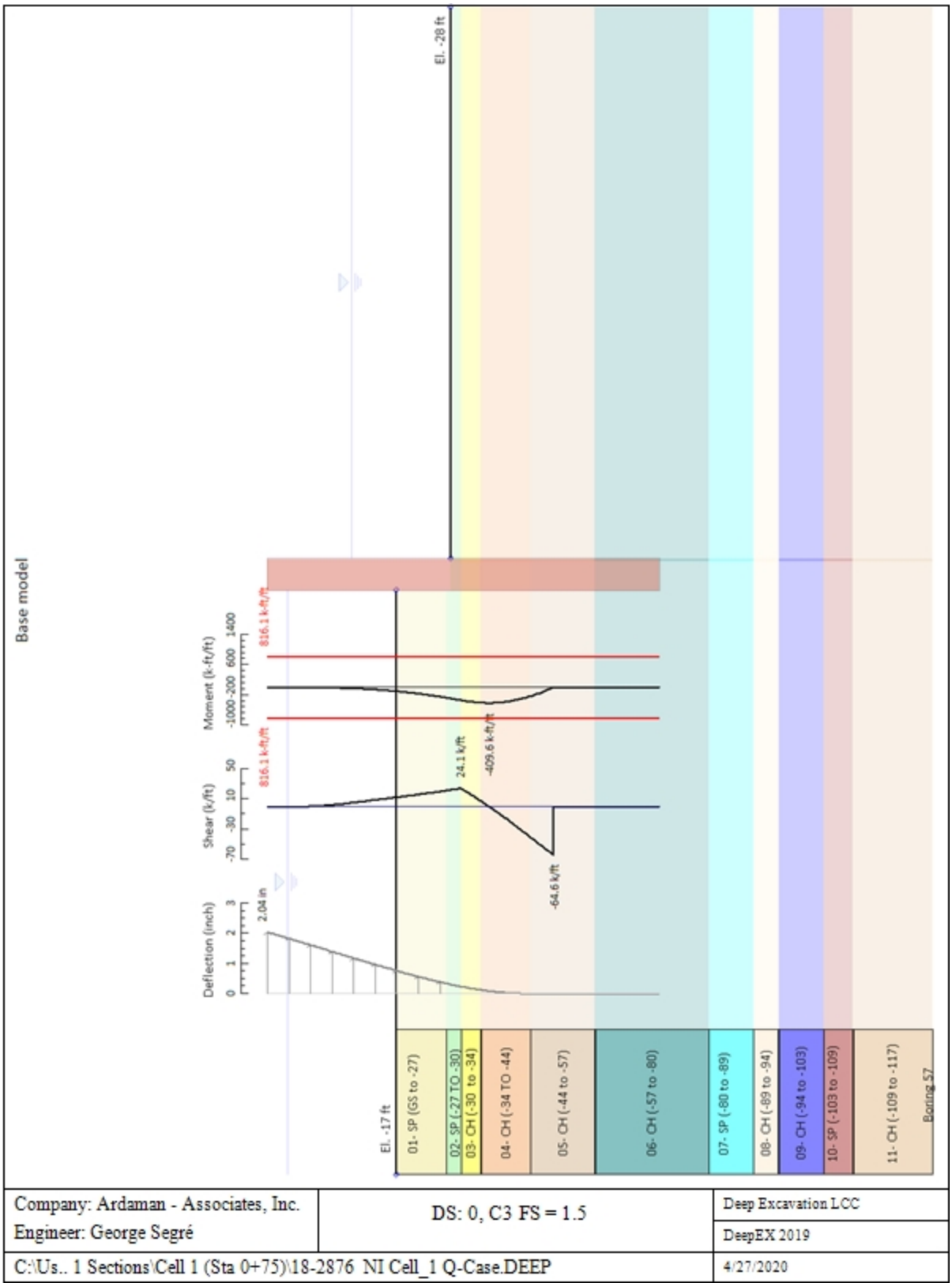

Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
9.916 ksf
4.706 ksf
3.869 ksf
4.88 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS =1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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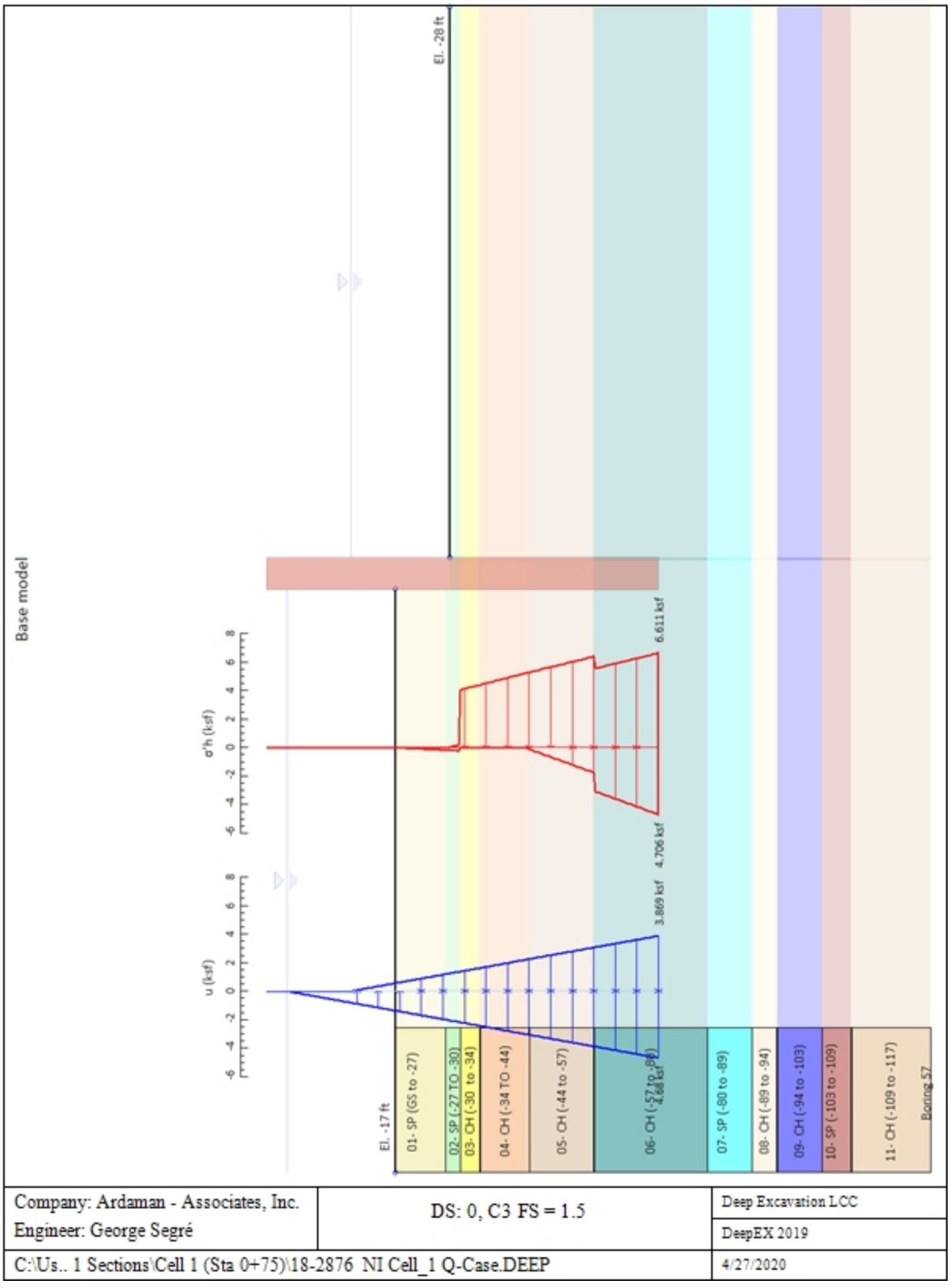
Base model
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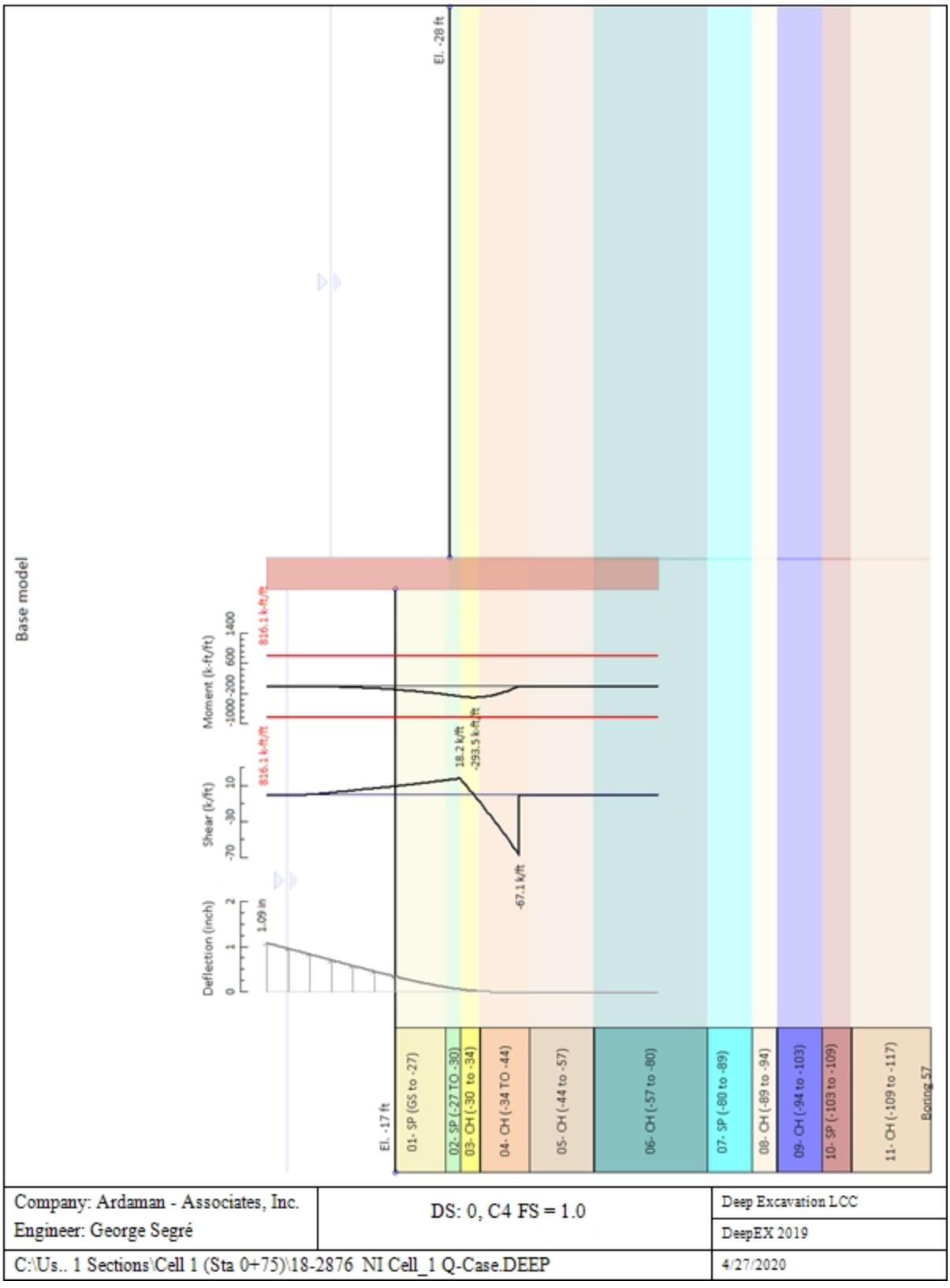
El. -17 ft
σ'h (ksf)
u (ksf)
6.611 ksf
4.706 ksf
3.869 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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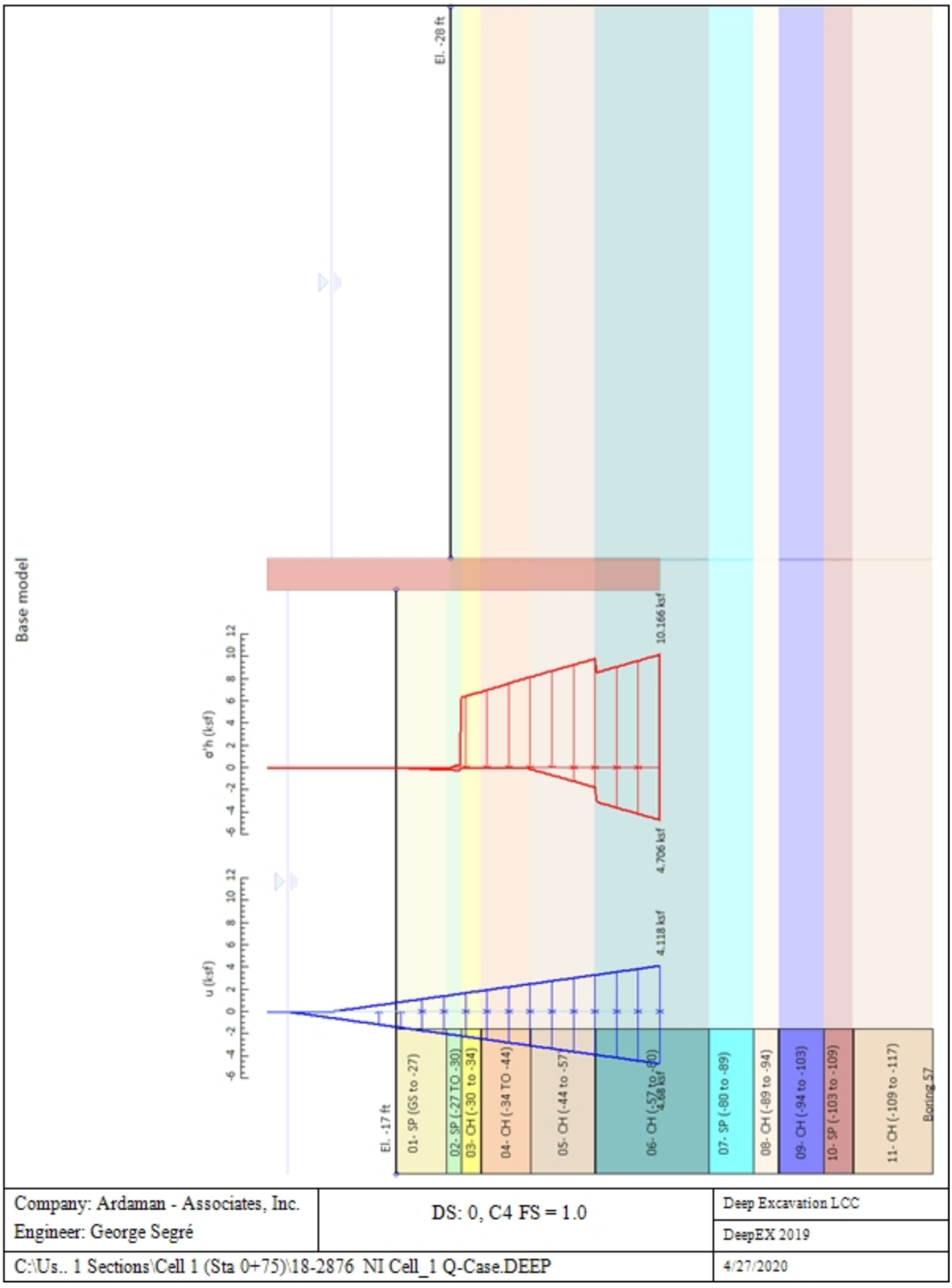
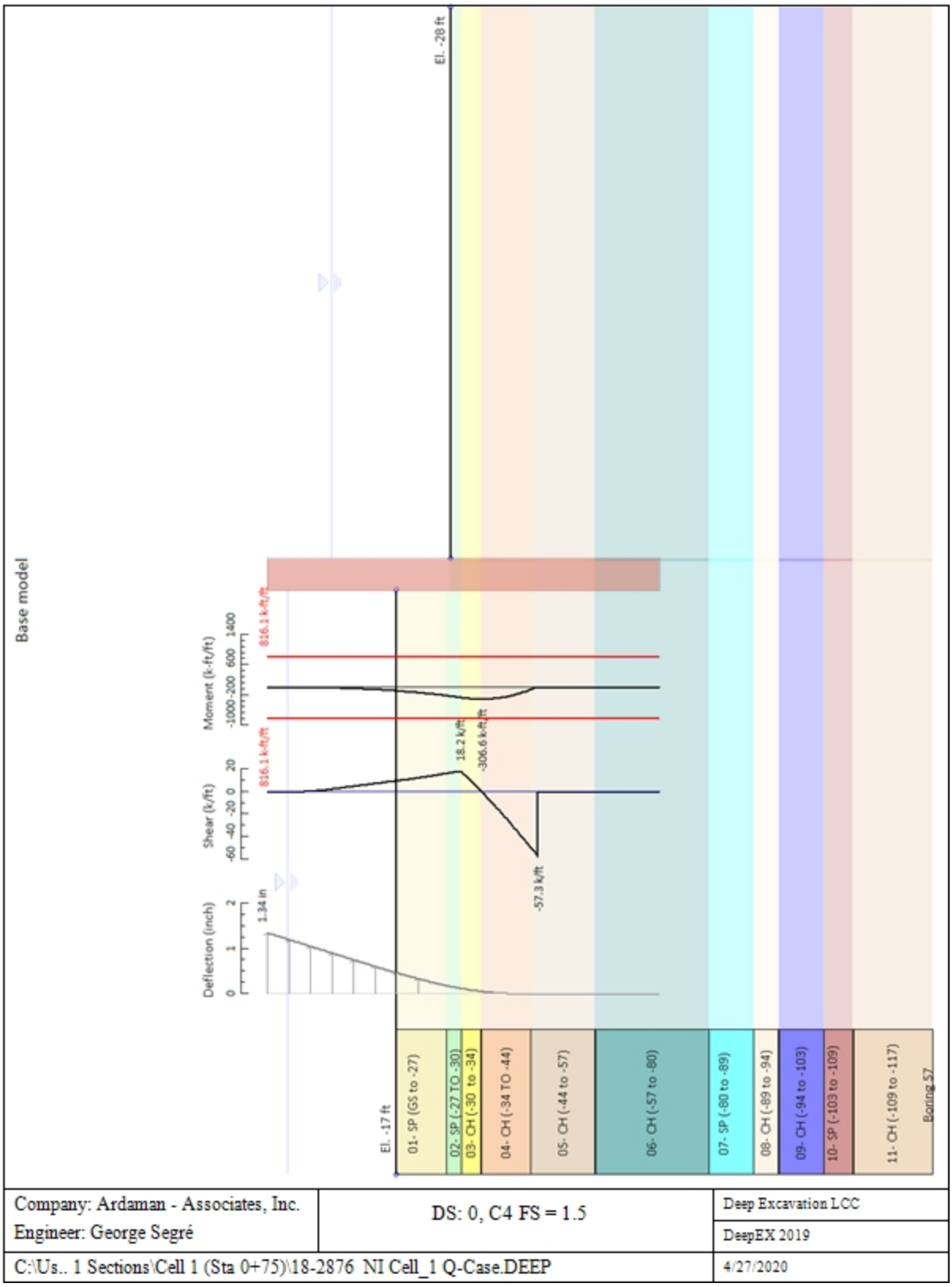

Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
10.166 ksf
4.706 ksf
4.118 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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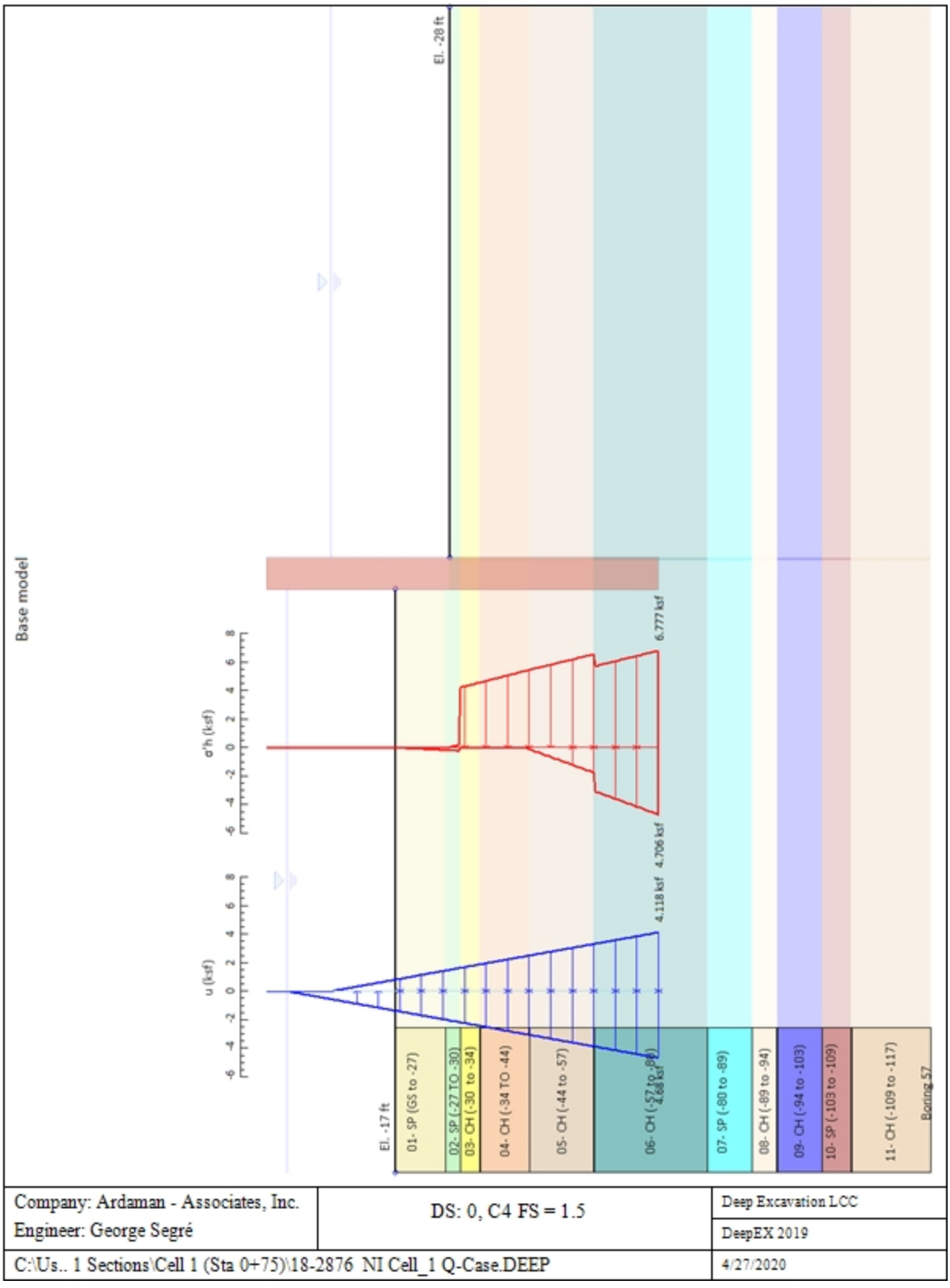
Base model
El. -28 ft
El. -17 ft
σ'h (ksf)
u (ksf)
6.777 ksf
4.706 ksf
4.118 ksf
4.68 ksf
01- SP (GS to -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -89)
07- SP (-89 to -94)
08- CH (-94 to -103)
09- CH (-103 to -109)
10- SP (-109 to -117)
11- CH (-117 to -127)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:14:21 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SP (GS TO	115	115	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	33	0	N/A	N/A	N/A	60	3	0.3	3.39	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	26	0	N/A	N/A	N/A	150	3	0.39	2.56	N/A	N/A	True	Linear	
04- CH (-34 T	134	134	26	0	N/A	N/A	N/A	521.92	3	0.39	2.56	N/A	N/A	True	Linear	
05- CH (-44 to	126	126	26	0	N/A	N/A	N/A	417.54	3	0.39	2.56	N/A	N/A	True	Linear	
06- CH (-57 to	127	127	26	0	N/A	N/A	N/A	626.3	3	0.39	2.56	N/A	N/A	True	Linear	
07- SP (-80 to	122	122	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- CH (-94 to	120	120	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
10- SP (-103 t	120	120	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SP (GS TO	0.4	-	-	0.455	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.455	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	-	-	0.562	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	-	-	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	-	-	0.562	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	-	-	0.562	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.455	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	-	-	0.562	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.455	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	-	-	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

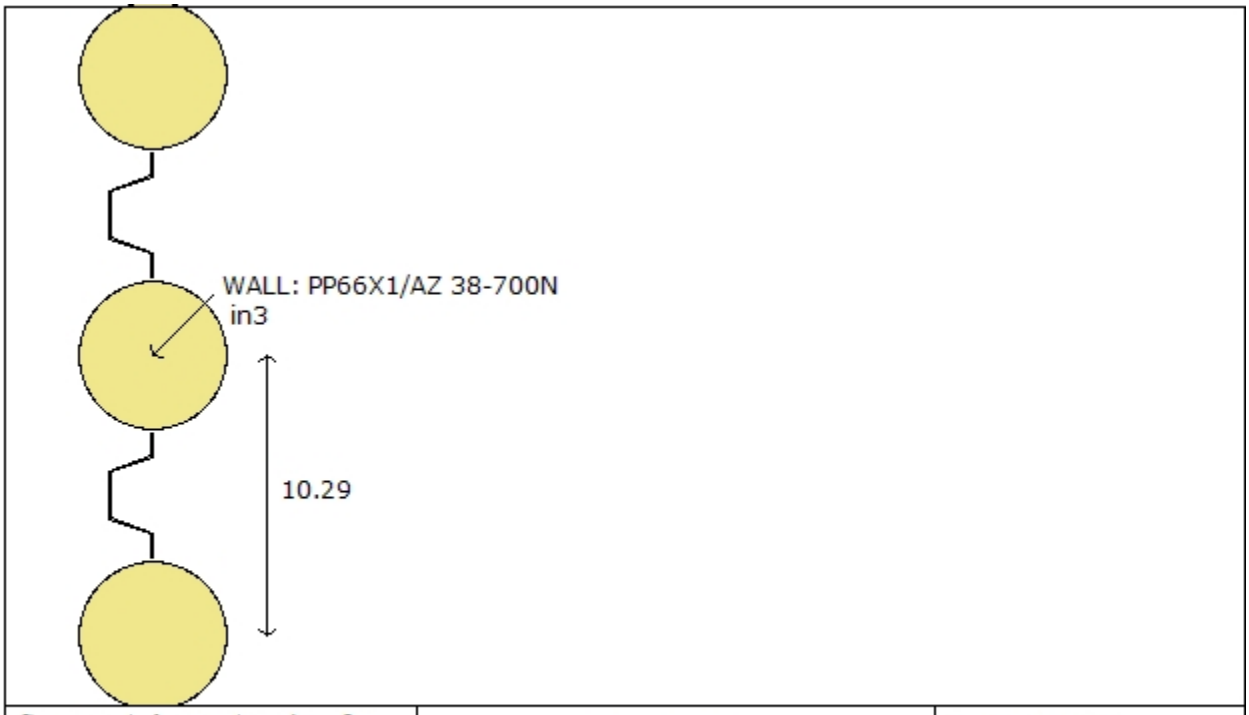
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
-17	01- SP (GS TO	1	0.46
-27	02- SP (-27 TO	1	0.46
-30	03- CH (-30 to	1	0.56
-34	04- CH (-34 TO	1	0.56
-44	05- CH (-44 to	1	0.56
-57	06- CH (-57 to	1	0.56
-80	07- SP (-80 to -	1	0.46
-89	08- CH (-89 to	1	0.56
-94	09- CH (-94 to	1	0.56
-103	10- SP (-103 to	1	0.46
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.416	1.416	1.768
Stage 1	Simple span	N/A	1.6	1.243	1.243	1.537
Stage 2	Simple span	N/A	1.6	1.477	1.477	1.812
Stage 3	Simple span	N/A	1.6	1.304	1.304	1.581
Stage 4	Simple span	N/A	1.6	1.532	1.532	1.86
Stage 5	Simple span	N/A	1.6	1.221	1.221	1.455
Stage 6	Simple span	N/A	1.6	1.599	1.599	1.907
Stage 7	Simple span	N/A	1.6	1.287	1.287	1.502

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

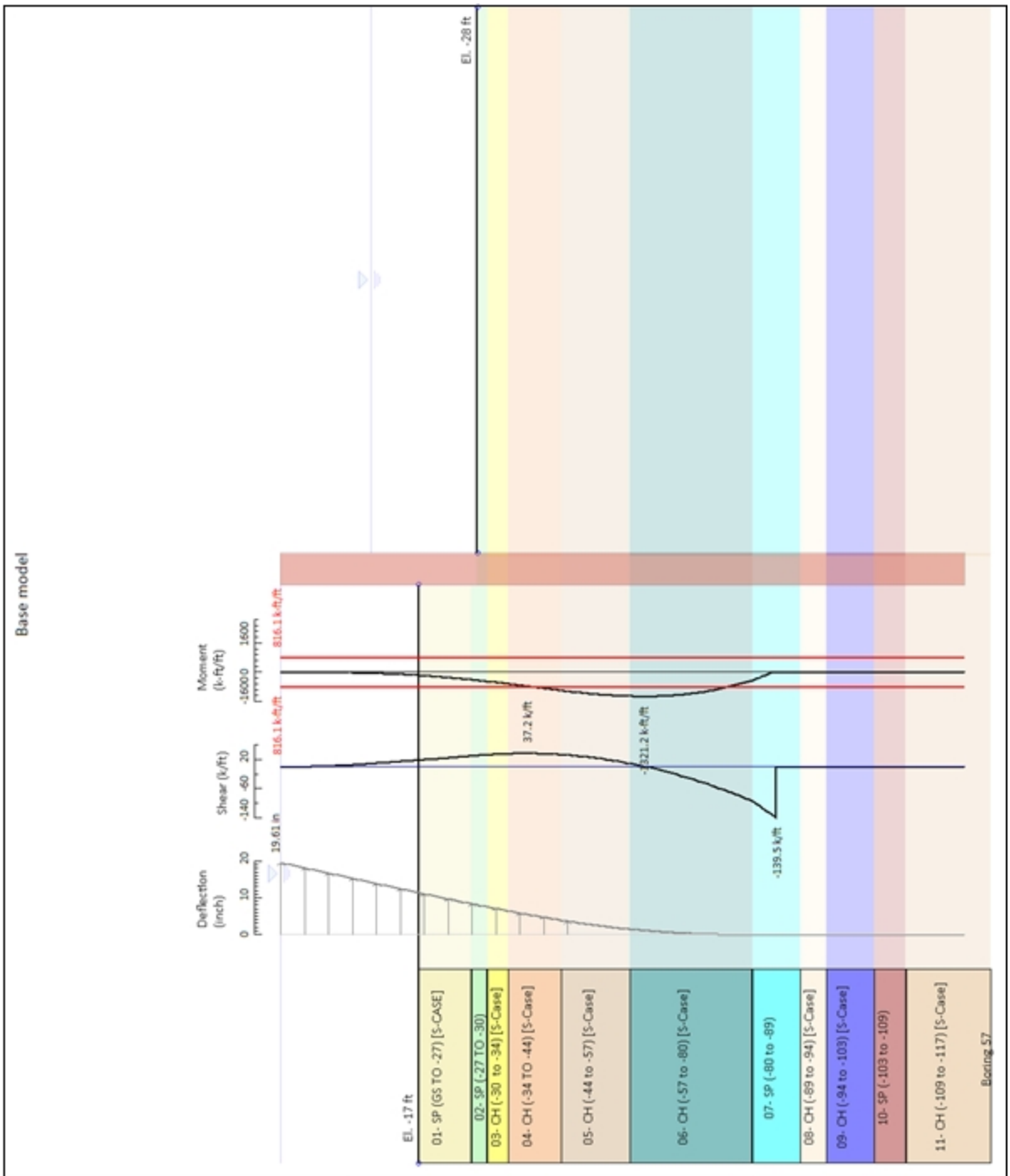
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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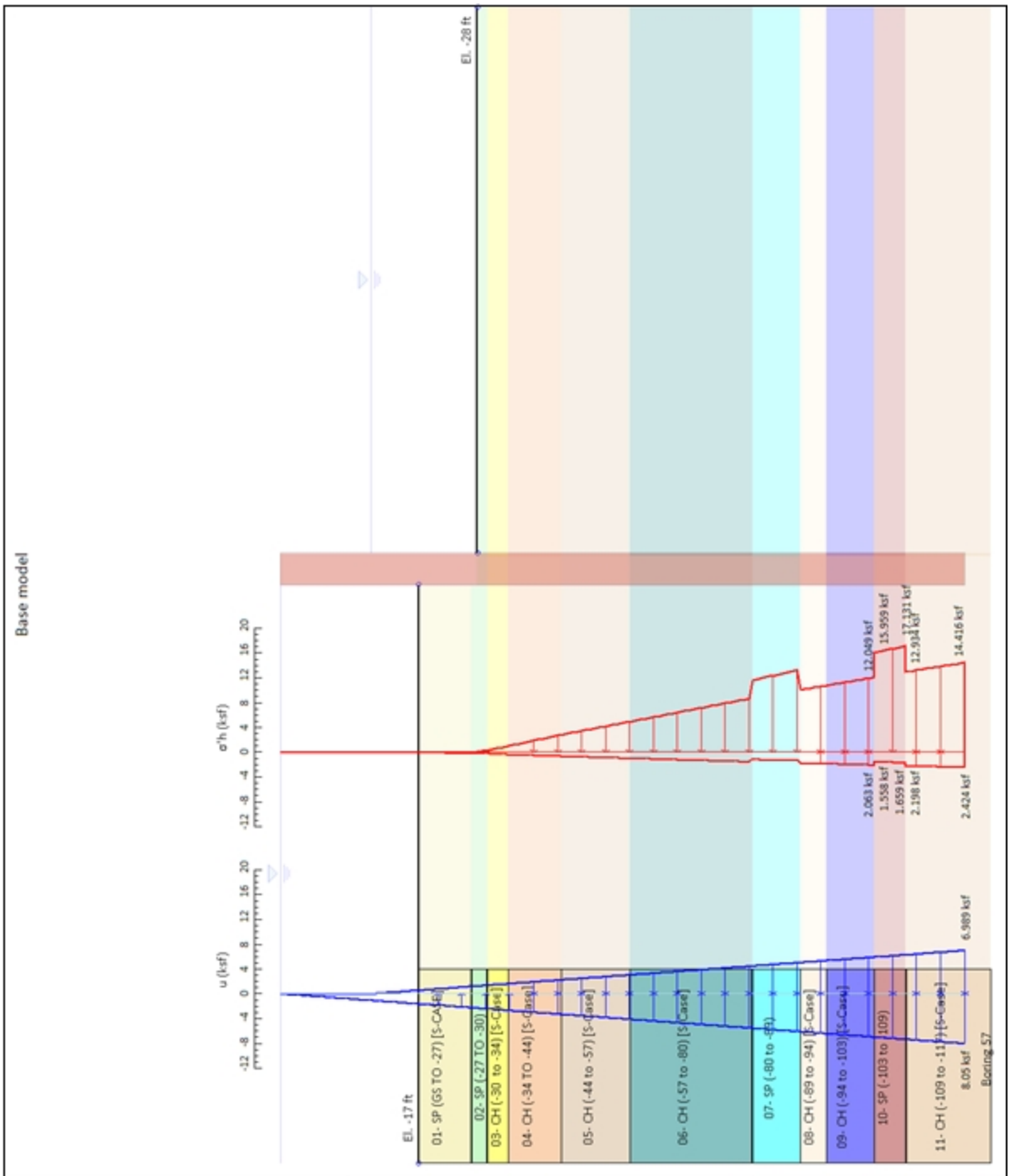
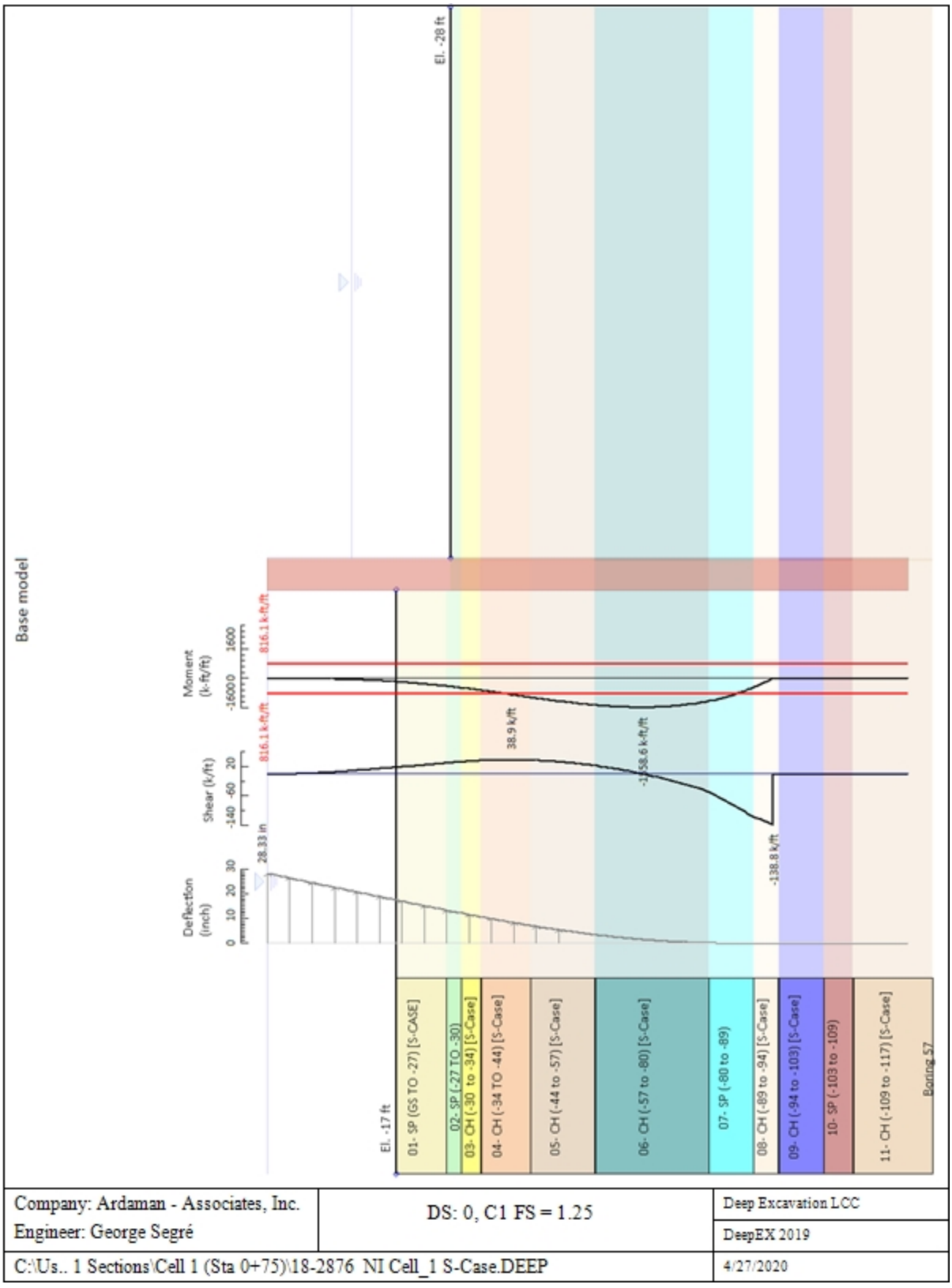
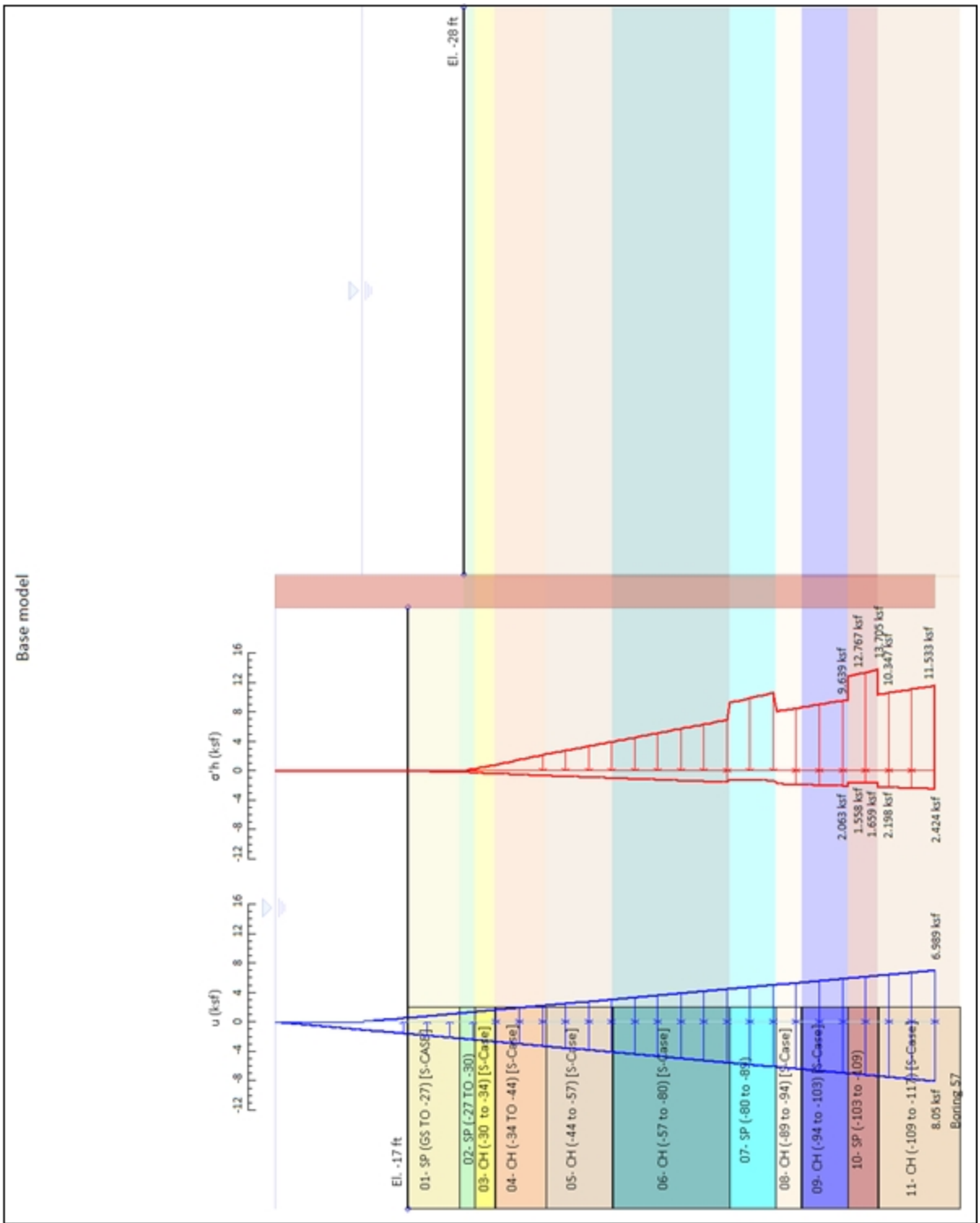


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

Attachment Figure C.1-37


Base model
El. -28 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
38.9 k/ft
-1158.6 k-ft/ft
-138.8 k/ft
28.33 in
Deflection (inch)
0 10 20 30
El. -17 ft
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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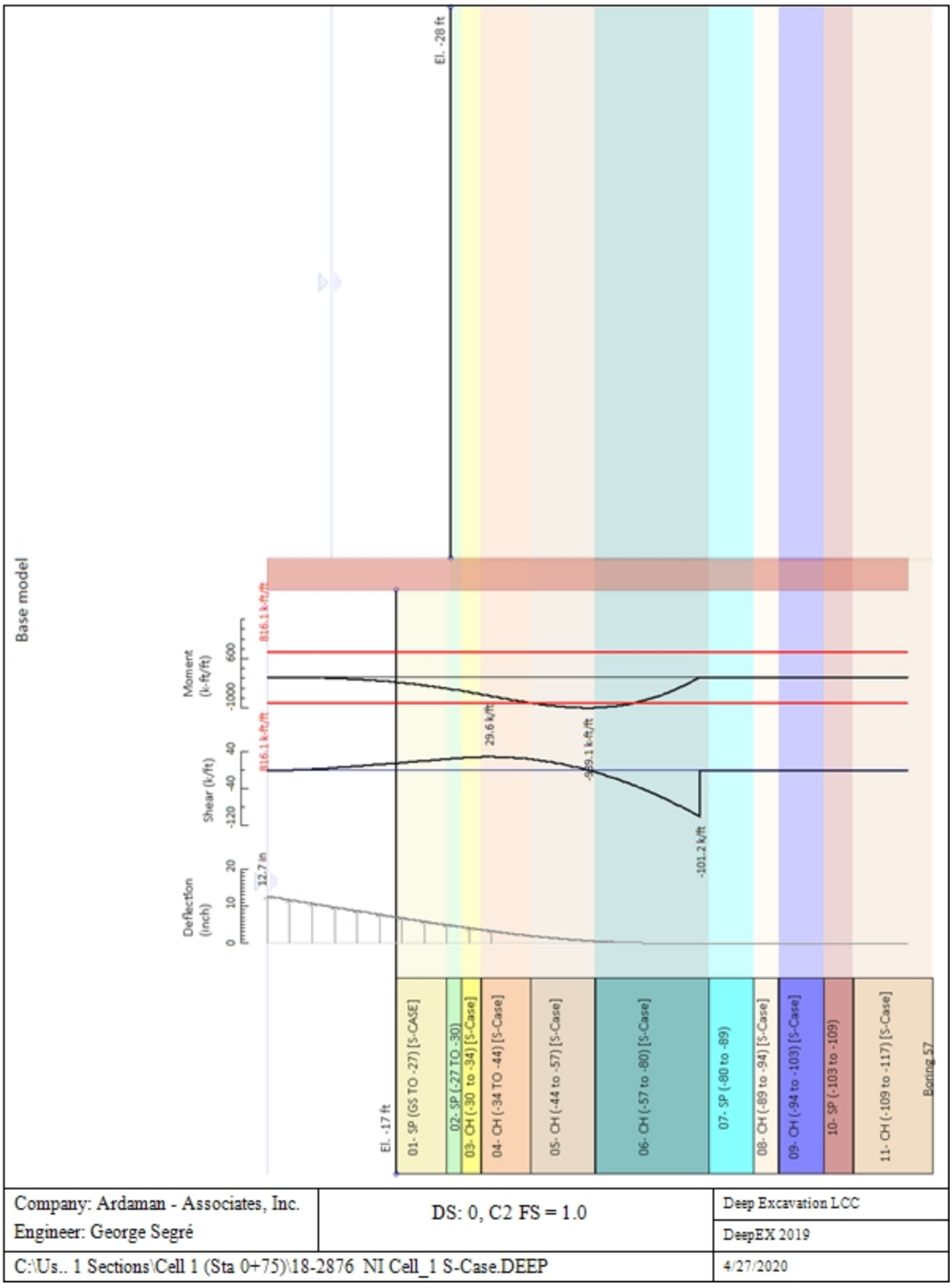

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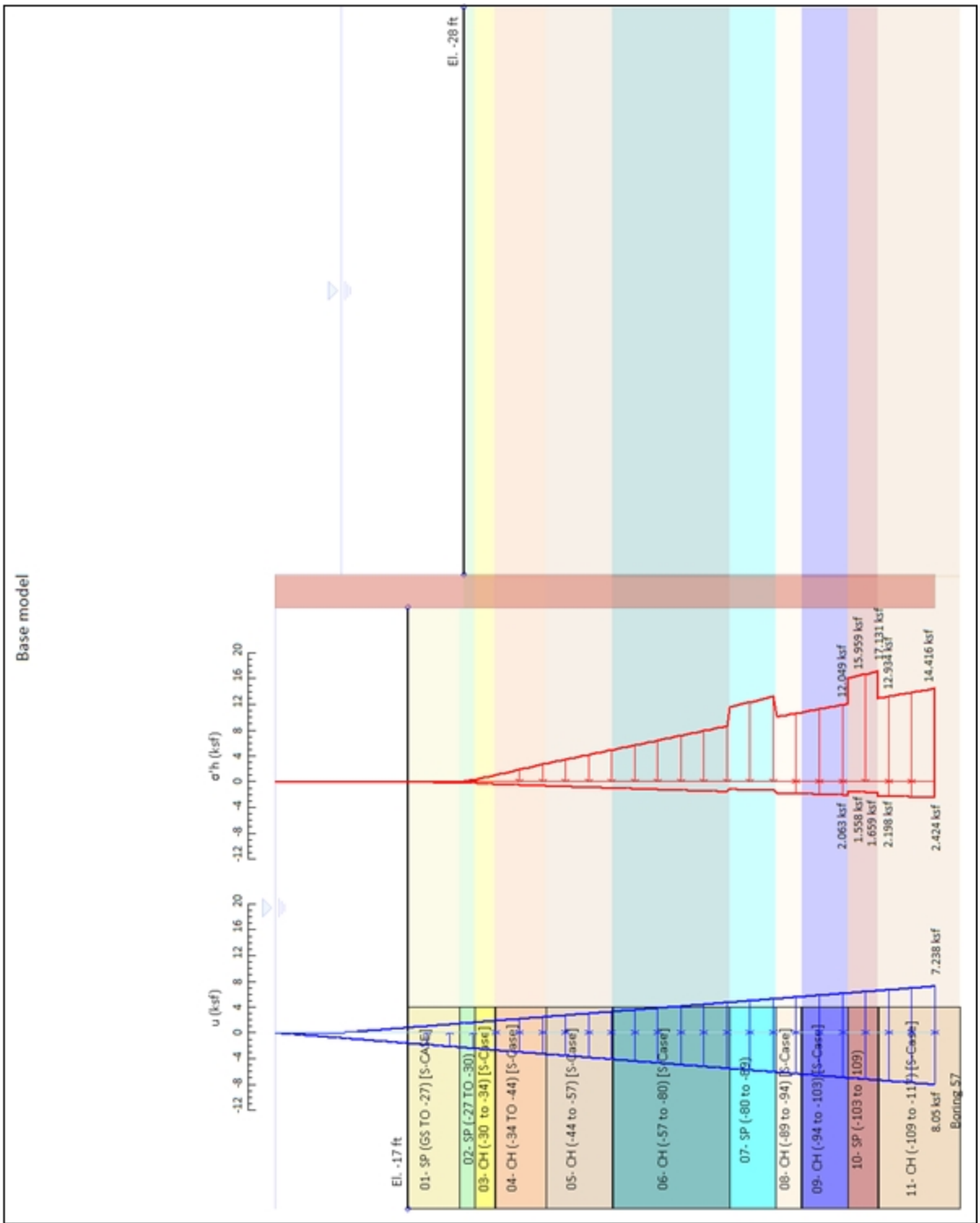
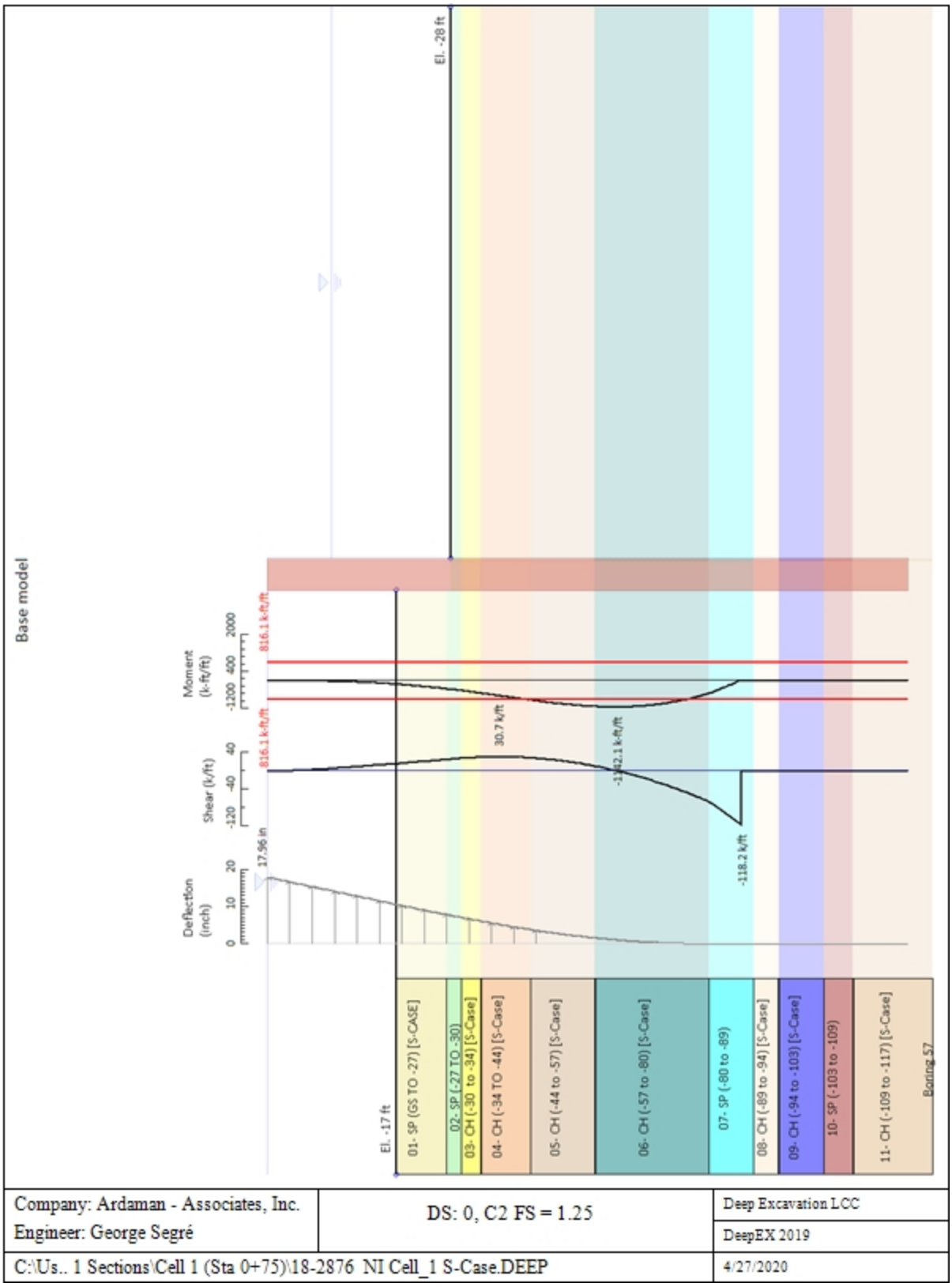


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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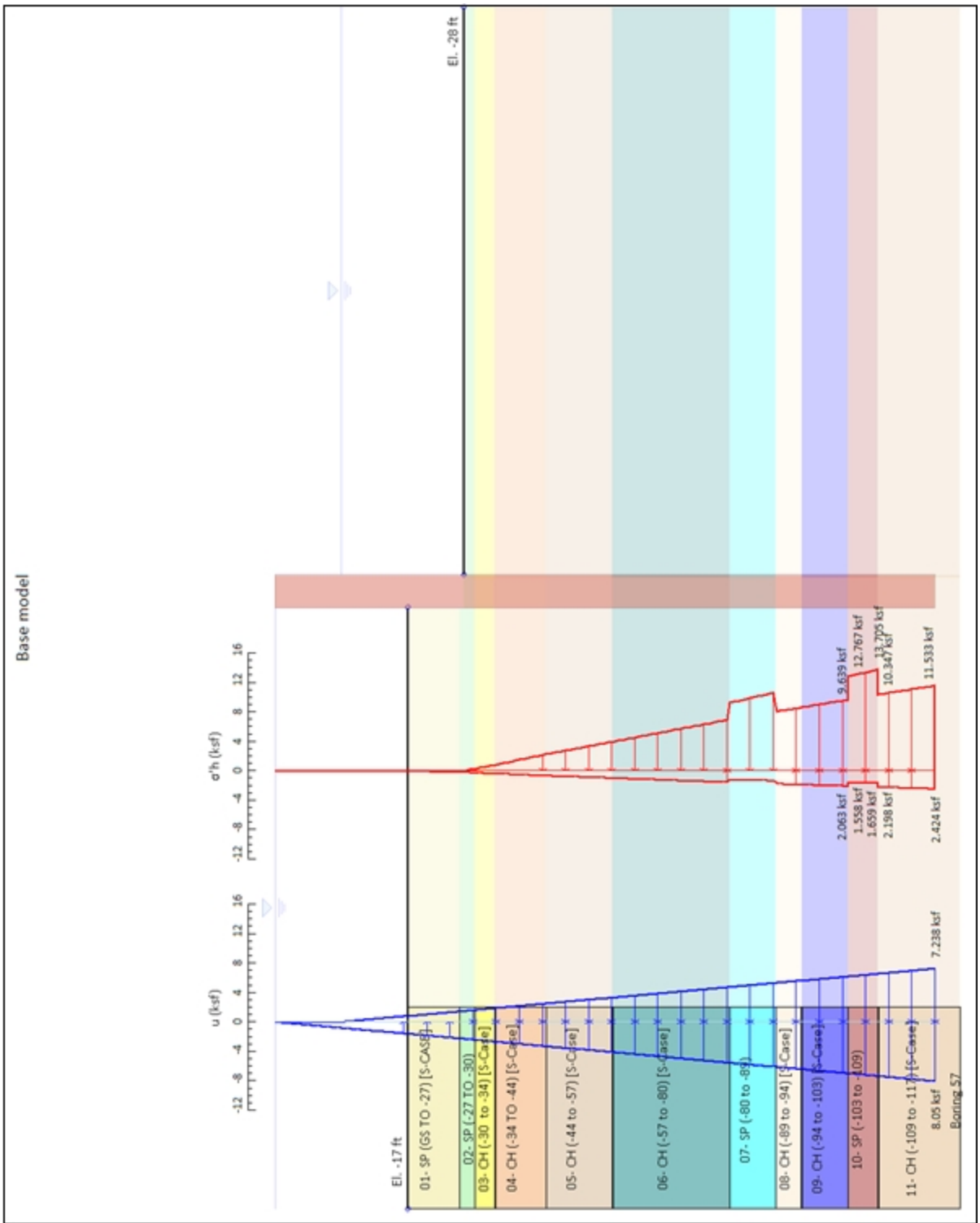

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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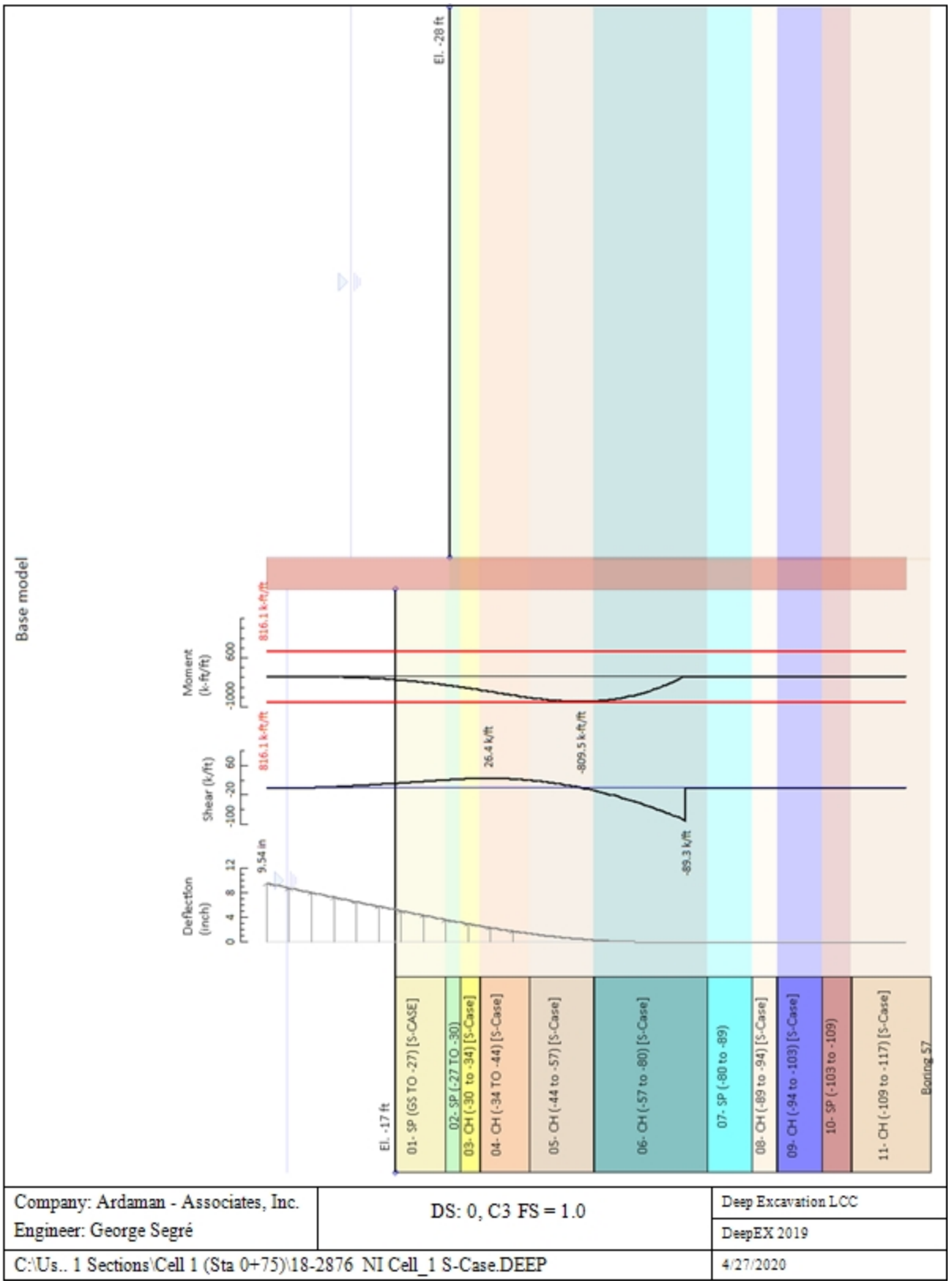

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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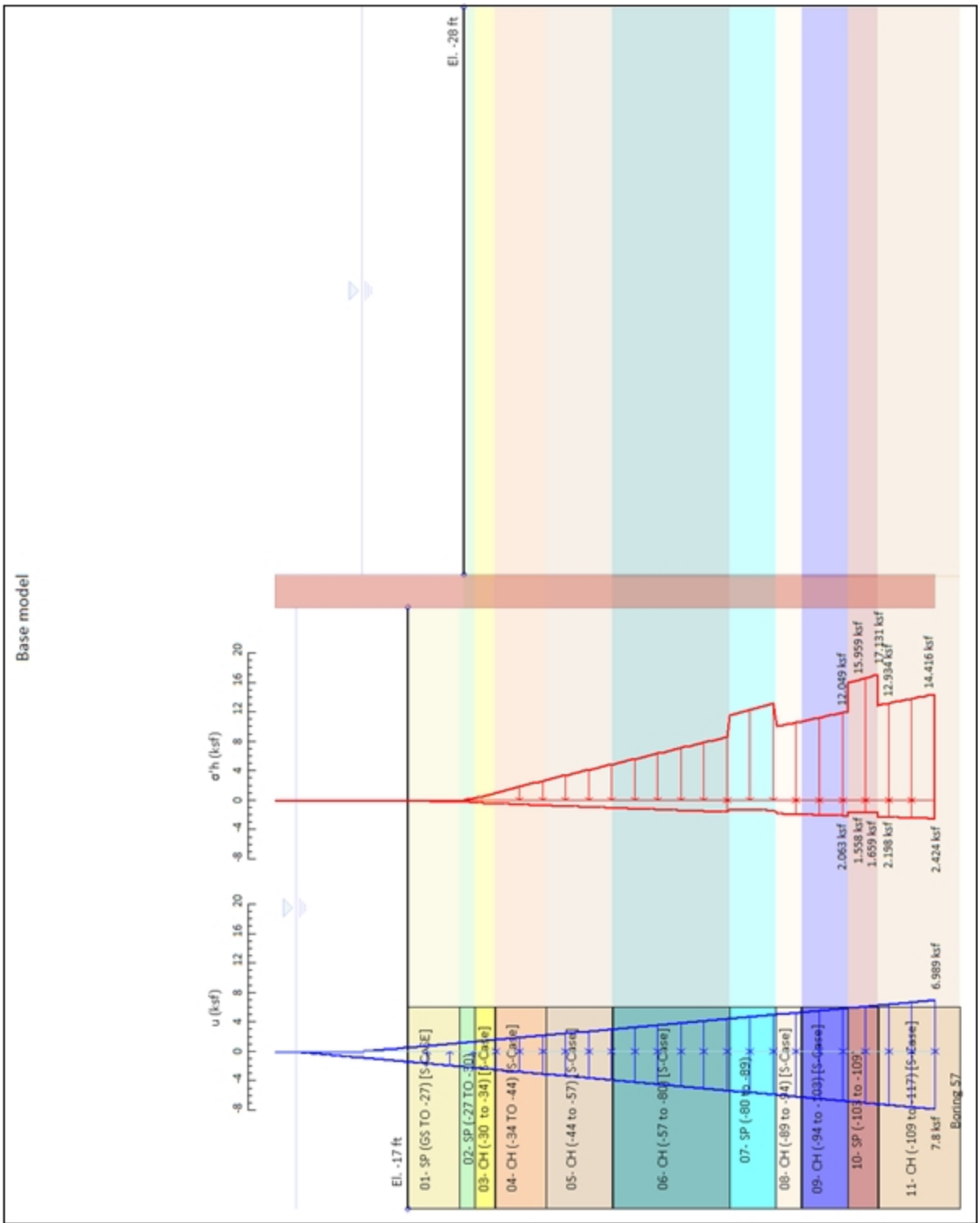

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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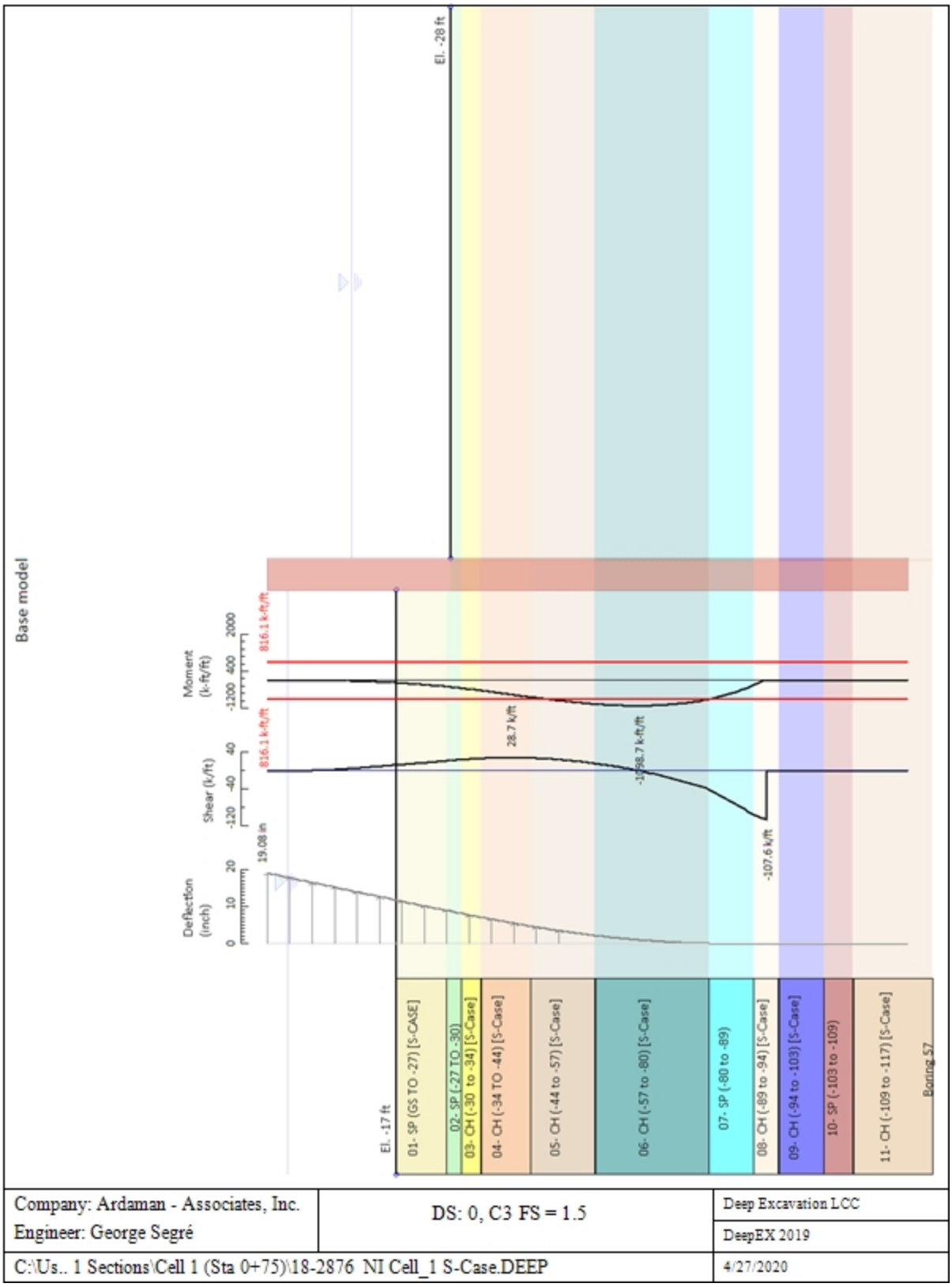
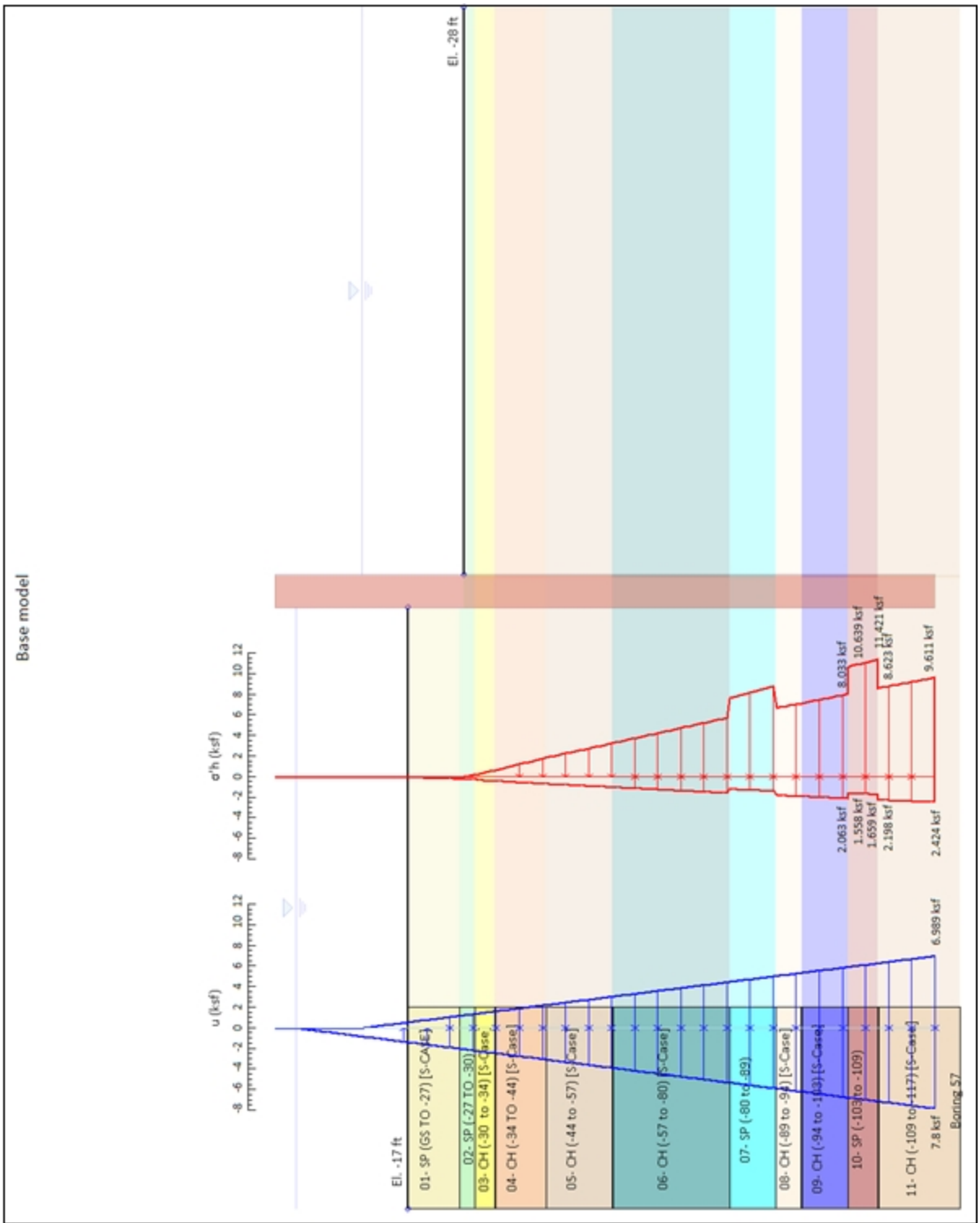


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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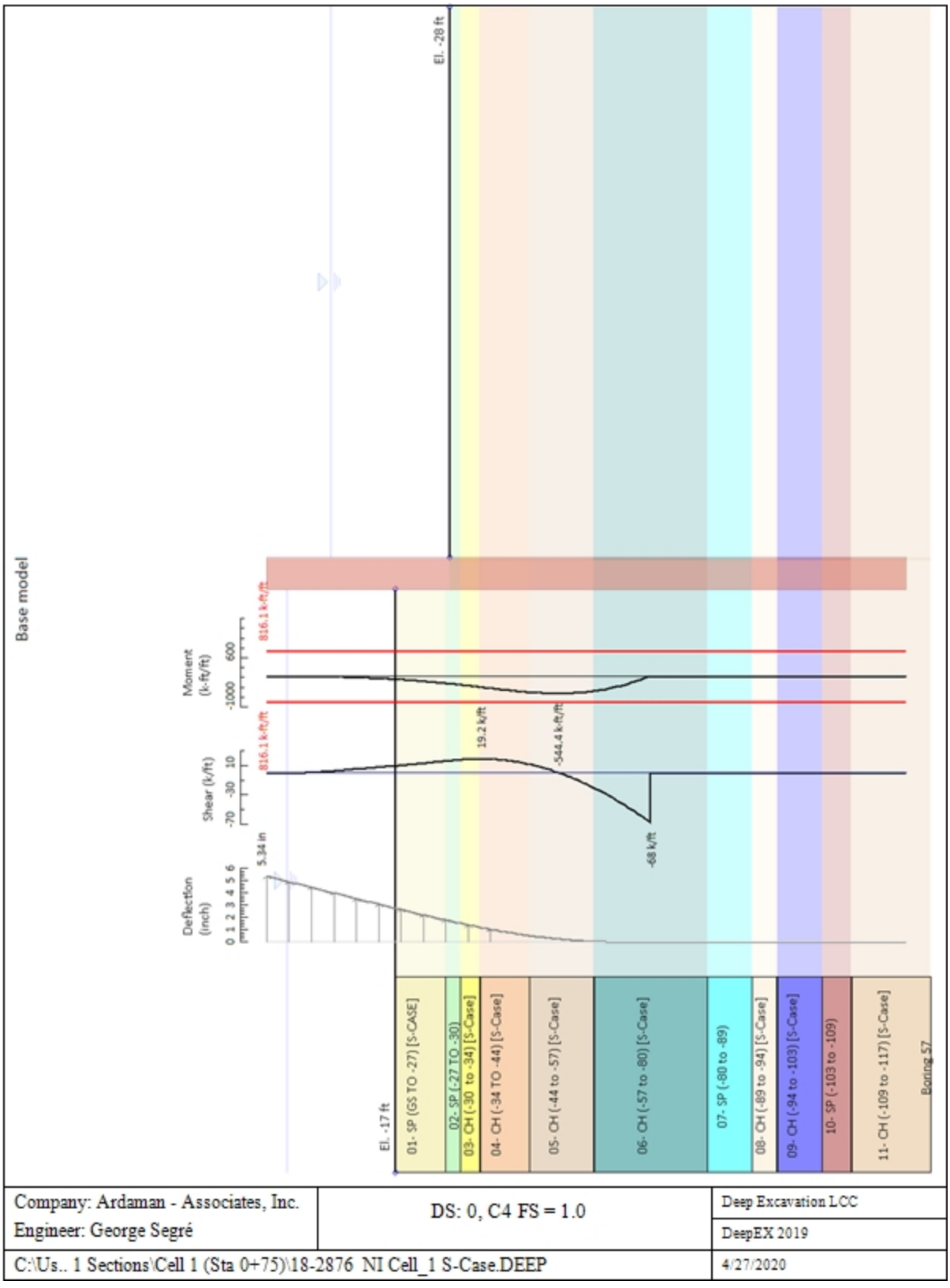

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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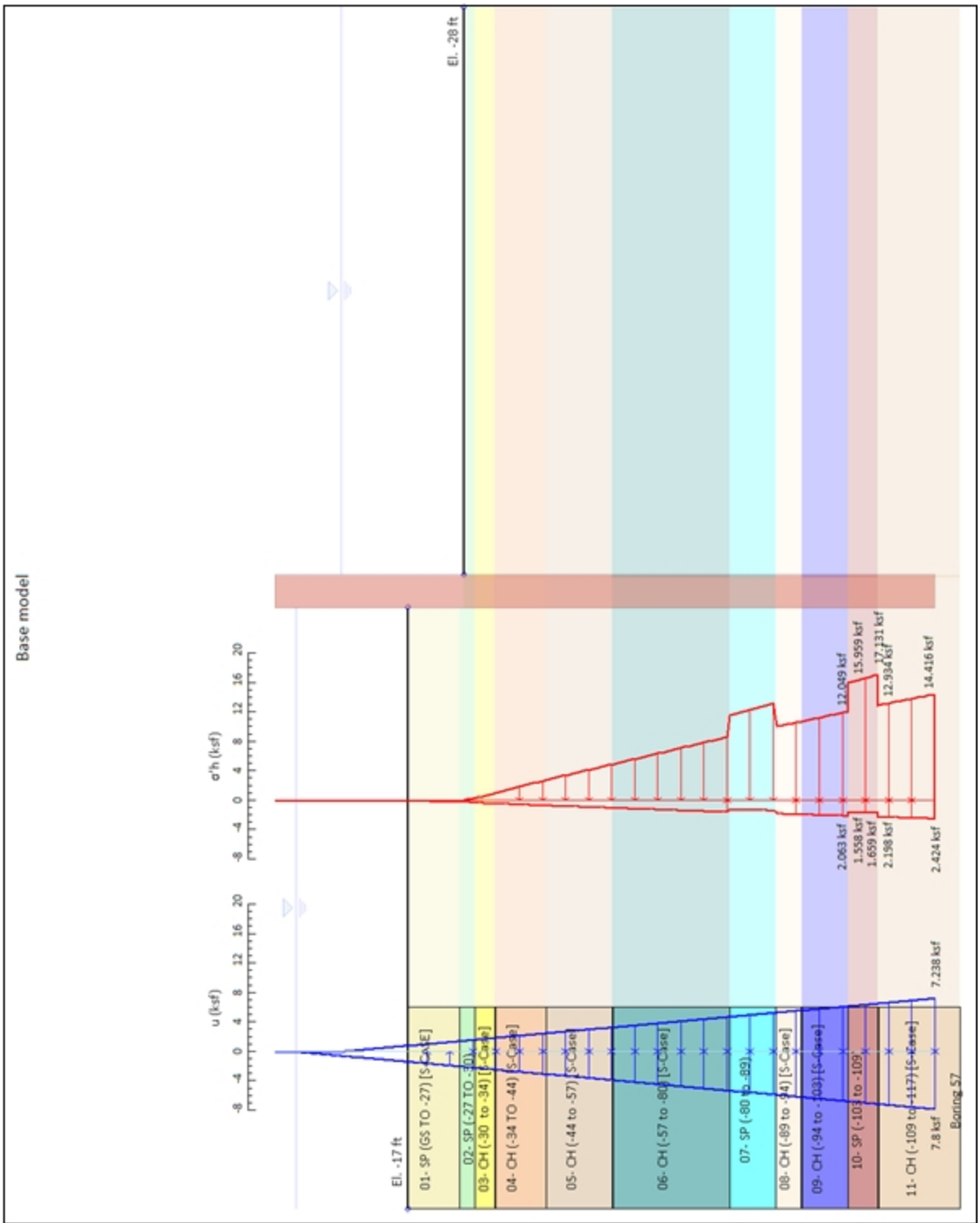
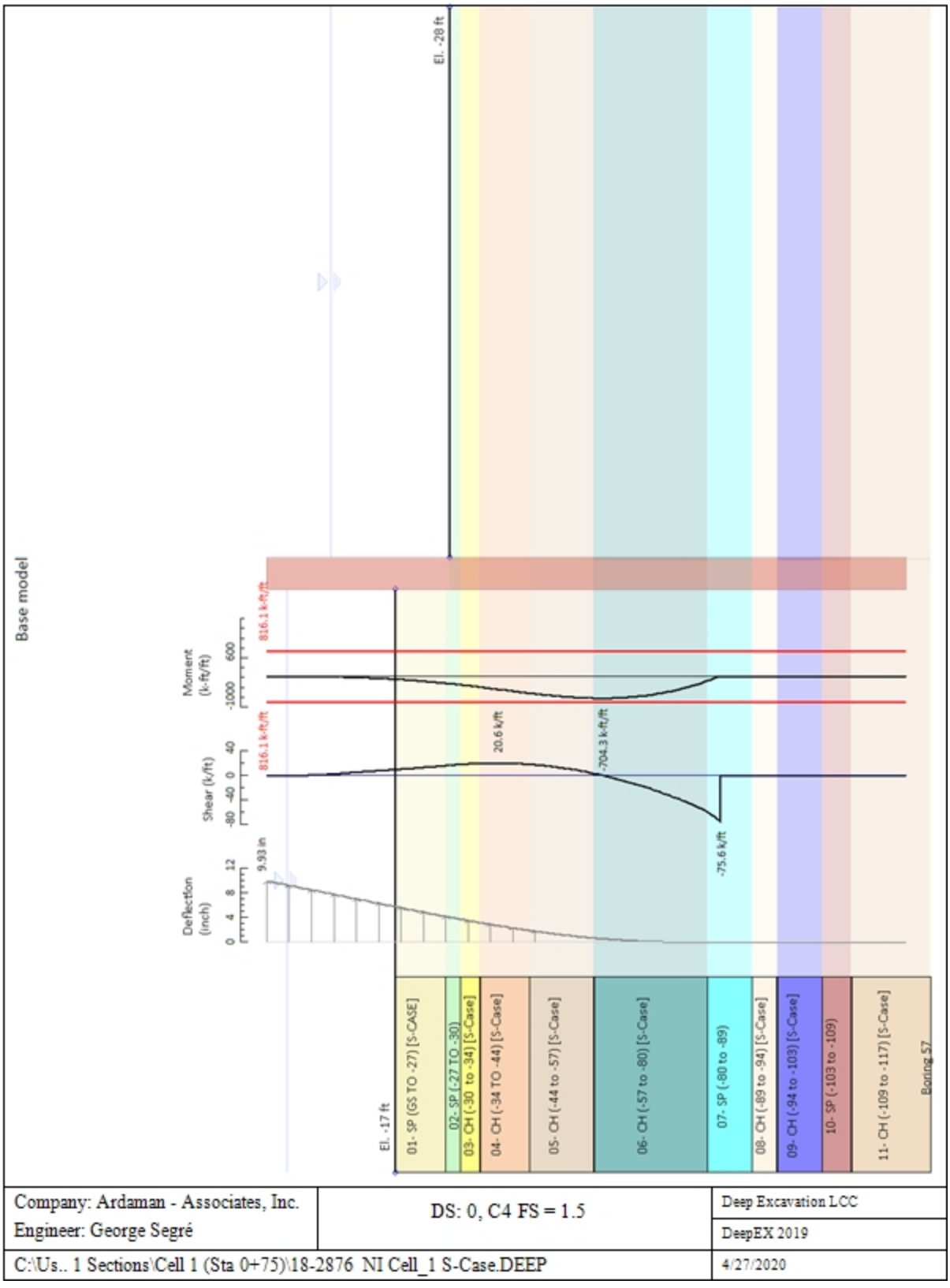


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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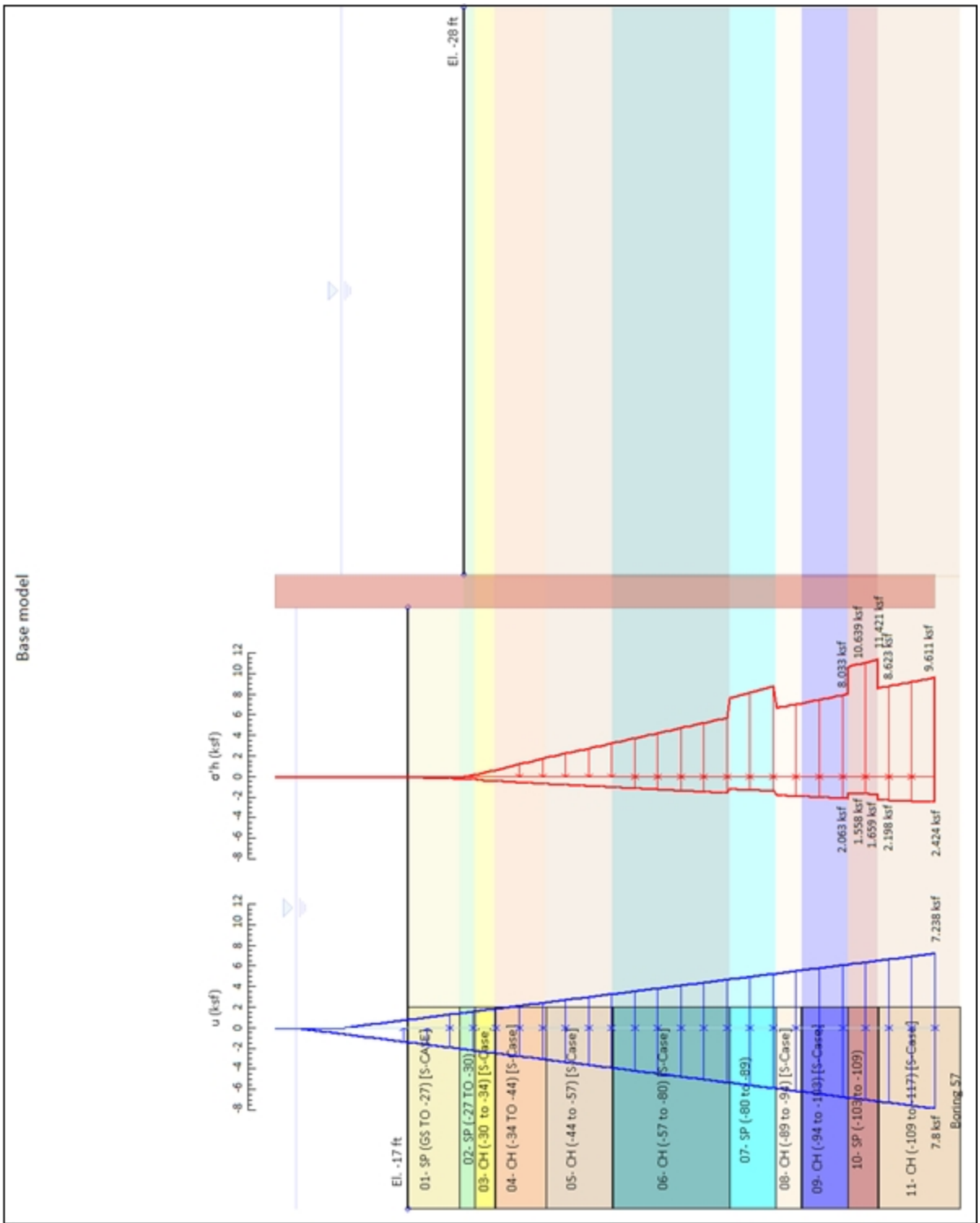

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 0+75)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 2+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -99.36 ft., NAVD88

Length of Sheetting = 108.36 ft.

Use = 110.0 ft.

Design Tip Elev. = -101.0 ft., NAVD88

Design Length of Sheeting = 110.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-46.70	500.82	87.78	2.31
		Open excavation - degraded	9	-8	1.00	1.25	-49.46	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-44.33	400.31	78.71	1.67
		Open excavation - degraded	9	-4	1.00	1.25	-46.70	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-43.53	324.83	70.87	1.23
		Open excavation - degraded	5	-8	1.00	1.50	-47.48	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-41.16	232.55	61.43	0.77
		Open excavation - degraded	5	-4	1.00	1.50	-44.33	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-89.00	1,607.73	166.42	26.49
		Open excavation - degraded	9	-8	1.00	1.25	-99.36	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-83.24	1,227.20	126.96	17.75
		Open excavation - degraded	9	-4	1.00	1.25	-92.26	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-81.30	1,035.74	111.37	13.92
		Open excavation - degraded	5	-8	1.00	1.50	-98.72	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-74.20	725.69	83.46	8.22
		Open excavation - degraded	5	-4	1.00	1.50	-90.33	--	--	--
						Governing Value:	-99.36	1,607.73	166.42	26.49

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:25:30 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
13- CH (GS to	112	112	0	0	800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (-17 T	115	115	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	30	0	N/A	N/A	N/A	60	3	0.33	3	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	0	0	2290	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-34 T	134	134	0	0	2290	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-44 to	126	126	0	0	2290	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-57 to	127	127	0	0	1650	0	0	626.3	3	1	1	1	1	True	Linear	
07- SP (-80 to	122	122	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	0	0	1200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-94 to	120	120	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- SP (-103 t	120	120	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	0	0	1670	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
13- CH (GS to	0.35	0	0	1	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (-17 T	0.4	-	-	0.5	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.5	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	0	0	1	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.5	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

Top Elev= superior SOil level

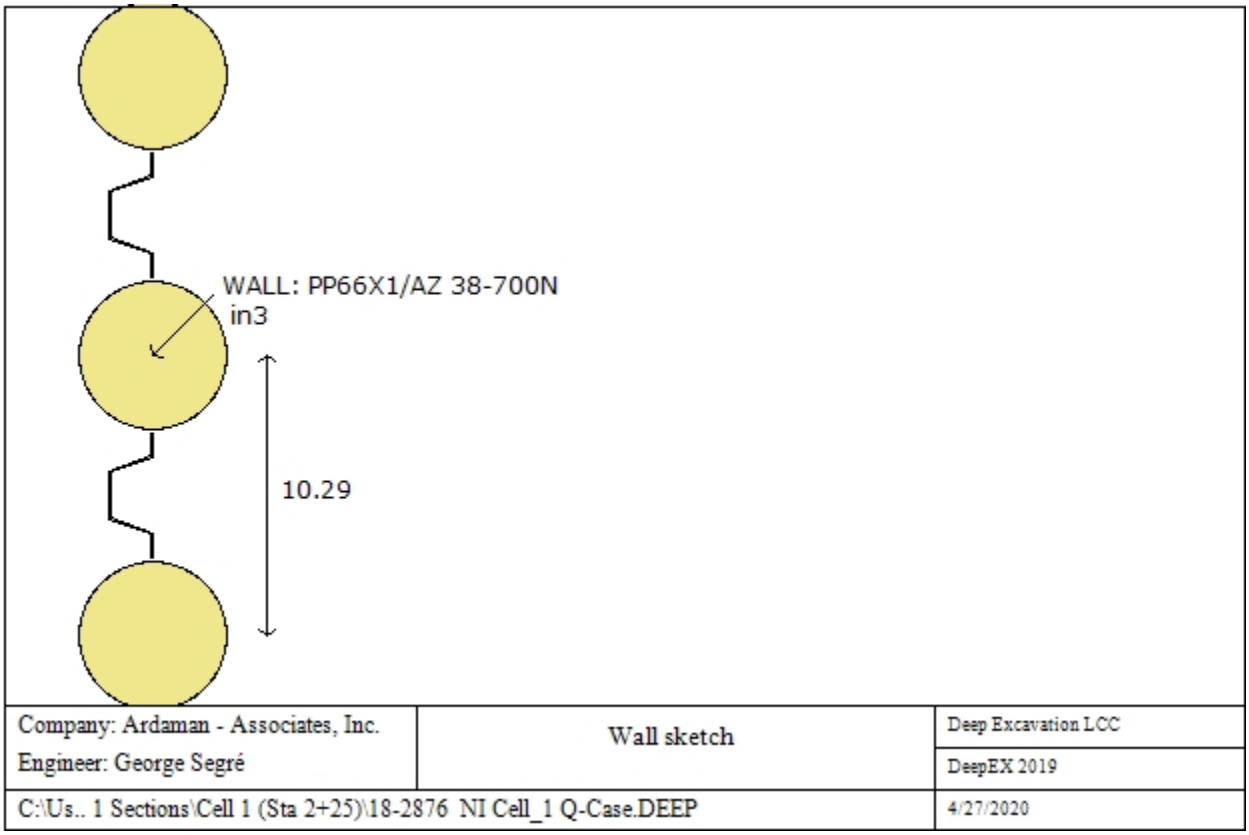
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
-2	13- CH (GS to -	1	1
-10	12- SP (-10 to -	1	0.5
-17	01- SP (-17 TO	1	0.5
-27	02- SP (-27 TO	1	0.5
-30	03- CH (-30 to	1	1
-34	04- CH (-34 TO	1	1
-44	05- CH (-44 to	1	0.45
-57	06- CH (-57 to	1	1
-80	07- SP (-80 to -	1	0.5
-89	08- CH (-89 to	1	1
-94	09- CH (-94 to	1	1
-103	10- SP (-103 to	1	0.5
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall

Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)

rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.246	2.766	6.475
Stage 1	Simple span	N/A	1.6	1.957	2.27	5.236
Stage 2	Simple span	N/A	1.6	2.572	2.972	6.775
Stage 3	Simple span	N/A	1.6	2.246	2.459	5.499
Stage 4	Simple span	N/A	1.6	2.704	3.393	7.605
Stage 5	Simple span	N/A	1.6	2.156	2.379	5.18
Stage 6	Simple span	N/A	1.6	3.19	3.645	7.958
Stage 7	Simple span	N/A	1.6	2.572	2.598	5.46

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

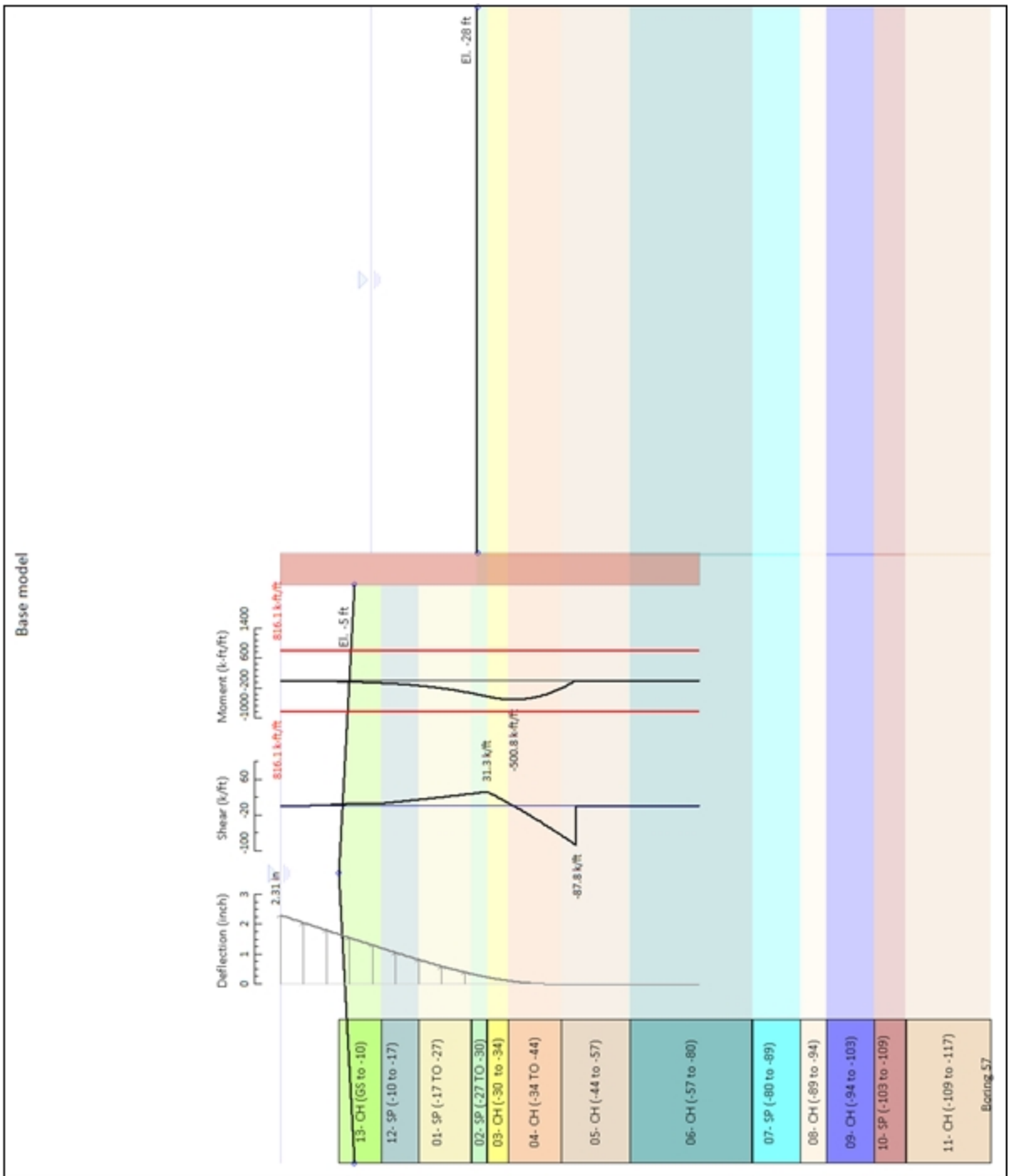
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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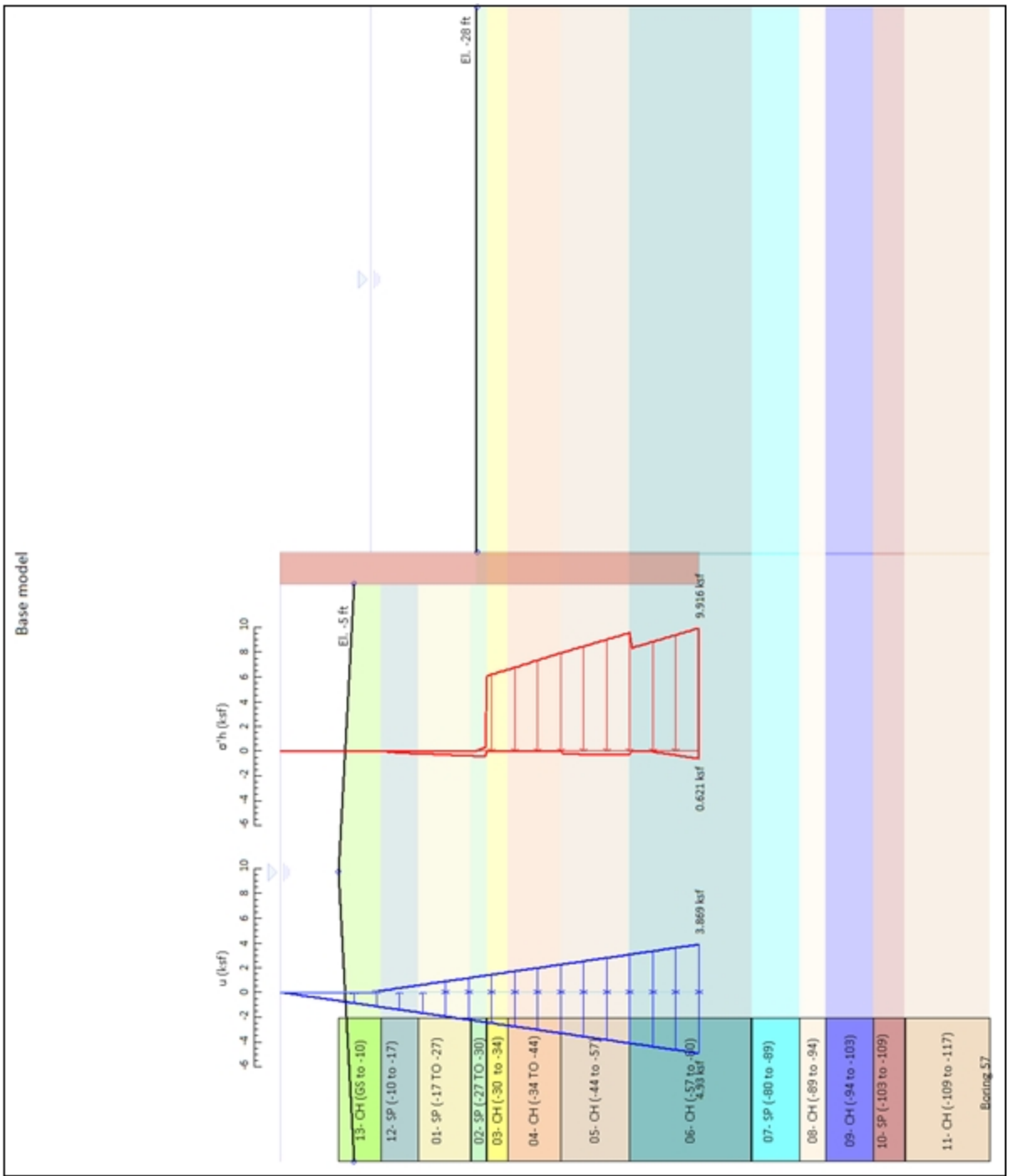

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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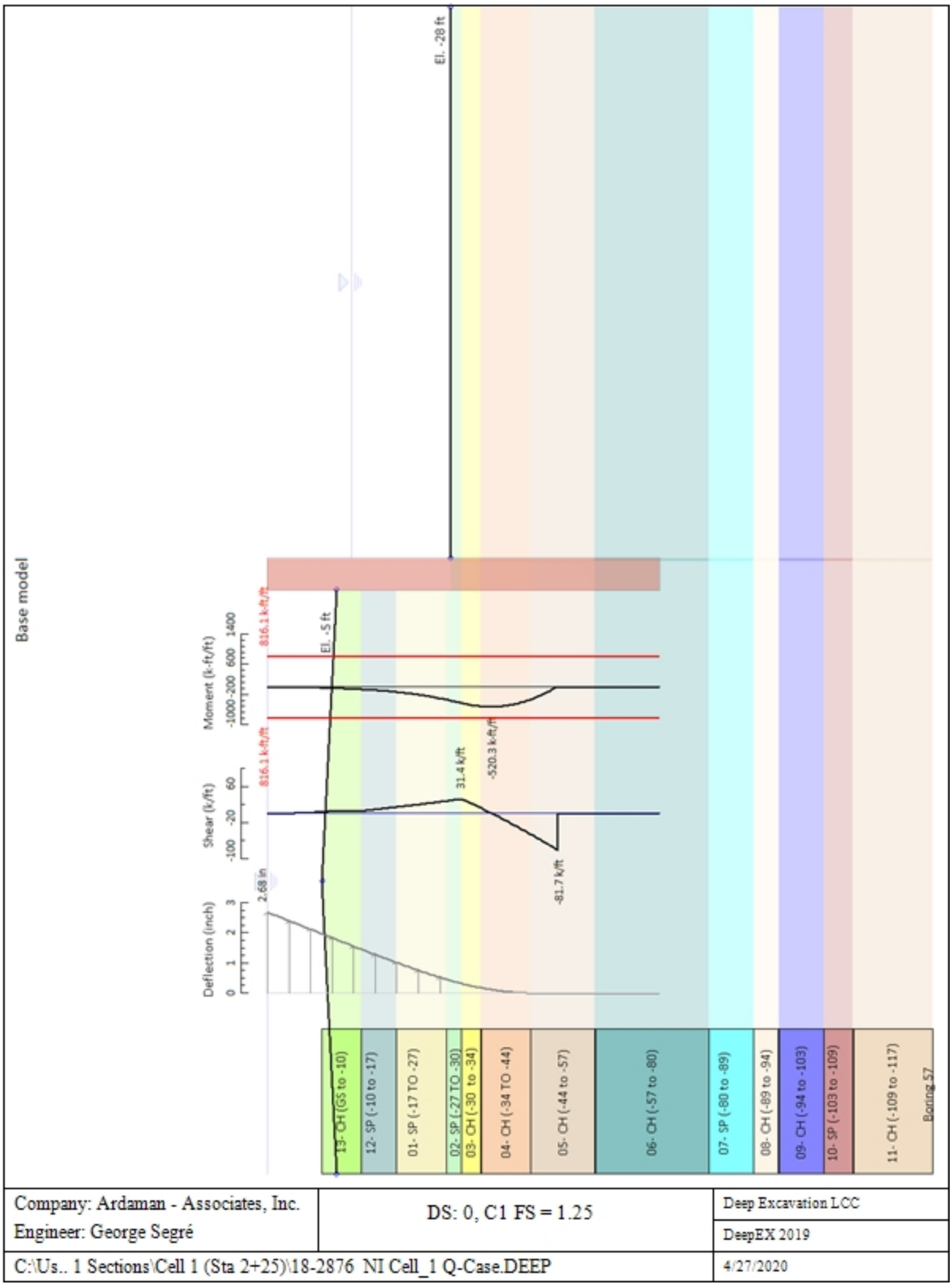

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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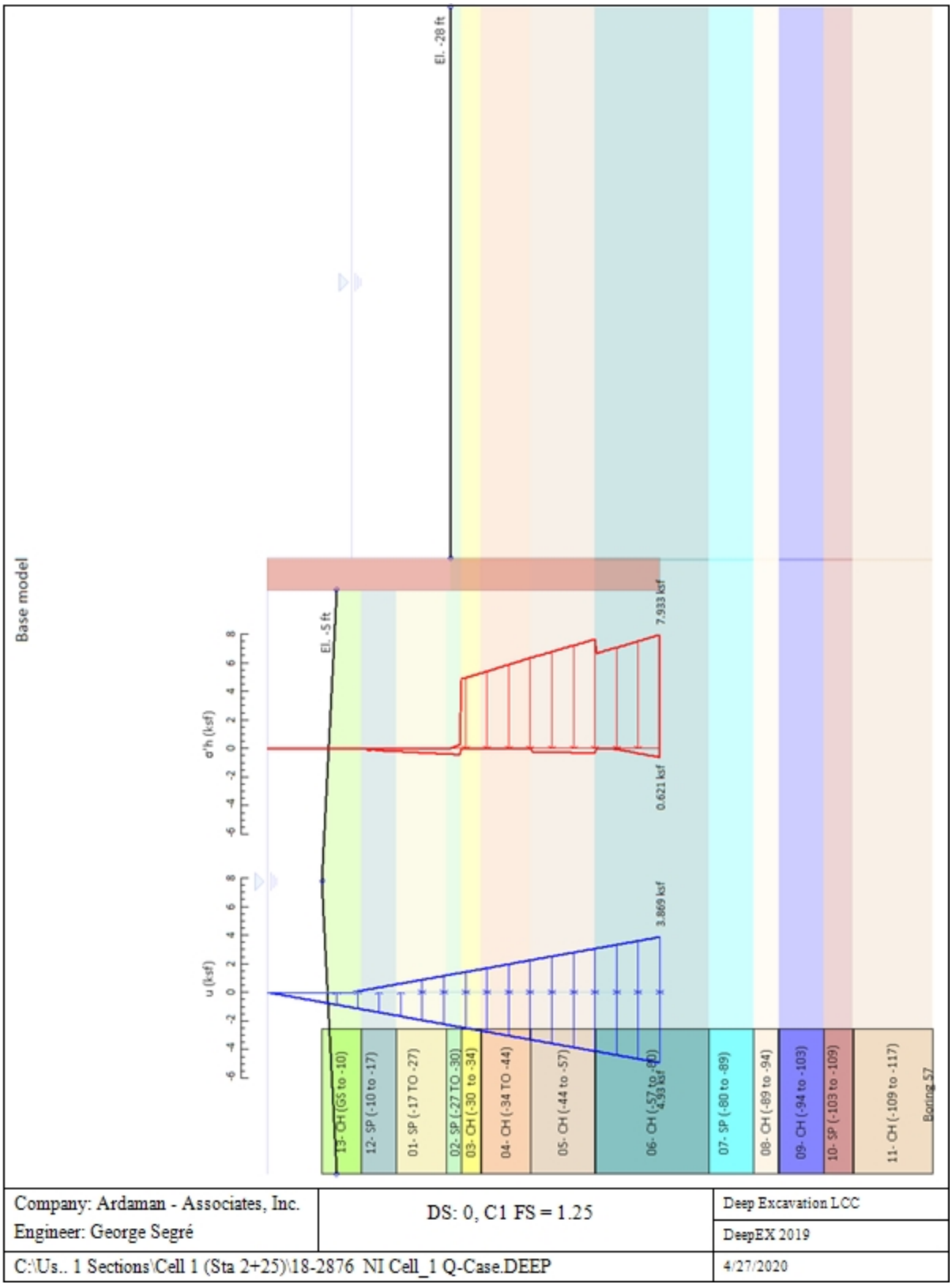
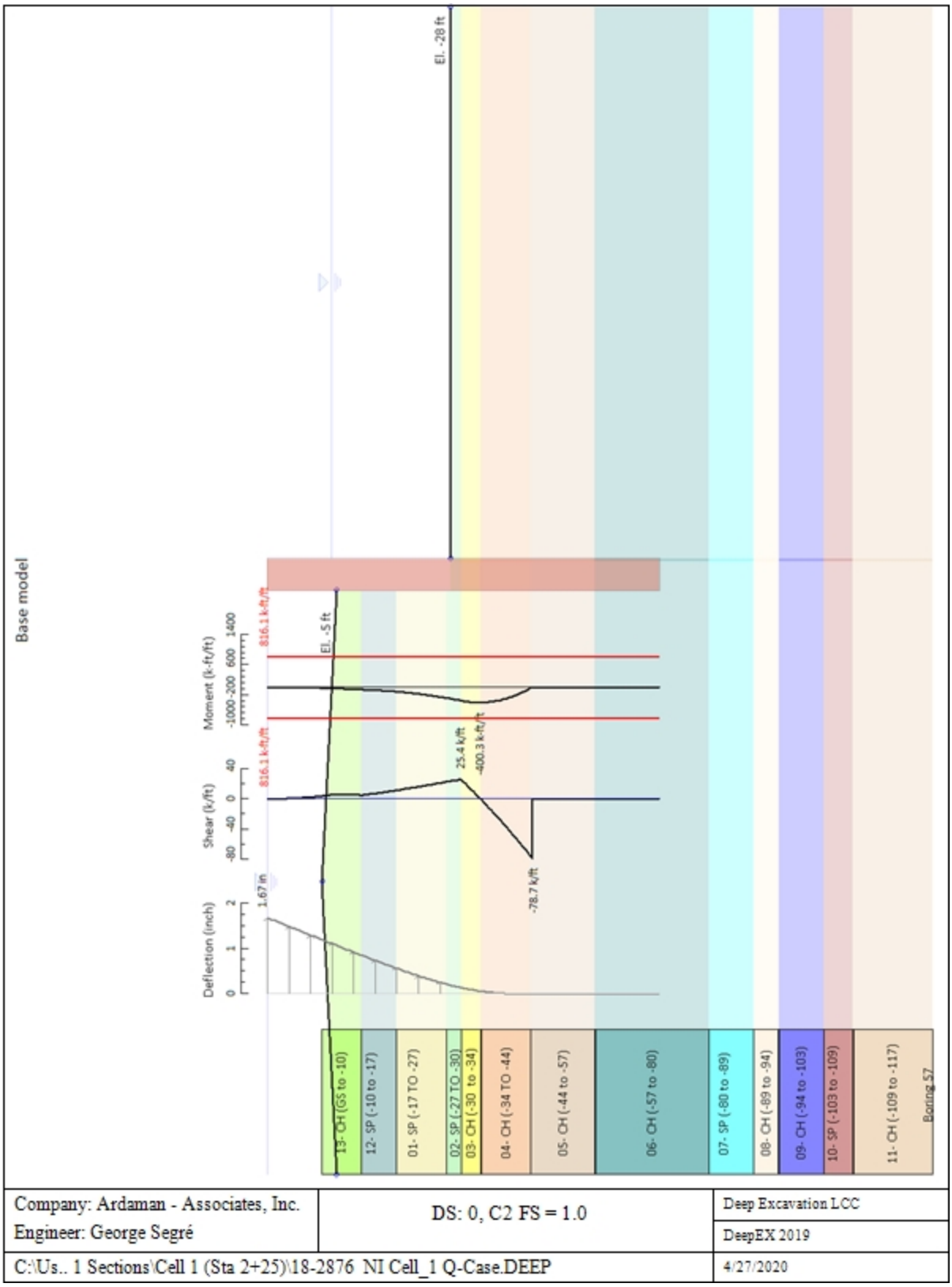

Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
7.933 ksf
0.621 ksf
3.869 ksf
4.93 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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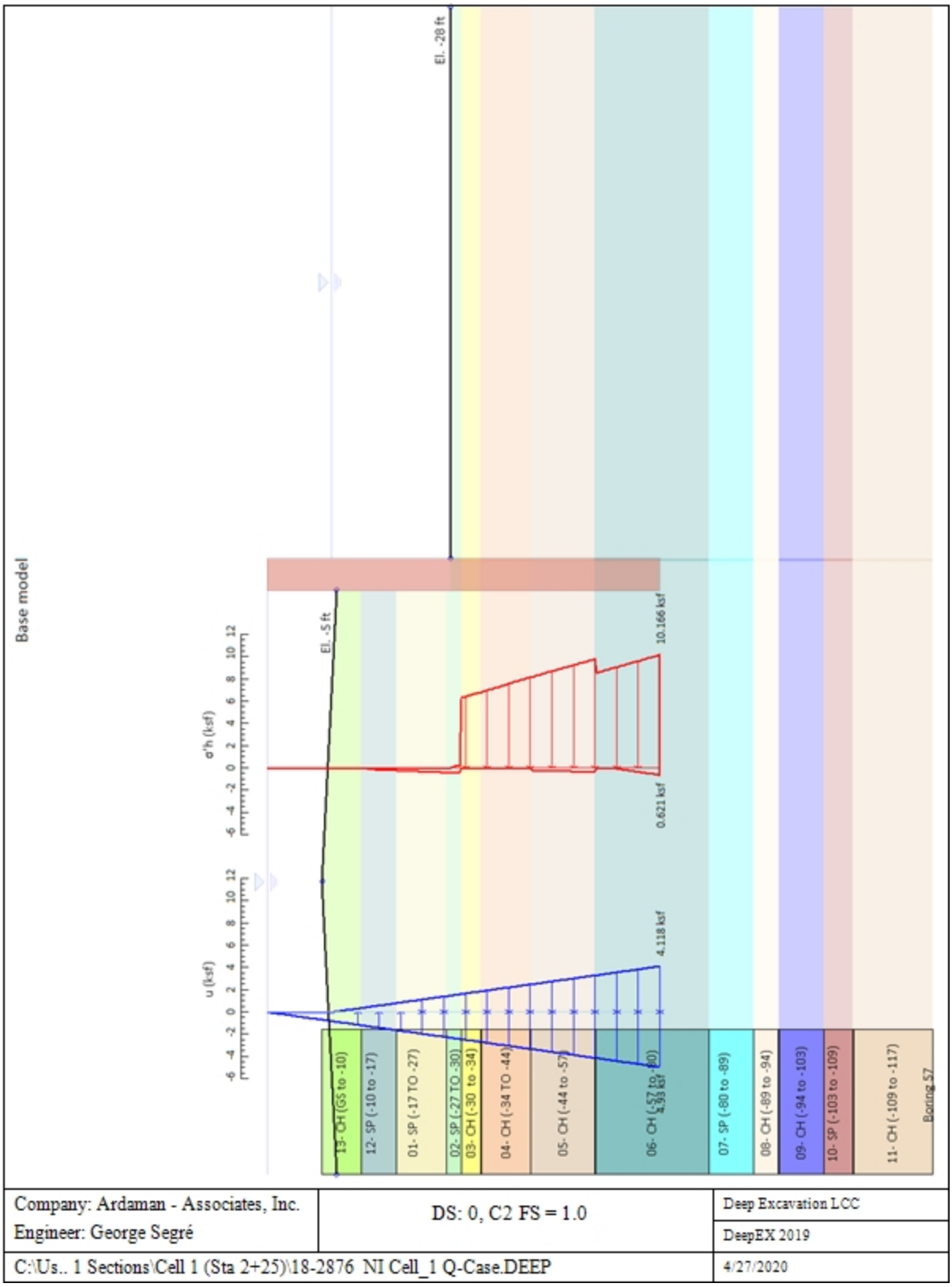
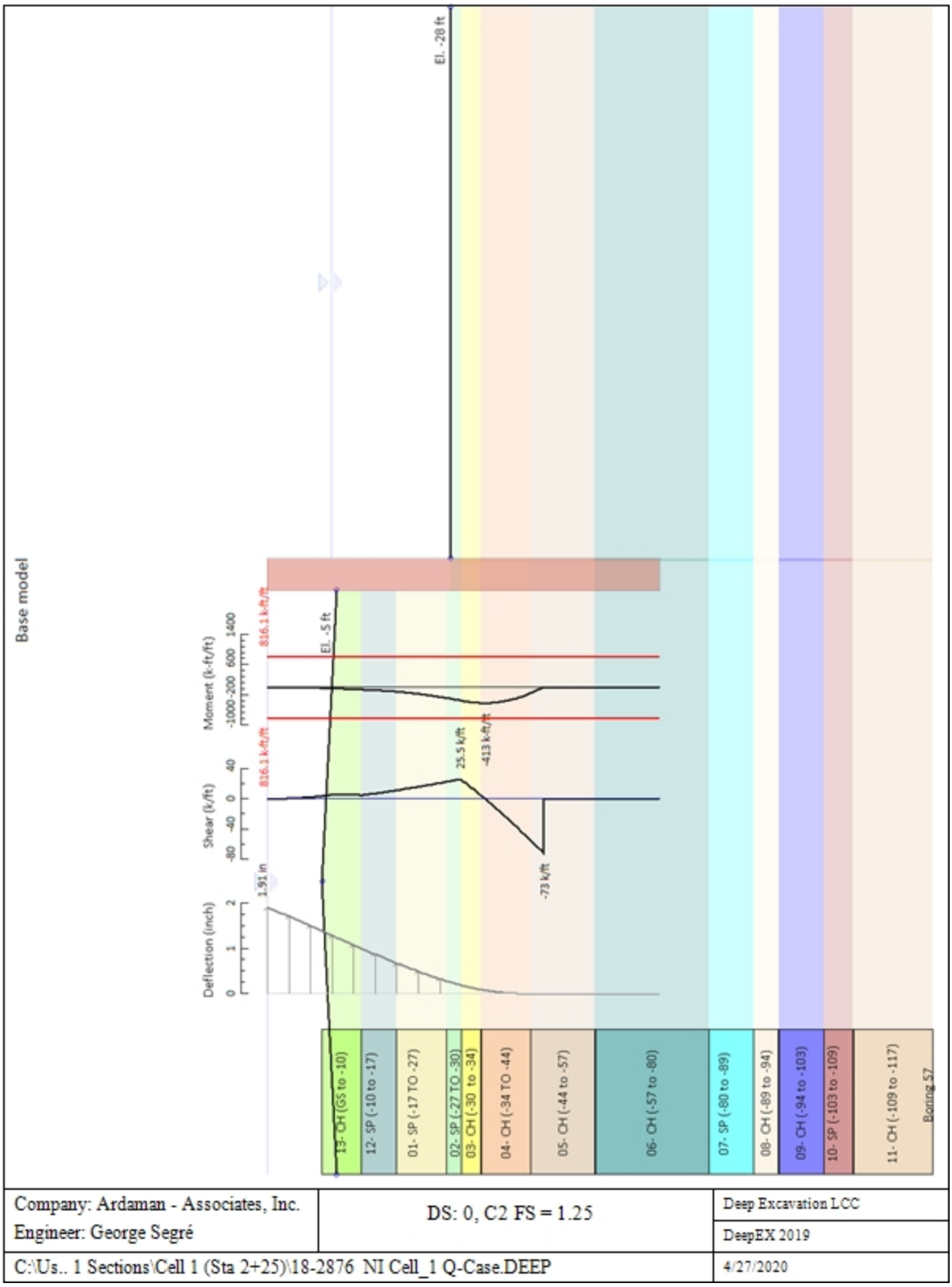

Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
10.166 ksf
0.621 ksf
4.118 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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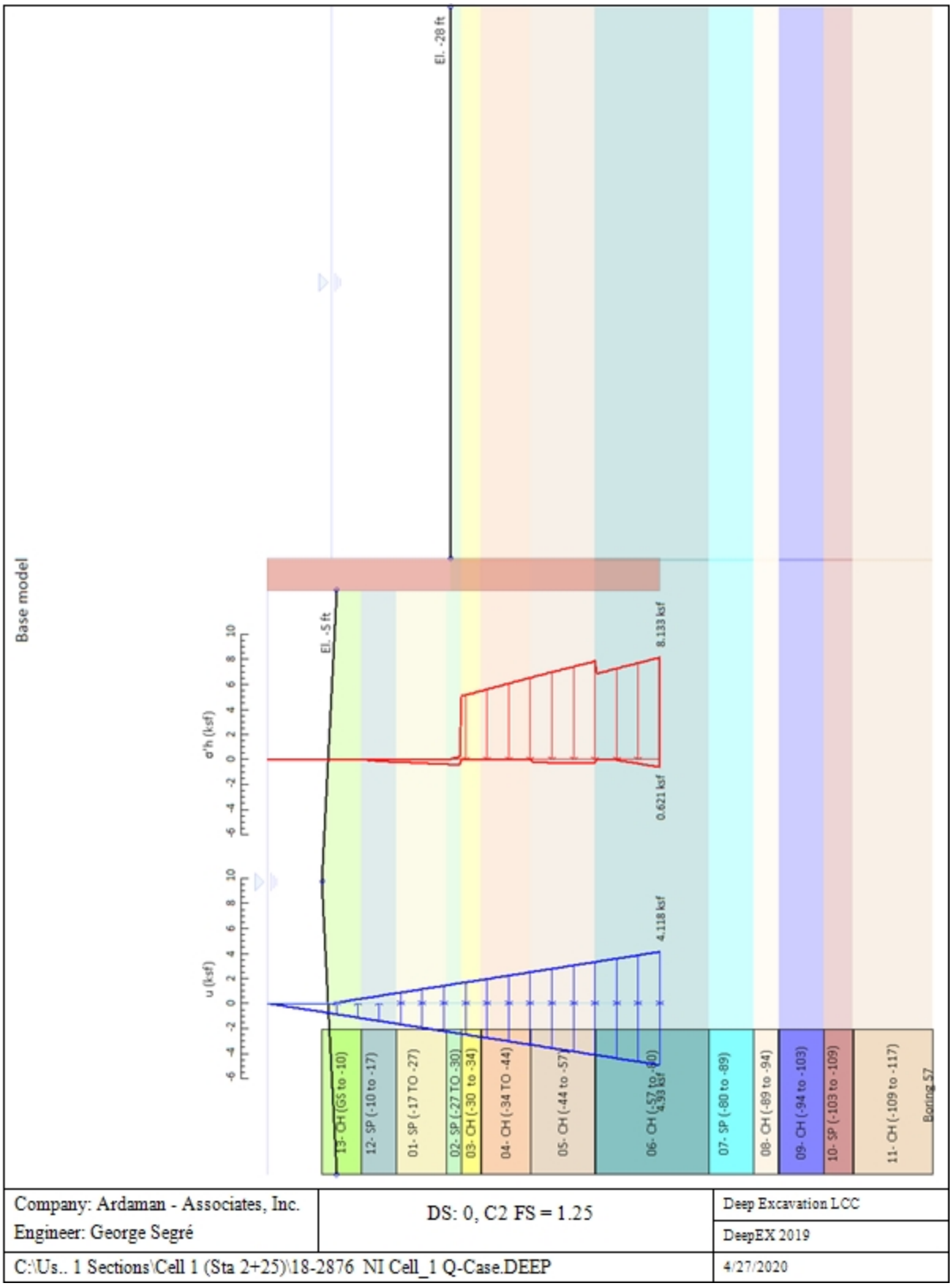
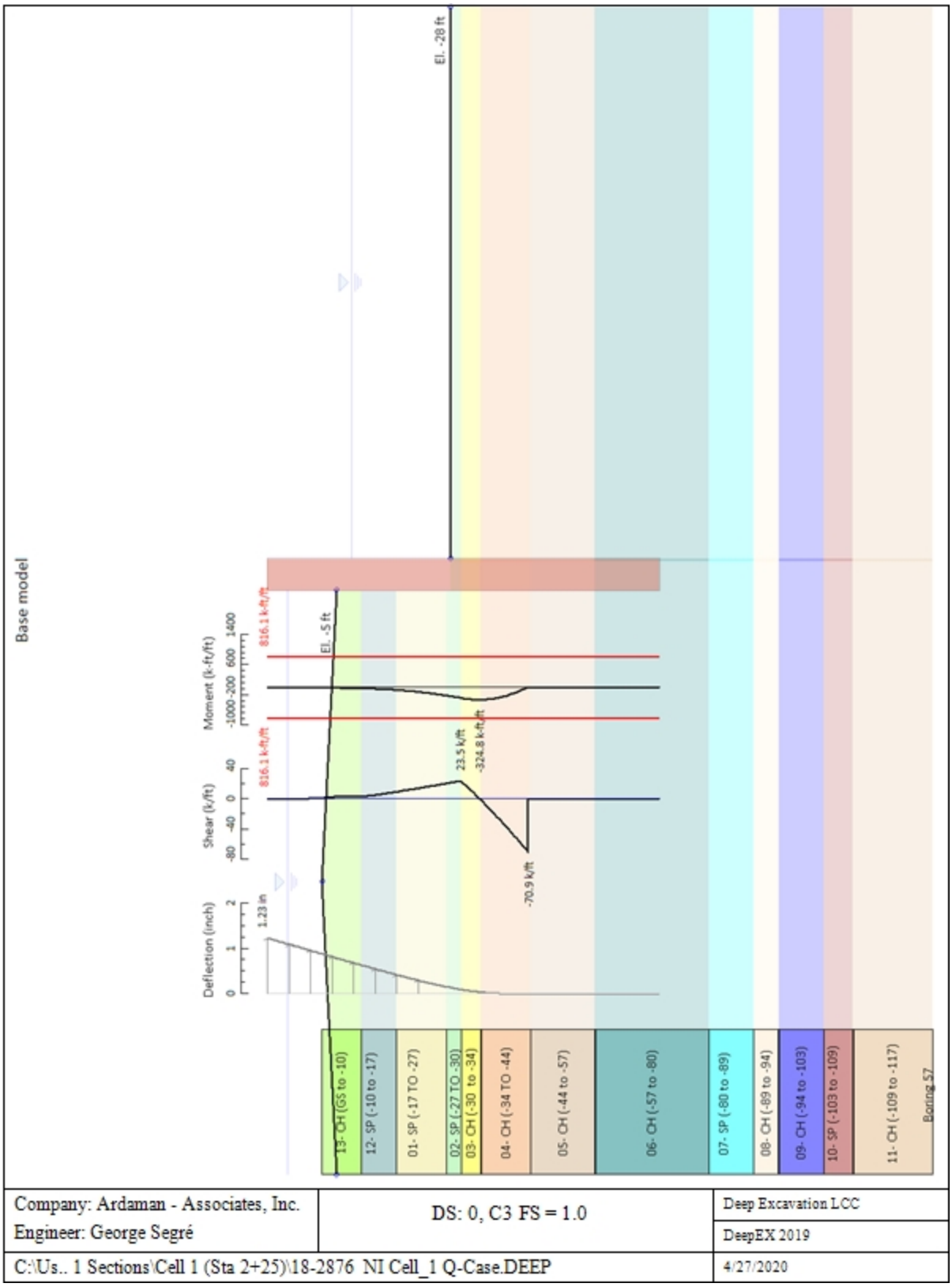
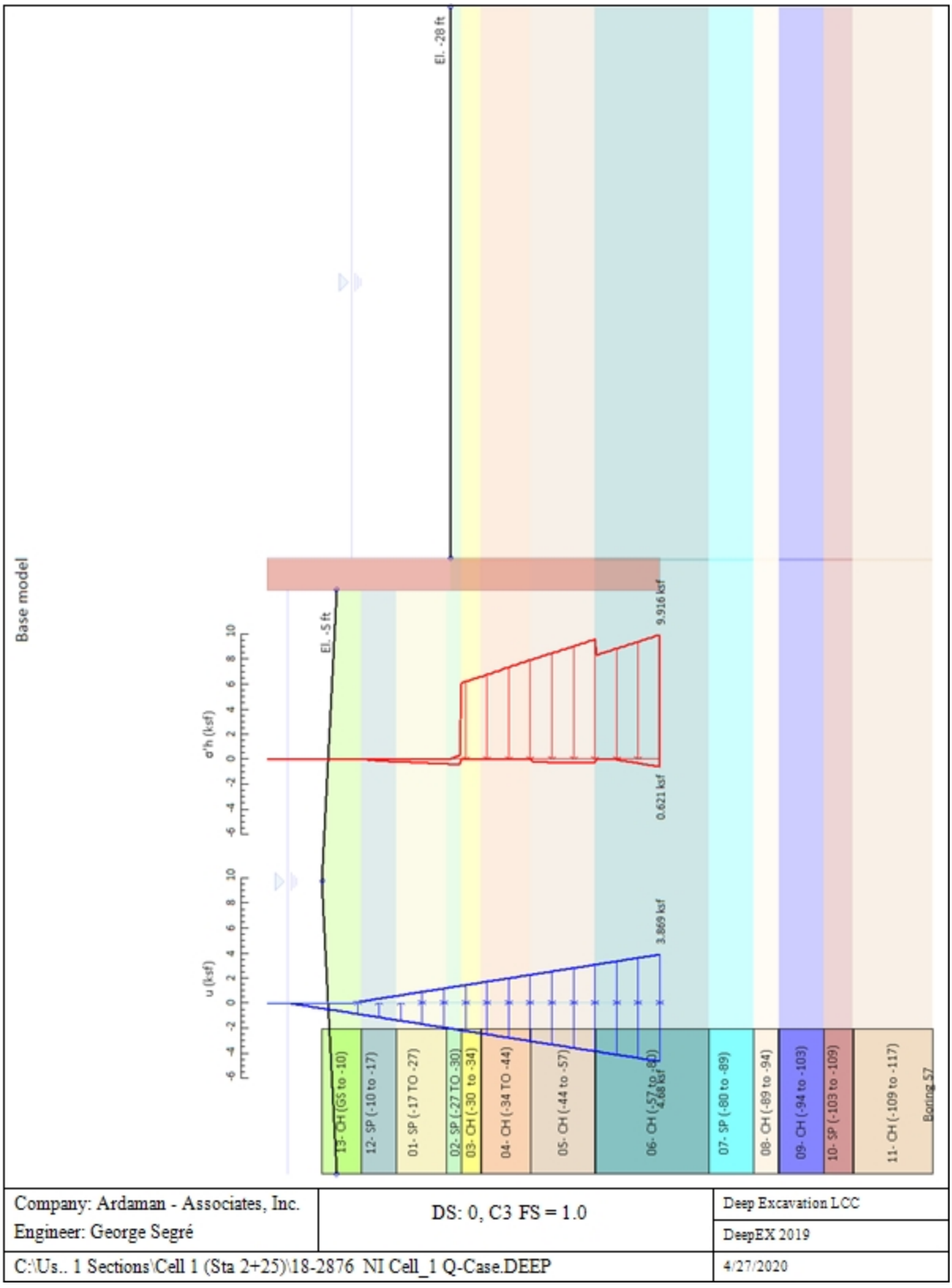

Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
8.133 ksf
0.621 ksf
4.118 ksf
4.93 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP		4/27/2020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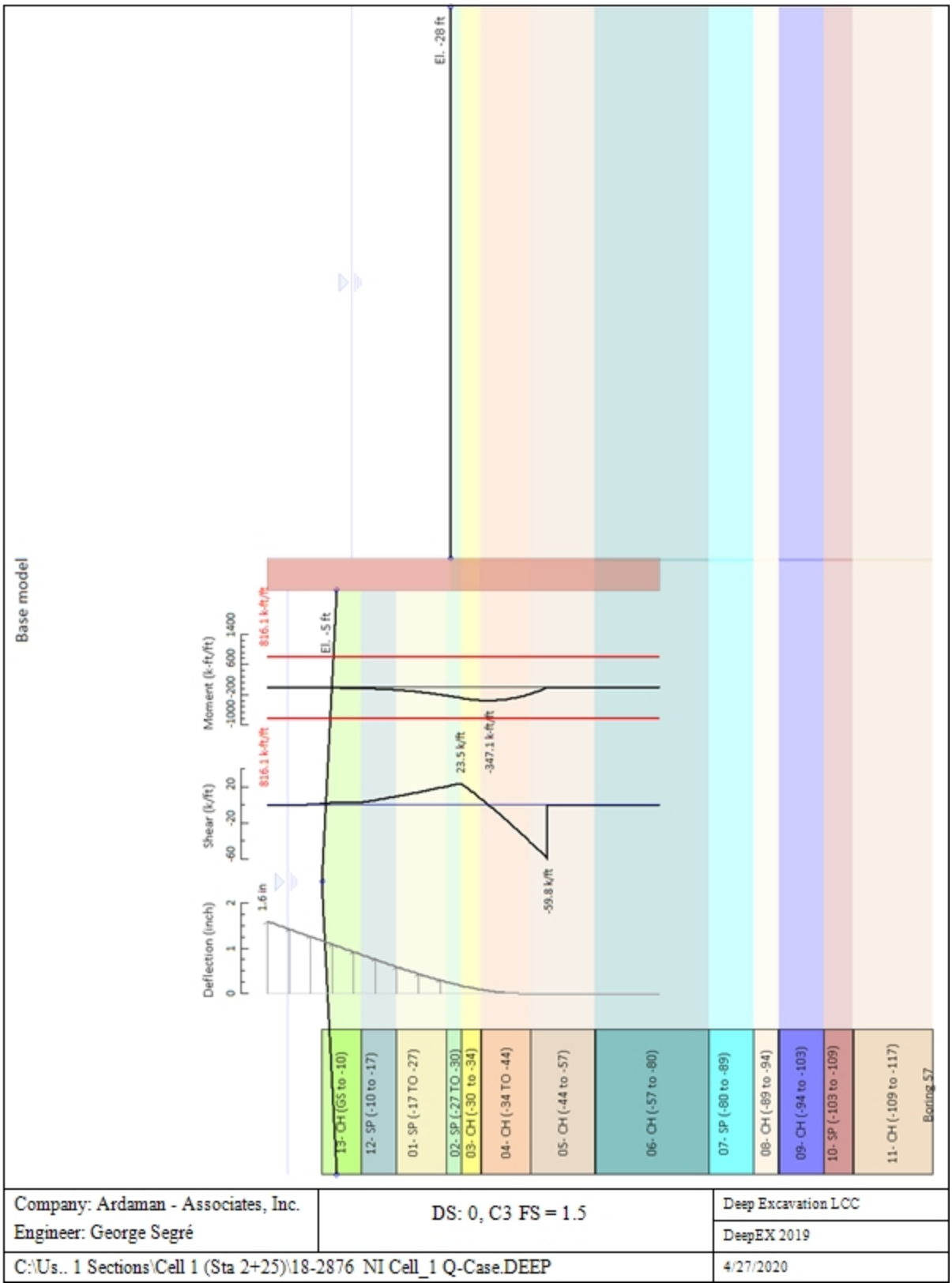
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
9.916 ksf
0.621 ksf
3.869 ksf
4.88 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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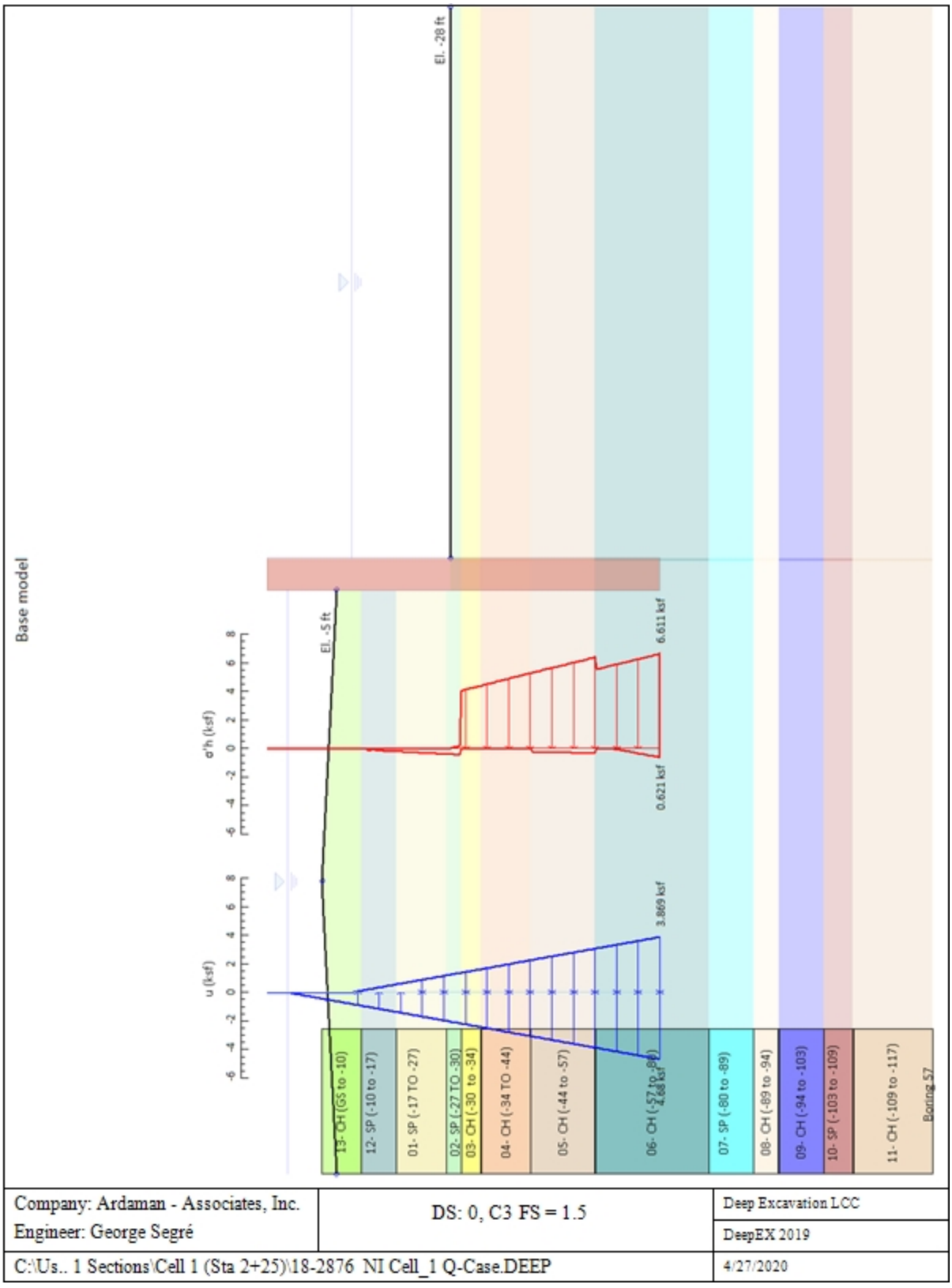
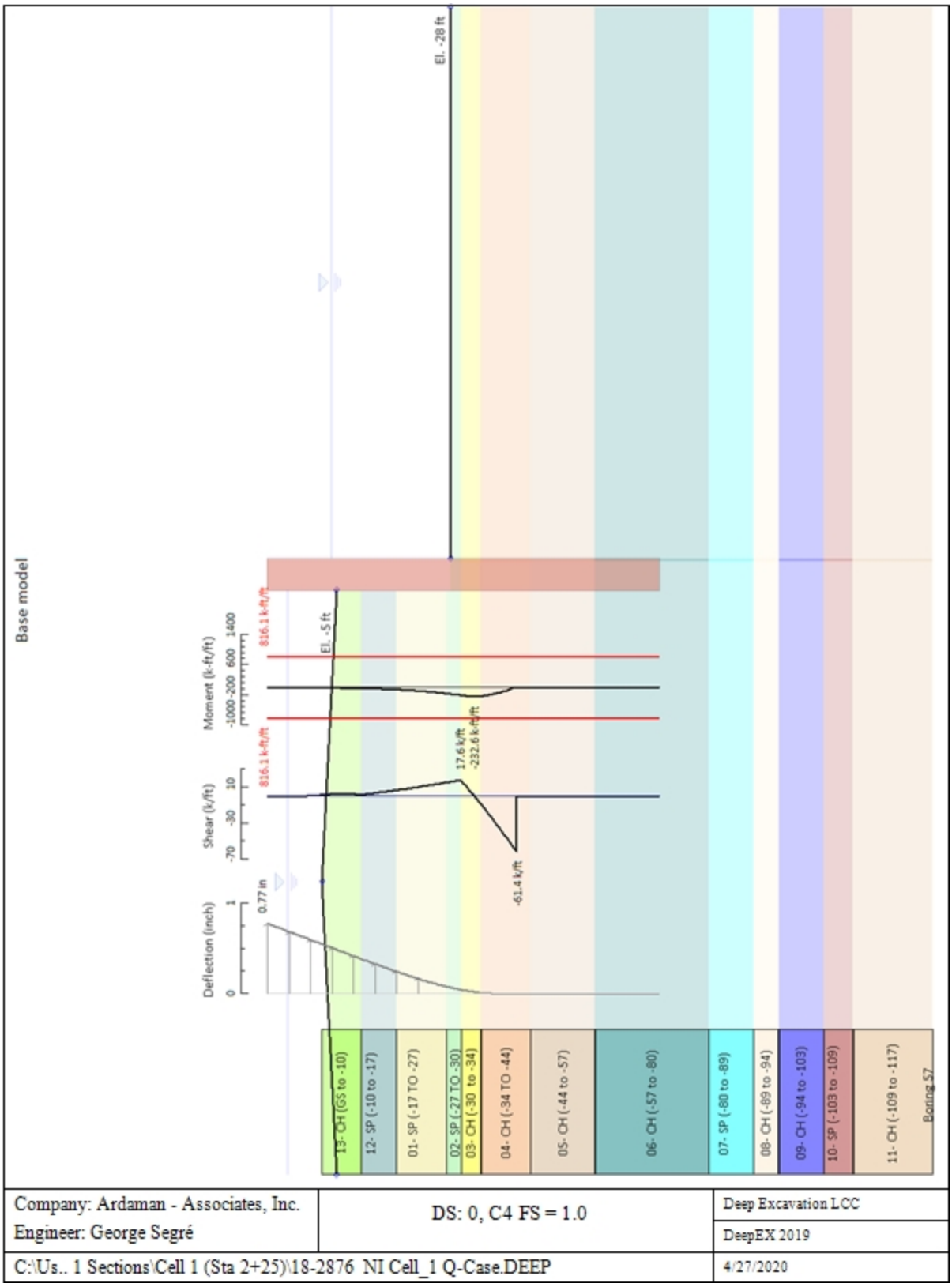


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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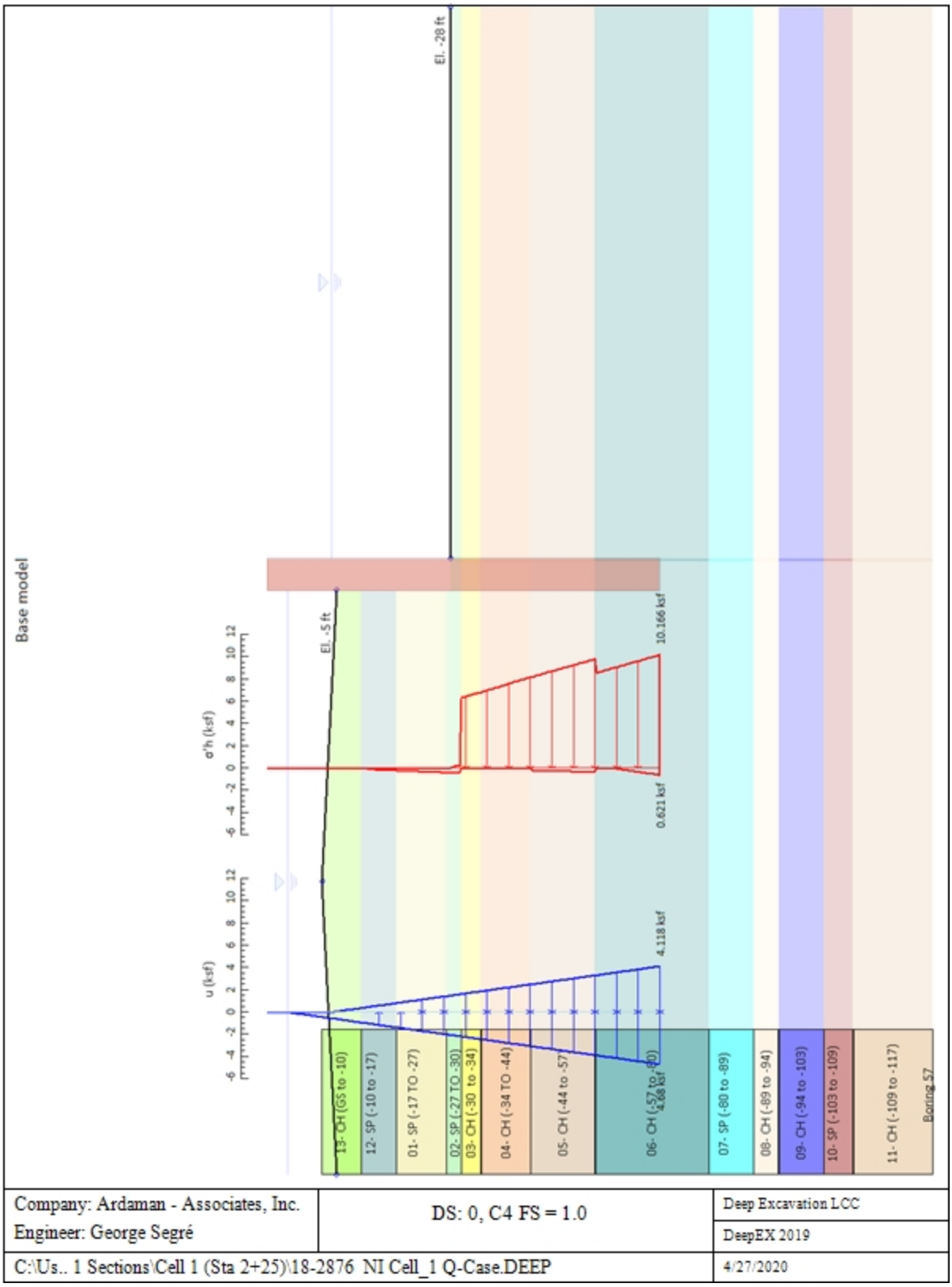
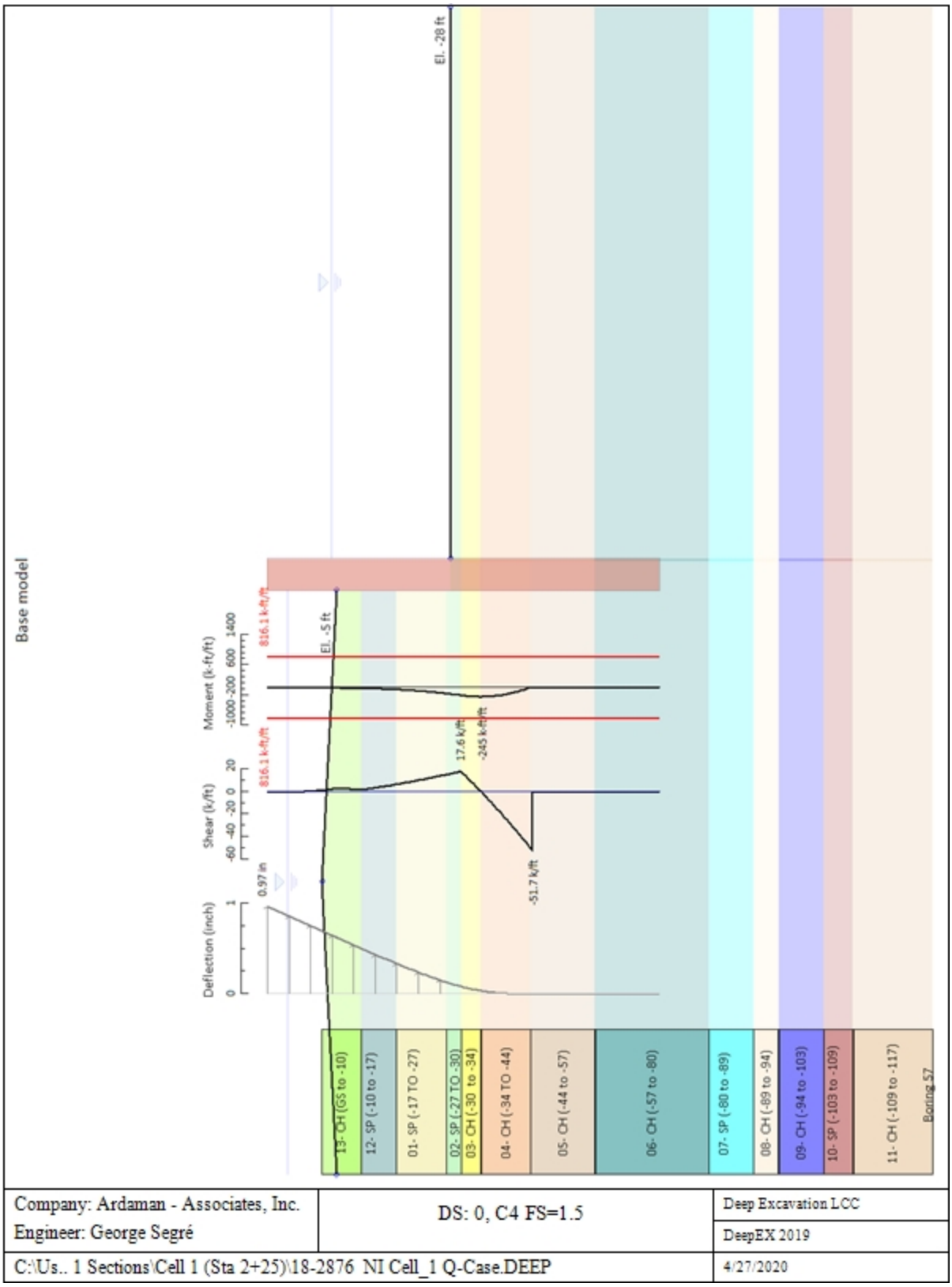
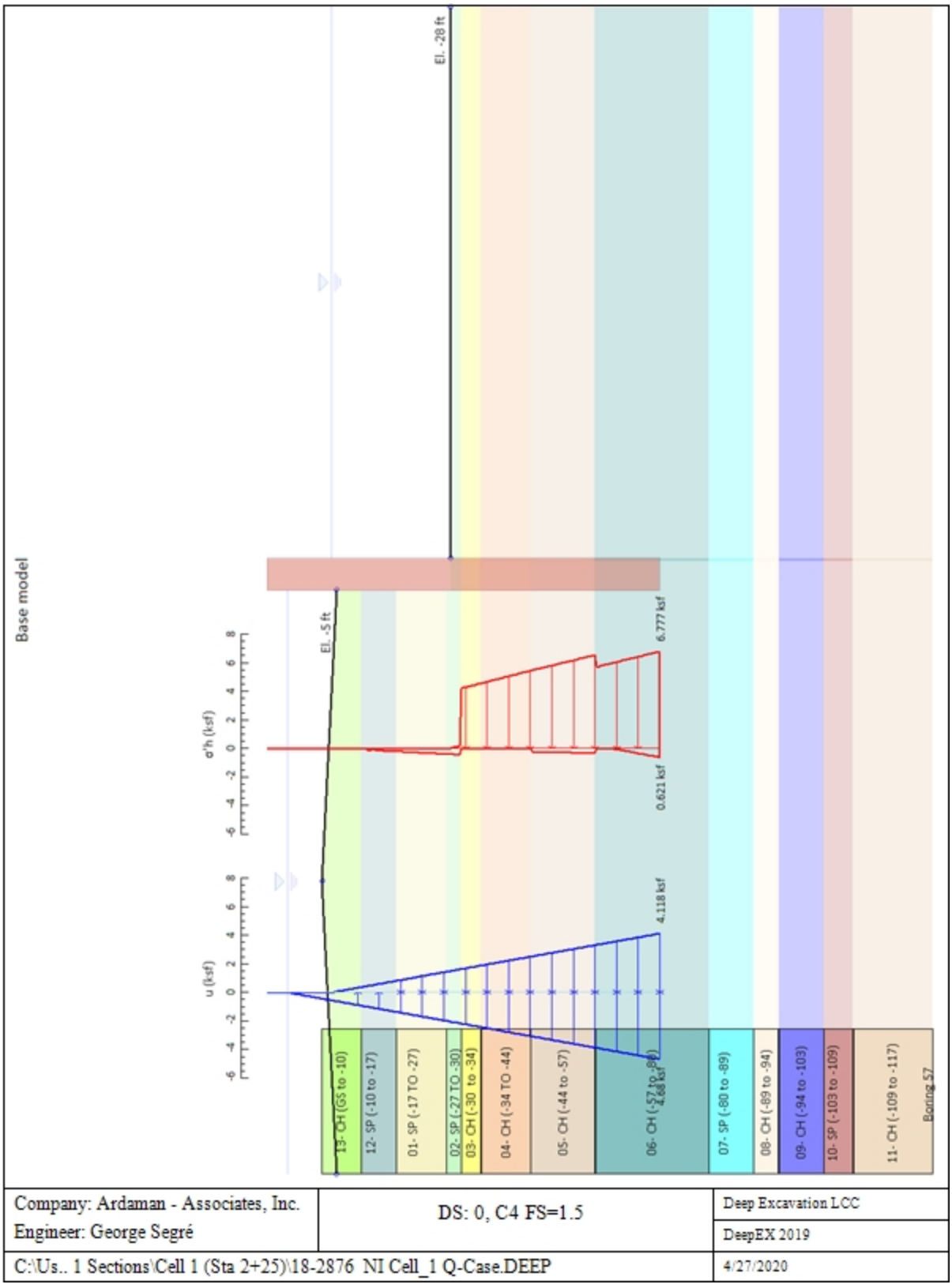

Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
10.166 ksf
0.621 ksf
4.118 ksf
4.68 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS=1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP		4/27/2020


Base model
El. -28 ft
El. -5 ft
σ'h (ksf)
u (ksf)
6.777 ksf
0.621 ksf
4.118 ksf
4.68 ksf
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS=1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:34:01 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
13- CH (GS to	112	112	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (GS TO	115	115	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	33	0	N/A	N/A	N/A	60	3	0.3	3.39	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	26	0	N/A	N/A	N/A	150	3	0.39	2.56	N/A	N/A	True	Linear	
04- CH (-34 T	134	134	26	0	N/A	N/A	N/A	521.92	3	0.39	2.56	N/A	N/A	True	Linear	
05- CH (-44 to	126	126	26	0	N/A	N/A	N/A	417.54	3	0.39	2.56	N/A	N/A	True	Linear	
06- CH (-57 to	127	127	26	0	N/A	N/A	N/A	626.3	3	0.39	2.56	N/A	N/A	True	Linear	
07- SP (-80 to	122	122	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- CH (-94 to	120	120	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
10- SP (-103 t	120	120	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
13- CH (GS to	0.35	-	-	0.609	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (GS TO	0.4	-	-	0.455	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.455	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	-	-	0.562	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	-	-	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	-	-	0.562	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	-	-	0.562	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.455	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	-	-	0.562	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.455	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	-	-	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

Top Elev= superior SOil level

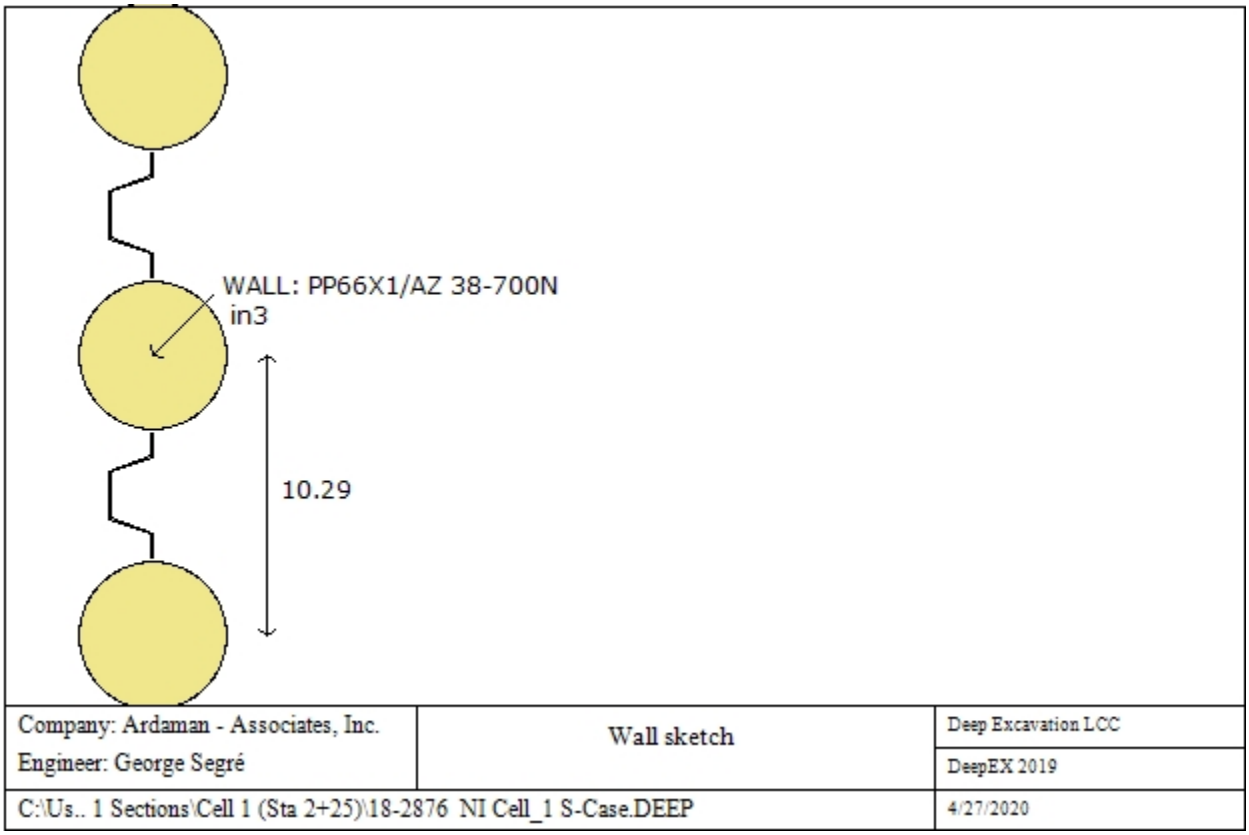
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
-2	13- CH (GS to -	1	0.61
-10	12- SP (-10 to -	1	0.5
-17	01- SP (GS TO	1	0.46
-27	02- SP (-27 TO	1	0.46
-30	03- CH (-30 to	1	0.56
-34	04- CH (-34 TO	1	0.56
-44	05- CH (-44 to	1	0.56
-57	06- CH (-57 to	1	0.56
-80	07- SP (-80 to -	1	0.46
-89	08- CH (-89 to	1	0.56
-94	09- CH (-94 to	1	0.56
-103	10- SP (-103 to	1	0.46
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall

Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)

rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.342	1.342	1.694
Stage 1	Simple span	N/A	1.6	1.178	1.178	1.473
Stage 2	Simple span	N/A	1.6	1.4	1.4	1.737
Stage 3	Simple span	N/A	1.6	1.236	1.236	1.515
Stage 4	Simple span	N/A	1.6	1.446	1.446	1.779
Stage 5	Simple span	N/A	1.6	1.152	1.152	1.391
Stage 6	Simple span	N/A	1.6	1.509	1.509	1.823
Stage 7	Simple span	N/A	1.6	1.215	1.215	1.436

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

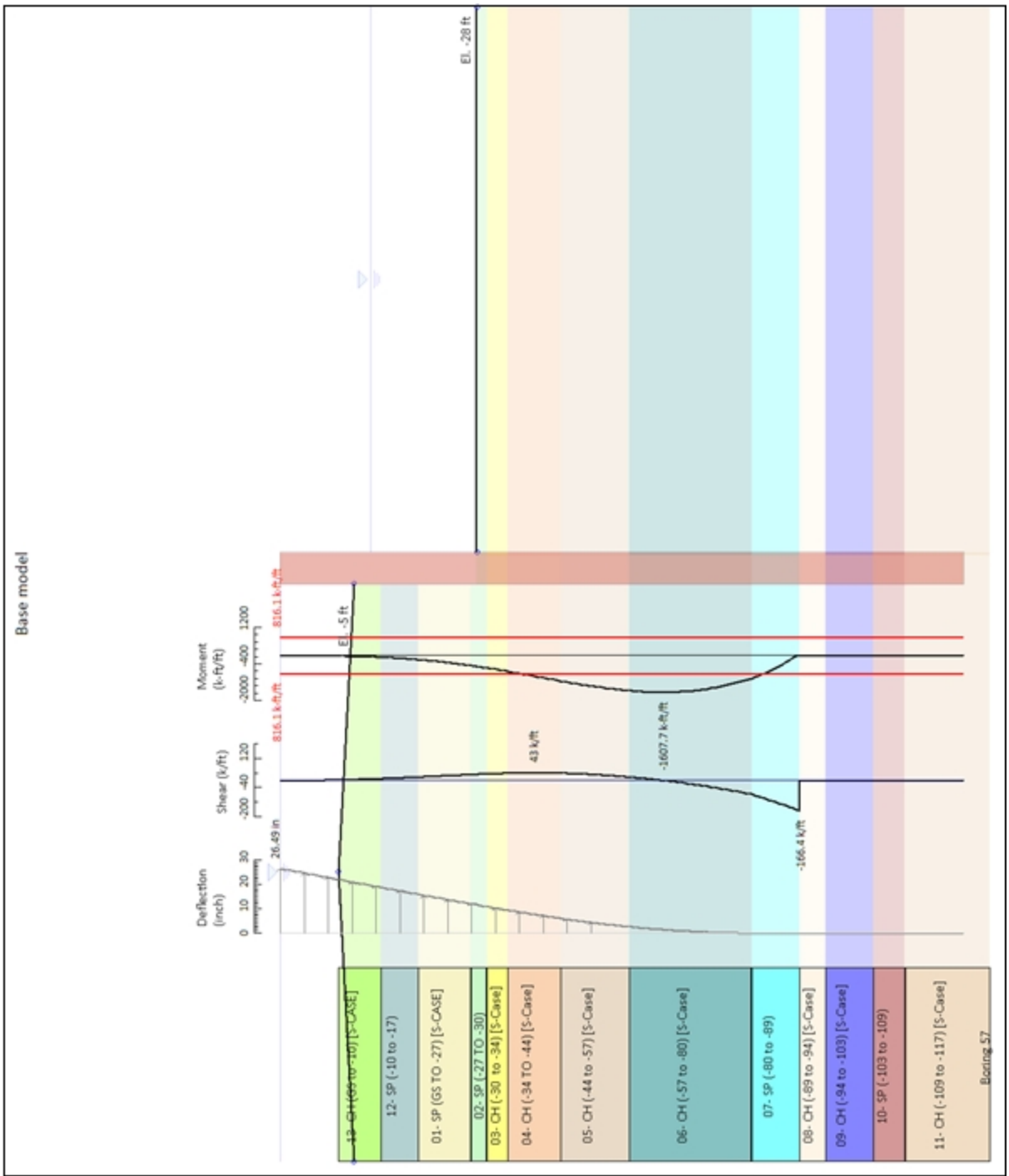
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

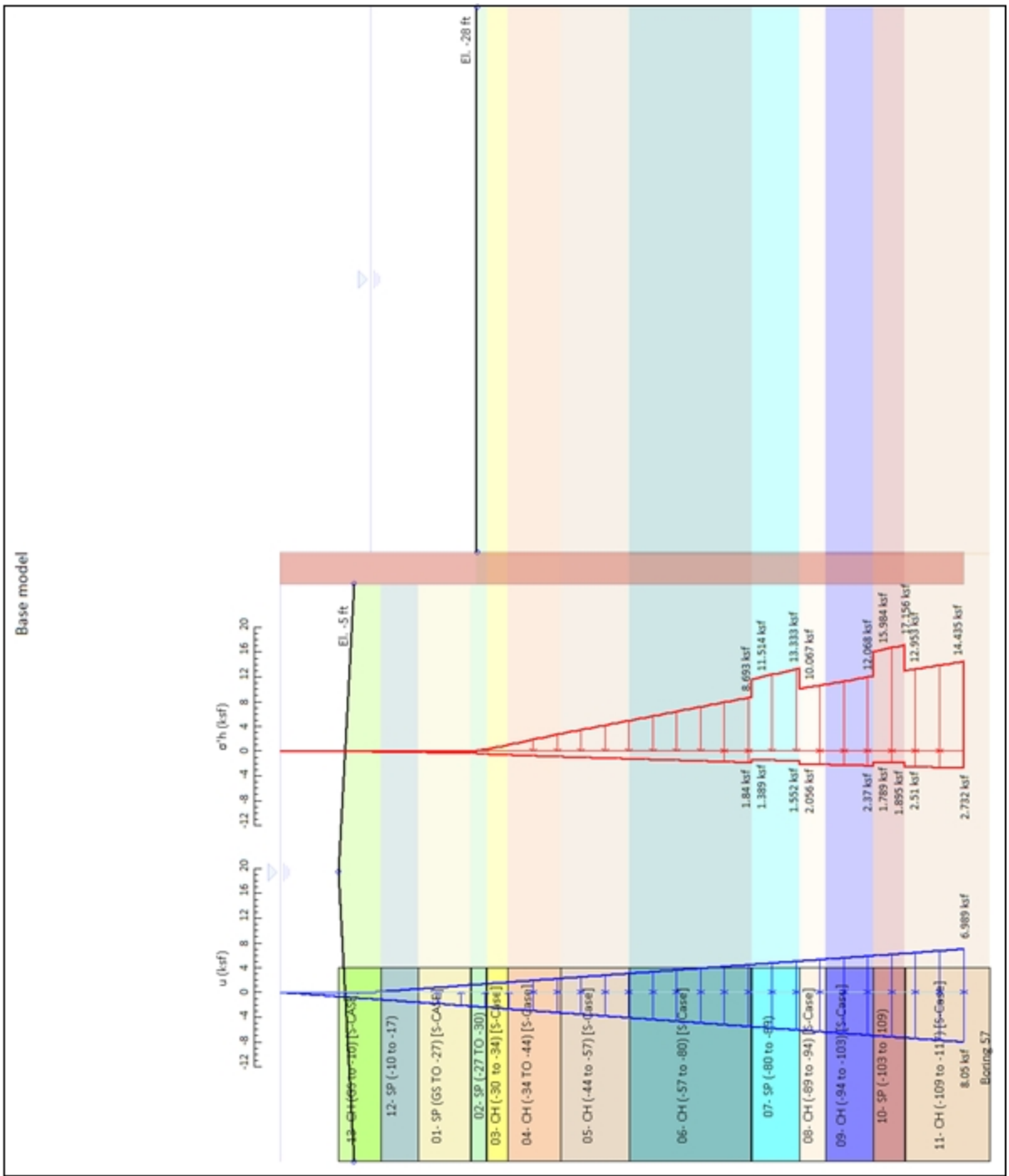
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

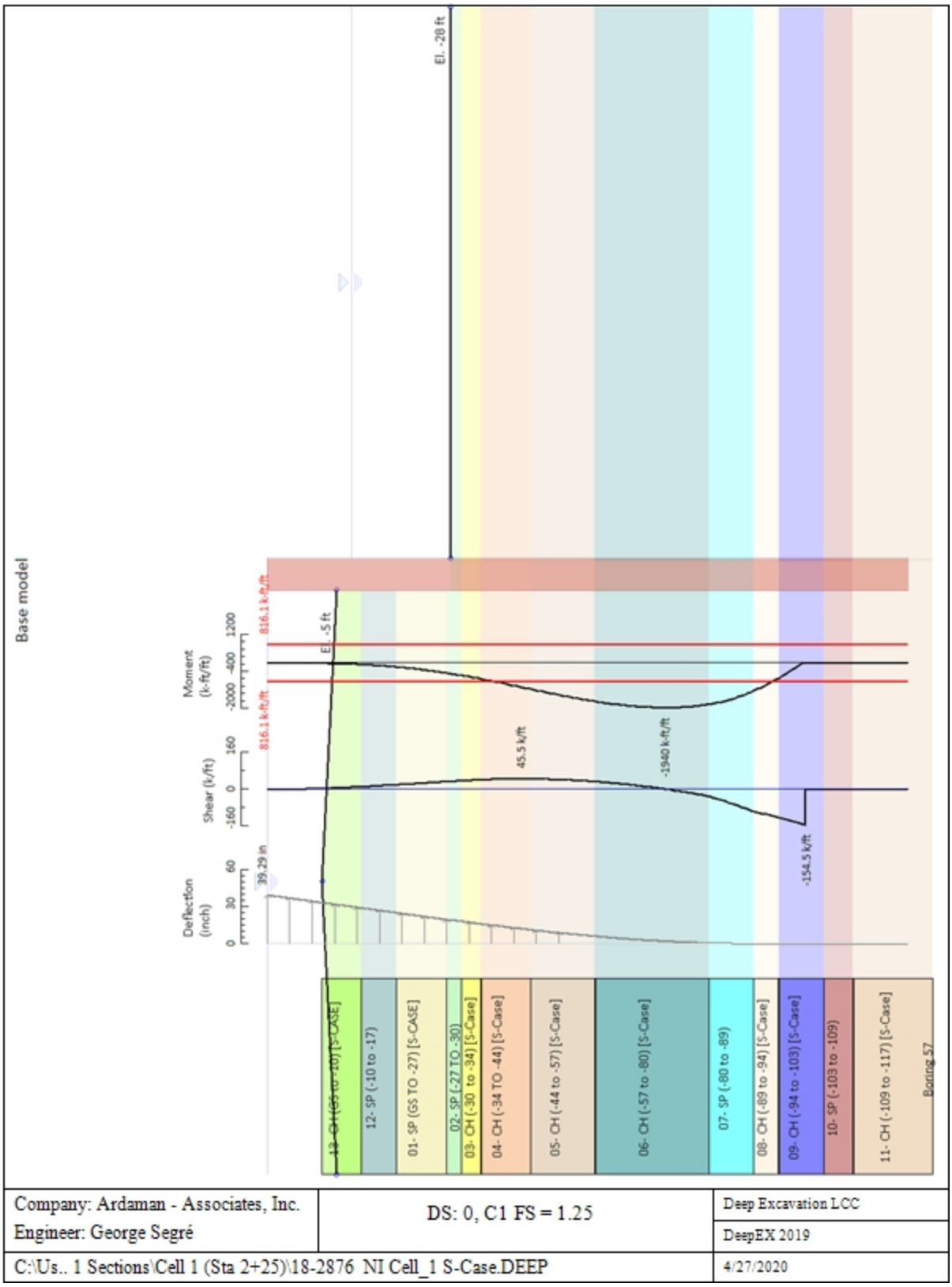
A sequence of figures for each excavation stage is reported



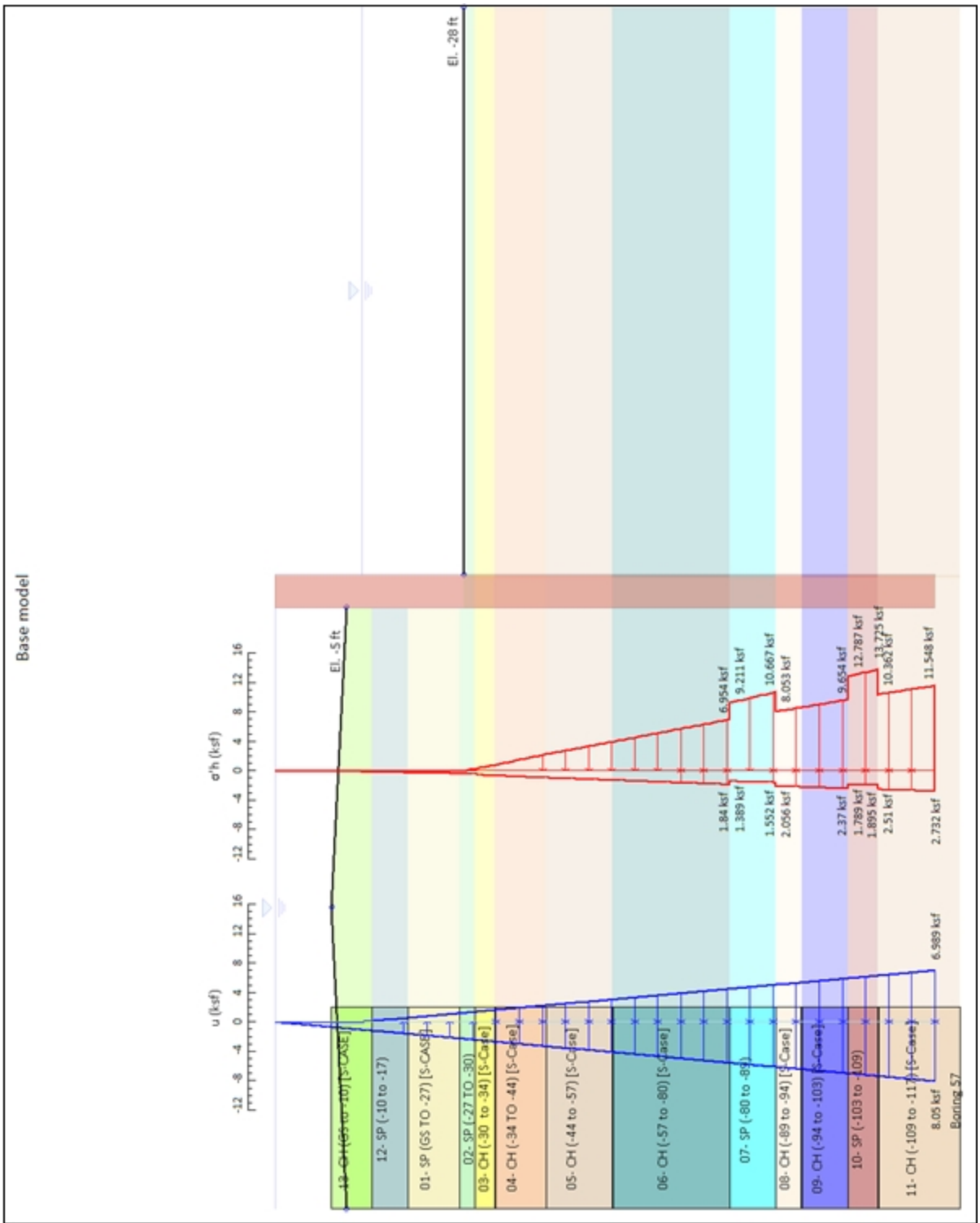
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



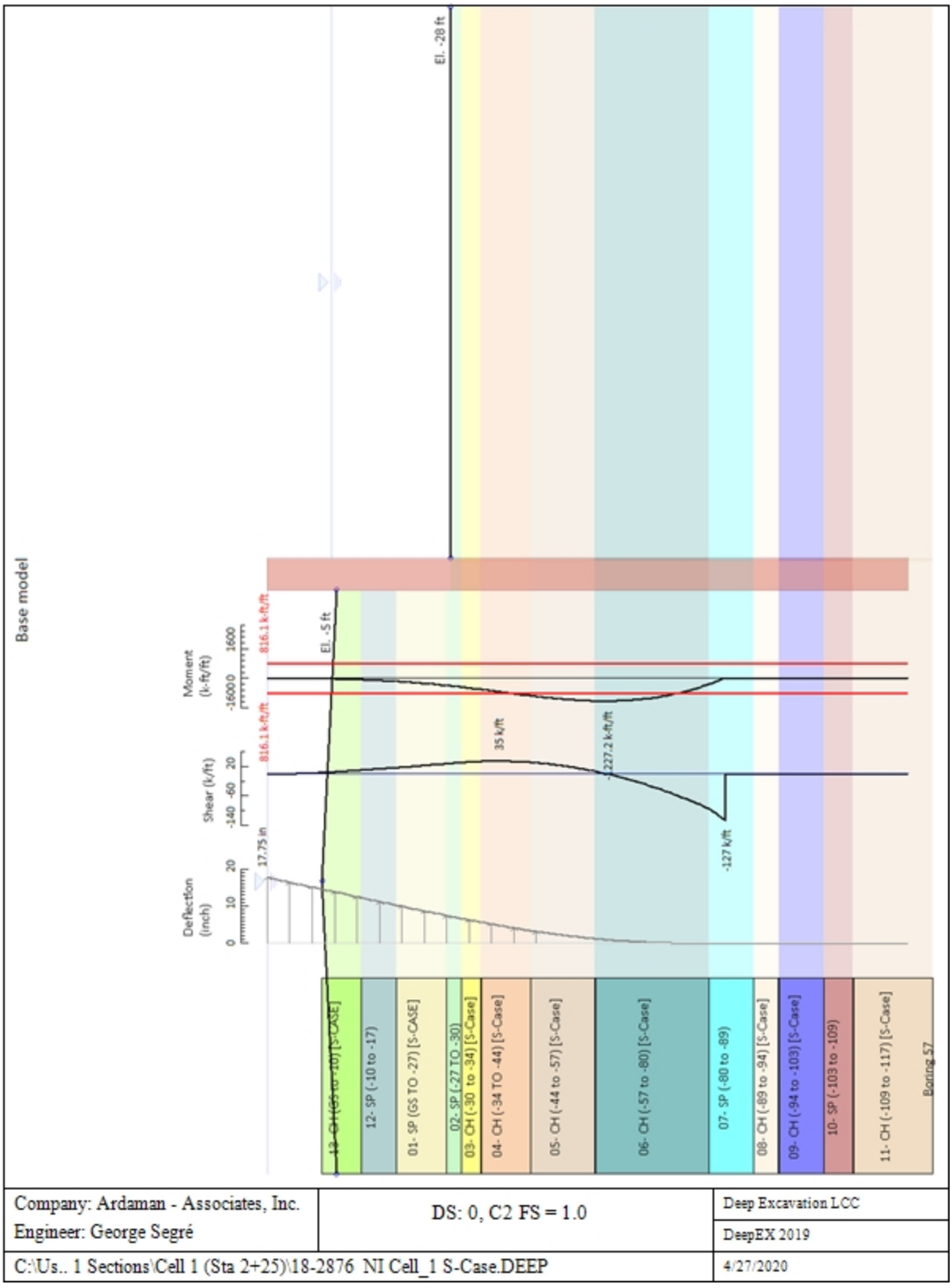
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

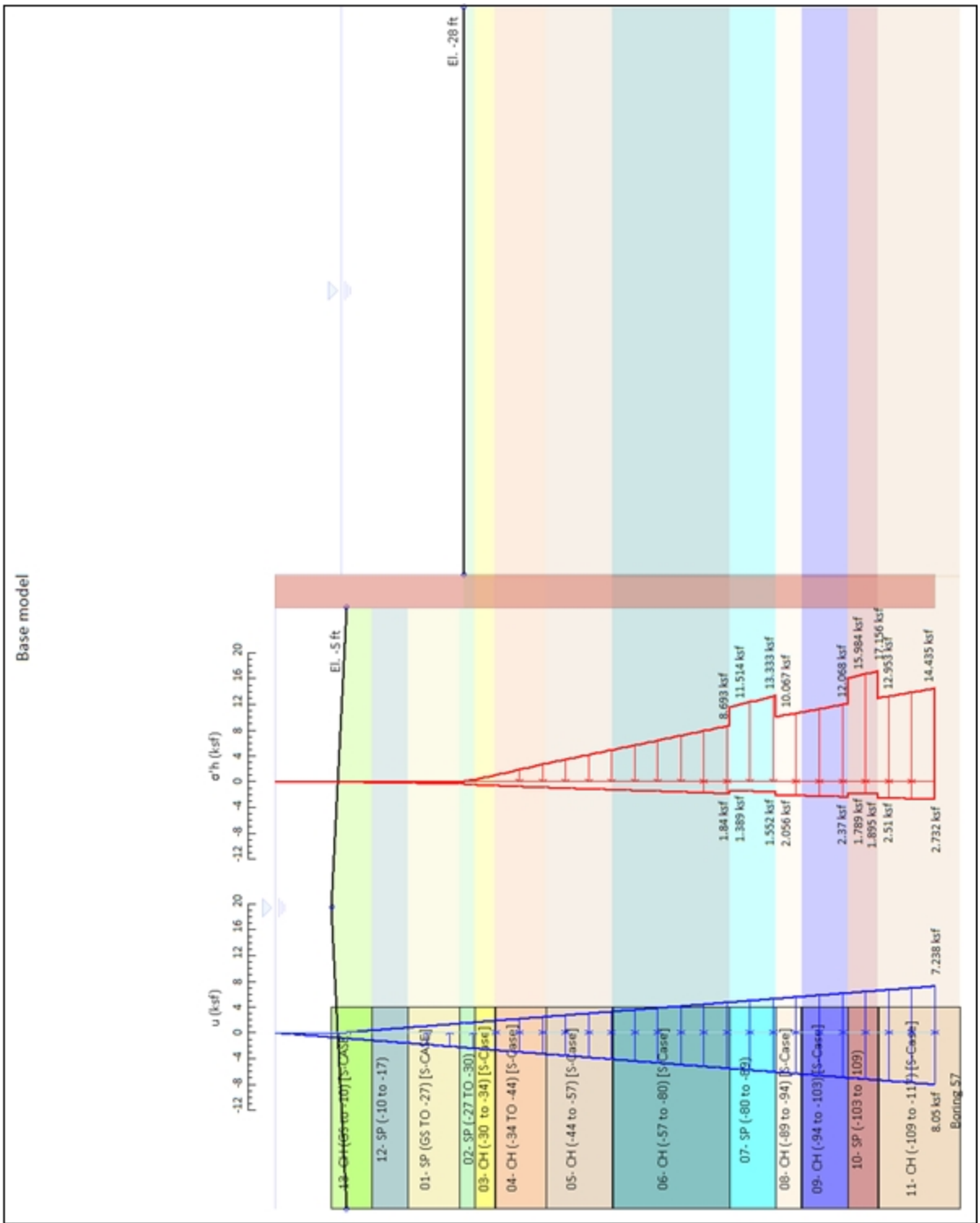


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

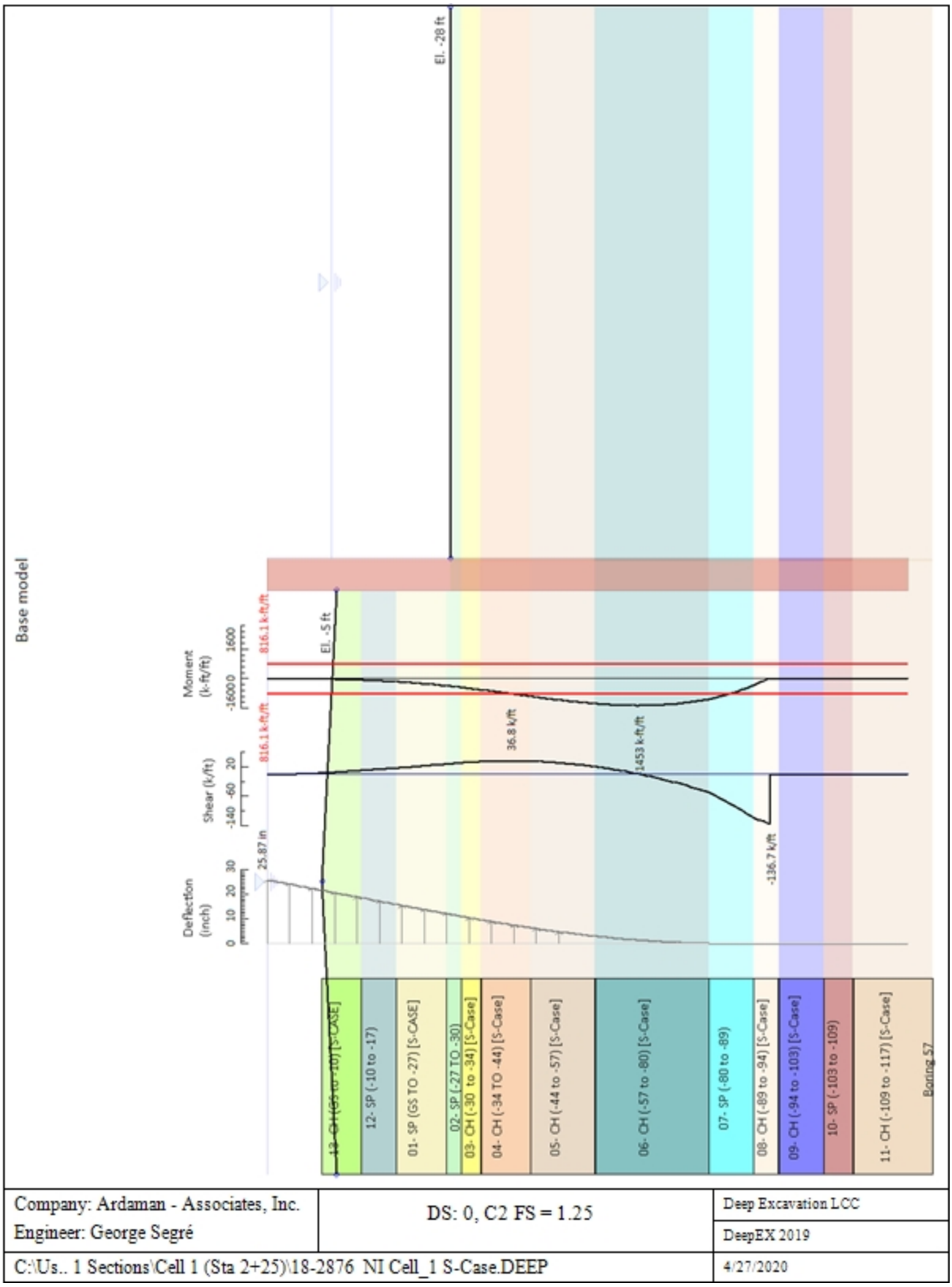


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

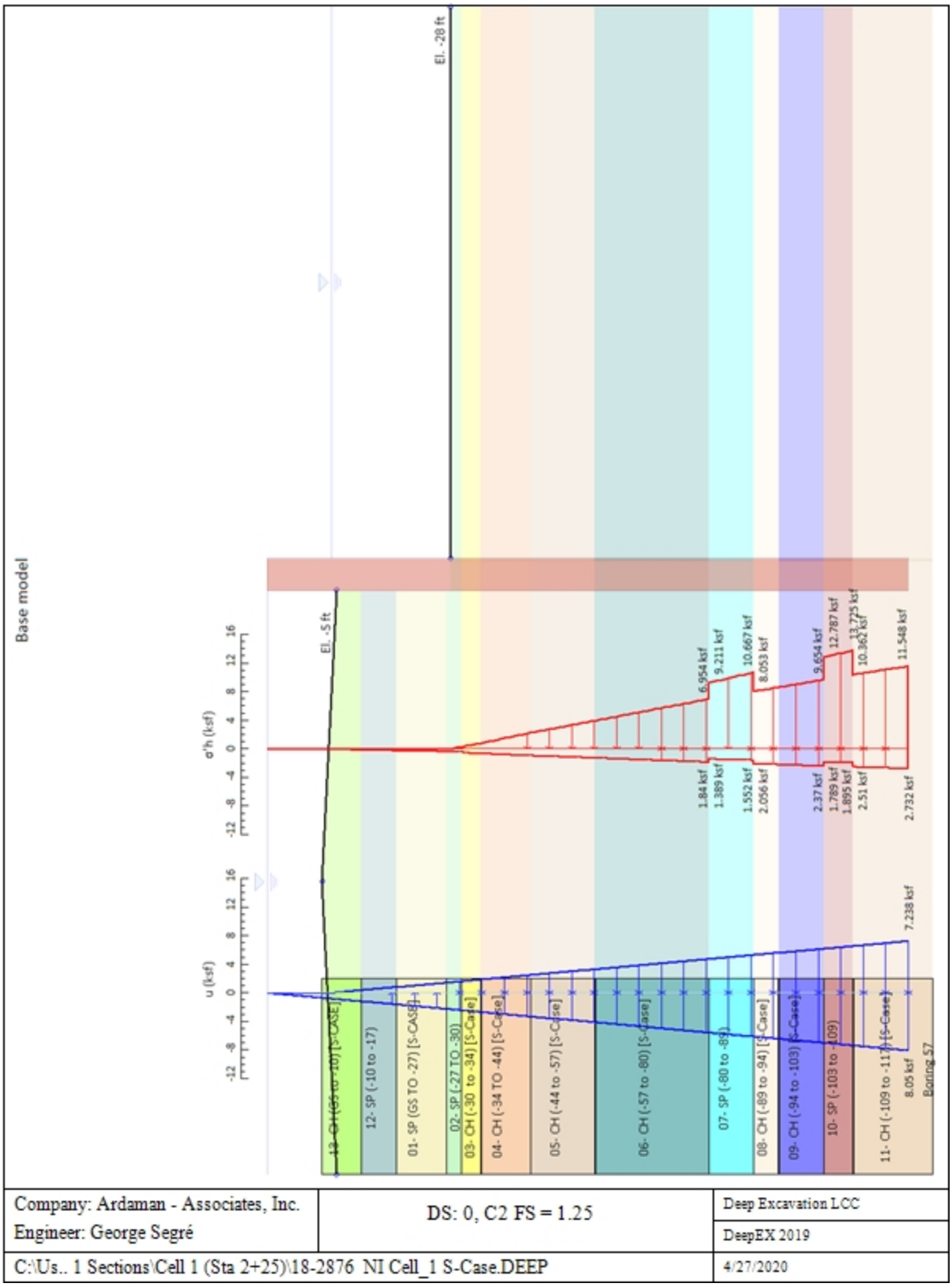

Base model
El. -28 ft
El. -5 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
35 k/ft
-227.2 k-ft/ft
-127 k/ft
Deflection (inch)
0 10 20
17.75 in
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



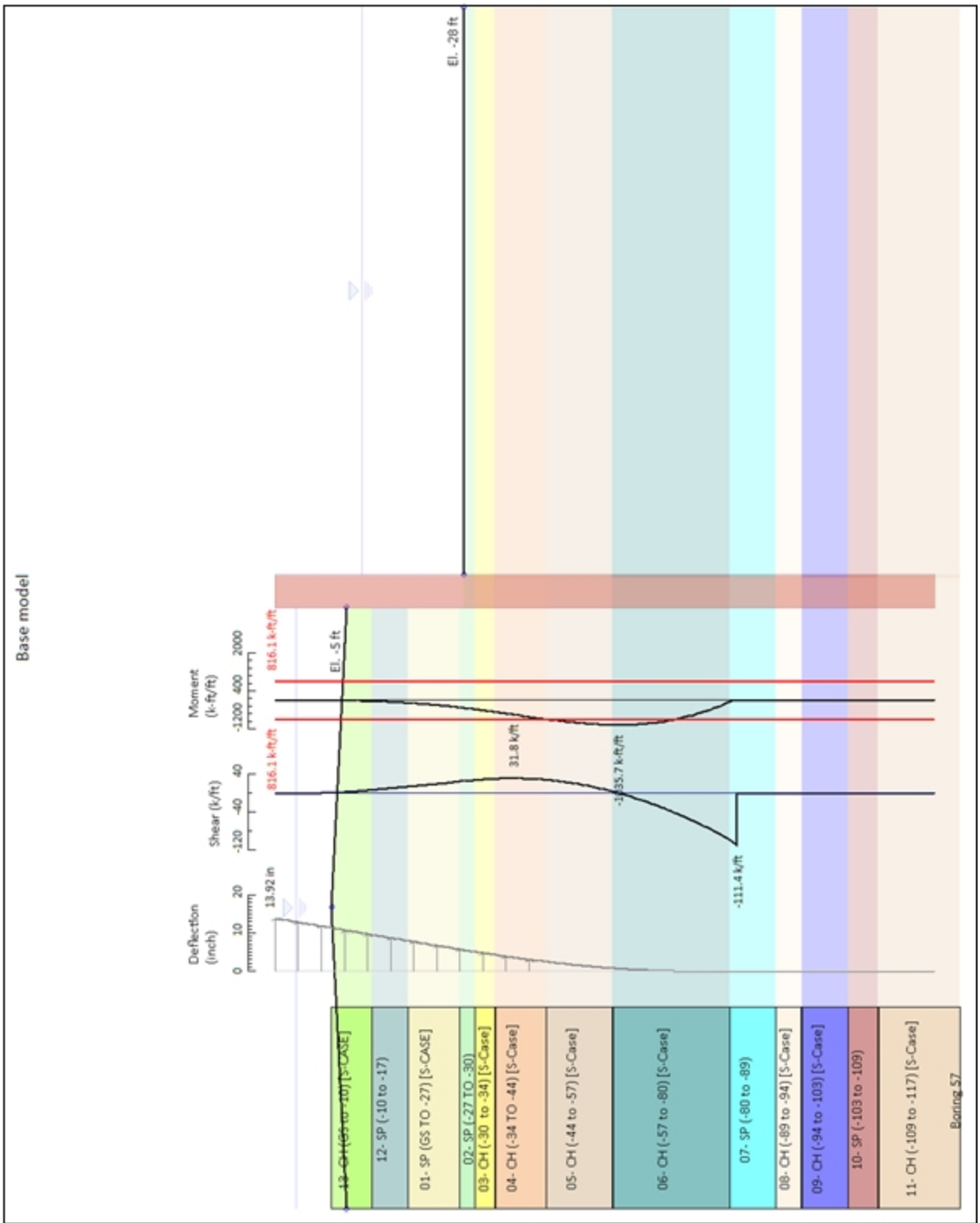
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

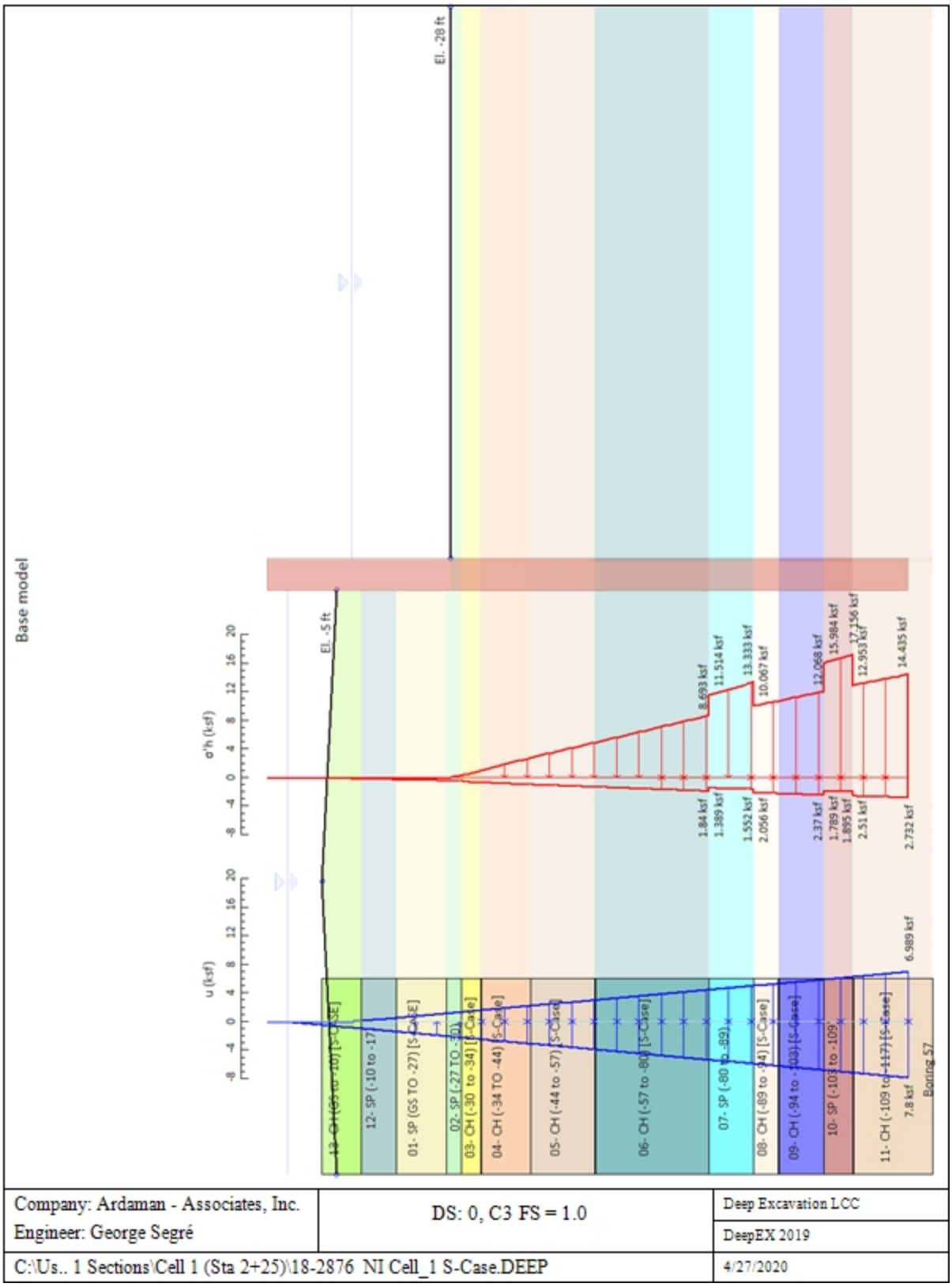


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

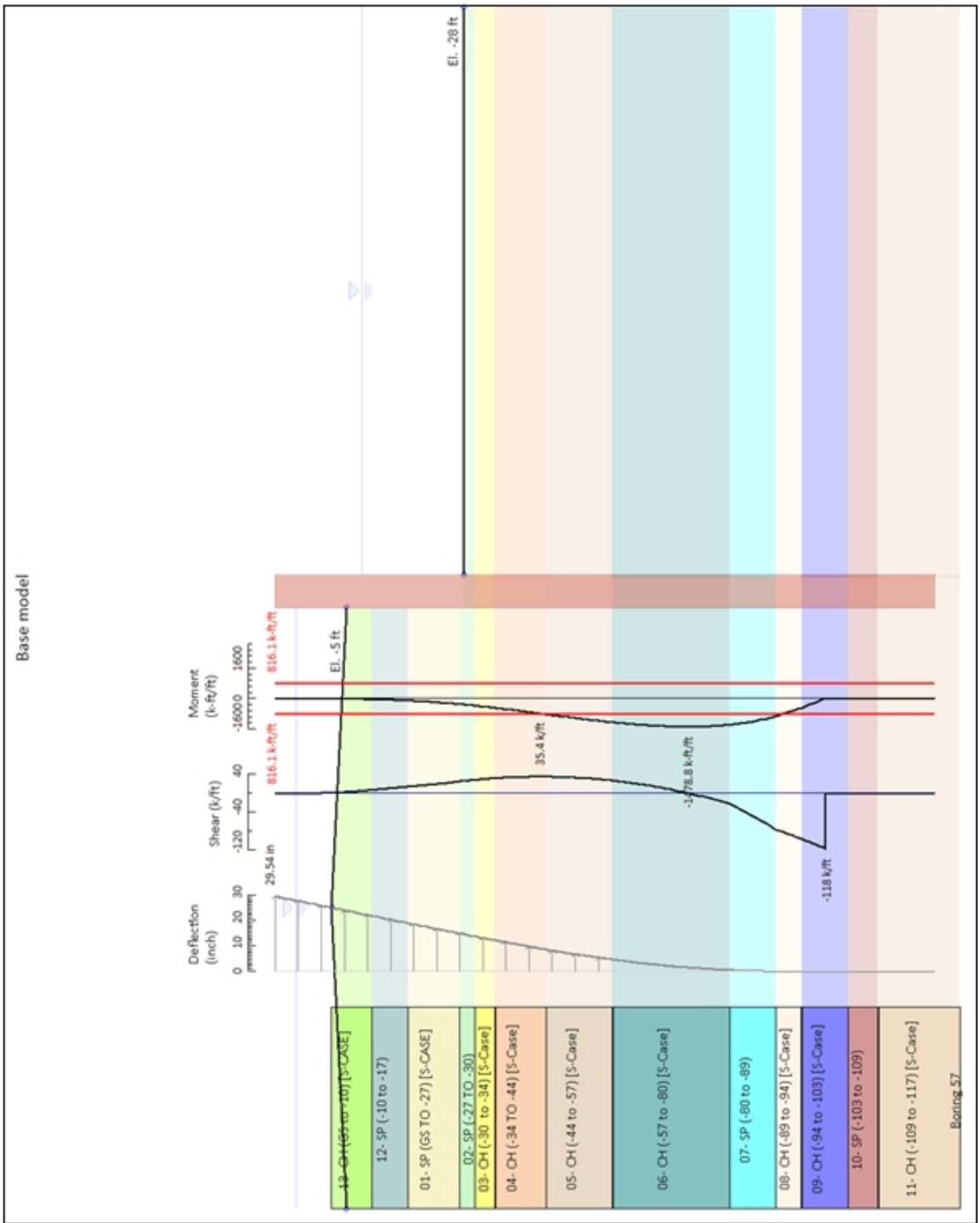


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

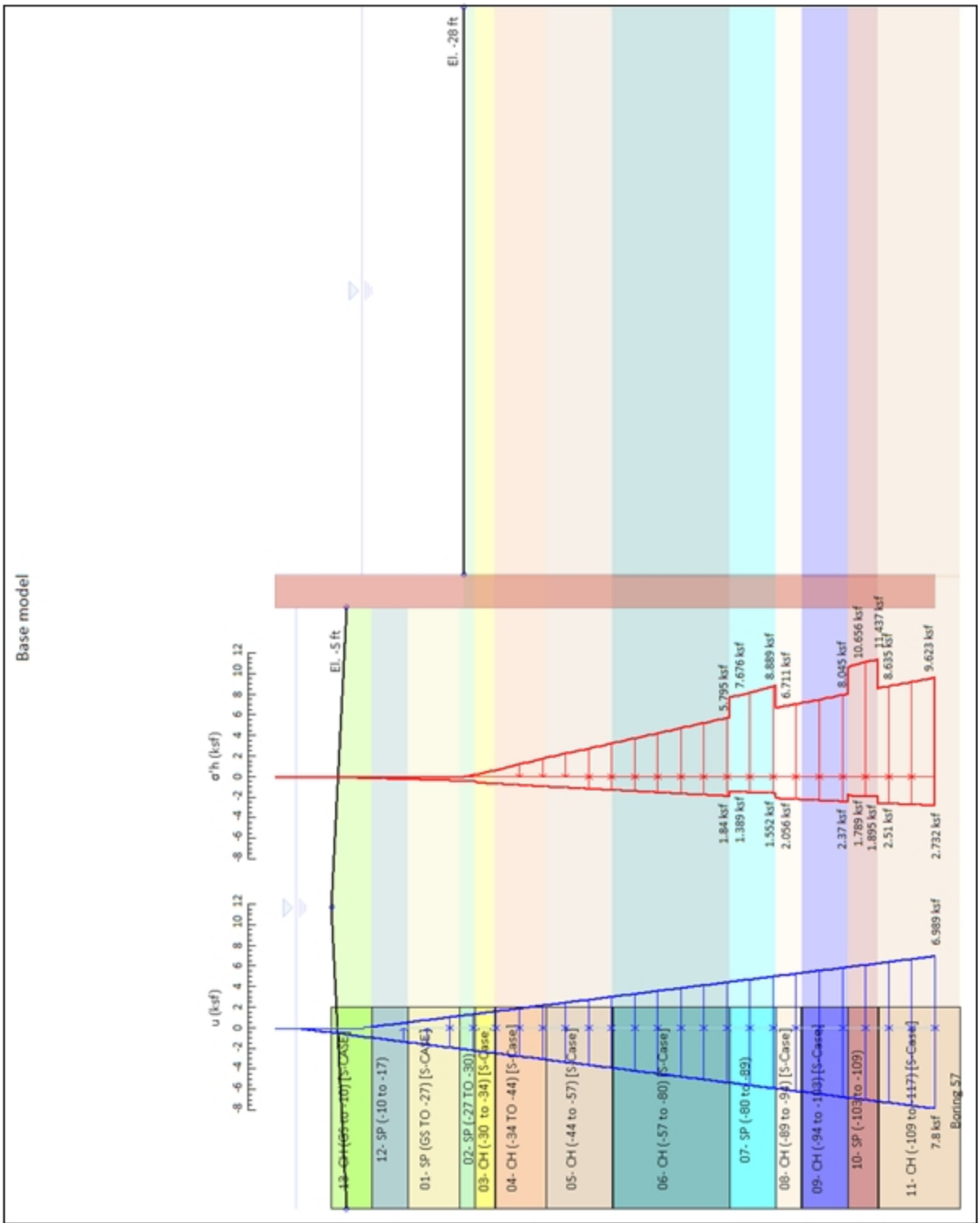

Base model
El. -28 ft
El. -5 ft
Moment (k-ft/ft)
-1200 400 2000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-120 -40 40
31.8 k/ft
-1035.7 k-ft/ft
-111.4 k/ft
Deflection (inch)
0 10 20
13.92 in
13- CH (-85 to -10) [S-CASE]
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP
4/27/2020



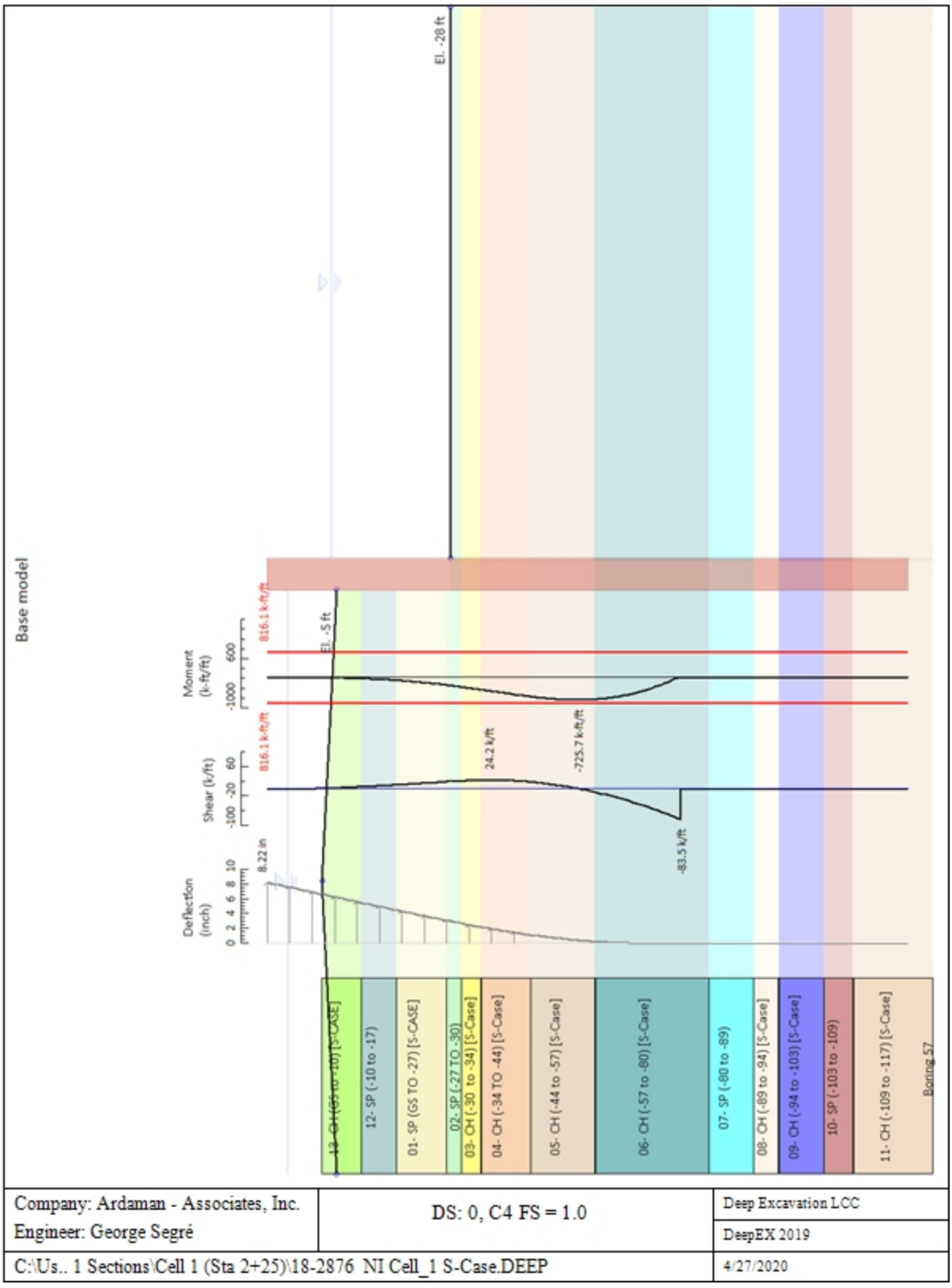
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



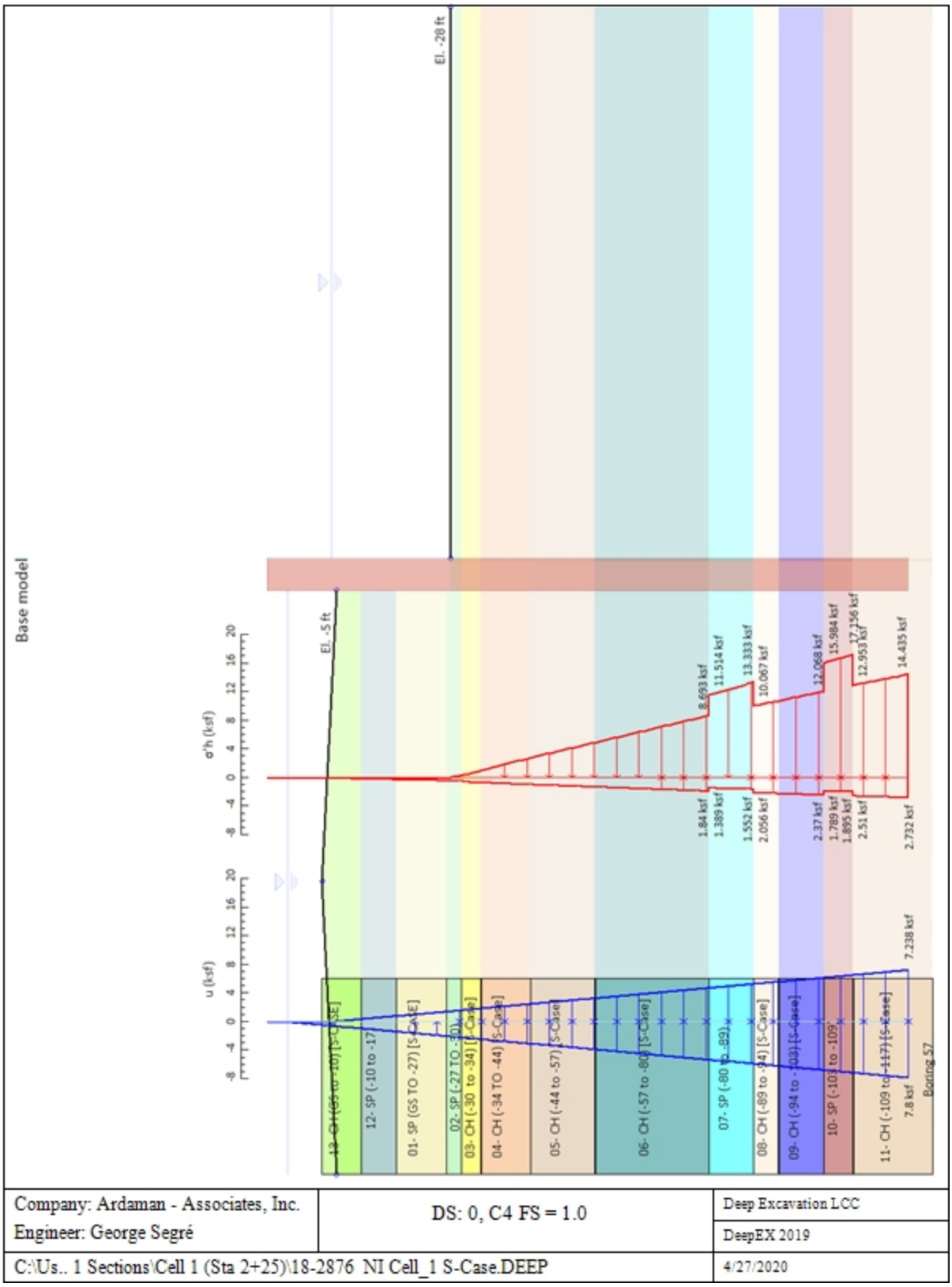
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



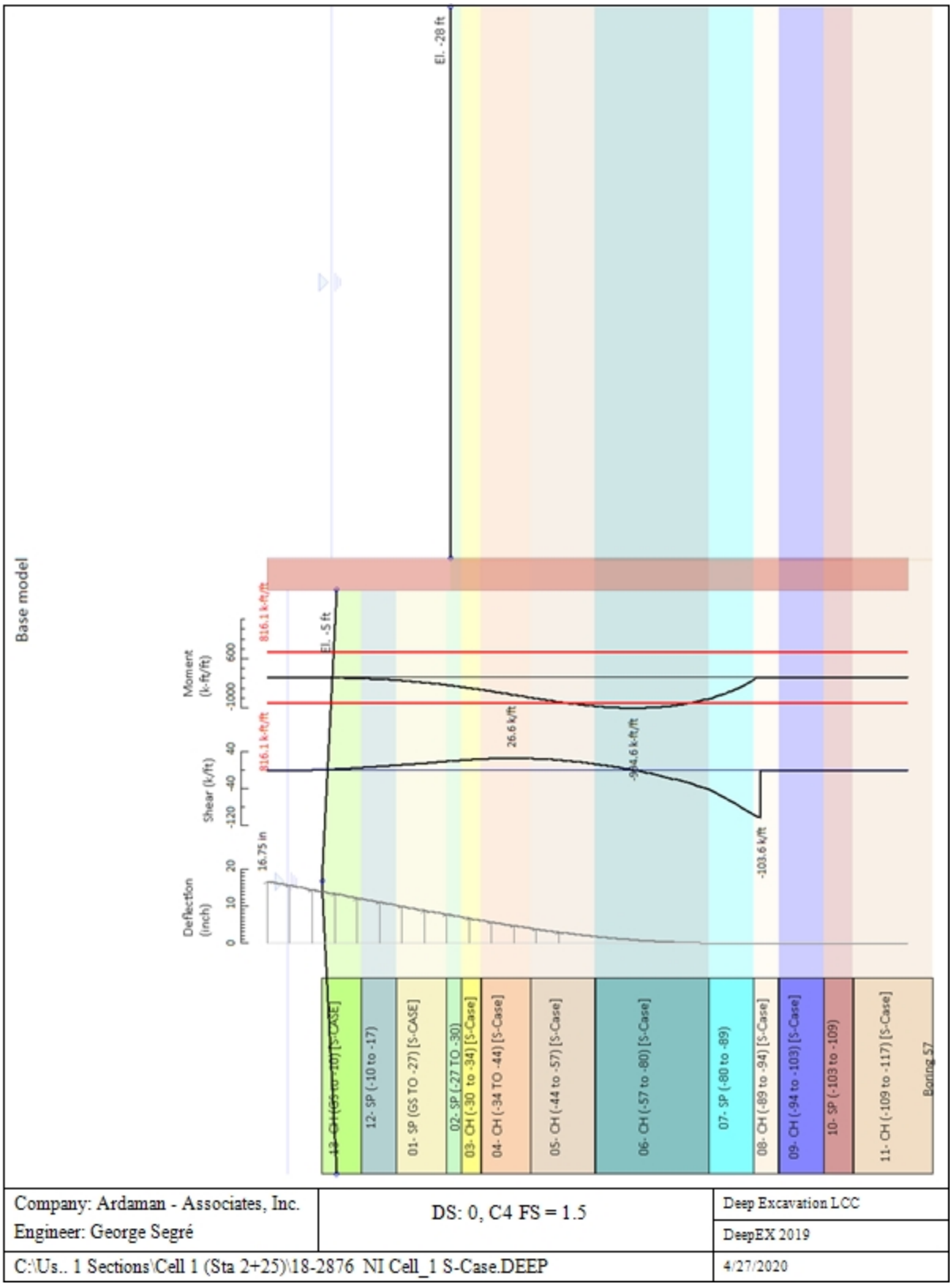
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



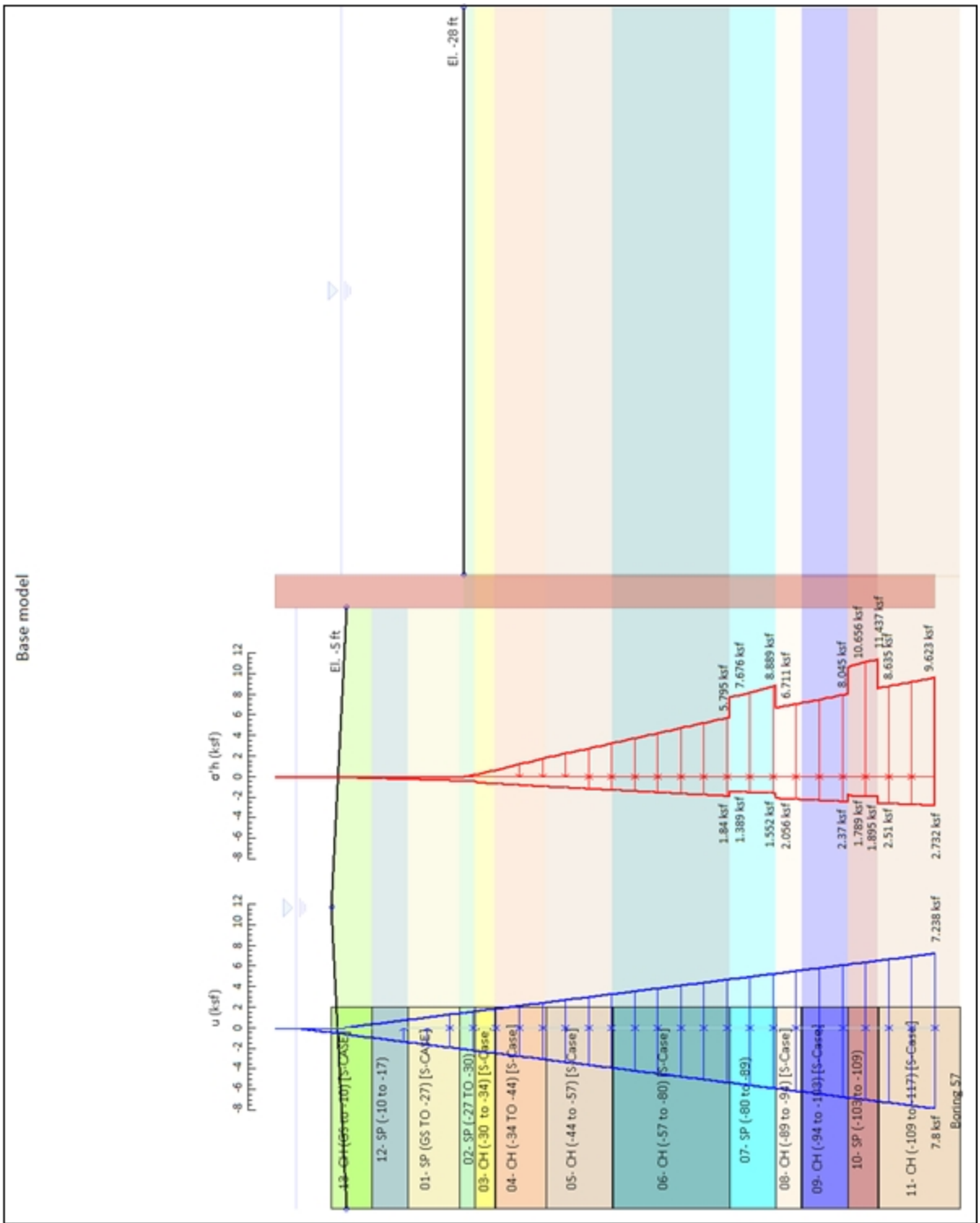
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. 1 Sections\Cell 1 (Sta 2+25)\18-2876 NI Cell_1 S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -80 ft., NAVD88

Length of Sheetting = 89 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-41.56	296.83	70.92	1.07
		Open excavation - degraded	9	-8	1.00	1.25	-43.93	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-39.19	213.97	60.12	0.70
		Open excavation - degraded	9	-4	1.00	1.25	-41.16	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-38.40	178.42	52.29	0.52
		Open excavation - degraded	5	-8	1.00	1.50	-42.35	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-36.03	101.44	41.71	0.26
		Open excavation - degraded	5	-4	1.00	1.50	-39.19	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-69.00	811.51	89.59	8.49
		Open excavation - degraded	9	-8	1.00	1.25	-80.00	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-63.28	616.43	73.78	5.56
		Open excavation - degraded	9	-4	1.00	1.25	-72.64	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-60.16	475.74	61.76	3.85
		Open excavation - degraded	5	-8	1.00	1.50	-79.40	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-53.92	331.22	47.26	2.23
		Open excavation - degraded	5	-4	1.00	1.50	-70.04	--	--	--
						Governing Value:	-80.00	811.51	89.59	8.49

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:42:11 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
14- GP Fill	120	120	34	0	N/A	N/A	N/A	300	3	0.28	3.54	N/A	N/A	True	Linear	
13- CH (GS to	112	112	0	0	800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (-17 T	115	115	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	30	0	N/A	N/A	N/A	60	3	0.33	3	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	0	0	2290	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-34 T	134	134	0	0	2290	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-44 to	126	126	0	0	2290	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-57 to	127	127	0	0	1650	0	0	626.3	3	1	1	1	1	True	Linear	
07- SP (-80 to	122	122	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	0	0	1200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-94 to	120	120	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- SP (-103 t	120	120	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	0	0	1670	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
14- GP Fill	0.35	-	-	0.441	0.8	-	-	0	0	0	-
13- CH (GS to	0.35	0	0	1	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (-17 T	0.4	-	-	0.5	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.5	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	0	0	1	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.5	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

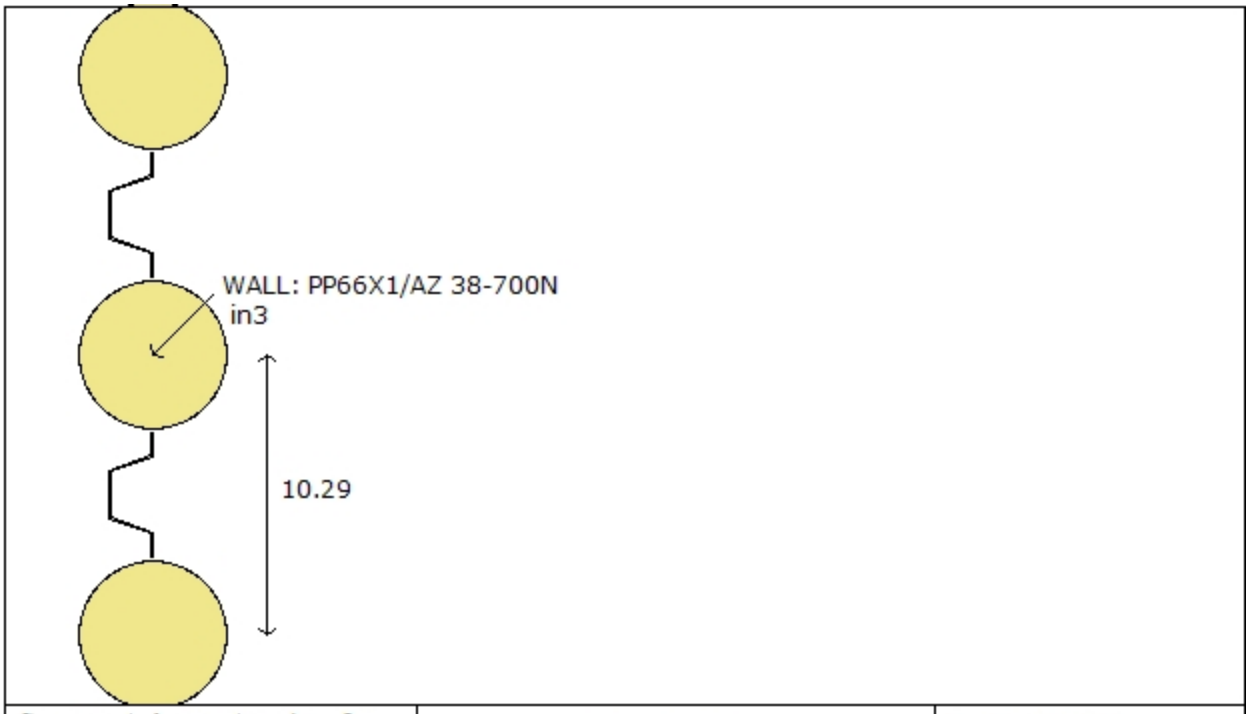
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	14- GP Fill	1	0.44
0	13- CH (GS to -	1	1
-10	12- SP (-10 to -	1	0.5
-17	01- SP (-17 TO	1	0.5
-27	02- SP (-27 TO	1	0.5
-30	03- CH (-30 to	1	1
-34	04- CH (-34 TO	1	1
-44	05- CH (-44 to	1	0.45
-57	06- CH (-57 to	1	1
-80	07- SP (-80 to -	1	0.5
-89	08- CH (-89 to	1	1
-94	09- CH (-94 to	1	1
-103	10- SP (-103 to	1	0.5
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.113	3.34	6.735
Stage 1	Simple span	N/A	1.6	1.933	2.731	5.441
Stage 2	Simple span	N/A	1.6	2.329	3.553	7.015
Stage 3	Simple span	N/A	1.6	2.146	2.927	5.686
Stage 4	Simple span	N/A	1.6	2.411	3.952	7.627
Stage 5	Simple span	N/A	1.6	2.049	2.751	5.184
Stage 6	Simple span	N/A	1.6	2.696	4.204	7.944
Stage 7	Simple span	N/A	1.6	2.329	2.97	5.435

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

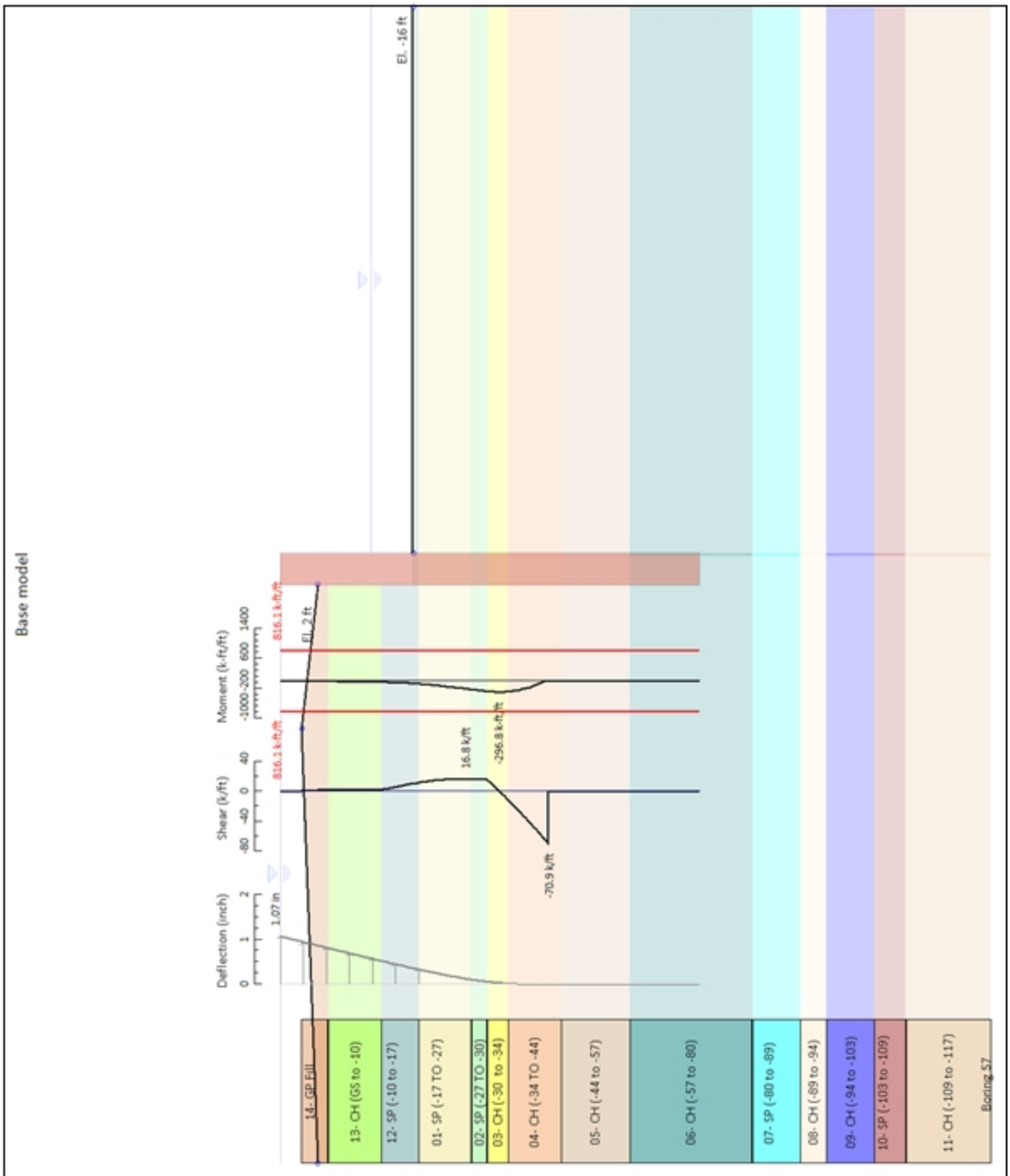
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

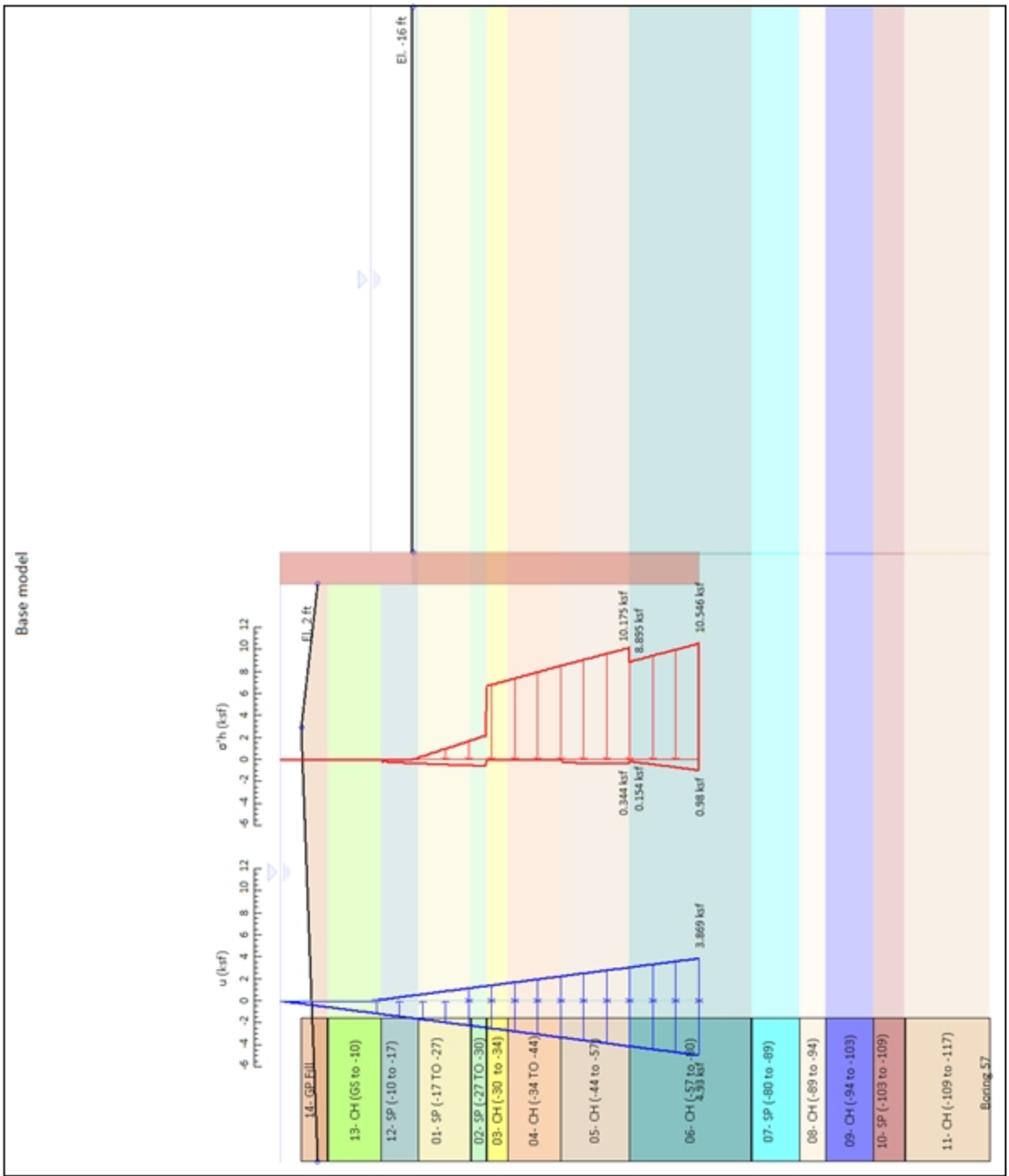
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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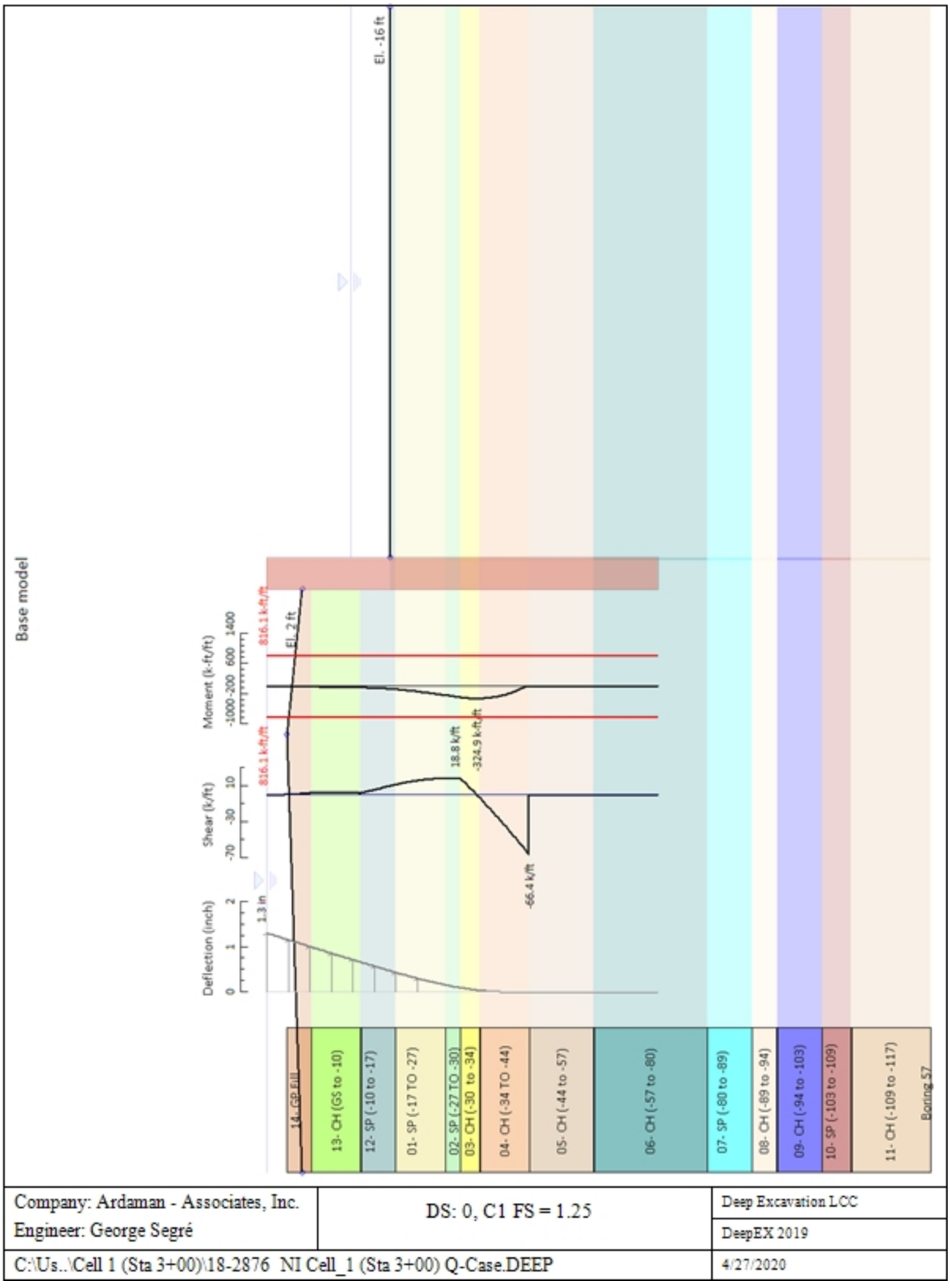

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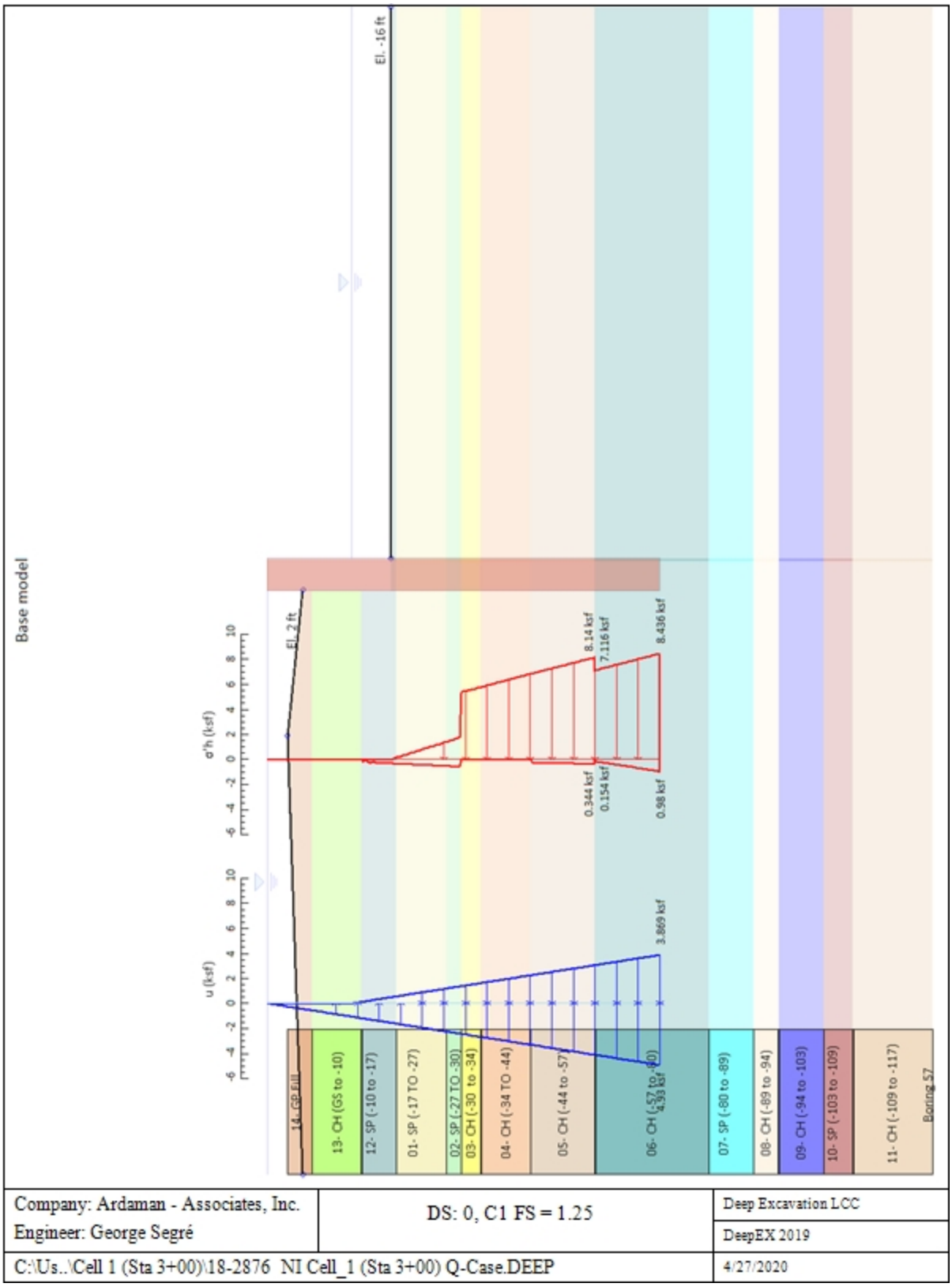

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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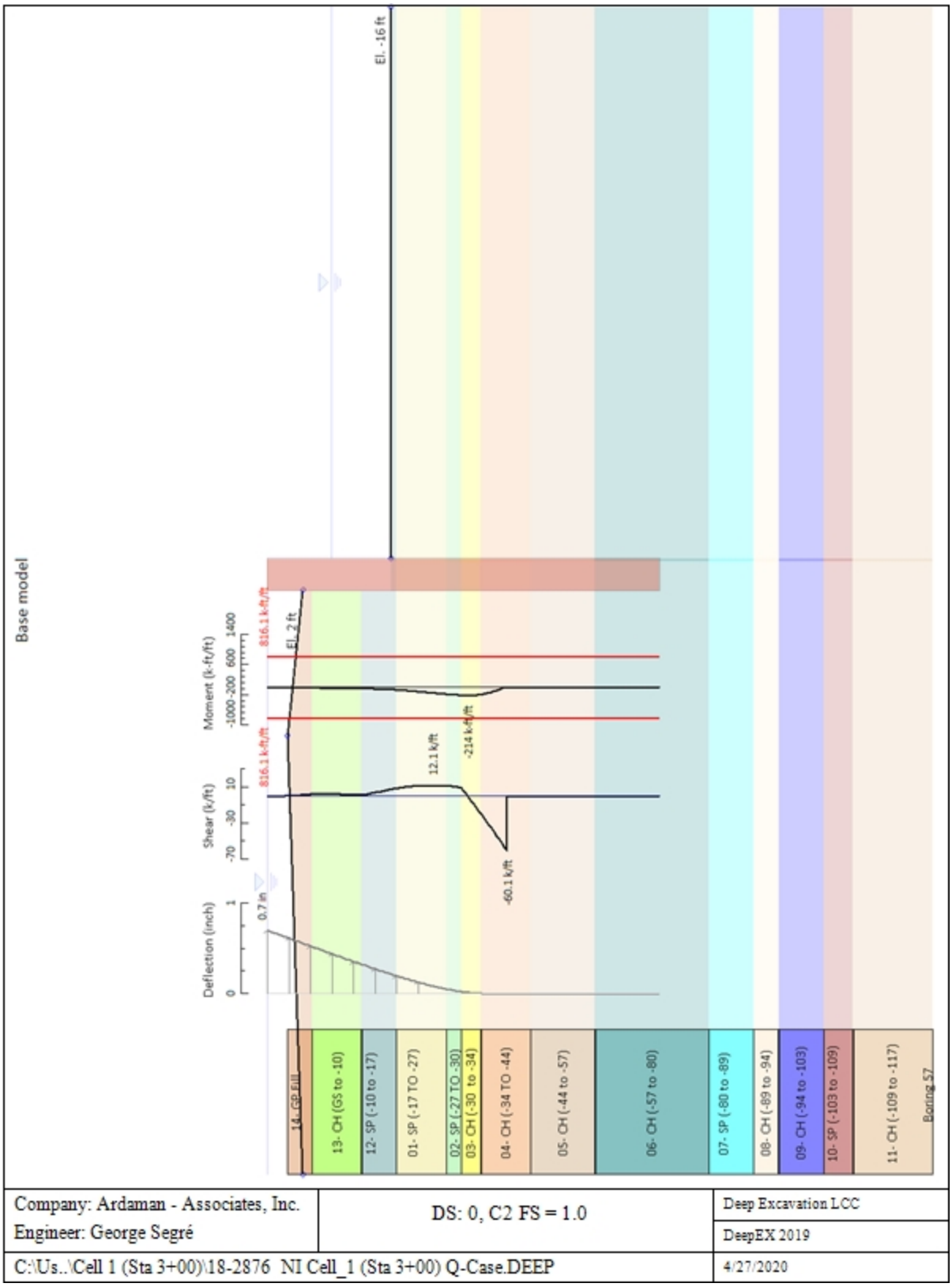

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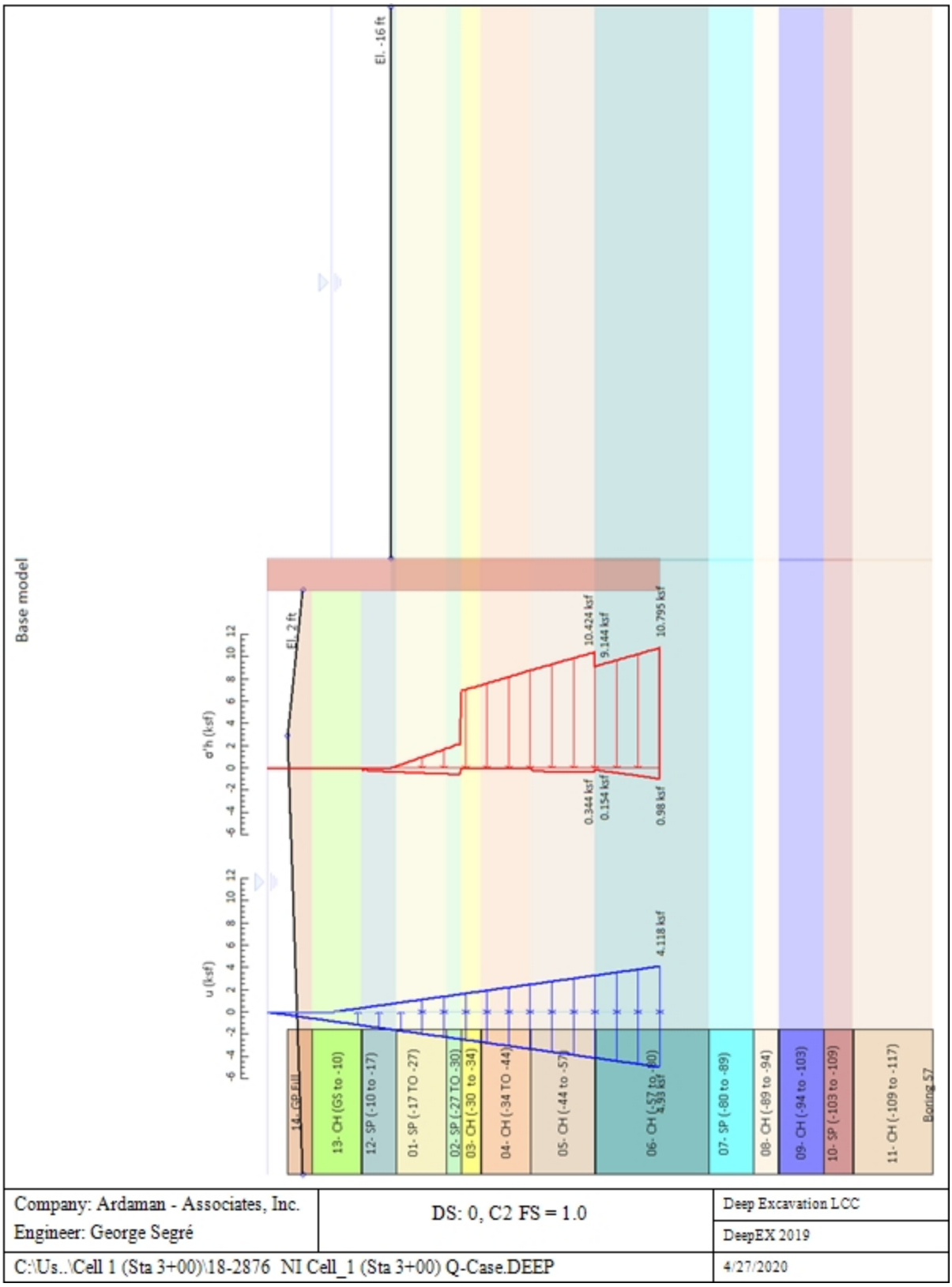

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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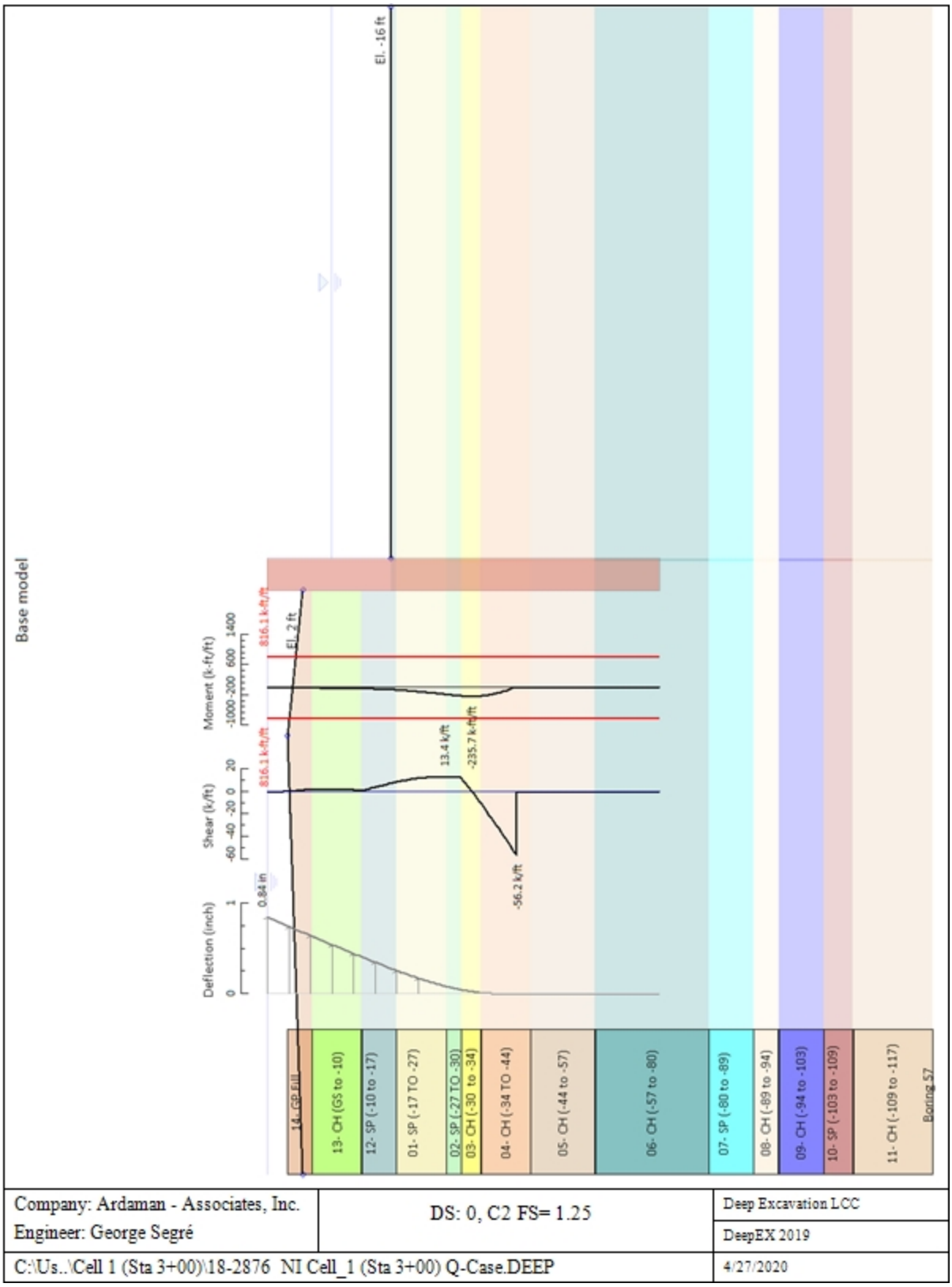

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS= 1.25	Deep Excavation LCC DeepEX 2019
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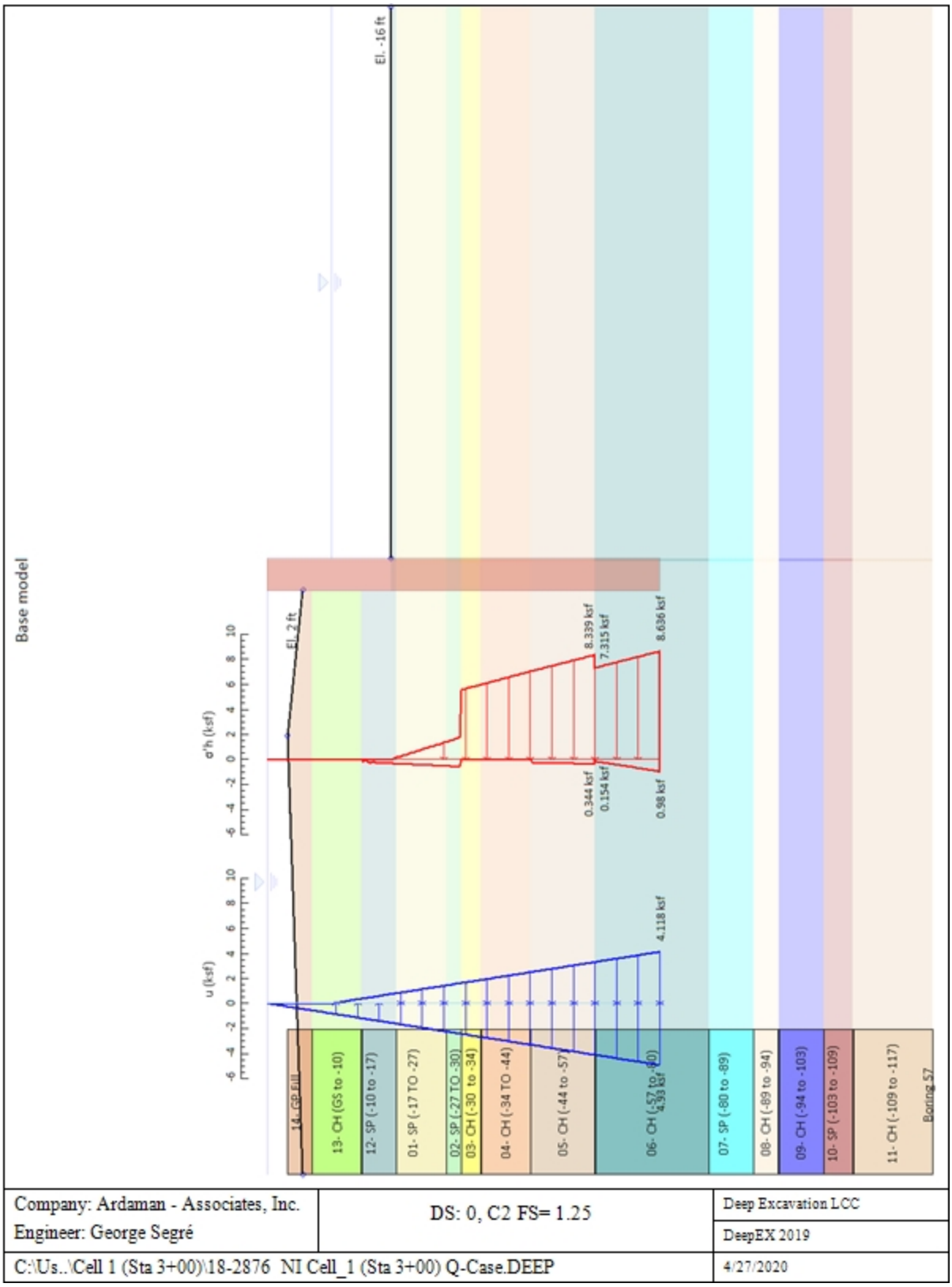

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS= 1.25	Deep Excavation LCC DeepEX 2019
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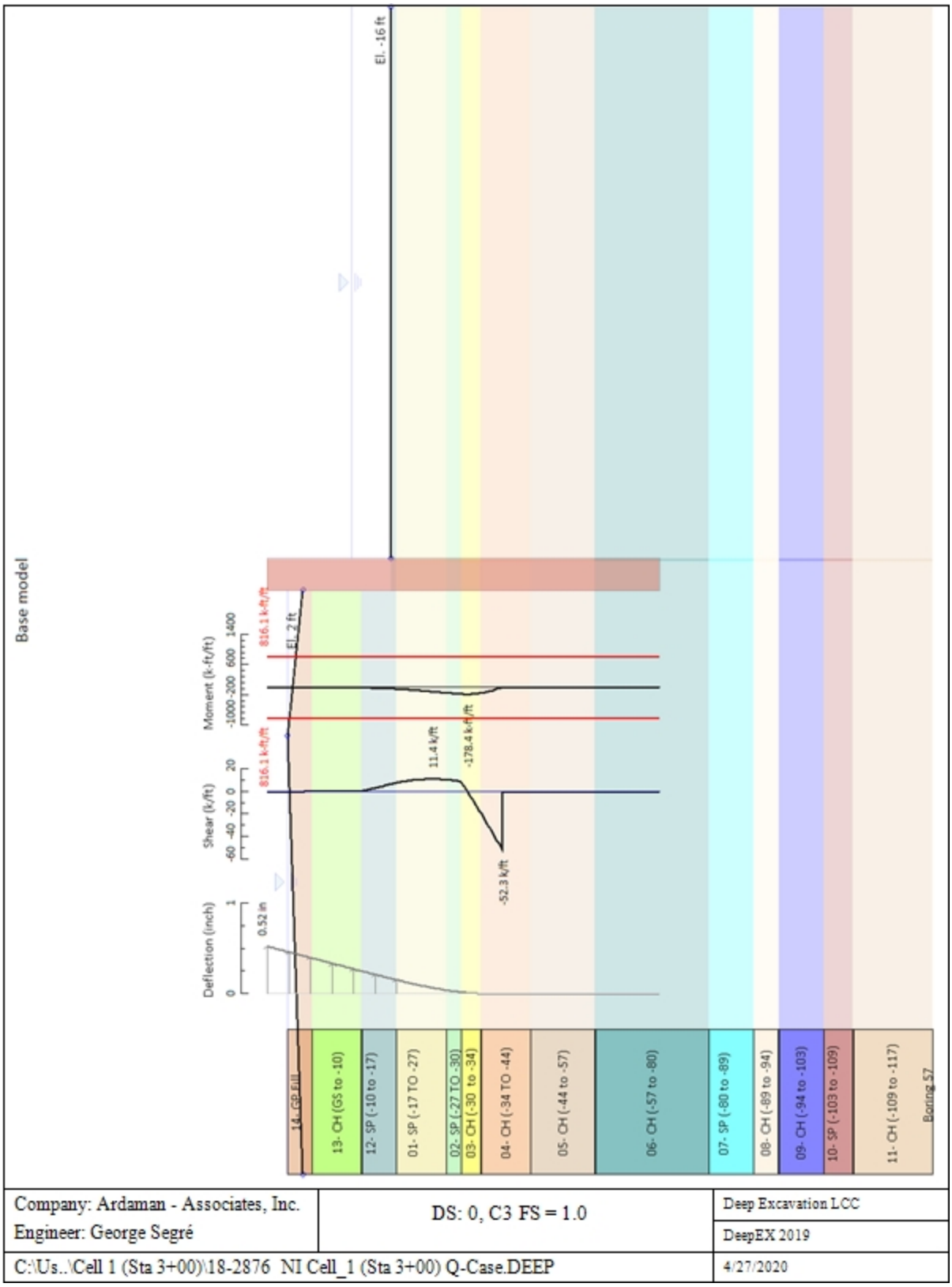

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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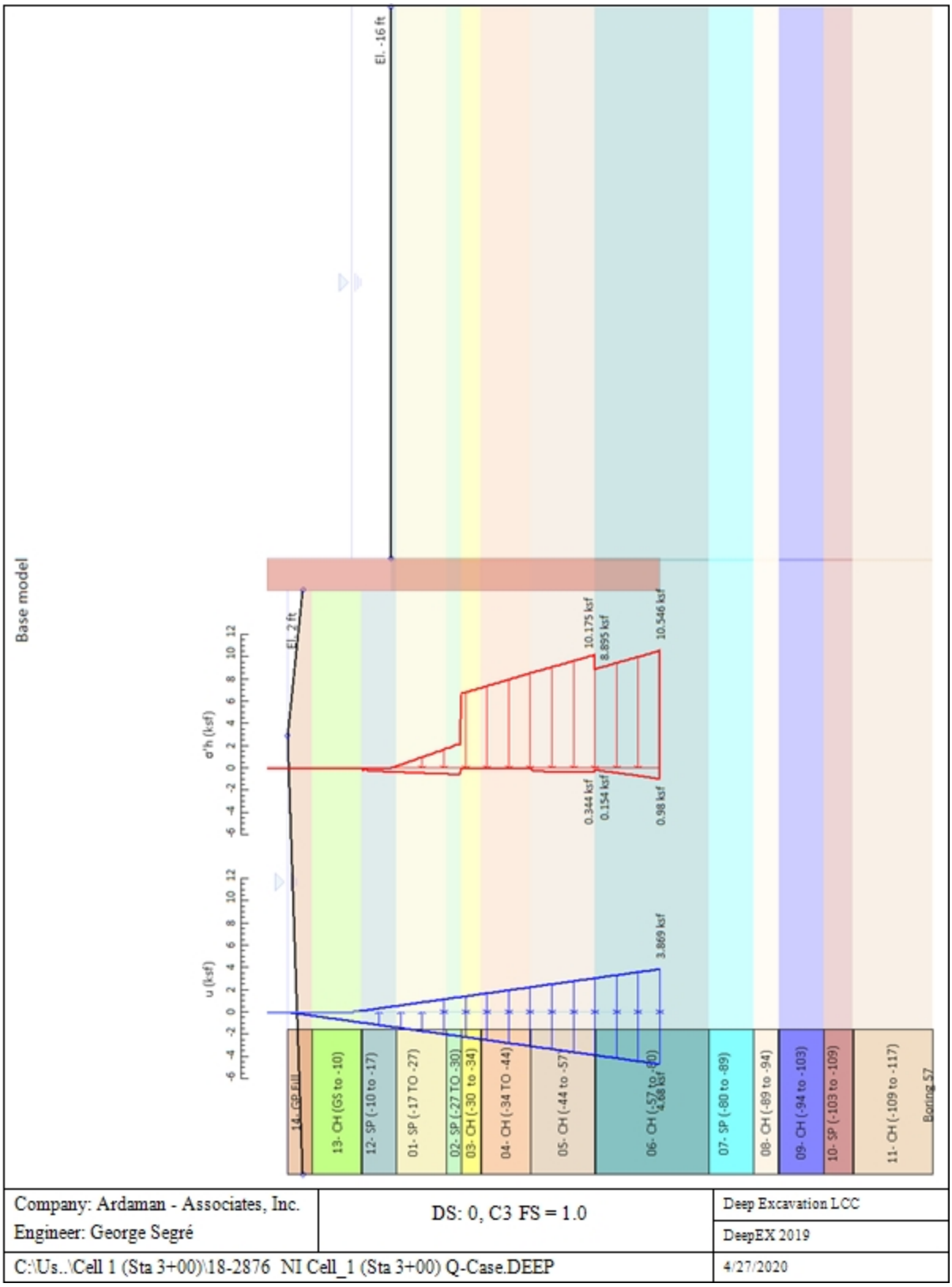

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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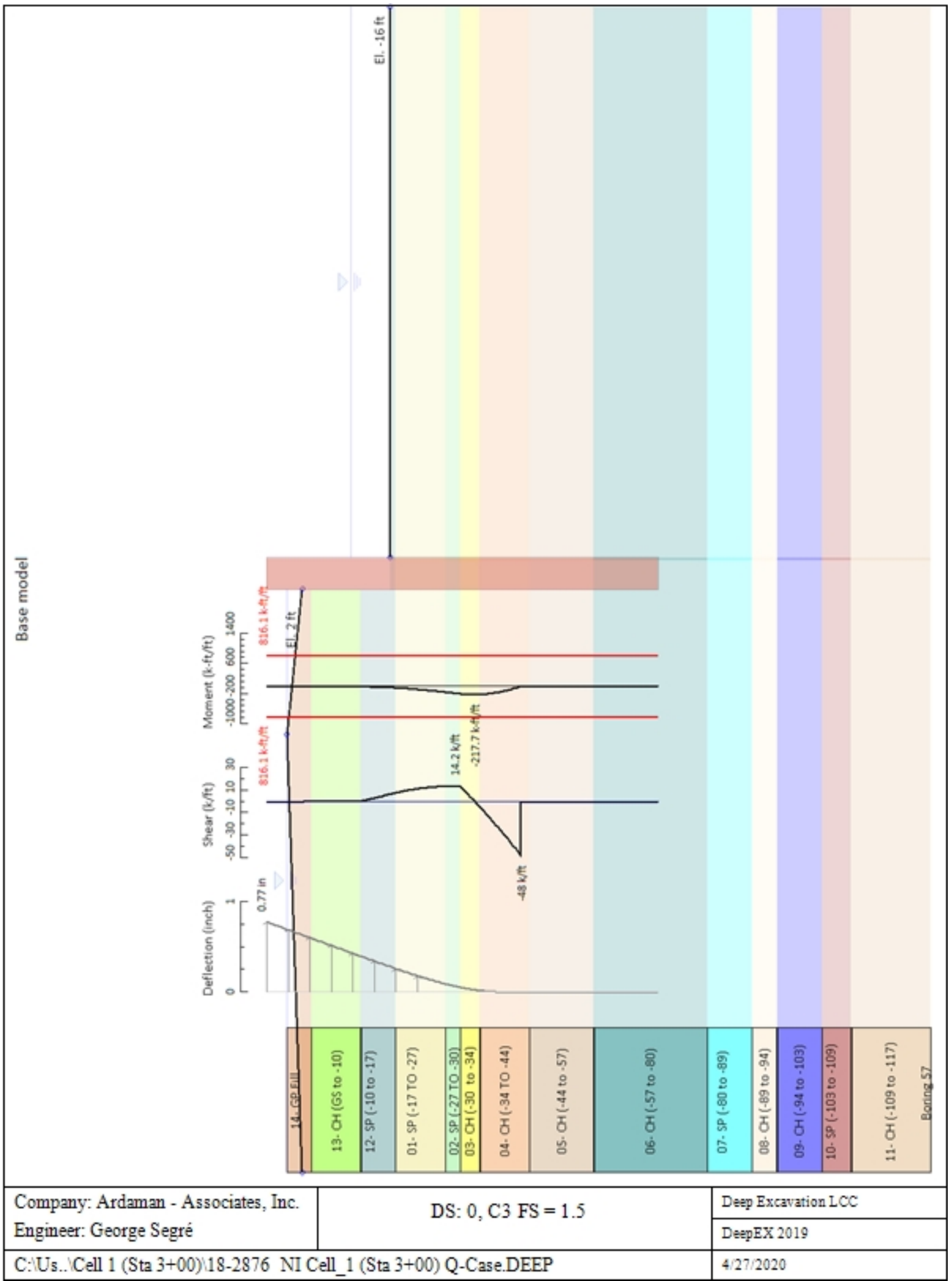

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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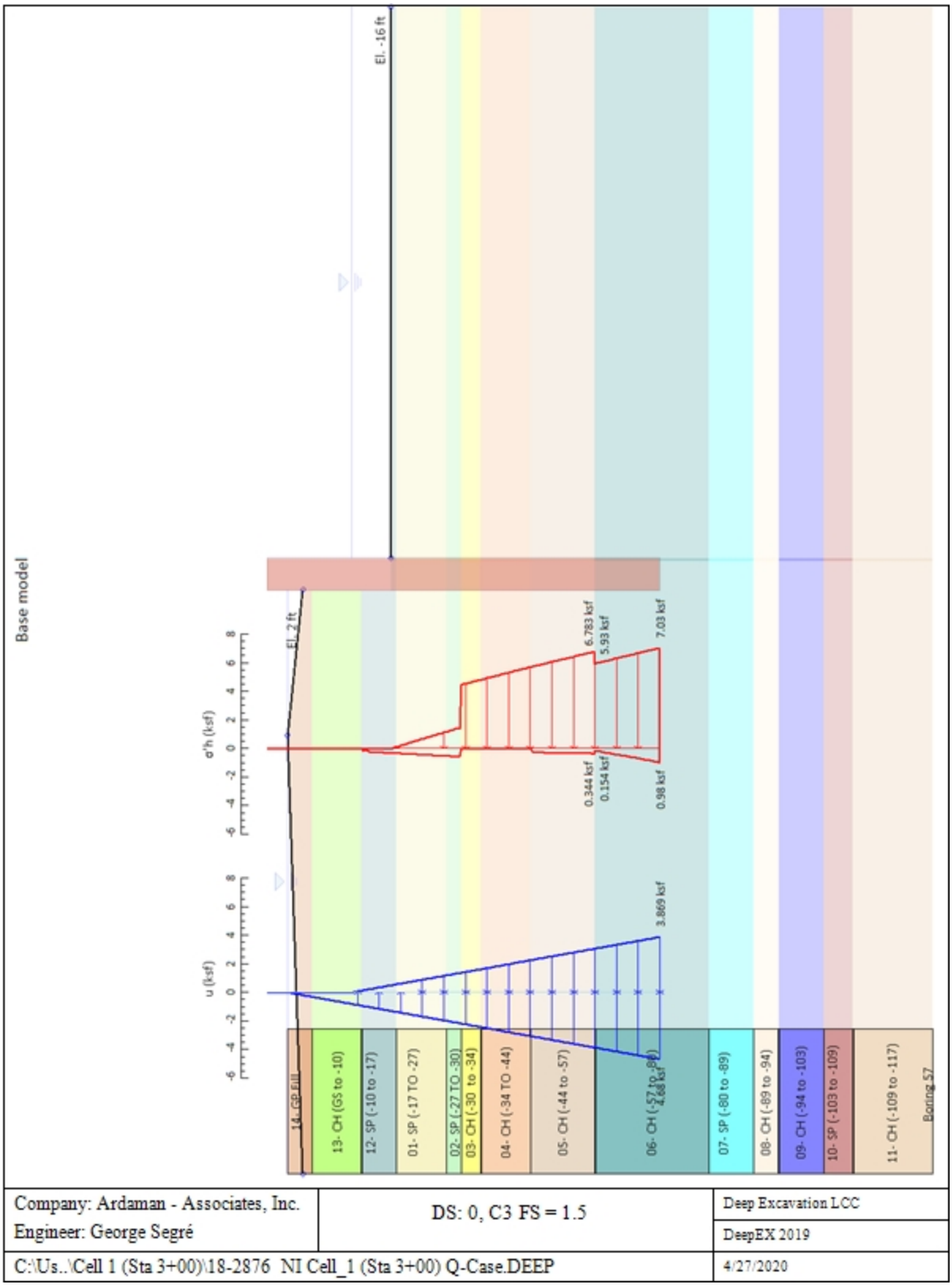
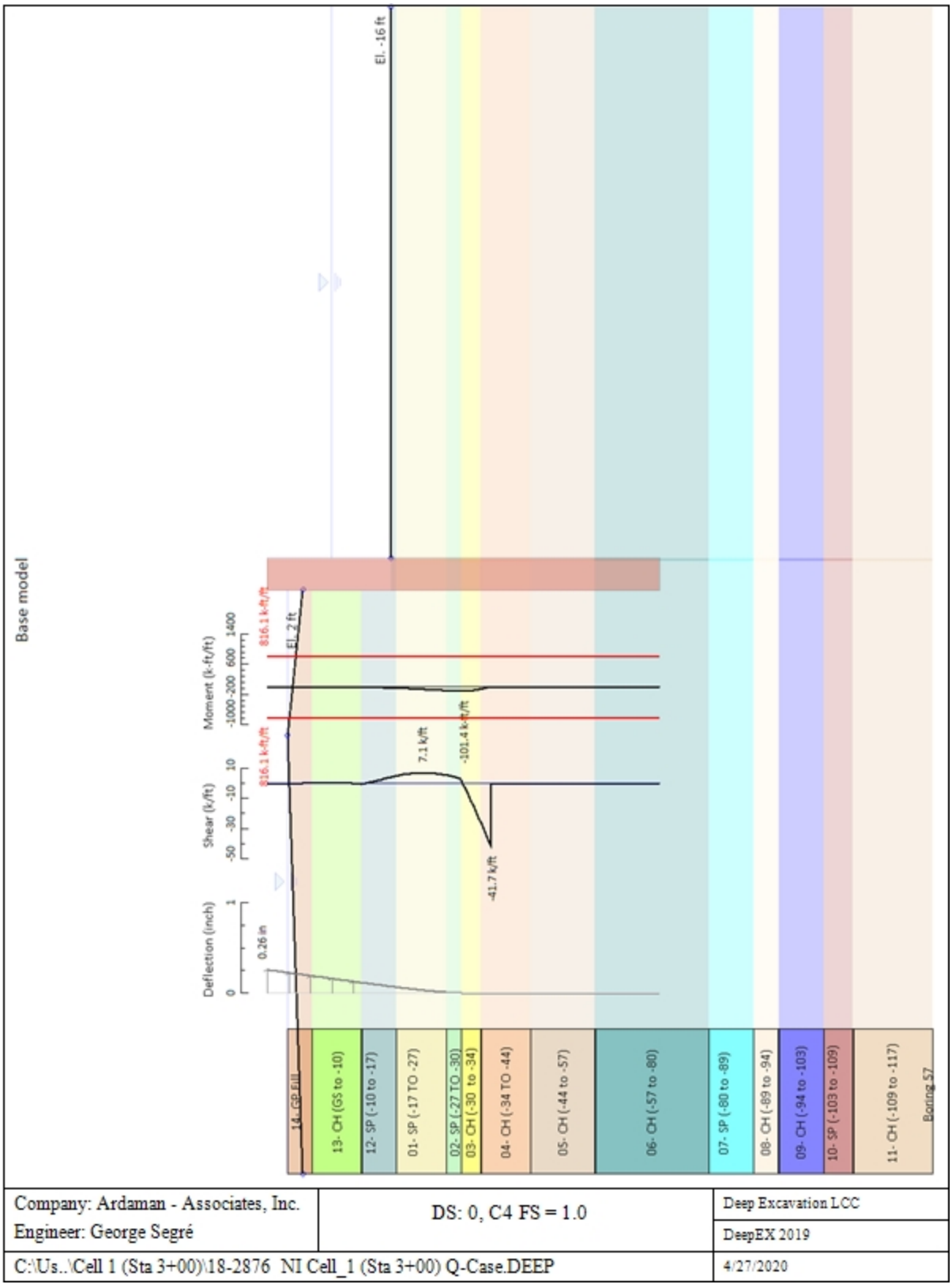

Base model
El. -16 ft
El. 2 ft
σ'h (ksf)
u (ksf)
6.783 ksf
5.93 ksf
7.03 ksf
0.344 ksf
0.154 ksf
0.98 ksf
3.869 ksf
4.68 ksf
14- GP Fill
13- CH (G5 to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -86)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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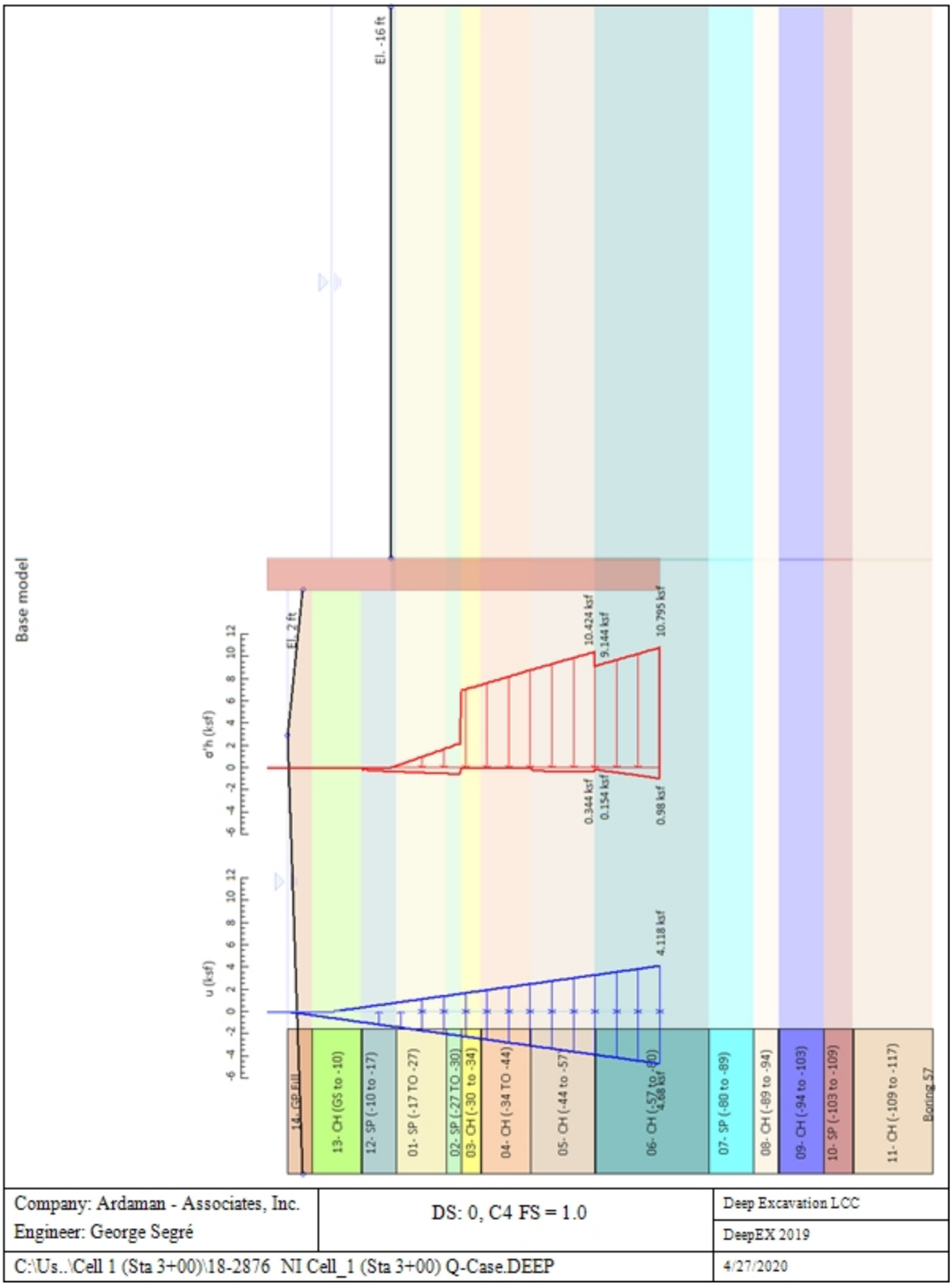

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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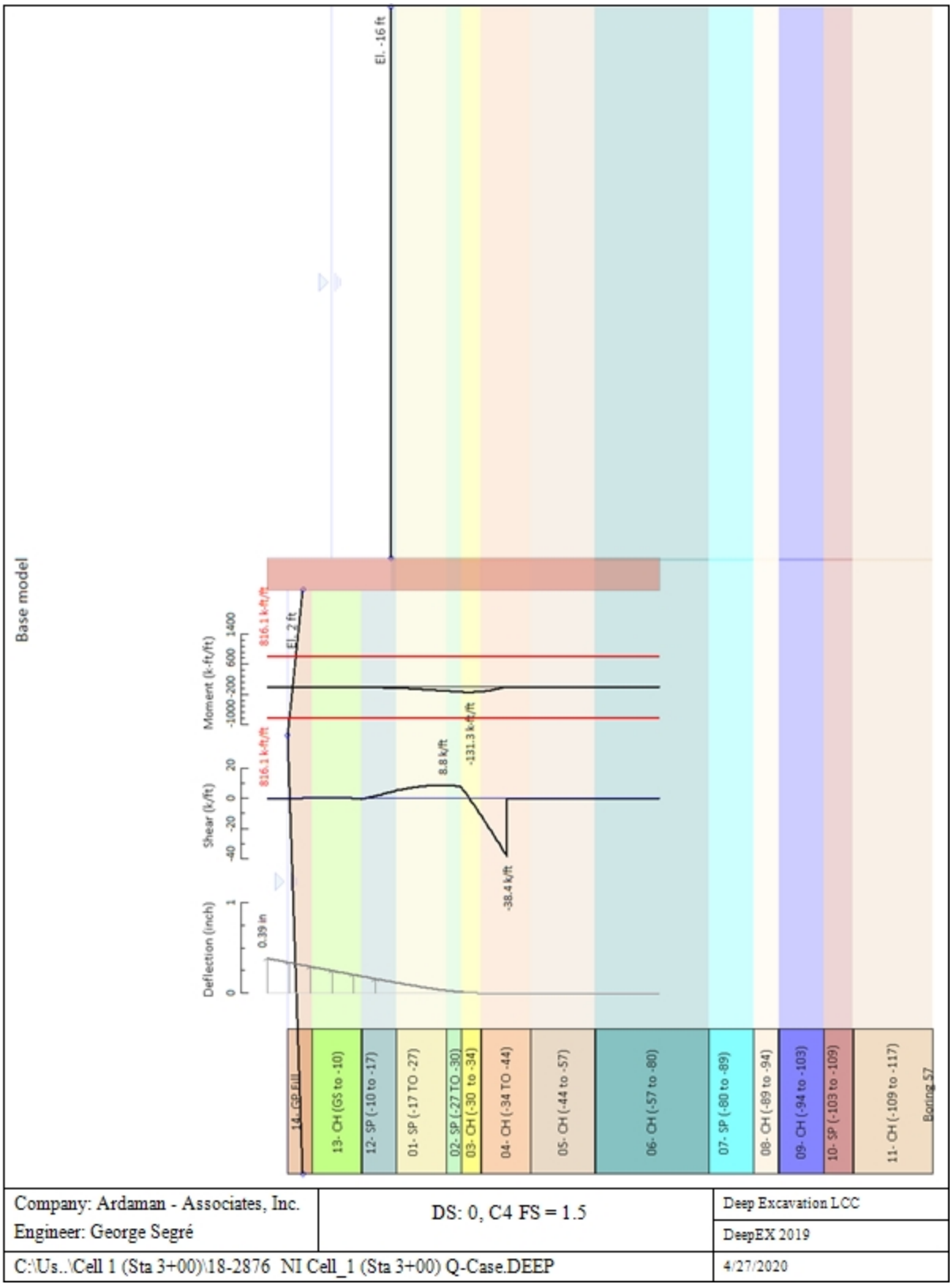

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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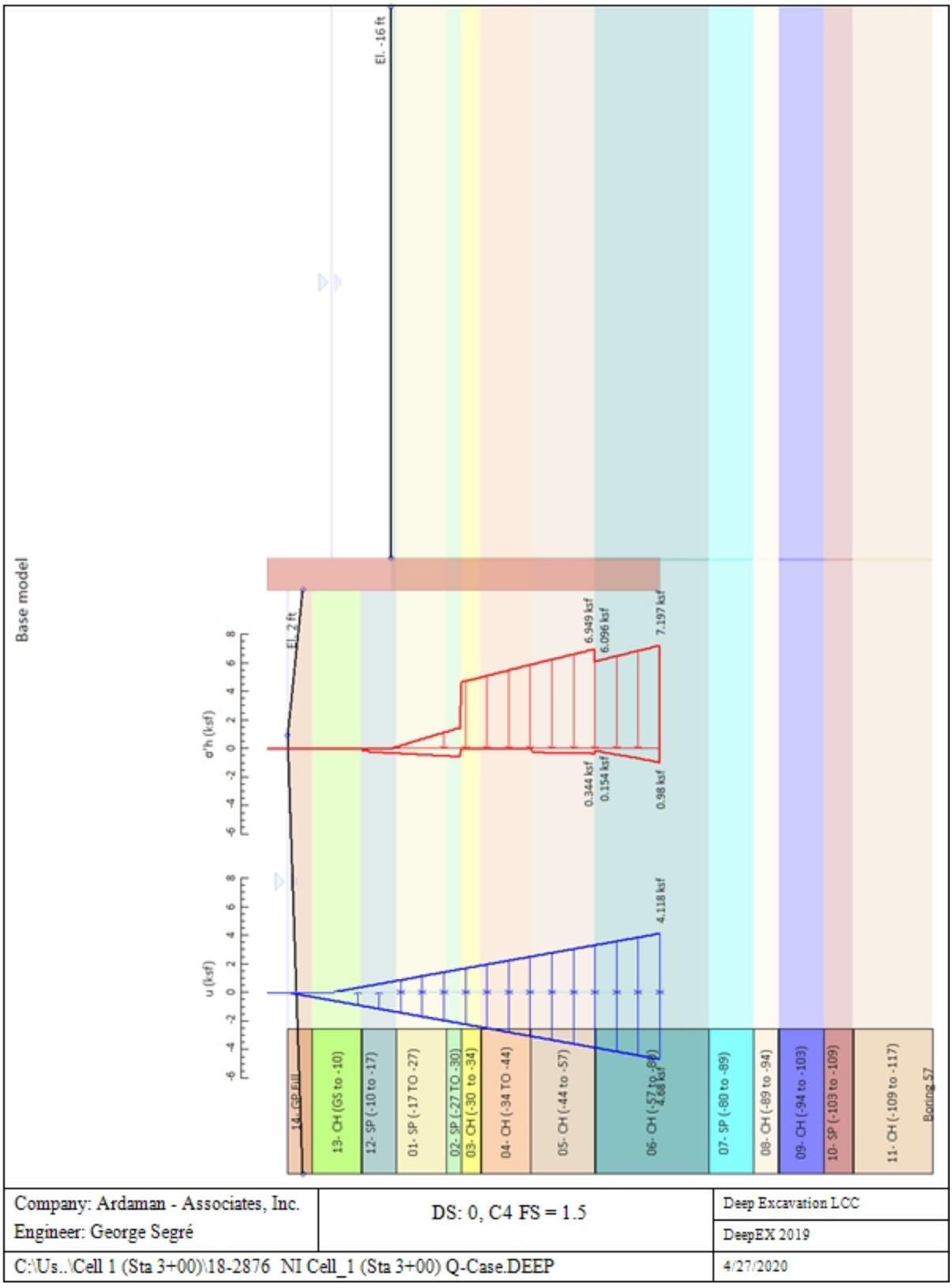

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) Q-Case.DEEP		4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:49:06 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
14-GP (FILL)	120	120	34	0	N/A	N/A	N/A	300	3	0.28	3.54	N/A	N/A	True	Linear	
13- CH (GS to	112	112	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (GS TO	115	115	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	33	0	N/A	N/A	N/A	60	3	0.3	3.39	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	26	0	N/A	N/A	N/A	150	3	0.39	2.56	N/A	N/A	True	Linear	
04- CH (-34 T	134	134	26	0	N/A	N/A	N/A	521.92	3	0.39	2.56	N/A	N/A	True	Linear	
05- CH (-44 to	126	126	26	0	N/A	N/A	N/A	417.54	3	0.39	2.56	N/A	N/A	True	Linear	
06- CH (-57 to	127	127	26	0	N/A	N/A	N/A	626.3	3	0.39	2.56	N/A	N/A	True	Linear	
07- SP (-80 to	122	122	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- CH (-94 to	120	120	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
10- SP (-103 t	120	120	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
14-GP (FILL)	0.35	-	-	0.441	0.8	-	-	0	0	0	-
13- CH (GS to	0.35	-	-	0.609	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (GS TO	0.4	-	-	0.455	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.455	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	-	-	0.562	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	-	-	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	-	-	0.562	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	-	-	0.562	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.455	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	-	-	0.562	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.455	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	-	-	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

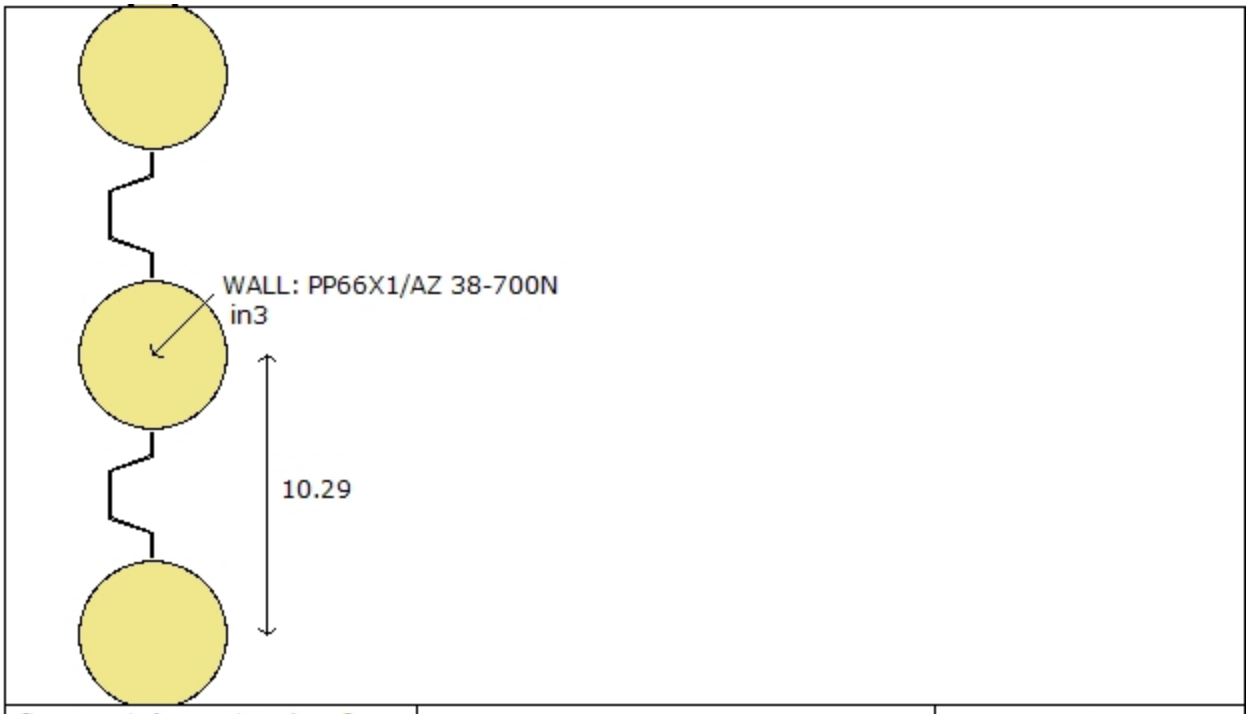
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	14-GP (FILL)	1	0.44
0	13- CH (GS to -	1	0.61
-10	12- SP (-10 to -	1	0.5
-17	01- SP (GS TO	1	0.46
-27	02- SP (-27 TO	1	0.46
-30	03- CH (-30 to	1	0.56
-34	04- CH (-34 TO	1	0.56
-44	05- CH (-44 to	1	0.56
-57	06- CH (-57 to	1	0.56
-80	07- SP (-80 to -	1	0.46
-89	08- CH (-89 to	1	0.56
-94	09- CH (-94 to	1	0.56
-103	10- SP (-103 to	1	0.46
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Company: Ardaman - Associates, Inc. Engineer: George Segré	Wall sketch	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP		4/27/2020

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -95 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.336	1.336	1.713
Stage 1	Simple span	N/A	1.6	1.16	1.16	1.477
Stage 2	Simple span	N/A	1.6	1.401	1.401	1.763
Stage 3	Simple span	N/A	1.6	1.225	1.225	1.527
Stage 4	Simple span	N/A	1.6	1.462	1.462	1.817
Stage 5	Simple span	N/A	1.6	1.14	1.14	1.4
Stage 6	Simple span	N/A	1.6	1.533	1.533	1.871
Stage 7	Simple span	N/A	1.6	1.212	1.212	1.453

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

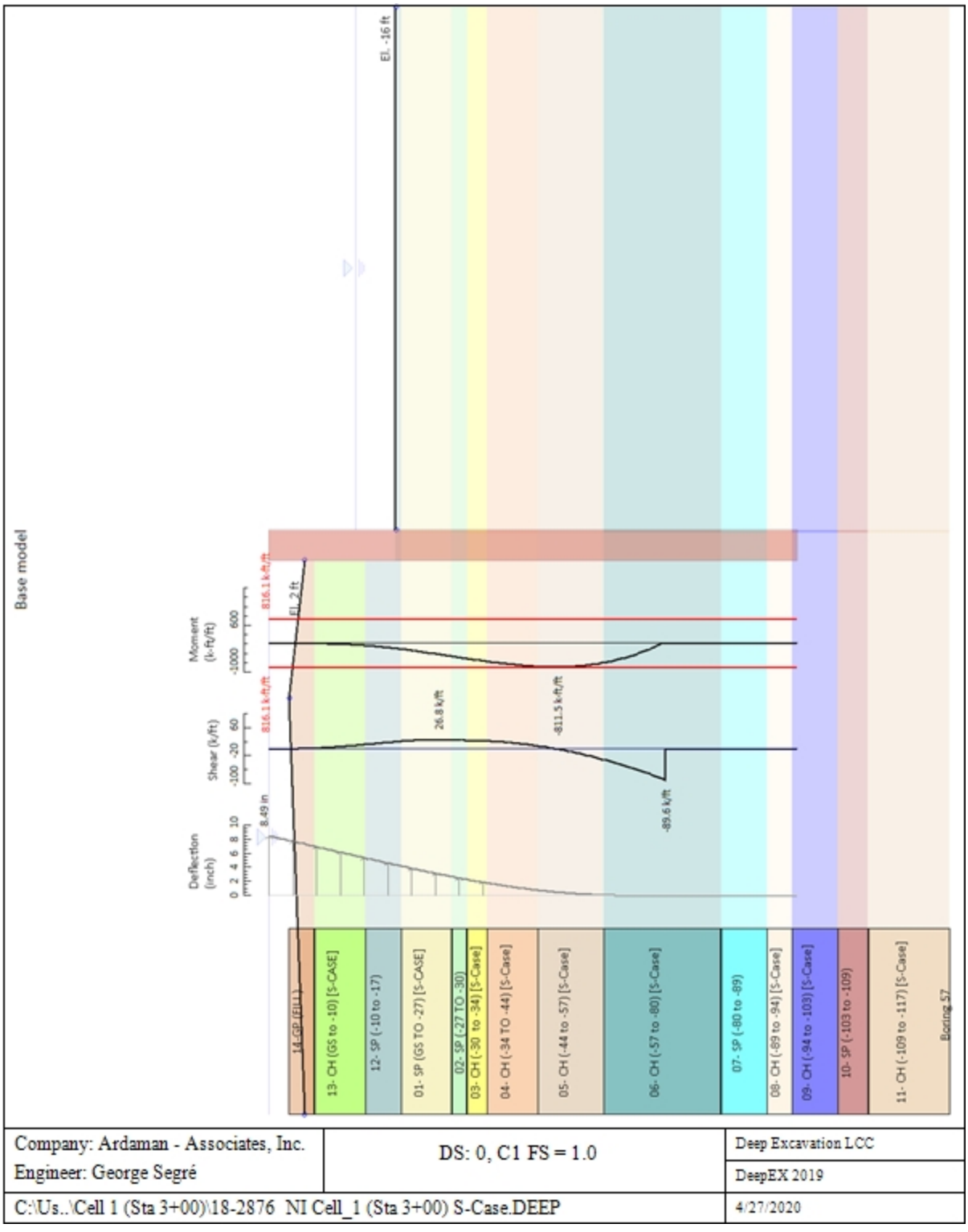
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

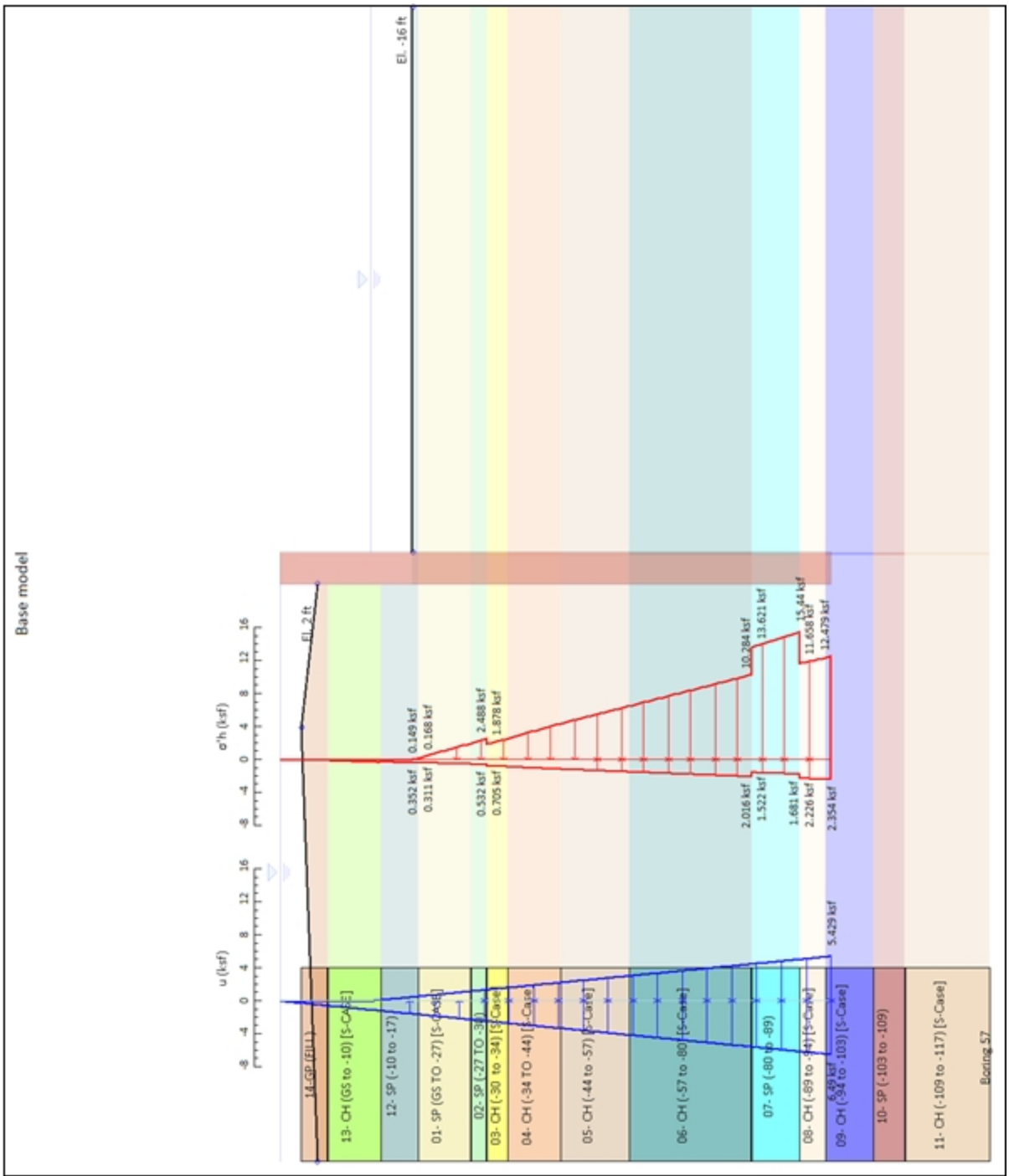
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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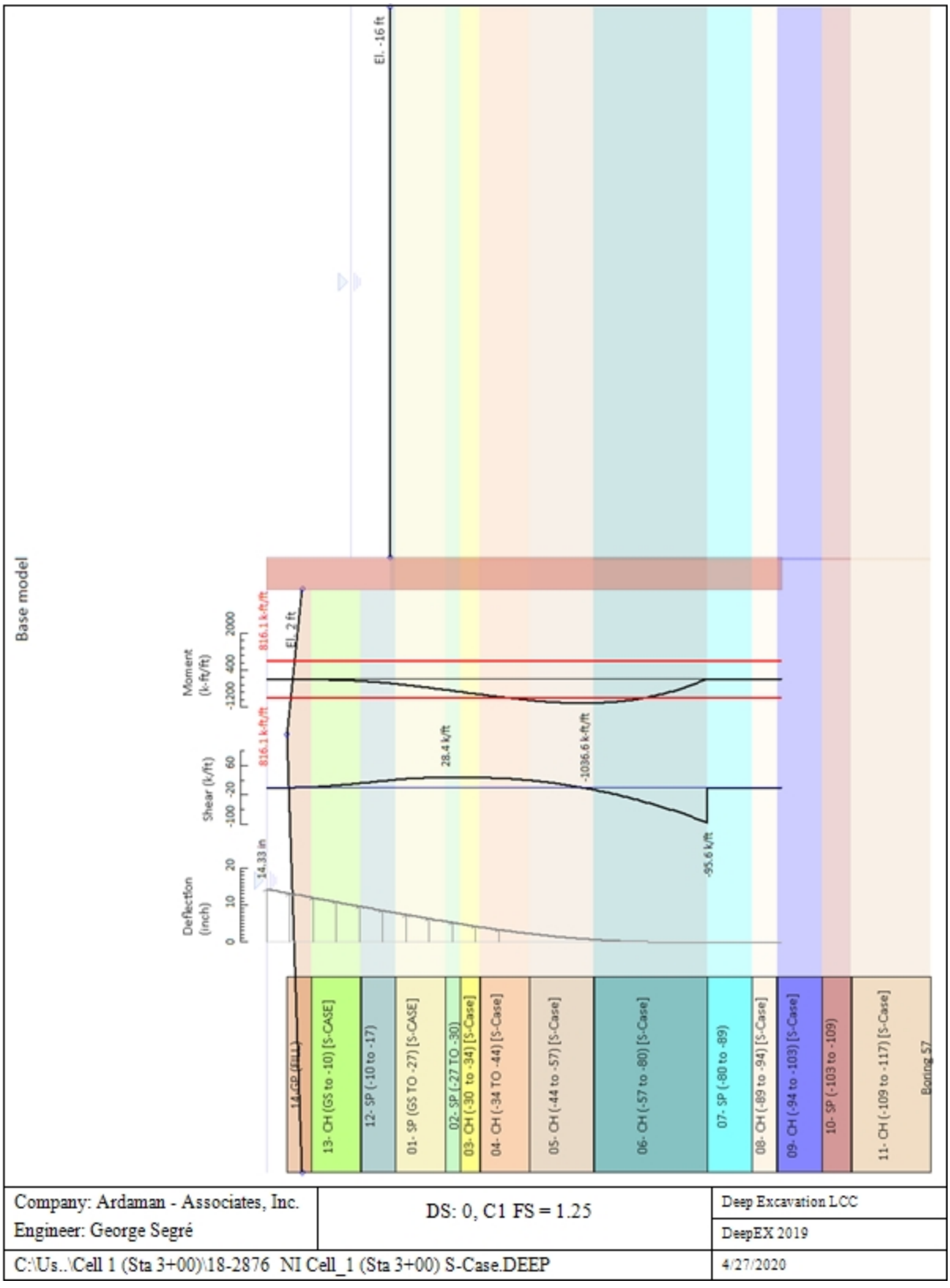

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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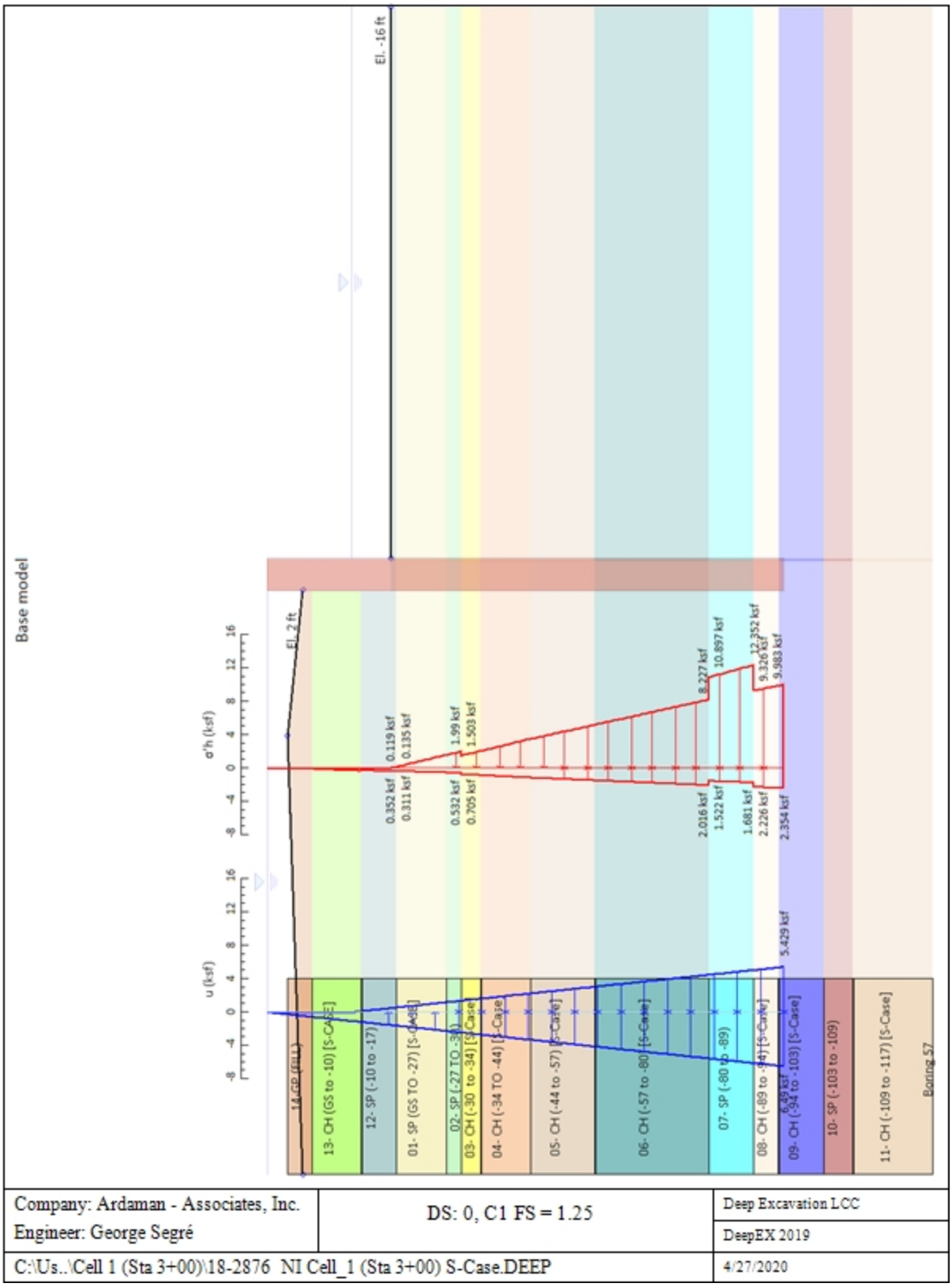
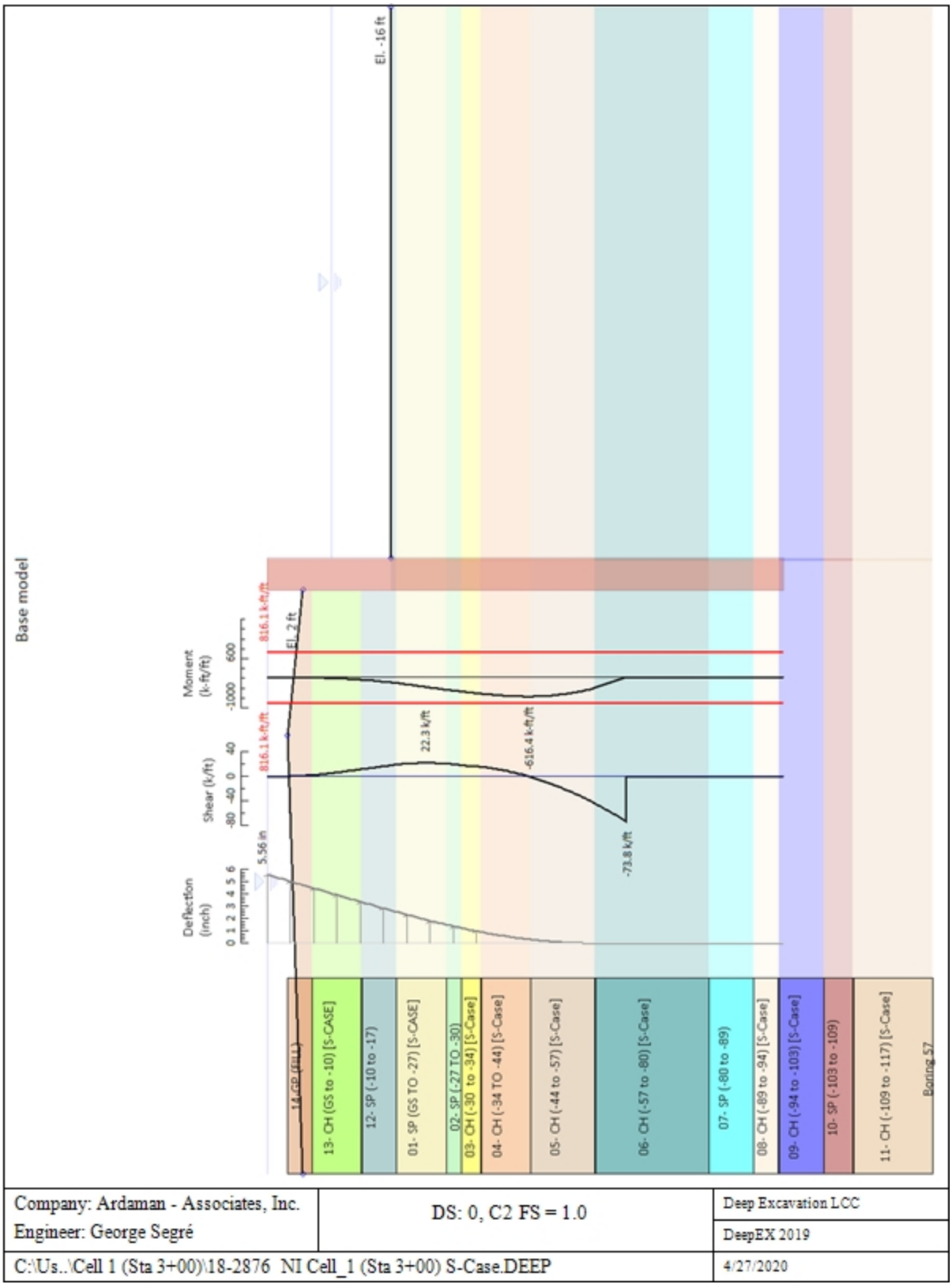


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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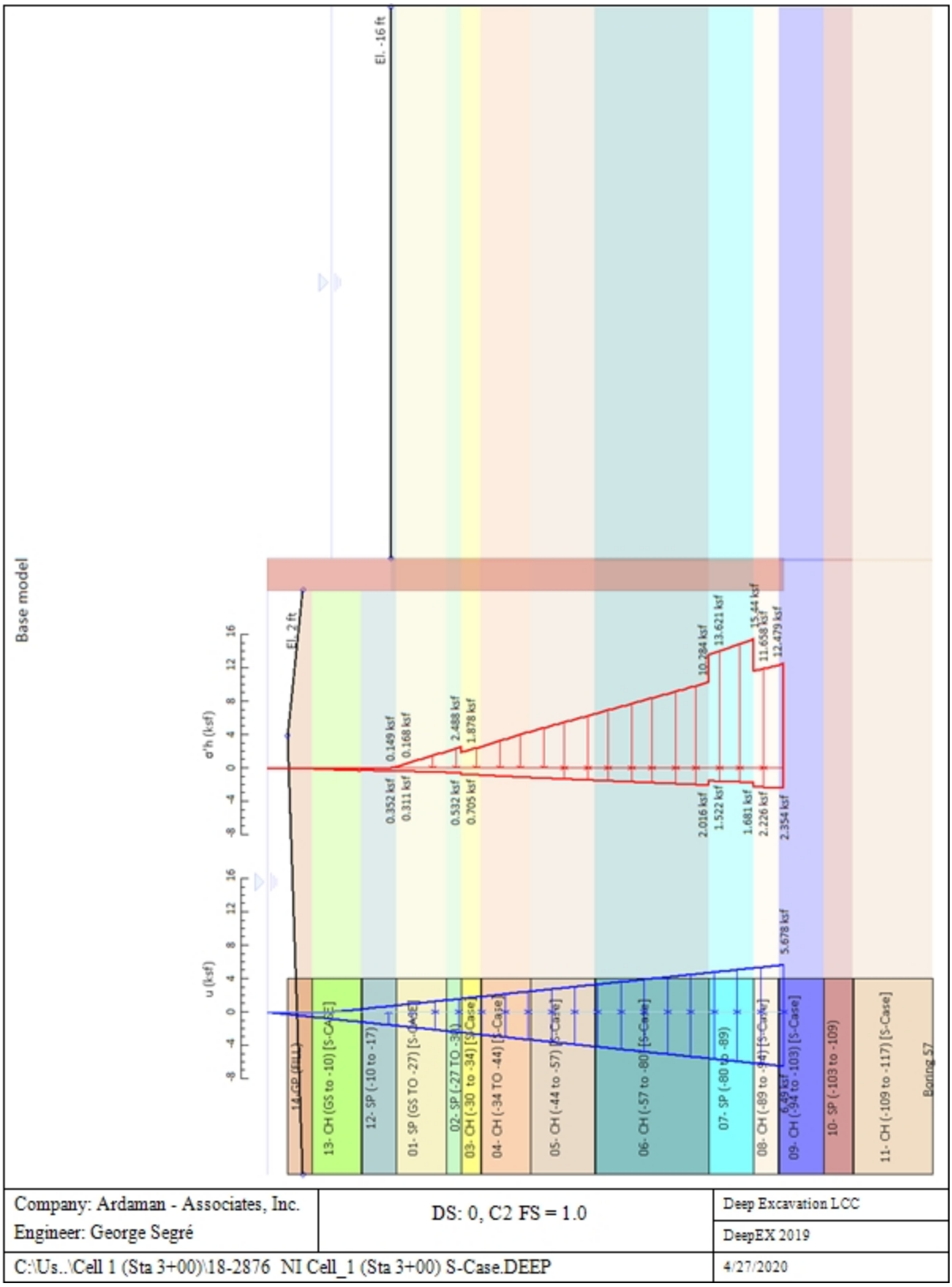

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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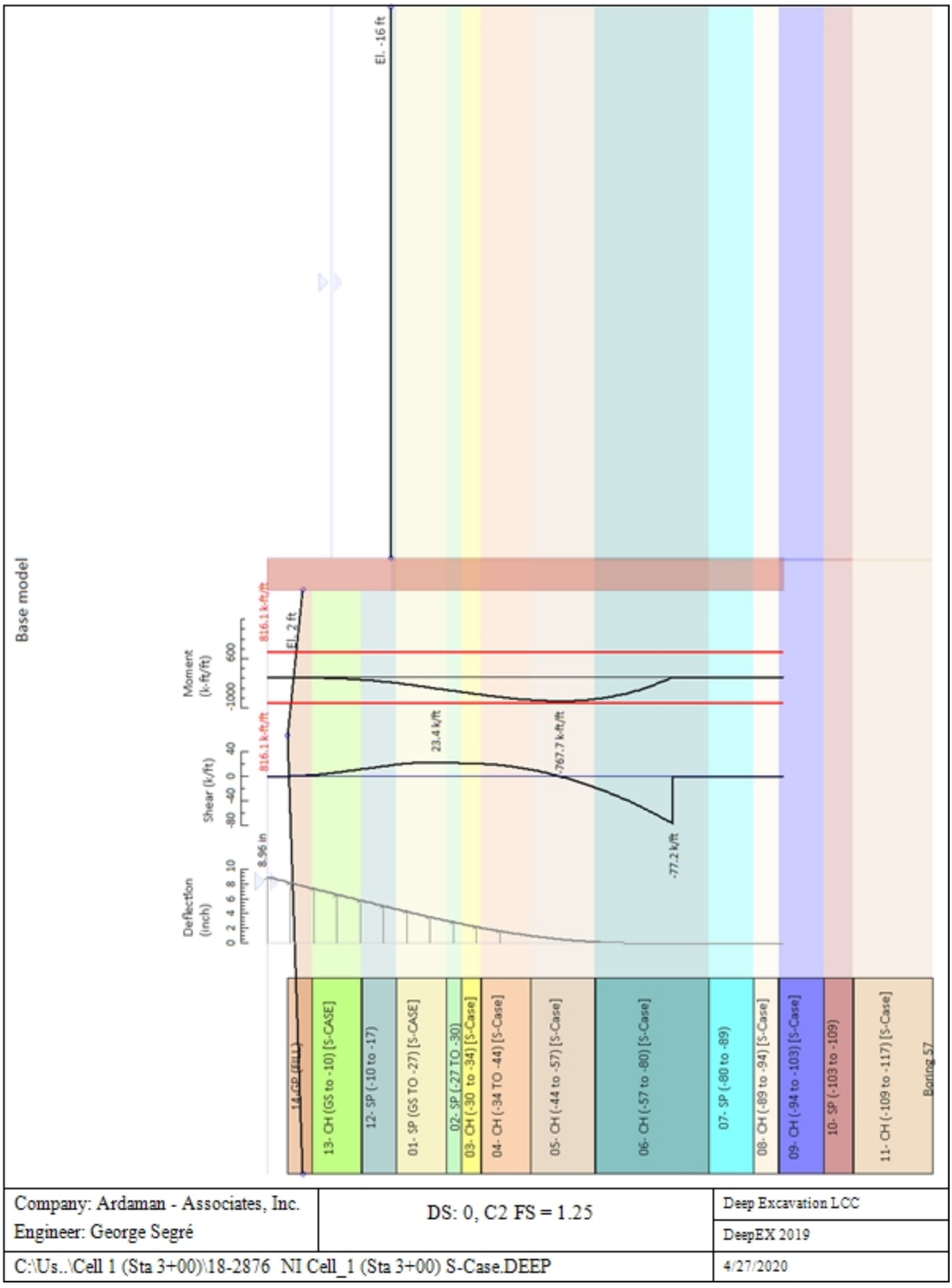

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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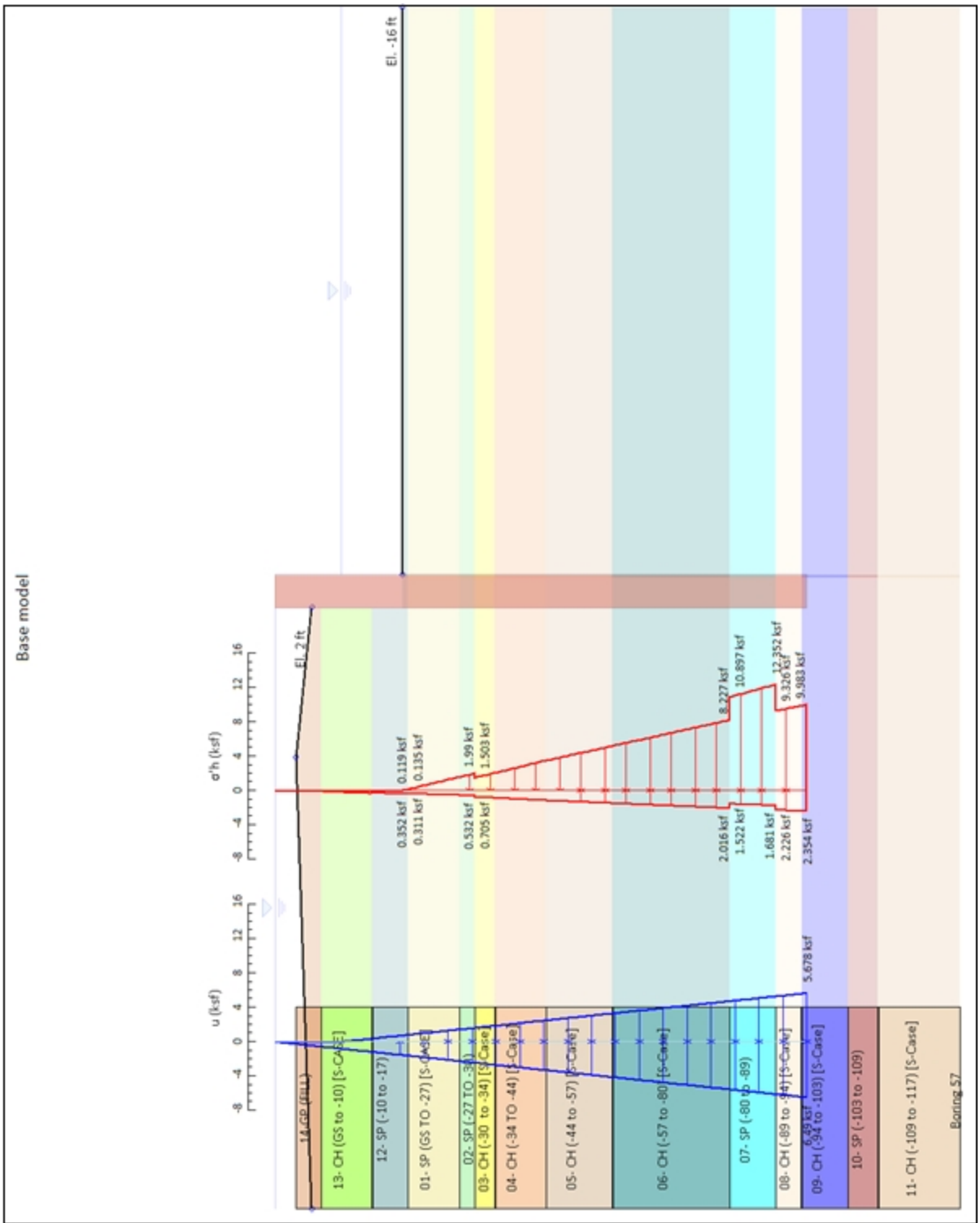

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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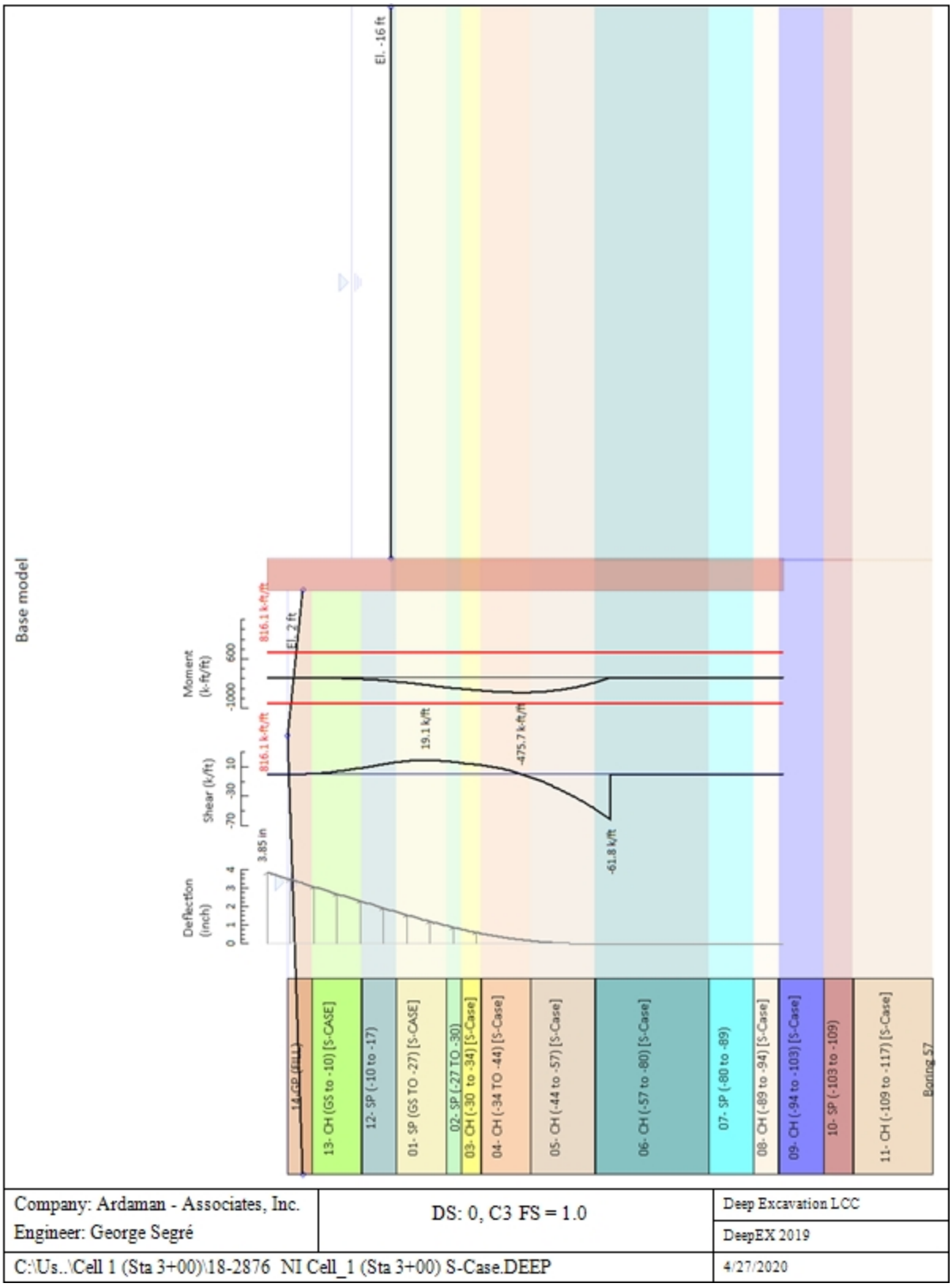

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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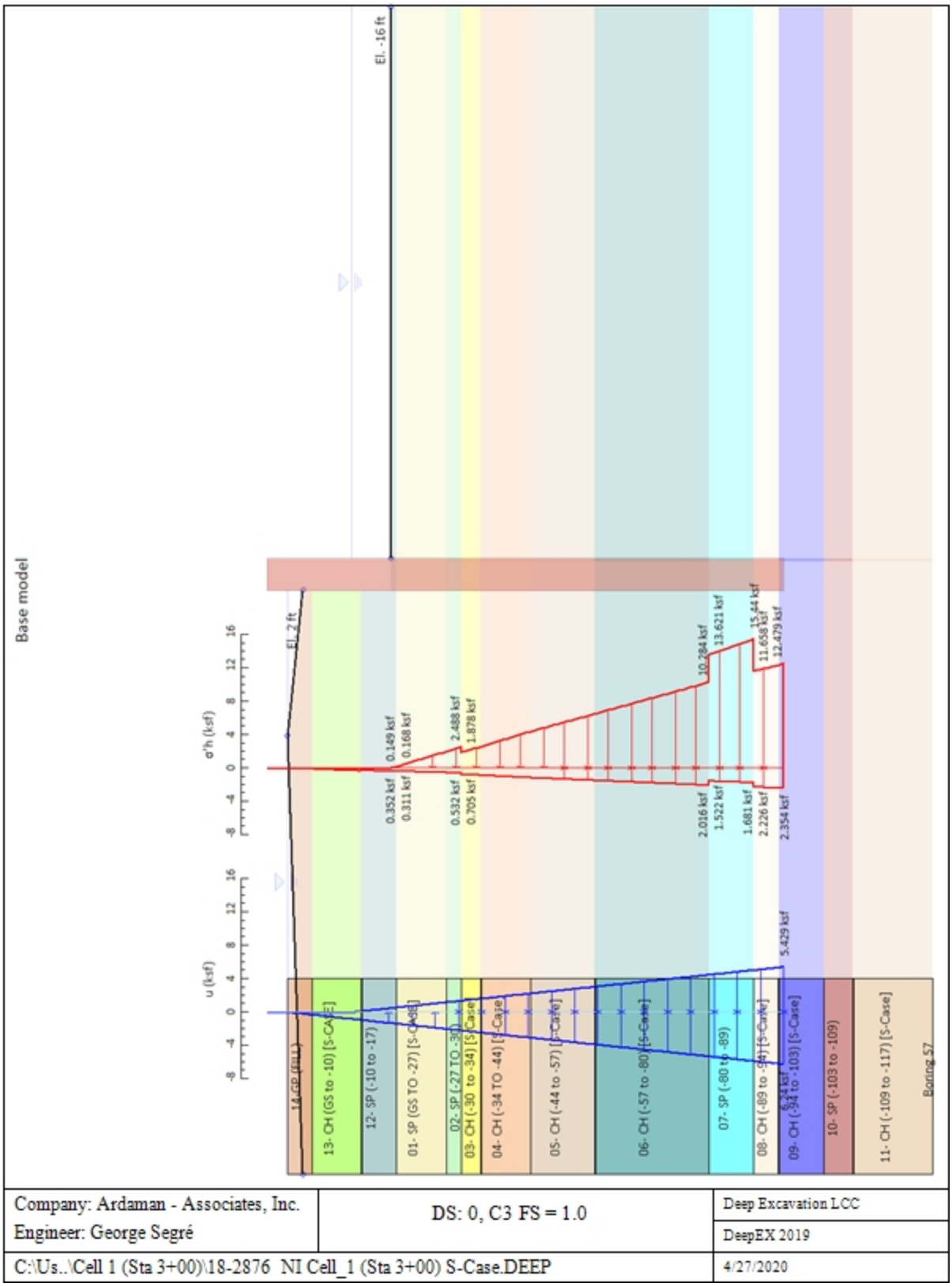

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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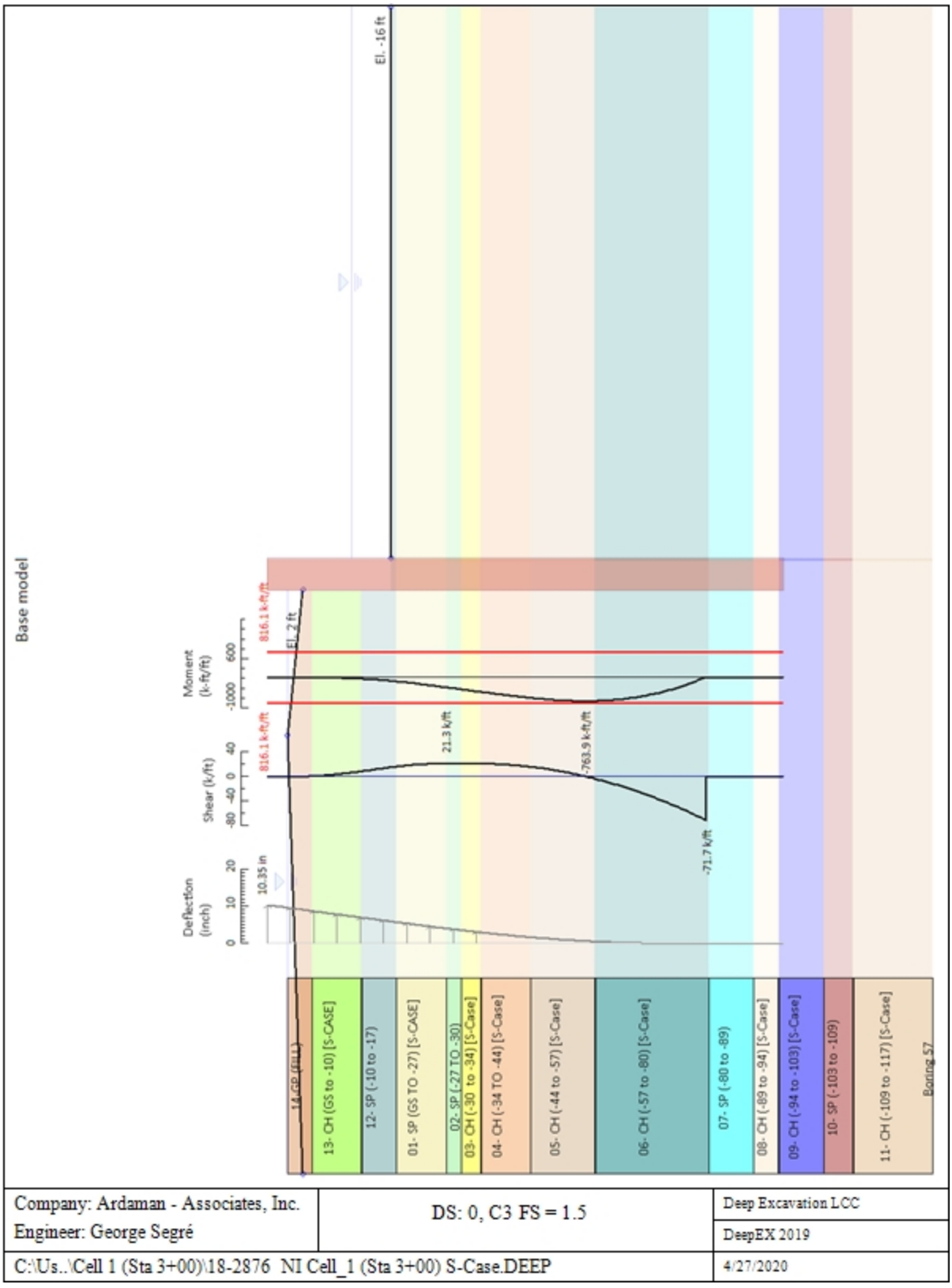

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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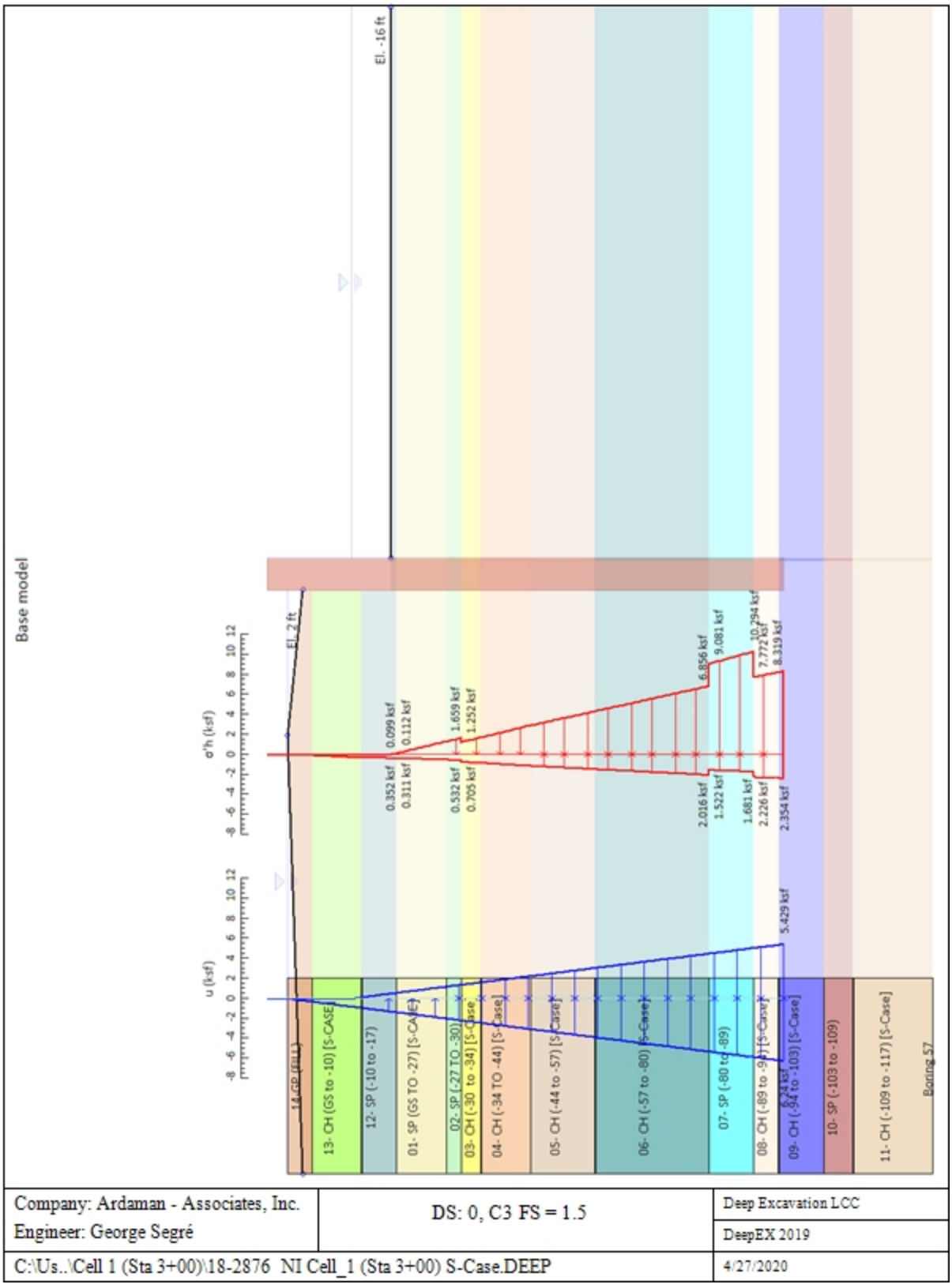

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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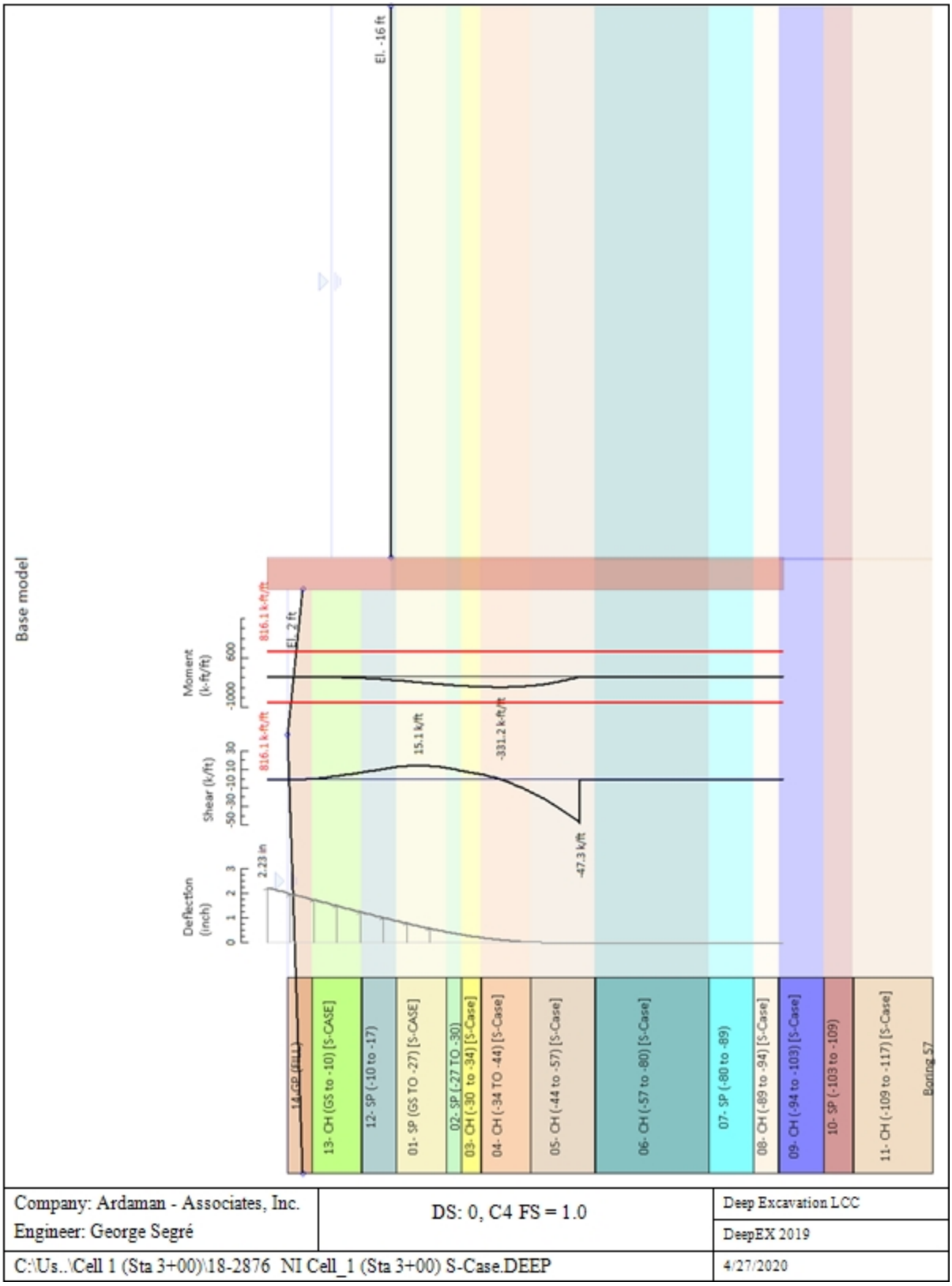

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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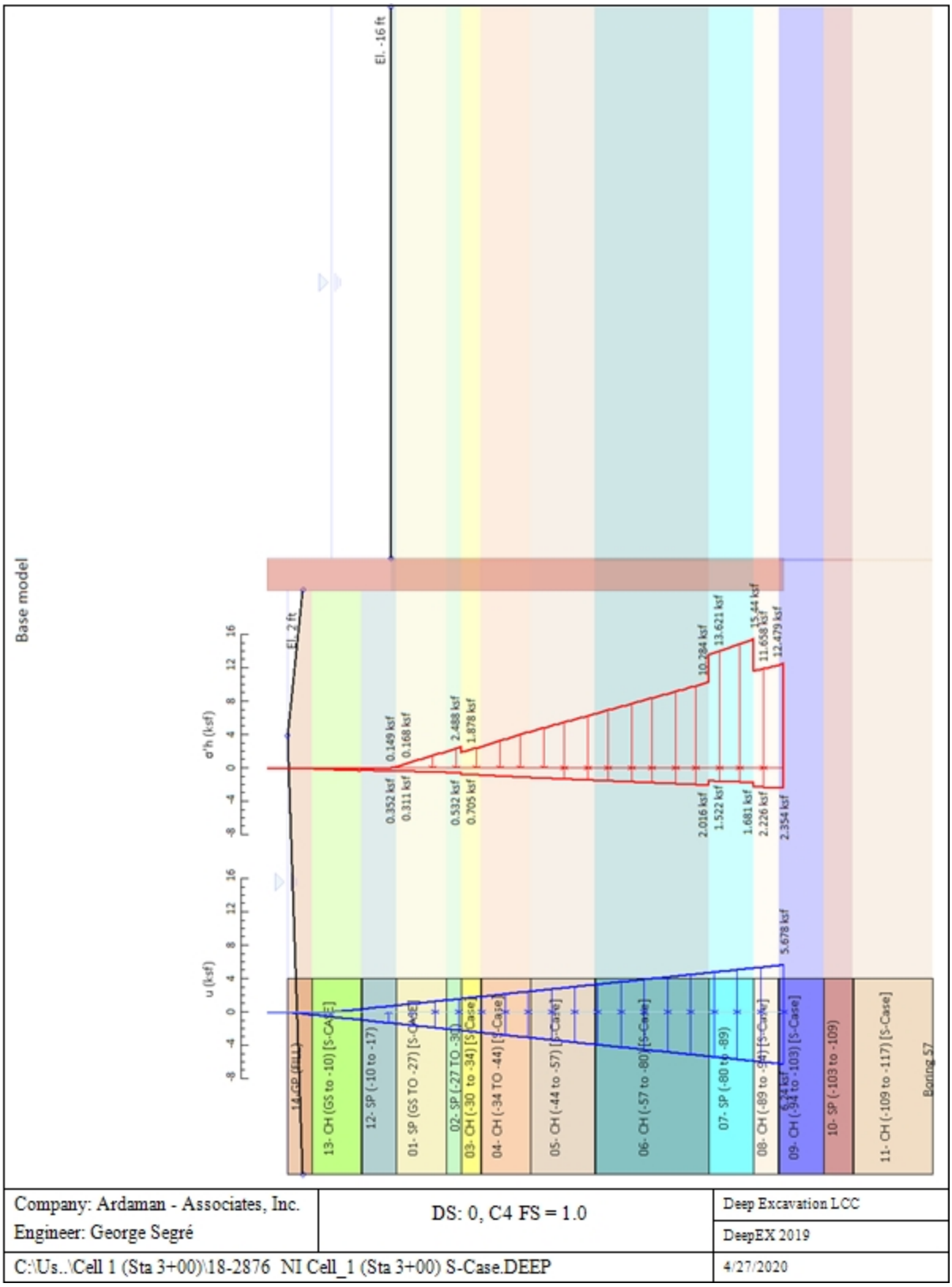

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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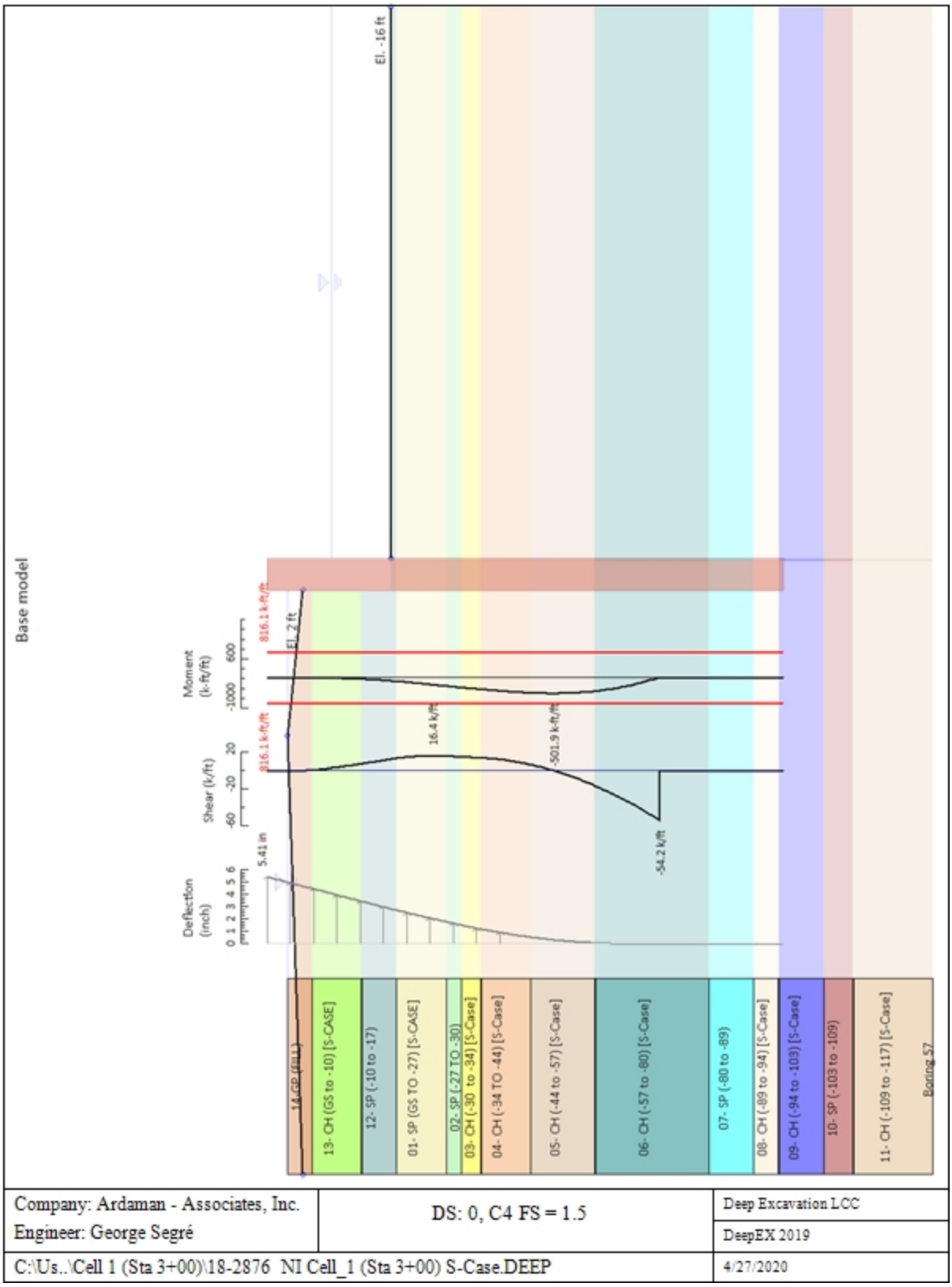

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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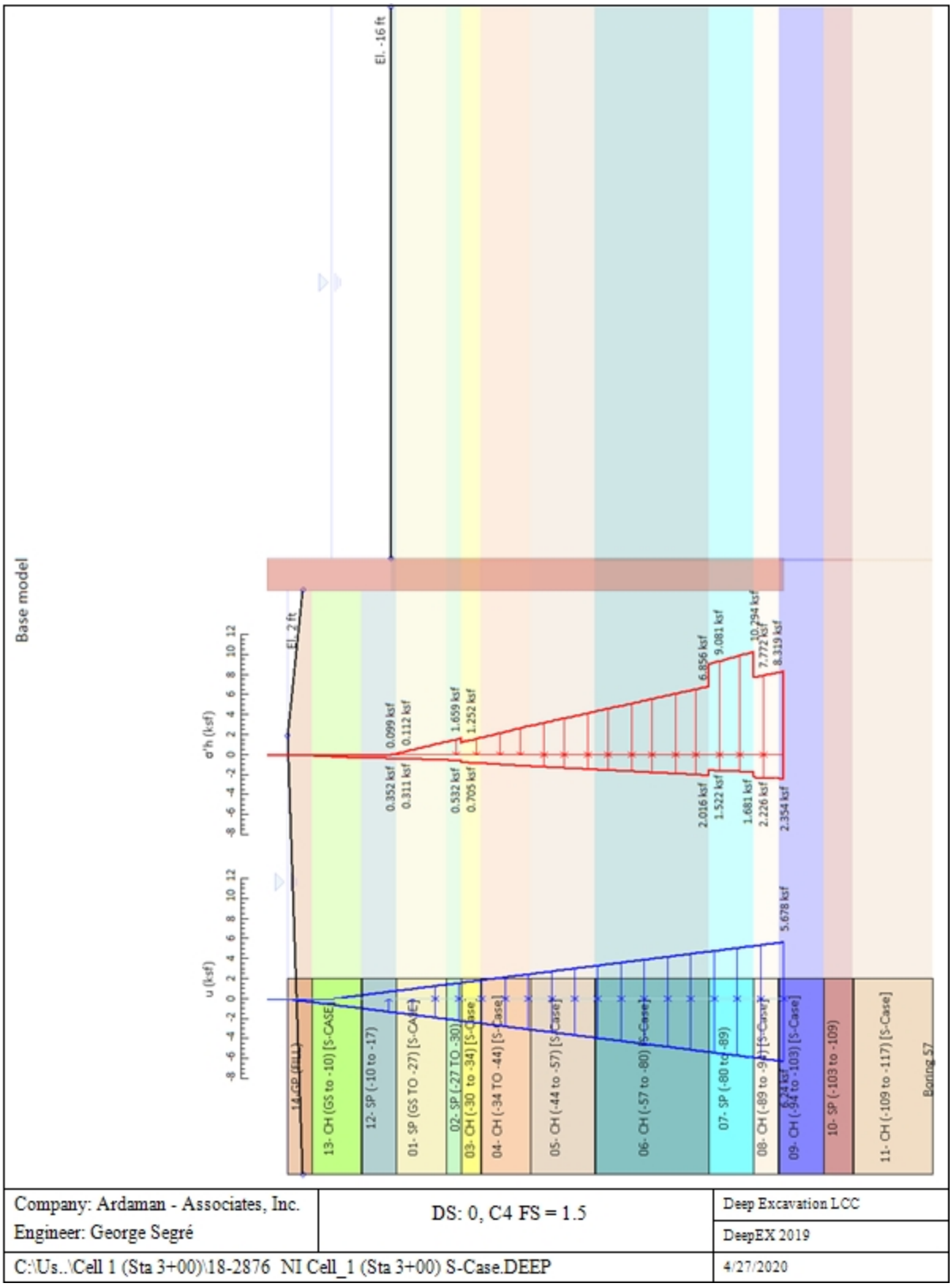

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+00)\18-2876 NI Cell_1 (Sta 3+00) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+50)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -72.78 ft., NAVD88

Length of Sheetting = 81.78 ft.

Use = 85.0 ft.

Design Tip Elev. = -76.0 ft., NAVD88

Design Length of Sheeting = 85.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-44.72	493.62	90.92	2.19
		Open excavation - degraded	9	-8	1.00	1.25	-47.48	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-42.74	405.38	83.52	1.67
		Open excavation - degraded	9	-4	1.00	1.25	-45.12	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-41.16	300.72	70.58	1.10
		Open excavation - degraded	5	-8	1.00	1.50	-45.12	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-38.80	220.86	59.93	0.75
		Open excavation - degraded	5	-4	1.00	1.50	-42.35	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-63.85	626.88	75.91	5.68
		Open excavation - degraded	9	-8	1.00	1.25	-72.78	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-58.21	463.57	61.75	3.58
		Open excavation - degraded	9	-4	1.00	1.25	-65.73	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-54.45	334.37	48.40	2.26
		Open excavation - degraded	5	-8	1.00	1.50	-69.49	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-48.34	219.60	36.17	1.20
		Open excavation - degraded	5	-4	1.00	1.50	-60.09	--	--	--
						Governing Value:	-72.78	626.88	90.92	5.68

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 7:56:32 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
14- GP Fill	120	120	34	0	N/A	N/A	N/A	300	3	0.28	3.54	N/A	N/A	True	Linear	
13- CH (GS to	112	112	0	0	800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (-17 T	115	115	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	30	0	N/A	N/A	N/A	60	3	0.33	3	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	0	0	2290	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-34 T	134	134	0	0	2290	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-44 to	126	126	0	0	2290	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-57 to	127	127	0	0	1650	0	0	626.3	3	1	1	1	1	True	Linear	
07- SP (-80 to	122	122	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	0	0	1200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-94 to	120	120	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- SP (-103 t	120	120	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	0	0	1670	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
14- GP Fill	0.35	-	-	0.441	0.8	-	-	0	0	0	-
13- CH (GS to	0.35	0	0	1	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (-17 T	0.4	-	-	0.5	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.5	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	0	0	1	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.5	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

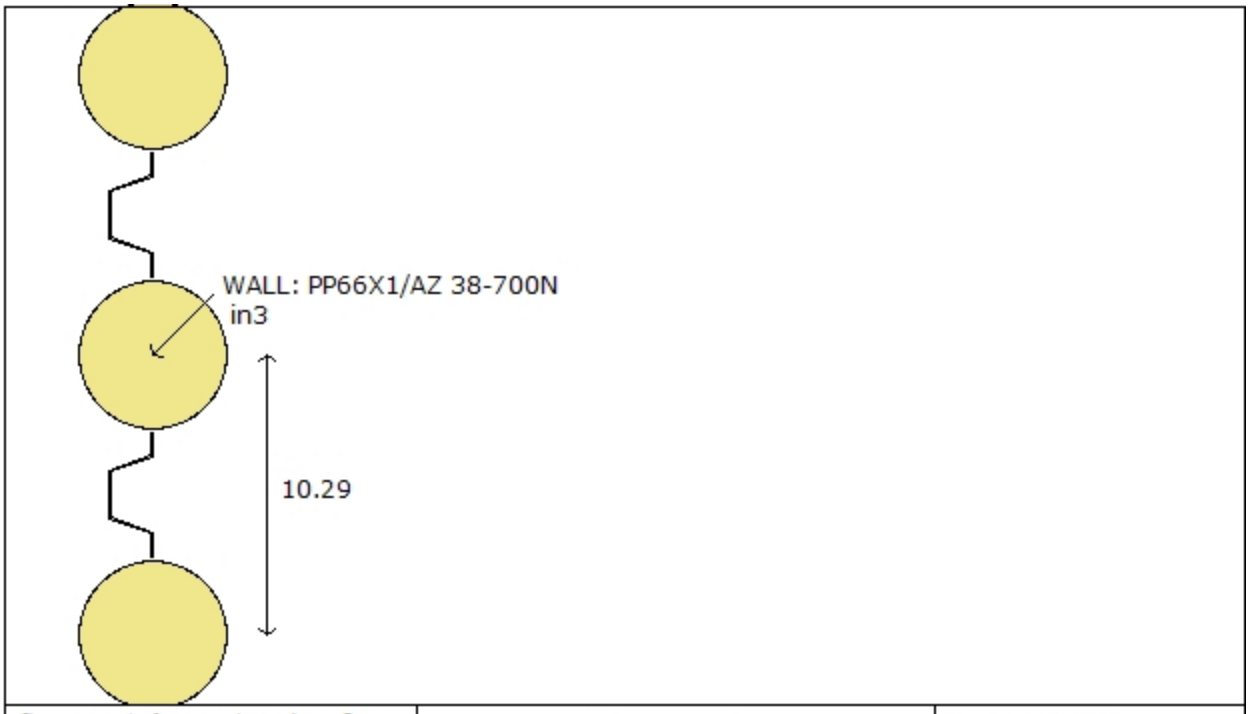
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	14- GP Fill	1	0.44
0	13- CH (GS to -	1	1
-10	12- SP (-10 to -	1	0.5
-17	01- SP (-17 TO	1	0.5
-27	02- SP (-27 TO	1	0.5
-30	03- CH (-30 to	1	1
-34	04- CH (-34 TO	1	1
-44	05- CH (-44 to	1	0.45
-57	06- CH (-57 to	1	1
-80	07- SP (-80 to -	1	0.5
-89	08- CH (-89 to	1	1
-94	09- CH (-94 to	1	1
-103	10- SP (-103 to	1	0.5
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Company: Ardaman - Associates, Inc. Engineer: George Segré	Wall sketch	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP		4/27/2020

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.912	2.962	7.188
Stage 1	Simple span	N/A	1.6	1.739	2.423	5.808
Stage 2	Simple span	N/A	1.6	2.059	3.154	7.49
Stage 3	Simple span	N/A	1.6	1.885	2.599	6.072
Stage 4	Simple span	N/A	1.6	2.193	3.712	8.71
Stage 5	Simple span	N/A	1.6	1.885	2.586	5.922
Stage 6	Simple span	N/A	1.6	2.431	3.952	9.076
Stage 7	Simple span	N/A	1.6	2.091	2.795	6.211

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

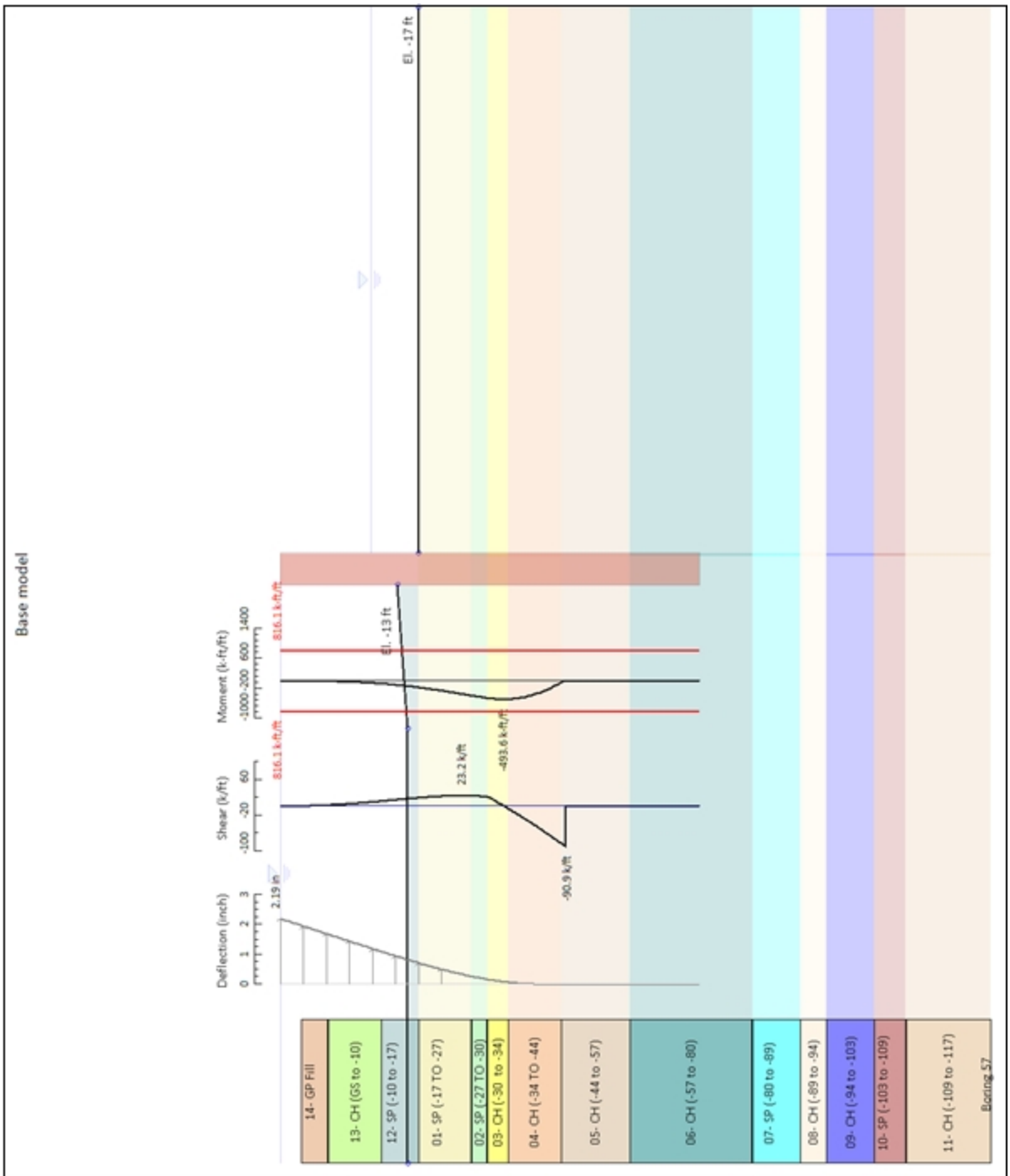
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

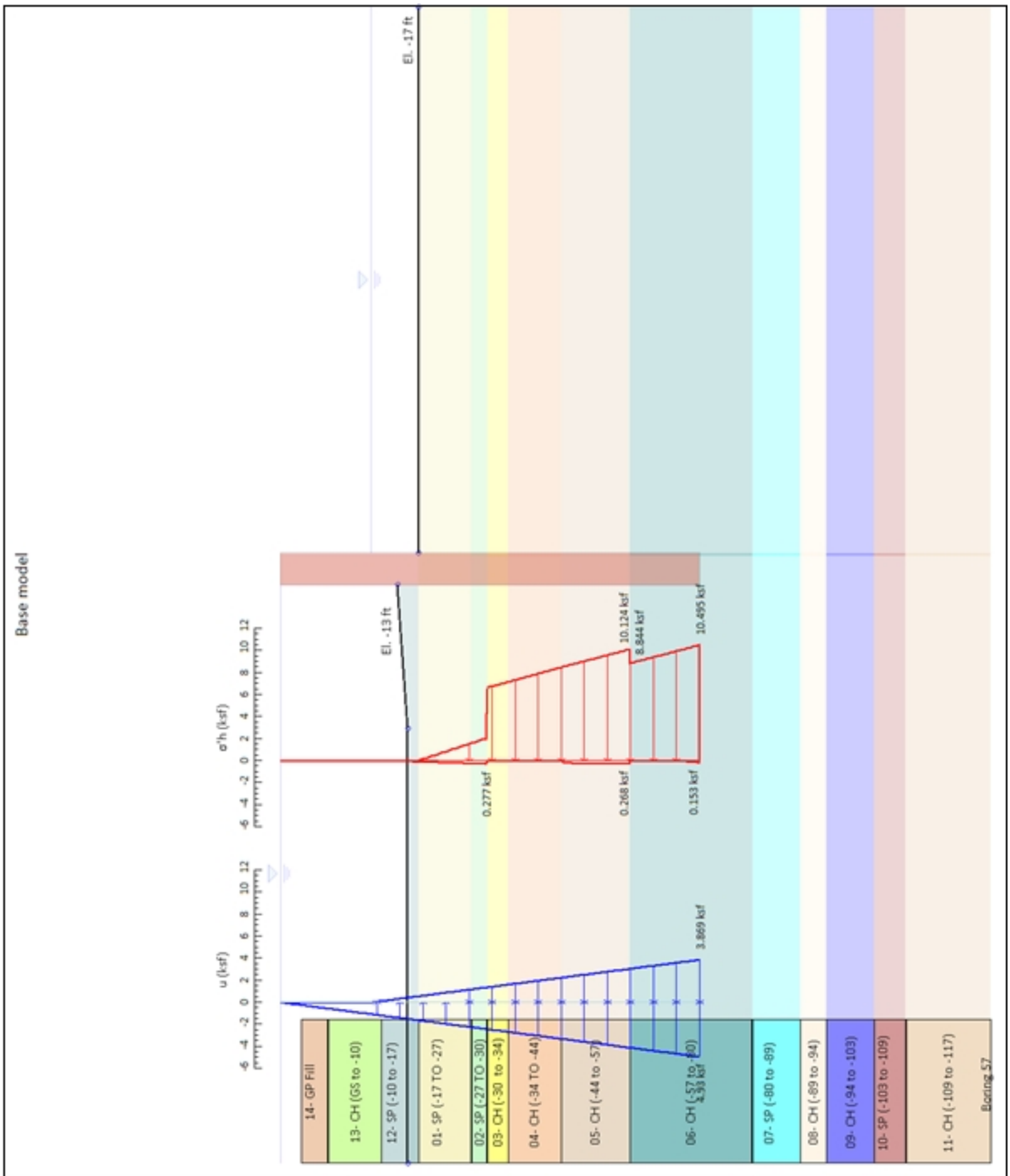
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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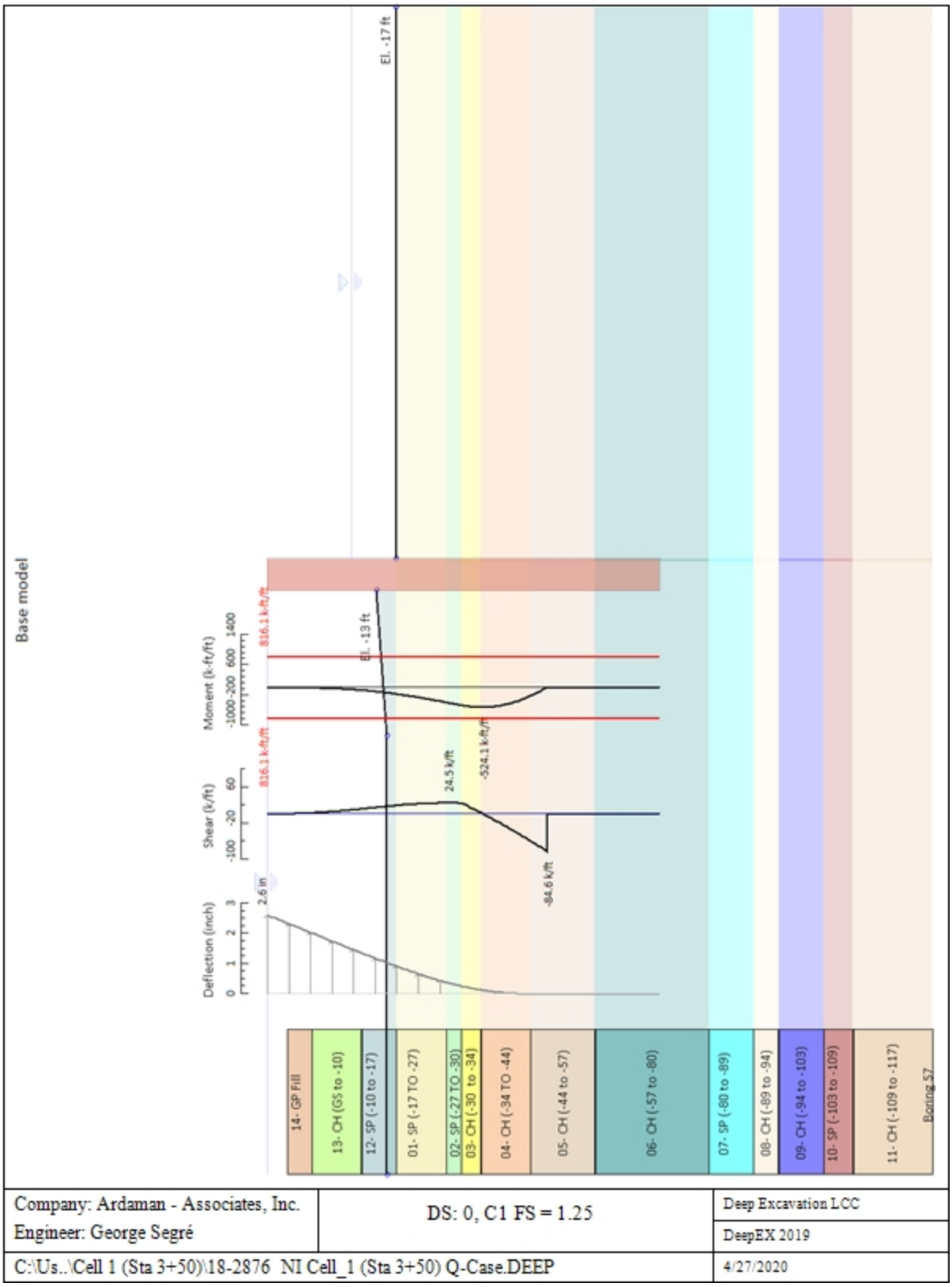

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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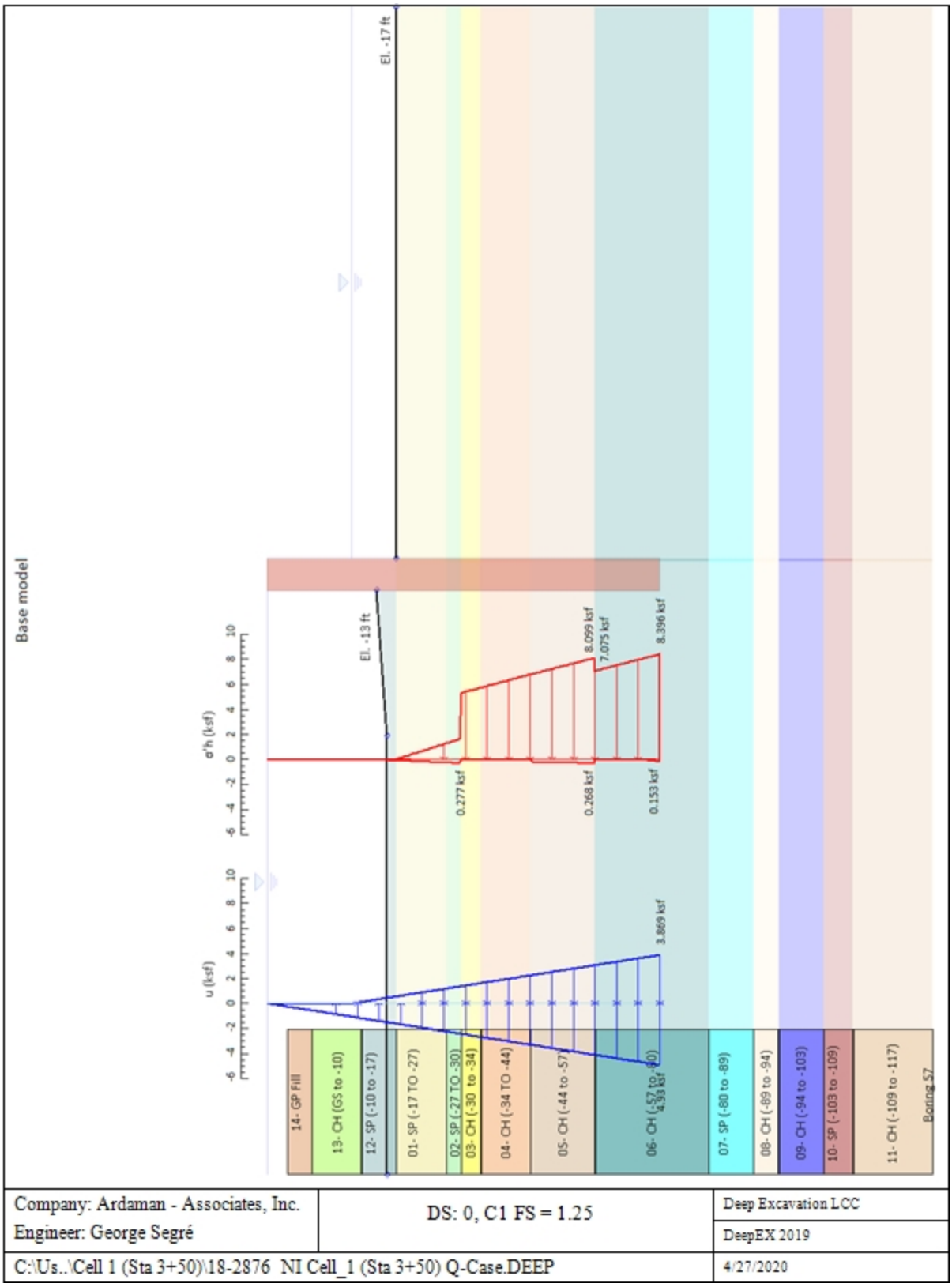

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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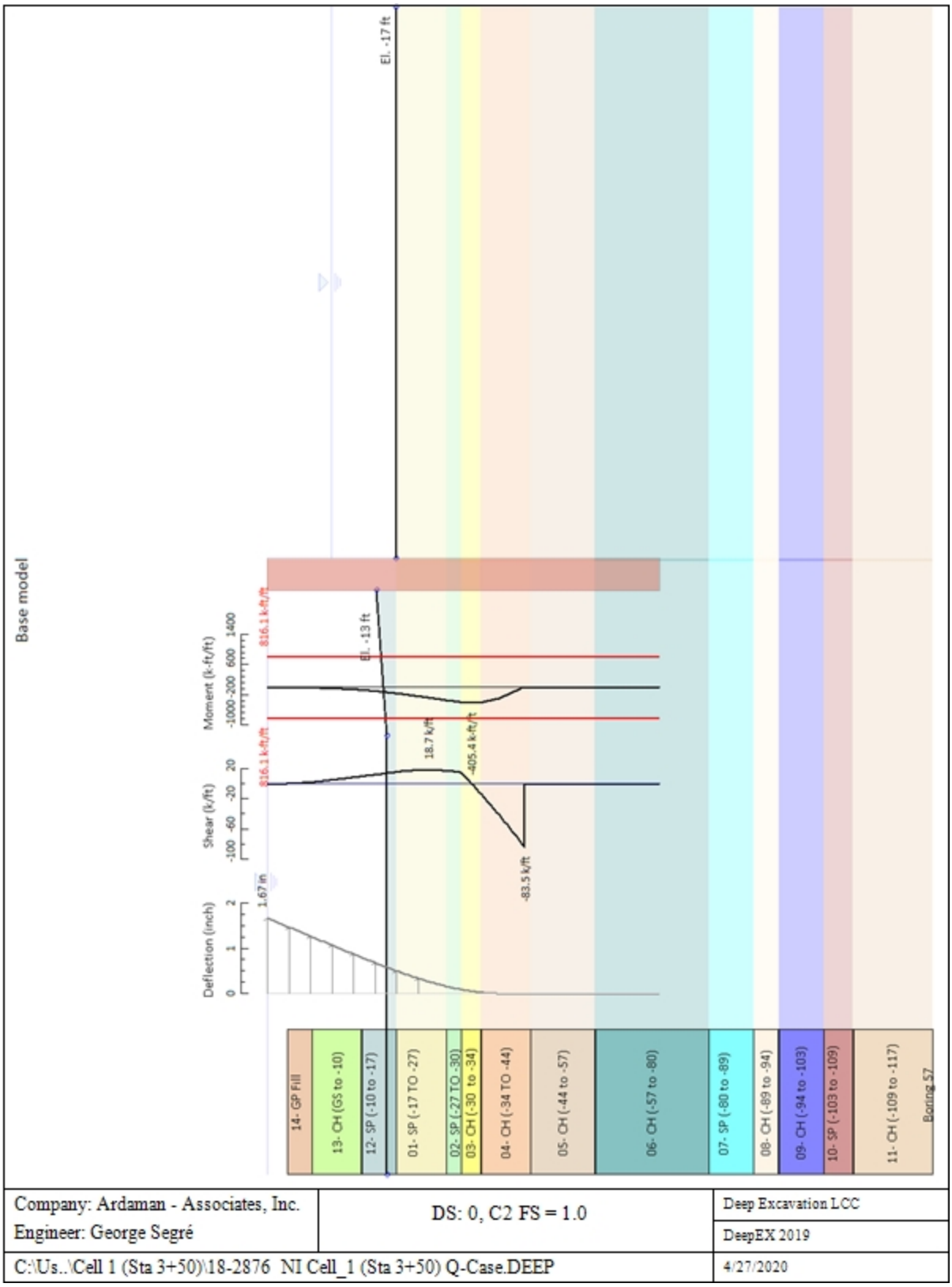

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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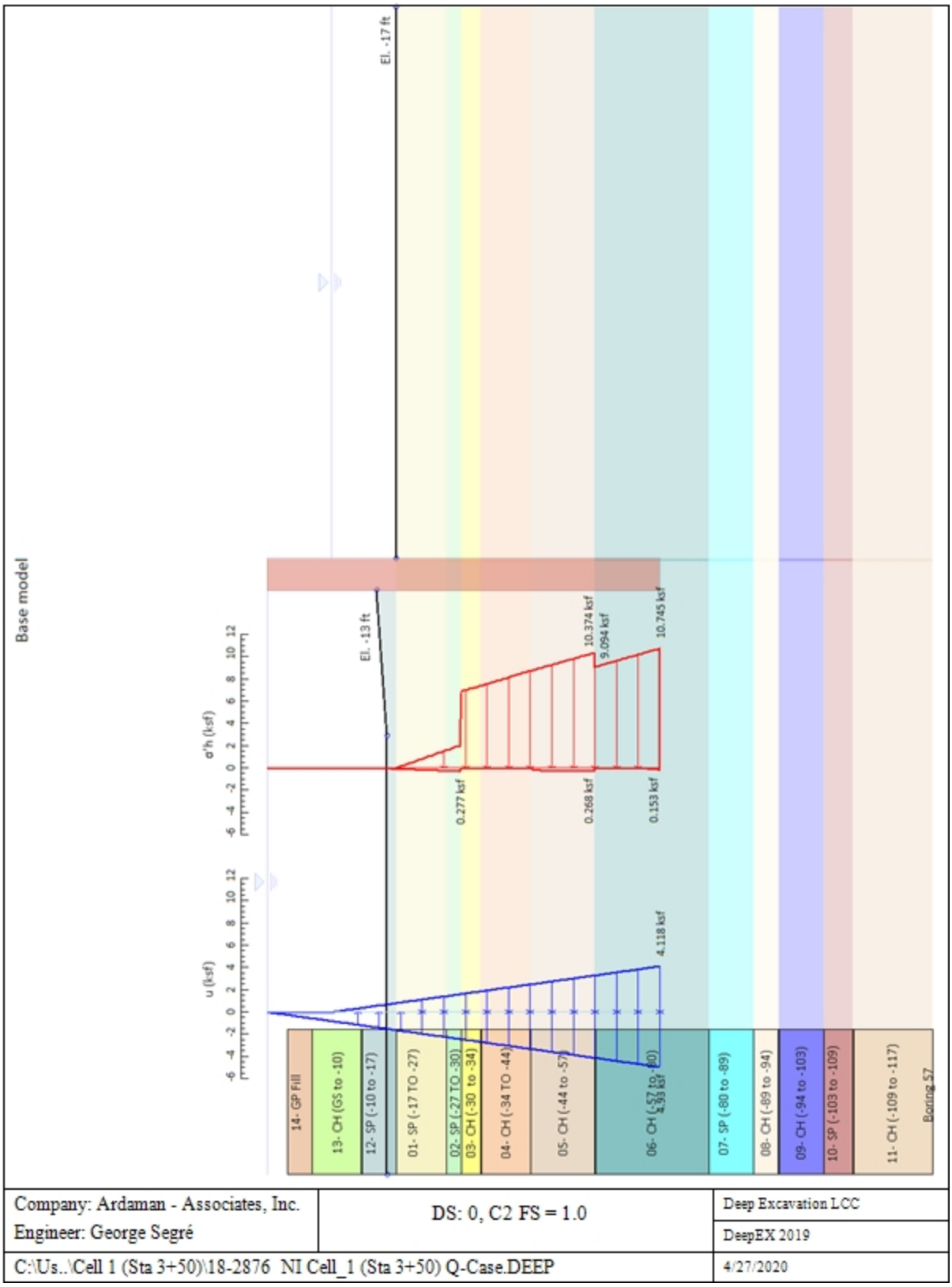

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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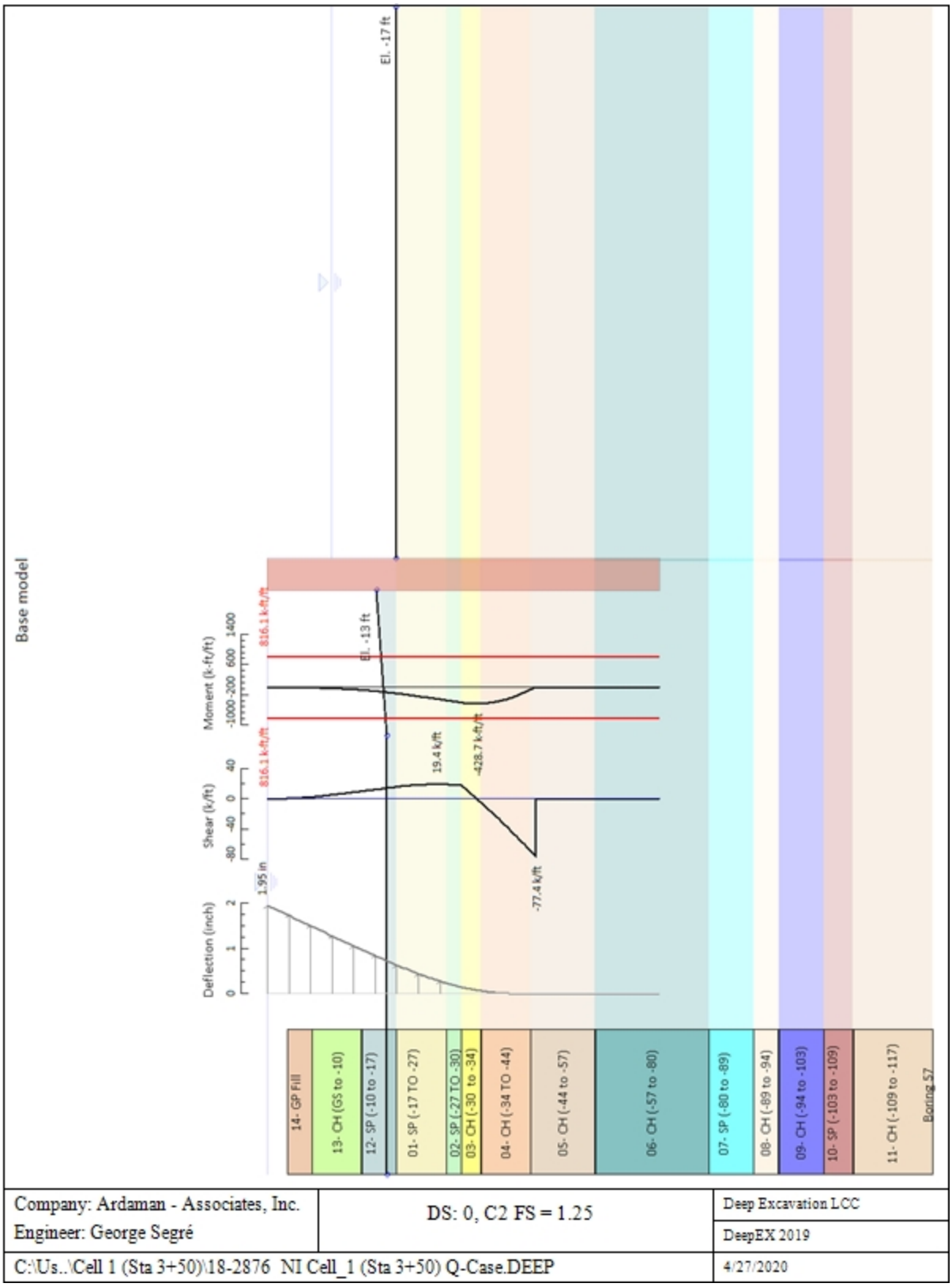

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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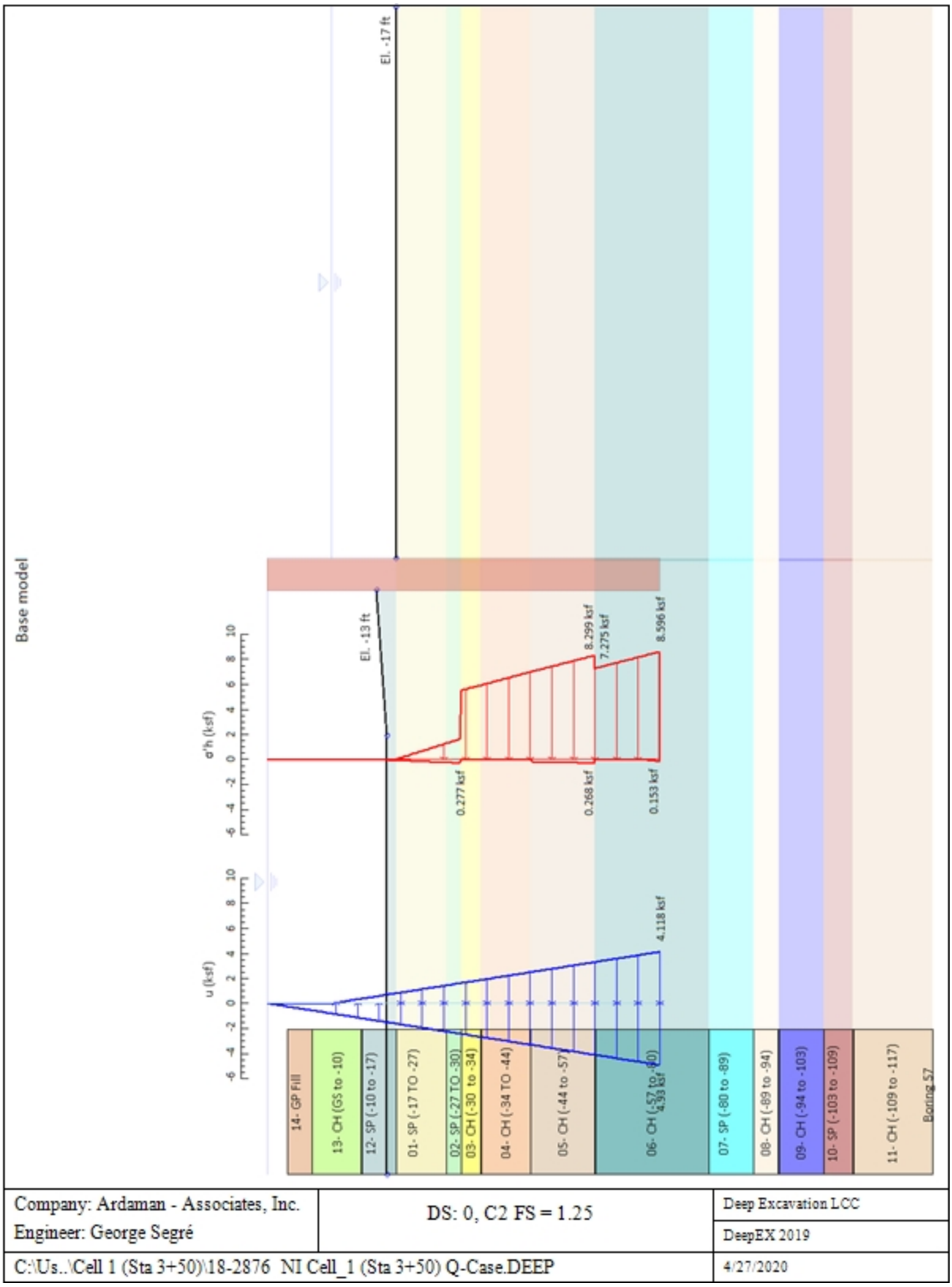

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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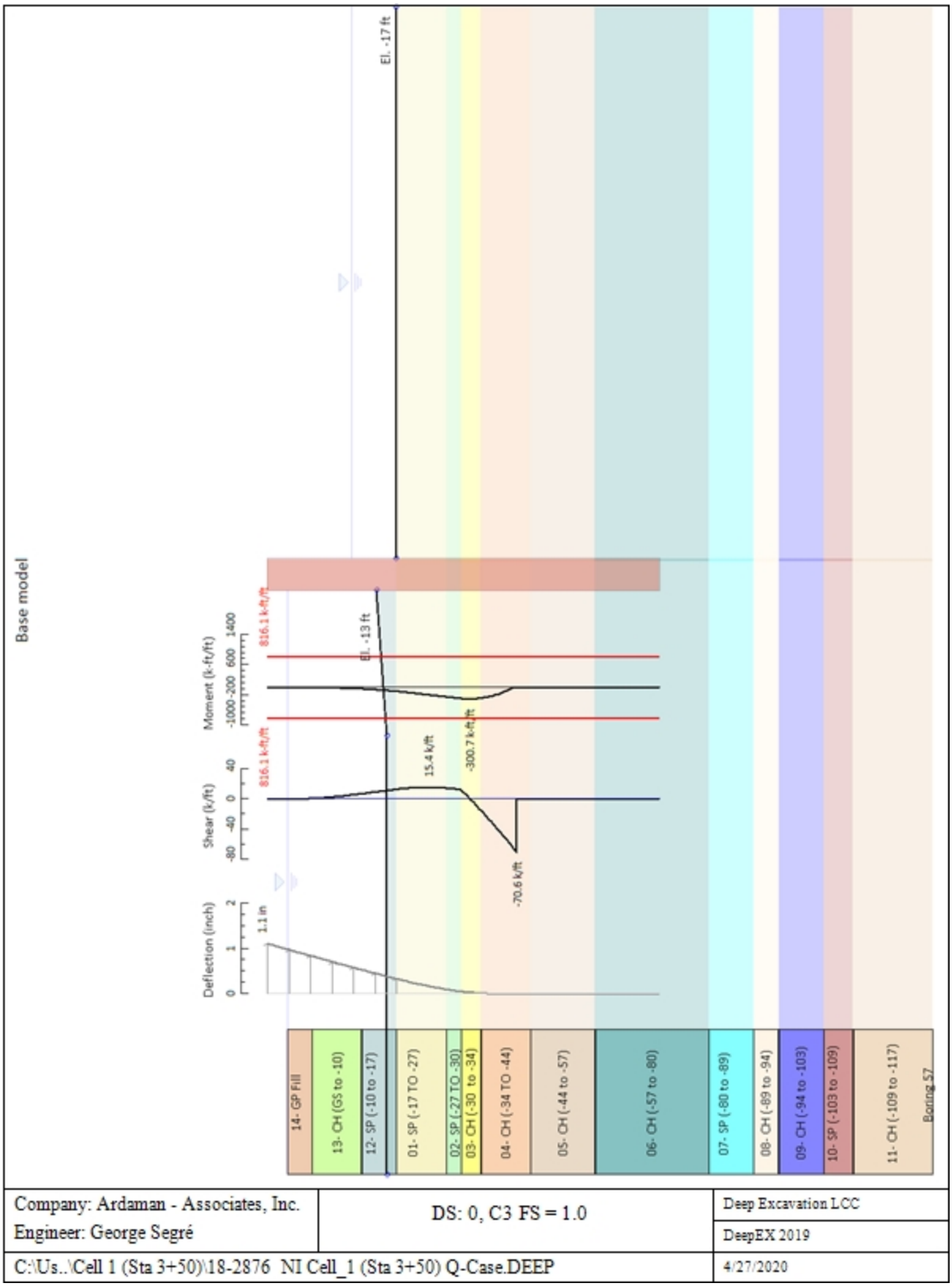
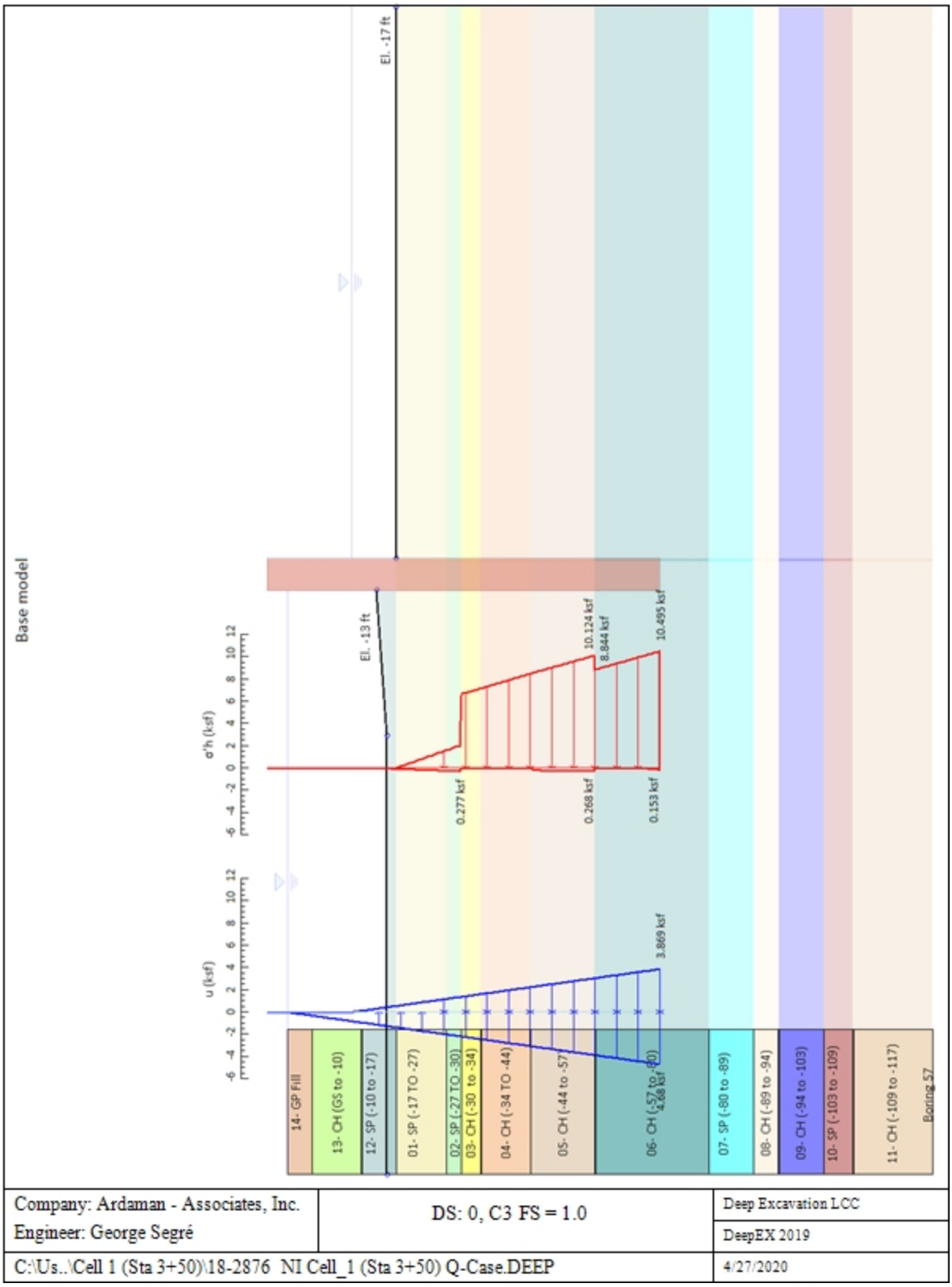

Base model
El. -17 ft
El. -13 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-80 -40 0 40
15.4 k/ft
-300.7 k-ft/ft
-70.6 k/ft
Deflection (inch)
0 1 2
1.1 in
14- GP Fill
13- CH (G5 to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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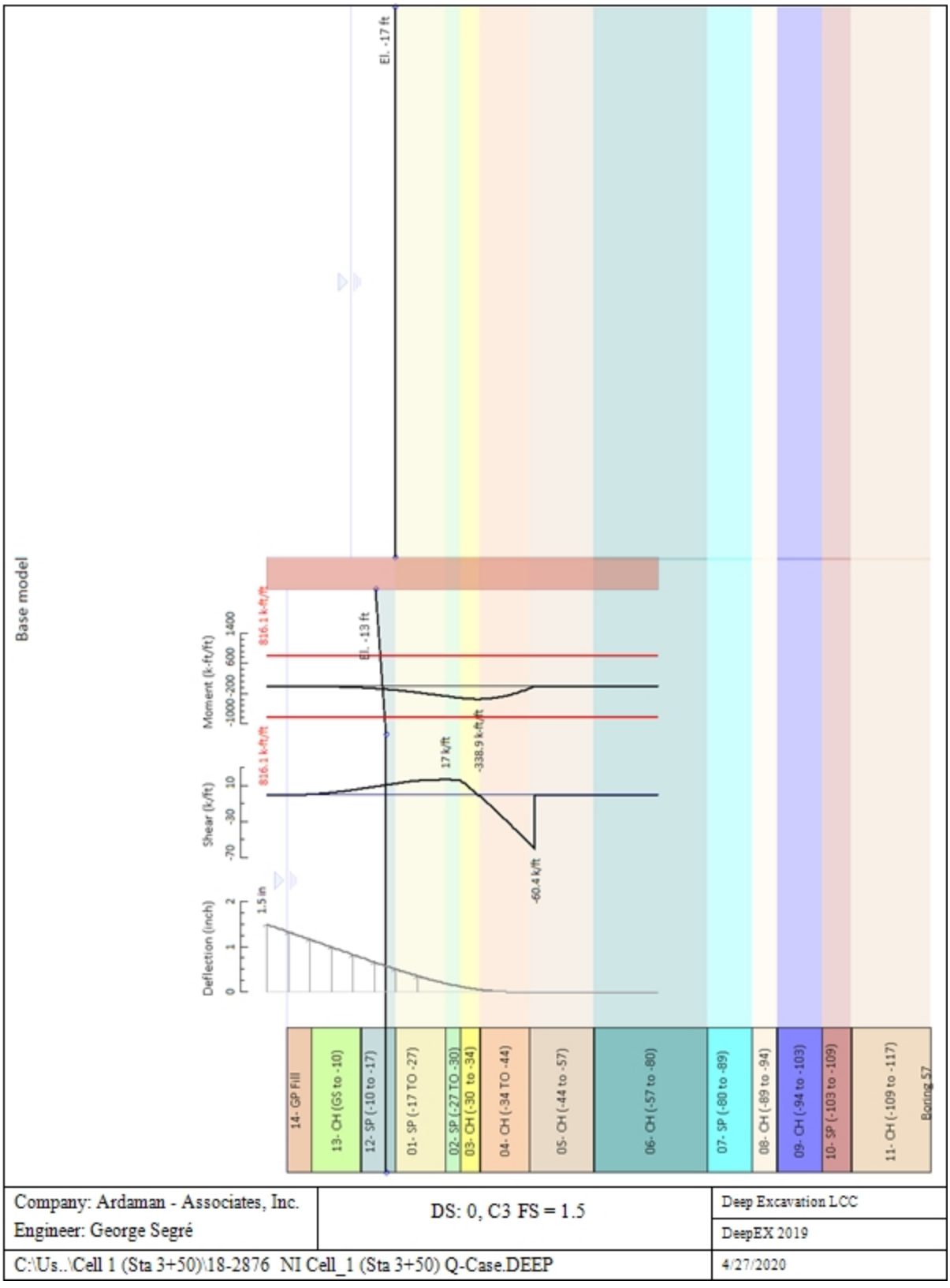

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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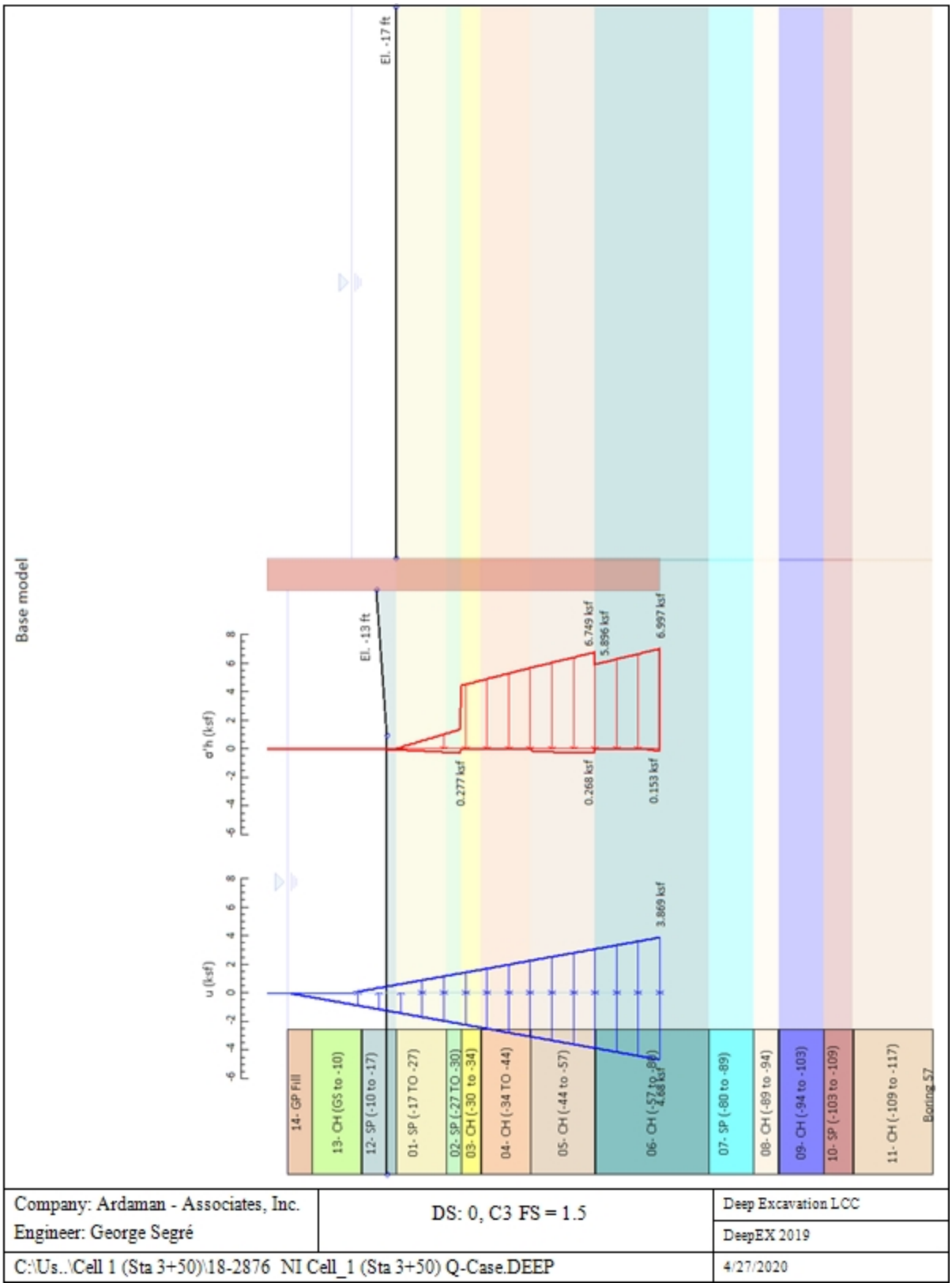
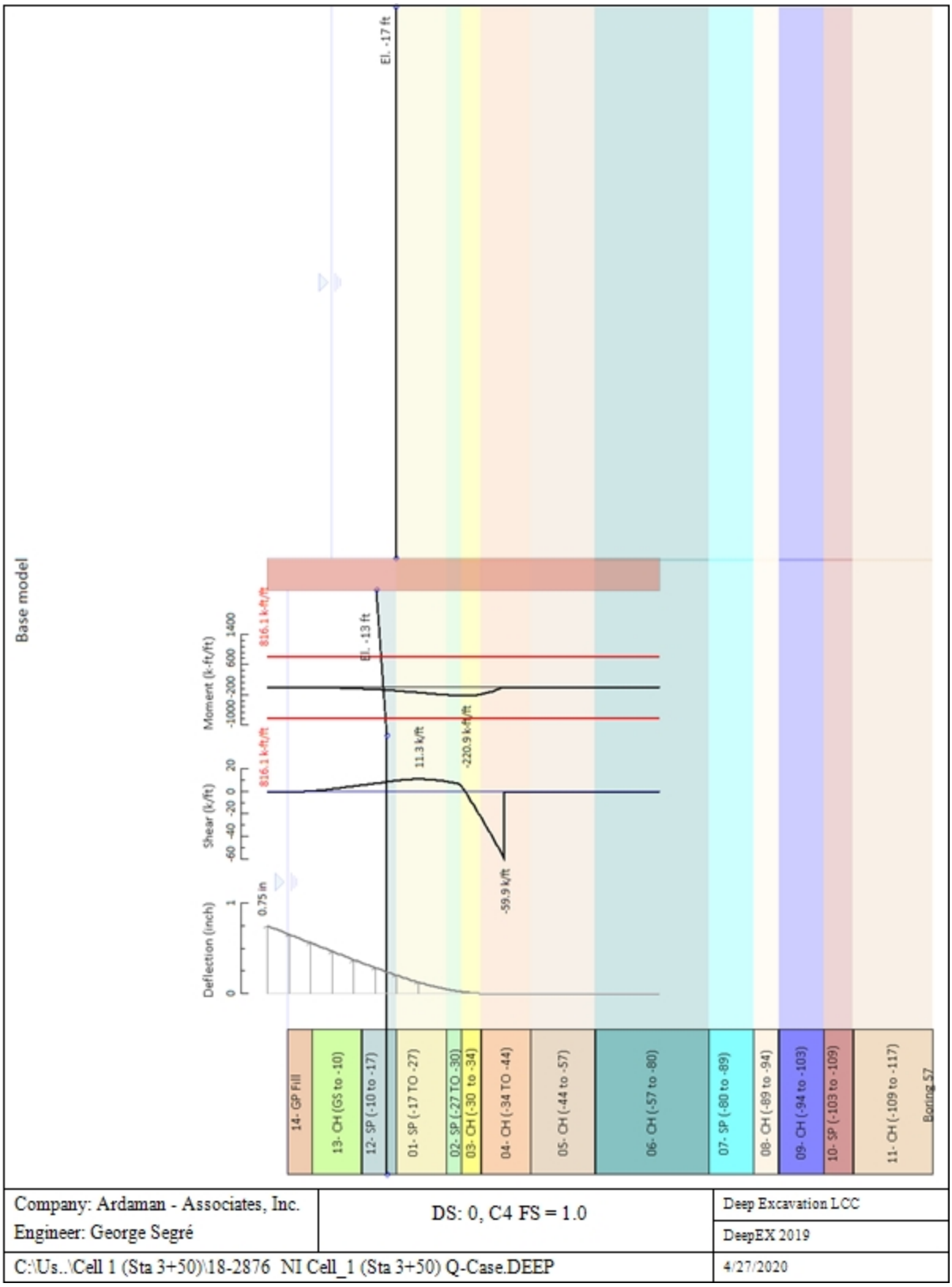
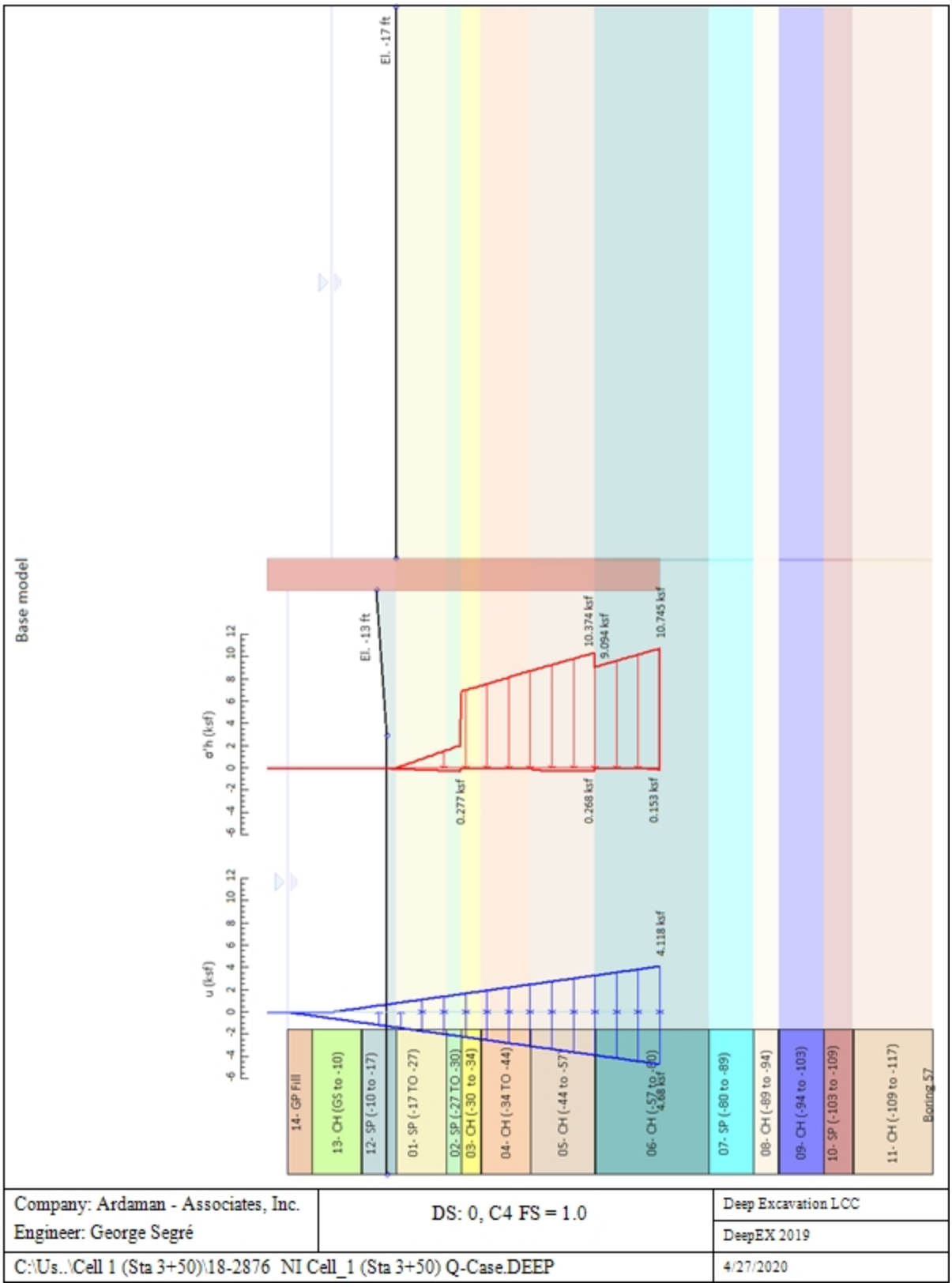

Base model
El. -17 ft
El. -13 ft
σ'h (ksf)
u (ksf)
6.749 ksf
5.896 ksf
6.997 ksf
0.277 ksf
0.268 ksf
0.153 ksf
3.869 ksf
14- GP Fill
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020


Base model
El. -17 ft
El. -13 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-60 -40 -20 0 20
11.3 k/ft
-220.9 k-ft/ft
-59.9 k/ft
Deflection (inch)
0 1
0.75 in
14- GP Fill
13- CH (GS to -10)
12- SP (-10 to -17)
01- SP (-17 TO -27)
02- SP (-27 TO -30)
03- CH (-30 to -34)
04- CH (-34 TO -44)
05- CH (-44 to -57)
06- CH (-57 to -80)
07- SP (-80 to -89)
08- CH (-89 to -94)
09- CH (-94 to -103)
10- SP (-103 to -109)
11- CH (-109 to -117)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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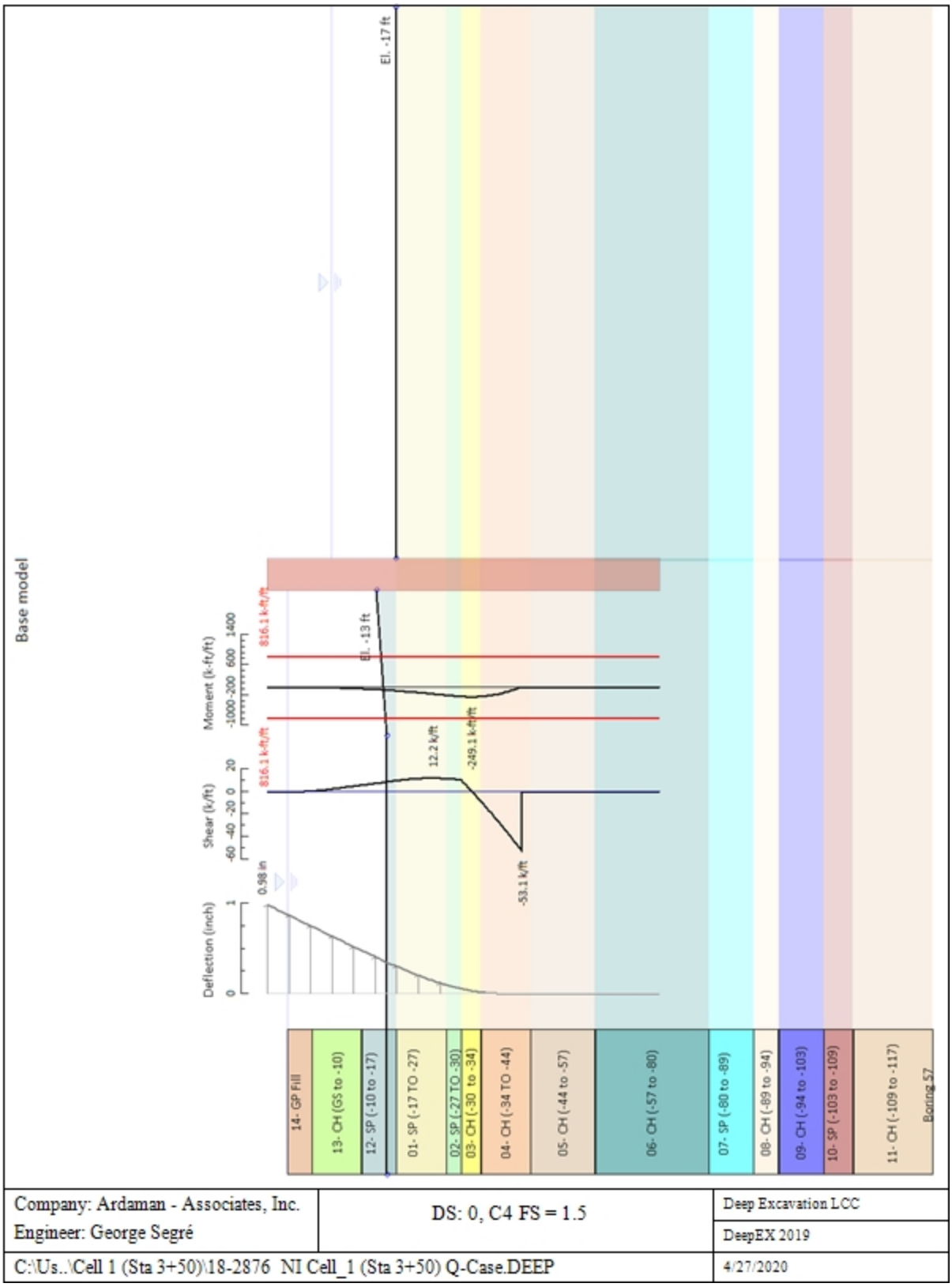

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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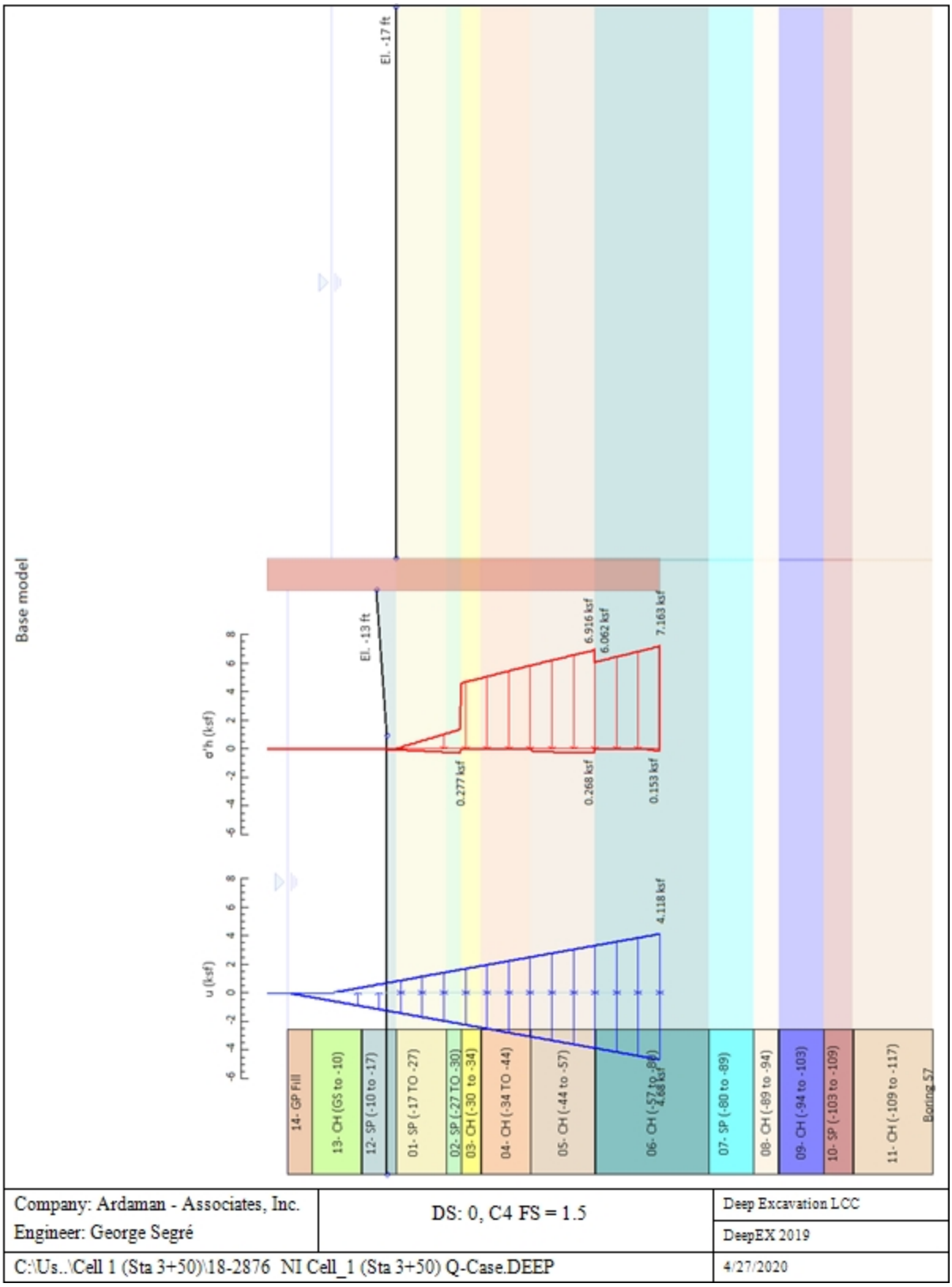

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) Q-Case.DEEP		4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:01:34 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
14-GP (FILL)	120	120	34	0	N/A	N/A	N/A	300	3	0.28	3.54	N/A	N/A	True	Linear	
13- CH (GS to	112	112	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (GS TO	115	115	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	33	0	N/A	N/A	N/A	60	3	0.3	3.39	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	26	0	N/A	N/A	N/A	150	3	0.39	2.56	N/A	N/A	True	Linear	
04- CH (-34 T	134	134	26	0	N/A	N/A	N/A	521.92	3	0.39	2.56	N/A	N/A	True	Linear	
05- CH (-44 to	126	126	26	0	N/A	N/A	N/A	417.54	3	0.39	2.56	N/A	N/A	True	Linear	
06- CH (-57 to	127	127	26	0	N/A	N/A	N/A	626.3	3	0.39	2.56	N/A	N/A	True	Linear	
07- SP (-80 to	122	122	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- CH (-94 to	120	120	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
10- SP (-103 t	120	120	33	0	N/A	N/A	N/A	300	3	0.3	3.39	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
14-GP (FILL)	0.35	-	-	0.441	0.8	-	-	0	0	0	-
13- CH (GS to	0.35	-	-	0.609	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (GS TO	0.4	-	-	0.455	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.455	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	-	-	0.562	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	-	-	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	-	-	0.562	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	-	-	0.562	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.455	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	-	-	0.562	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.455	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	-	-	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

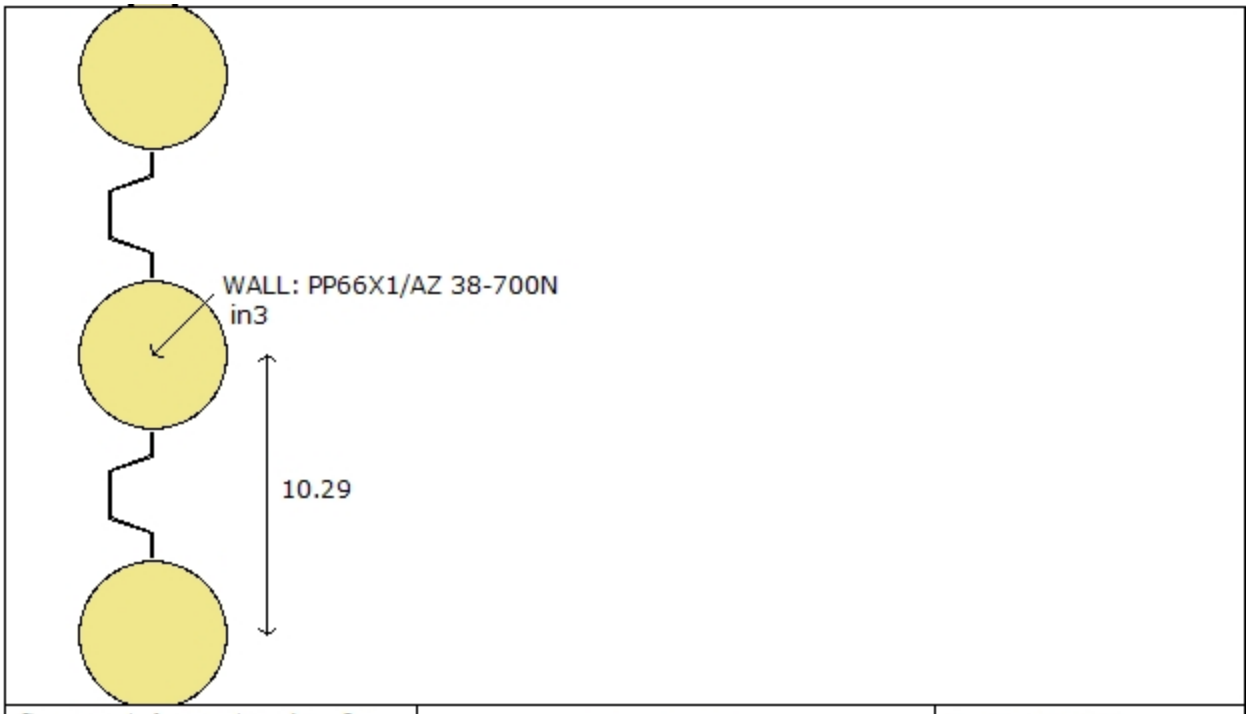
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	14-GP (FILL)	1	0.44
0	13- CH (GS to -	1	0.61
-10	12- SP (-10 to -	1	0.5
-17	01- SP (GS TO	1	0.46
-27	02- SP (-27 TO	1	0.46
-30	03- CH (-30 to	1	0.56
-34	04- CH (-34 TO	1	0.56
-44	05- CH (-44 to	1	0.56
-57	06- CH (-57 to	1	0.56
-80	07- SP (-80 to -	1	0.46
-89	08- CH (-89 to	1	0.56
-94	09- CH (-94 to	1	0.56
-103	10- SP (-103 to	1	0.46
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Company: Ardaman - Associates, Inc. Engineer: George Segré	Wall sketch	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP		4/27/2020

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -85 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.307	1.307	1.702
Stage 1	Simple span	N/A	1.6	1.14	1.14	1.472
Stage 2	Simple span	N/A	1.6	1.385	1.385	1.761
Stage 3	Simple span	N/A	1.6	1.218	1.218	1.532
Stage 4	Simple span	N/A	1.6	1.461	1.461	1.828
Stage 5	Simple span	N/A	1.6	1.151	1.151	1.417
Stage 6	Simple span	N/A	1.6	1.548	1.548	1.891
Stage 7	Simple span	N/A	1.6	1.238	1.238	1.48

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

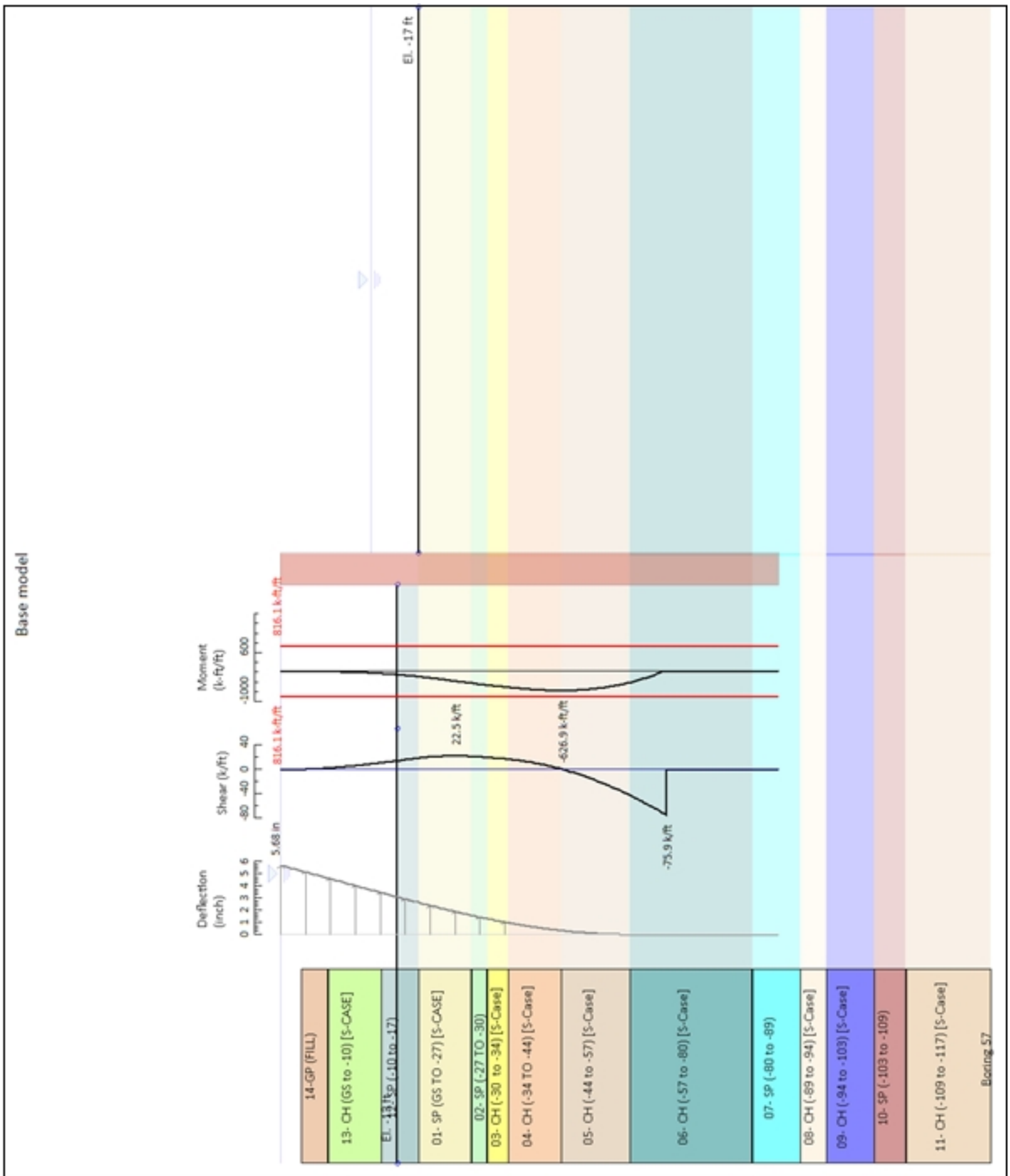
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

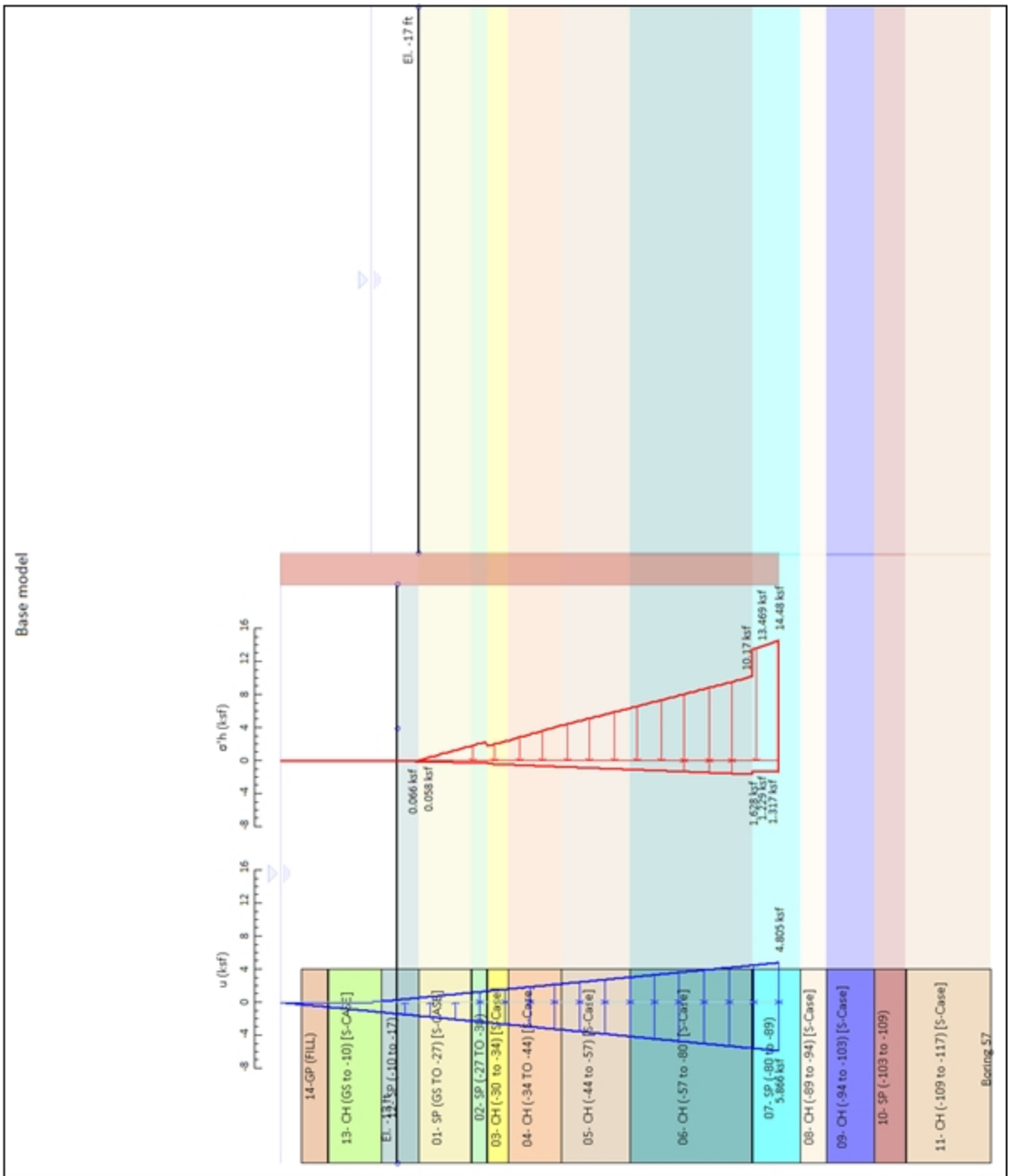
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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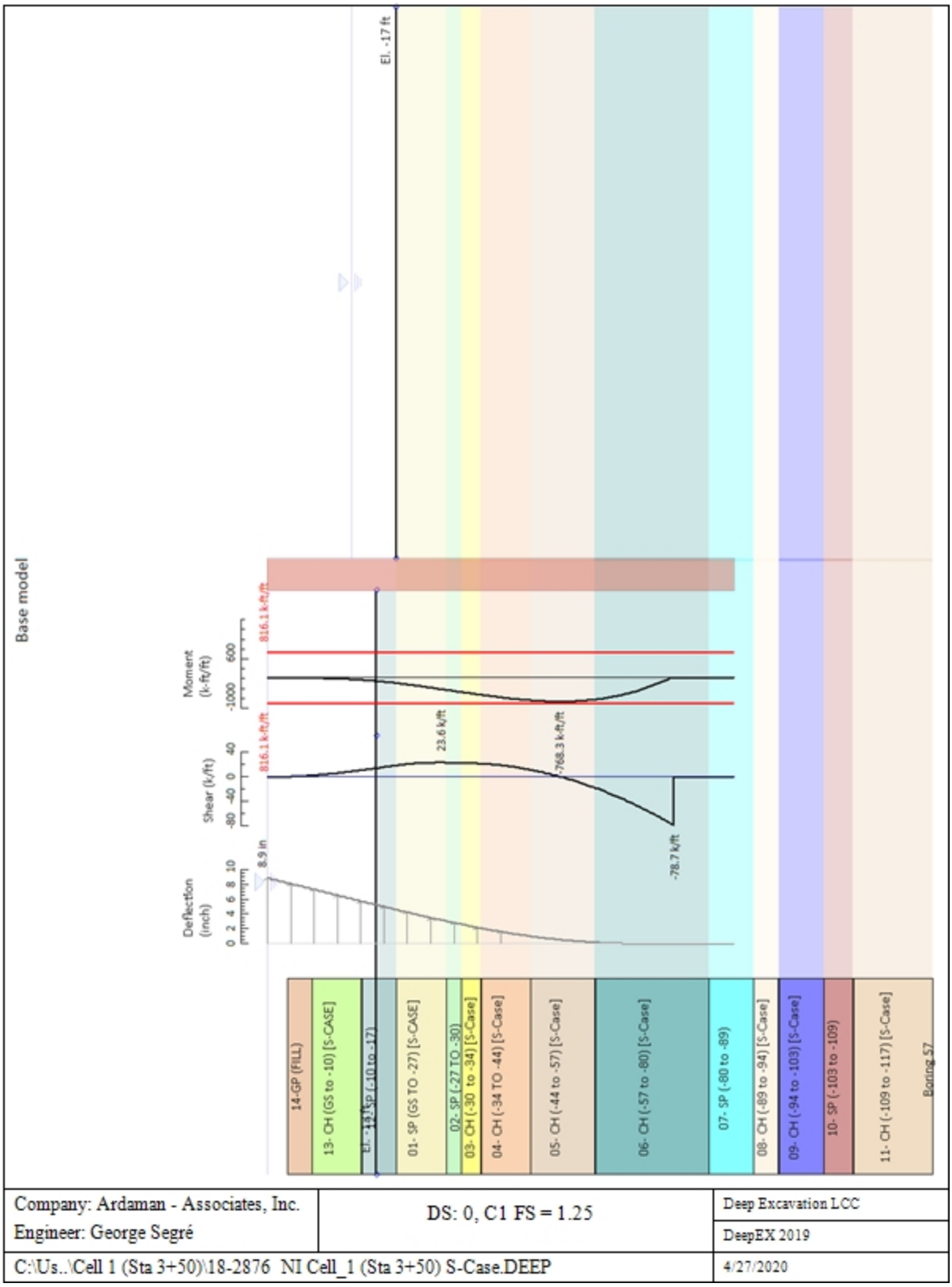

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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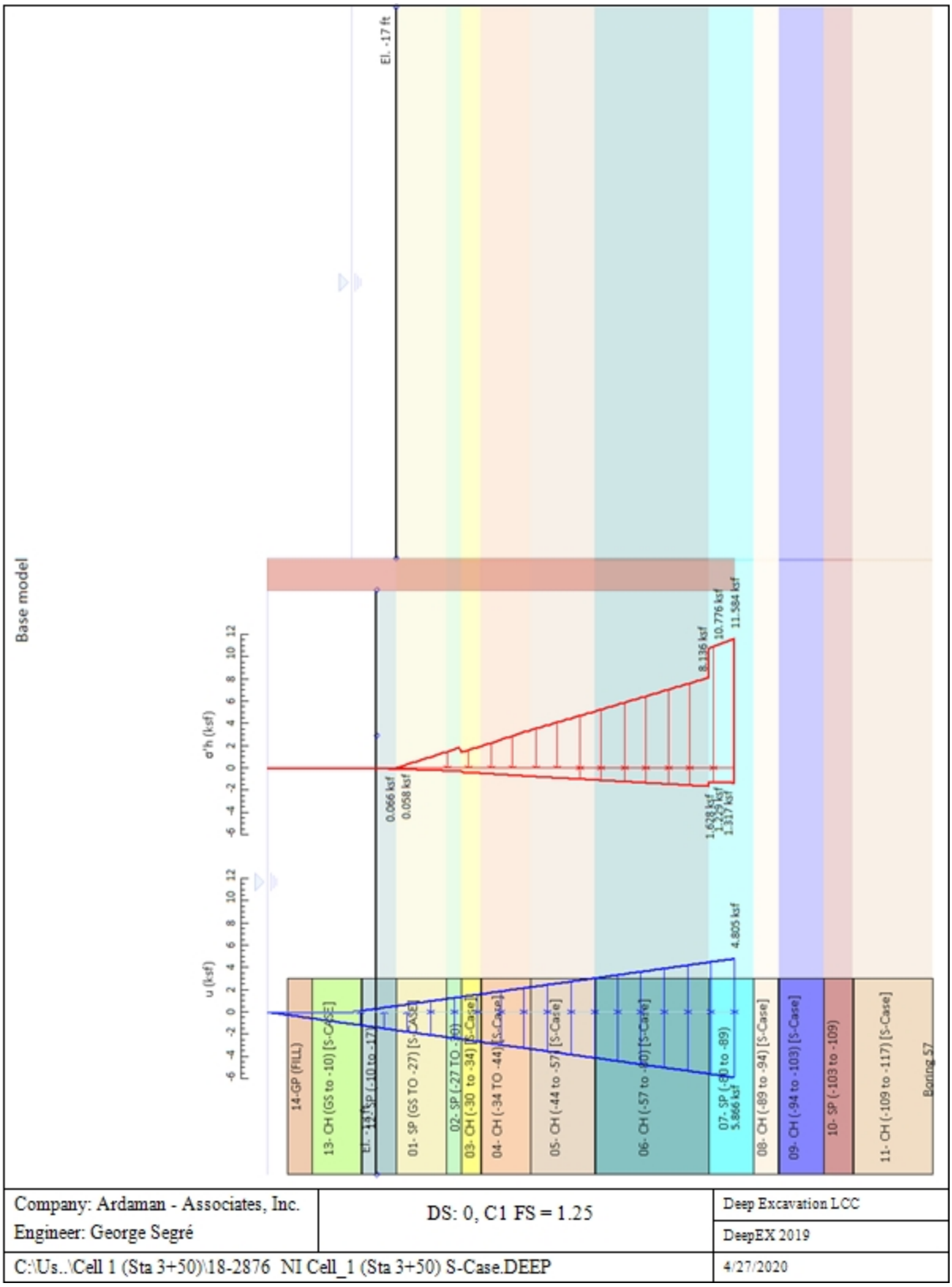
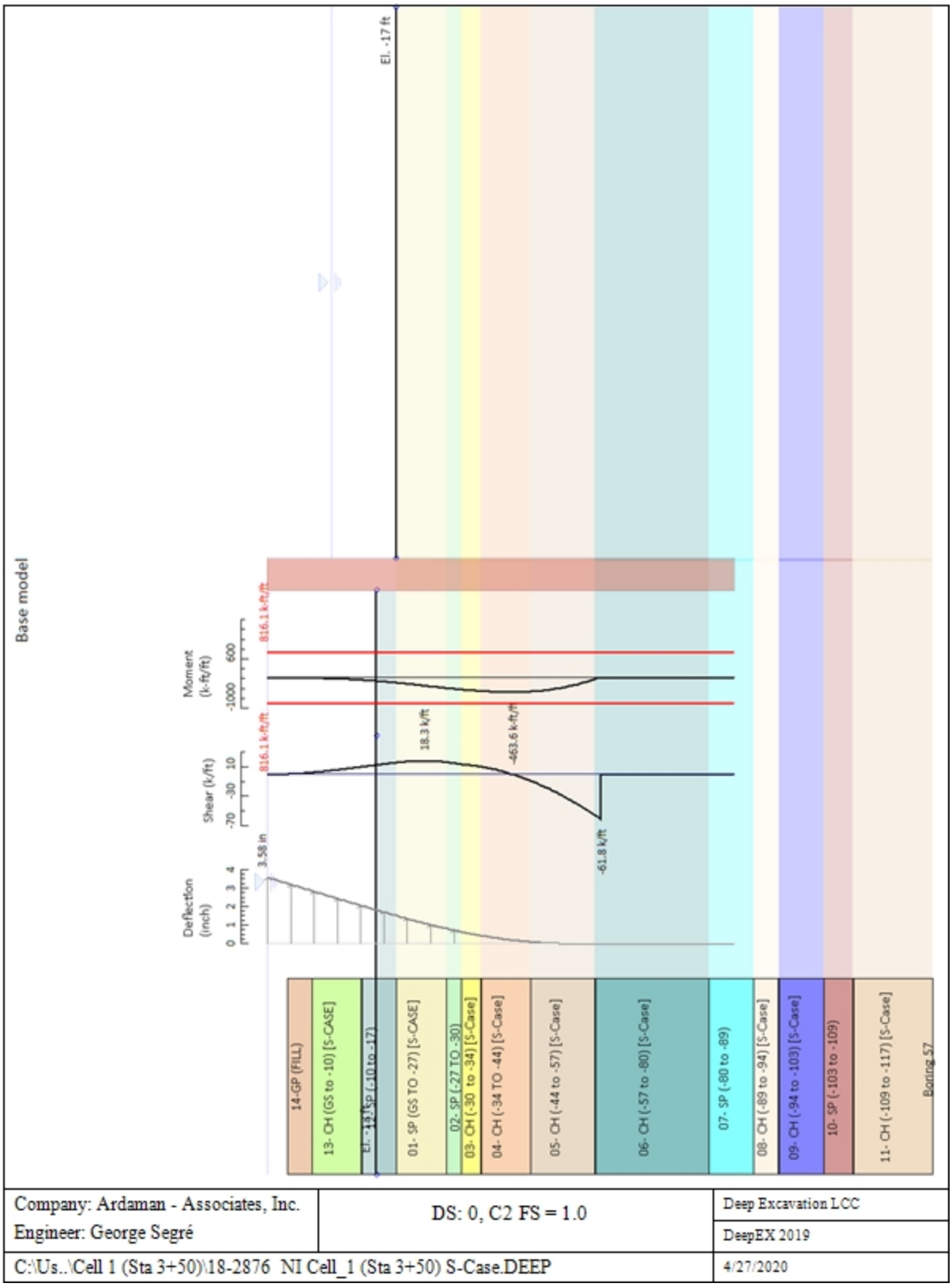


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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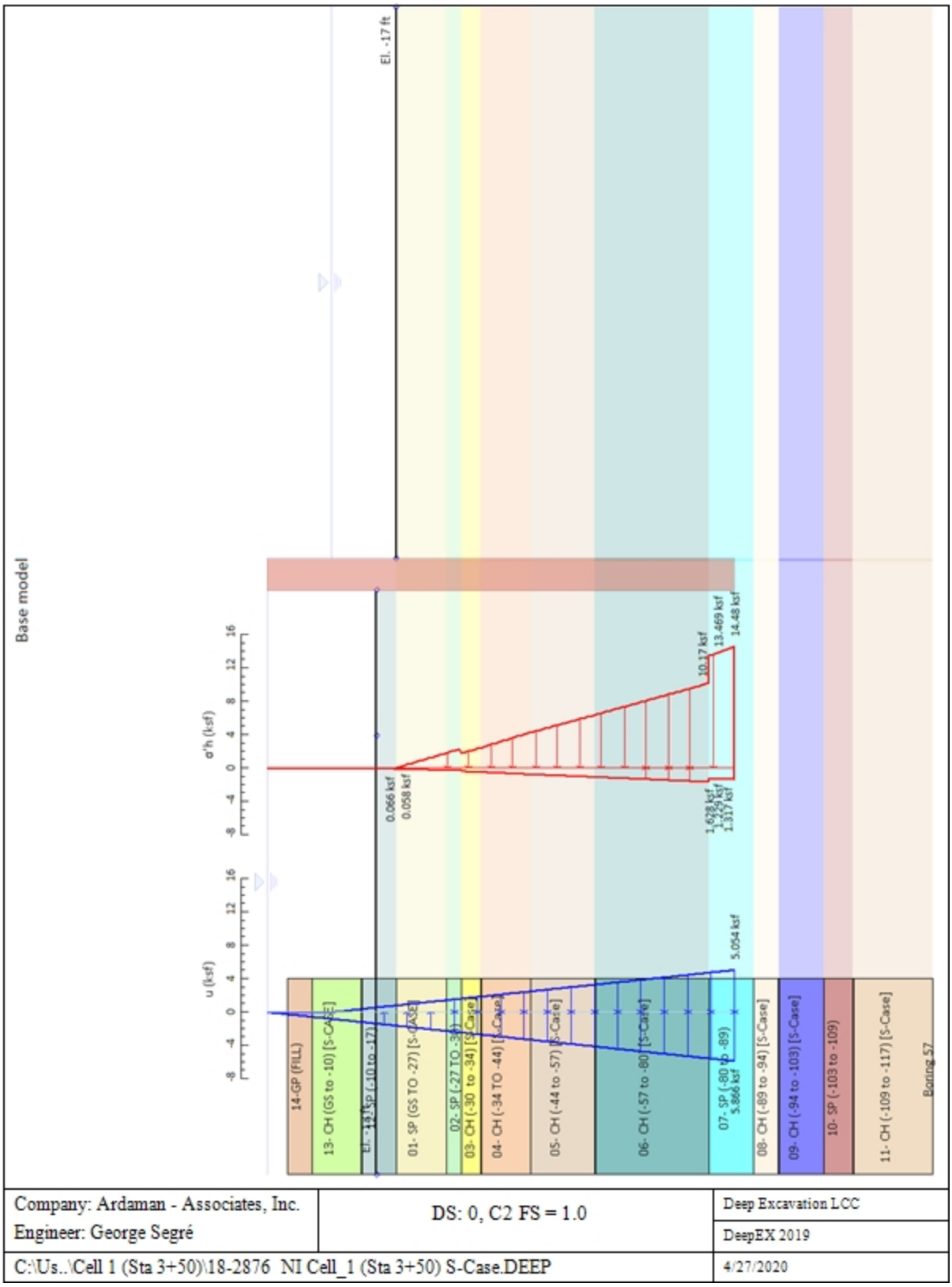

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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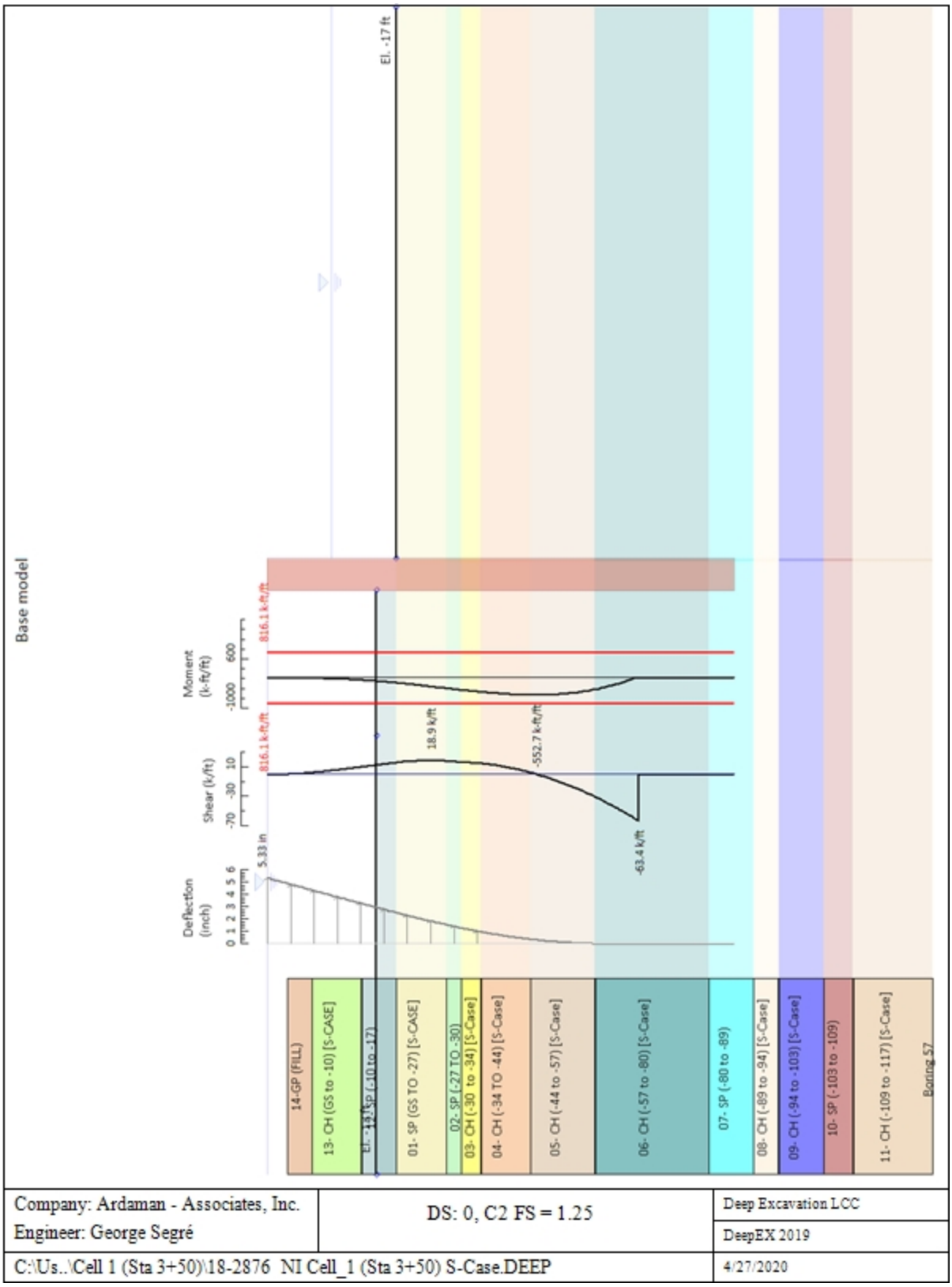

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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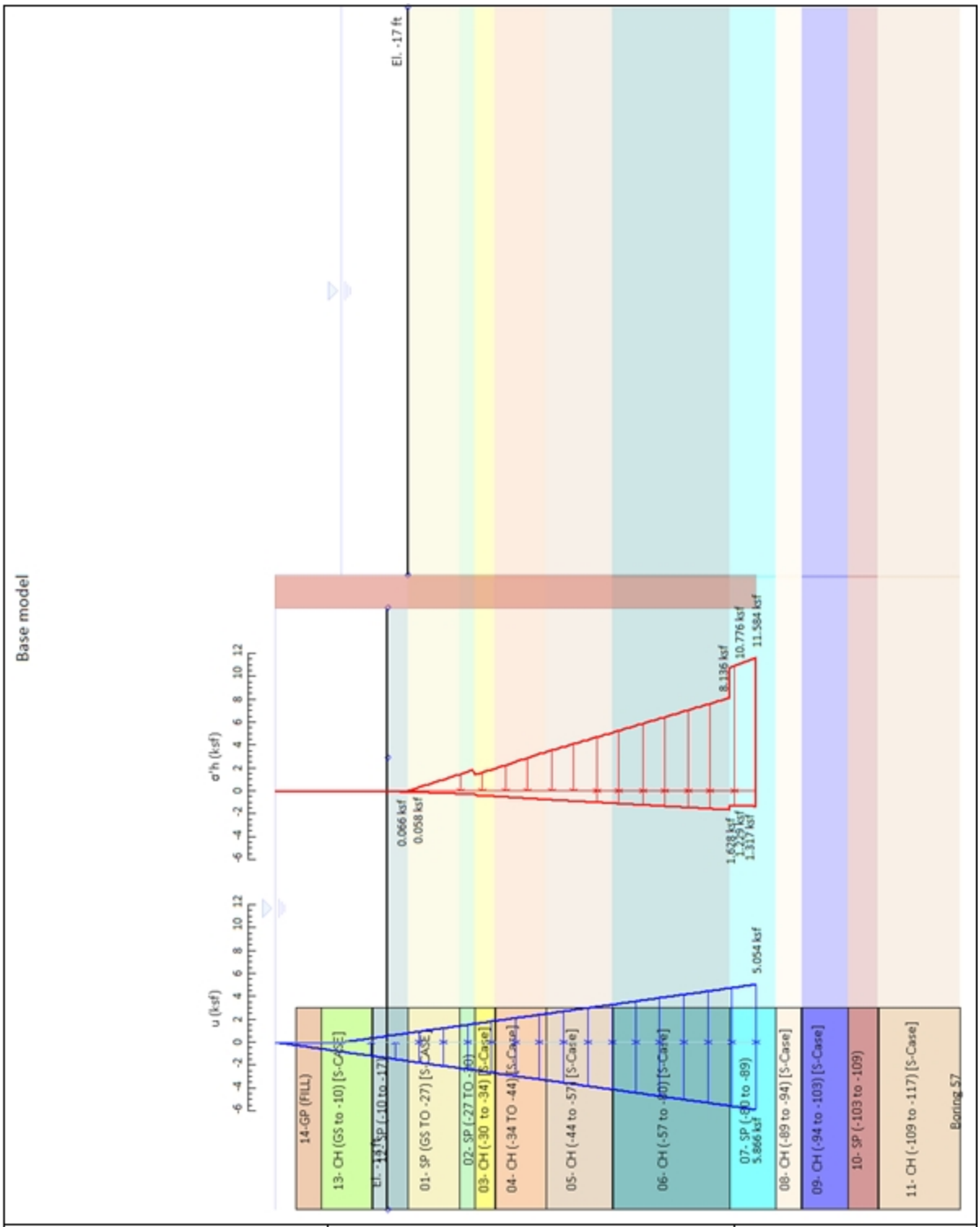

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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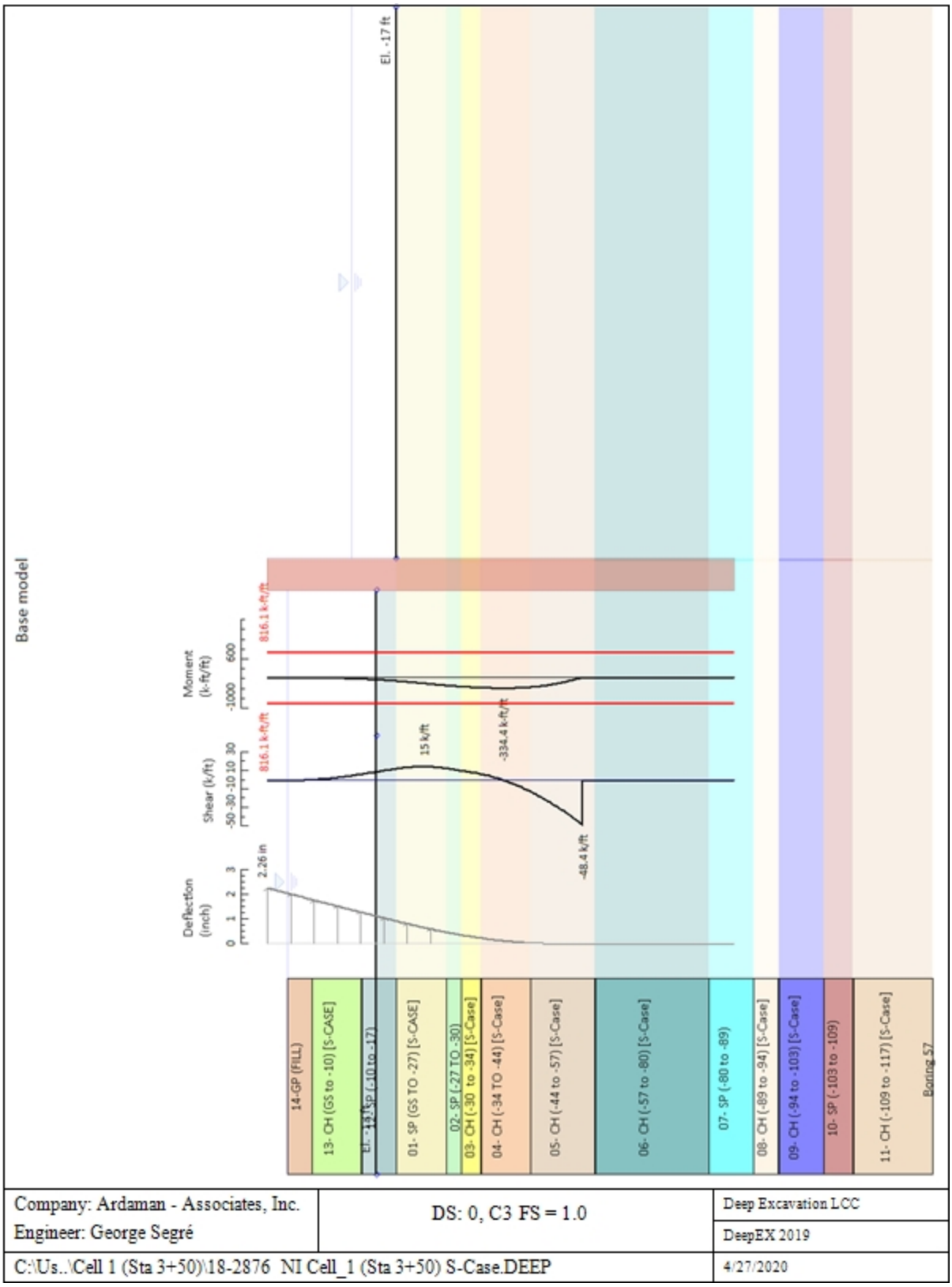

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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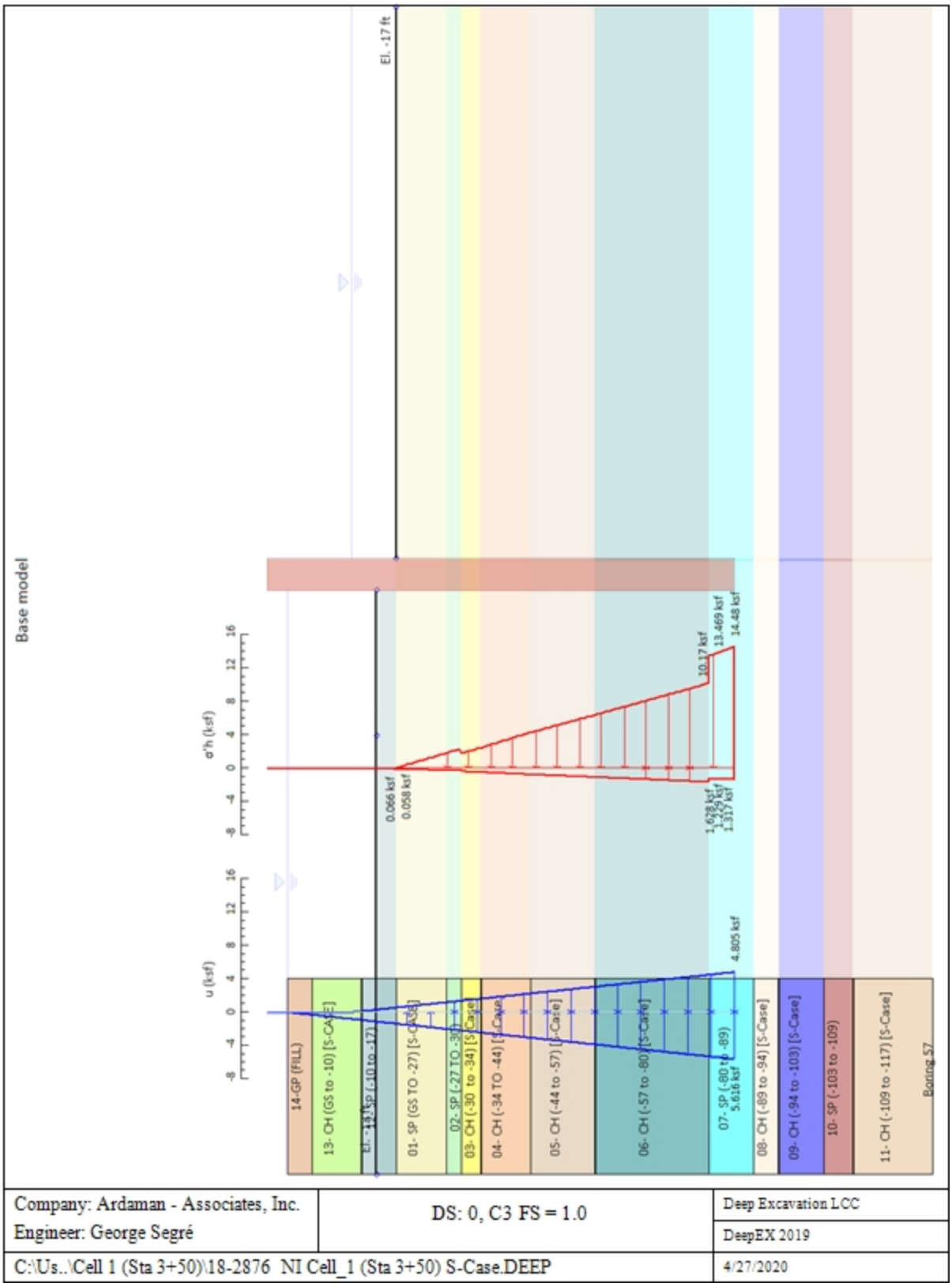

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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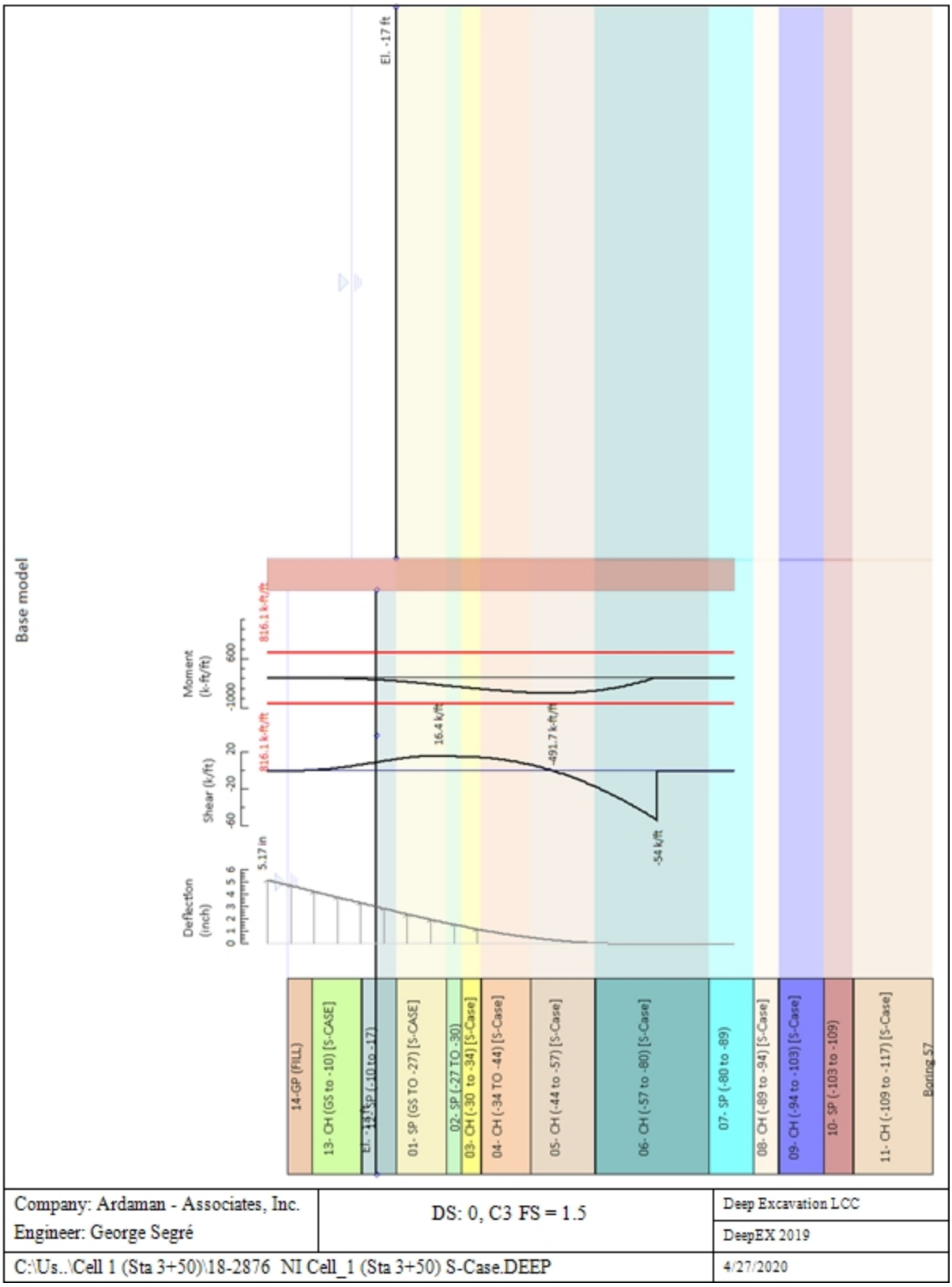

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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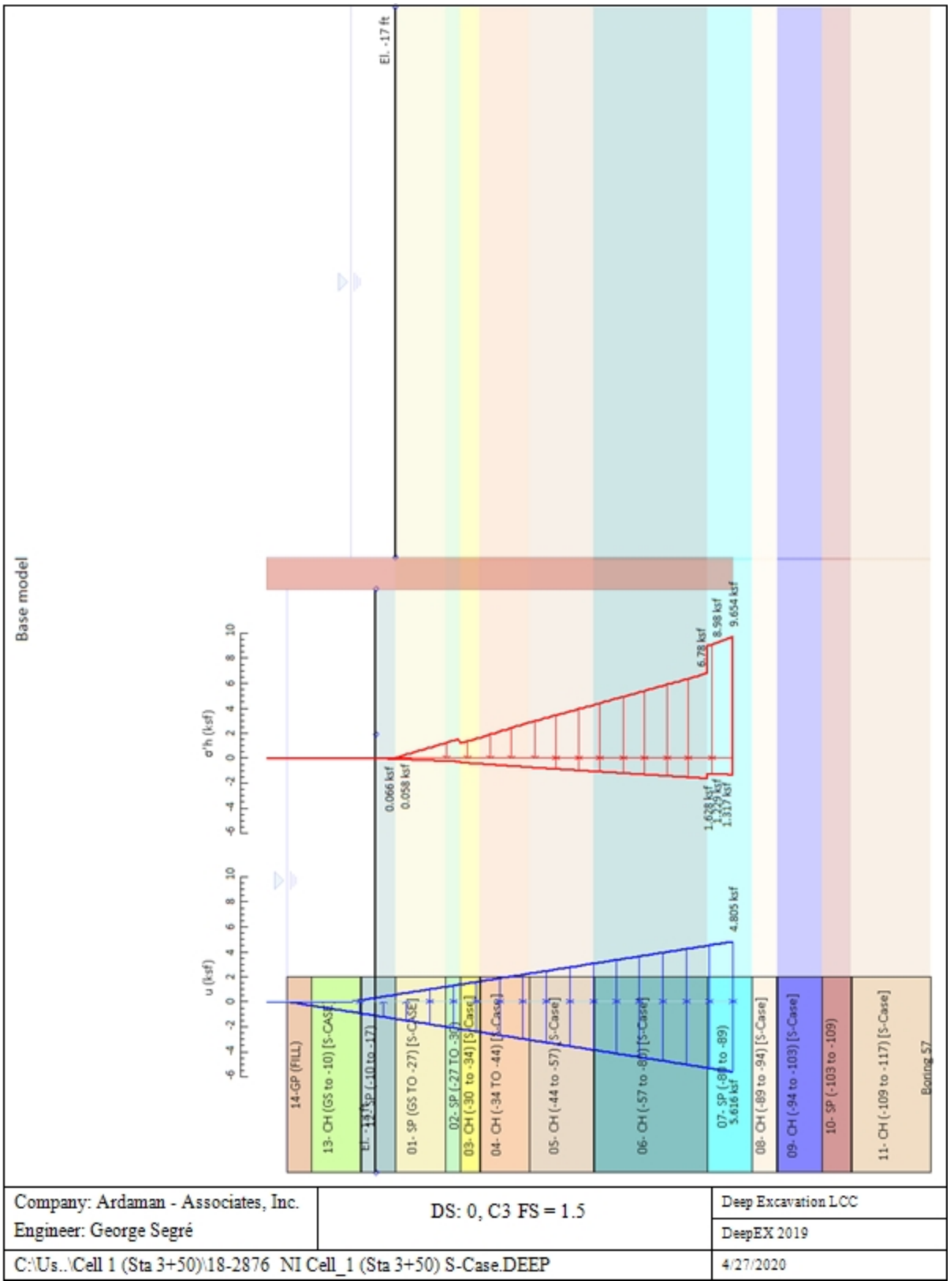

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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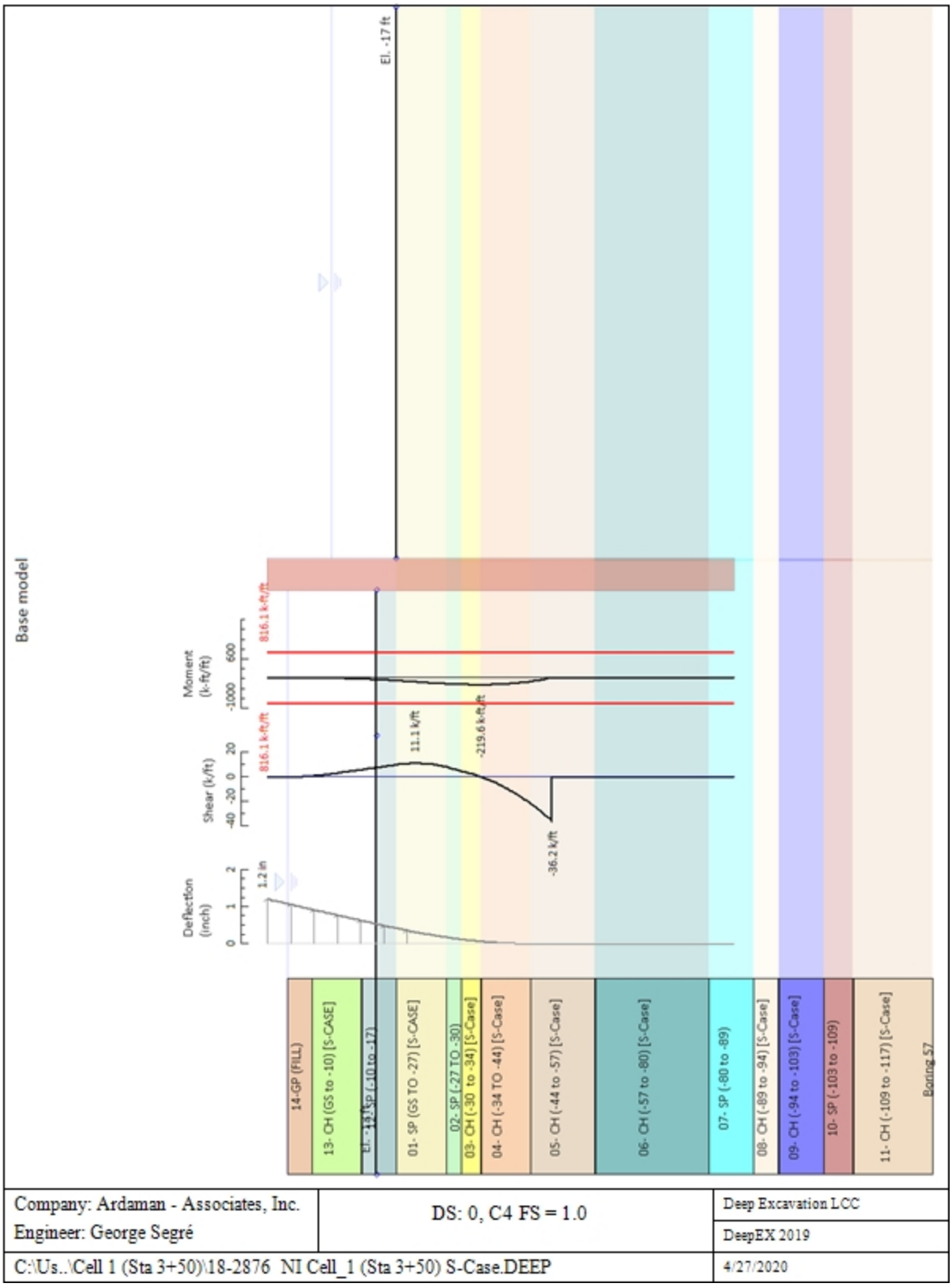
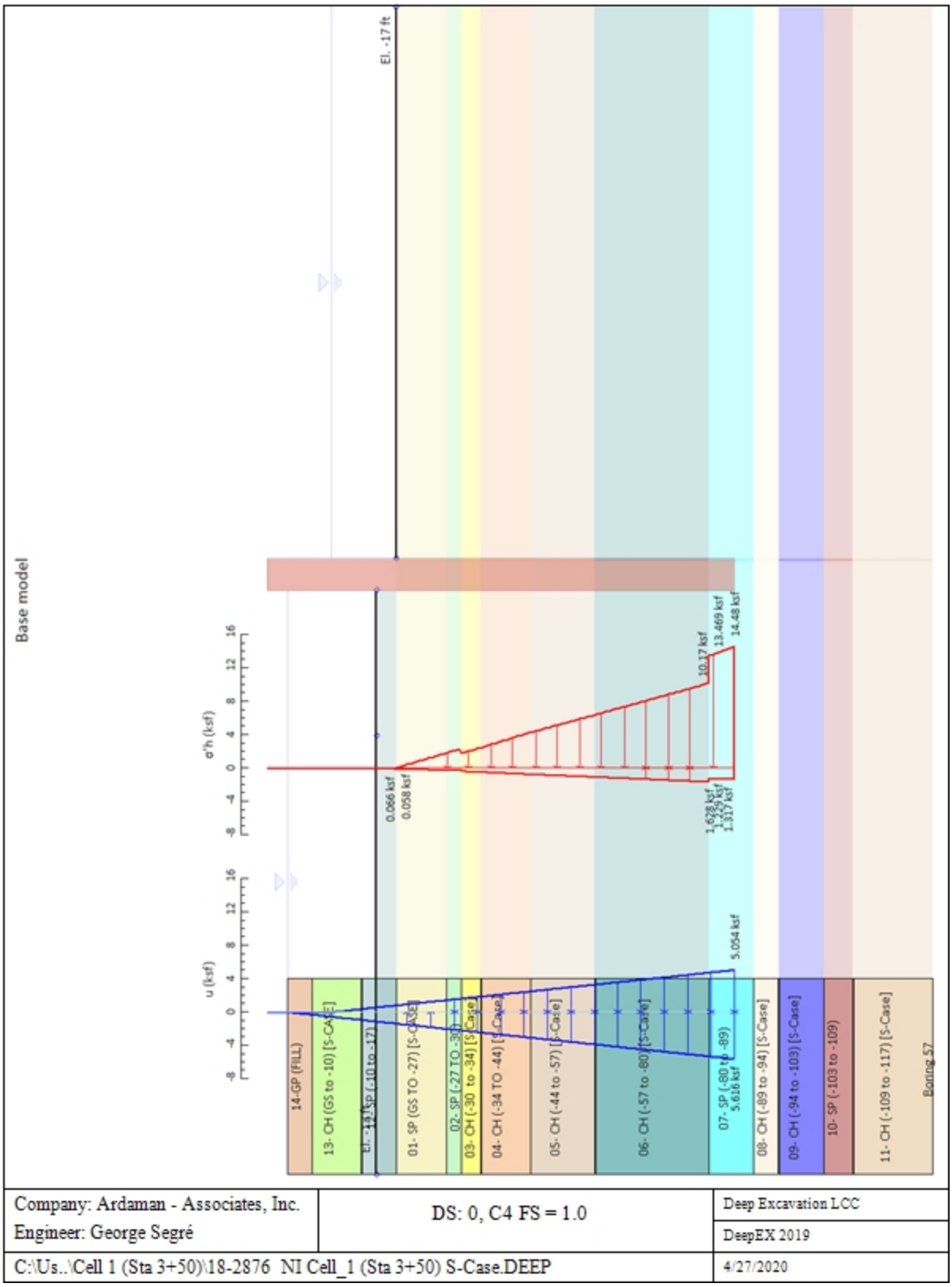

Base model
El. -17 ft
Deflection (inch)
0 1 2
1.2 in
Shear (k/ft)
-40 -20 0 20
816.1 k-ft/ft
-36.2 k/ft
Moment (k-ft/ft)
-1000 600
816.1 k-ft/ft
11.1 k/ft
-219.6 k-ft/ft
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
El. -10 to -17
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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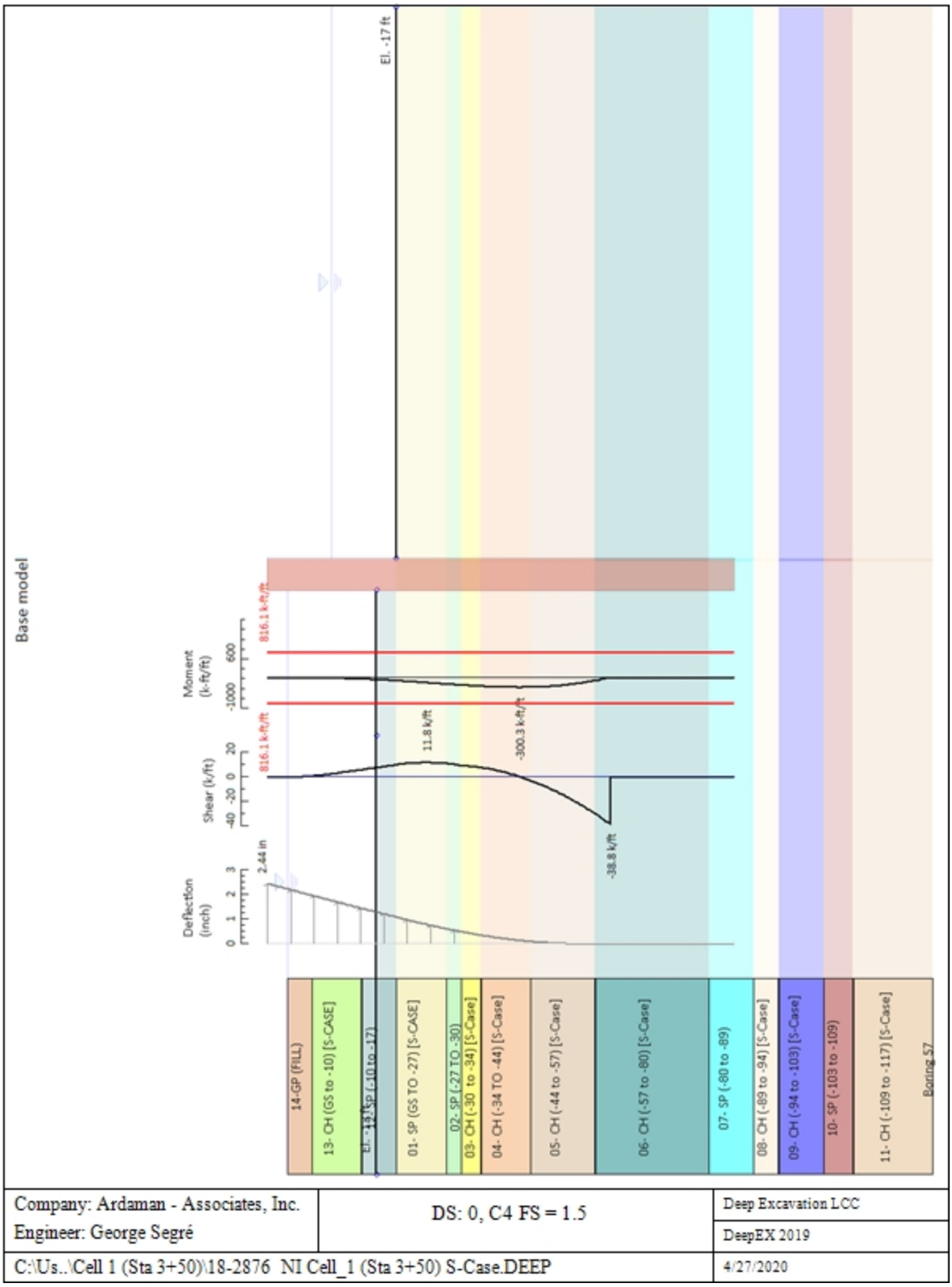
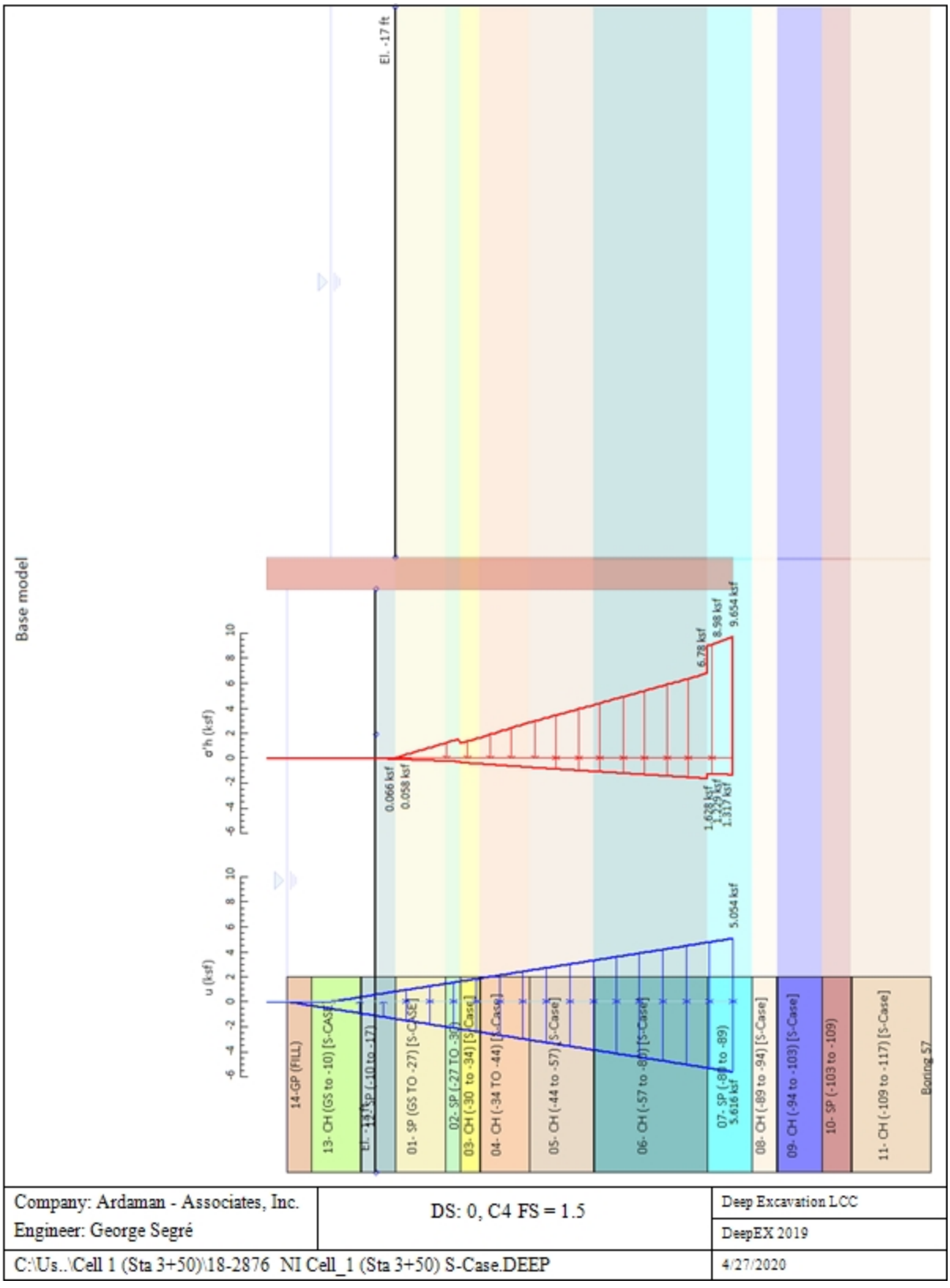

Base model
El. -17 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-40 -20 0 20
11.8 k/ft
-300.3 k-ft/ft
-38.8 k/ft
Deflection (inch)
0 1 2 3
2.44 in
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
El. -10 to -17
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+50)\18-2876 NI Cell_1 (Sta 3+50) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #1 @ Sta. 3+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -81.48 ft., NAVD88

Length of Sheetting = 90.48 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-46.30	553.18	92.49	2.59
		Open excavation - degraded	9	-8	1.00	1.25	-49.46	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-44.33	457.90	86.67	1.98
		Open excavation - degraded	9	-4	1.00	1.25	-46.70	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-42.74	350.65	74.37	1.36
		Open excavation - degraded	5	-8	1.00	1.50	-47.09	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-40.38	264.42	64.13	0.93
		Open excavation - degraded	5	-4	1.00	1.50	-49.93	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-71.60	864.92	92.09	9.62
		Open excavation - degraded	9	-8	1.00	1.25	-81.48	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-65.88	642.97	76.20	6.14
		Open excavation - degraded	9	-4	1.00	1.25	-73.68	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-62.76	493.70	63.78	4.22
		Open excavation - degraded	5	-8	1.00	1.50	-78.36	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-56.52	325.59	49.15	2.29
		Open excavation - degraded	5	-4	1.00	1.50	-68.48	--	--	--
						Governing Value:	-81.48	864.92	92.49	9.62

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:09:31 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 1 Sections\Cell 1 (Sta 3+75)\18-2876 NI Cell_1 (Sta 3+75) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
14- GP Fill	120	120	34	0	N/A	N/A	N/A	300	3	0.28	3.54	N/A	N/A	True	Linear	
13- CH (GS to	112	112	0	0	800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
12- SP (-10 to	112	112	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
01- SP (-17 T	115	115	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	EXP	
02- SP (-27 T	115	115	30	0	N/A	N/A	N/A	60	3	0.33	3	N/A	N/A	True	Linear	
03- CH (-30 t	126	126	0	0	2290	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-34 T	134	134	0	0	2290	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-44 to	126	126	0	0	2290	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-57 to	127	127	0	0	1650	0	0	626.3	3	1	1	1	1	True	Linear	
07- SP (-80 to	122	122	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
08- CH (-89 to	115	115	0	0	1200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-94 to	120	120	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- SP (-103 t	120	120	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
11- CH (-109 t	115	115	0	0	1670	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
14- GP Fill	0.35	-	-	0.441	0.8	-	-	0	0	0	-
13- CH (GS to	0.35	0	0	1	0.8	-	-	0	0	0	-
12- SP (-10 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
01- SP (-17 T	0.4	-	-	0.5	0.5	1	0	7.2	4.8	20	-
02- SP (-27 T	0.4	-	-	0.5	0.5	-	-	5.1	3.4	20	-
03- CH (-30 t	0.3	0	0	1	0.5	-	-	13	8.7	20	-
04- CH (-34 T	0.3	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-44 to	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- CH (-57 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- SP (-80 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
08- CH (-89 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-94 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- SP (-103 t	0.35	-	-	0.5	0.8	-	-	0	0	0	-
11- CH (-109 t	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

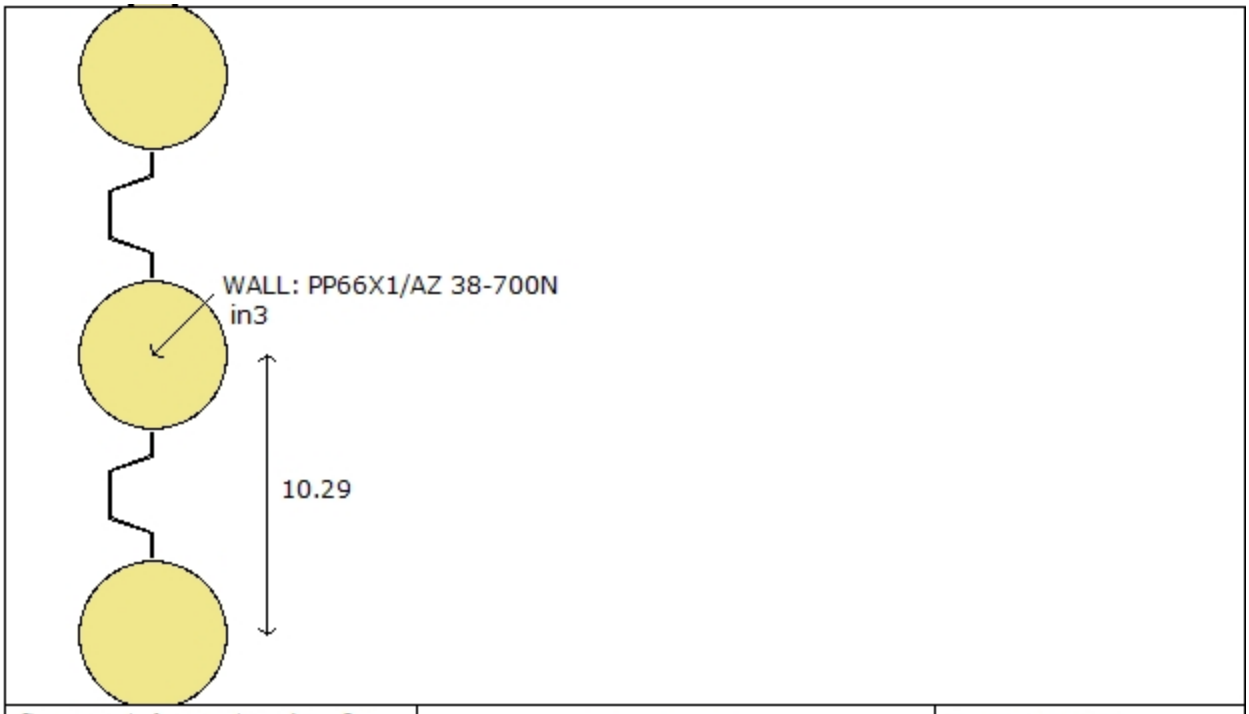
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	14- GP Fill	1	0.44
0	13- CH (GS to -	1	1
-10	12- SP (-10 to -	1	0.5
-17	01- SP (-17 TO	1	0.5
-27	02- SP (-27 TO	1	0.5
-30	03- CH (-30 to	1	1
-34	04- CH (-34 TO	1	1
-44	05- CH (-44 to	1	0.45
-57	06- CH (-57 to	1	1
-80	07- SP (-80 to -	1	0.5
-89	08- CH (-89 to	1	1
-94	09- CH (-94 to	1	1
-103	10- SP (-103 to	1	0.5
-109	11- CH (-109 t	1	1

WALL DATA

Wall section 0: Wall 1



Company: Ardaman - Associates, Inc. Engineer: George Segré	Wall sketch	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 3+75)\18-2876 NI Cell_1 (Sta 3+75) Q-Case.DEEP		4/27/2020

Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.405	1.405	1.806
Stage 1	Simple span	N/A	1.6	1.203	1.203	1.543
Stage 2	Simple span	N/A	1.6	1.469	1.469	1.857
Stage 3	Simple span	N/A	1.6	1.268	1.268	1.595
Stage 4	Simple span	N/A	1.6	1.551	1.551	1.926
Stage 5	Simple span	N/A	1.6	1.181	1.181	1.459
Stage 6	Simple span	N/A	1.6	1.623	1.623	1.982
Stage 7	Simple span	N/A	1.6	1.252	1.252	1.514

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

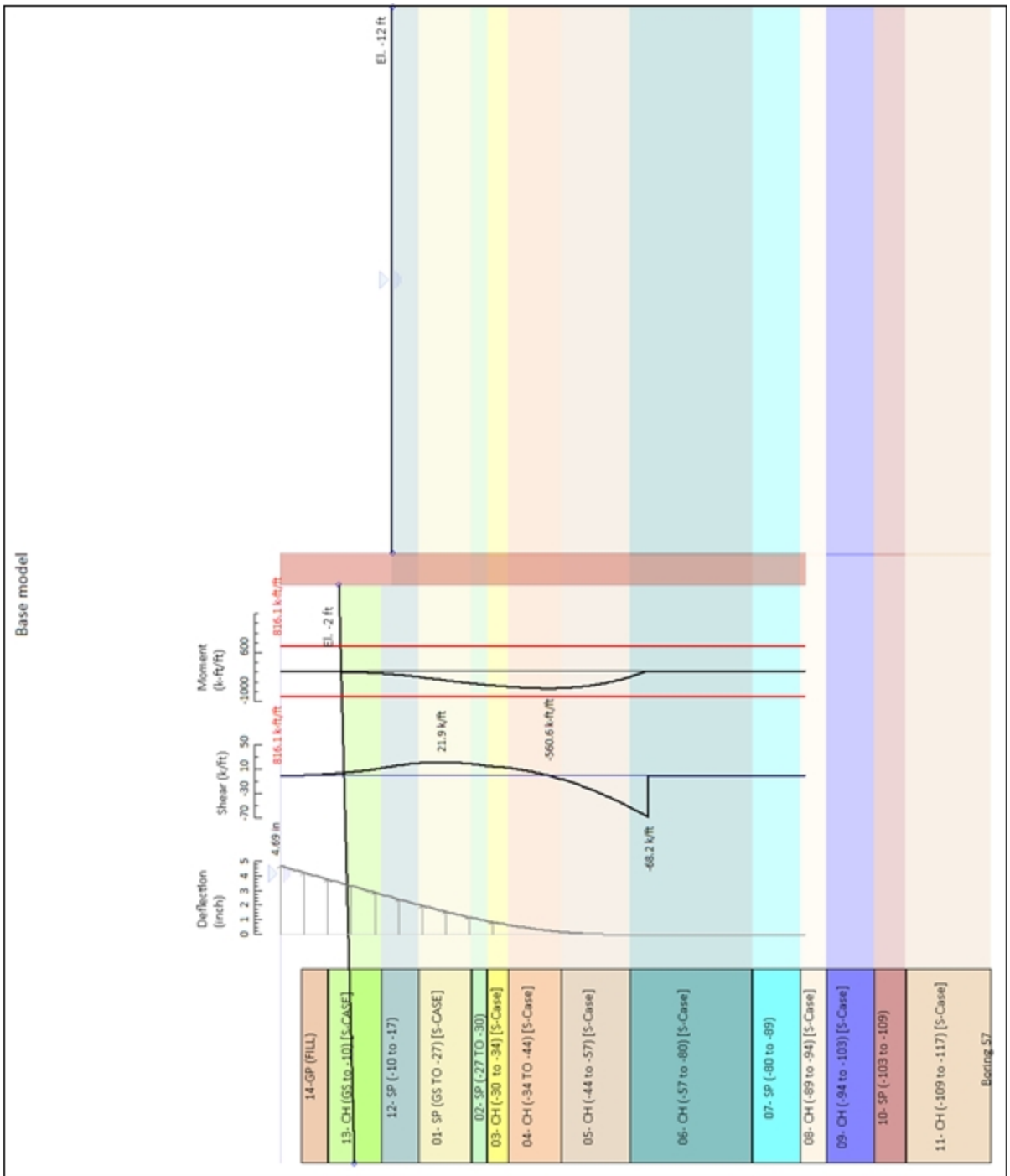
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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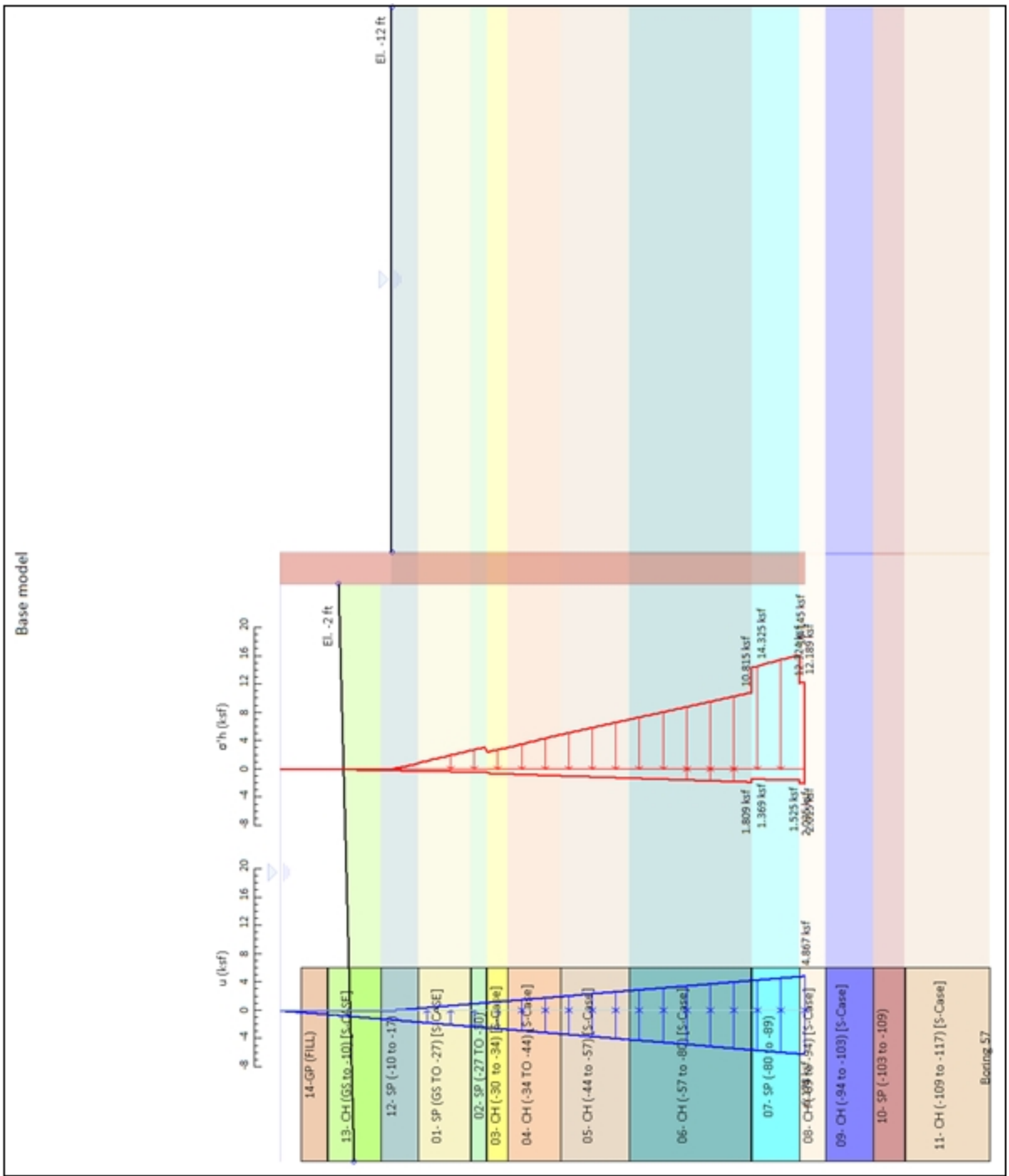

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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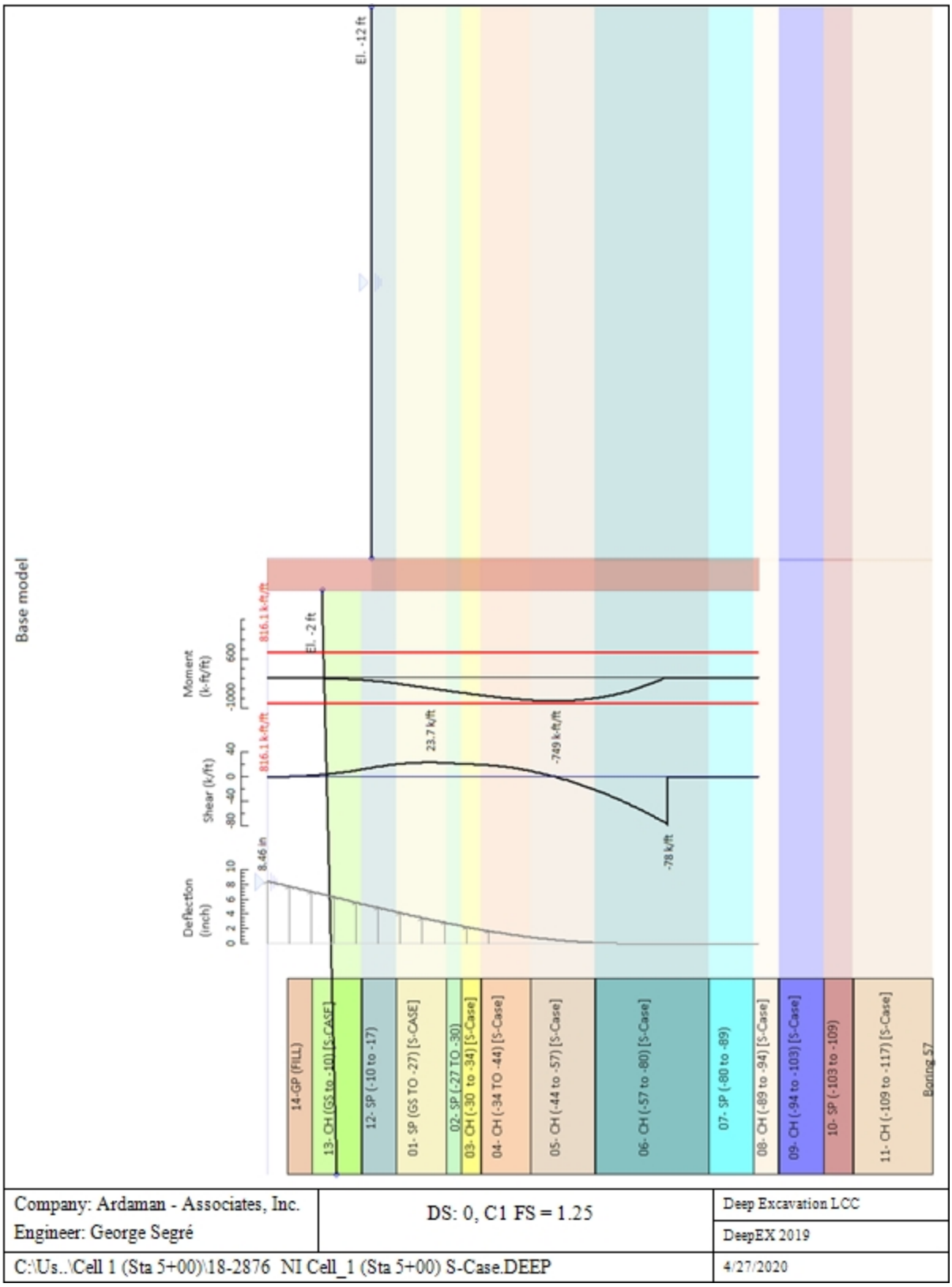

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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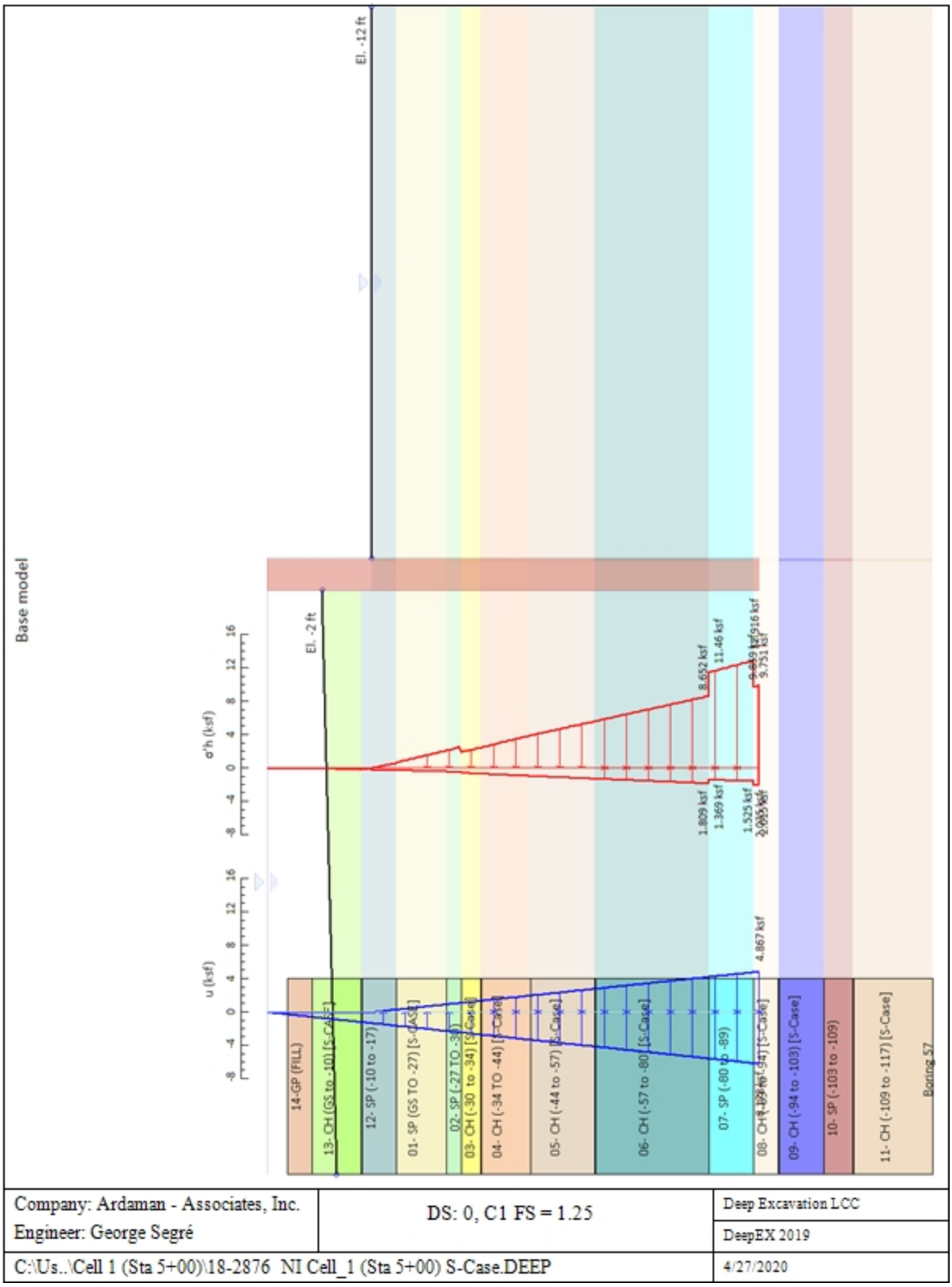

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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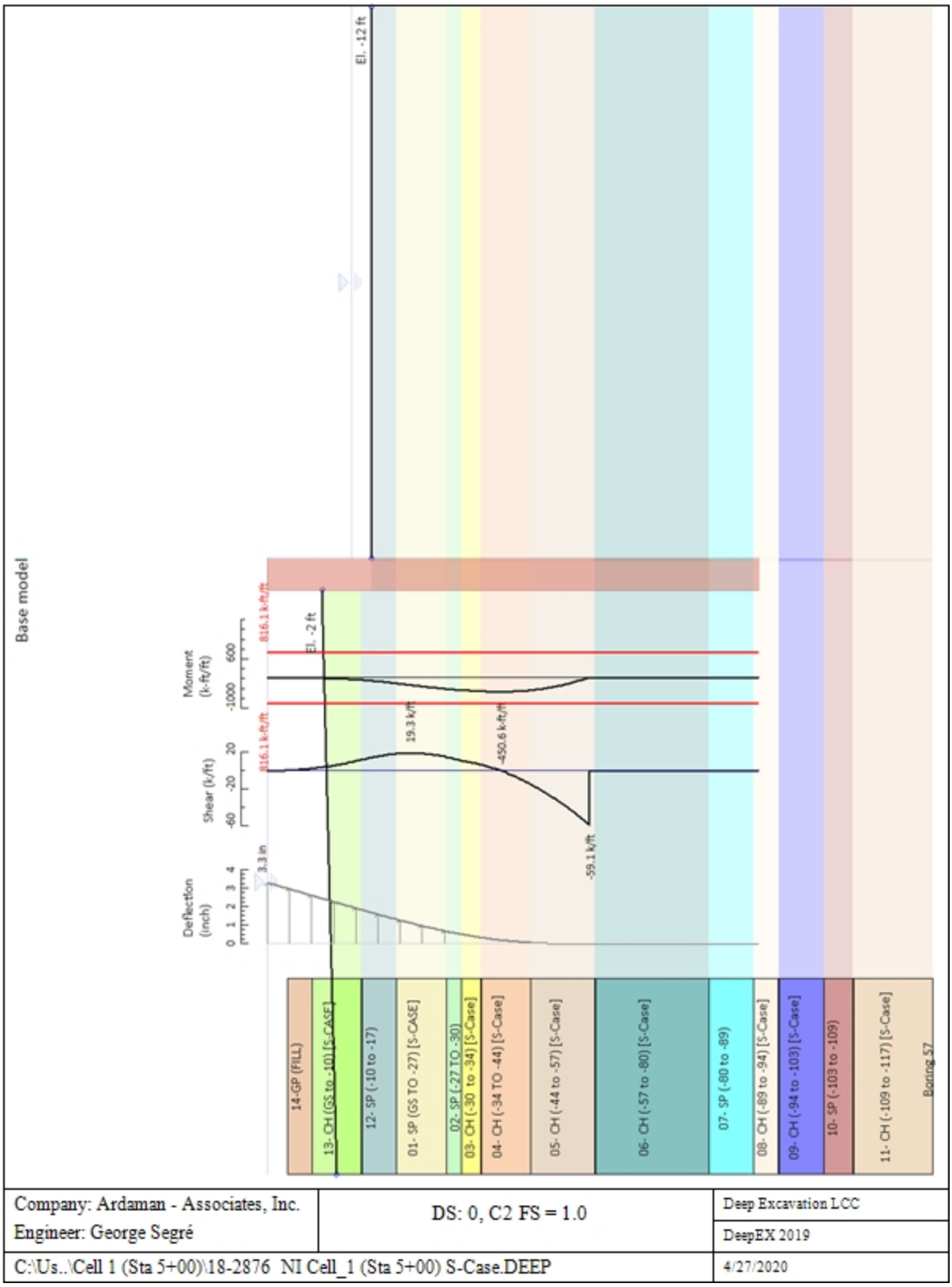

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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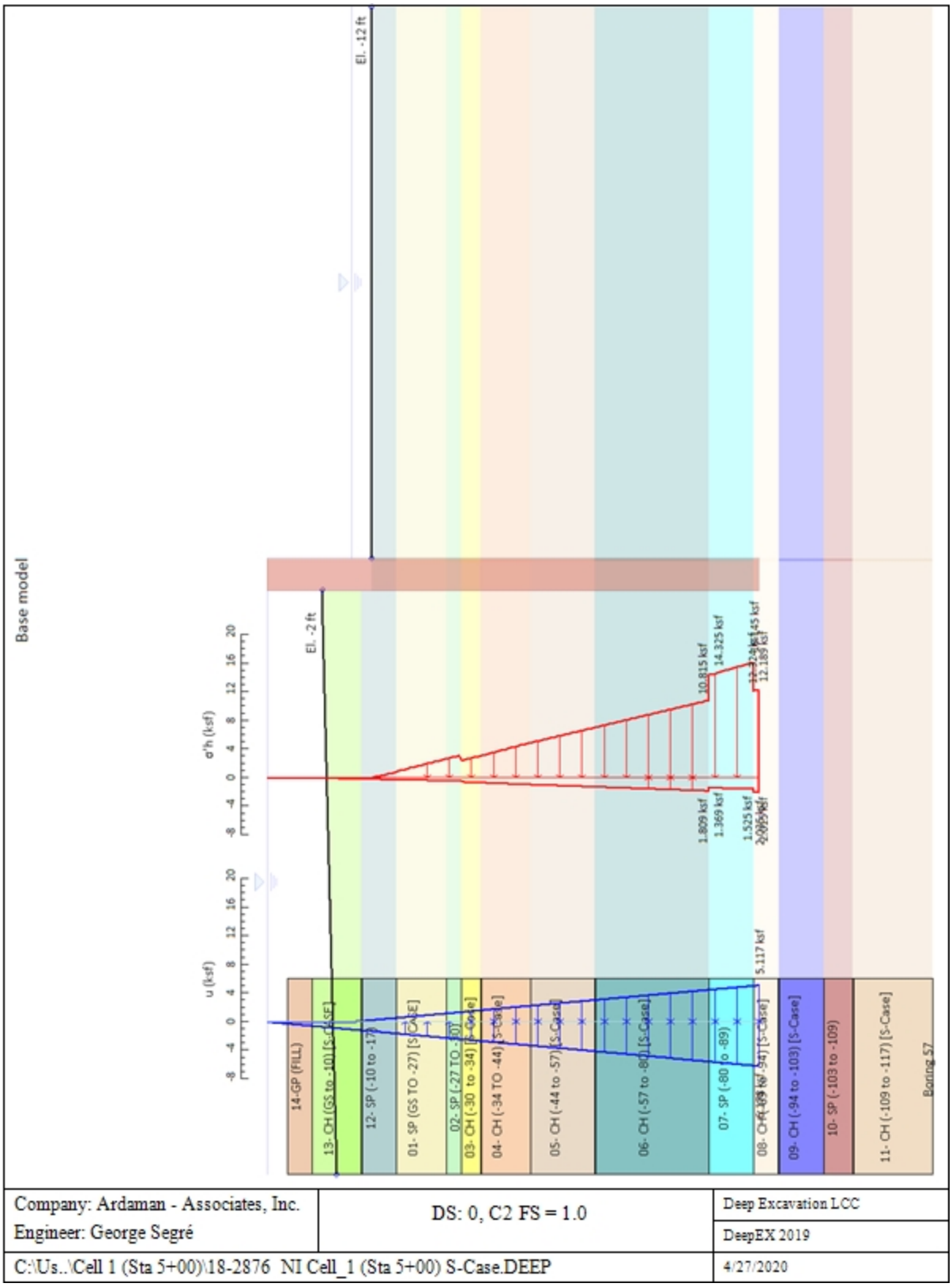

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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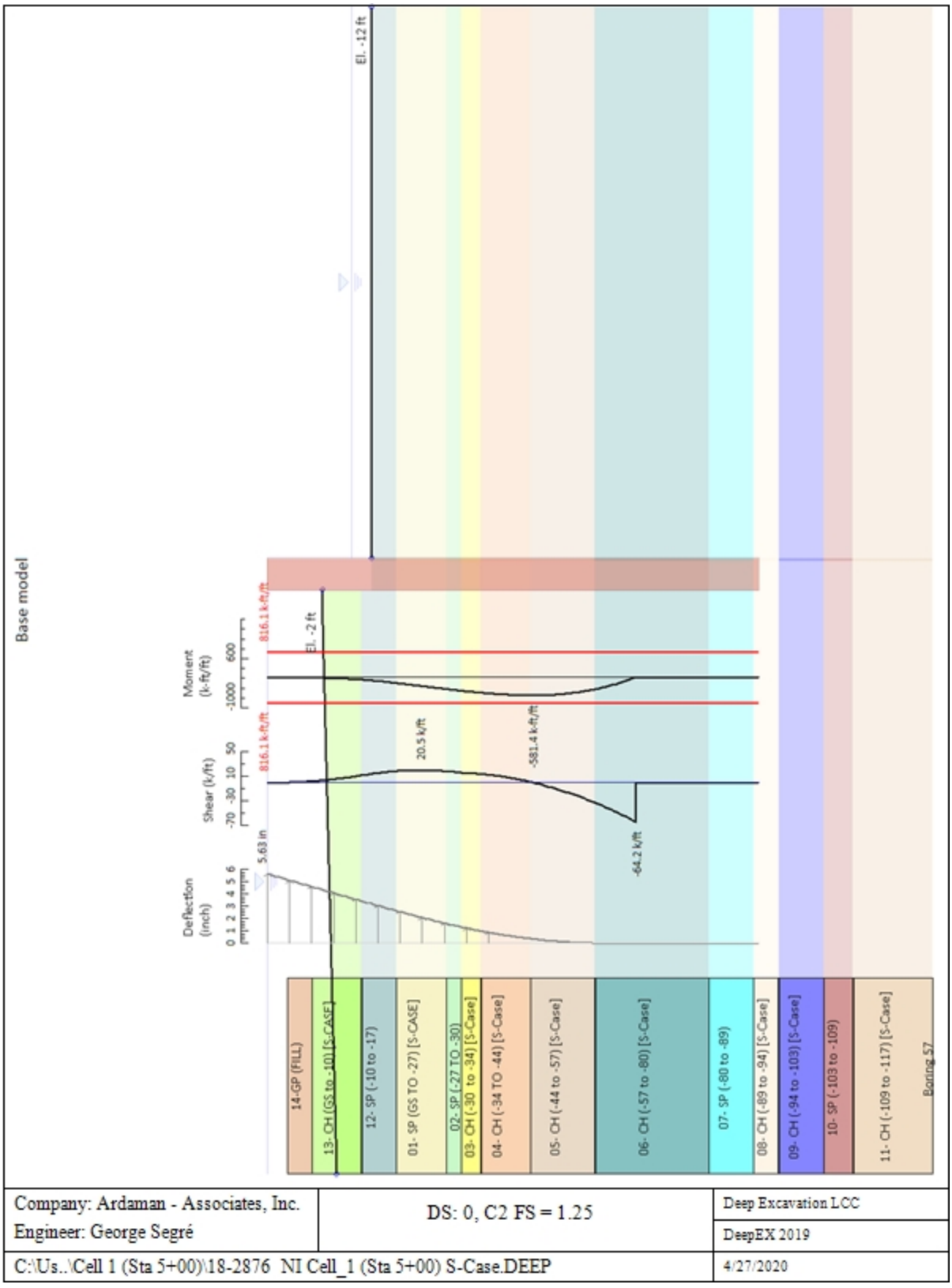

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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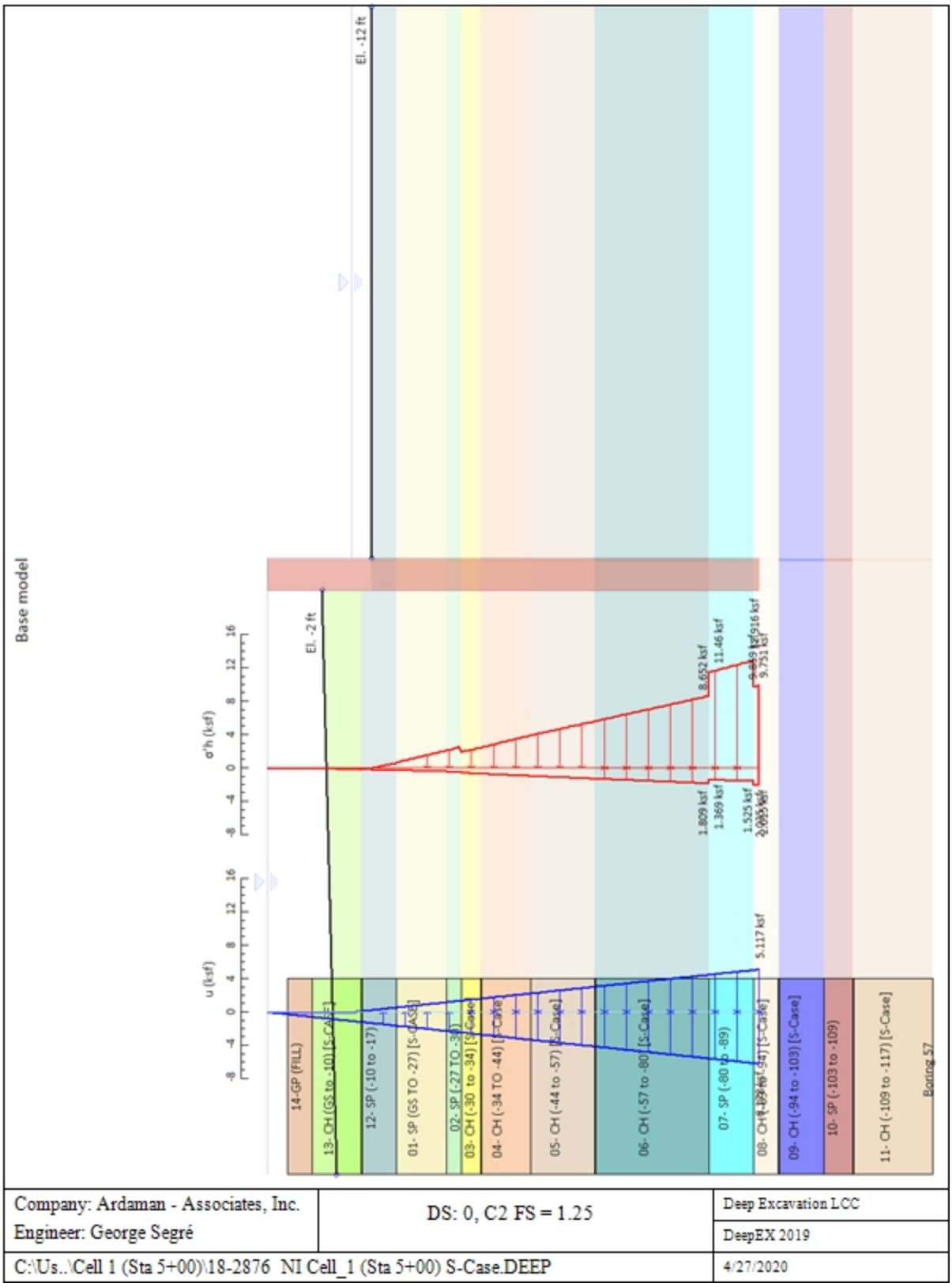

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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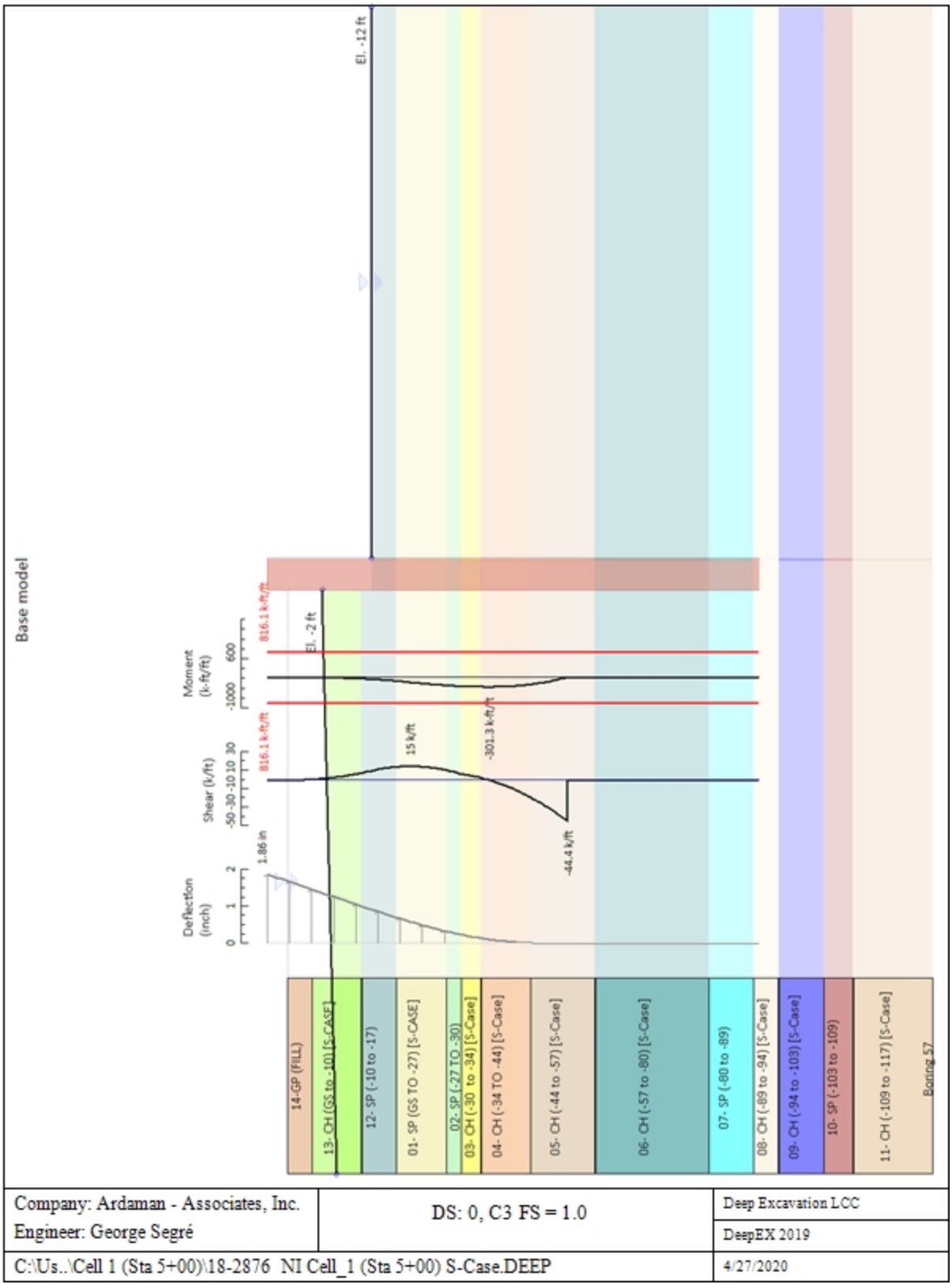

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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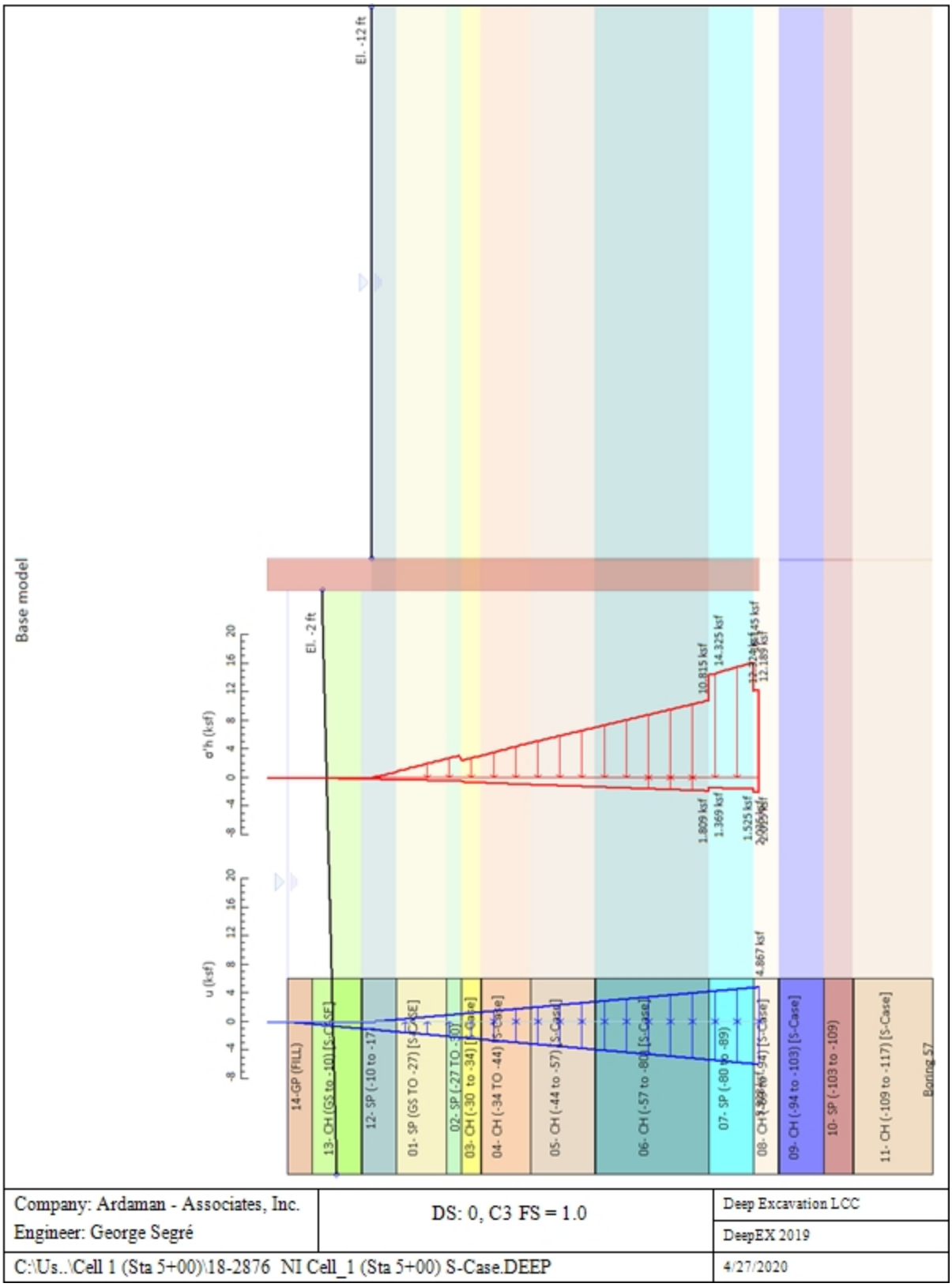
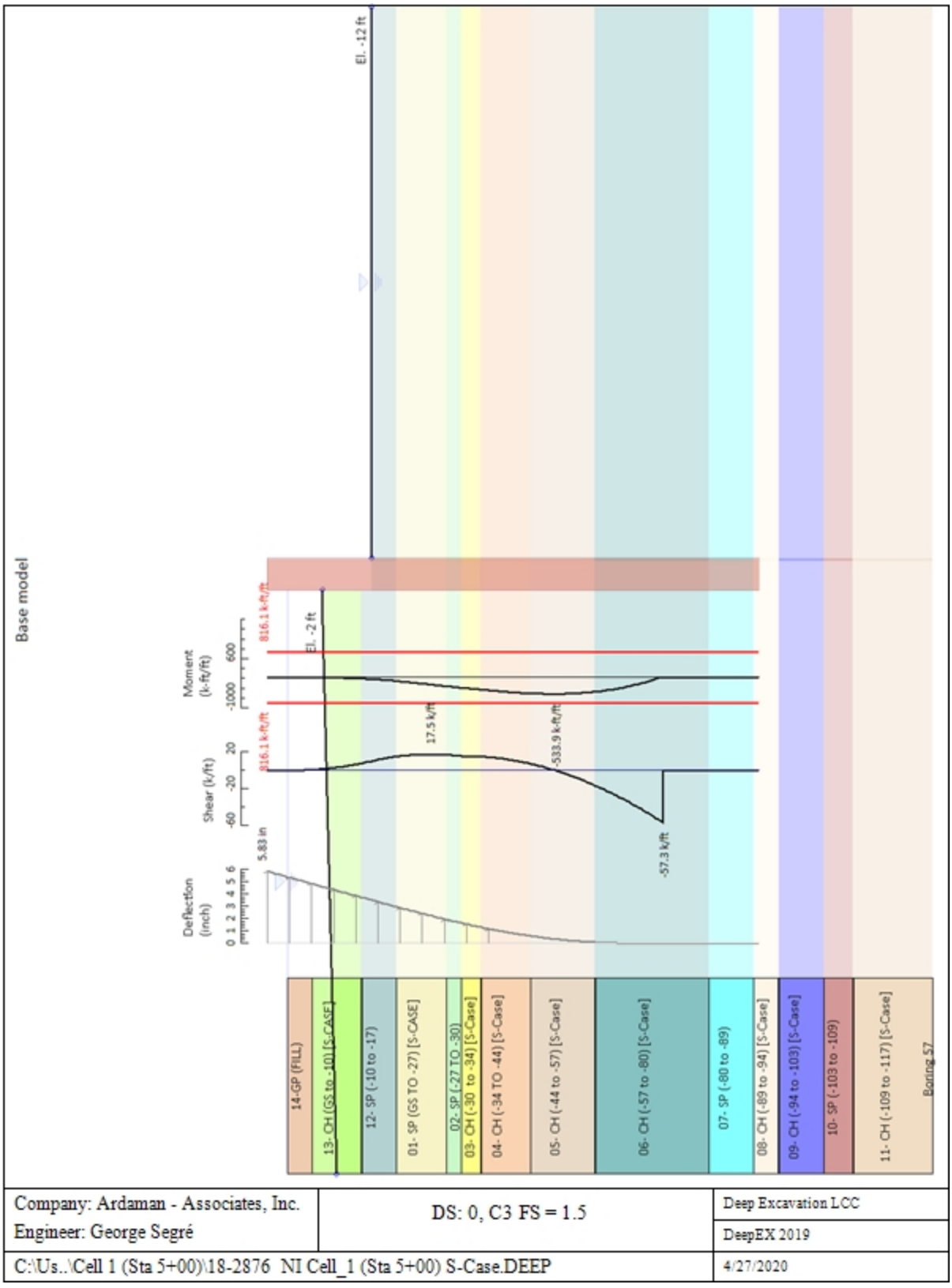


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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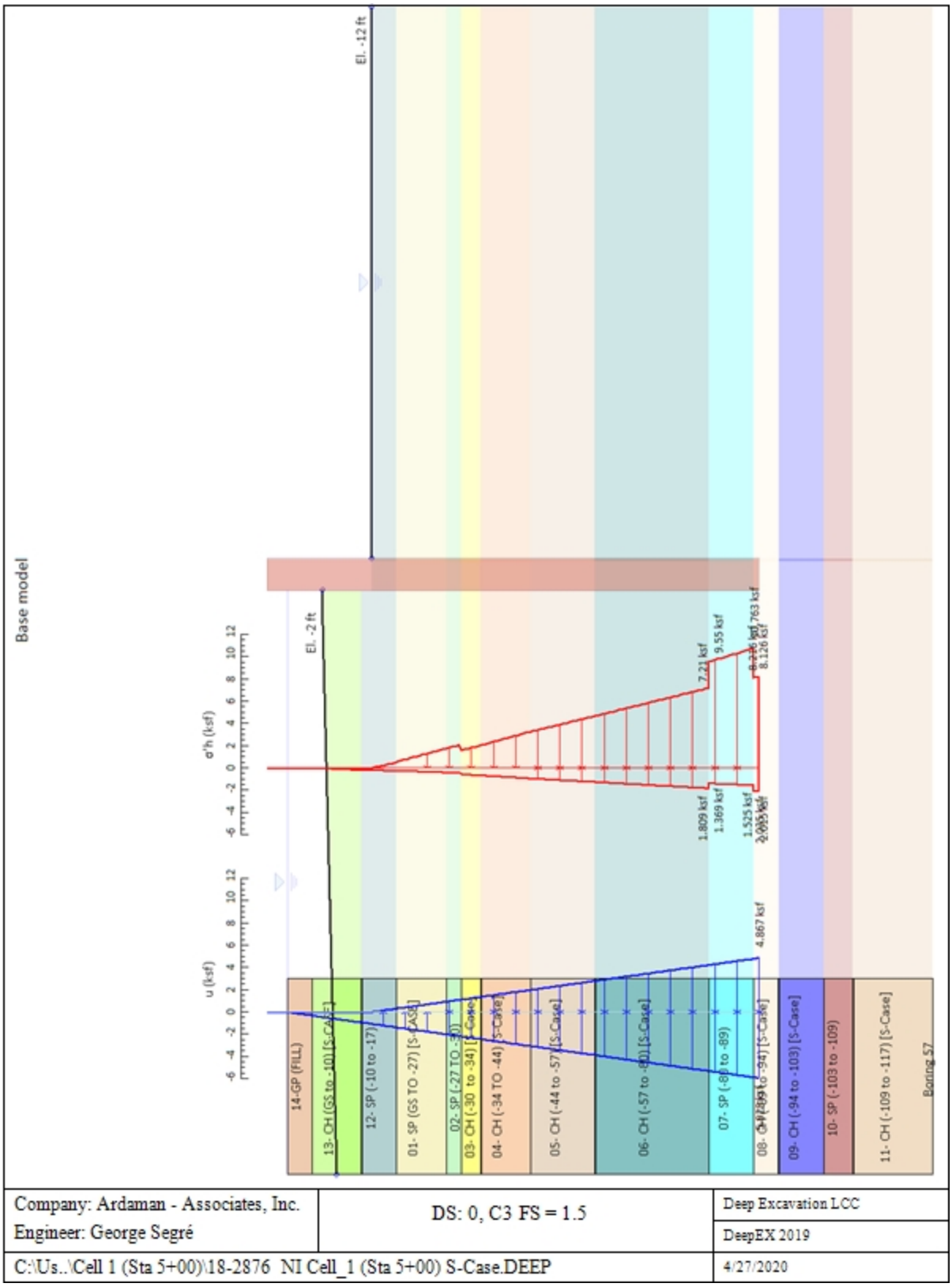
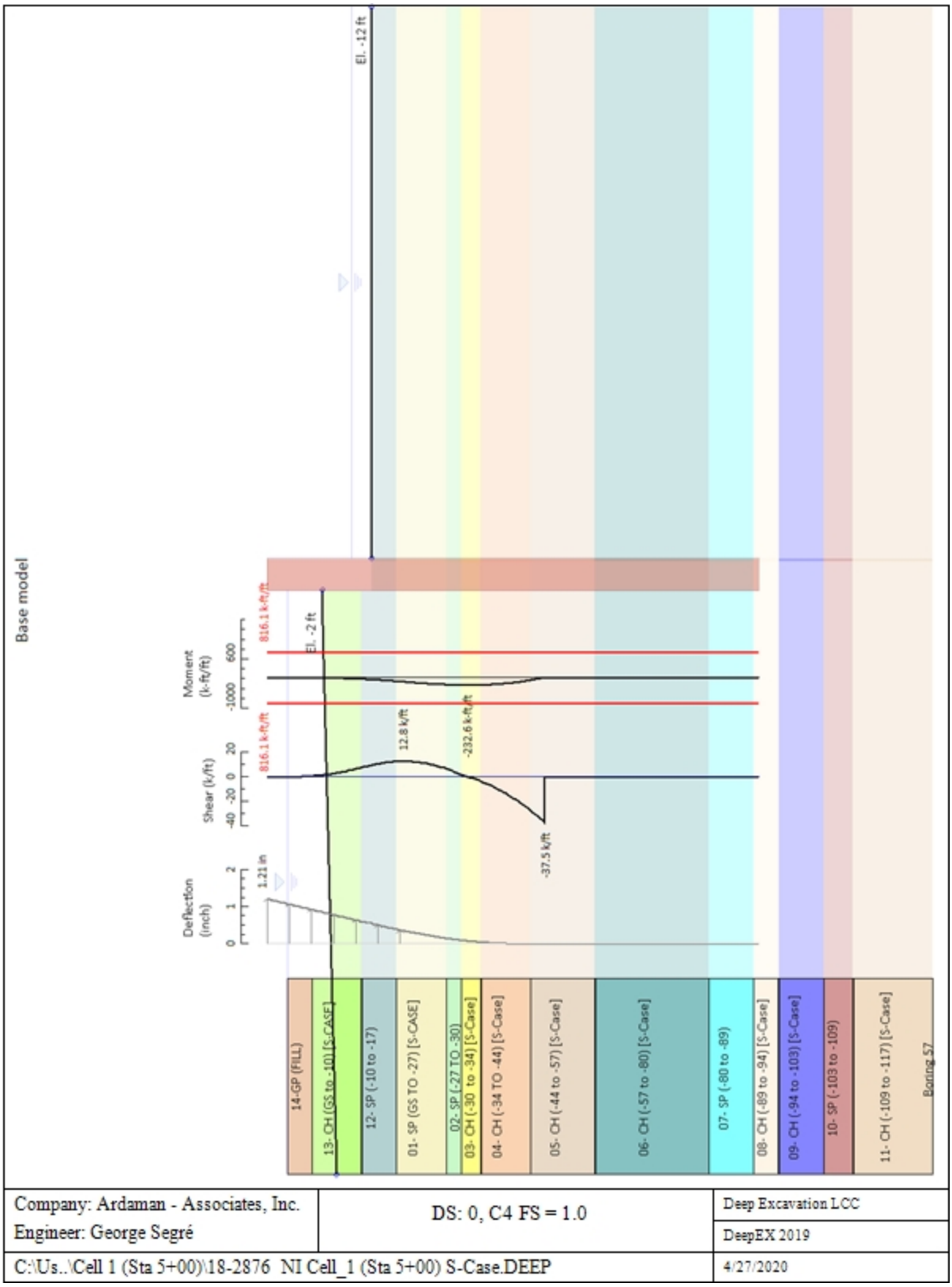
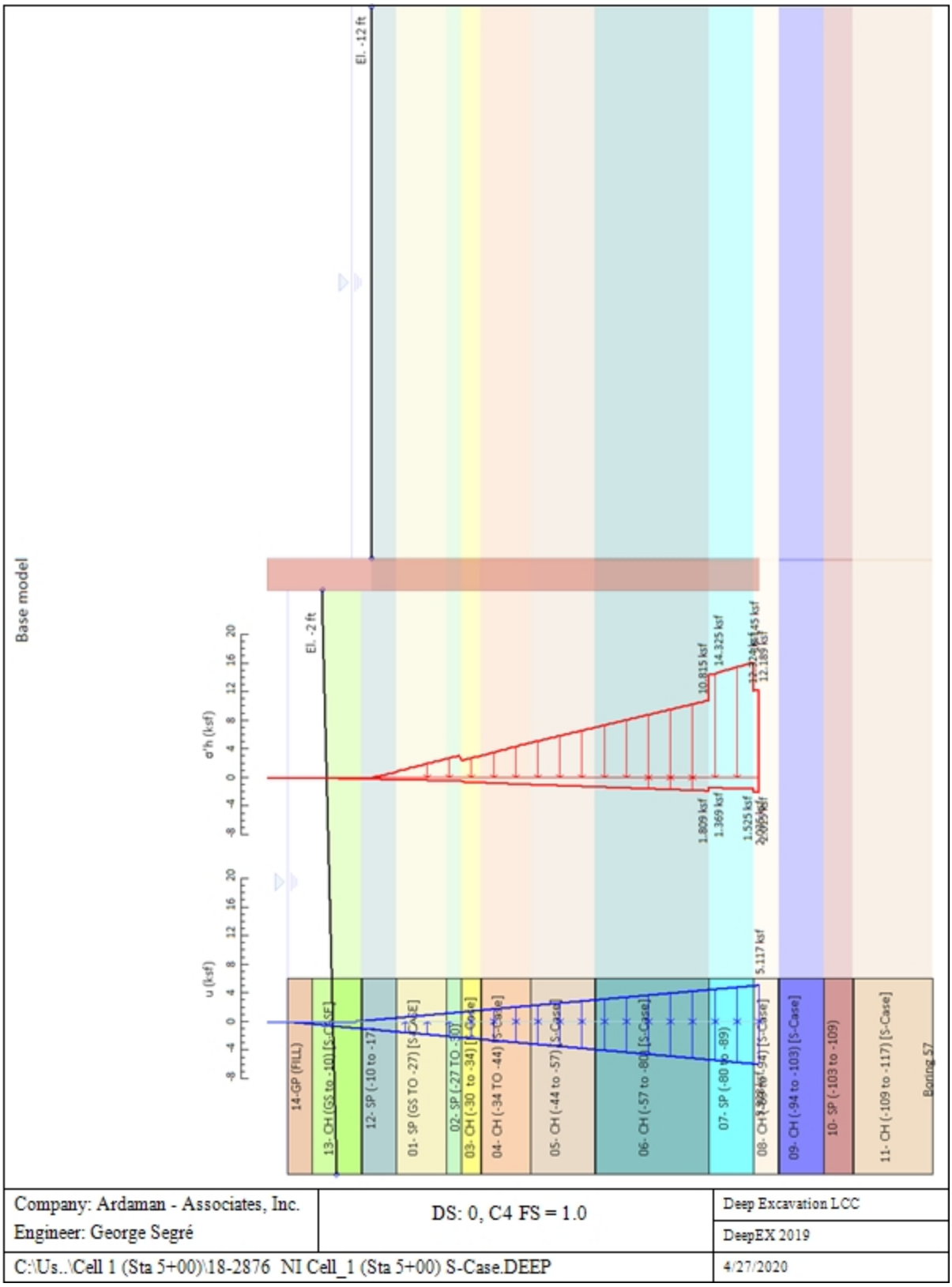
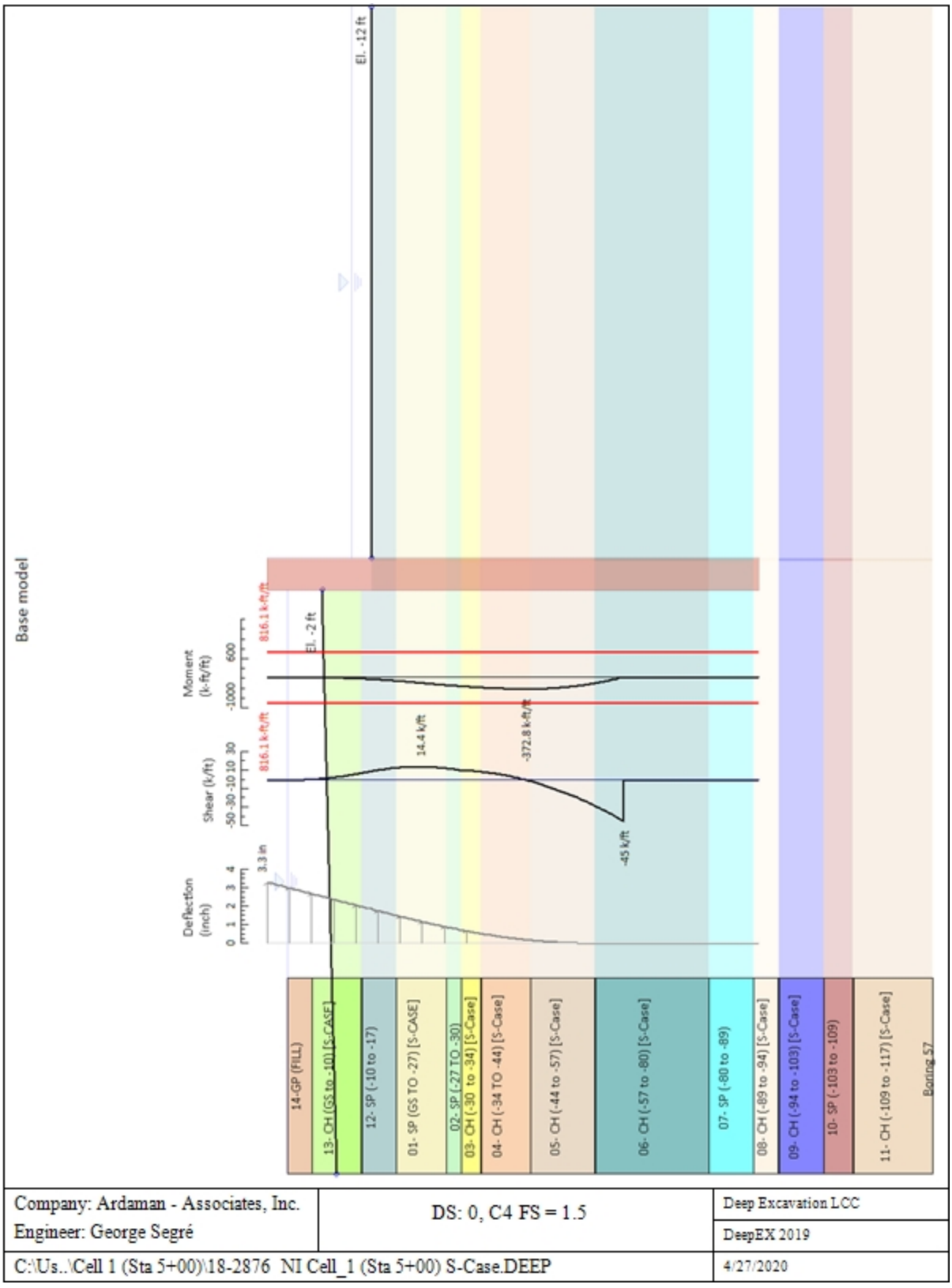


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP		4/27/2020

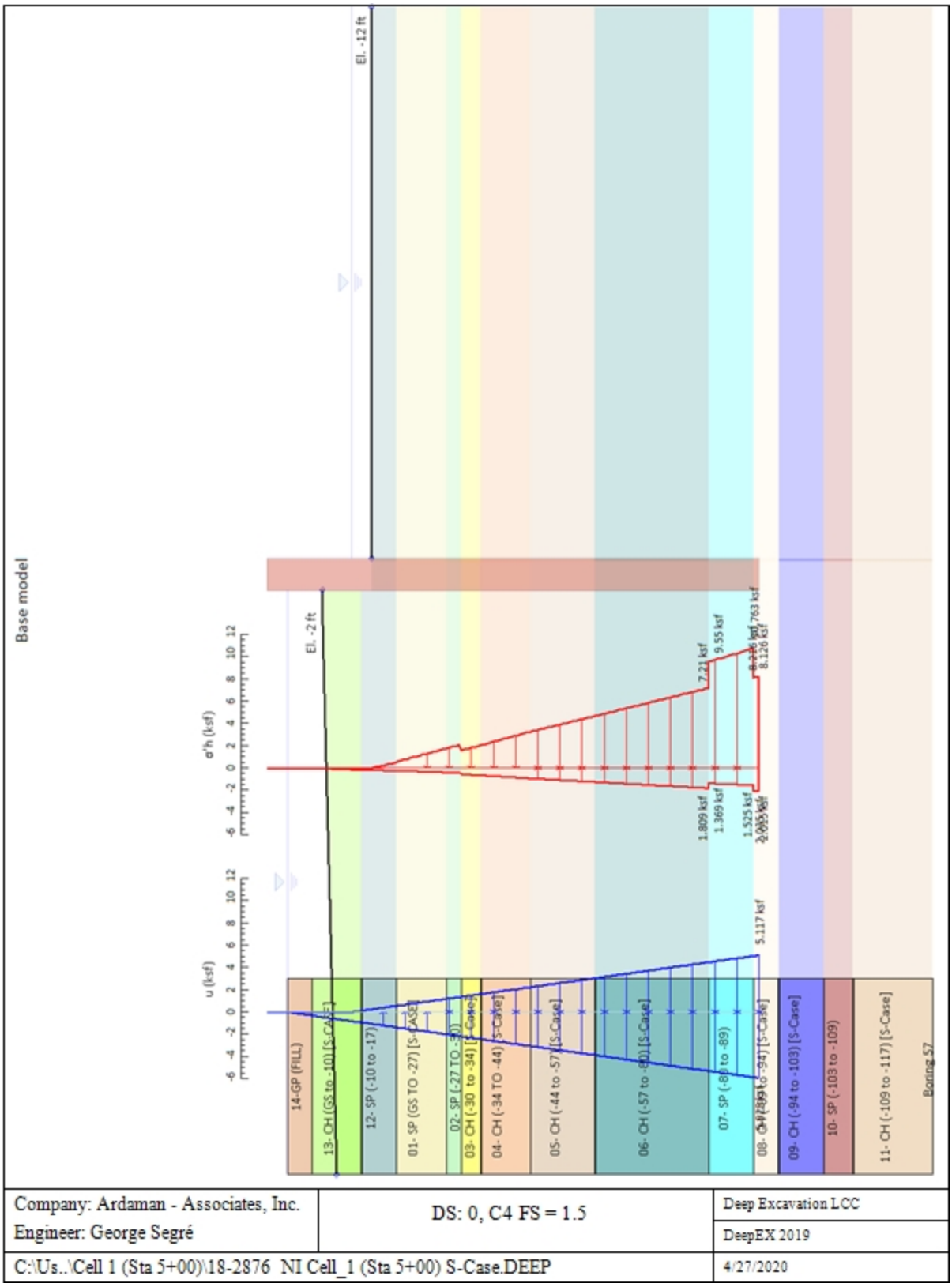

Base model
El. -12 ft
El. -2 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
Shear (k/ft)
20
0
-20
-40
12.8 k/ft
-232.6 k-ft/ft
-37.5 k/ft
Deflection (inch)
2
1
0
1.21 in
14-GP (FILL)
13- CH (GS to -10) [S-CASE]
12- SP (-10 to -17)
01- SP (GS TO -27) [S-CASE]
02- SP (-27 TO -30)
03- CH (-30 to -34) [S-Case]
04- CH (-34 TO -44) [S-Case]
05- CH (-44 to -57) [S-Case]
06- CH (-57 to -80) [S-Case]
07- SP (-80 to -89)
08- CH (-89 to -94) [S-Case]
09- CH (-94 to -103) [S-Case]
10- SP (-103 to -109)
11- CH (-109 to -117) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 1 (Sta 5+00)\18-2876 NI Cell_1 (Sta 5+00) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 0+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -83.56 ft., NAVD88

Length of Sheetting = 92.56 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-24.97	90.97	19.04	0.17
		Open excavation - degraded	9	-8	1.00	1.25	-27.34	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-23.39	77.45	23.38	0.13
		Open excavation - degraded	9	-4	1.00	1.25	-24.18	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-21.41	39.14	16.26	0.05
		Open excavation - degraded	5	-8	1.00	1.50	-22.60	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-19.44	28.52	13.60	0.04
		Open excavation - degraded	5	-4	1.00	1.50	-20.23	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-72.64	839.09	96.58	9.85
		Open excavation - degraded	9	-8	1.00	1.25	-83.56	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-67.00	616.24	73.58	6.15
		Open excavation - degraded	9	-4	1.00	1.25	-76.28	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-63.28	468.70	58.72	4.15
		Open excavation - degraded	5	-8	1.00	1.50	-82.52	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-56.00	309.76	41.79	2.19
		Open excavation - degraded	5	-4	1.00	1.50	-73.16	--	--	--
						Governing Value:	-83.56	839.09	96.58	9.85

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:41:33 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

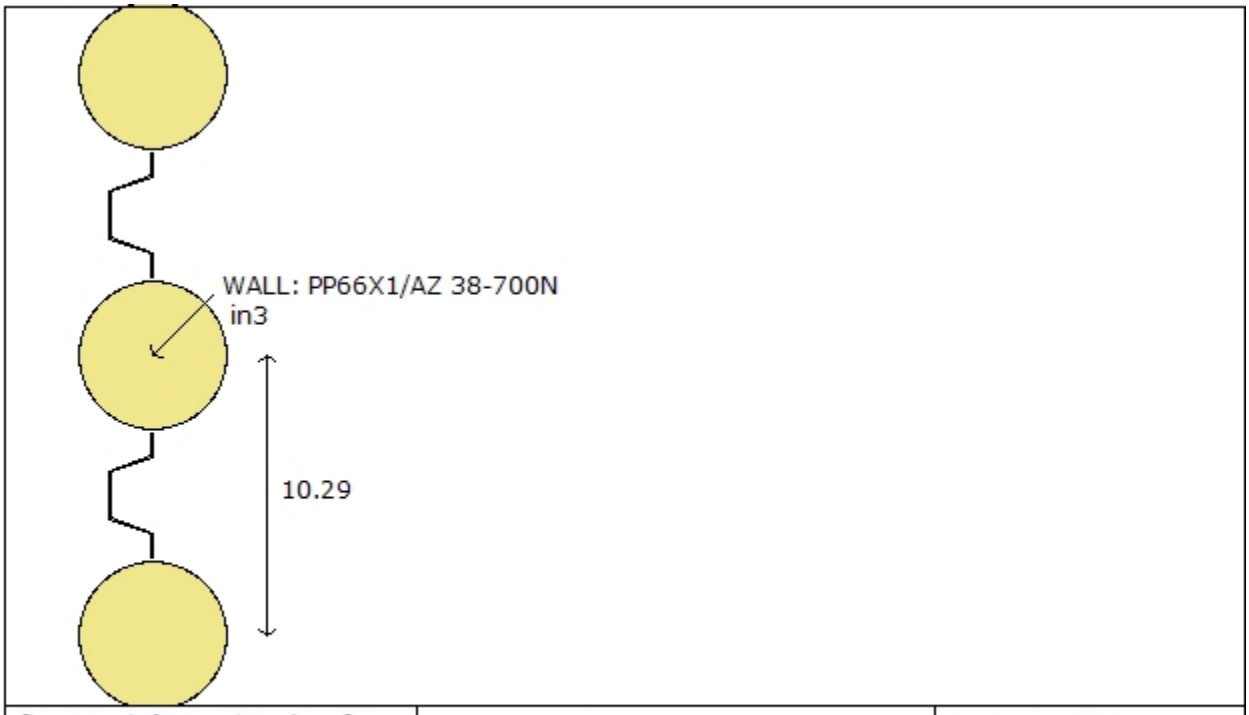
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	5.517	9.803	11.293
Stage 1	Simple span	N/A	1.6	4.457	7.903	9.13
Stage 2	Simple span	N/A	1.6	6.555	10.325	11.725
Stage 3	Simple span	N/A	1.6	5.991	8.357	9.497
Stage 4	Simple span	N/A	1.6	8.574	13.312	12.947
Stage 5	Simple span	N/A	1.6	7.237	9.01	8.814
Stage 6	Simple span	N/A	1.6	12.387	14.021	13.442
Stage 7	Simple span	N/A	1.6	9.186	9.566	9.186

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

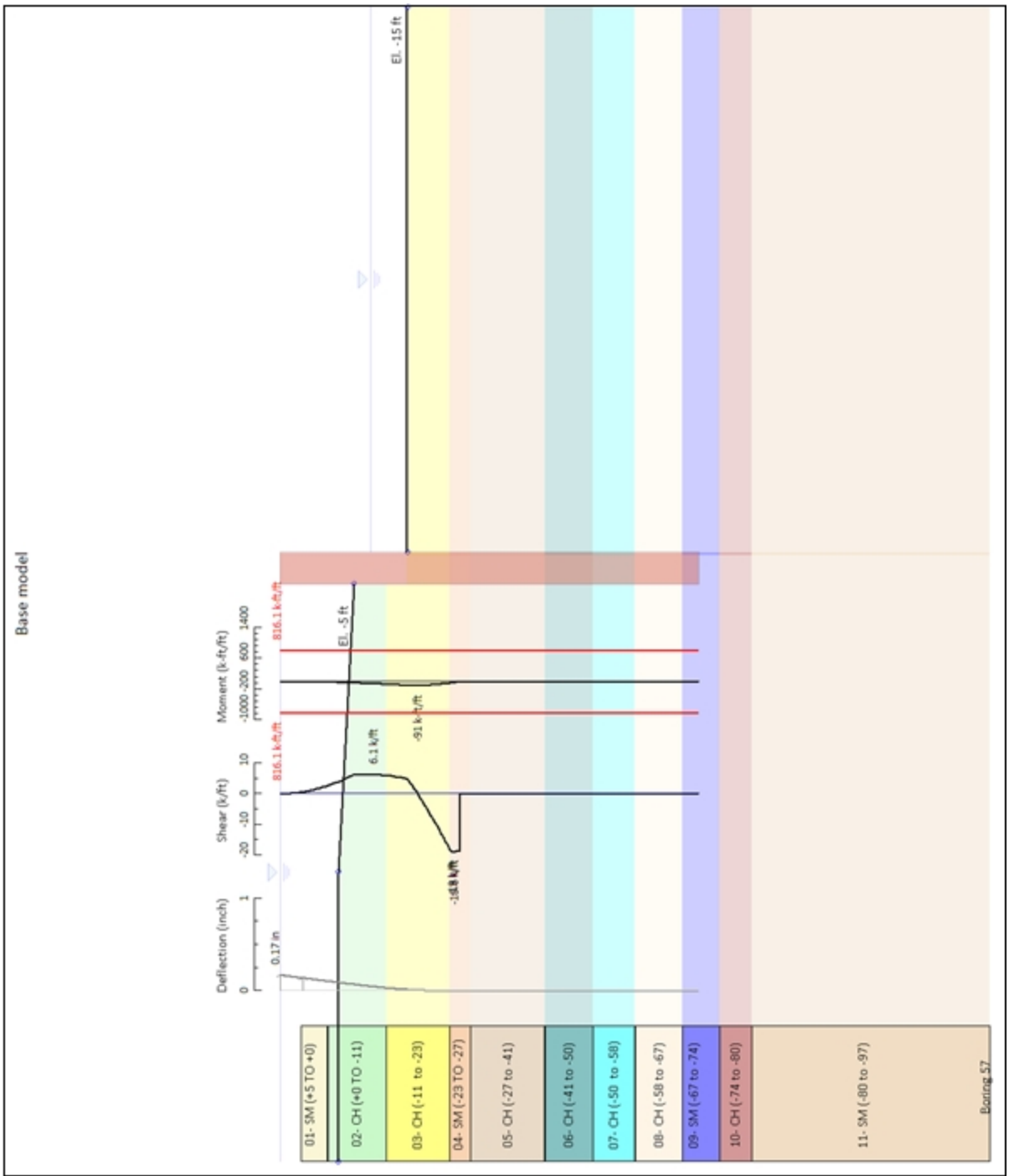
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

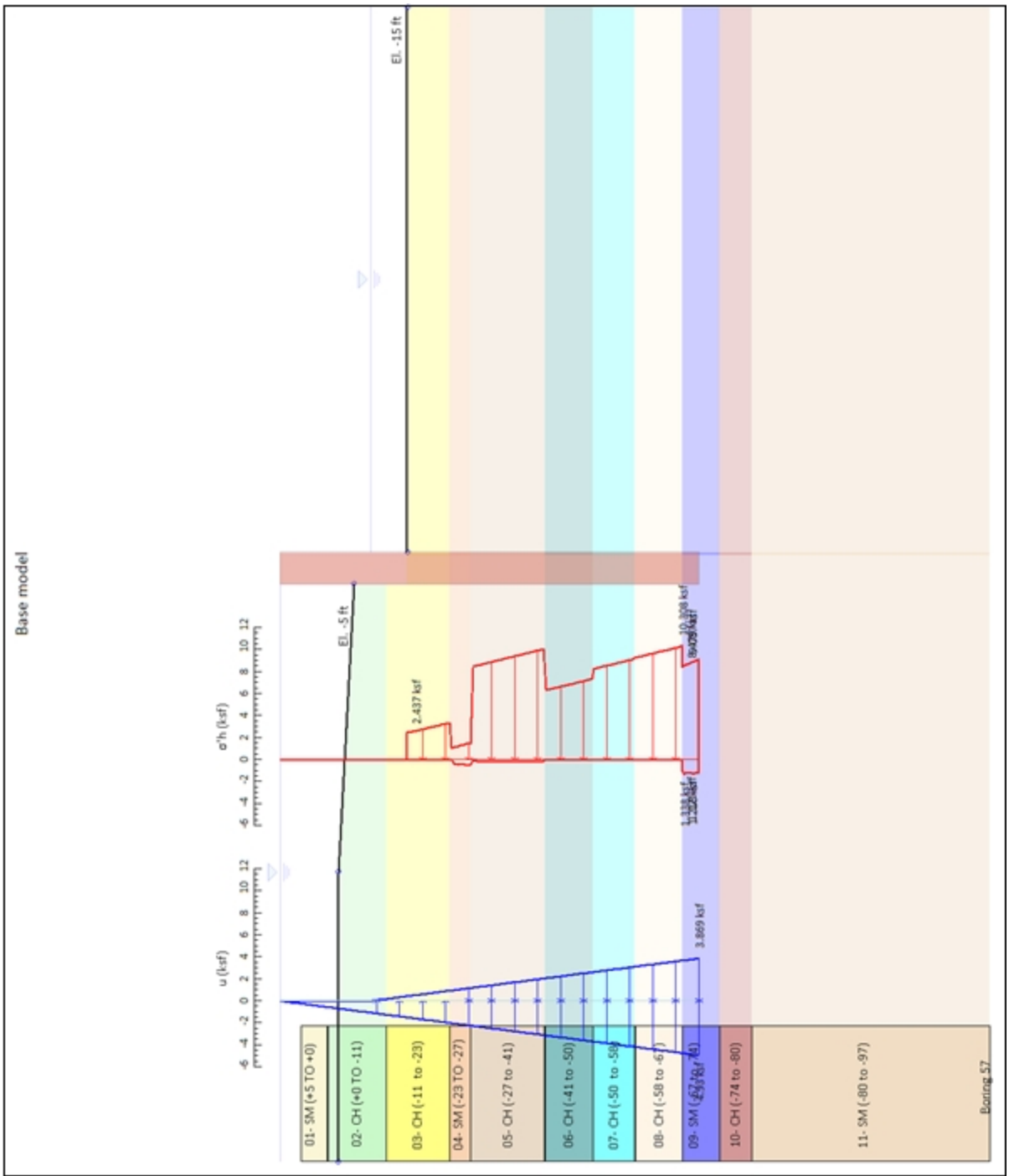
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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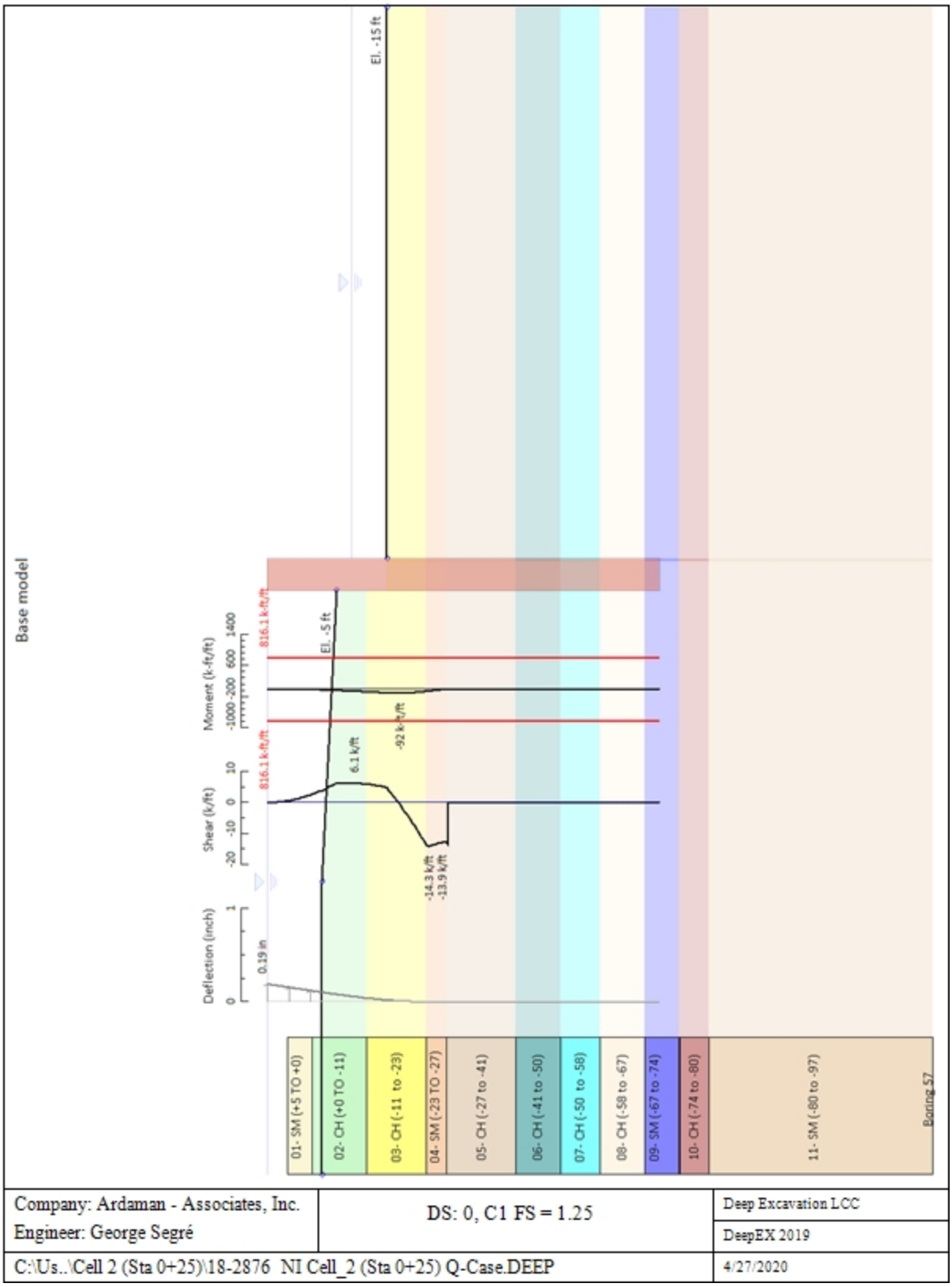
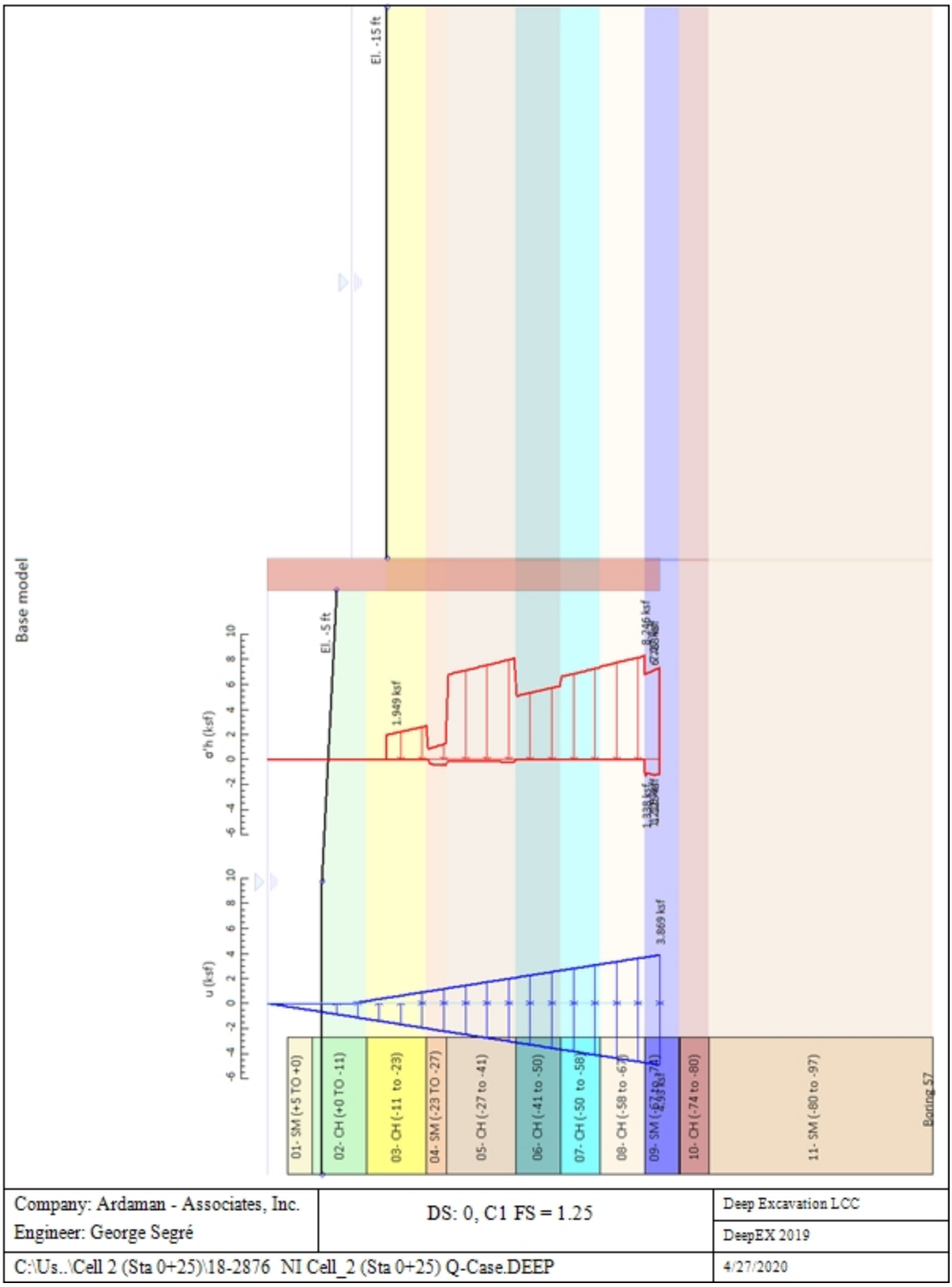
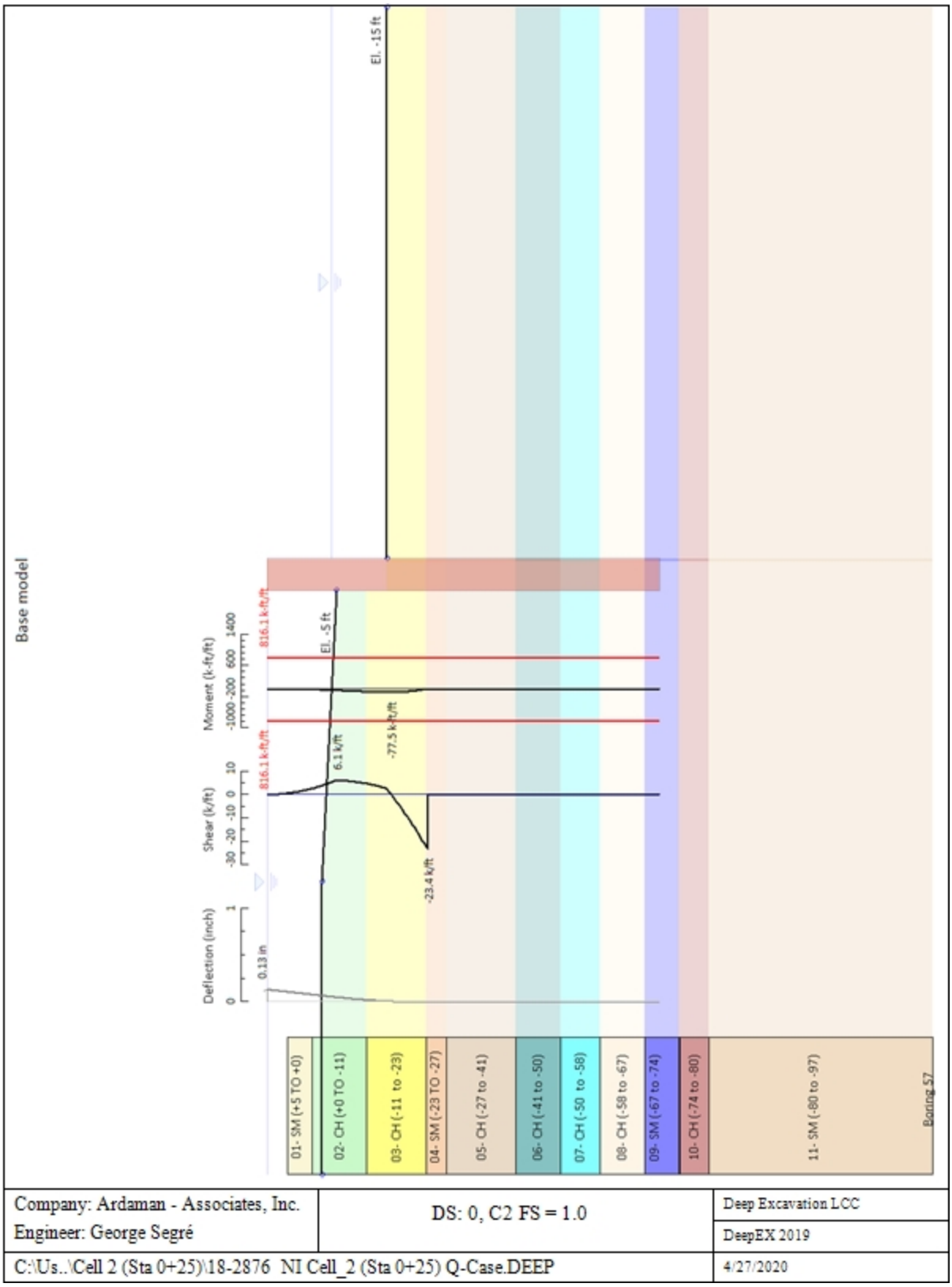
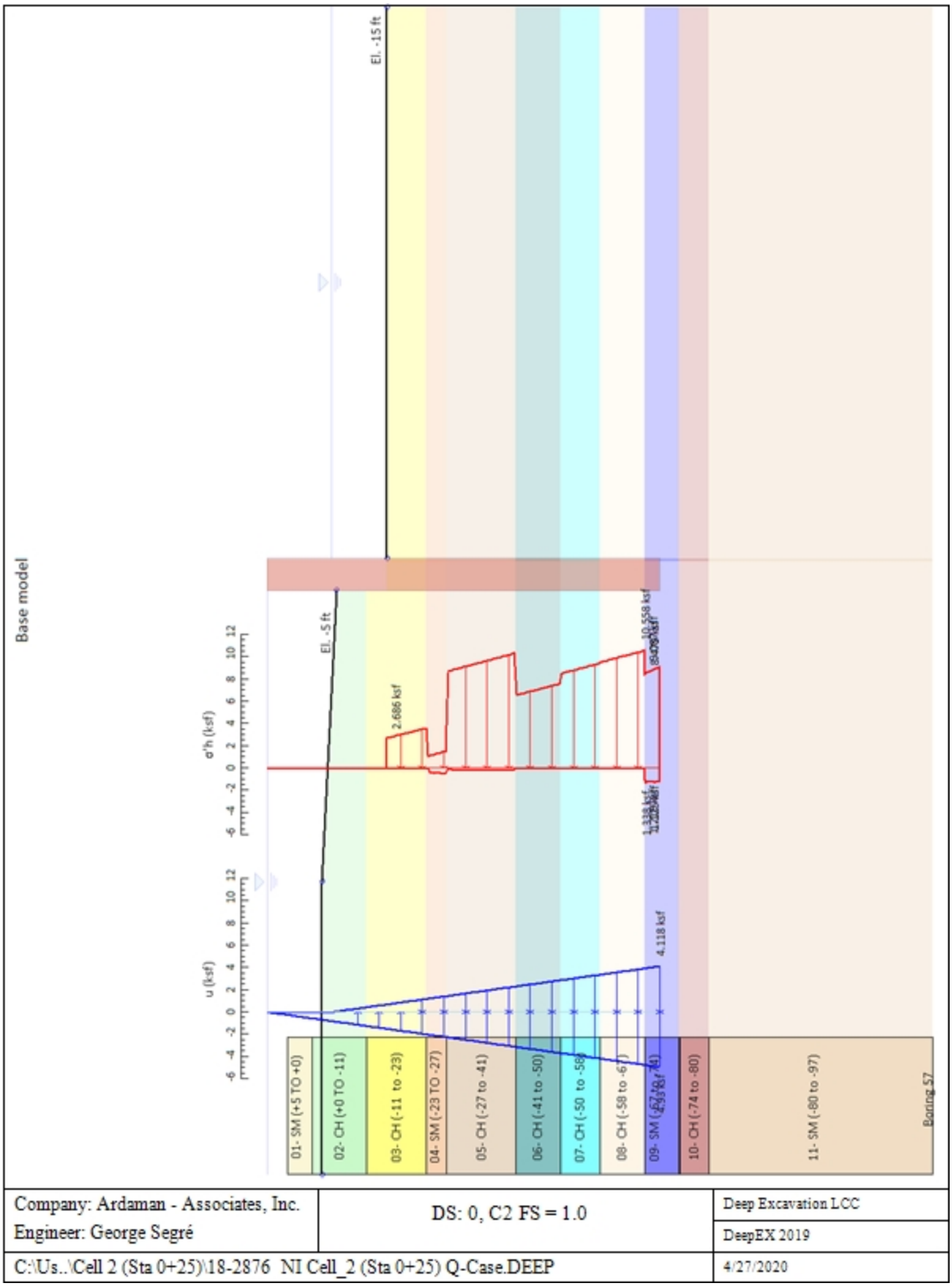
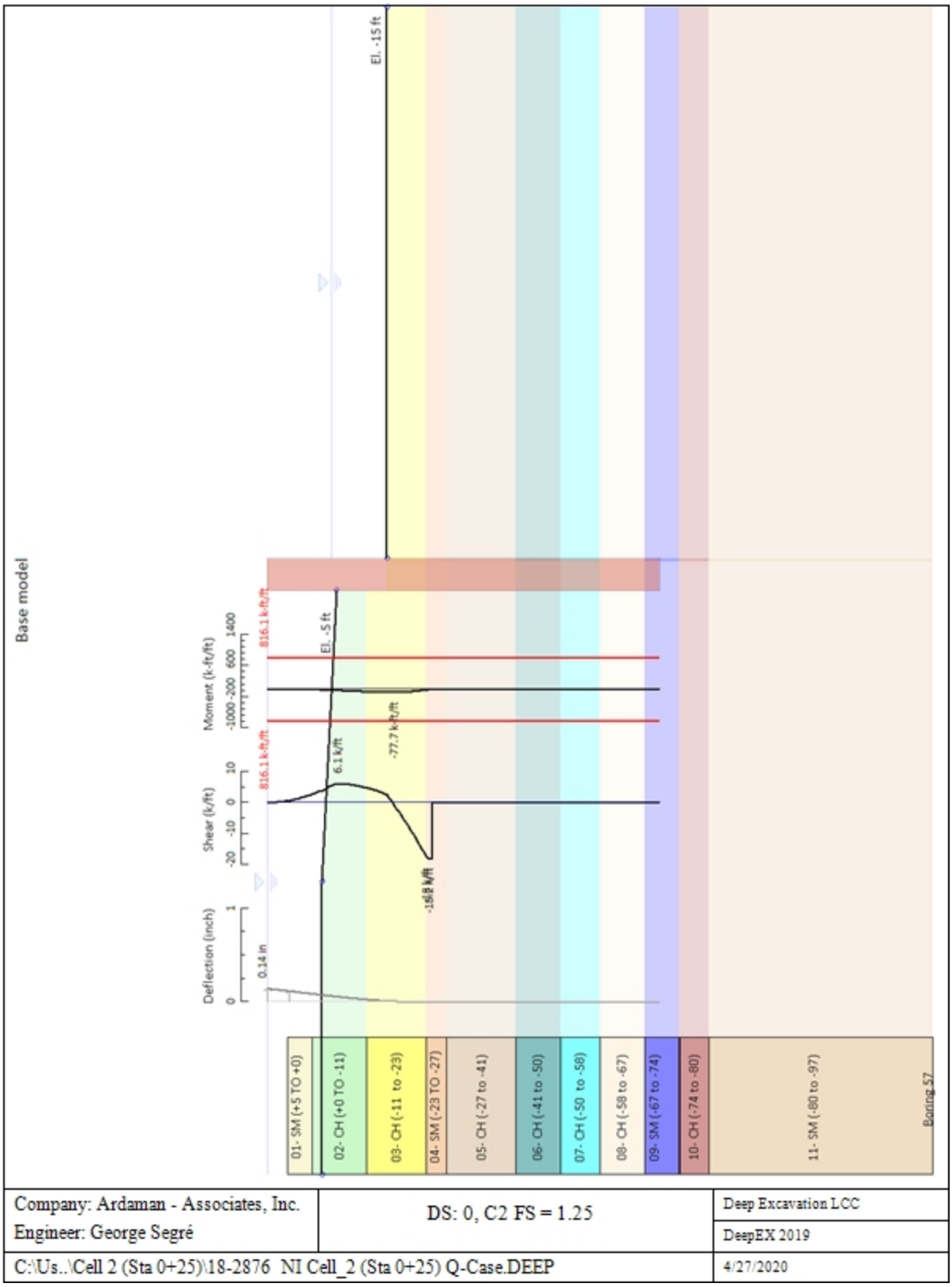

Base model
El. -15 ft
El. -5 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-92 k-ft/ft
Shear (k/ft)
-20 -10 0 10
816.1 k-ft/ft
6.1 k/ft
-14.3 k/ft
-13.9 k/ft
Deflection (inch)
0 1
0.19 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

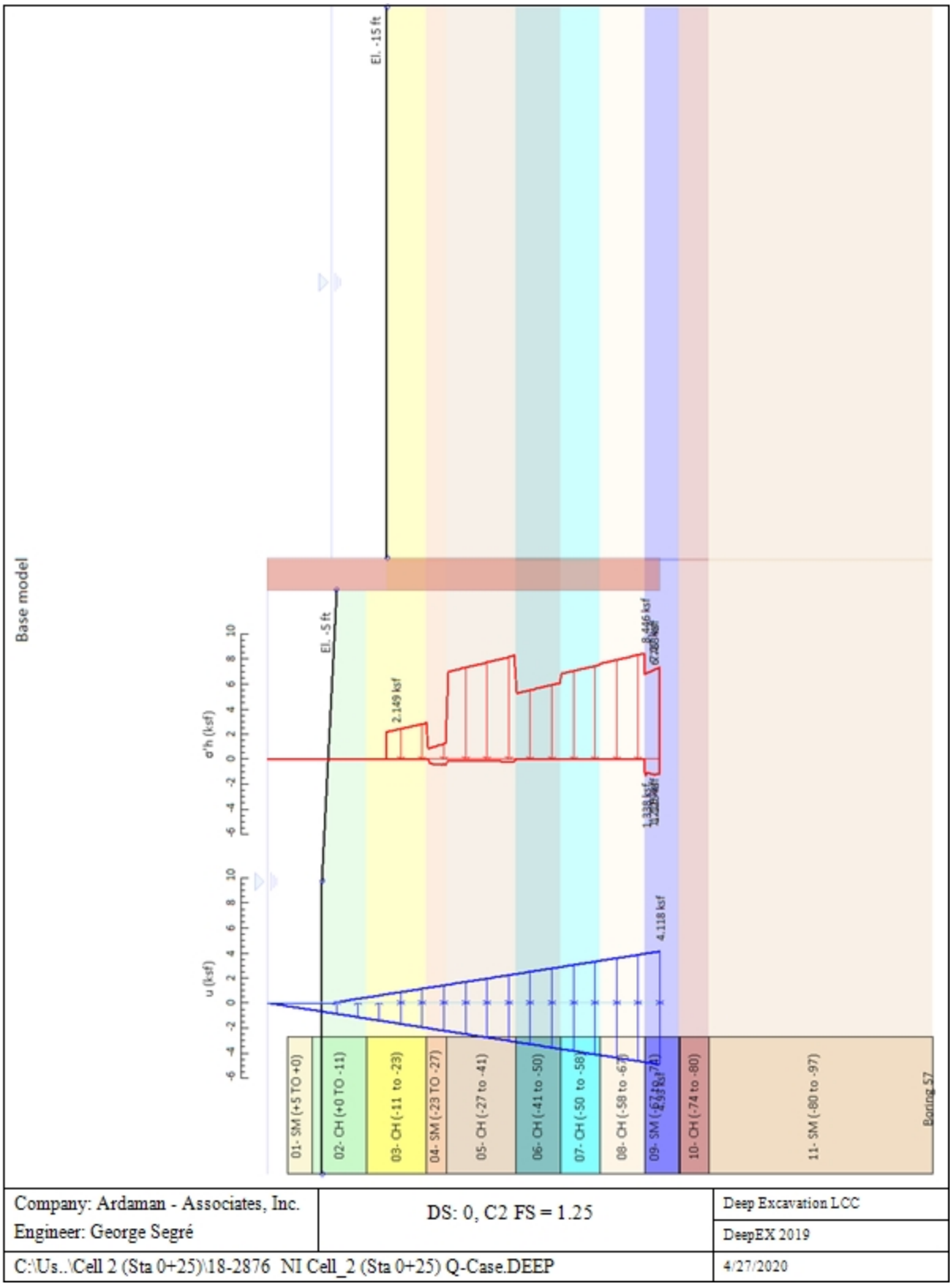

Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
1.949 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

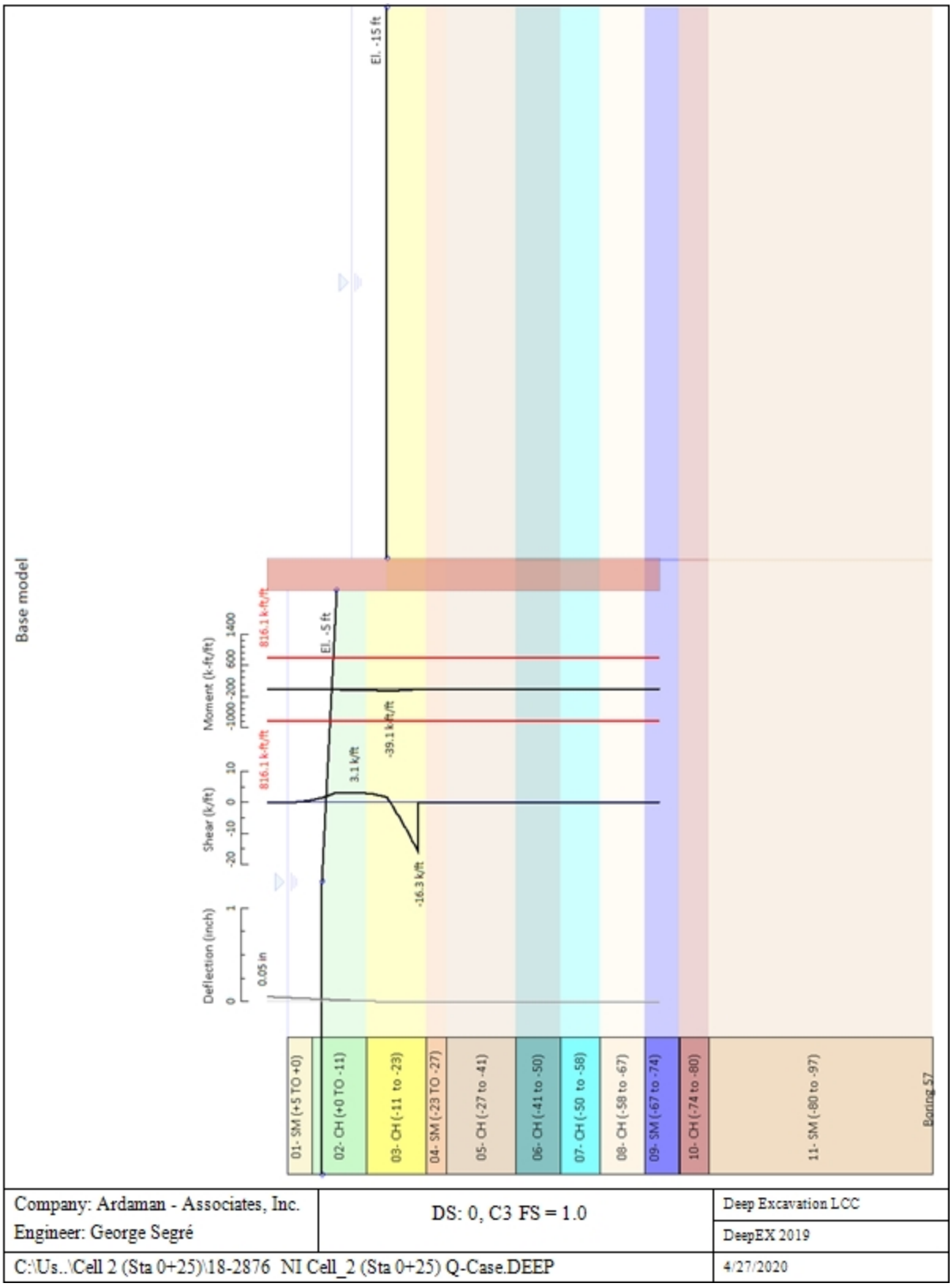

Base model
El. -15 ft
El. -5 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-77.5 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
6.1 k/ft
-23.4 k/ft
Deflection (inch)
0 1
0.13 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

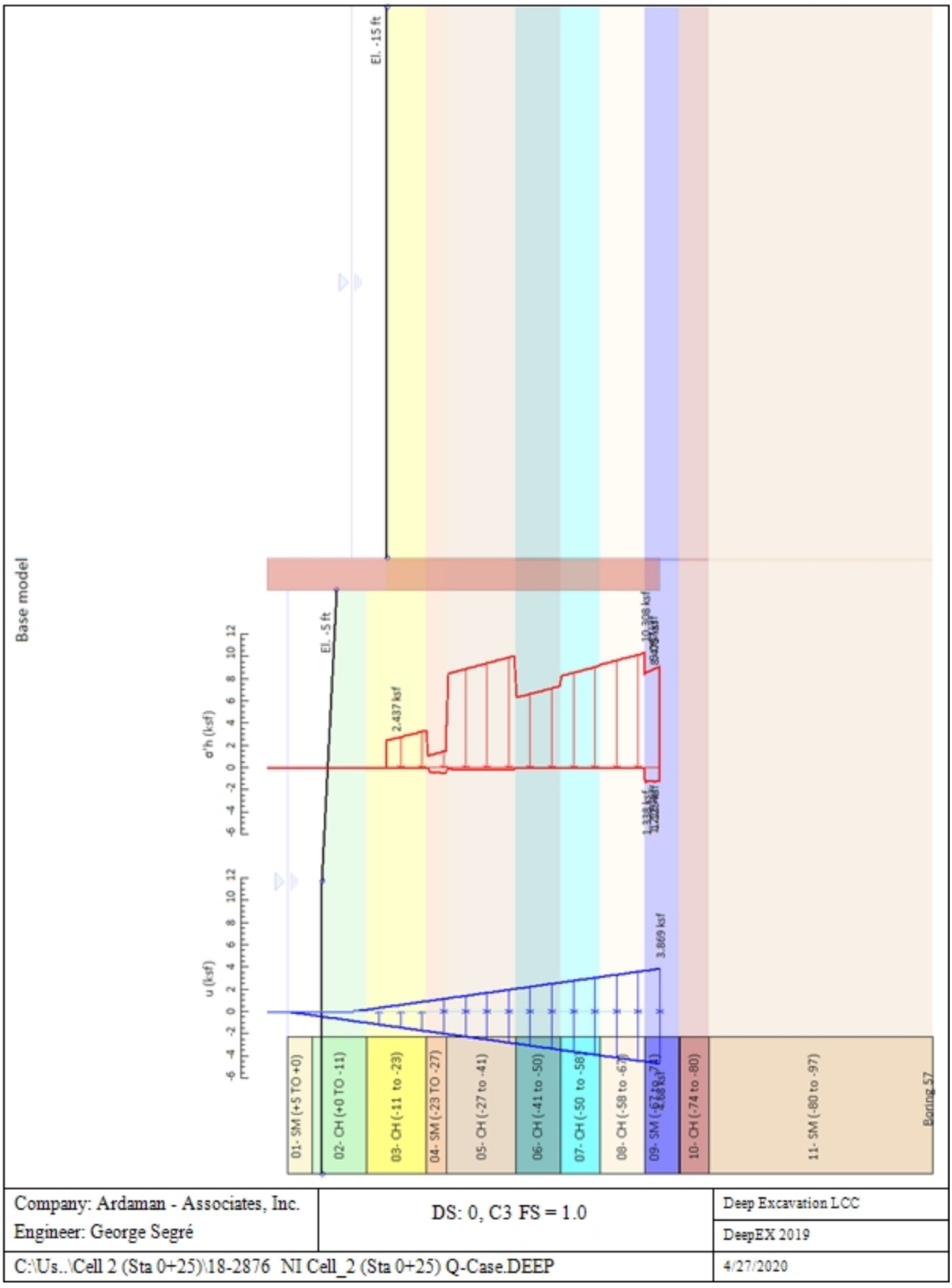


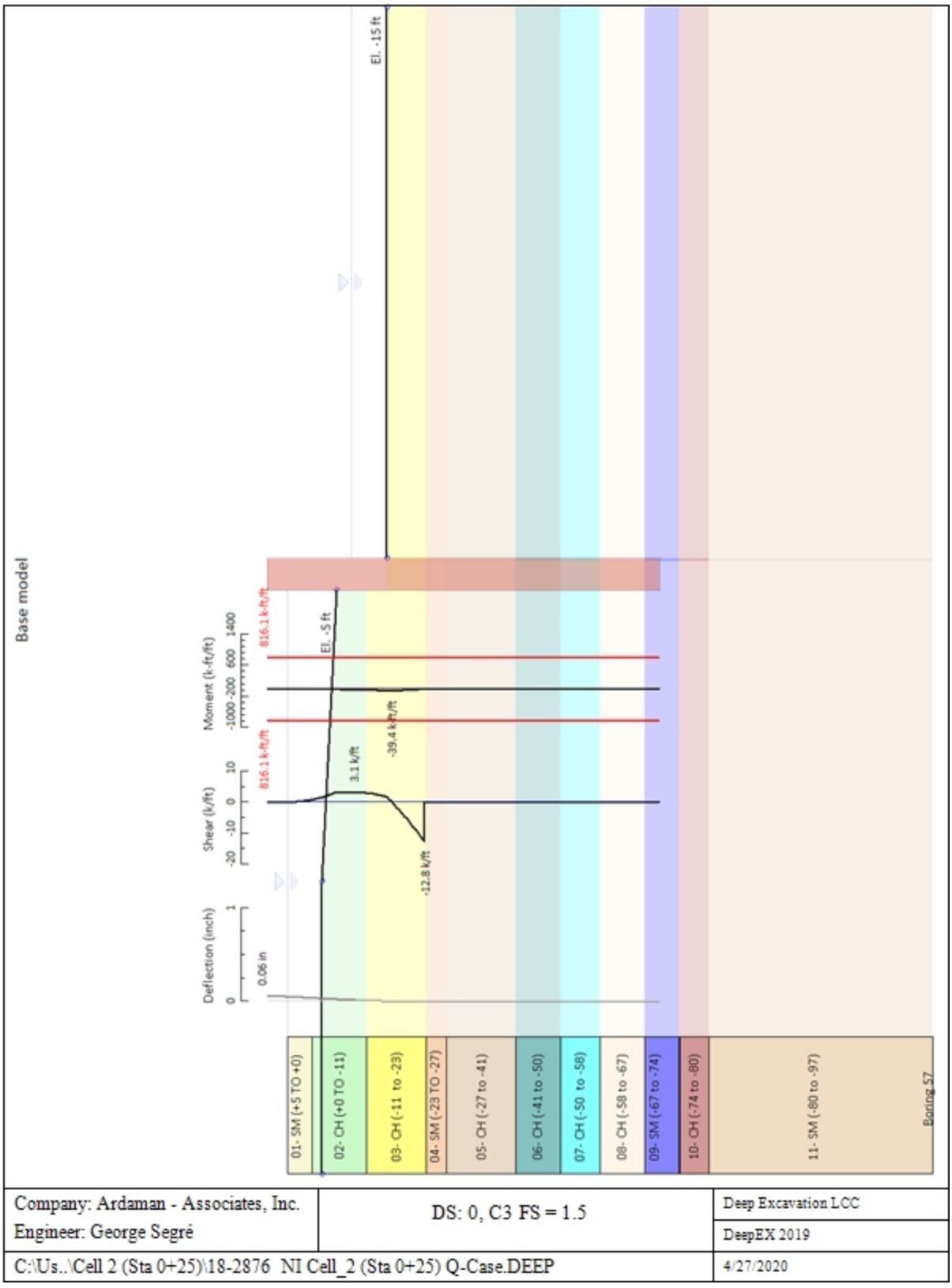
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.149 ksf
8.446 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020

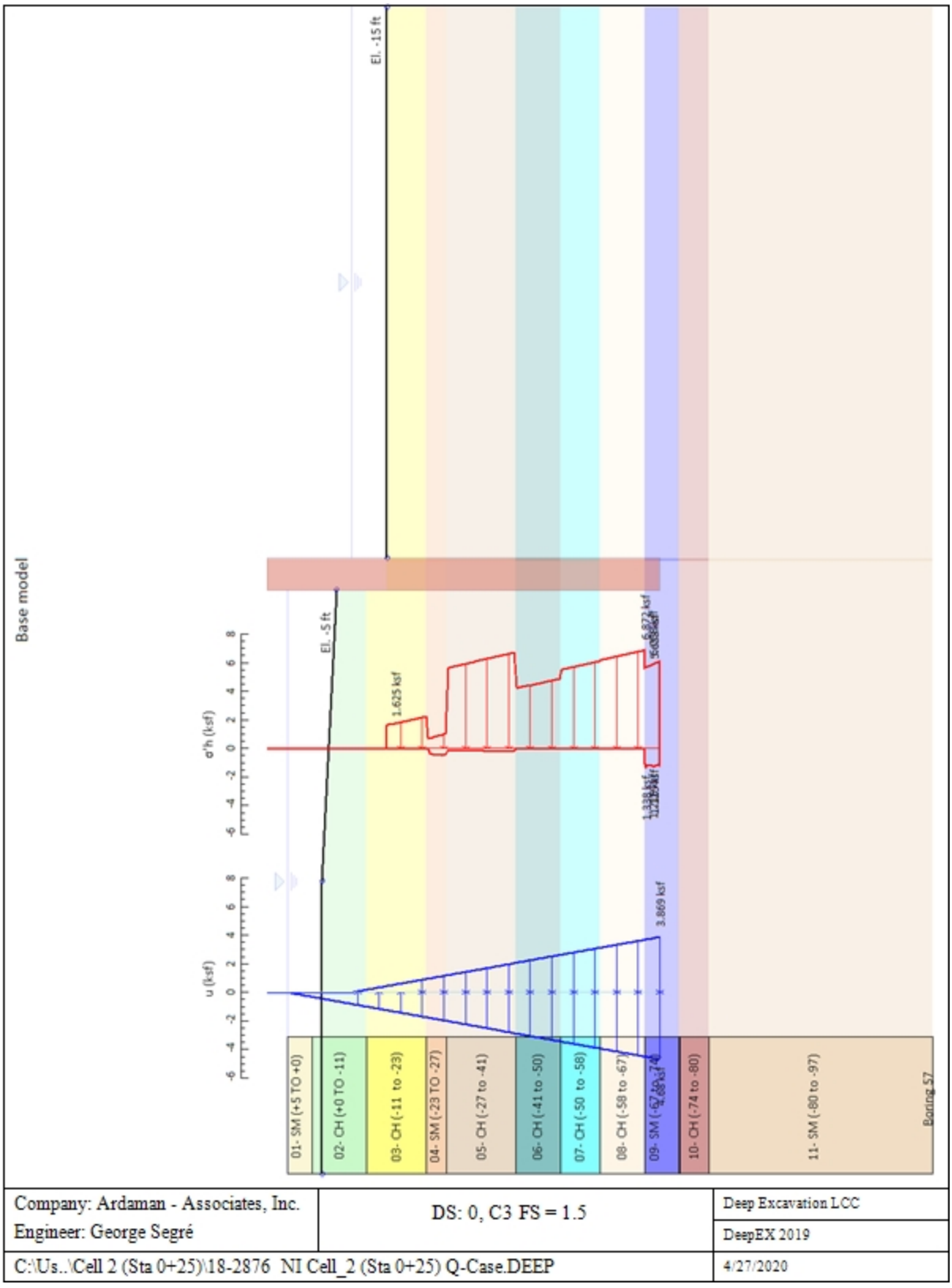


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020

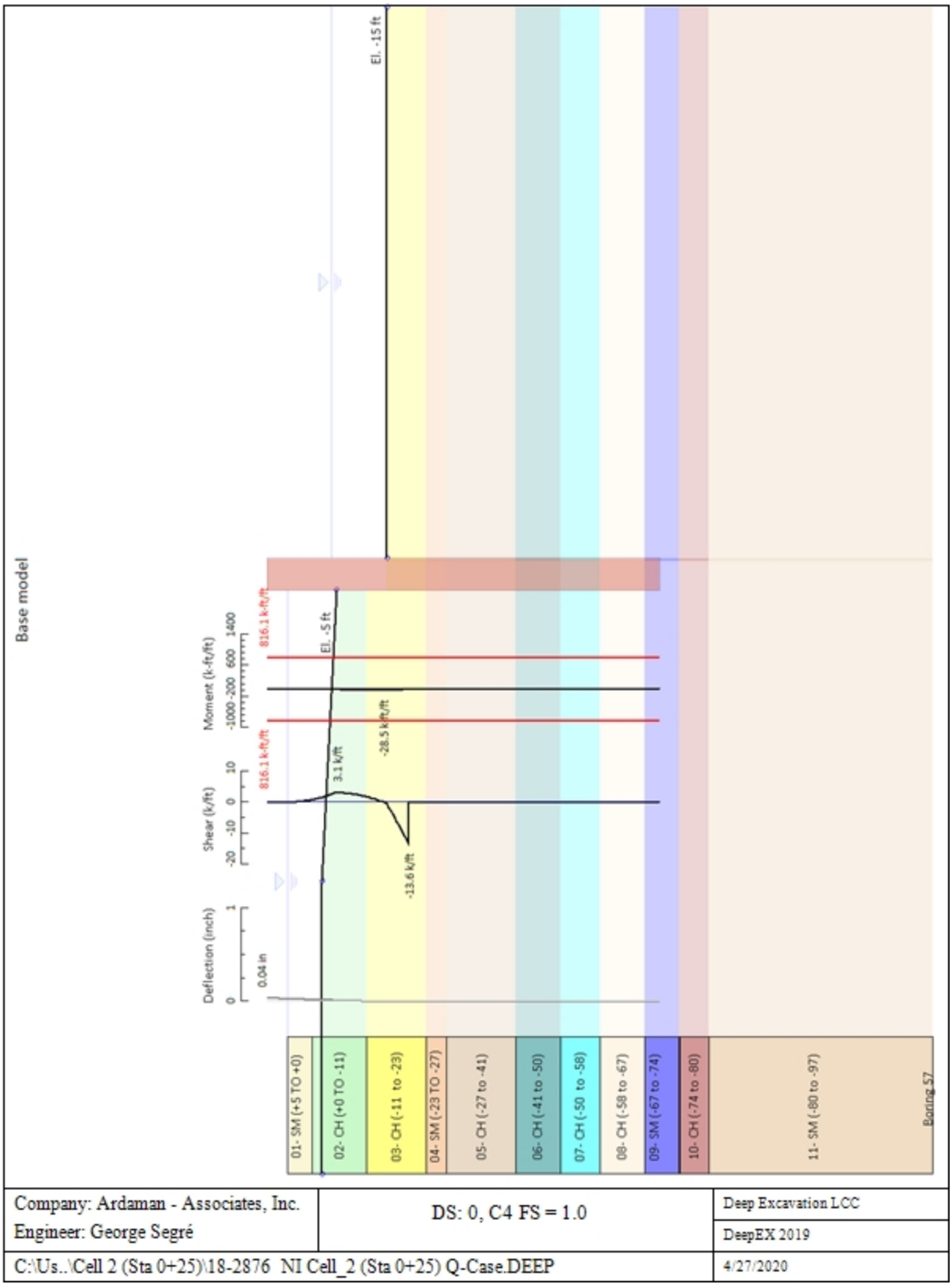

Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.437 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020



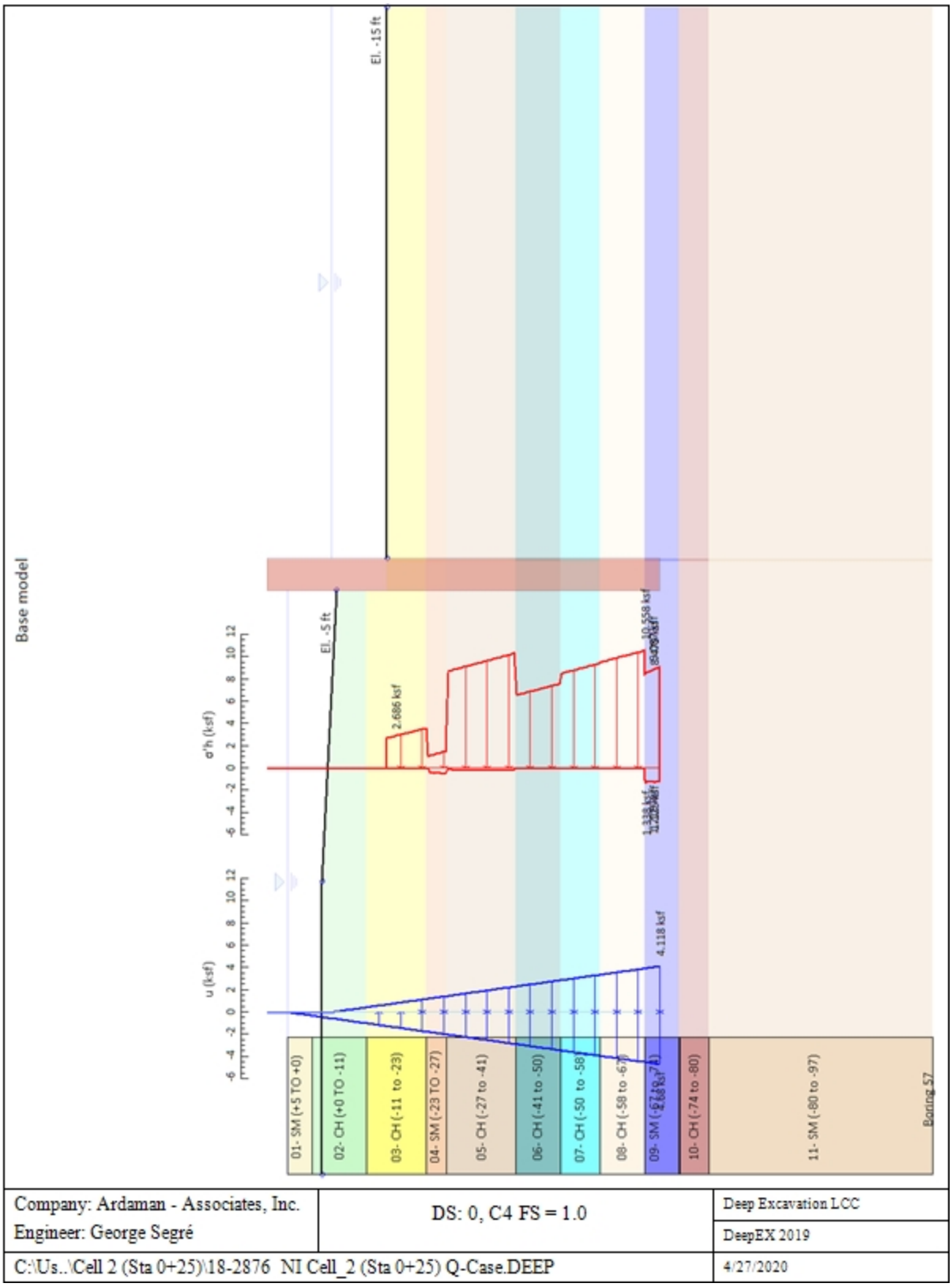
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020

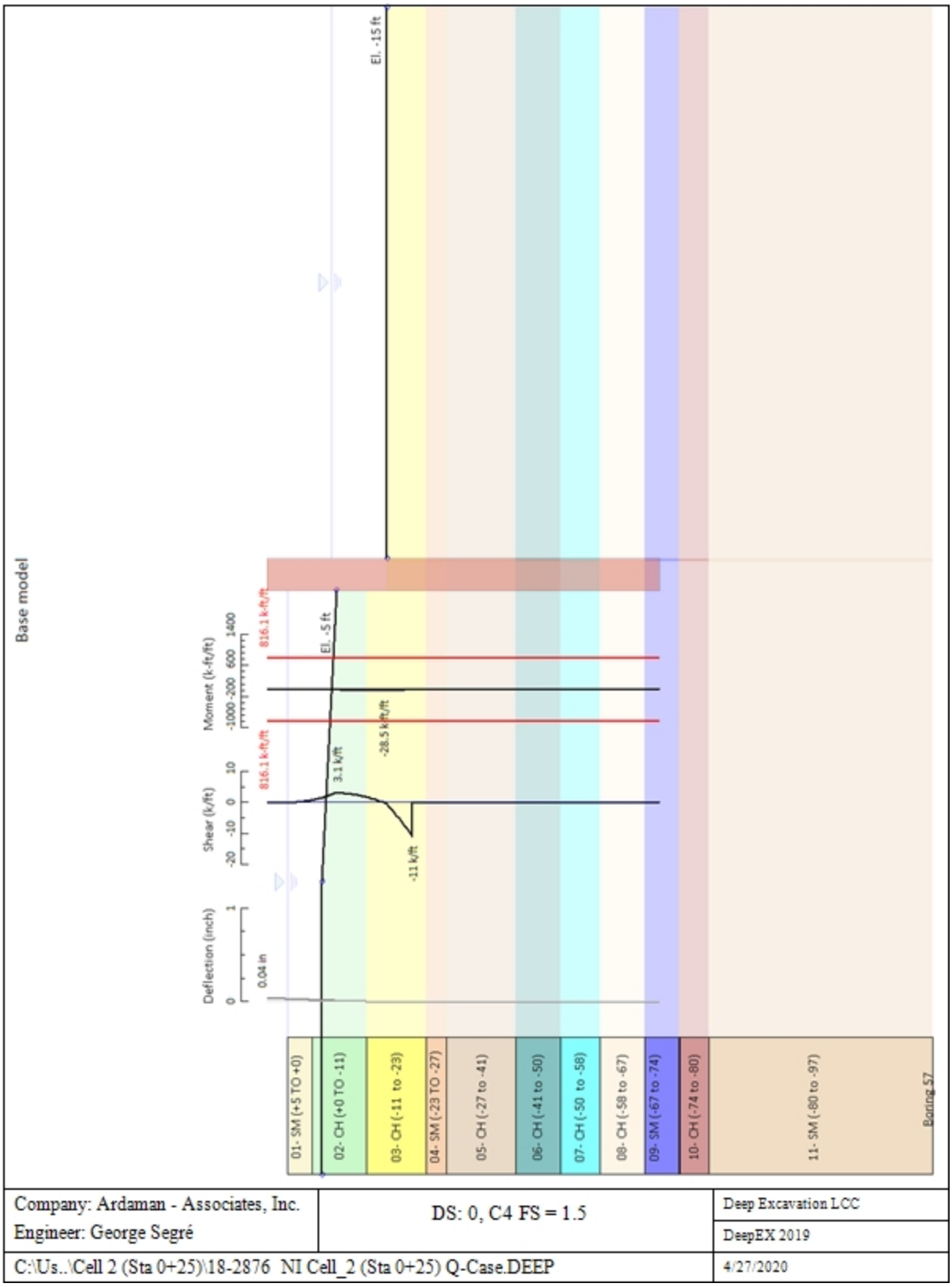


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020

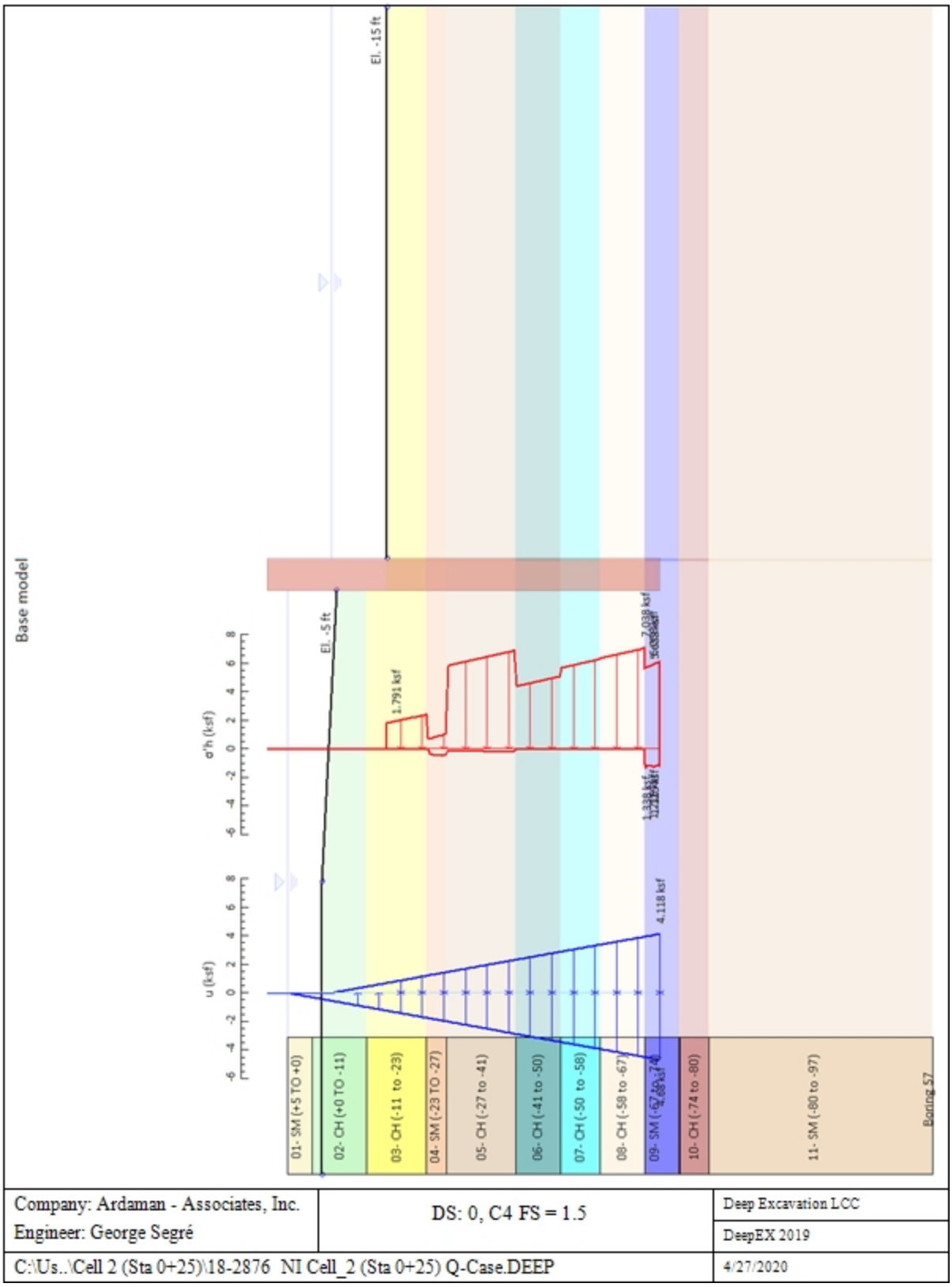


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020


Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP
4/27/2020



Attachment Figure C.2-25



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) Q-Case.DEEP		4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:48:49 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

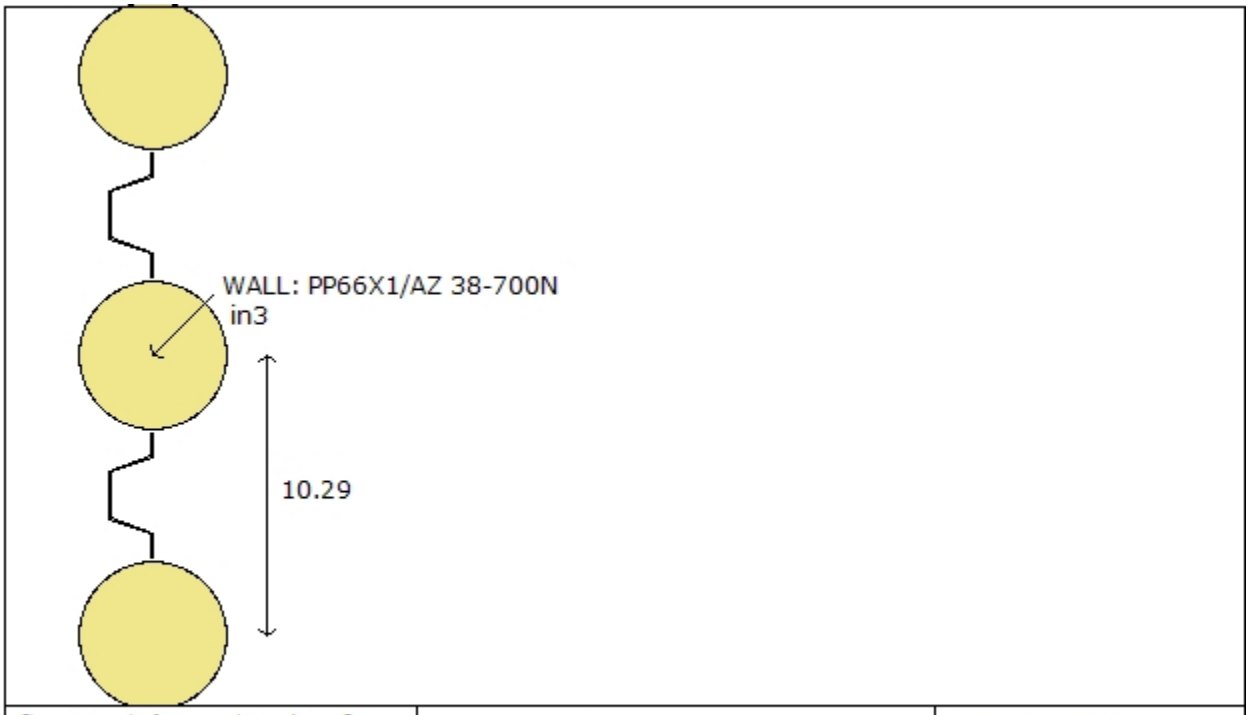
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -95 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.293	1.293	1.721
Stage 1	Simple span	N/A	1.6	1.129	1.129	1.489
Stage 2	Simple span	N/A	1.6	1.361	1.361	1.774
Stage 3	Simple span	N/A	1.6	1.197	1.197	1.541
Stage 4	Simple span	N/A	1.6	1.42	1.42	1.832
Stage 5	Simple span	N/A	1.6	1.121	1.121	1.419
Stage 6	Simple span	N/A	1.6	1.495	1.495	1.887
Stage 7	Simple span	N/A	1.6	1.196	1.196	1.475

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

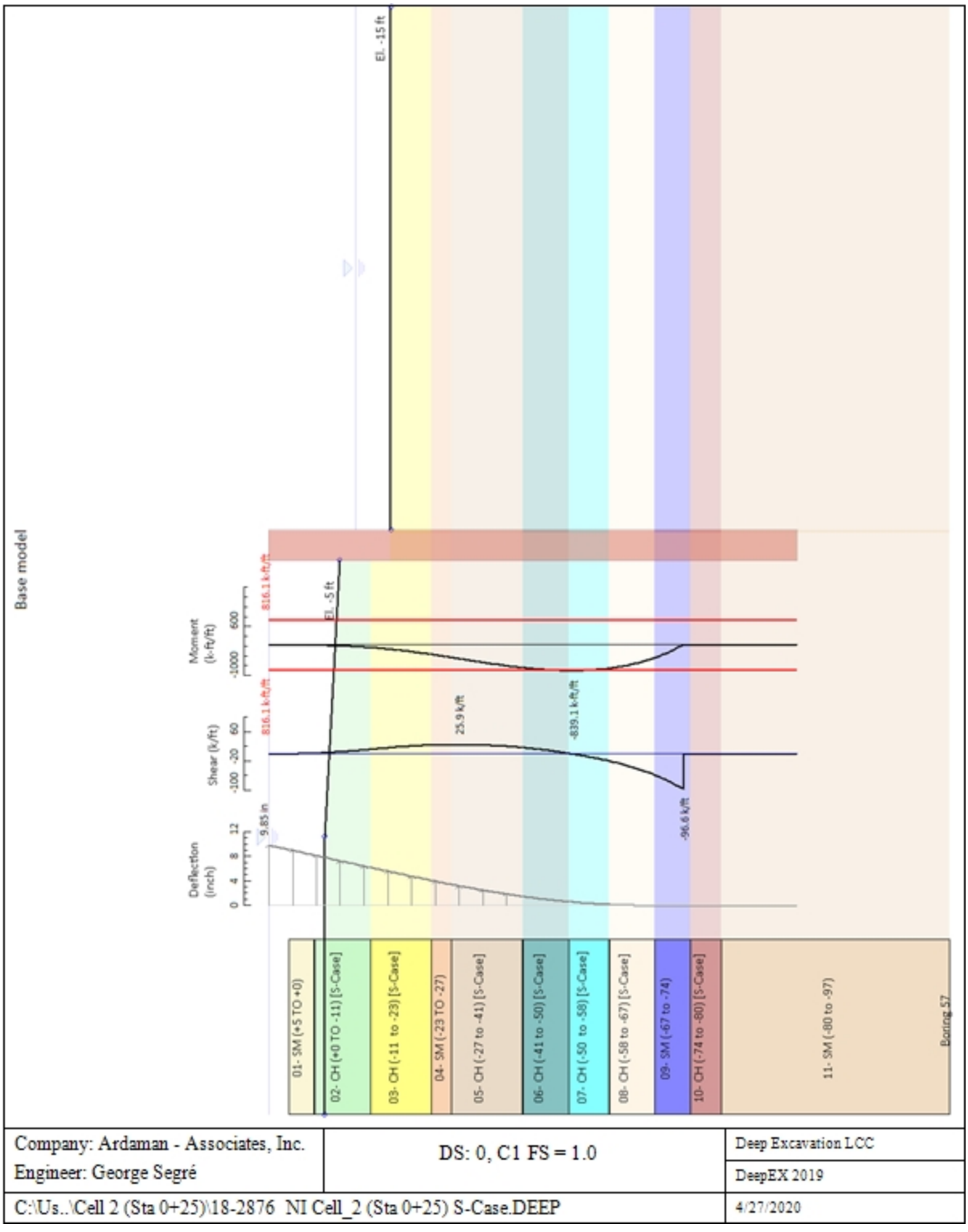
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

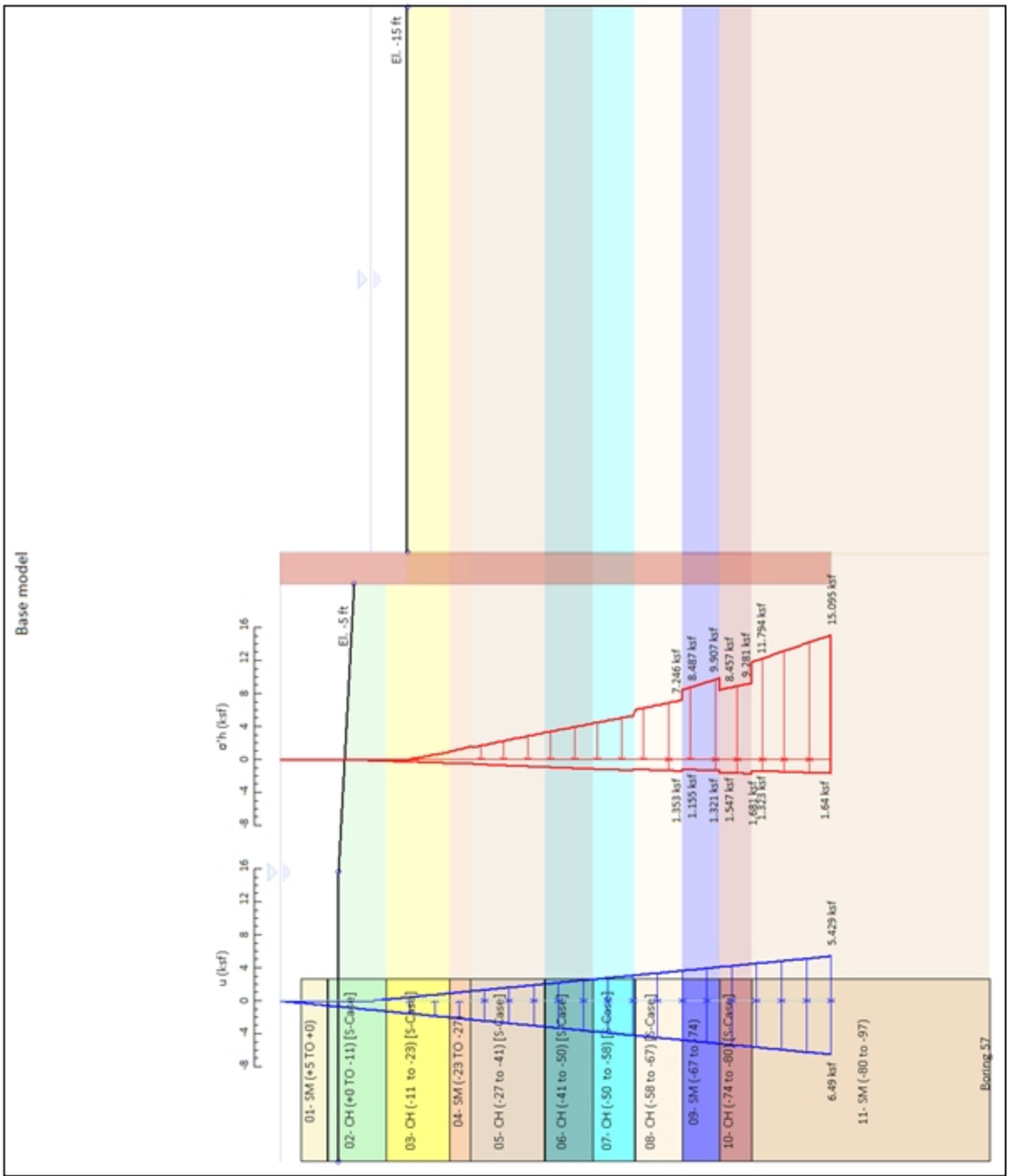
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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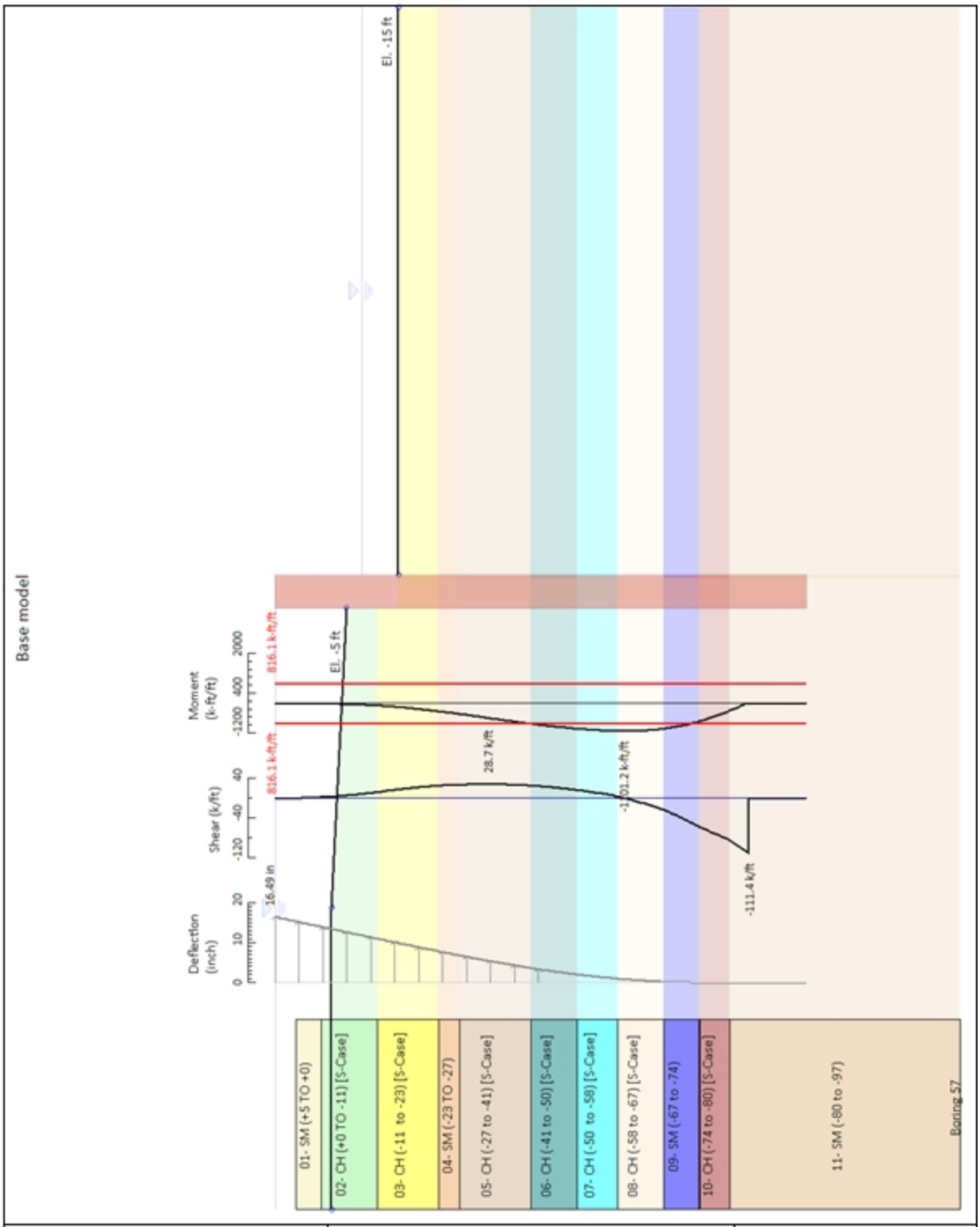

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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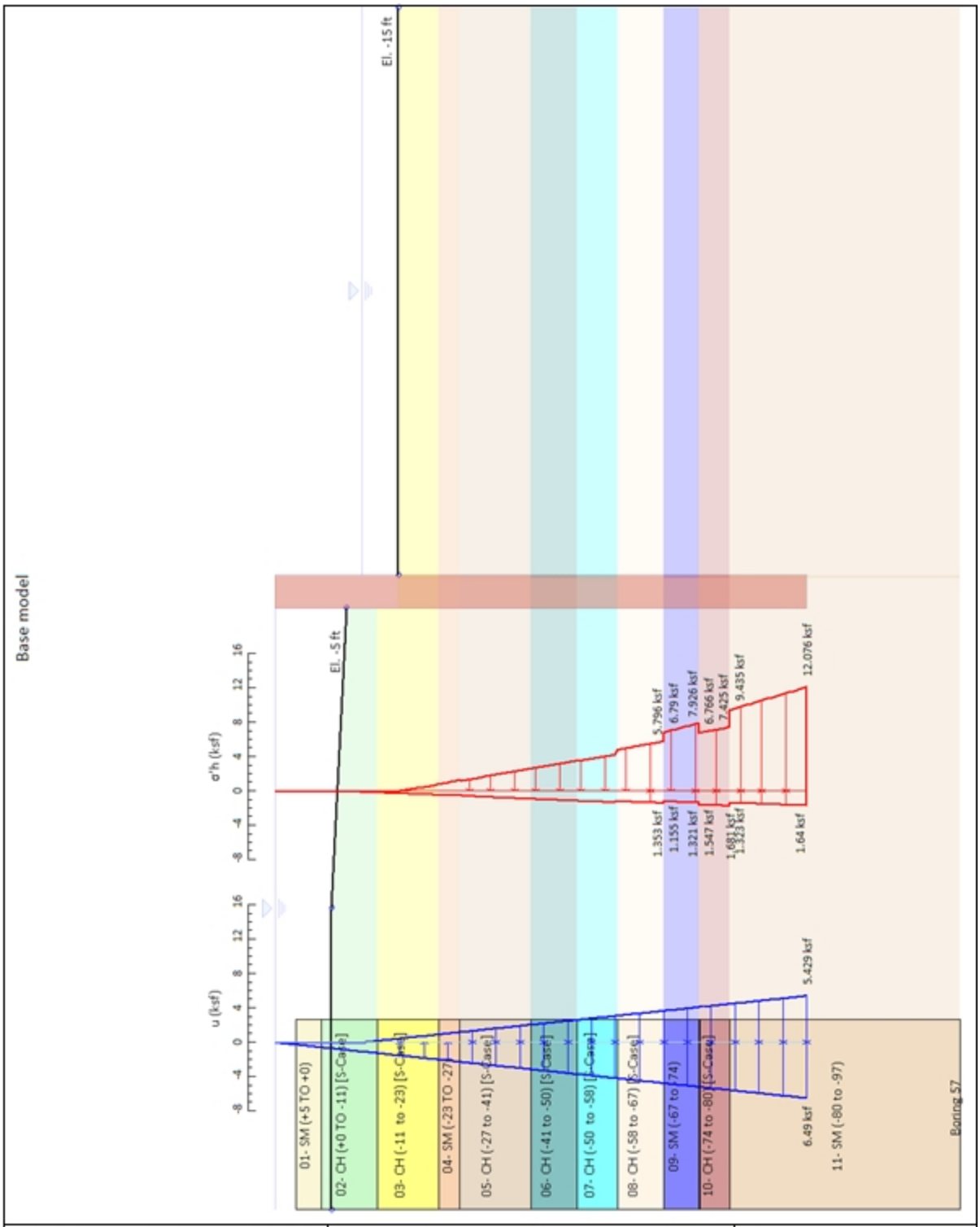

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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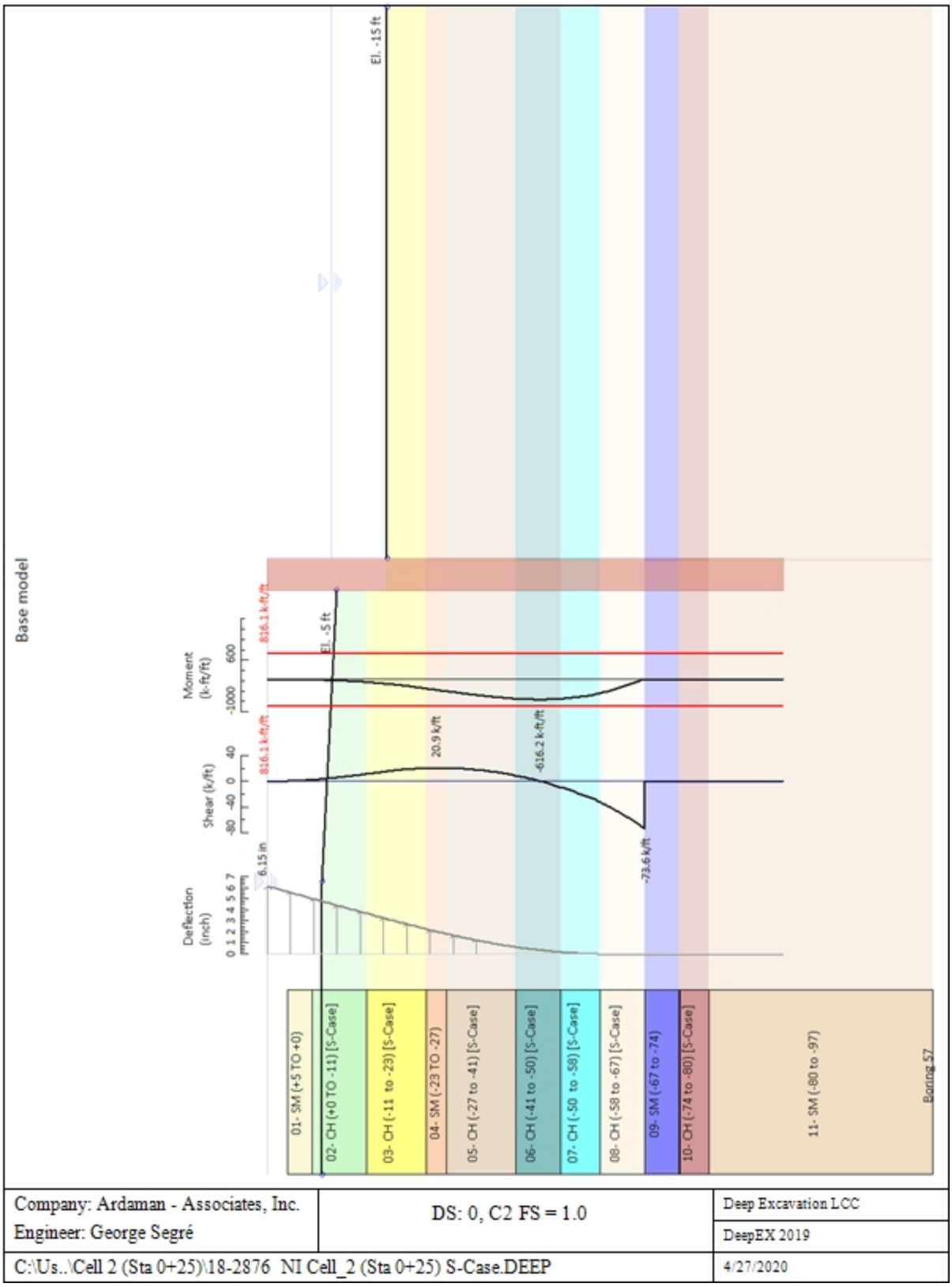

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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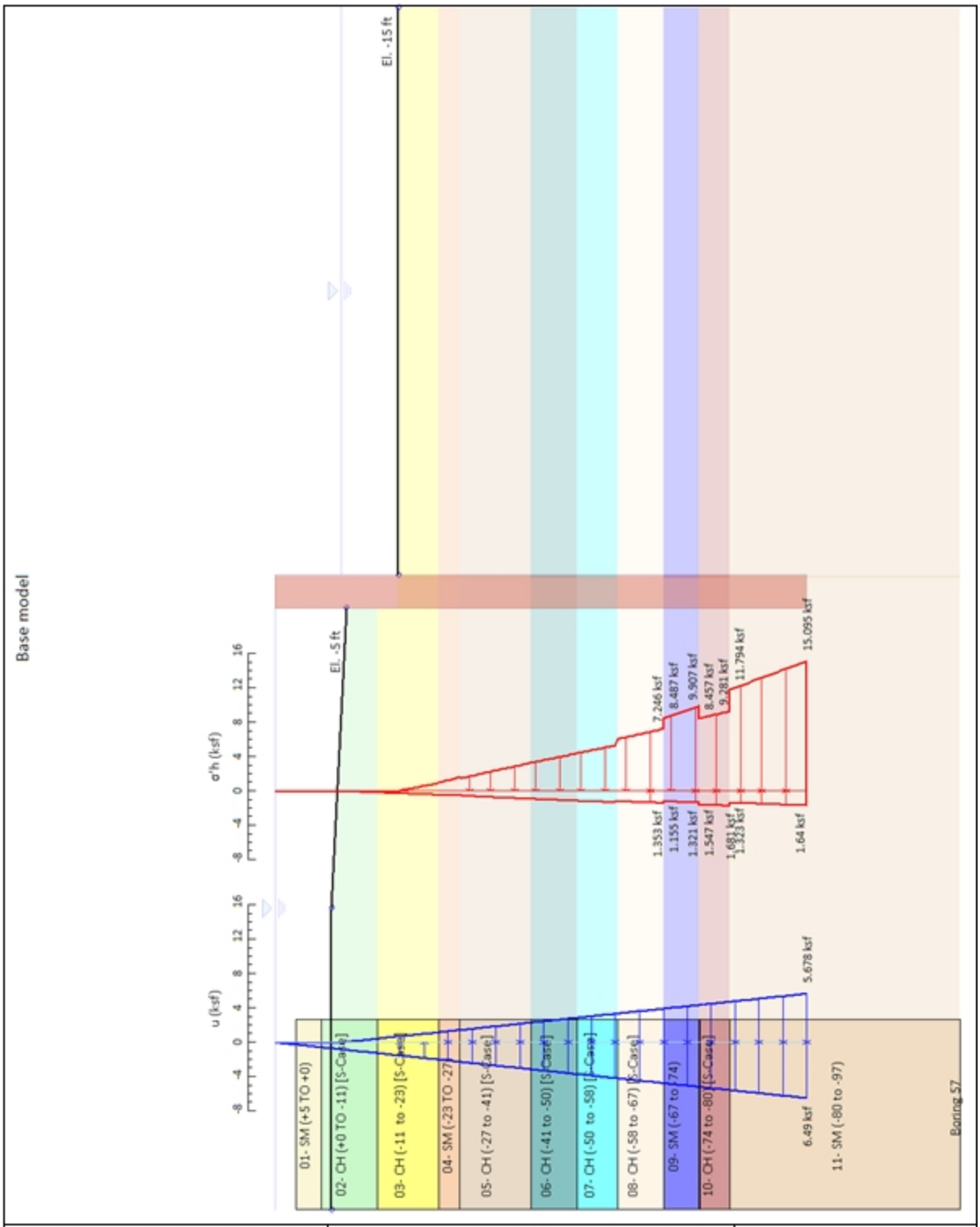

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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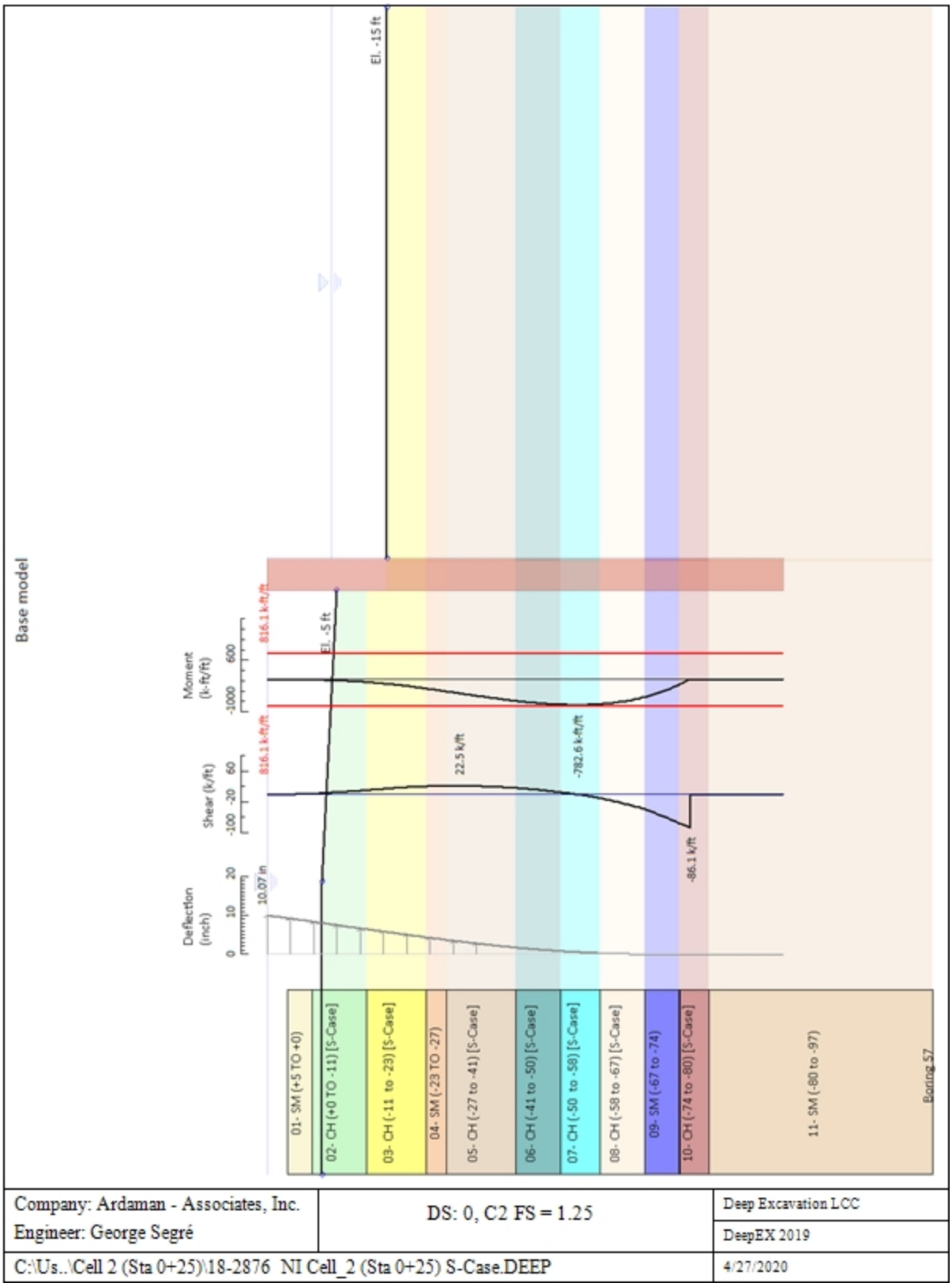

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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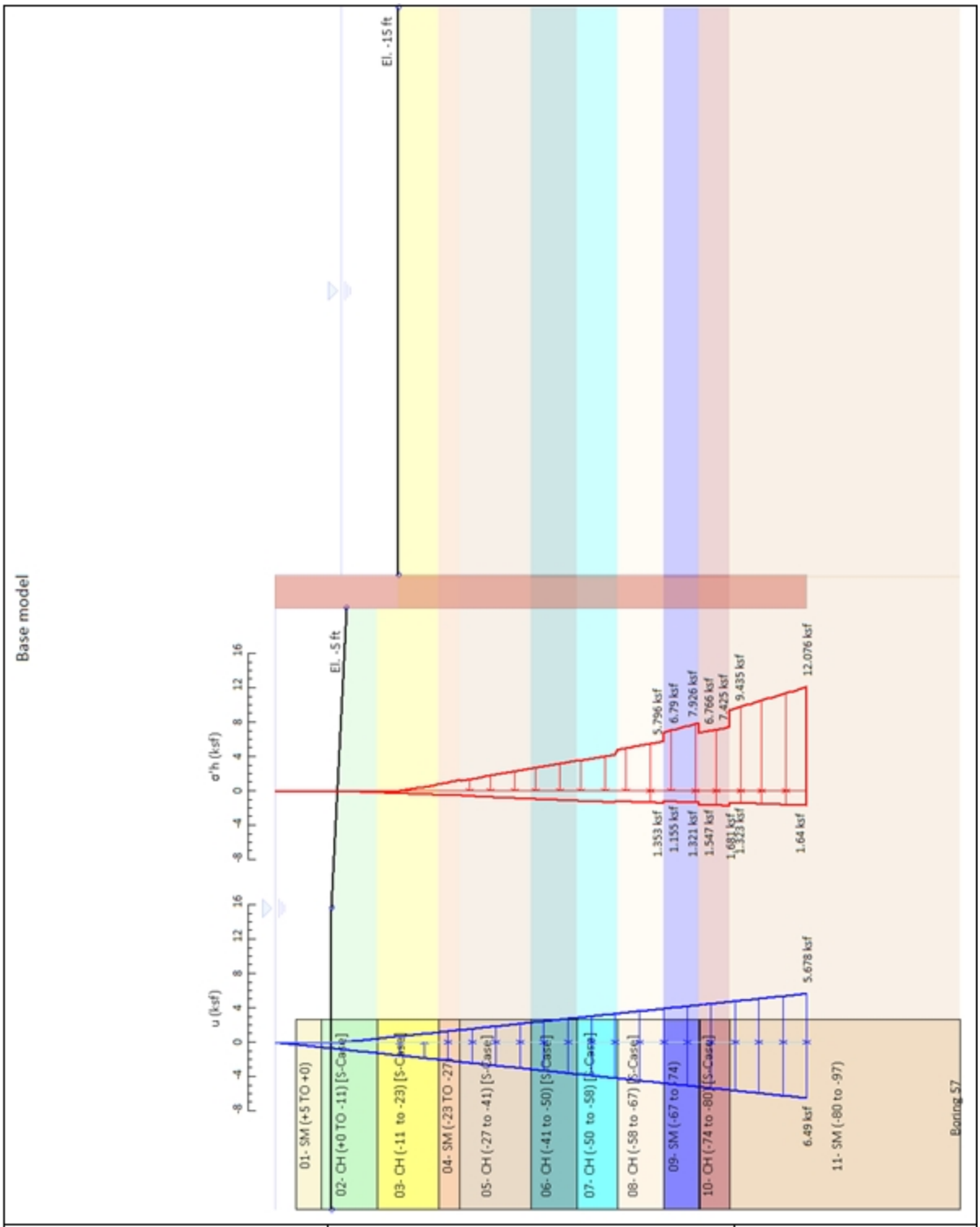
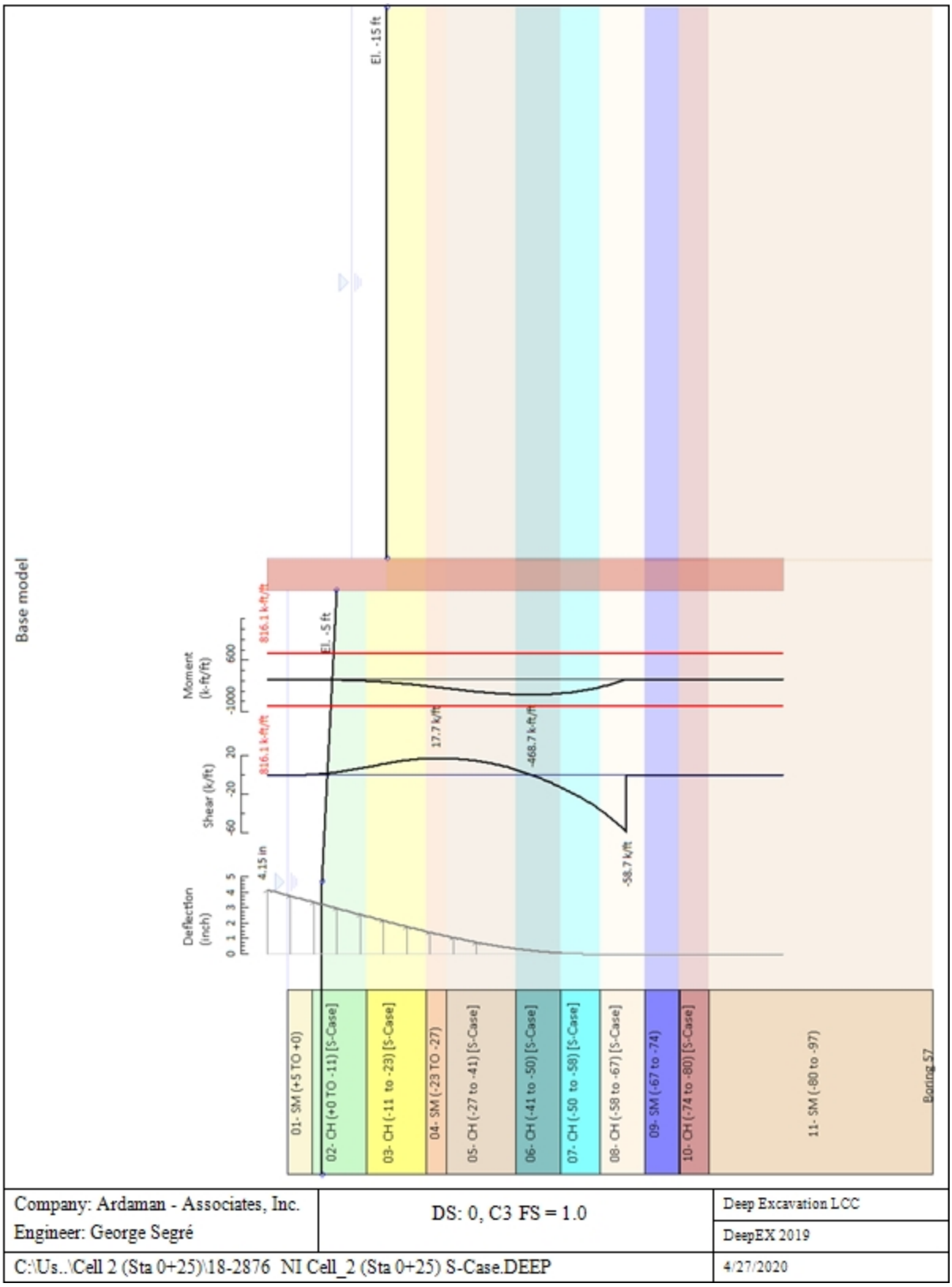
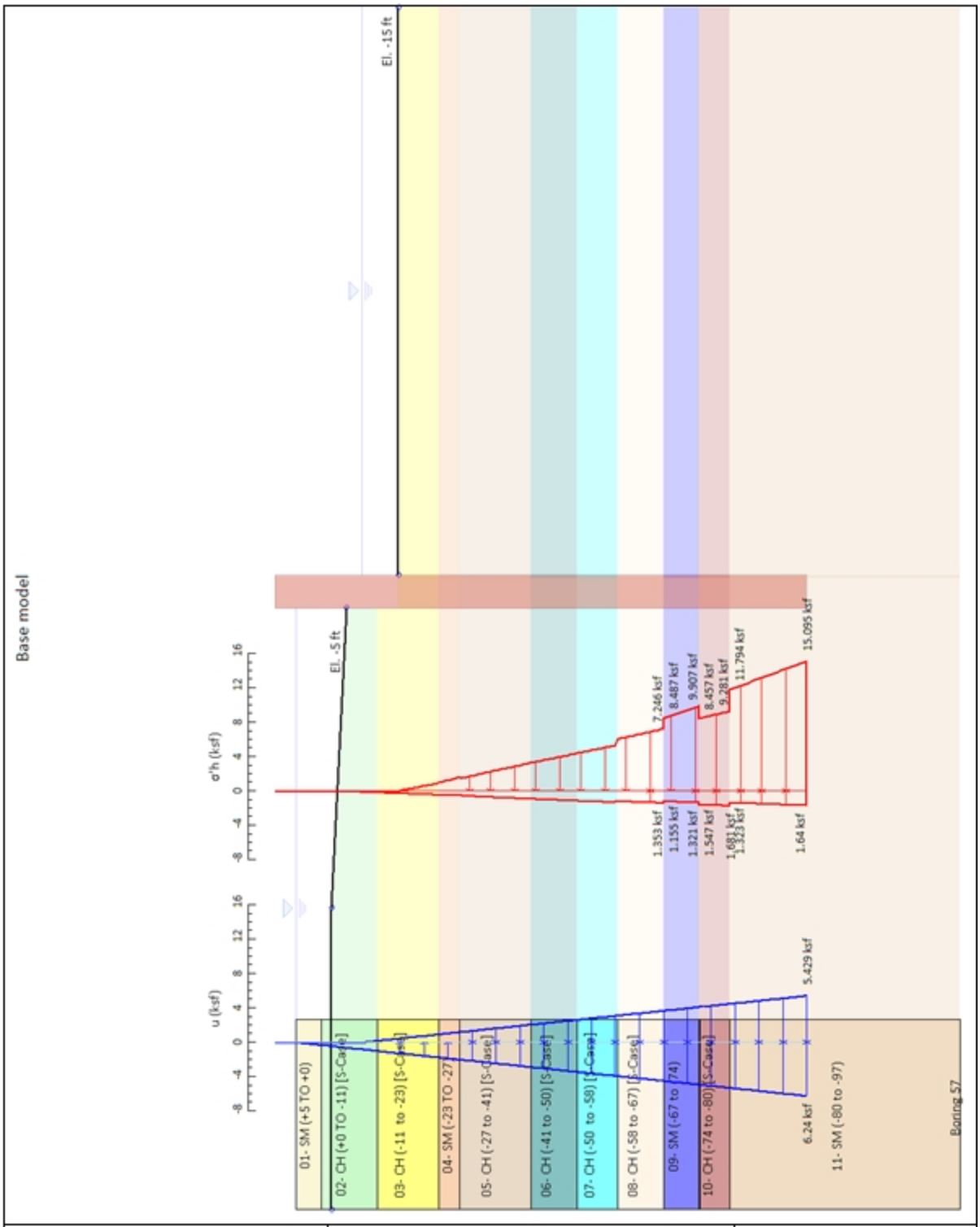
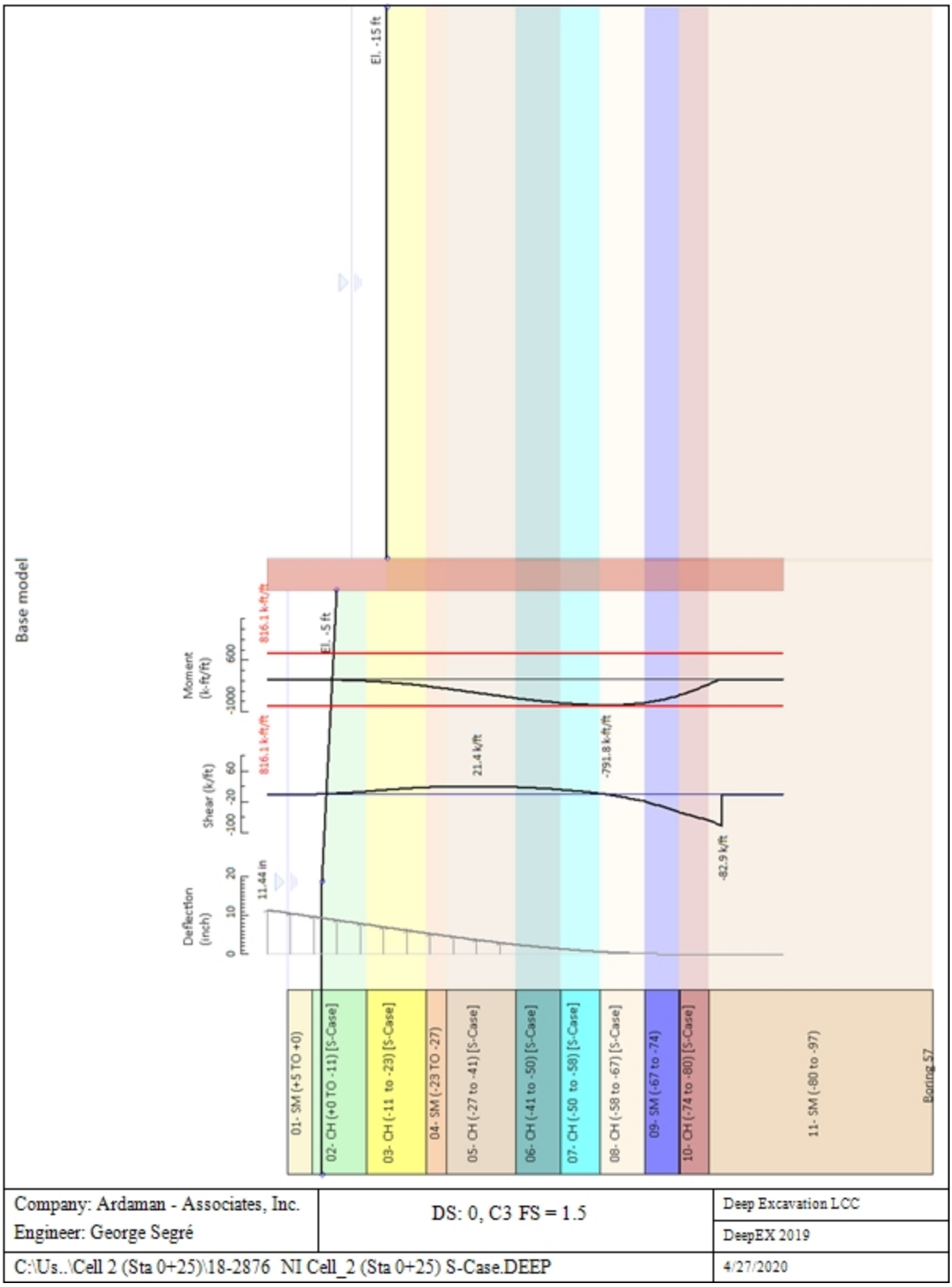


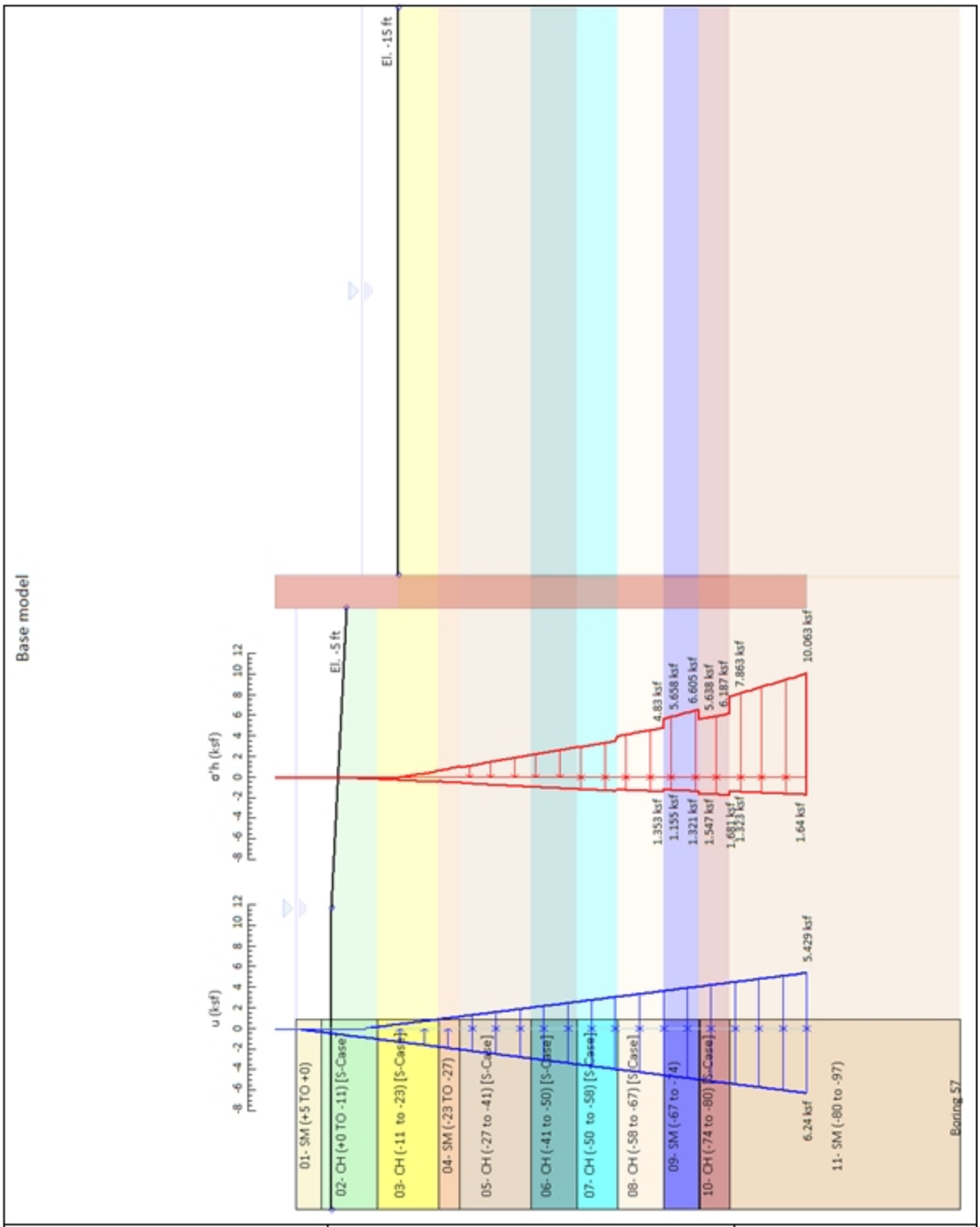
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP		4/27/2020


Base model
El. -15 ft
El. -5 ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
17.7 k/ft
-468.7 k-ft/ft
Shear (k/ft)
20
-20
-60
4.15 in
Deflection (inch)
0 1 2 3 4 5
-58.7 k/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020

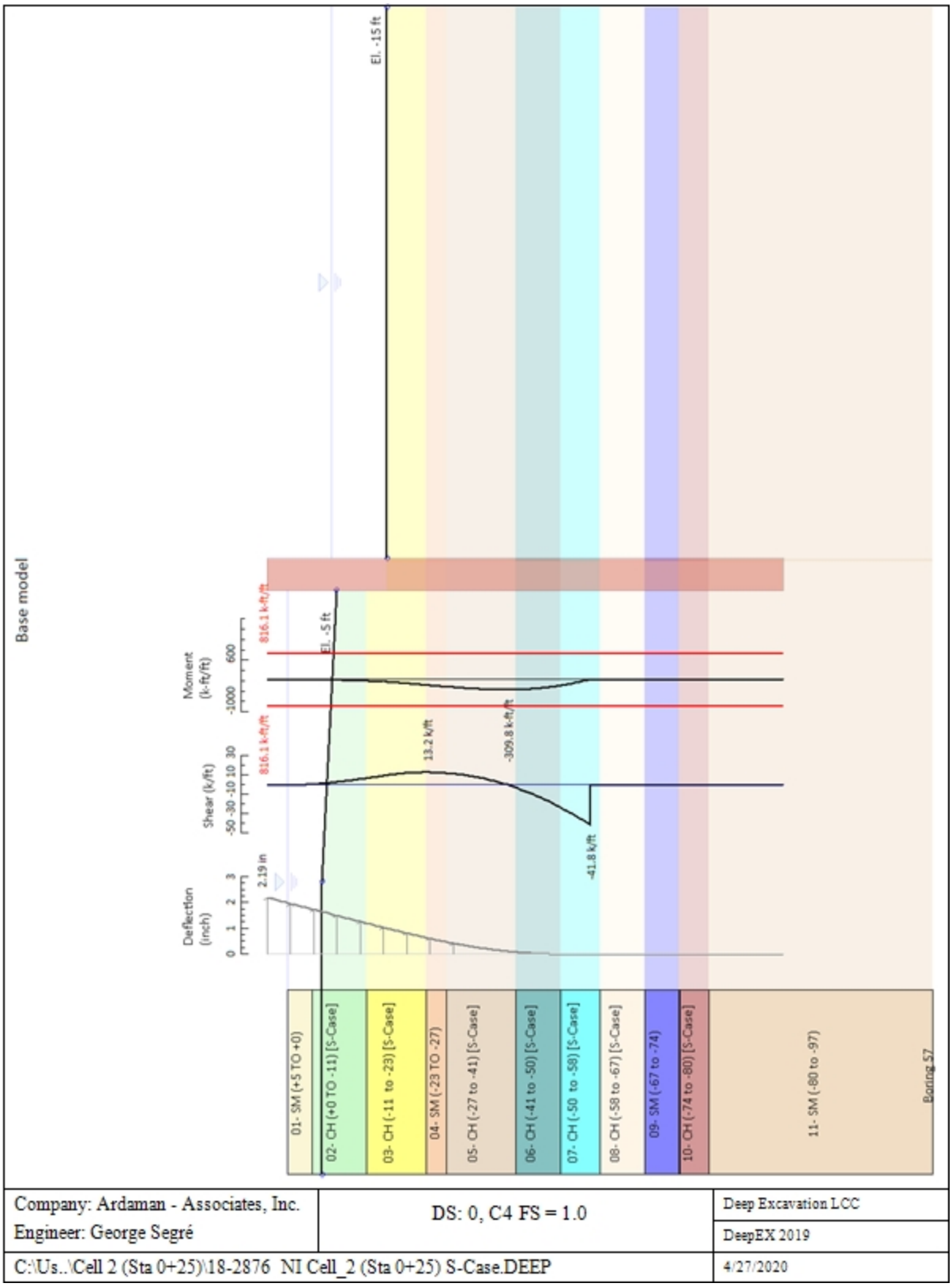


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP		4/27/2020


Base model
El. -15 ft
El. -5 ft
816.1 k-ft/ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
Shear (k/ft)
60
-20
-100
21.4 k/ft
-791.8 k-ft/ft
-82.9 k/ft
11.44 in
Deflection (inch)
20
10
0
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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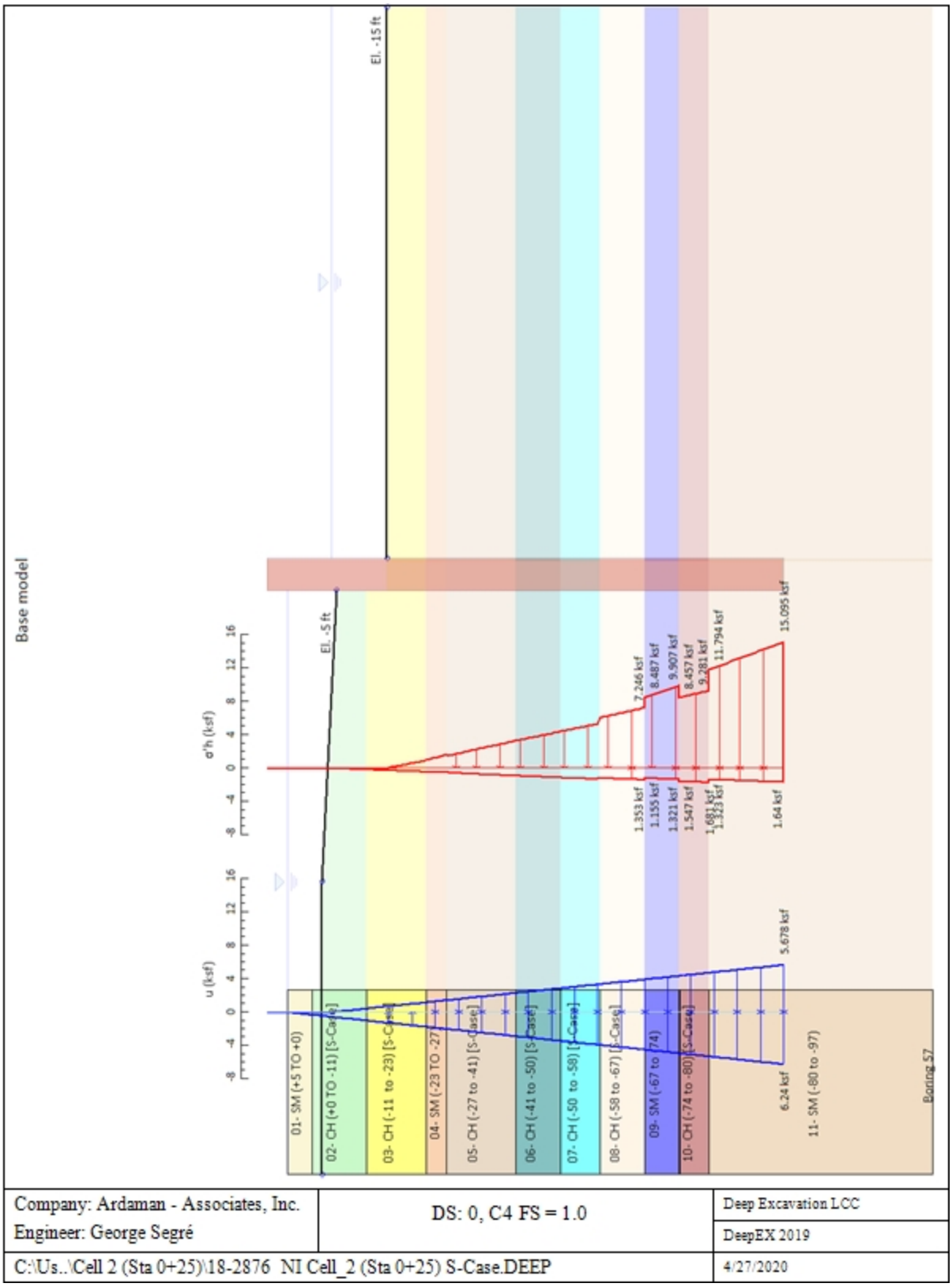
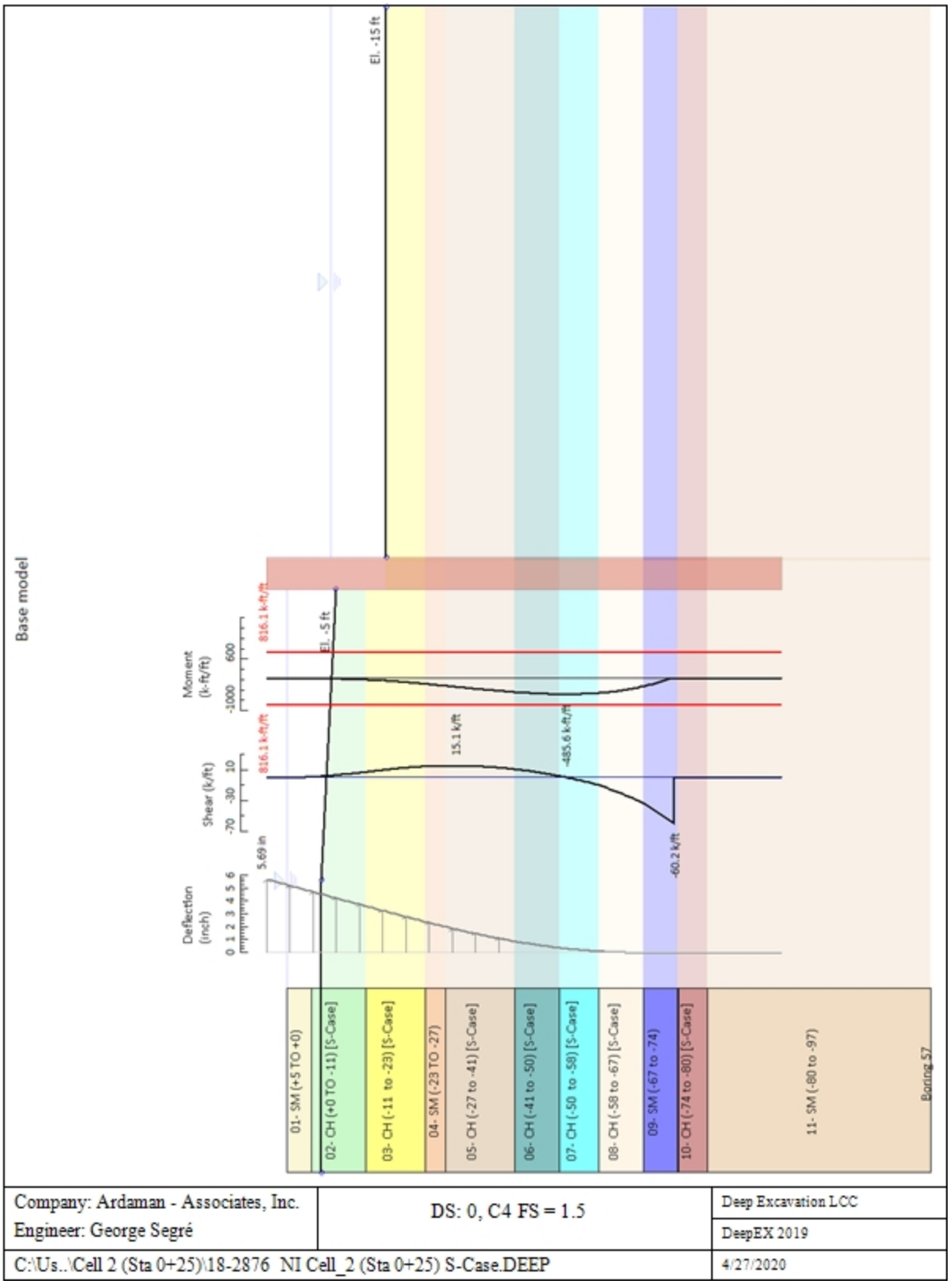

Base model
El. -15 ft
El. -5 ft
σ'h (ksf)
u (ksf)
7.246 ksf
8.487 ksf
9.907 ksf
8.457 ksf
9.281 ksf
11.794 ksf
15.095 ksf
1.353 ksf
1.155 ksf
1.321 ksf
1.547 ksf
1.681 ksf
1.323 ksf
1.64 ksf
5.678 ksf
6.24 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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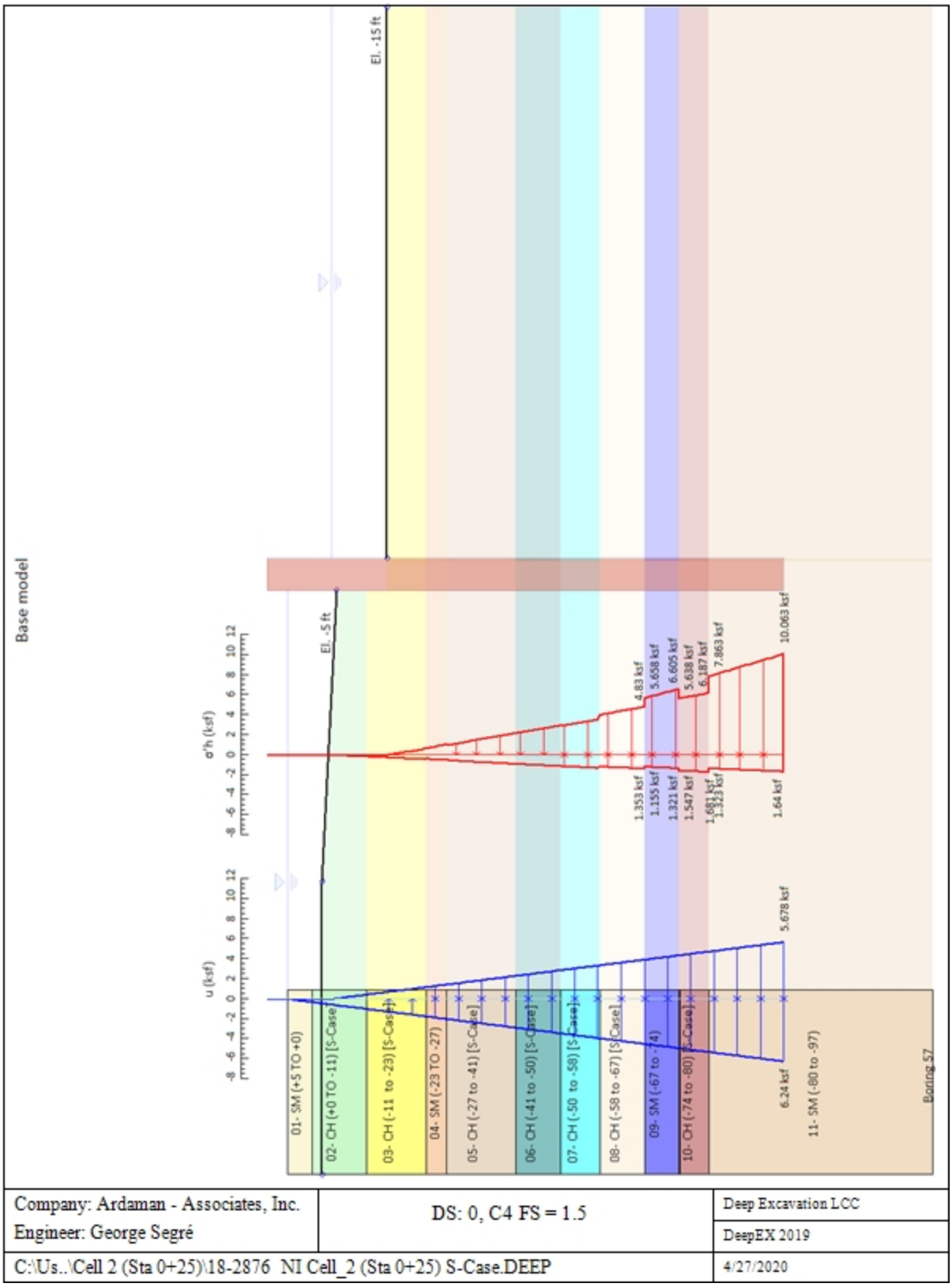

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+25)\18-2876 NI Cell_2 (Sta 0+25) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 0+75)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -79.6 ft., NAVD88

Length of Sheetting = 88.6 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-30.50	144.35	40.10	0.36
		Open excavation - degraded	9	-8	1.00	1.25	-32.48	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-28.13	125.44	25.27	0.26
		Open excavation - degraded	9	-4	1.00	1.25	-30.10	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-24.58	72.68	17.47	0.12
		Open excavation - degraded	5	-8	1.00	1.50	-28.52	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-22.60	58.33	19.86	0.08
		Open excavation - degraded	5	-4	1.00	1.50	-24.58	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-69.70	730.84	84.25	7.94
		Open excavation - degraded	9	-8	1.00	1.25	-79.60	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-63.76	532.54	65.18	4.86
		Open excavation - degraded	9	-4	1.00	1.25	-72.68	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-59.81	392.67	50.10	3.14
		Open excavation - degraded	5	-8	1.00	1.50	-77.62	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-52.88	254.37	37.93	1.61
		Open excavation - degraded	5	-4	1.00	1.50	-68.22	--	--	--
						Governing Value:	-79.60	730.84	84.25	7.94

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 8:56:36 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

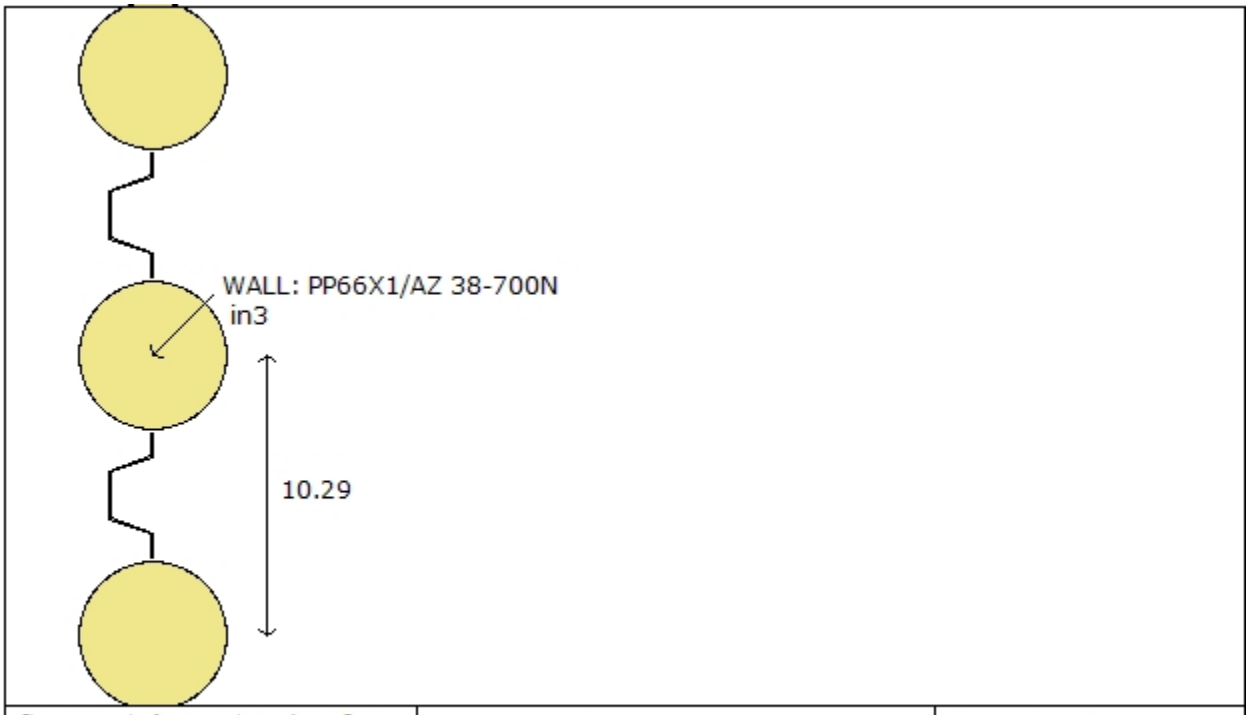
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	3.548	3.86	3.548
Stage 1	Simple span	N/A	1.6	2.869	3.111	2.869
Stage 2	Simple span	N/A	1.6	3.684	4.065	3.684
Stage 3	Simple span	N/A	1.6	2.984	3.29	2.984
Stage 4	Simple span	N/A	1.6	4.023	4.86	4.023
Stage 5	Simple span	N/A	1.6	2.739	3.29	2.739
Stage 6	Simple span	N/A	1.6	4.177	5.119	4.177
Stage 7	Simple span	N/A	1.6	2.854	3.493	2.854

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

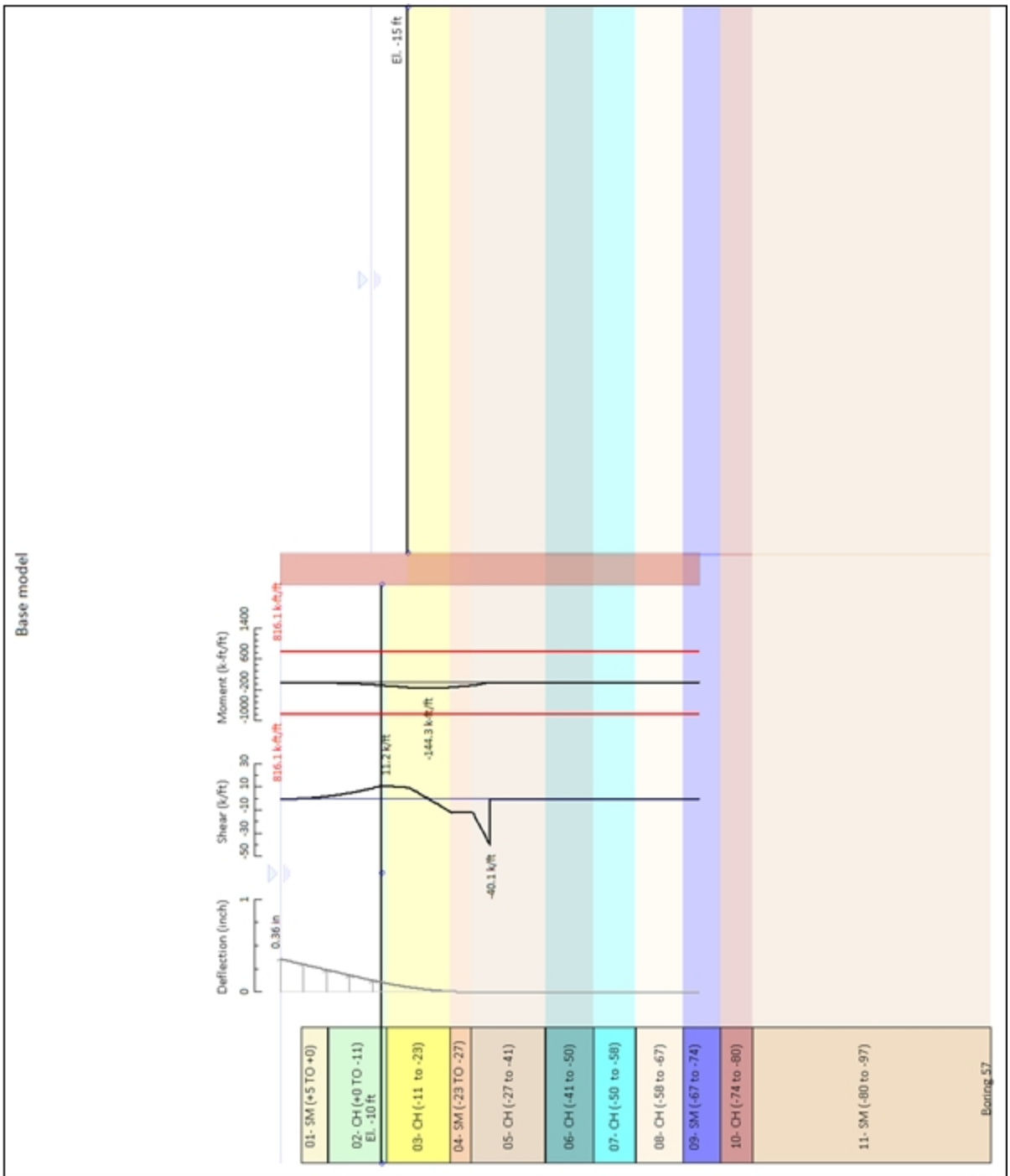
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

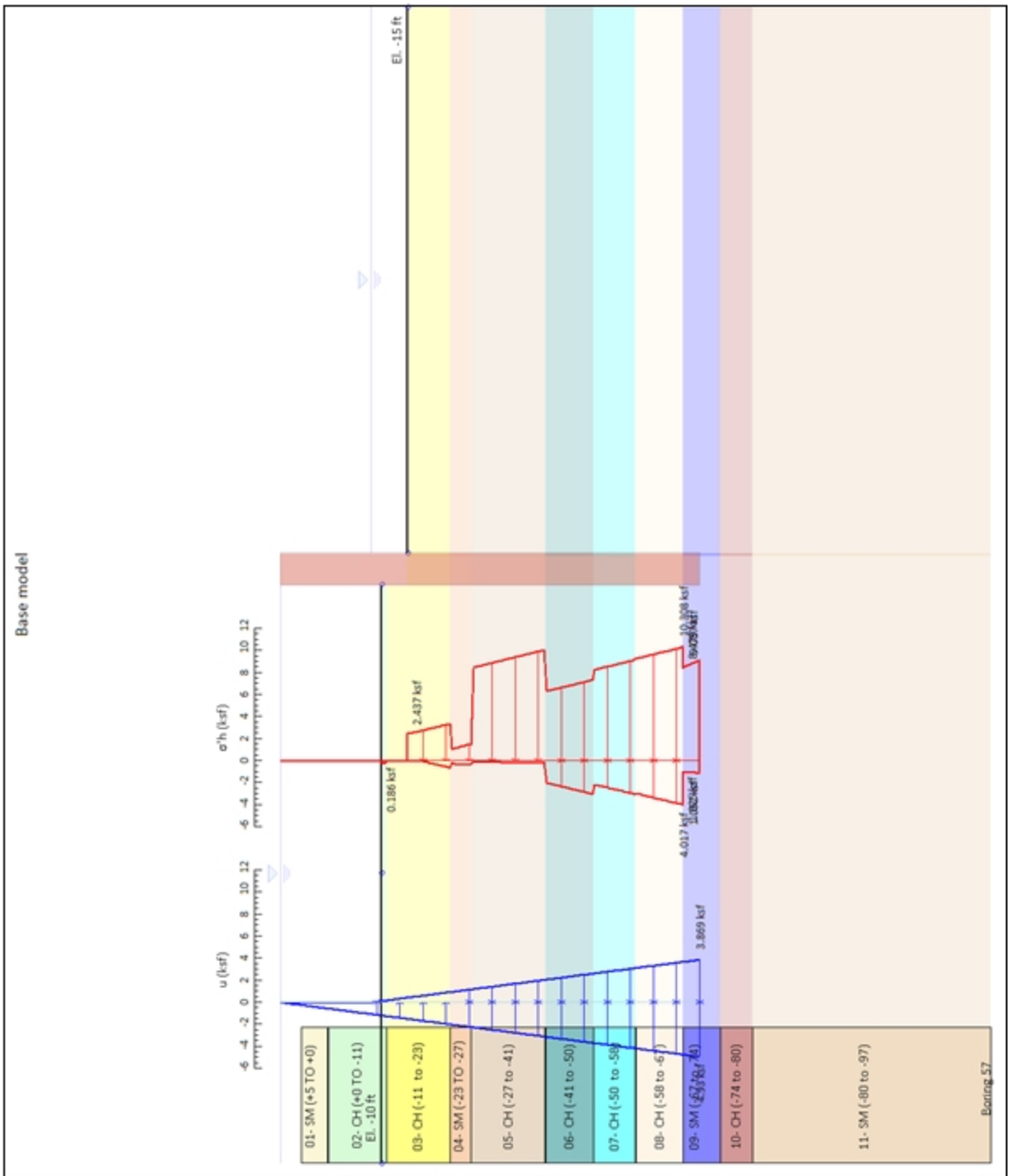
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

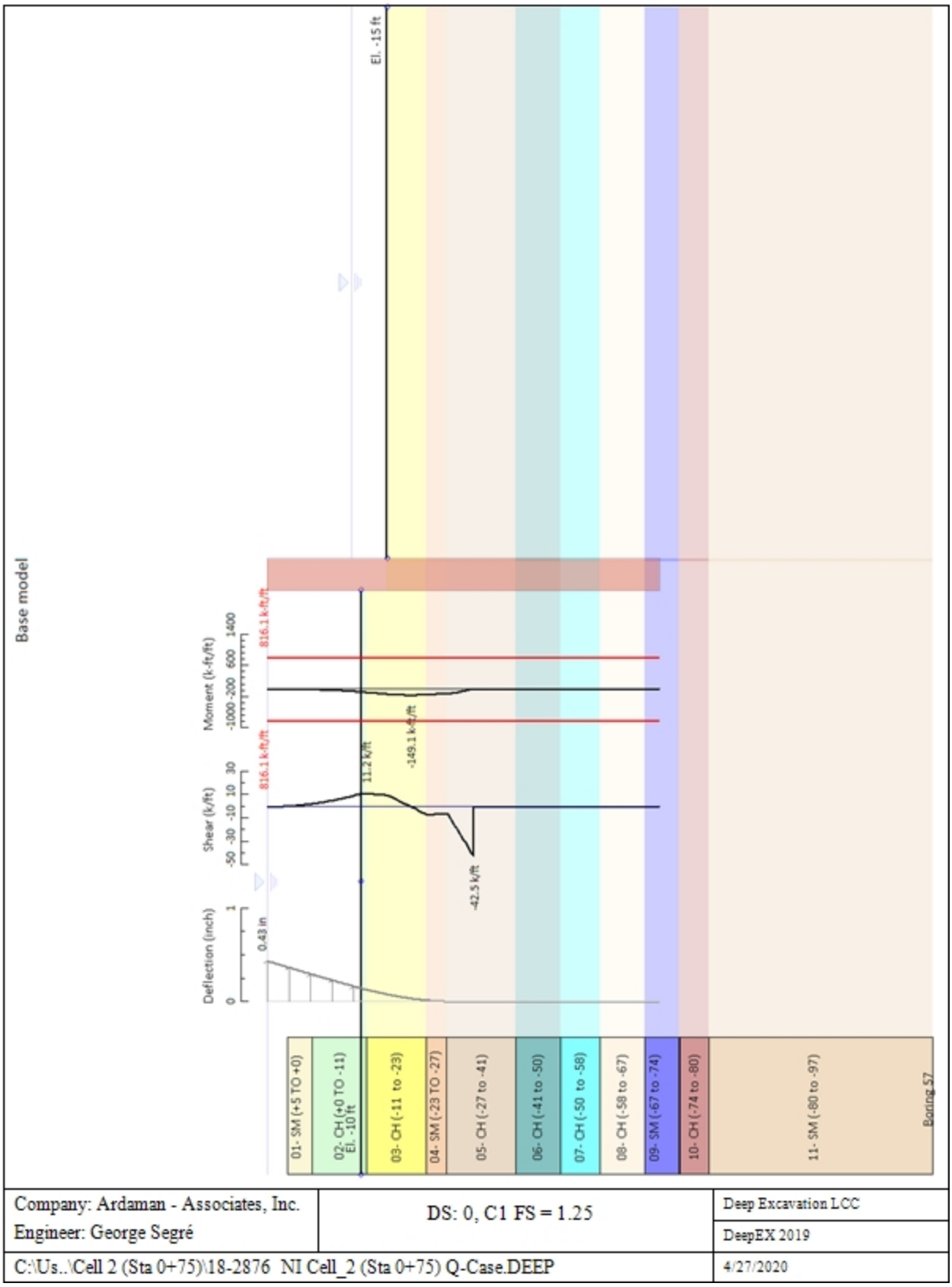
A sequence of figures for each excavation stage is reported

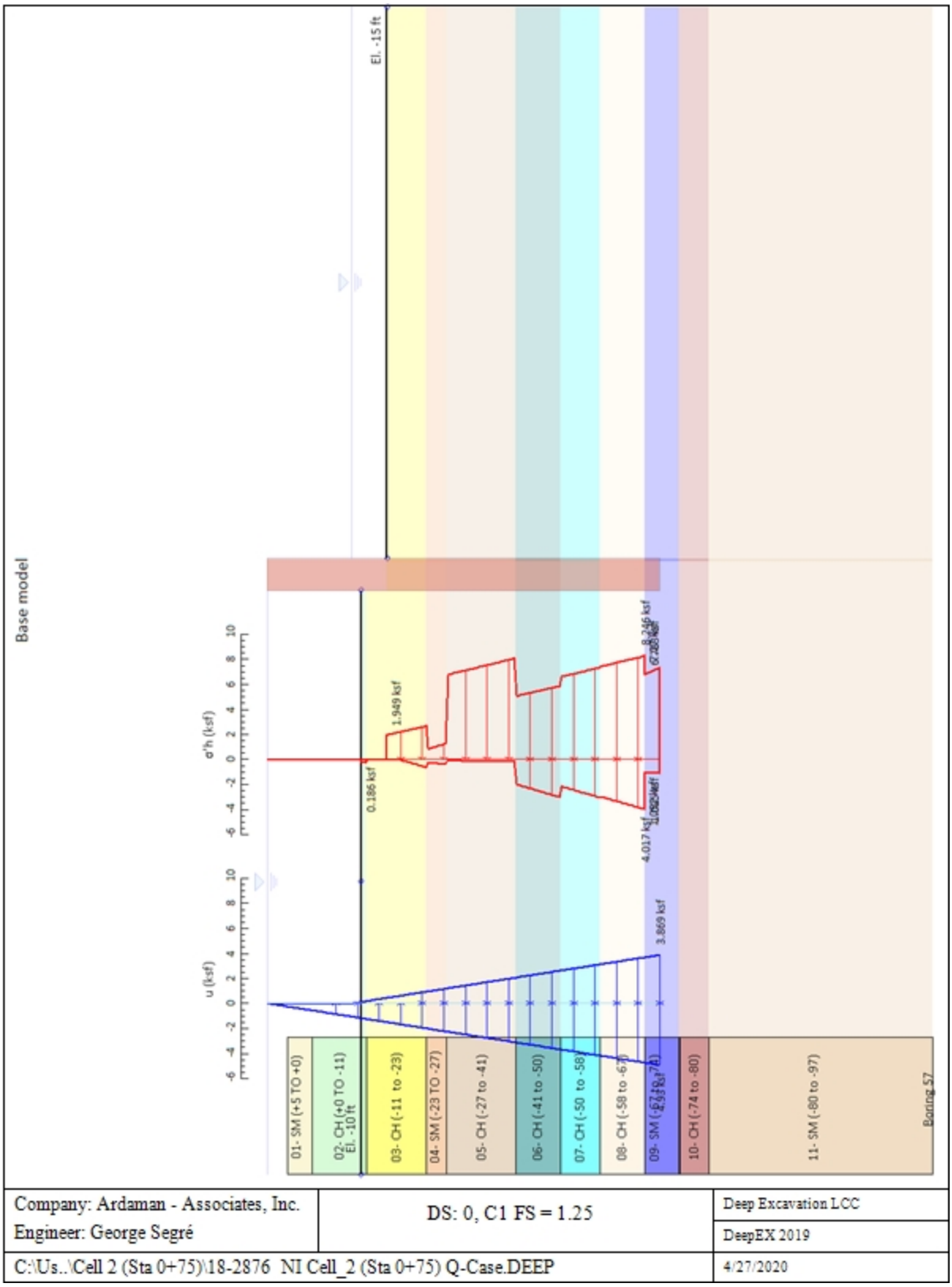


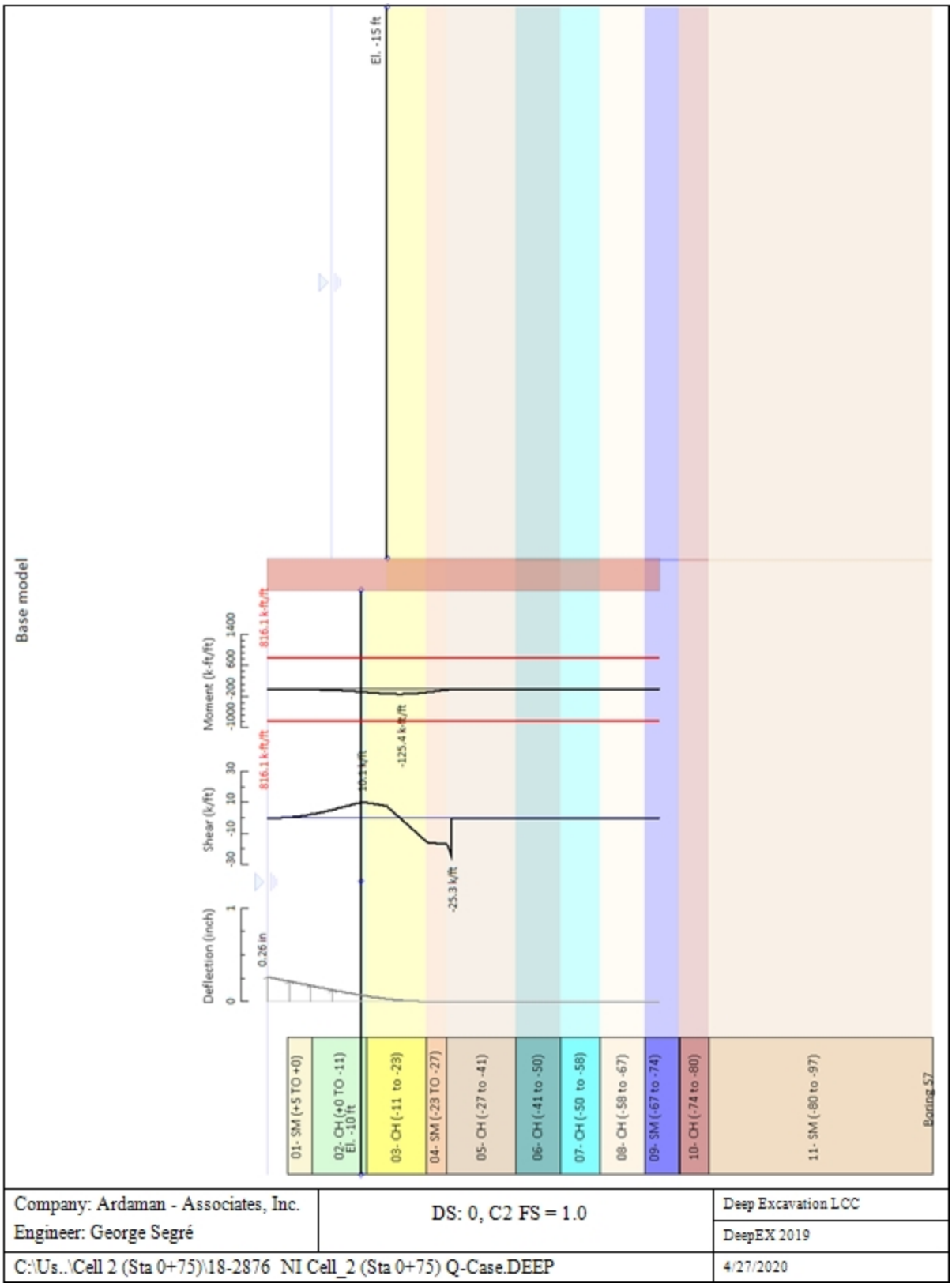
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020



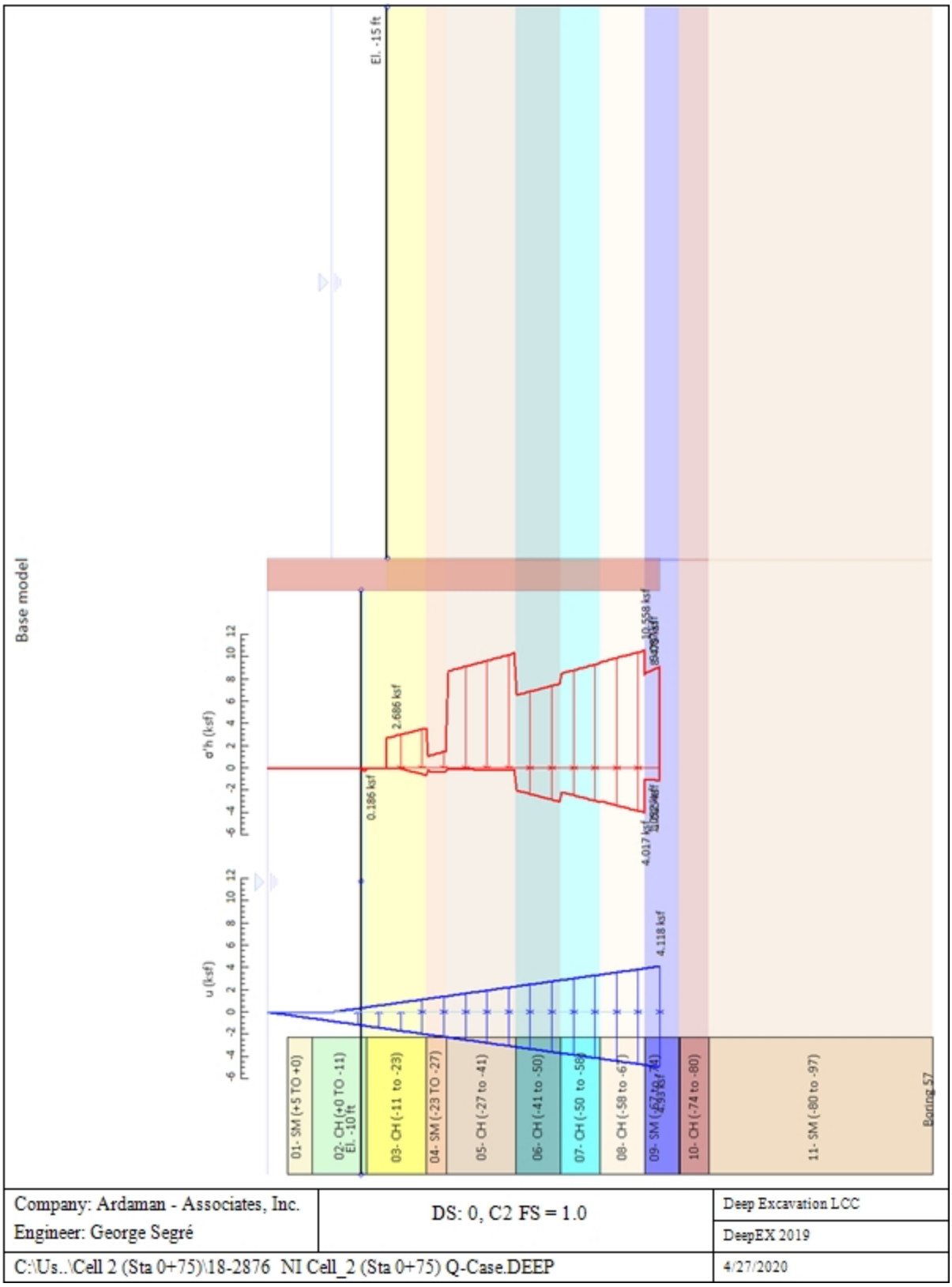
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020

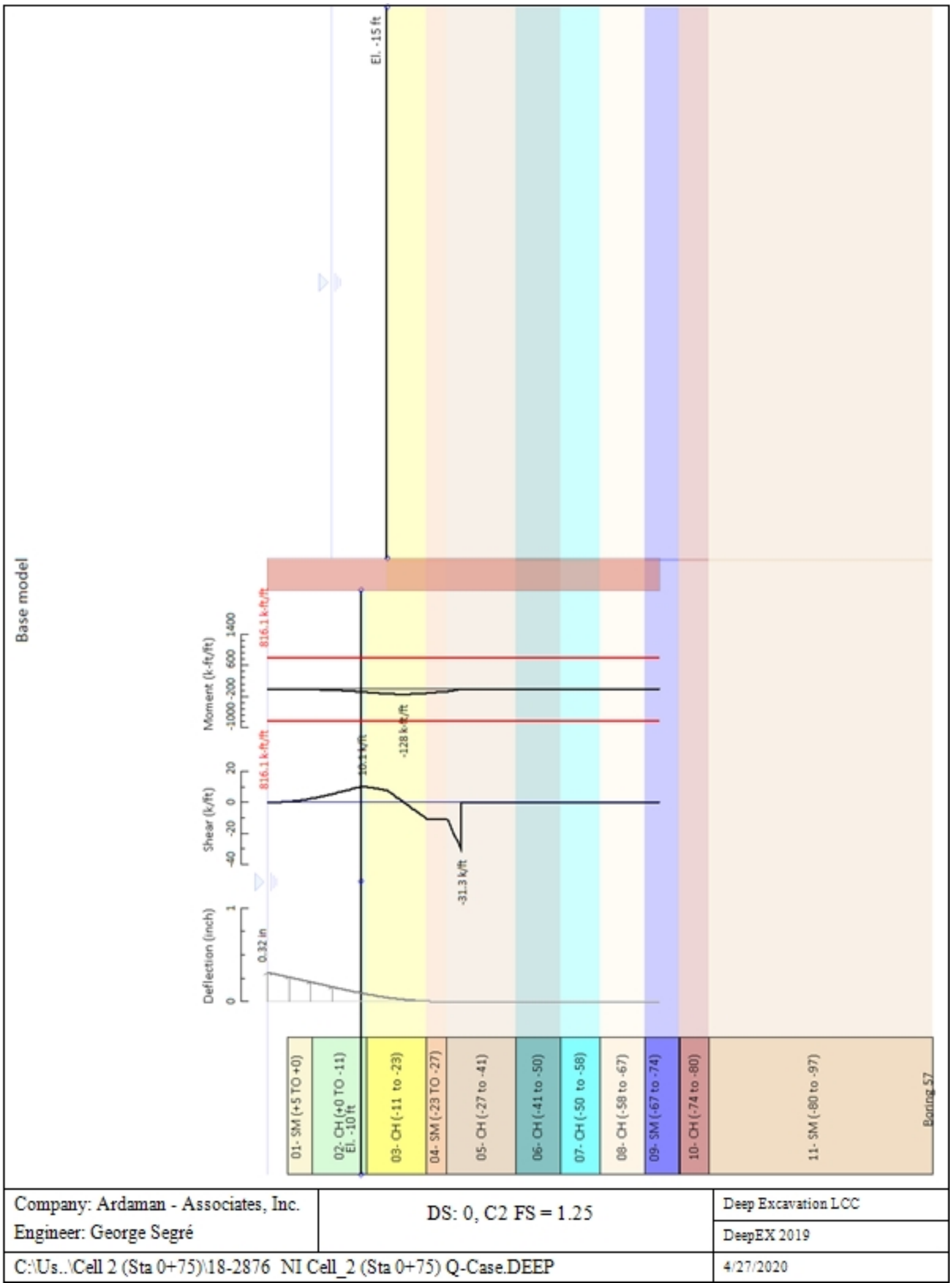

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-349.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
11.2 k/ft
-42.5 k/ft
Deflection (inch)
0 1
0.43 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
0.186 ksf
1.949 ksf
4.017 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

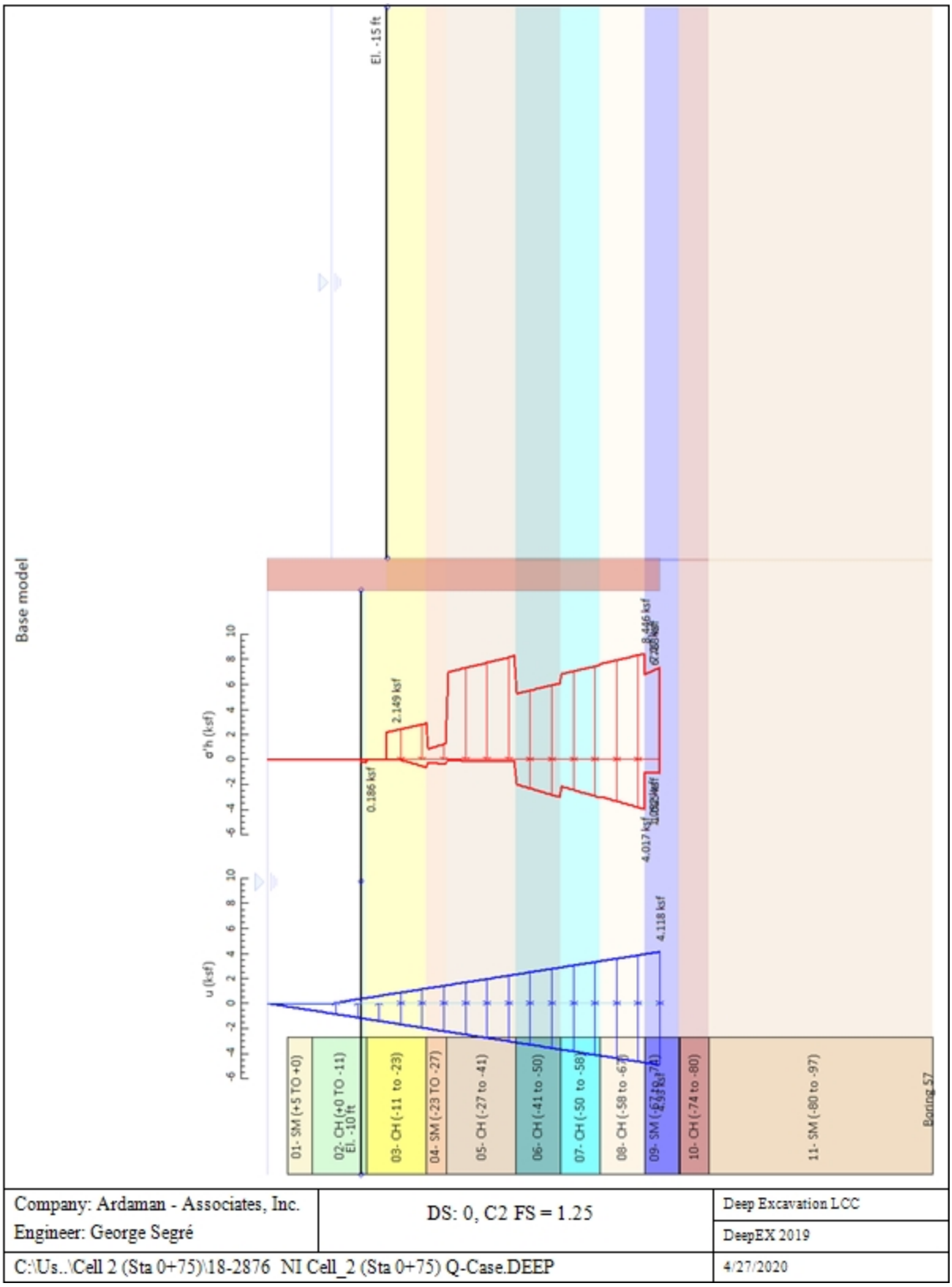


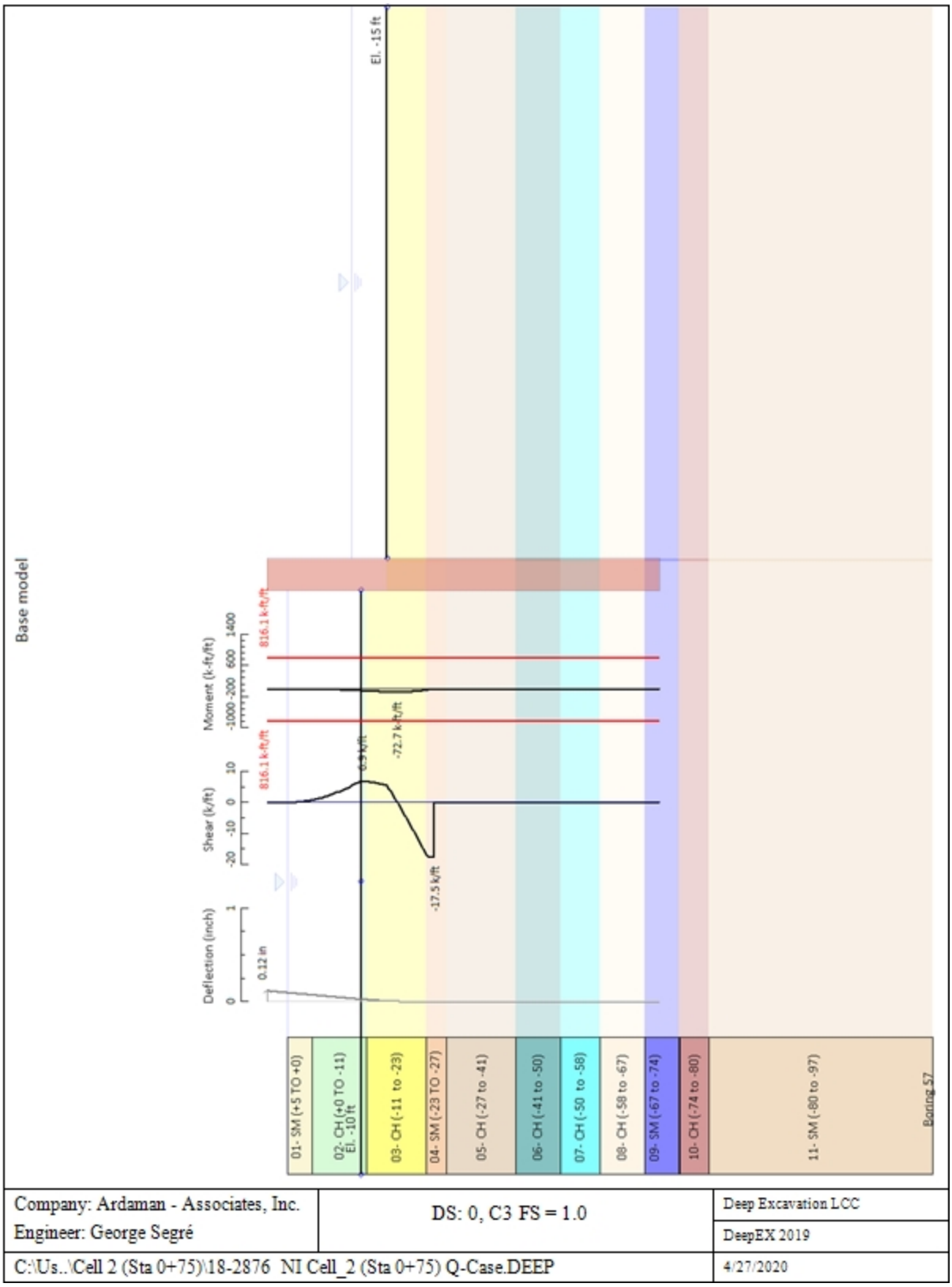
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
0.186 ksf
2.686 ksf
10.558 ksf
4.017 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

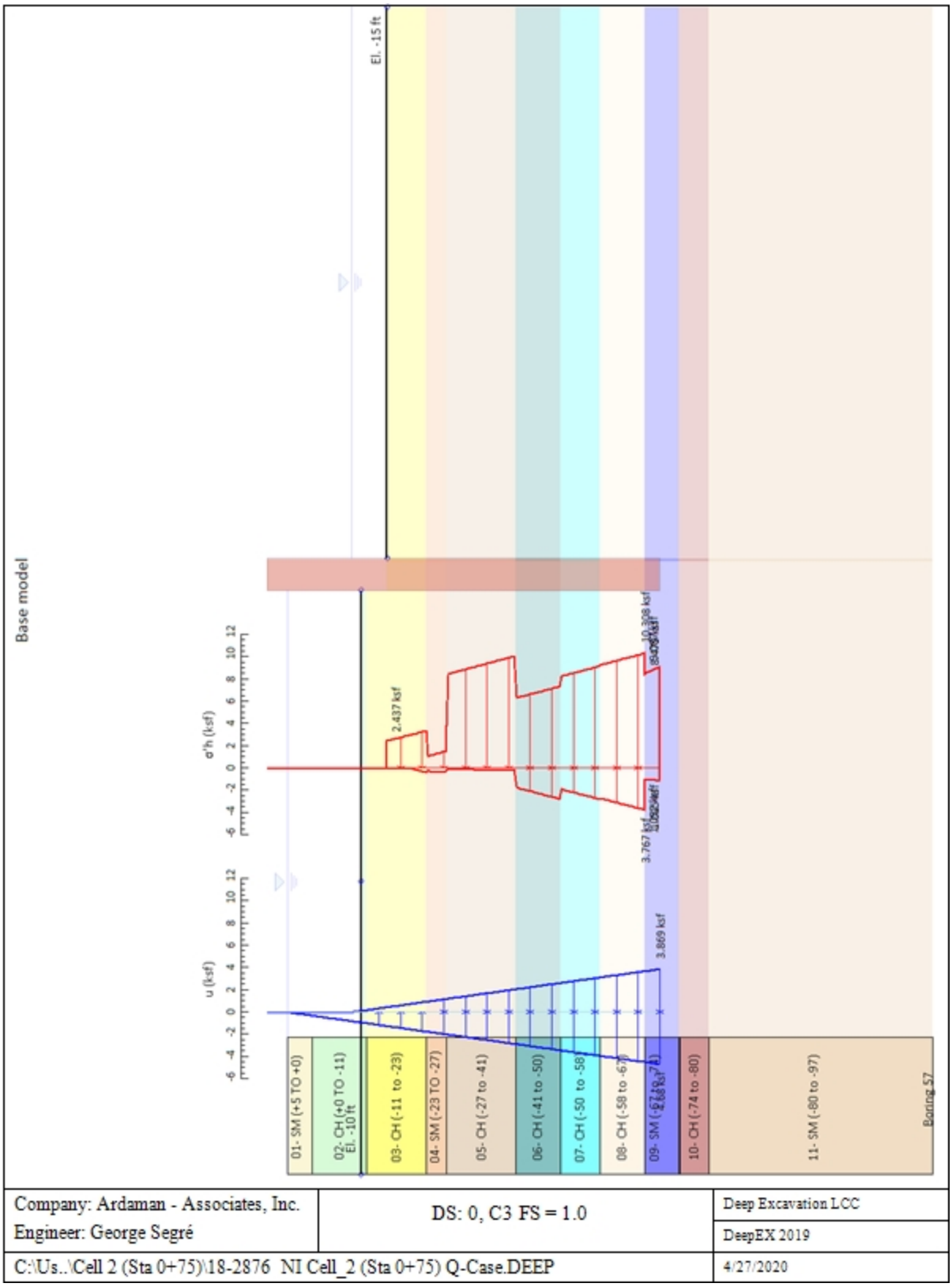


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020

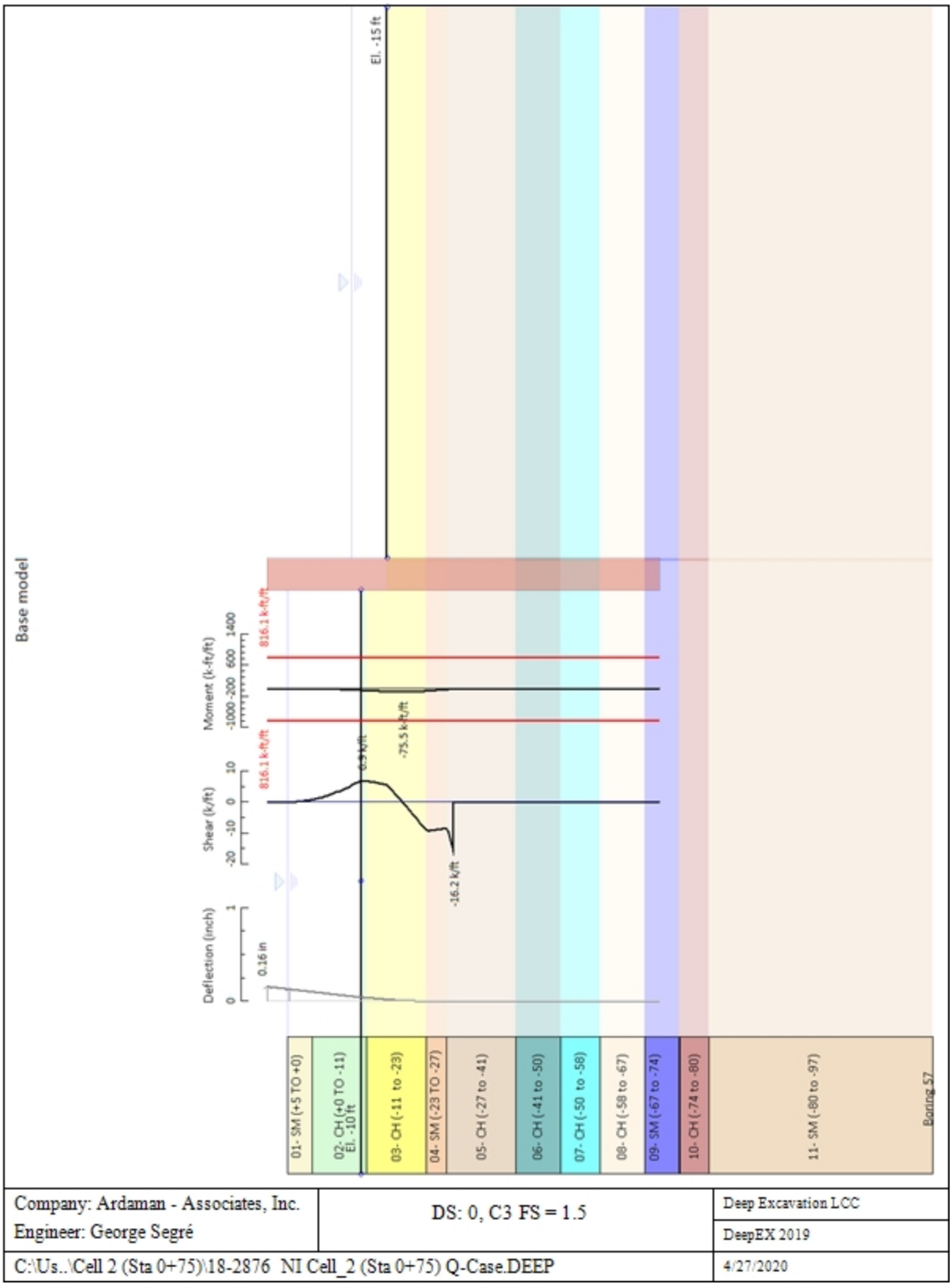

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10
0.186 ksf
2.149 ksf
8.446 ksf
4.017 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020



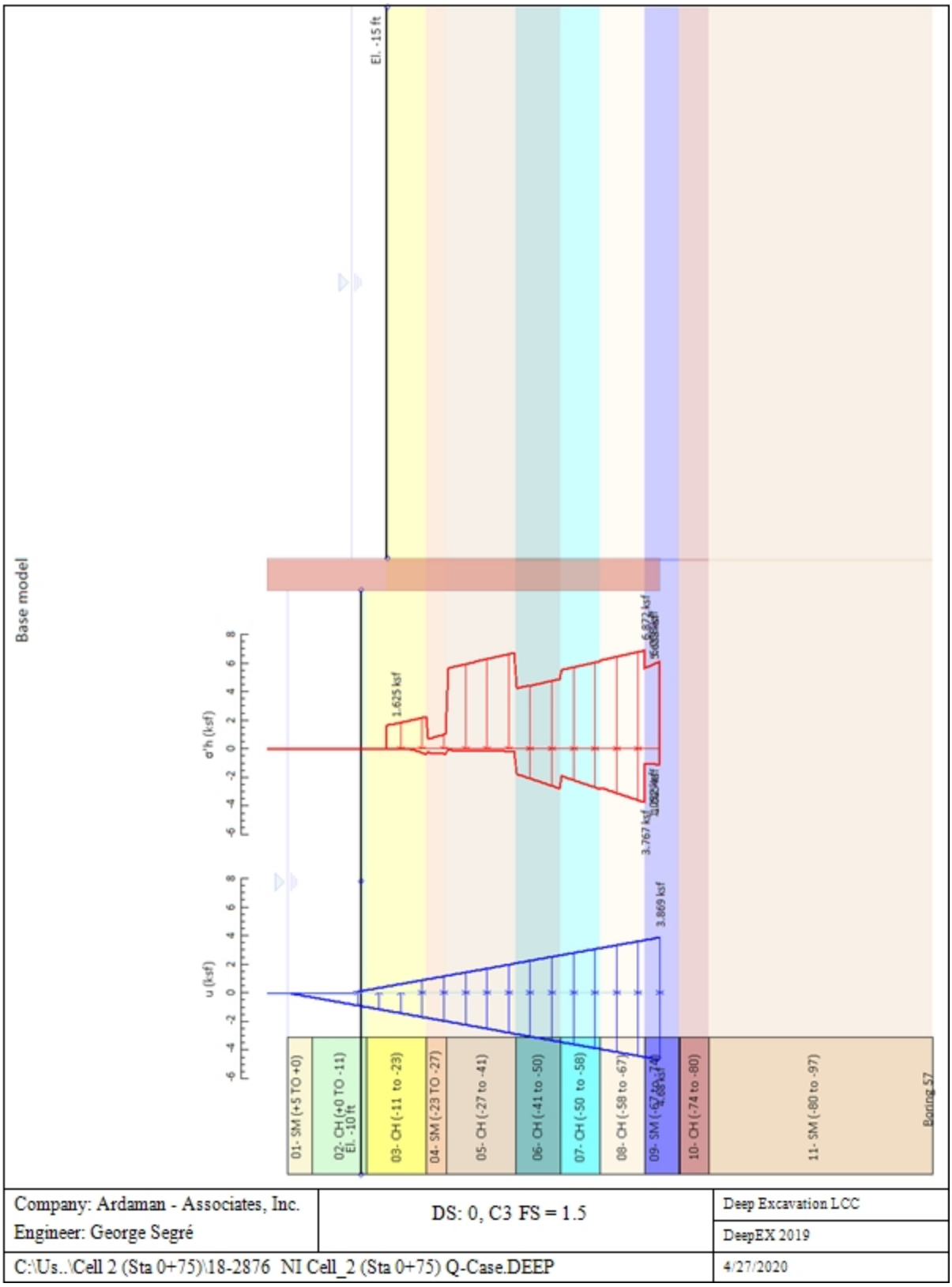
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020



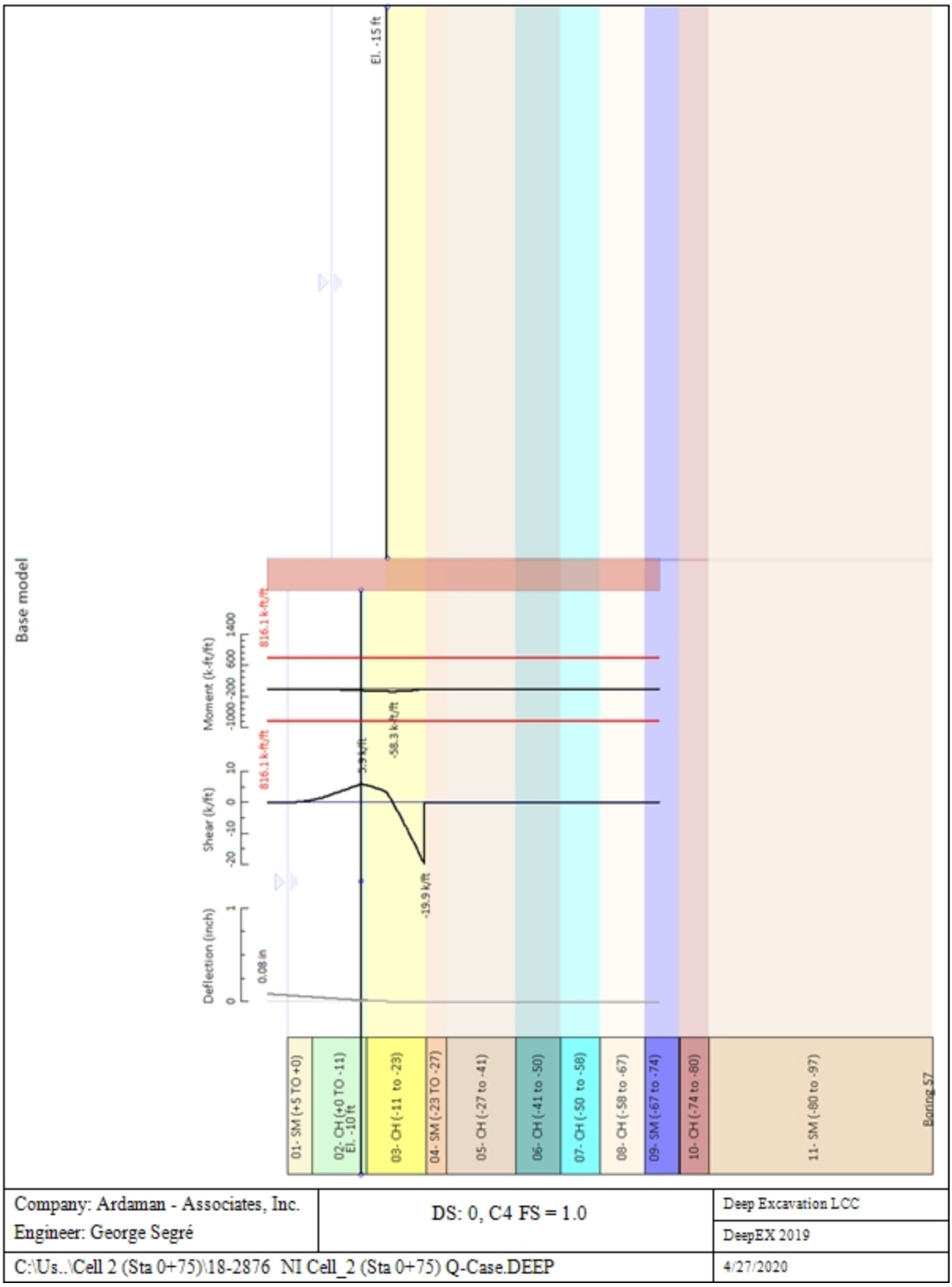
Attachment Figure C.2-71



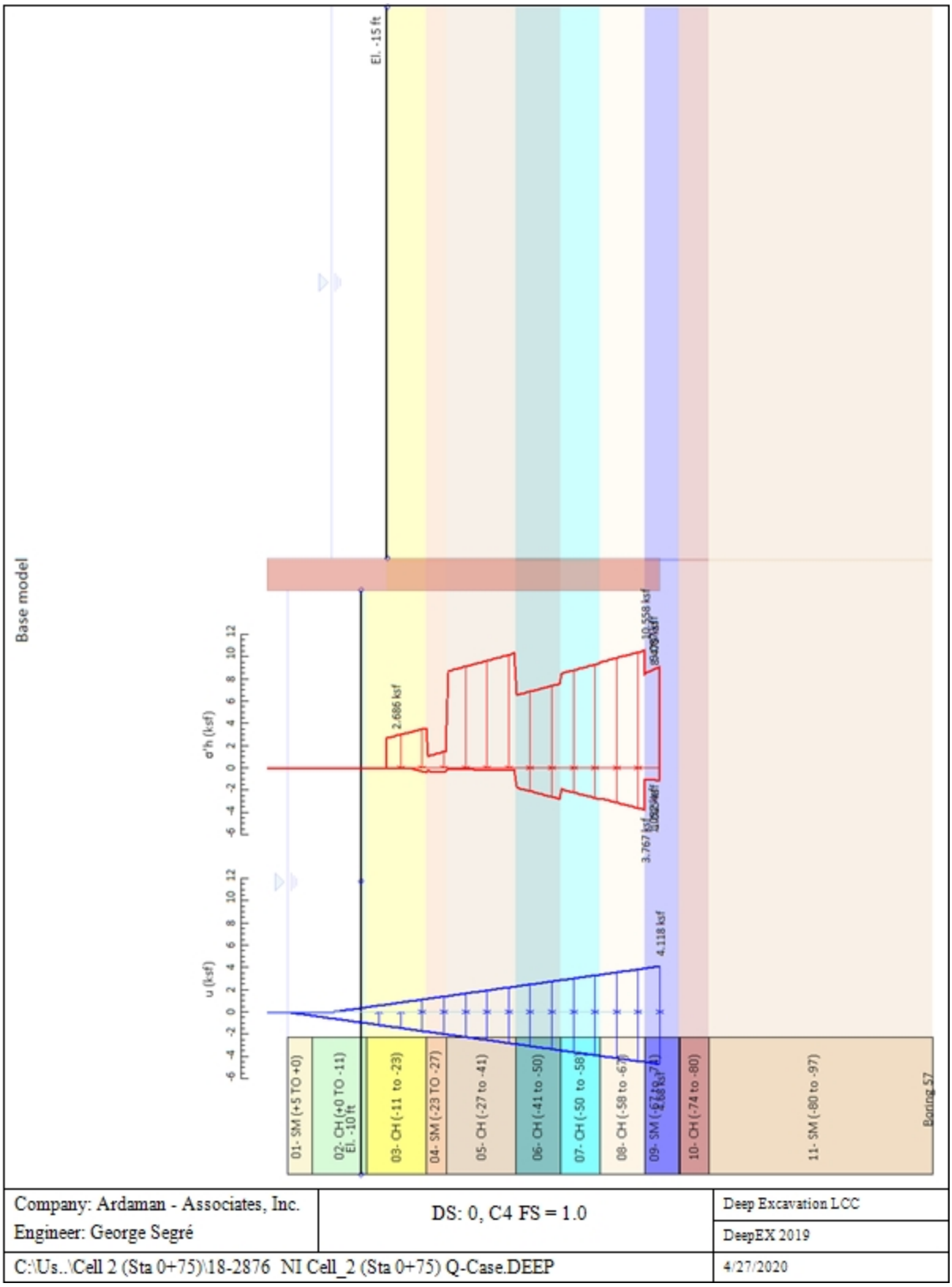
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020

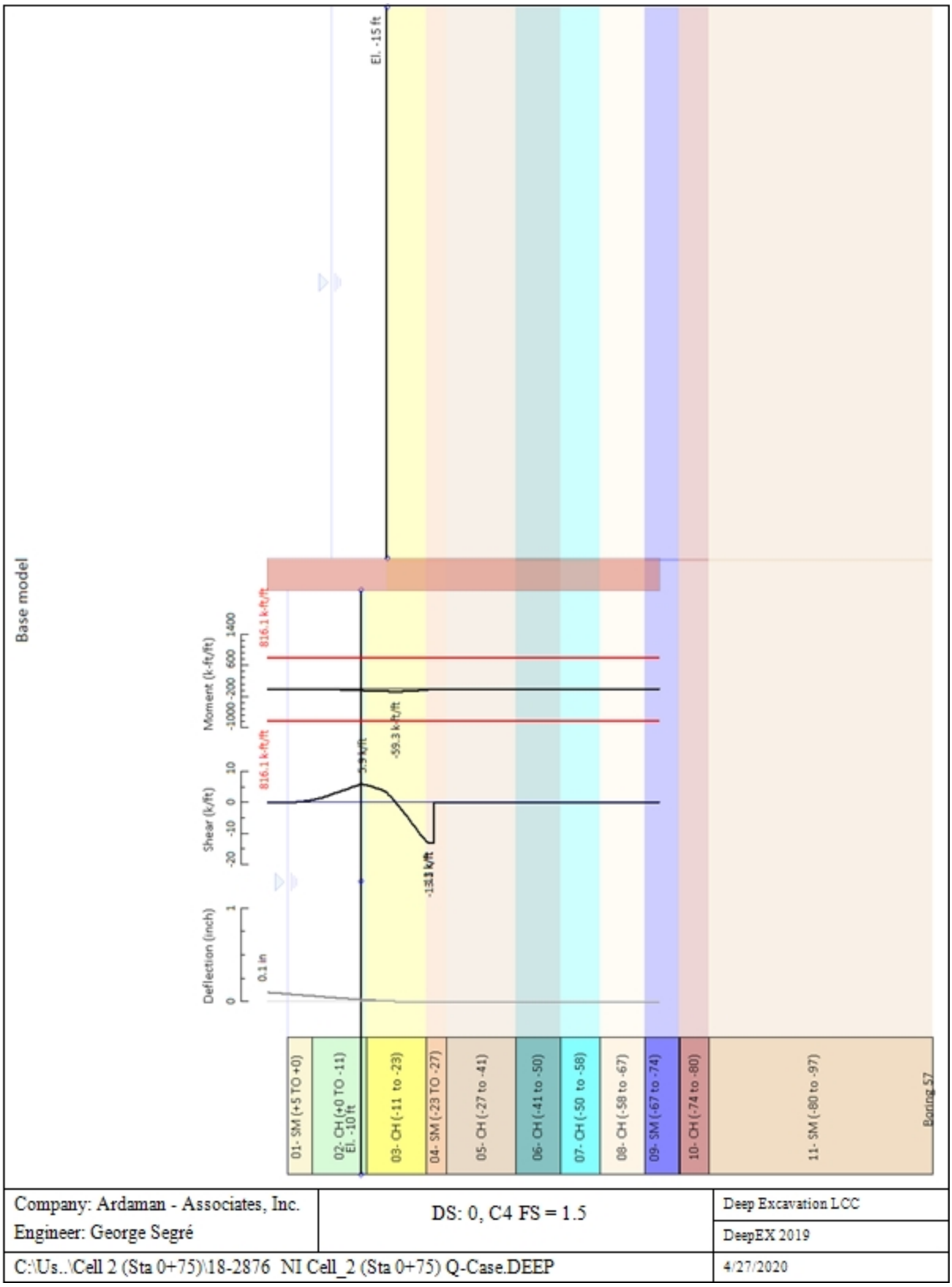


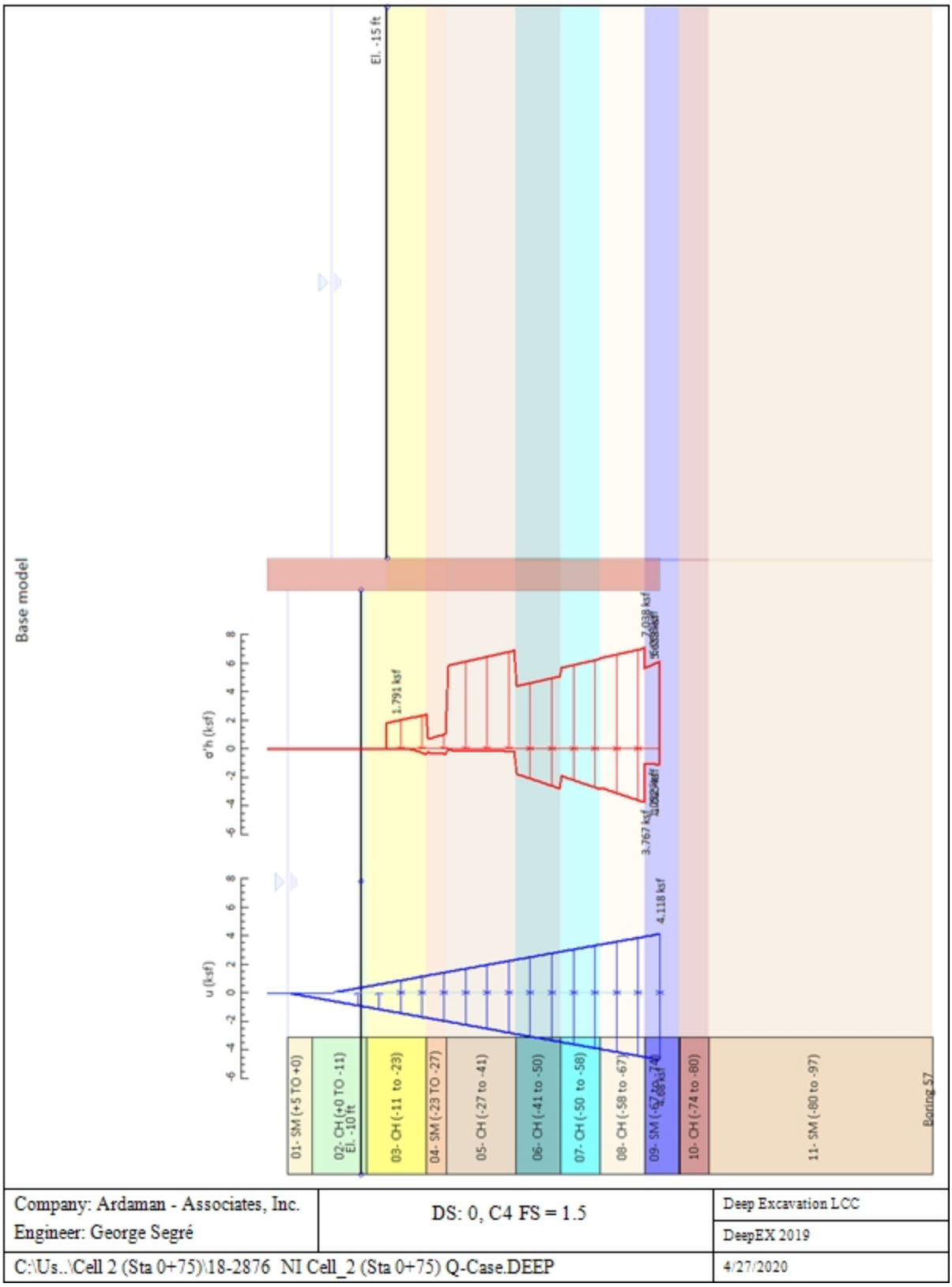
Attachment Figure C.2-73



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP		4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
3.767 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.1 in
Shear (k/ft)
-20 -10 0 10
-13.1 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-59.3 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.791 ksf
7.038 ksf
3.767 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
El. -10 ft
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 TO -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:00:26 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

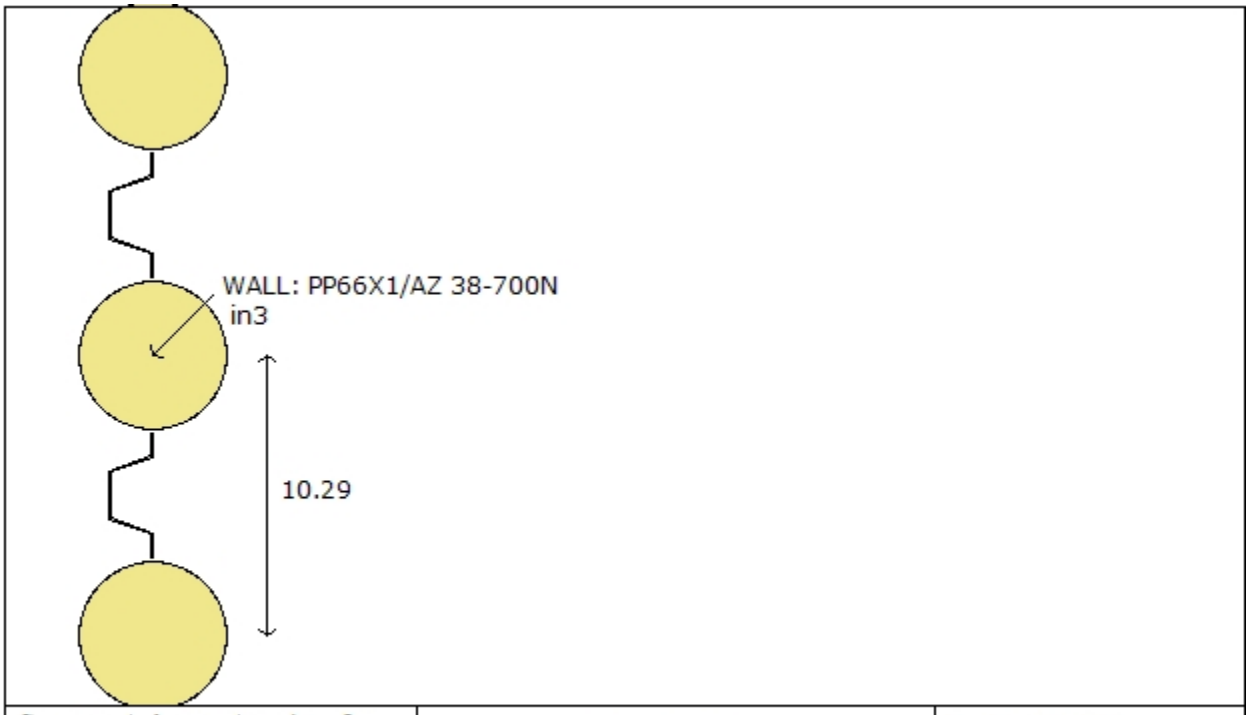
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.274	1.274	1.688
Stage 1	Simple span	N/A	1.6	1.115	1.115	1.463
Stage 2	Simple span	N/A	1.6	1.348	1.348	1.744
Stage 3	Simple span	N/A	1.6	1.189	1.189	1.519
Stage 4	Simple span	N/A	1.6	1.413	1.413	1.805
Stage 5	Simple span	N/A	1.6	1.119	1.119	1.405
Stage 6	Simple span	N/A	1.6	1.494	1.494	1.866
Stage 7	Simple span	N/A	1.6	1.2	1.2	1.465

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

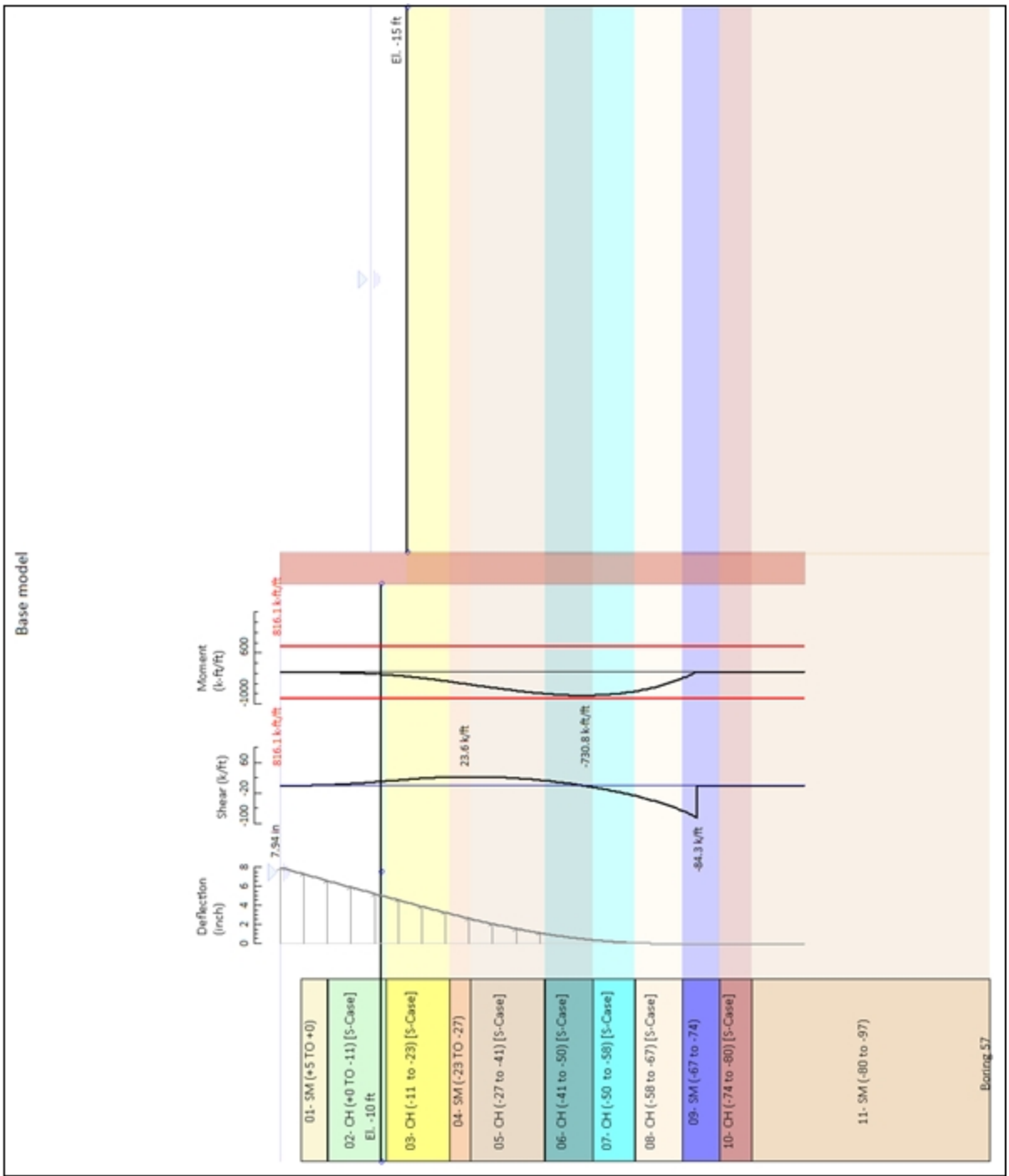
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

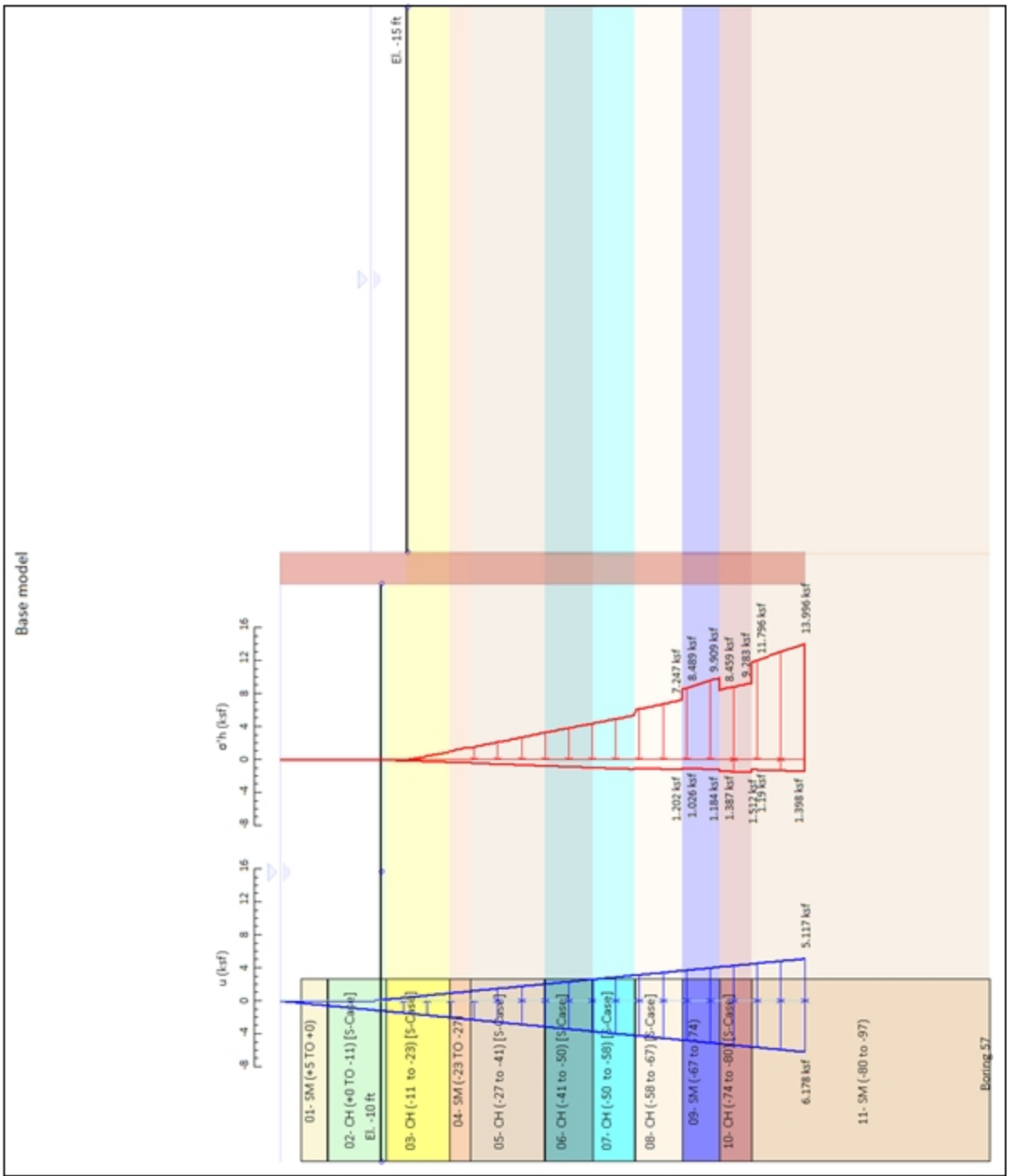
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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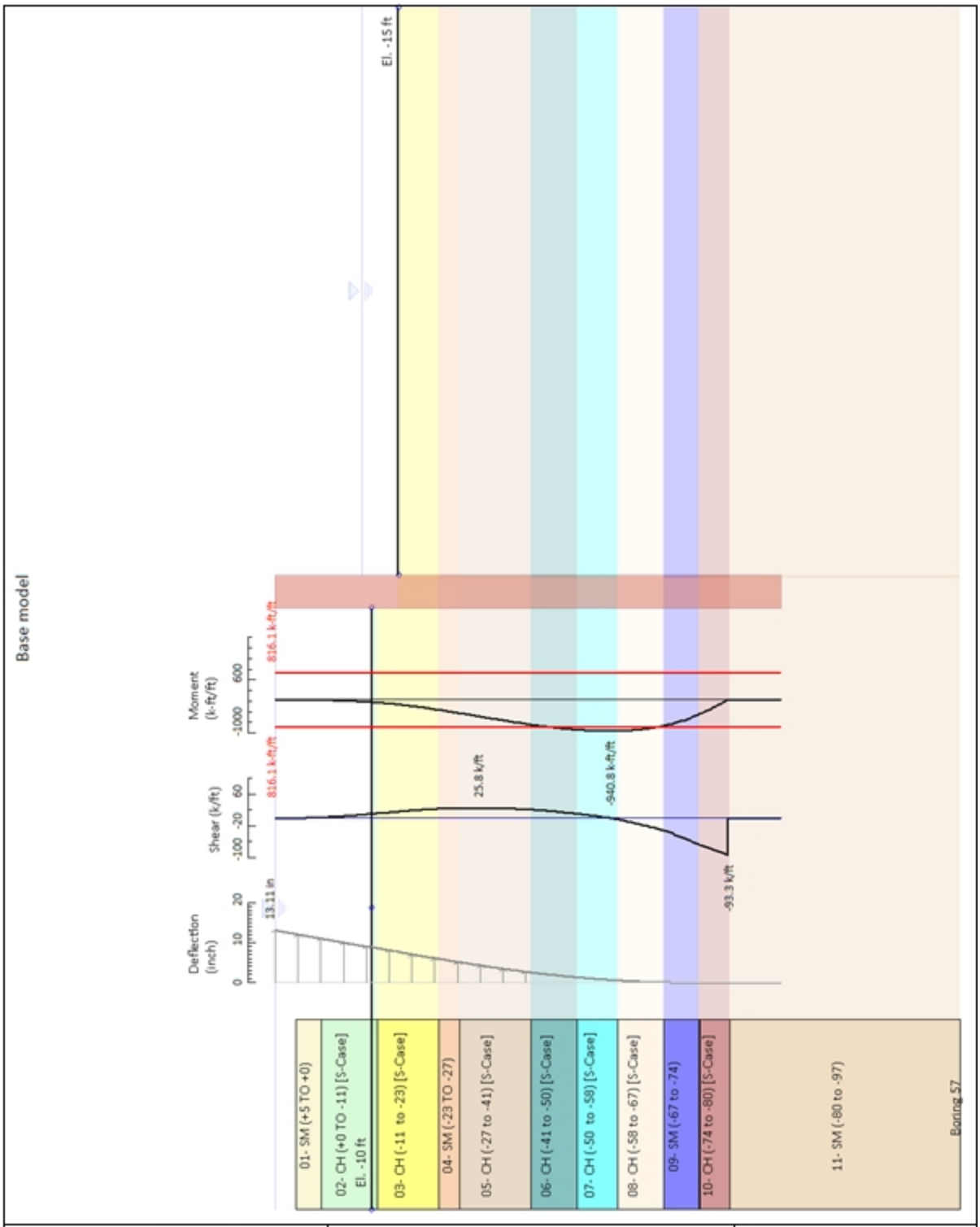

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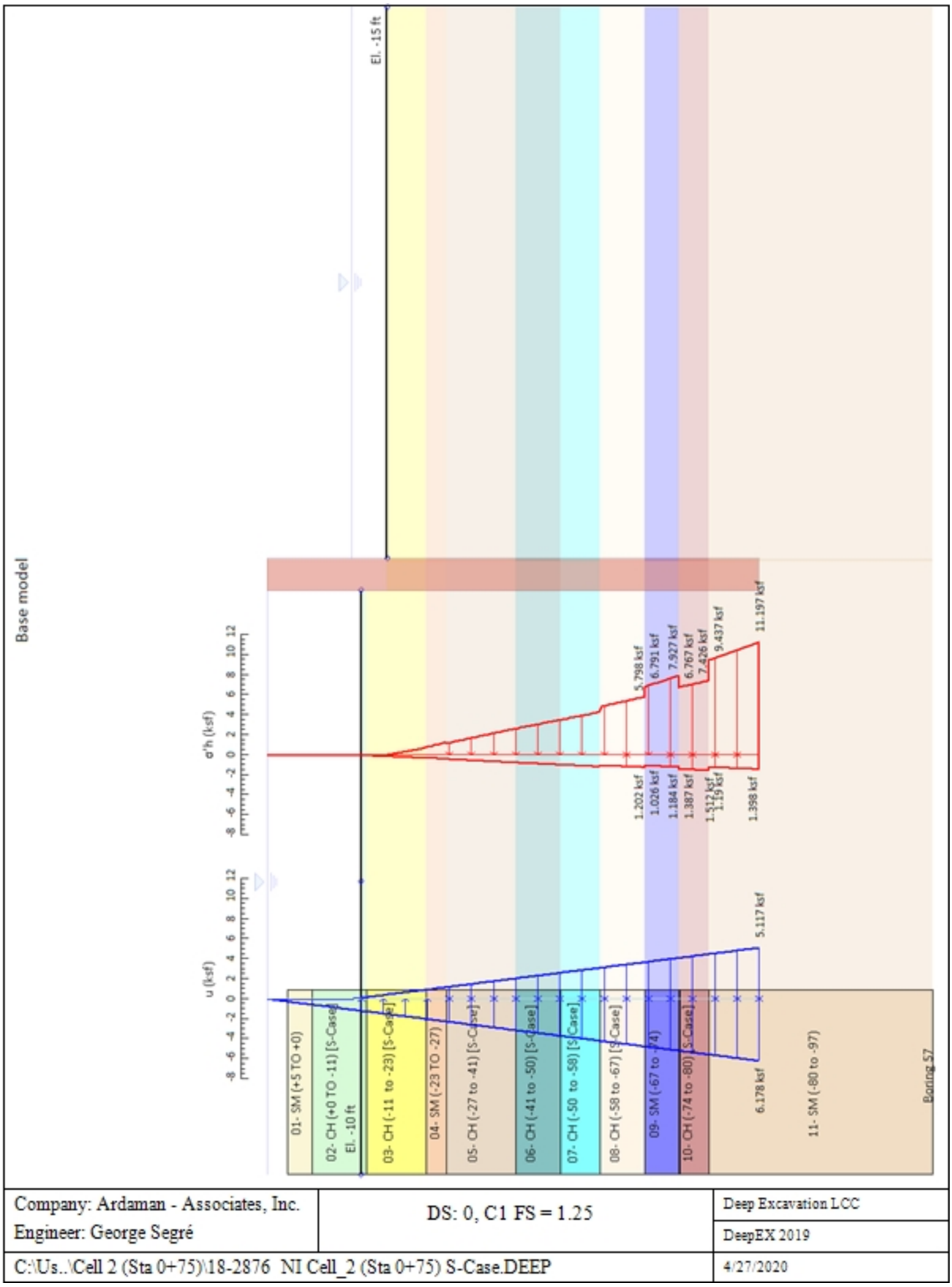

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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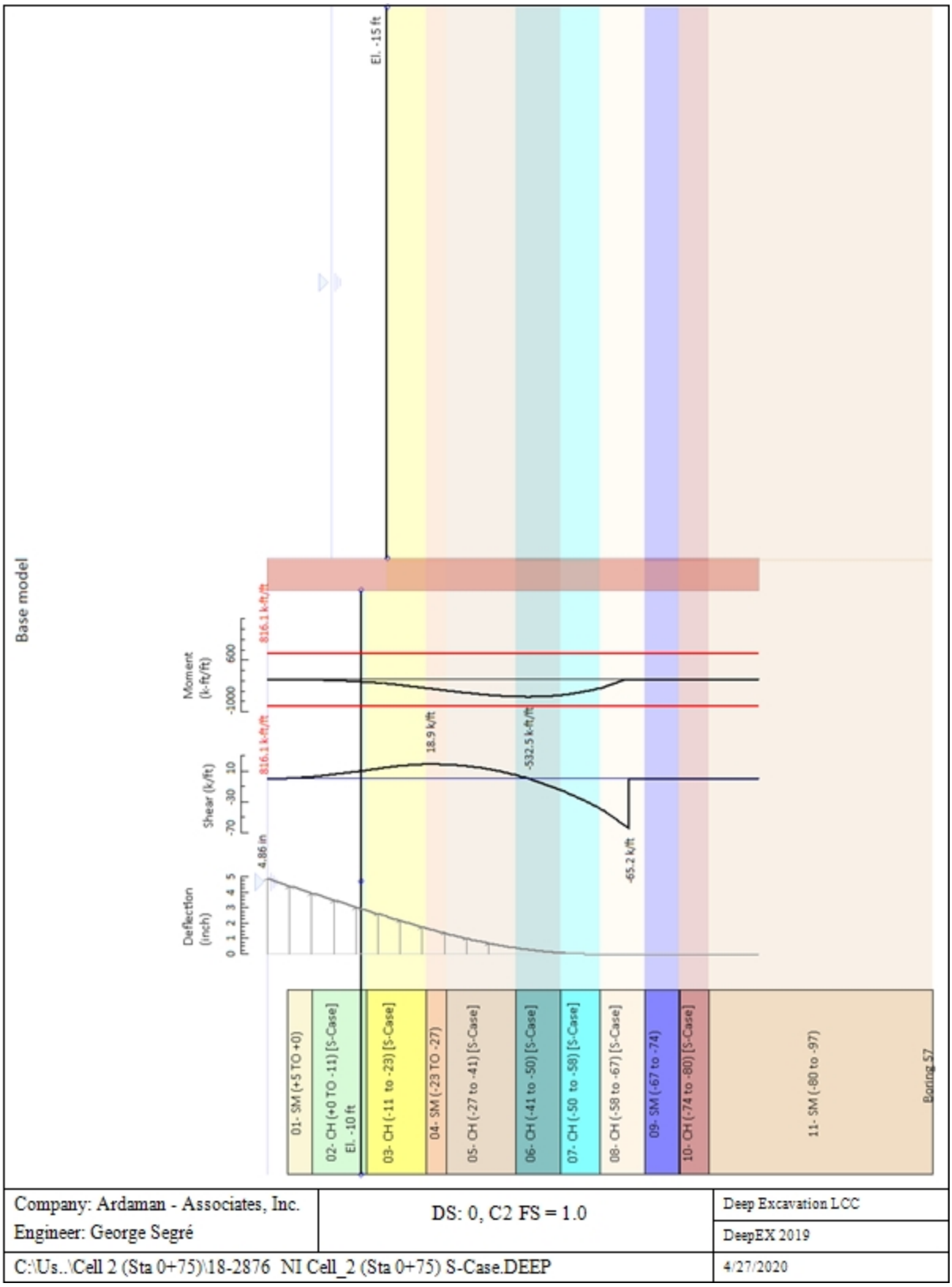

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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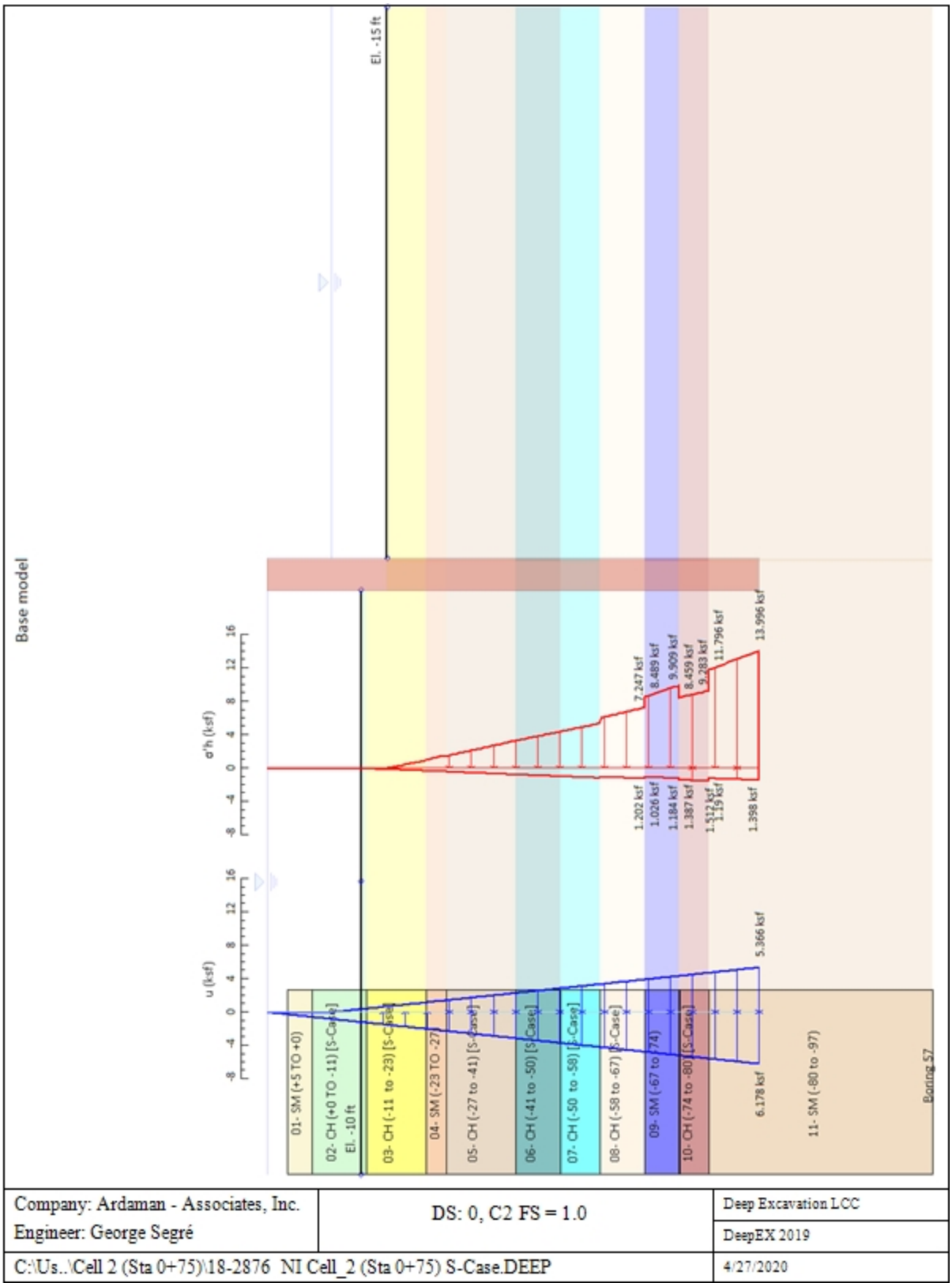

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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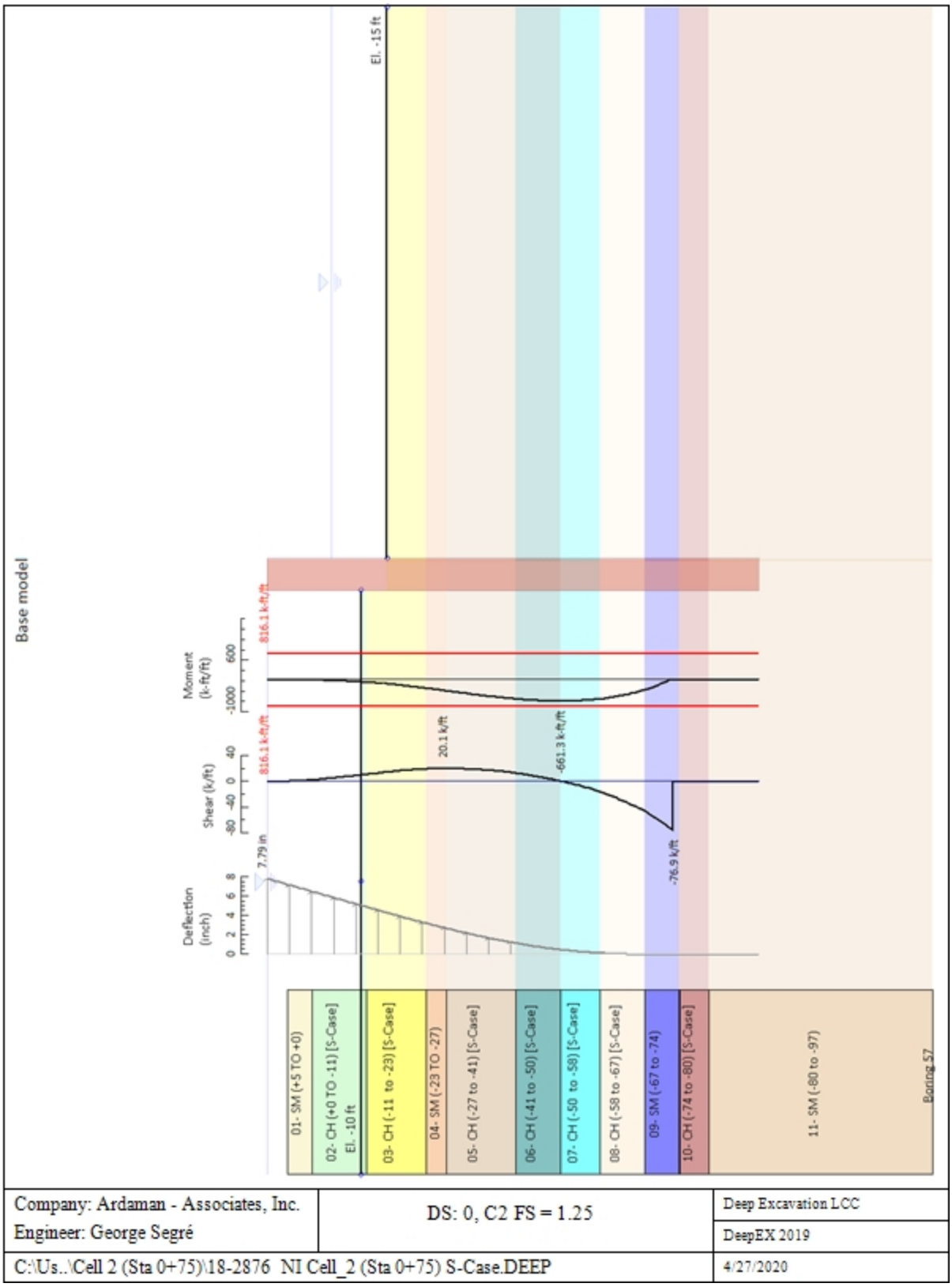

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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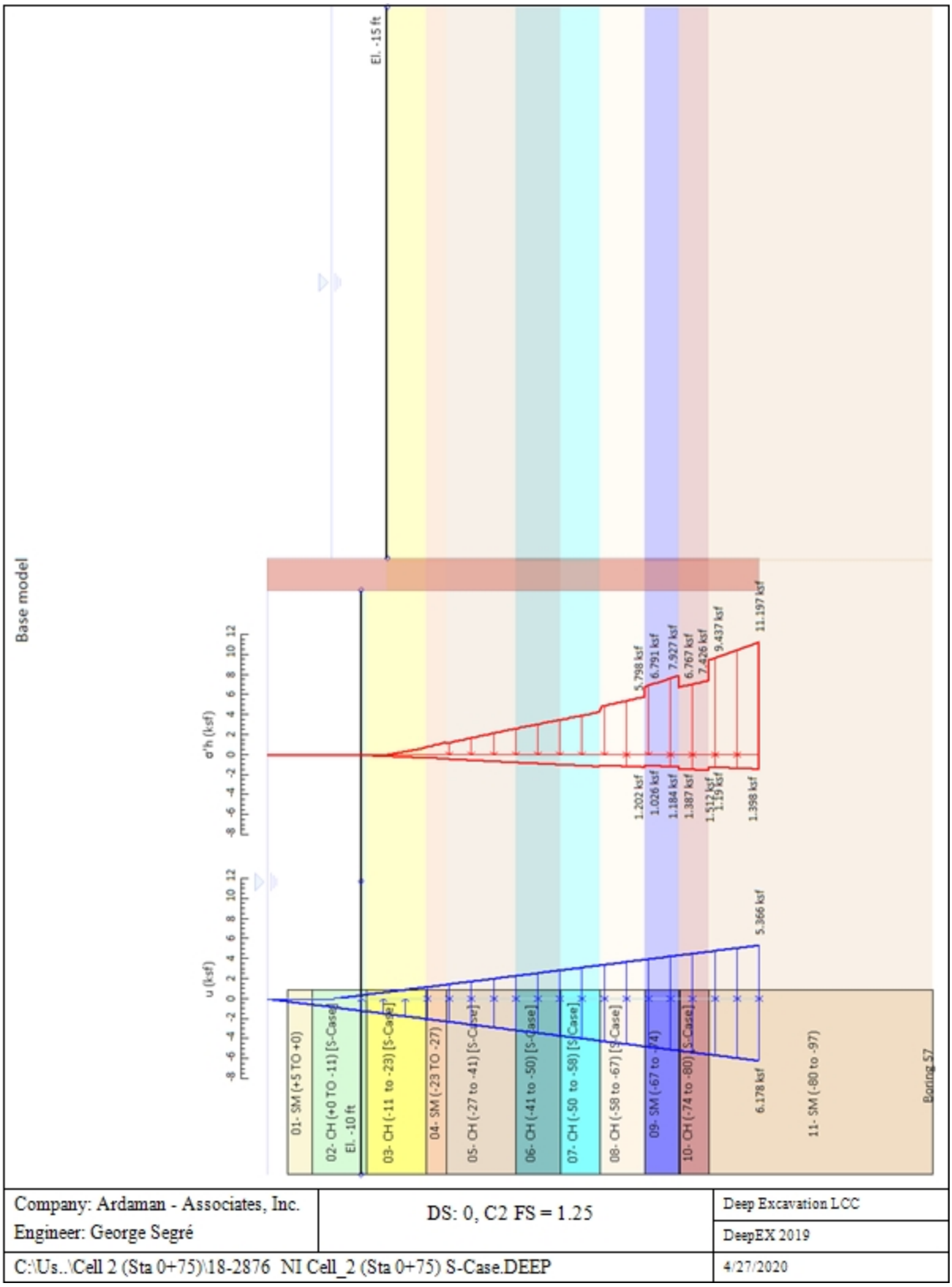

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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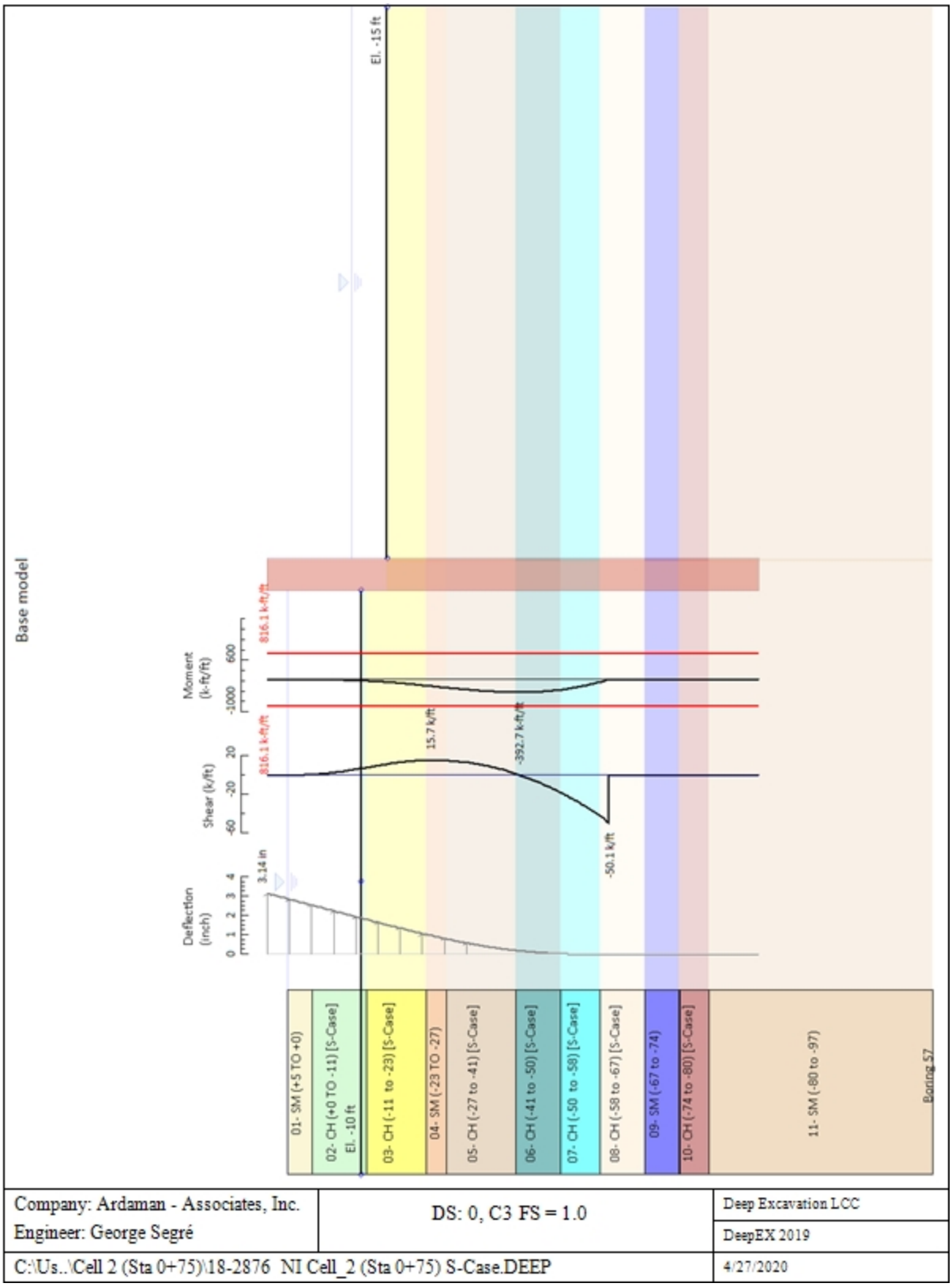
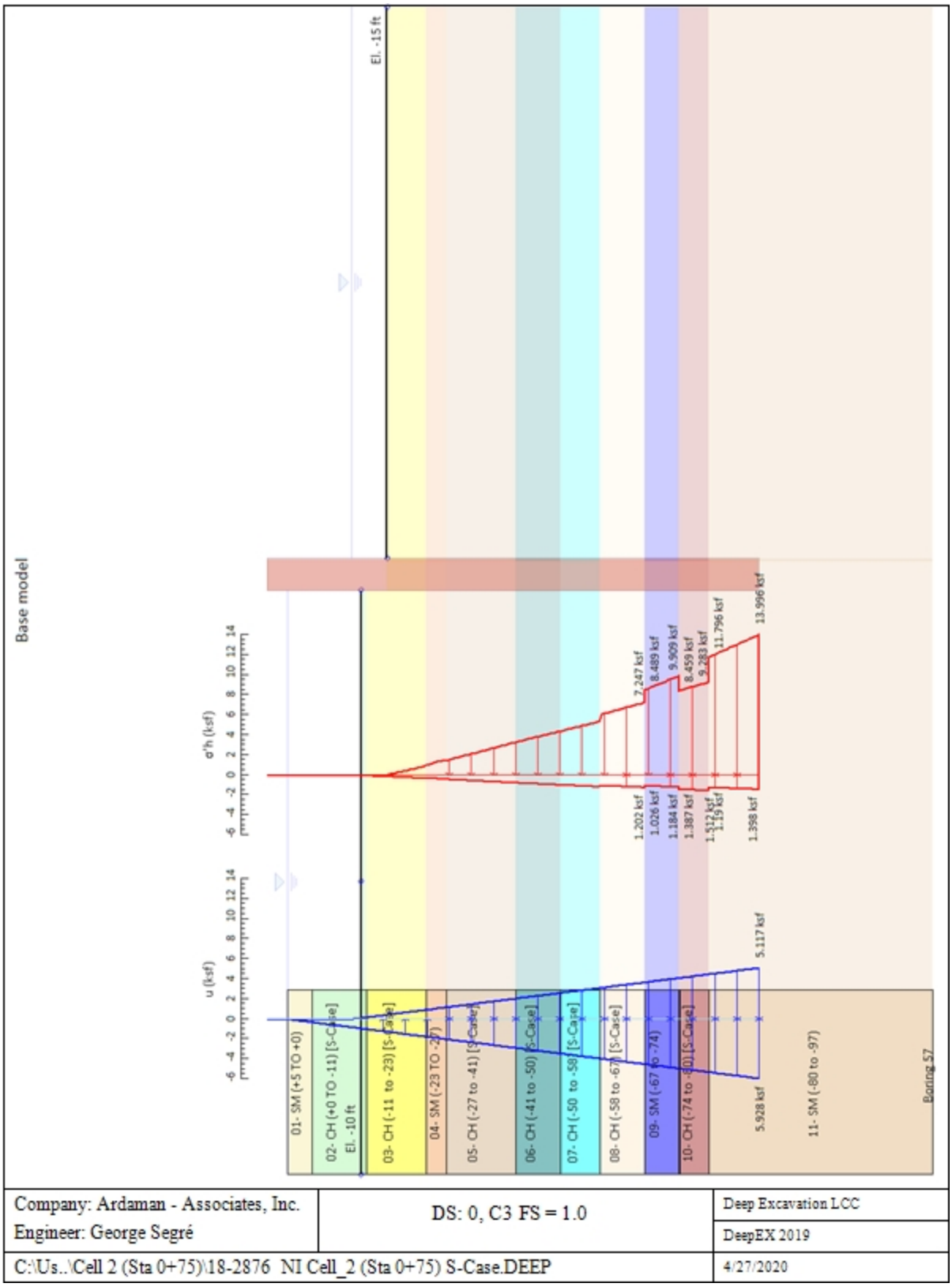
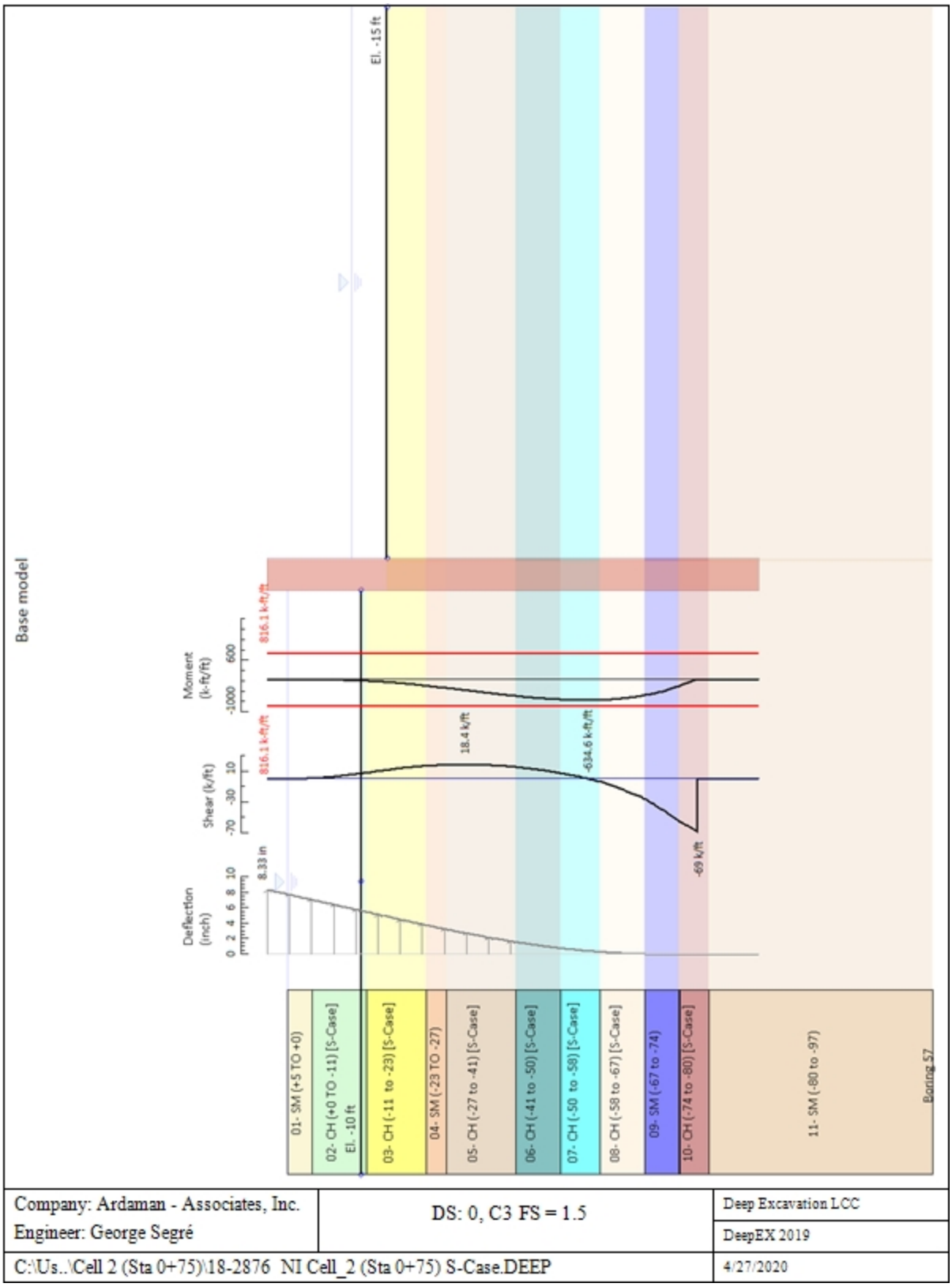

Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
-20
-60
15.7 k/ft
-392.7 k-ft/ft
-50.1 k/ft
Deflection (inch)
0 1 2 3 4
3.14 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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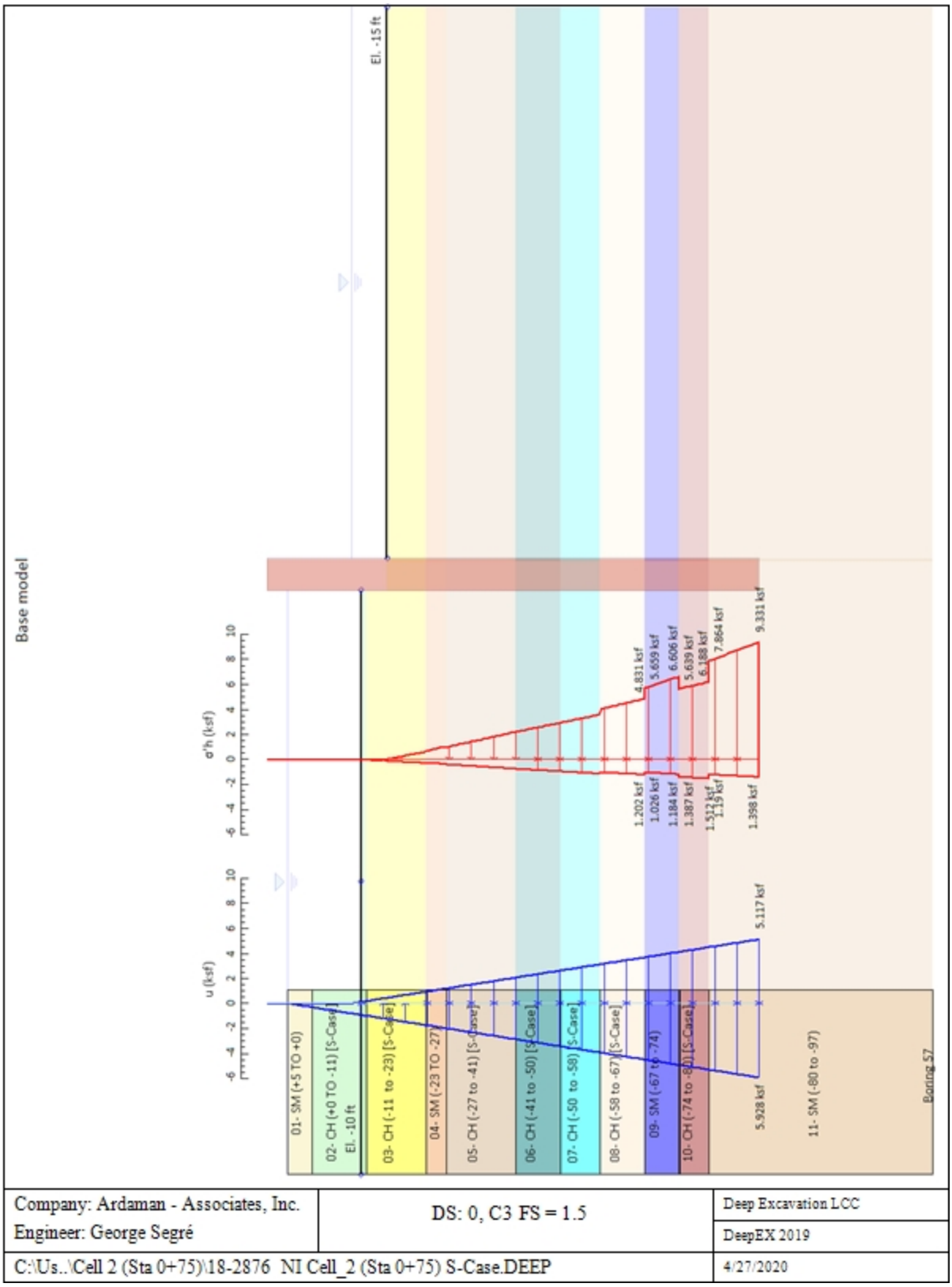

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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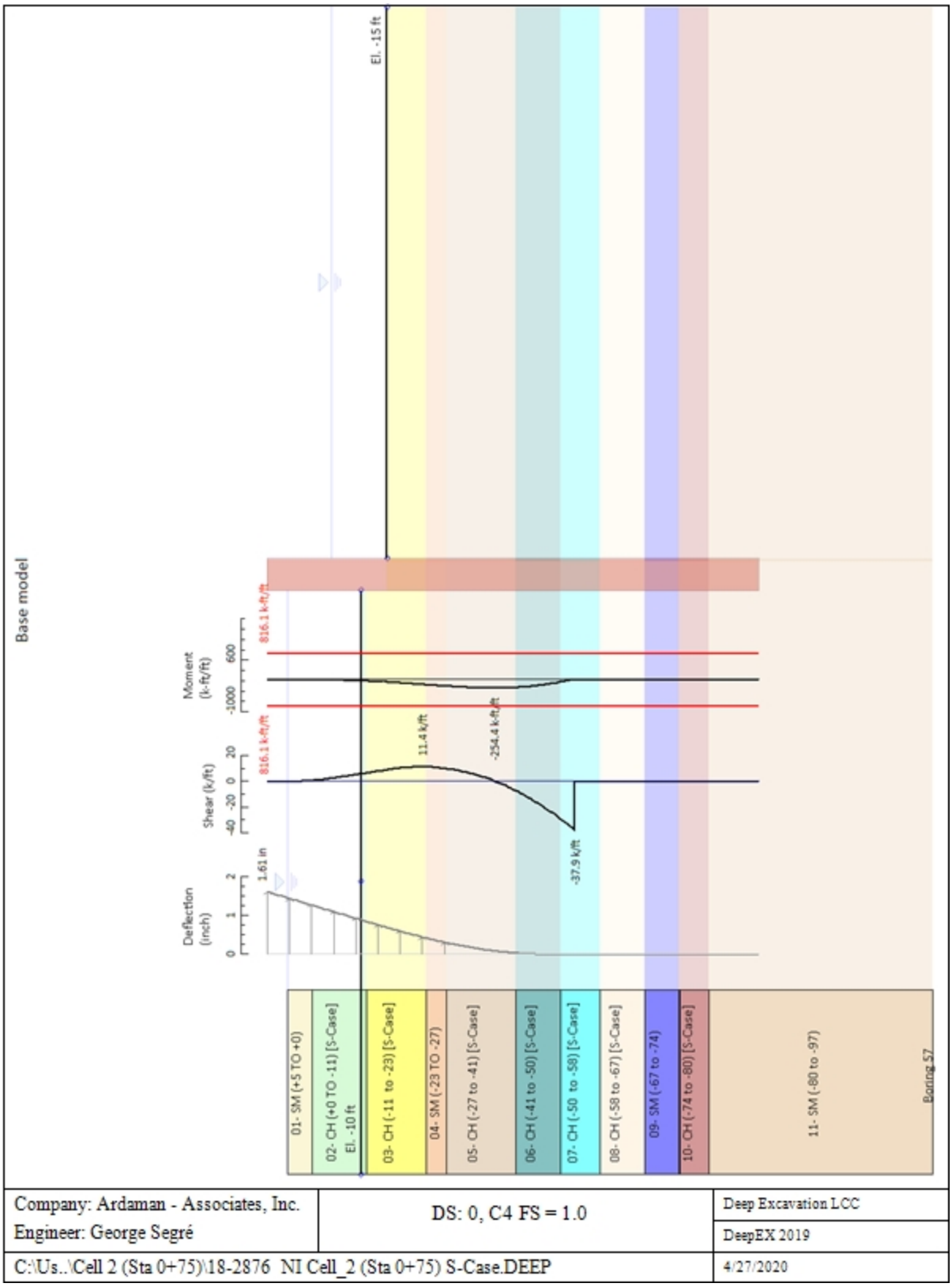
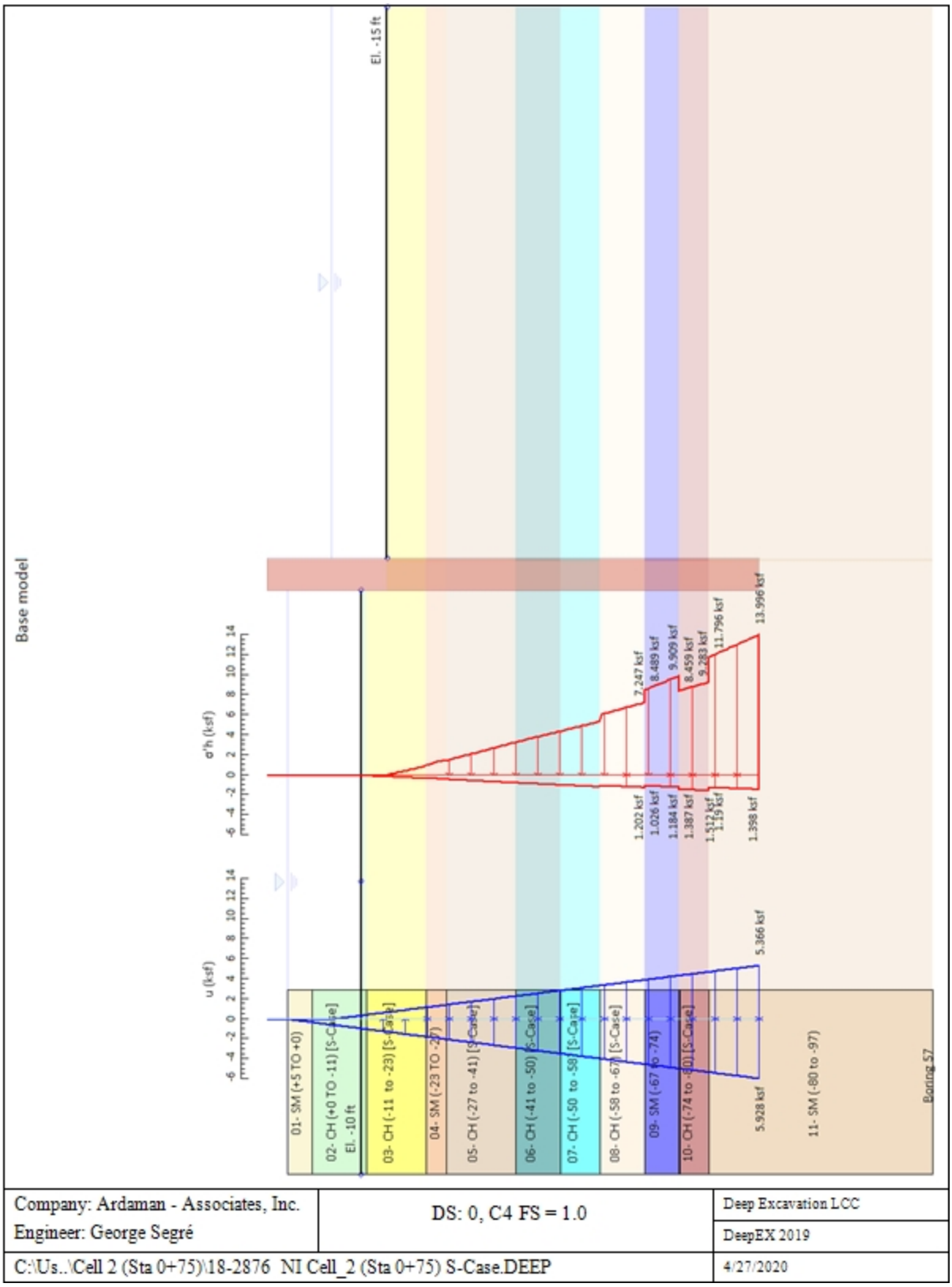
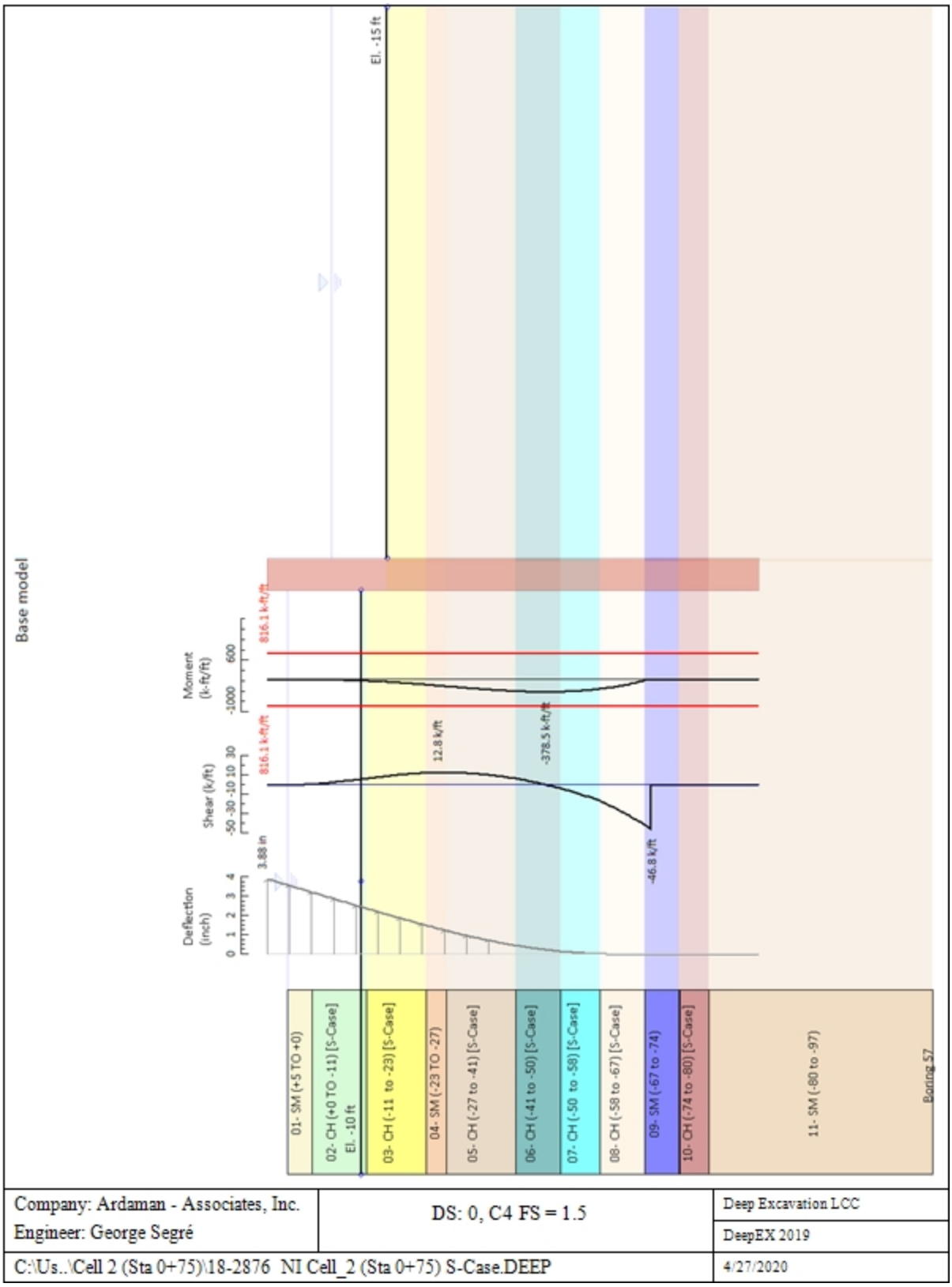

Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
11.4 k/ft
-254.4 k-ft/ft
-37.9 k/ft
Deflection (inch)
0
1
2
1.61 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP		4/27/2020


Base model
El. -15 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
12.8 k/ft
-378.5 k-ft/ft
-46.8 k/ft
Deflection (inch)
0 1 2 3 4
3.88 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -10 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
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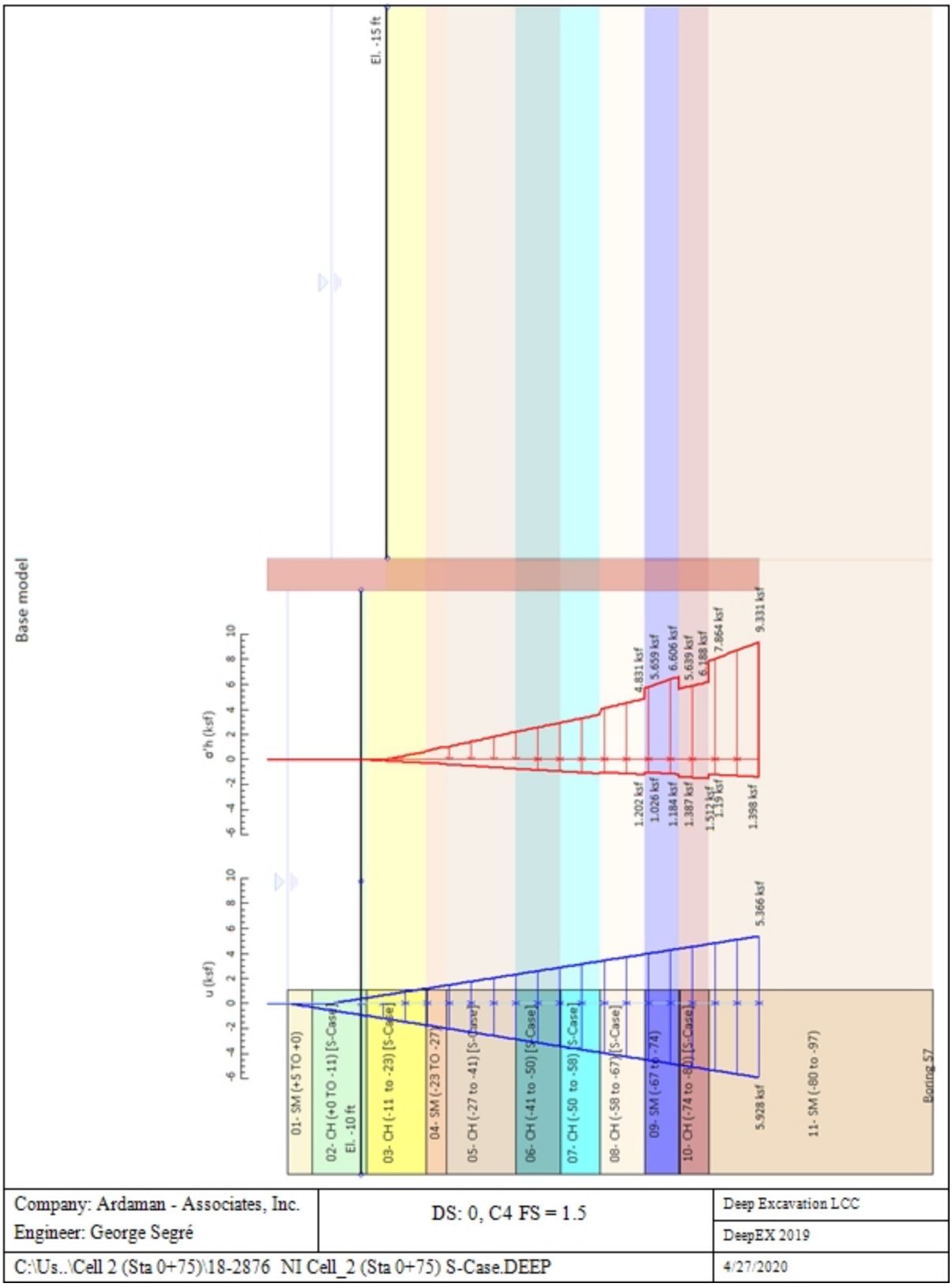
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 0+75)\18-2876 NI Cell_2 (Sta 0+75) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+25 Left Wall)

Top of Wall =	9.0	ft., NAVD88	Design Tip Elev. =	-102.0 ft., NAVD88
Governing Tip Elev. =	-101.36	ft., NAVD88	Design Length of Sheeting =	111.0 ft.
Length of Sheetting =	110.36	ft.		
Use =	111.0	ft.		

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS_{Active}	$FS_{Passive}$	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-35.63	214.27	61.60	0.71
		Open excavation - degraded	9	-8	1.00	1.25	-36.82	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-34.06	154.04	54.84	0.51
		Open excavation - degraded	9	-4	1.00	1.25	-34.84	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-32.87	99.17	42.93	0.30
		Open excavation - degraded	5	-8	1.00	1.50	-34.06	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-30.50	63.20	29.26	0.17
		Open excavation - degraded	5	-4	1.00	1.50	-30.90	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-91.44	1,700.82	168.83	29.21
		Open excavation - degraded	9	-8	1.00	1.25	-101.36	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-85.24	1,275.34	130.60	19.46
		Open excavation - degraded	9	-4	1.00	1.25	-94.54	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-83.38	1,073.77	117.46	15.33
		Open excavation - degraded	5	-8	1.00	1.50	-101.36	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-76.56	725.91	89.05	8.90
		Open excavation - degraded	5	-4	1.00	1.50	-92.68	--	--	--
						Governing Value:	-101.36	1,700.82	168.83	29.21

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:06:50 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

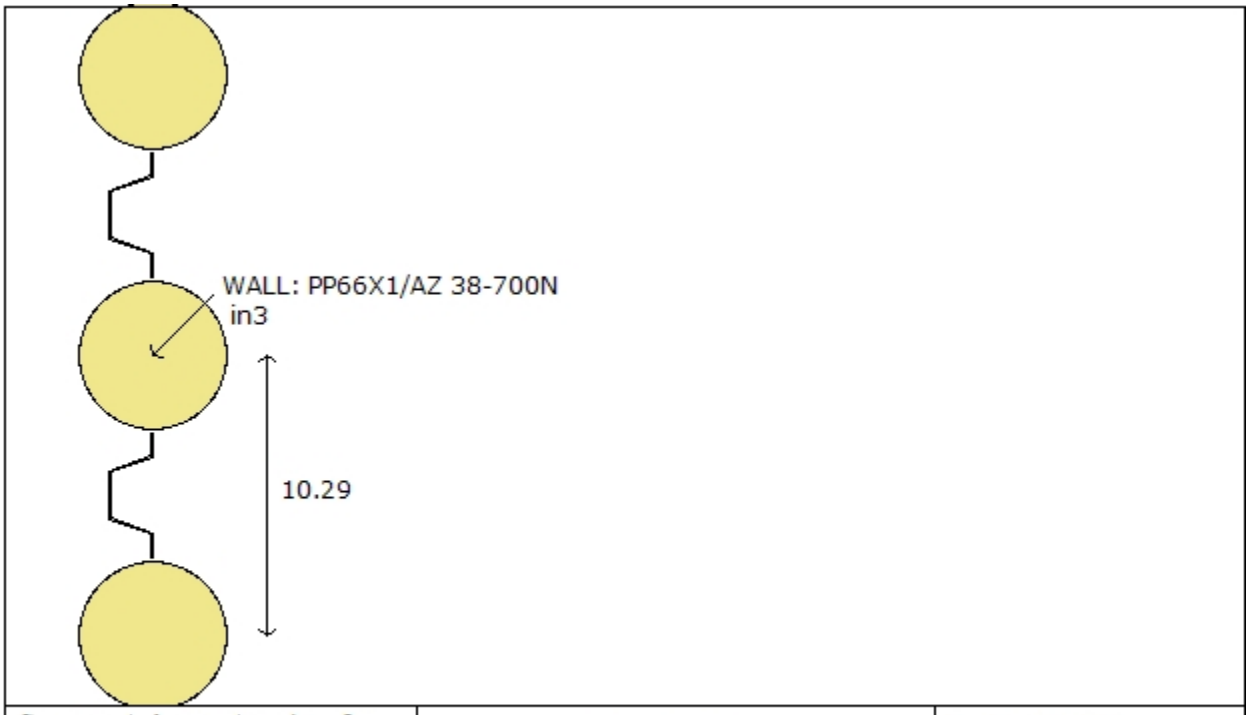
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	4.231	6.335	8.947
Stage 1	Simple span	N/A	1.6	3.807	5.16	7.27
Stage 2	Simple span	N/A	1.6	4.967	6.74	9.333
Stage 3	Simple span	N/A	1.6	4.571	5.529	7.609
Stage 4	Simple span	N/A	1.6	5.718	8.635	10.466
Stage 5	Simple span	N/A	1.6	4.967	5.965	7.198
Stage 6	Simple span	N/A	1.6	8.182	9.187	10.918
Stage 7	Simple span	N/A	1.6	6.435	6.435	7.556

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

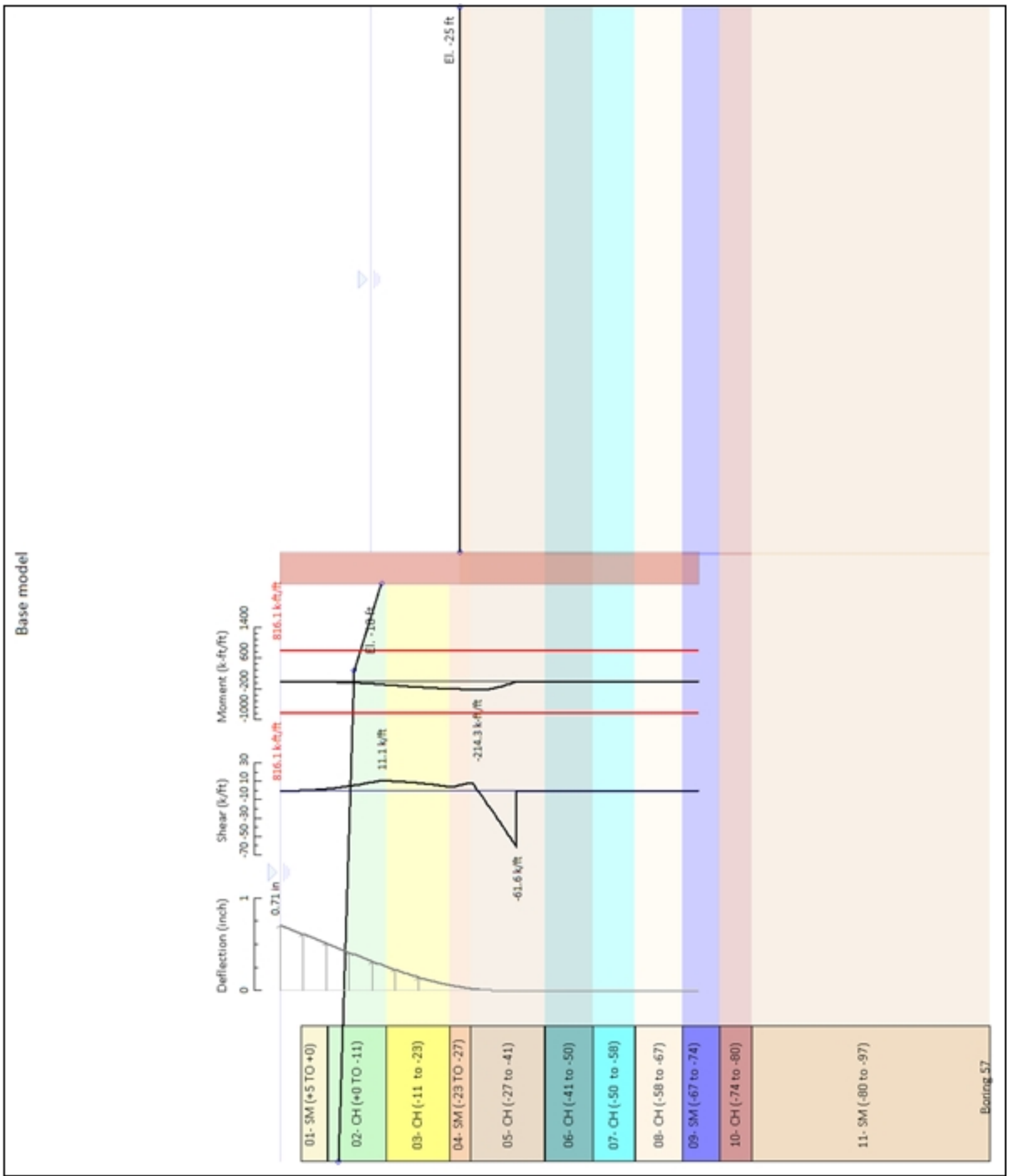
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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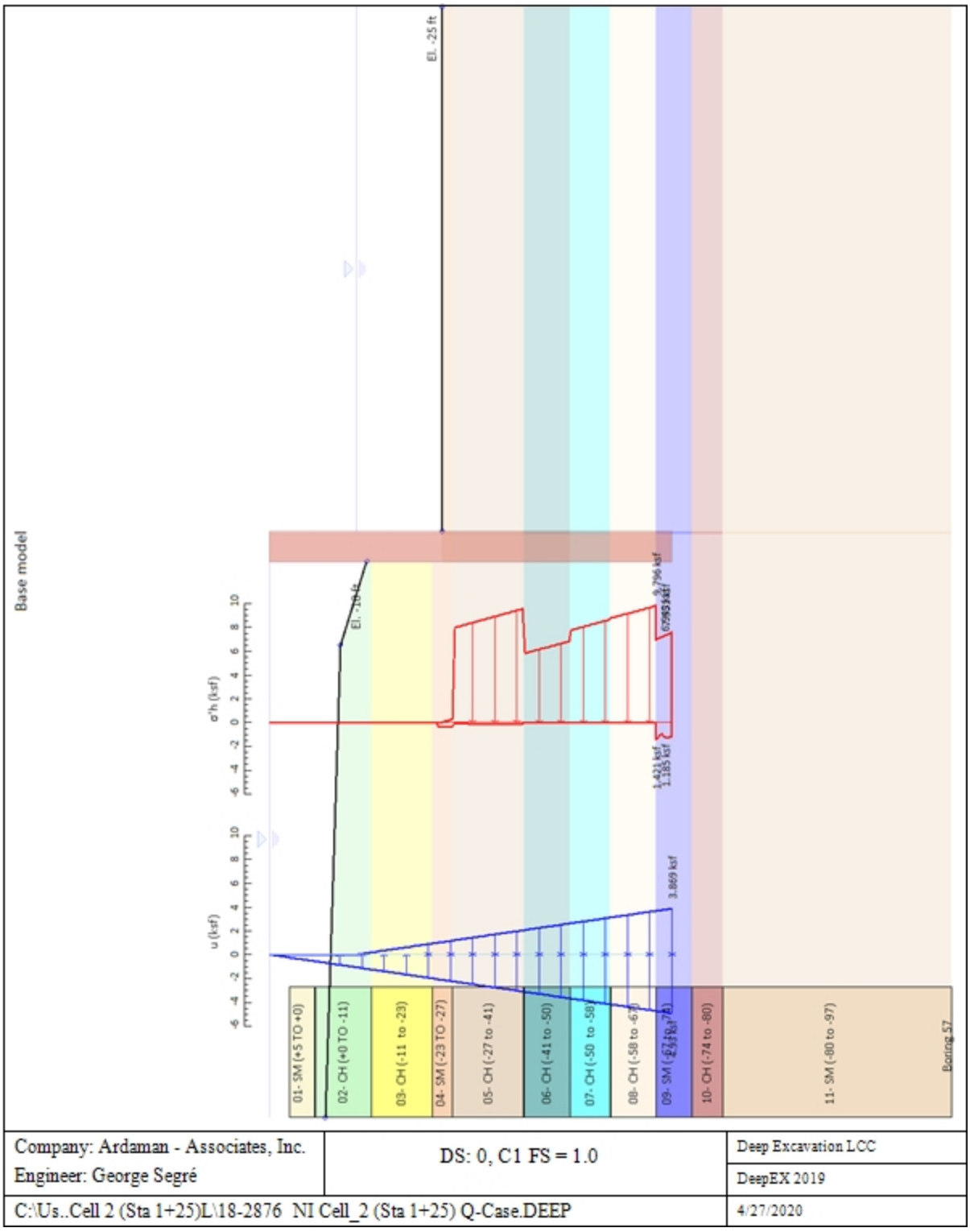

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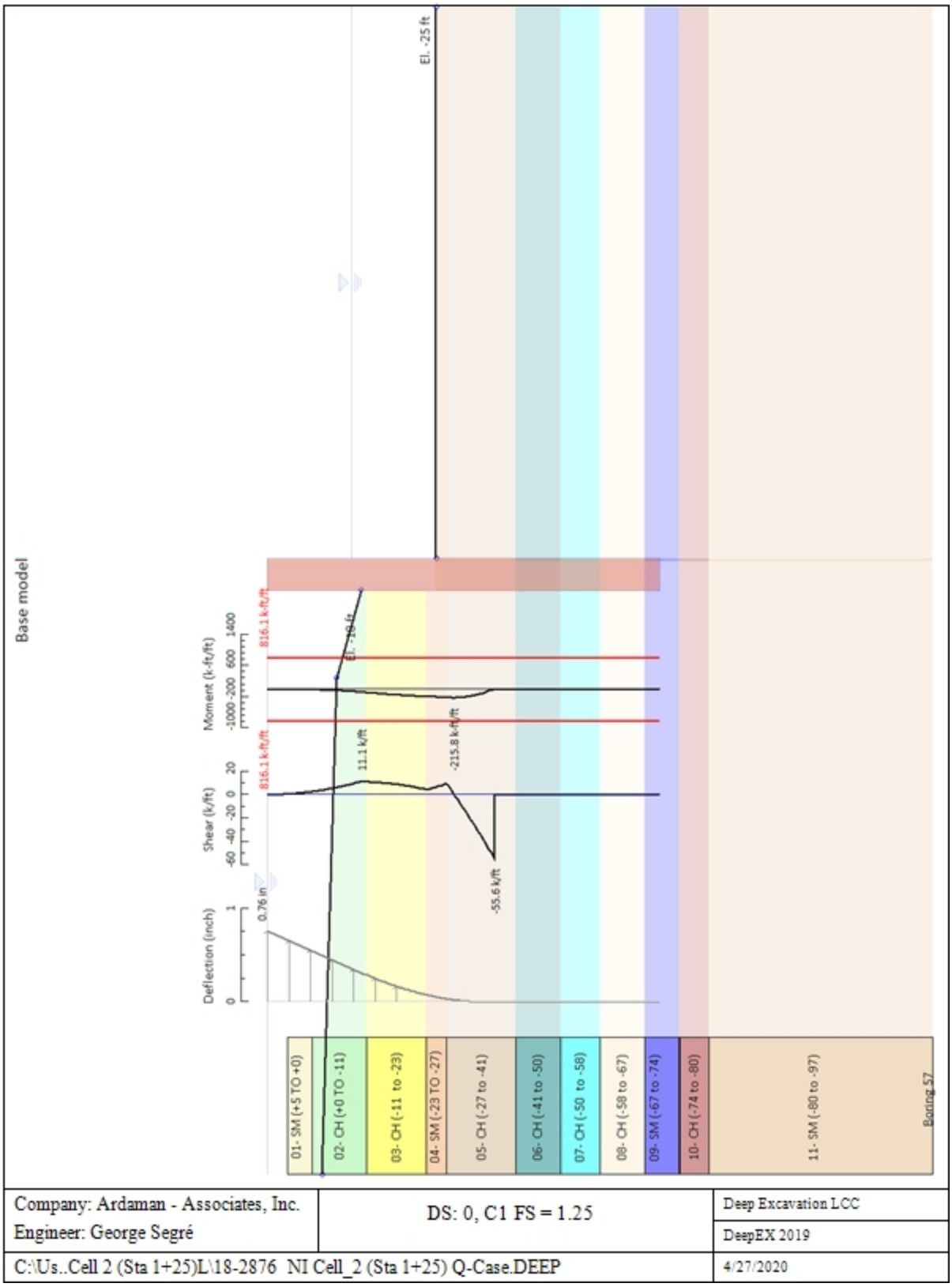

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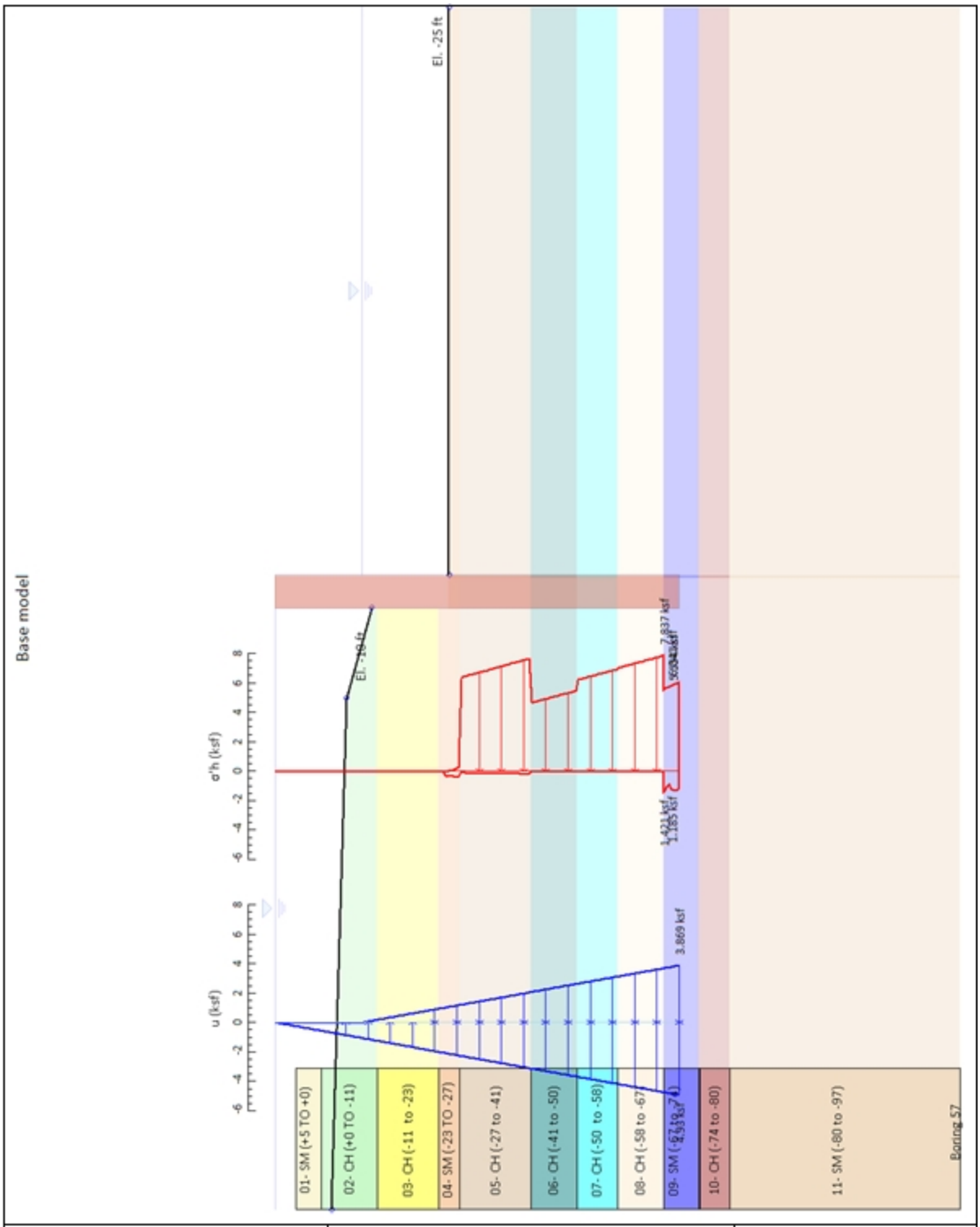

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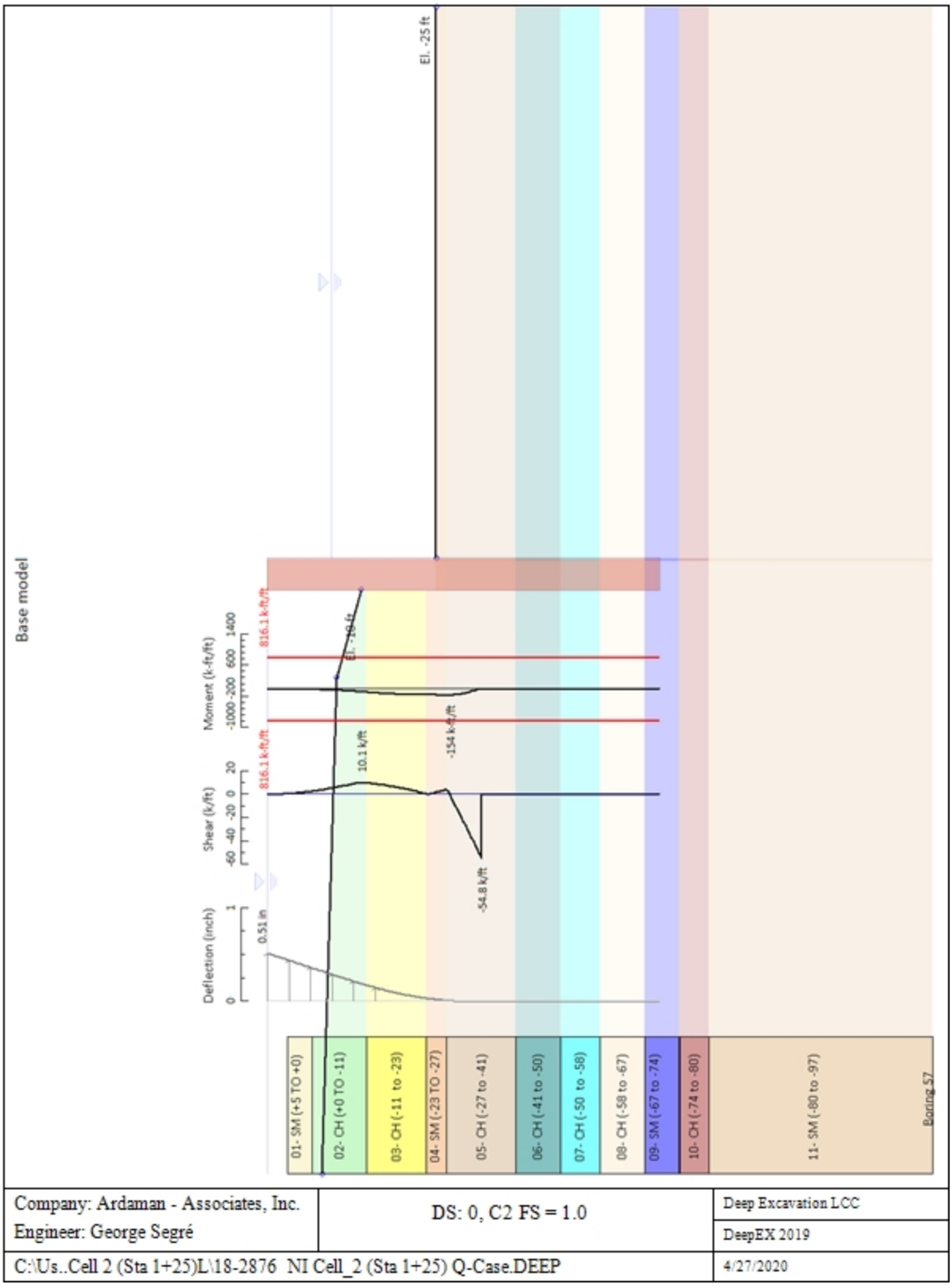

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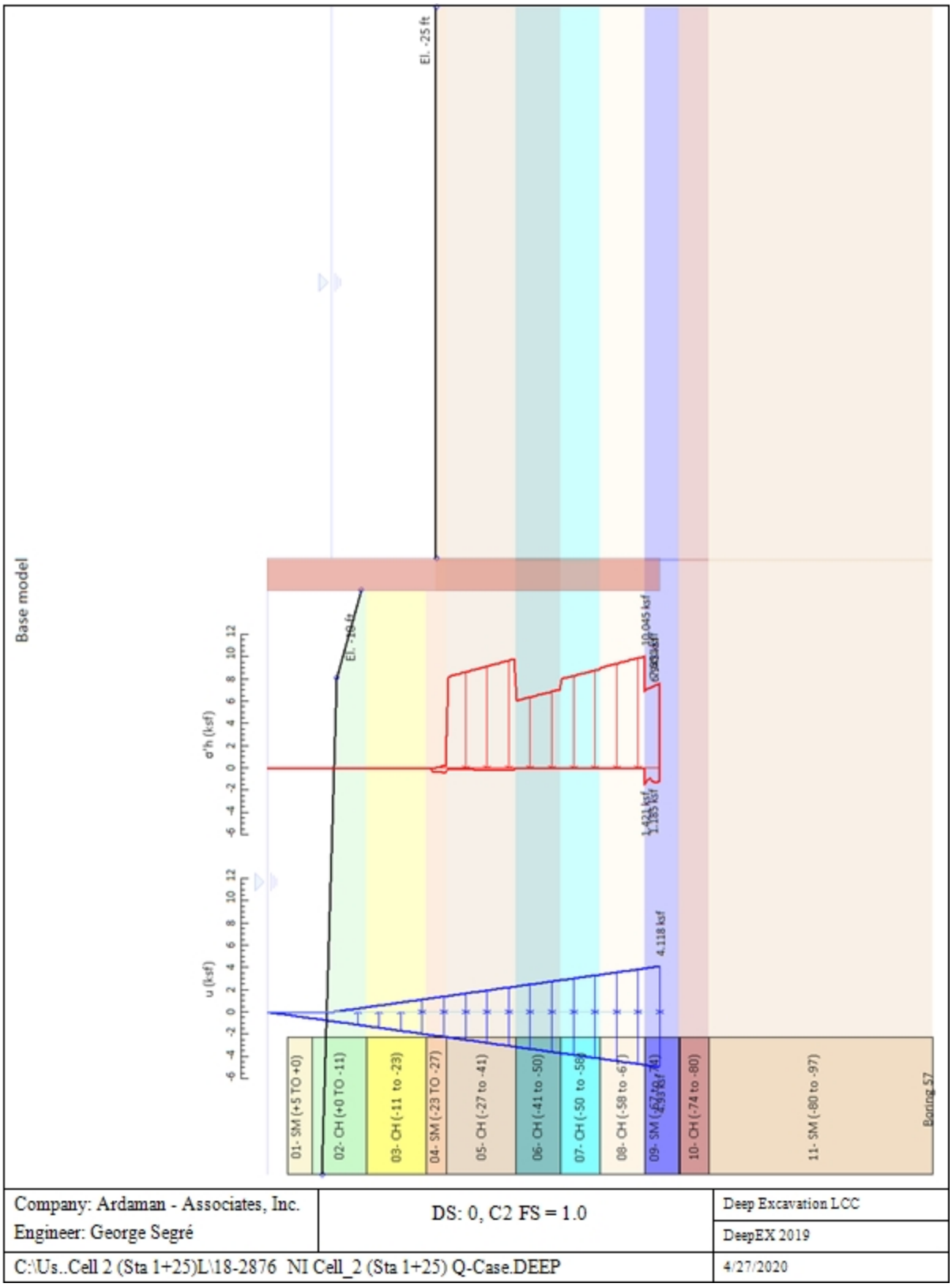
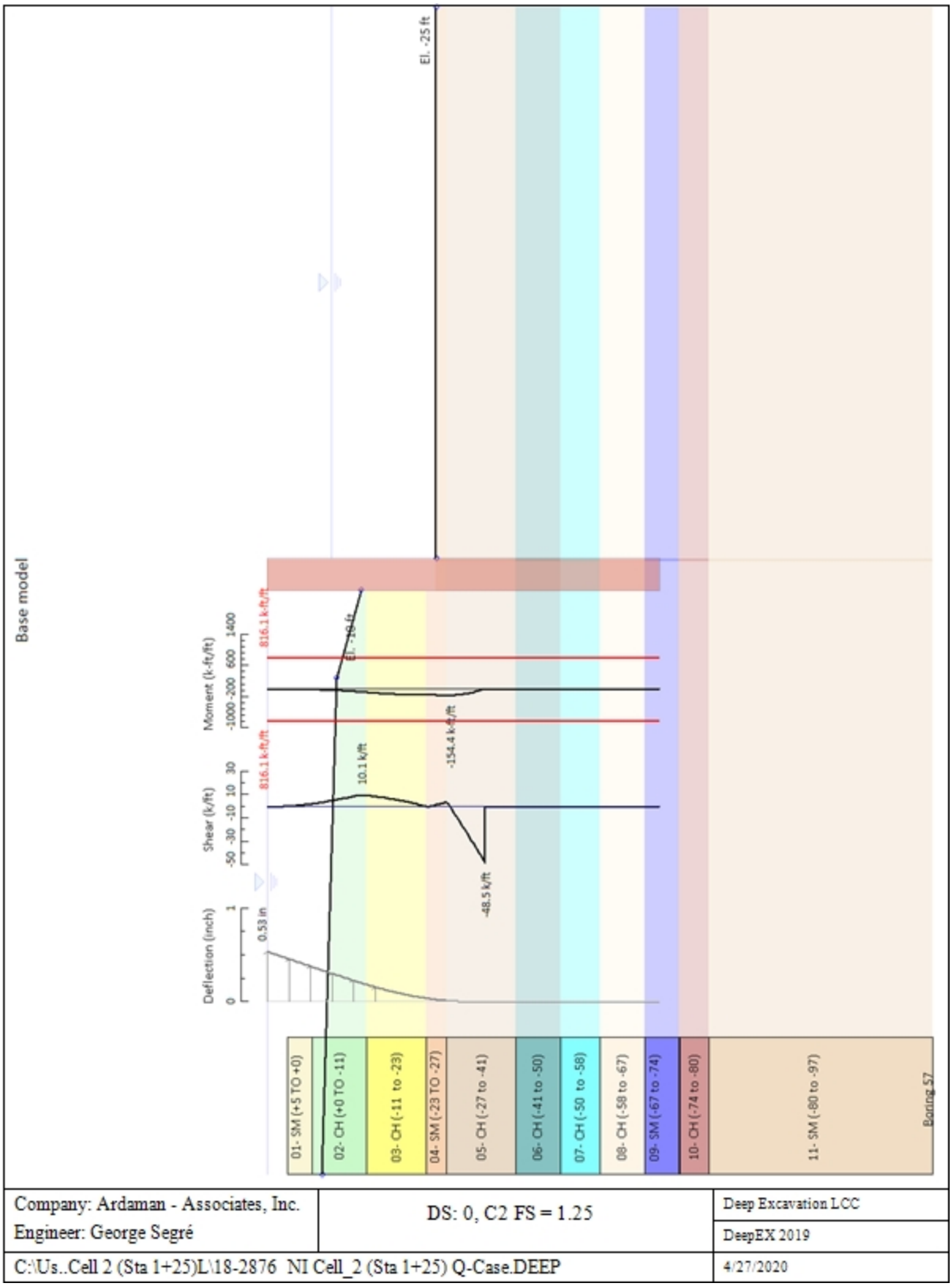

Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
10.045 ksf
1.421 ksf
1.185 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020



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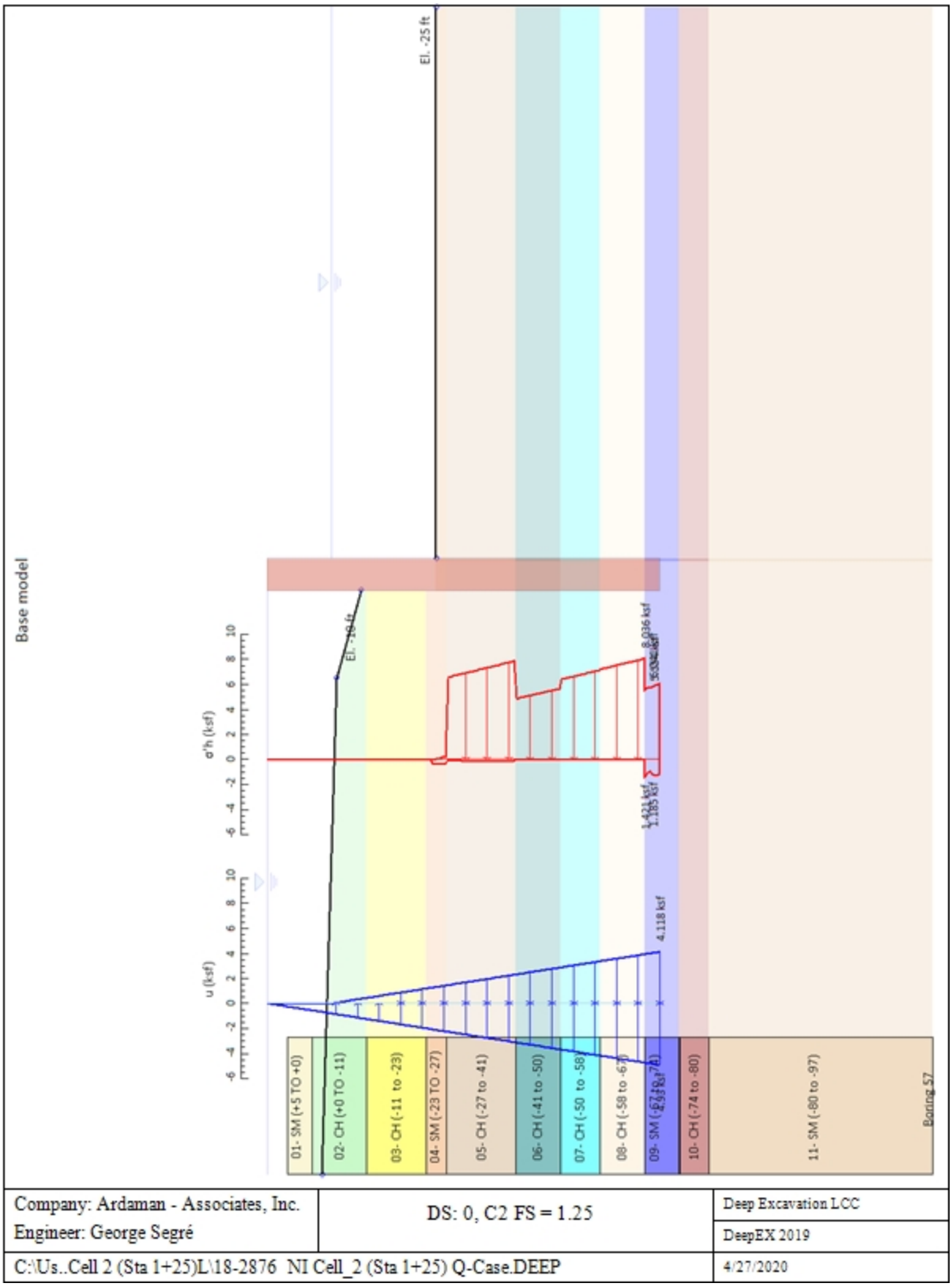

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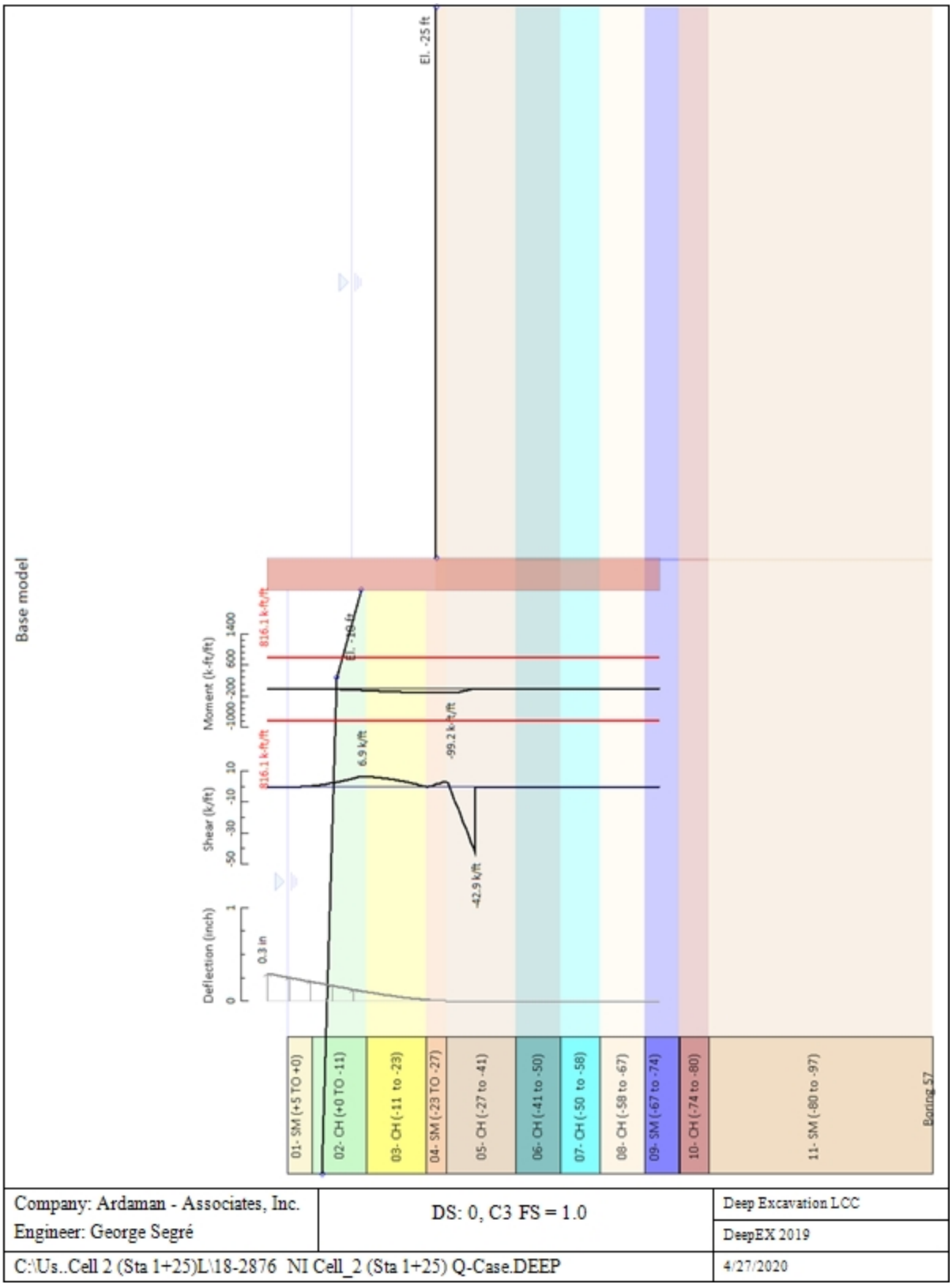
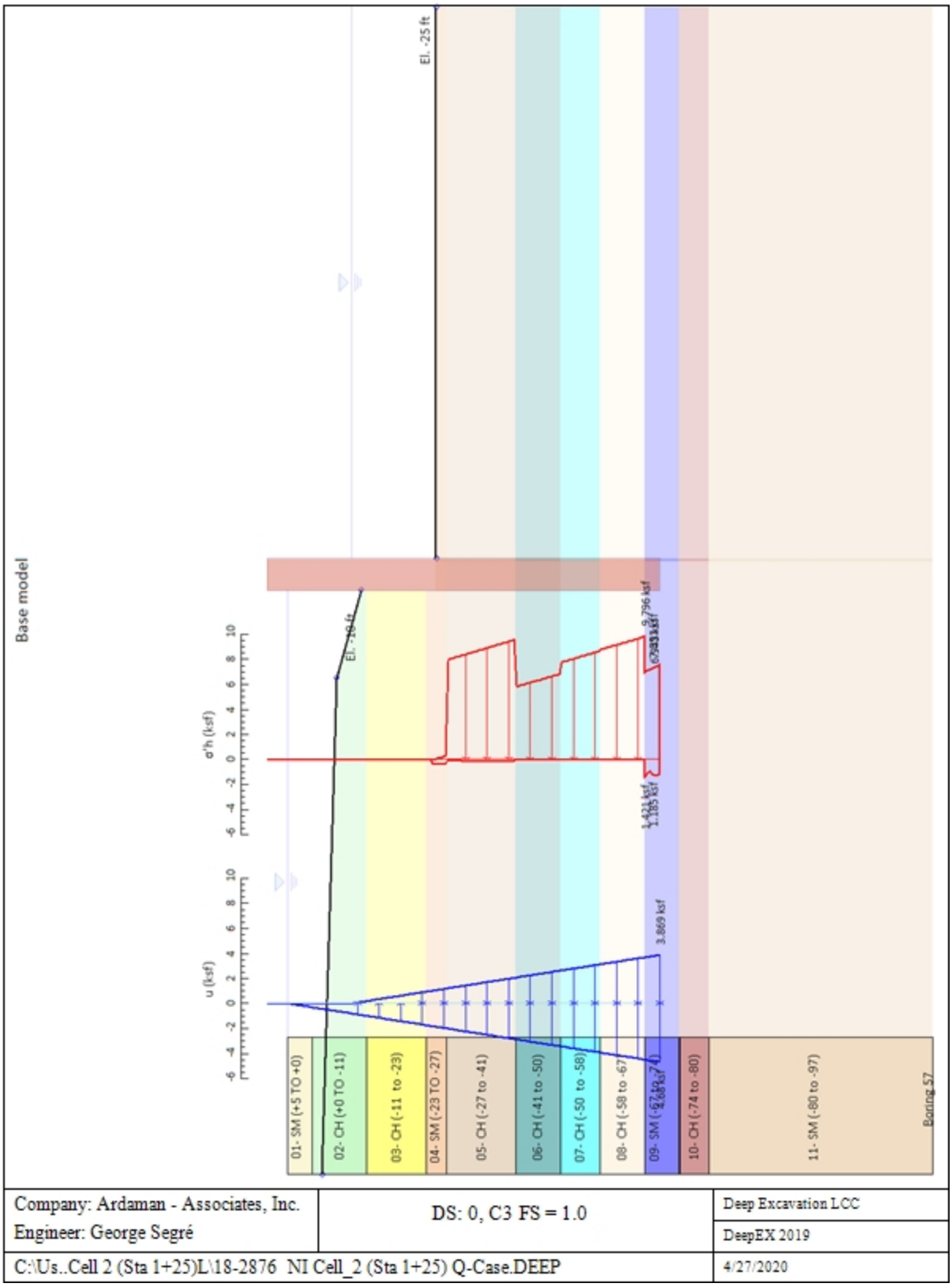
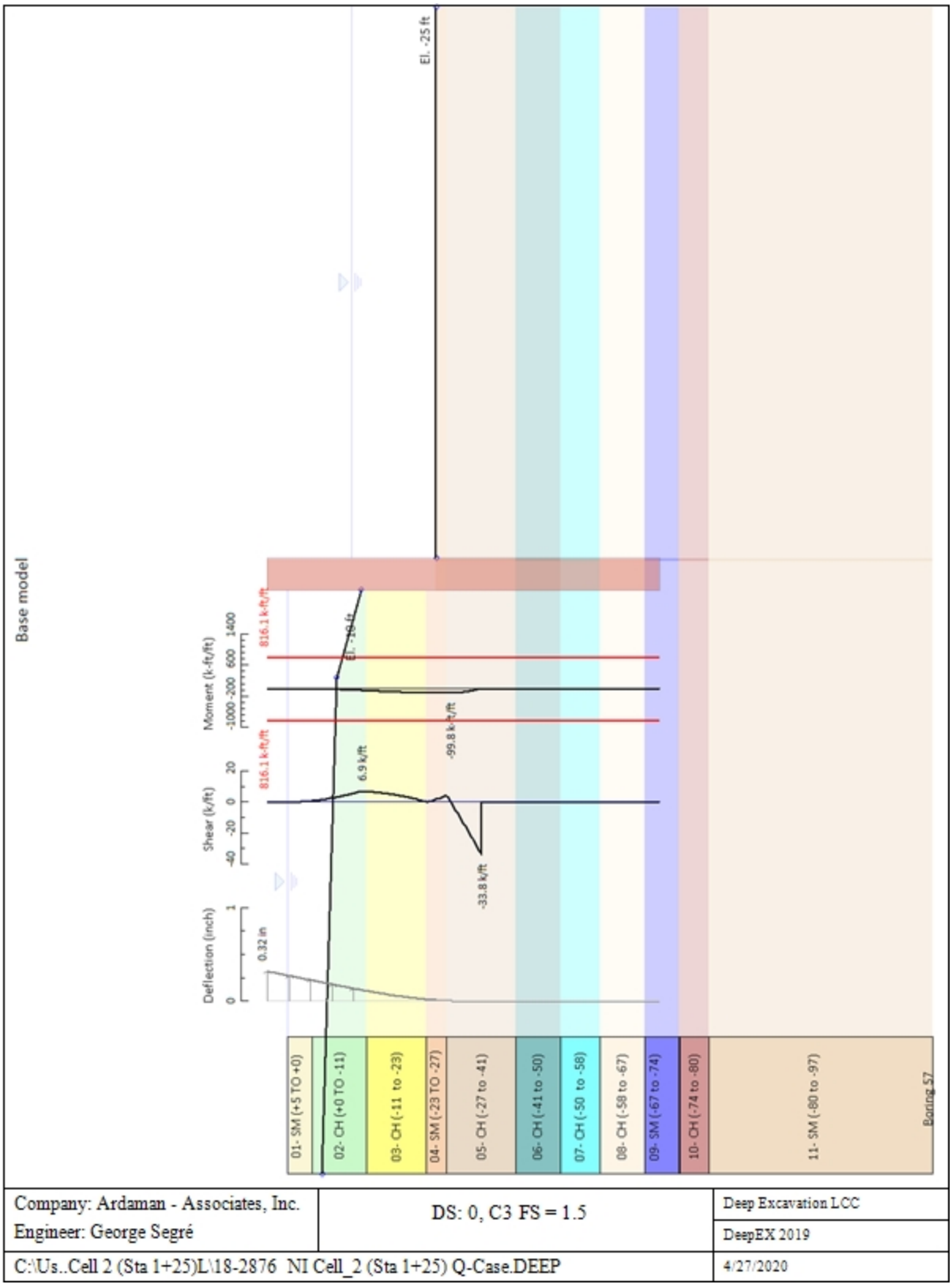
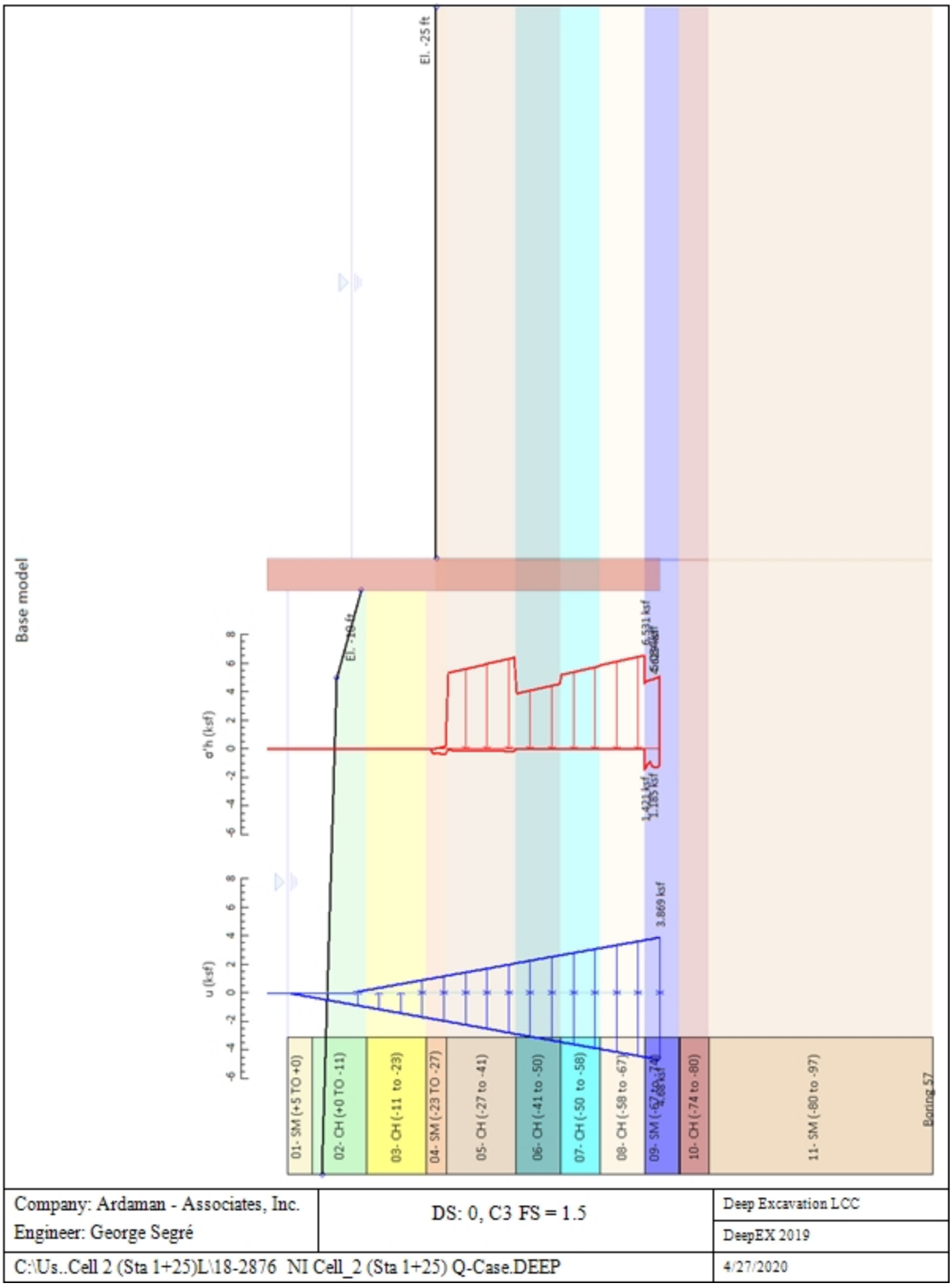
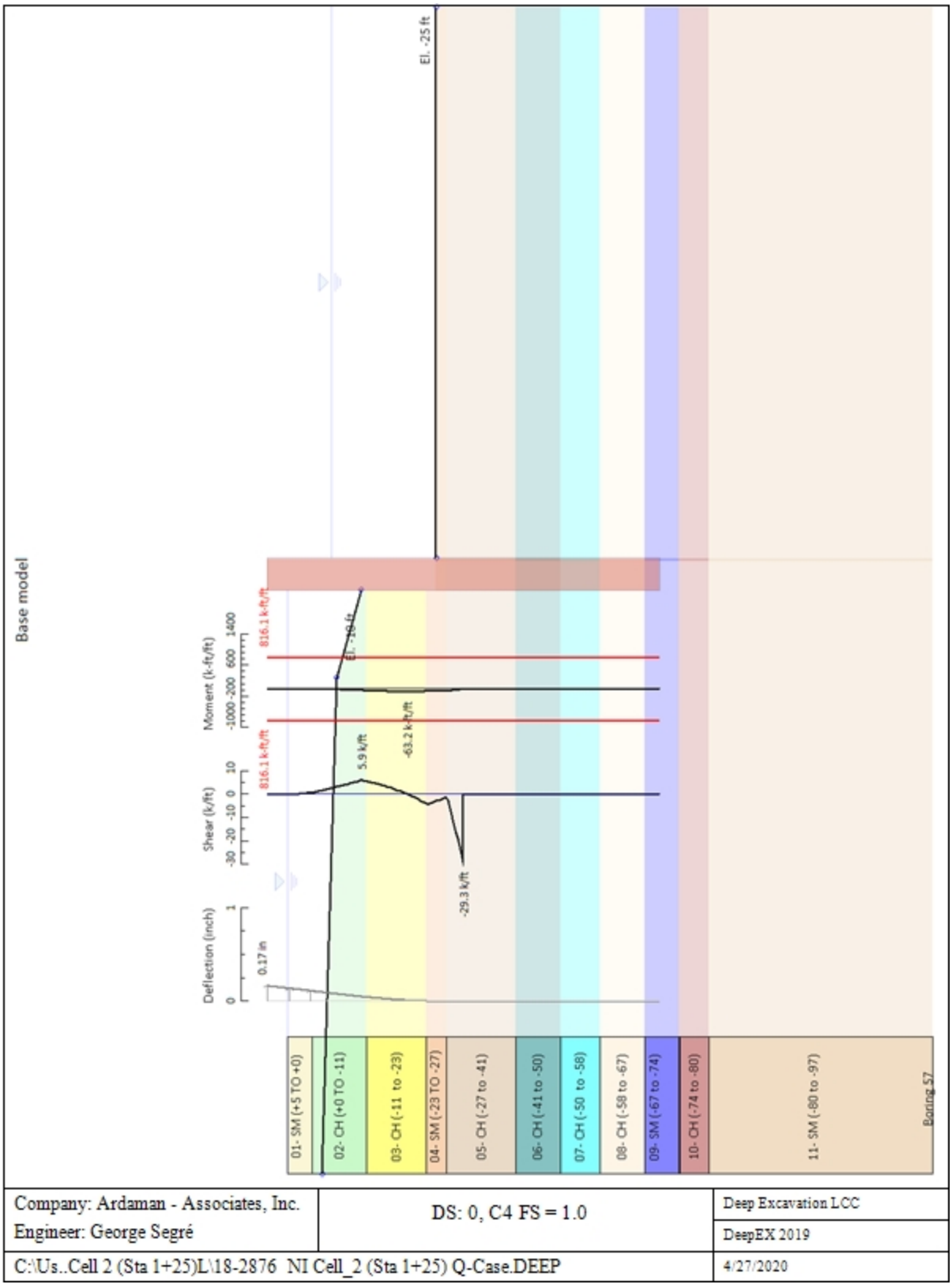

Base model
El. -25 ft
El. -16 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-50 -30 -10 10
6.9 k/ft
-99.2 k-ft/ft
-42.9 k/ft
Deflection (inch)
0 1
0.3 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
9.796 ksf
1.421 ksf
1.185 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020

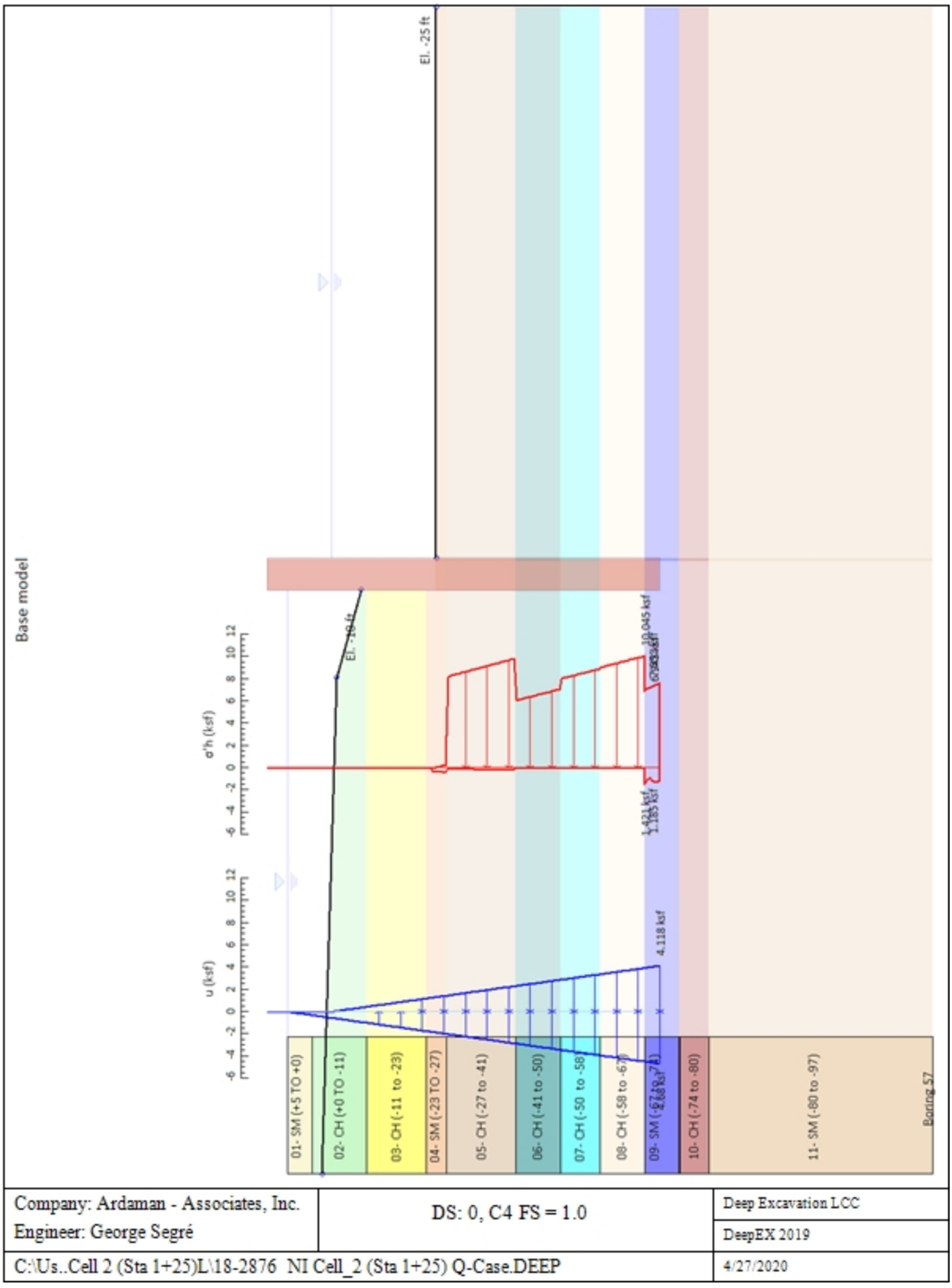


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP		4/27/2020


Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
6.531 ksf
1.421 ksf
1.185 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 TO -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP		4/27/2020


Base model
El. -25 ft
El. -58 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
10.045 ksf
1.421 ksf
1.185 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
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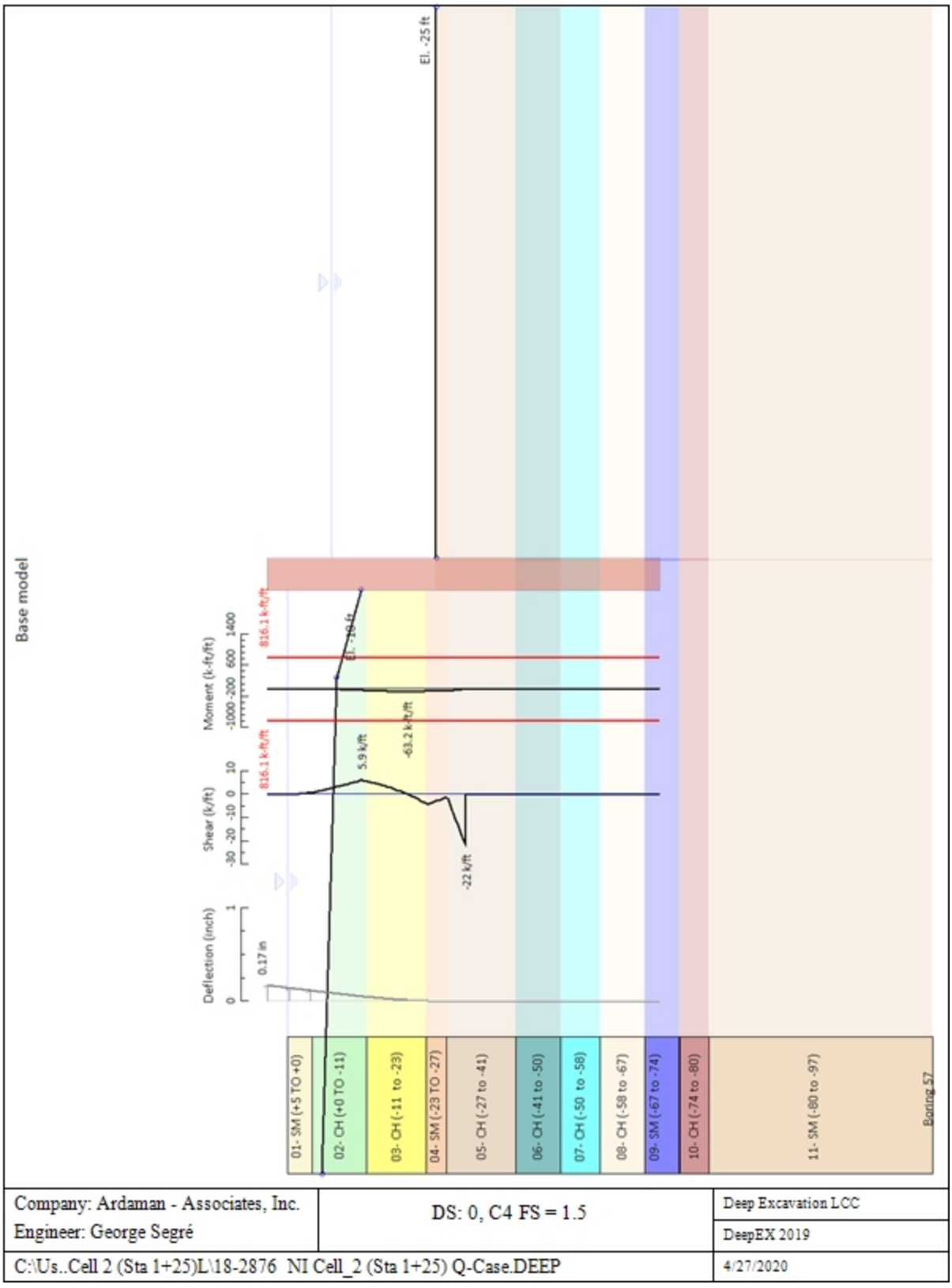
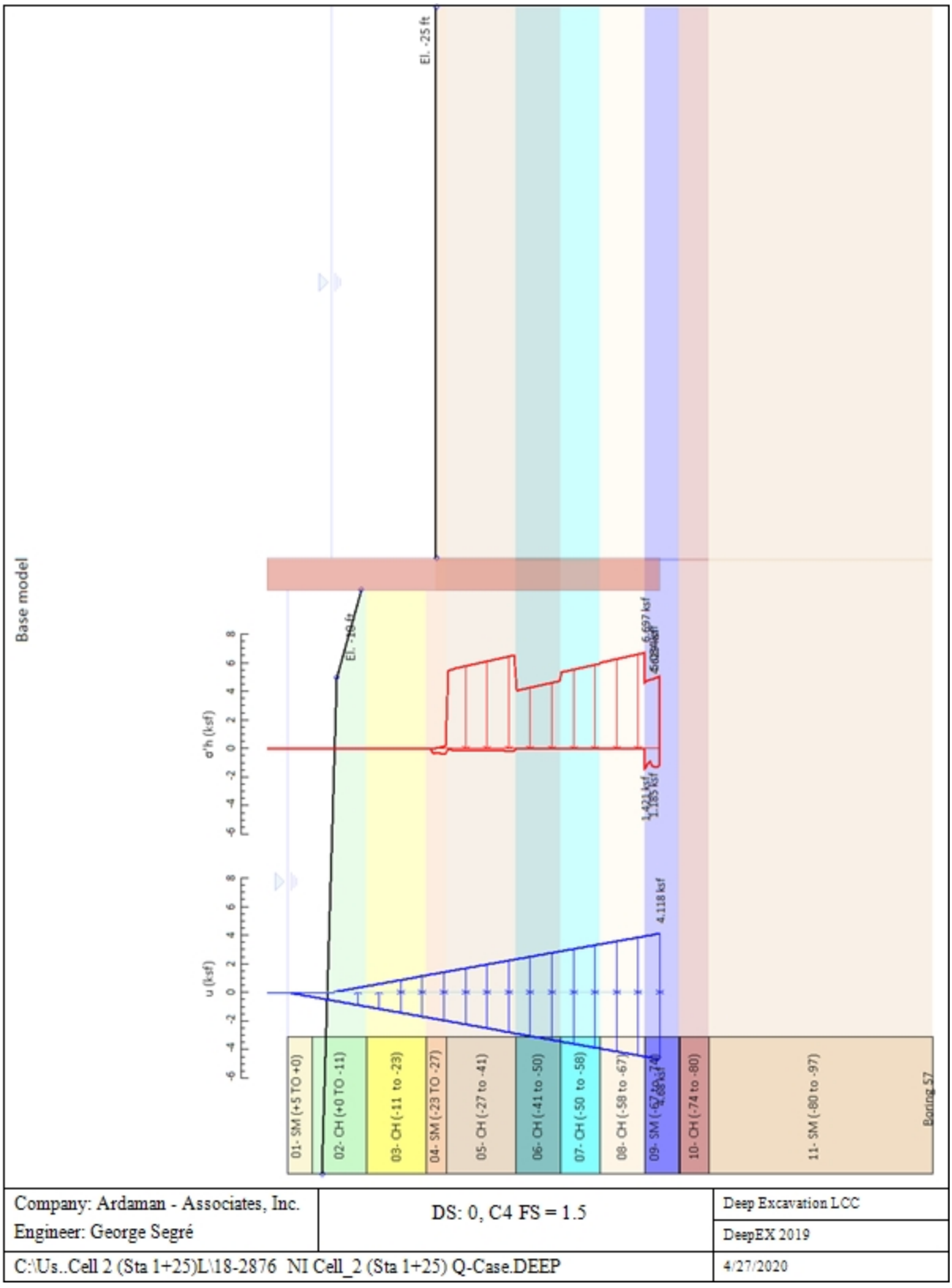

Base model
El. -25 ft
El. -16 ft
816.1 k-ft/ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
-63.2 k-ft/ft
5.9 k/ft
-22 k/ft
Shear (k/ft)
-30 -20 -10 0 10
Deflection (inch)
0 1
0.17 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) Q-Case.DEEP		4/27/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:13:45 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

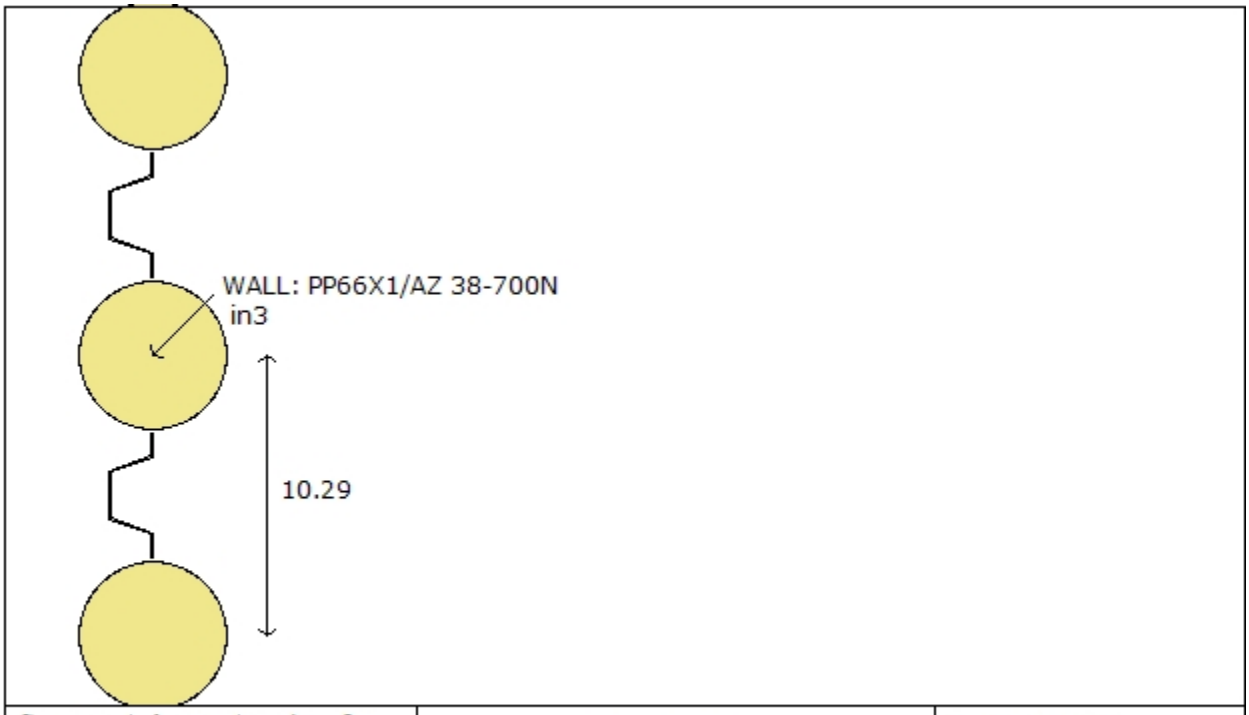
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -115 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.295	1.295	1.751
Stage 1	Simple span	N/A	1.6	1.139	1.139	1.519
Stage 2	Simple span	N/A	1.6	1.355	1.355	1.796
Stage 3	Simple span	N/A	1.6	1.2	1.2	1.564
Stage 4	Simple span	N/A	1.6	1.4	1.4	1.844
Stage 5	Simple span	N/A	1.6	1.12	1.12	1.437
Stage 6	Simple span	N/A	1.6	1.466	1.466	1.891
Stage 7	Simple span	N/A	1.6	1.185	1.185	1.484

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

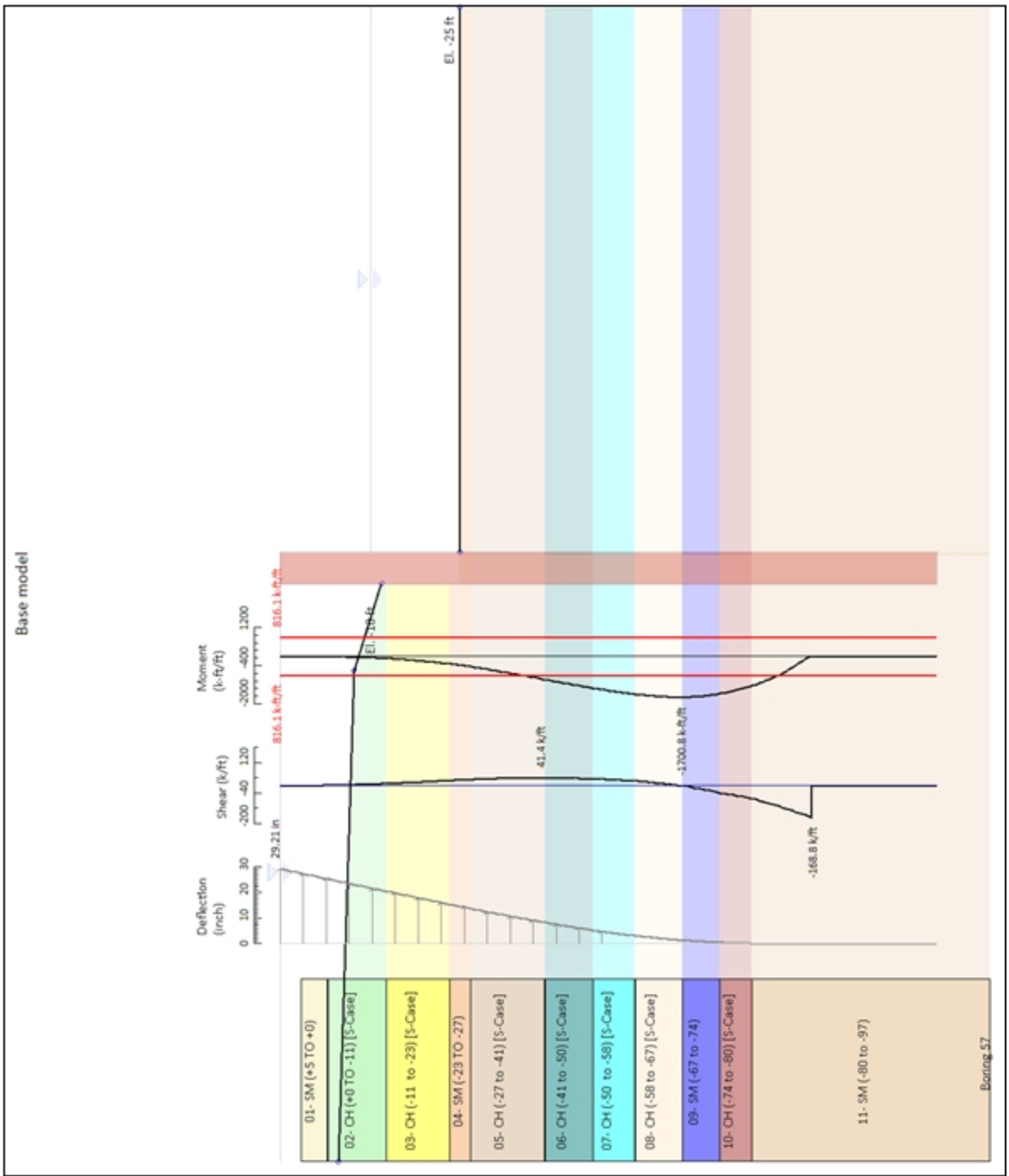
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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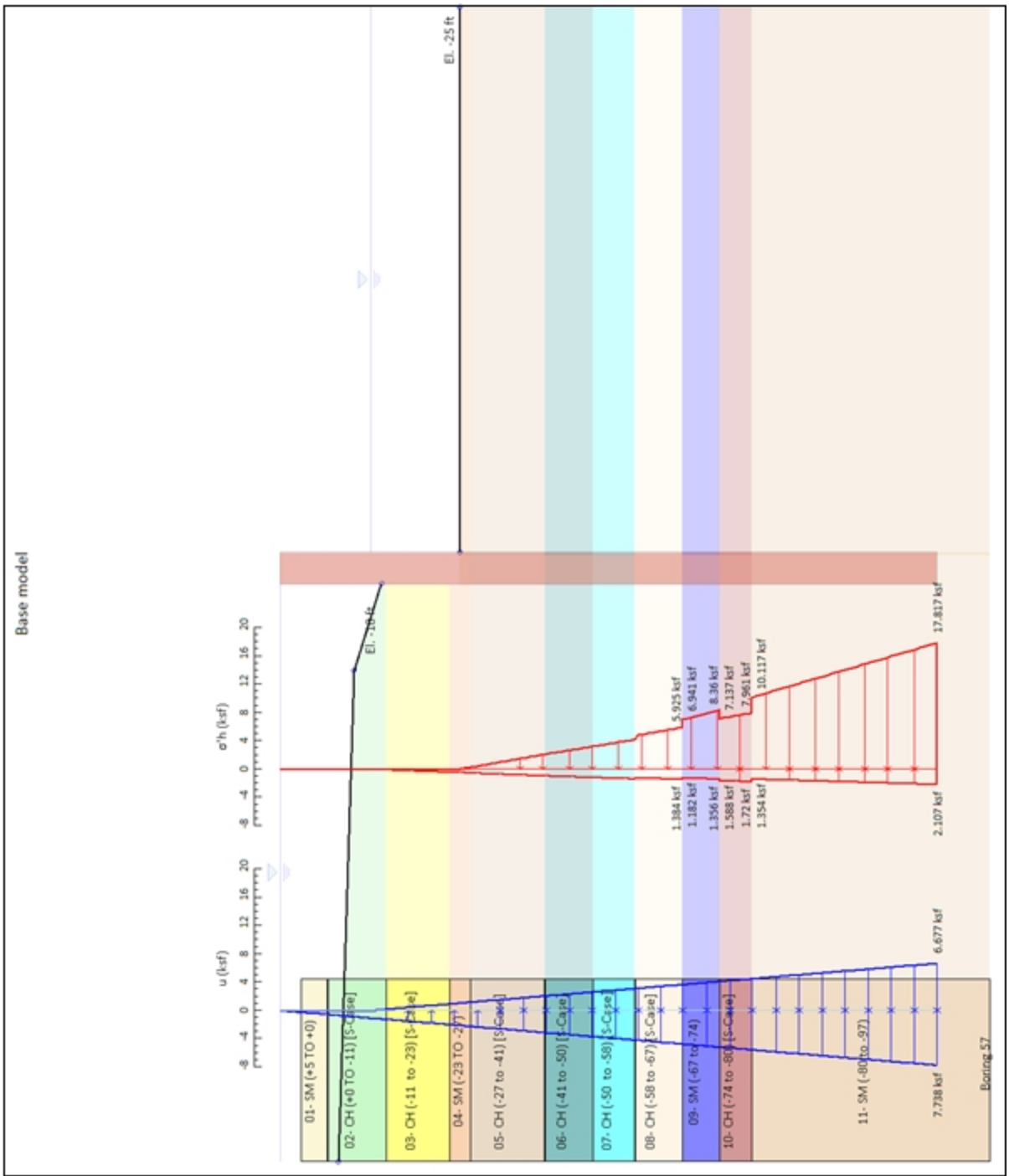

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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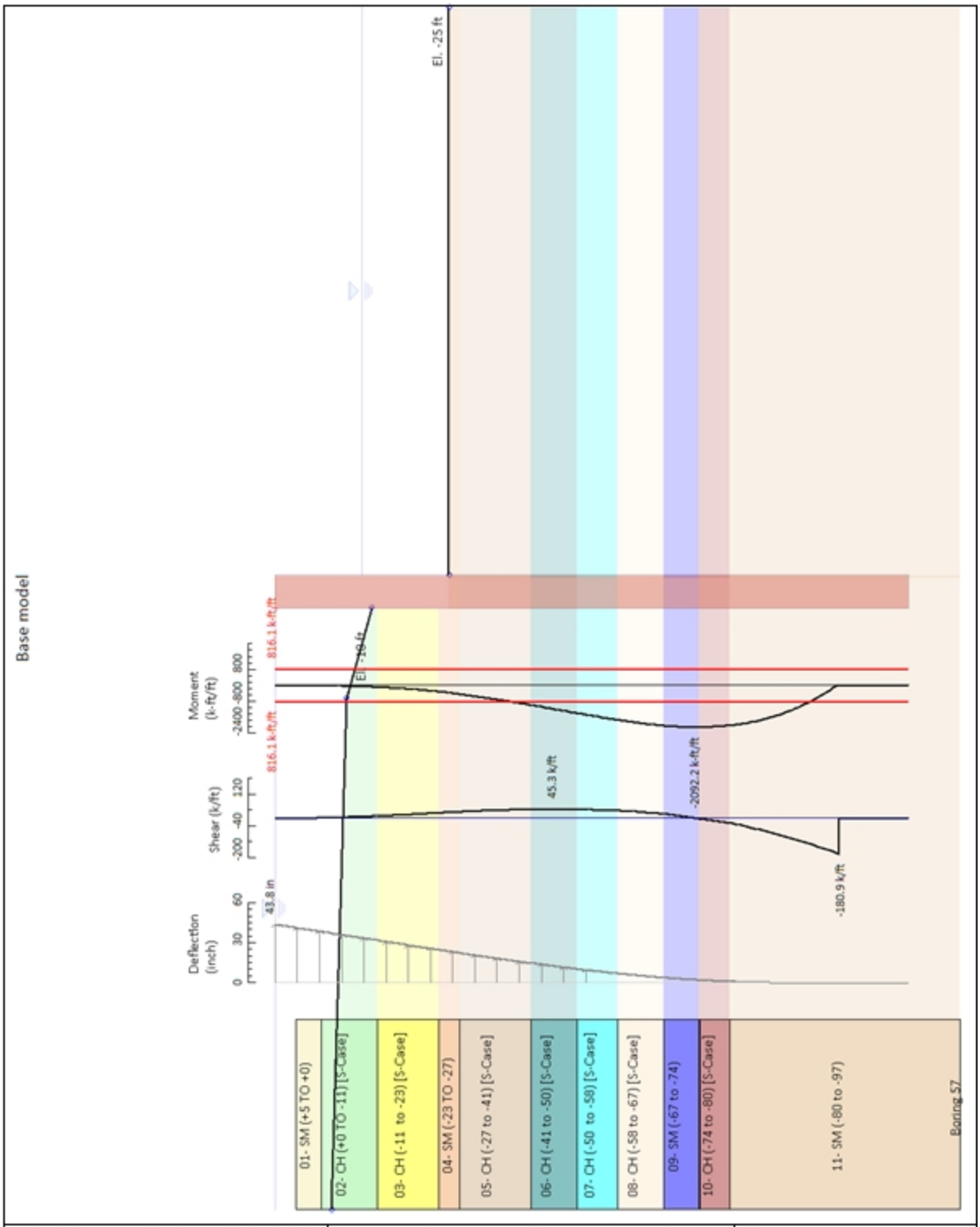

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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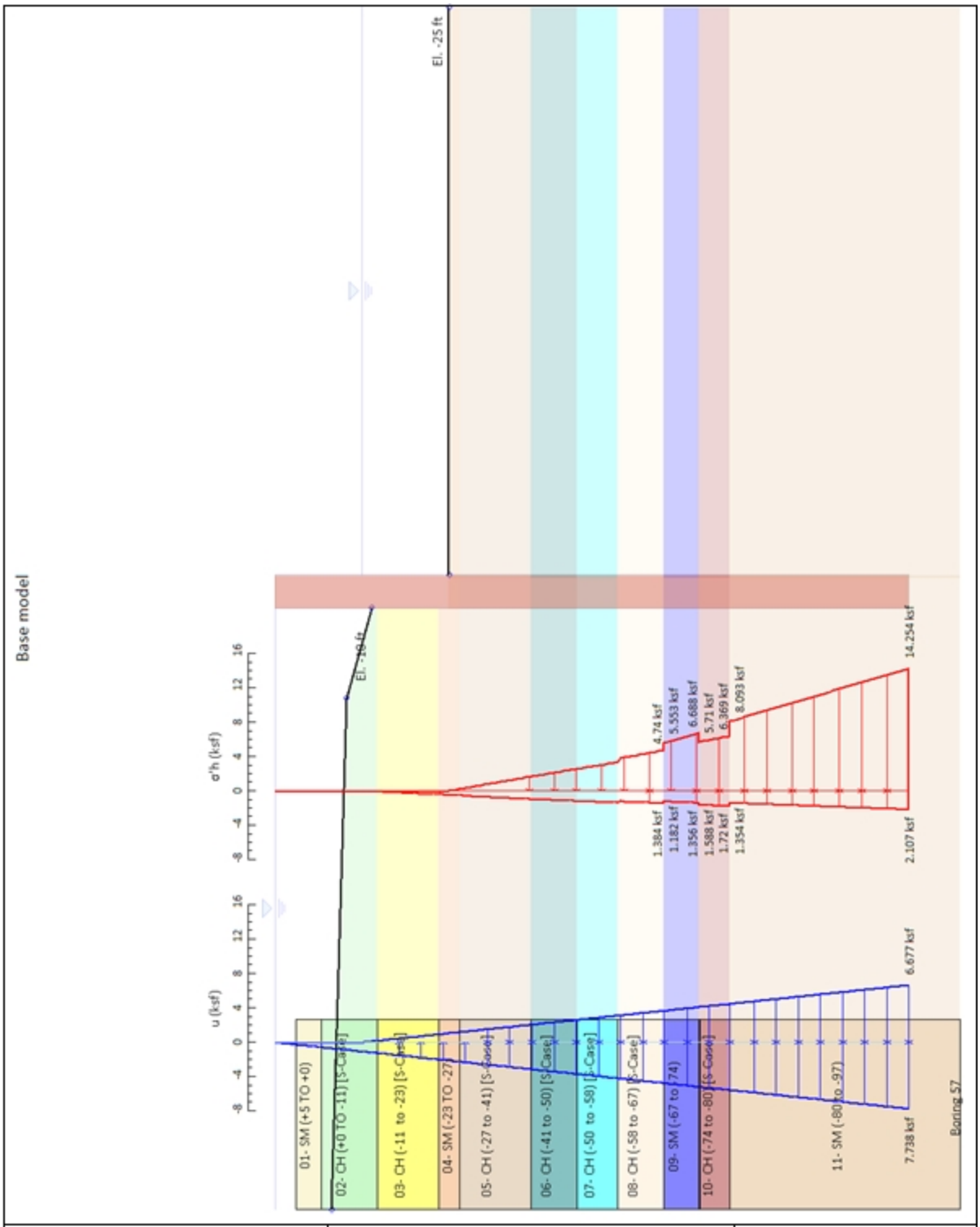
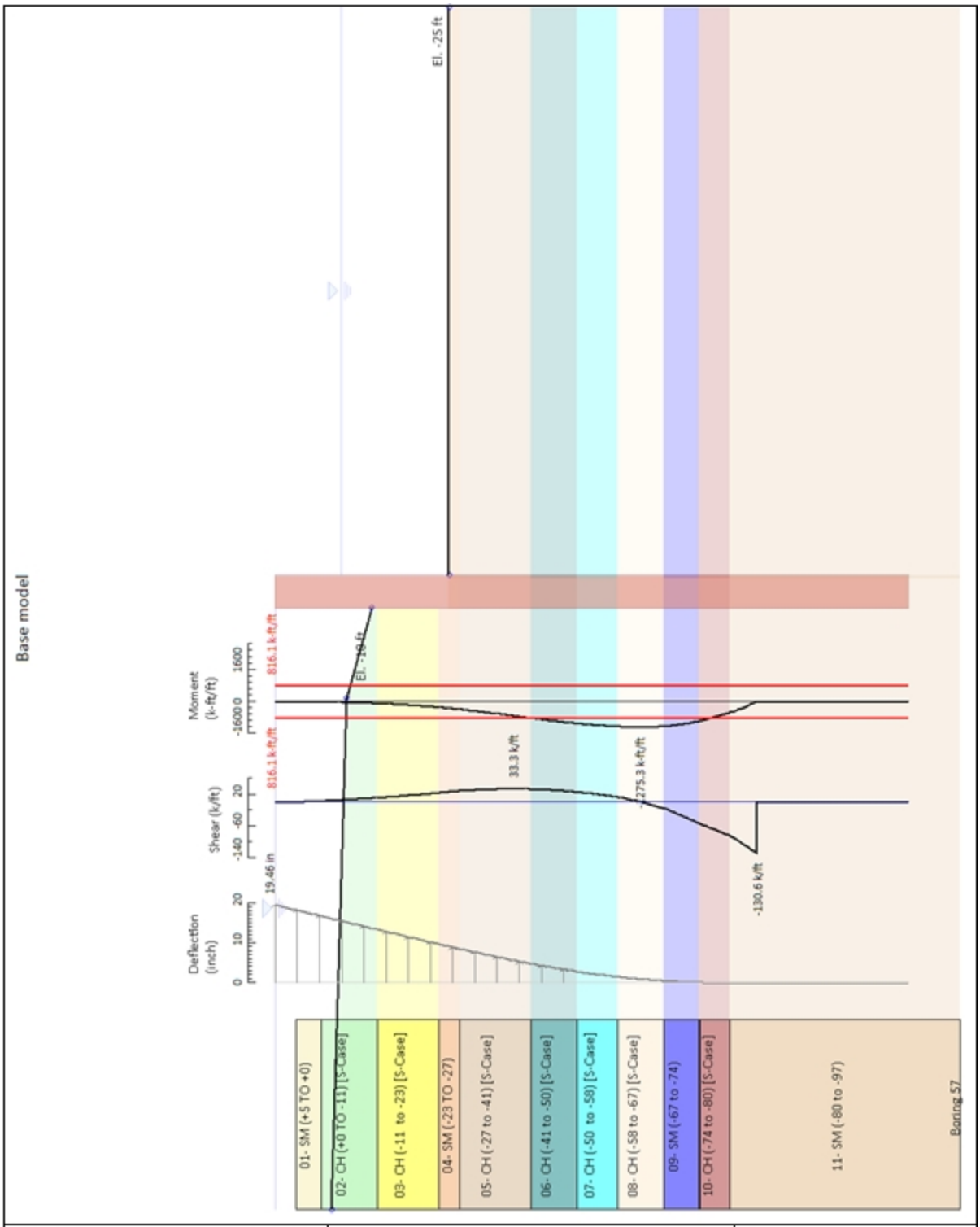
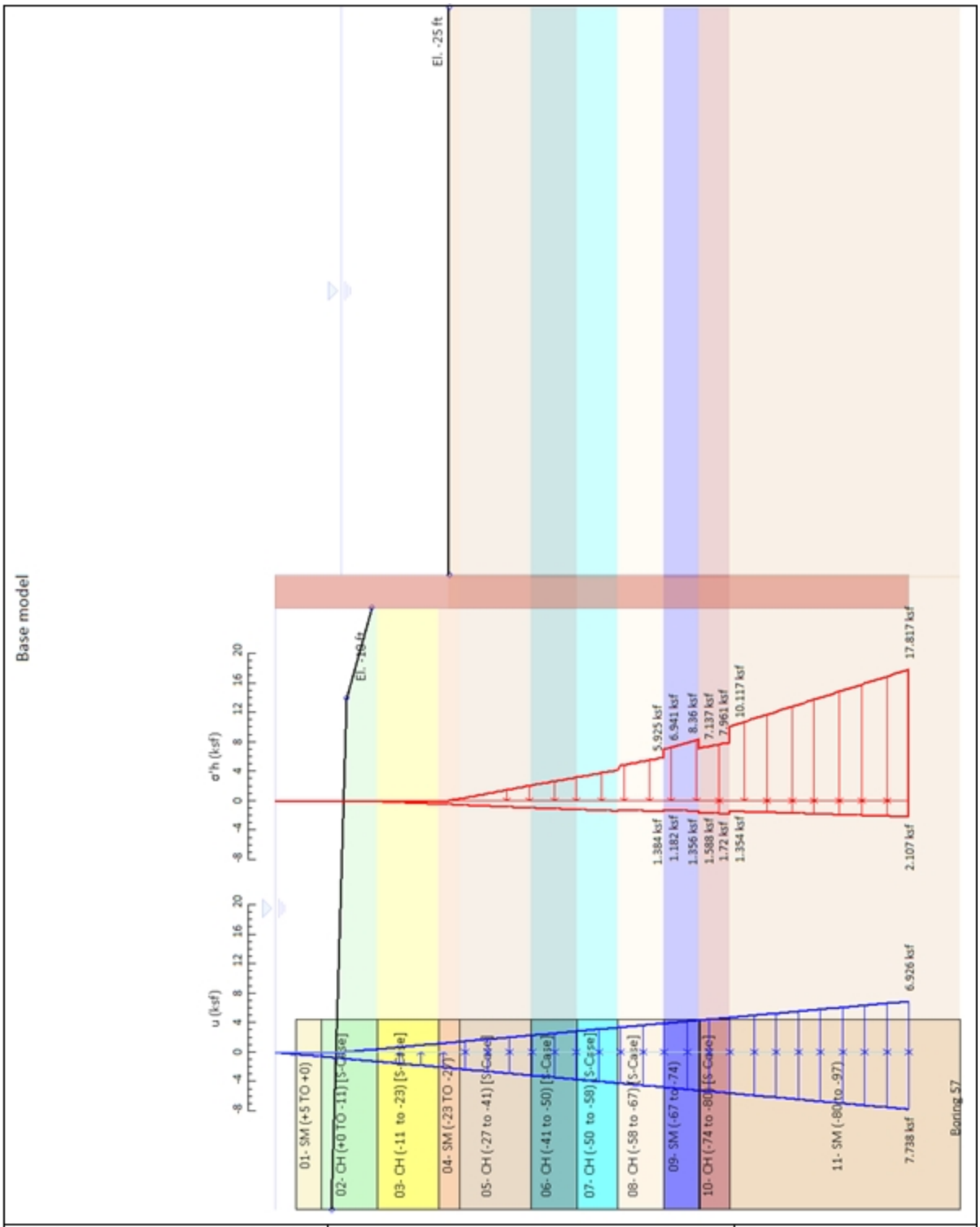


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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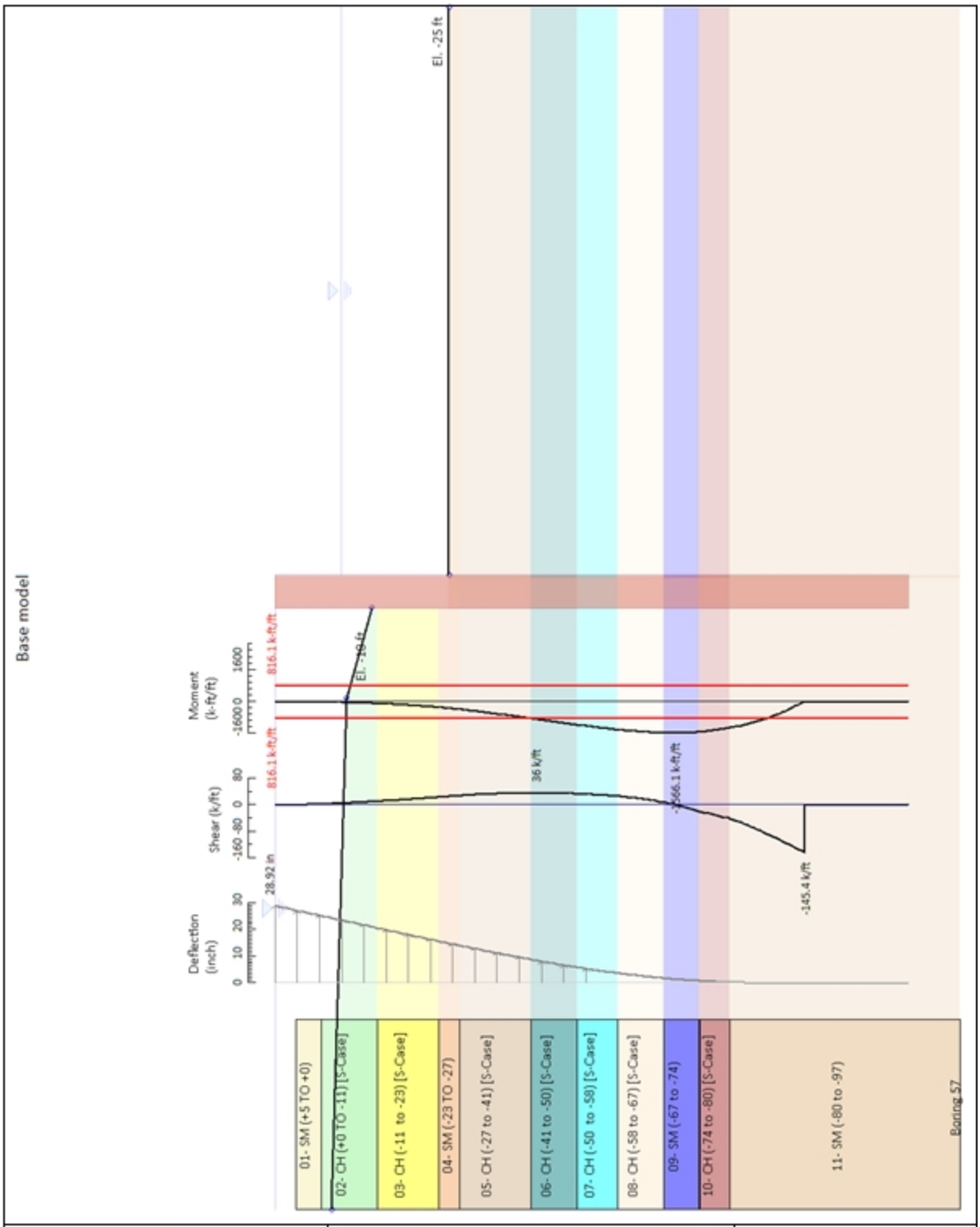

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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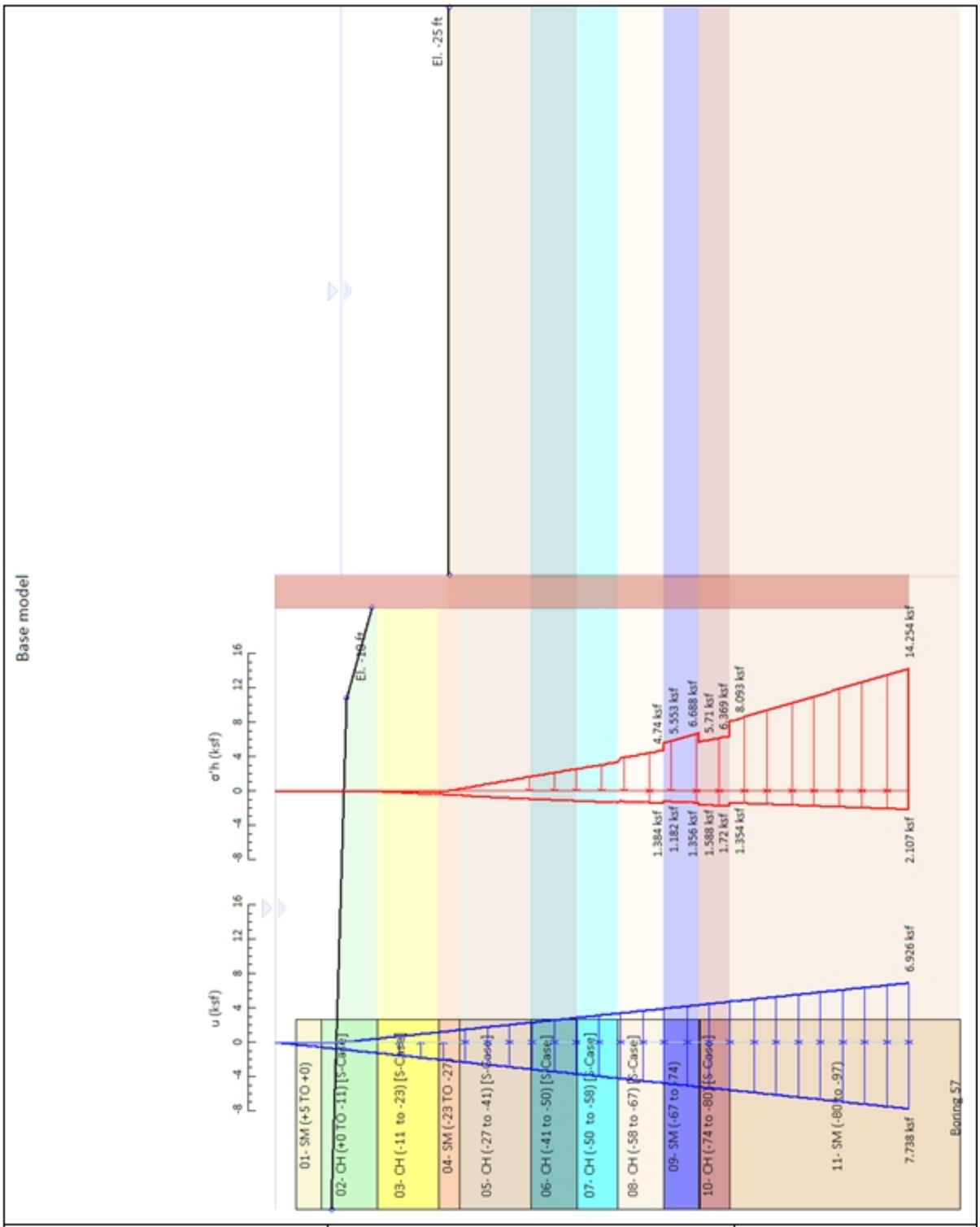
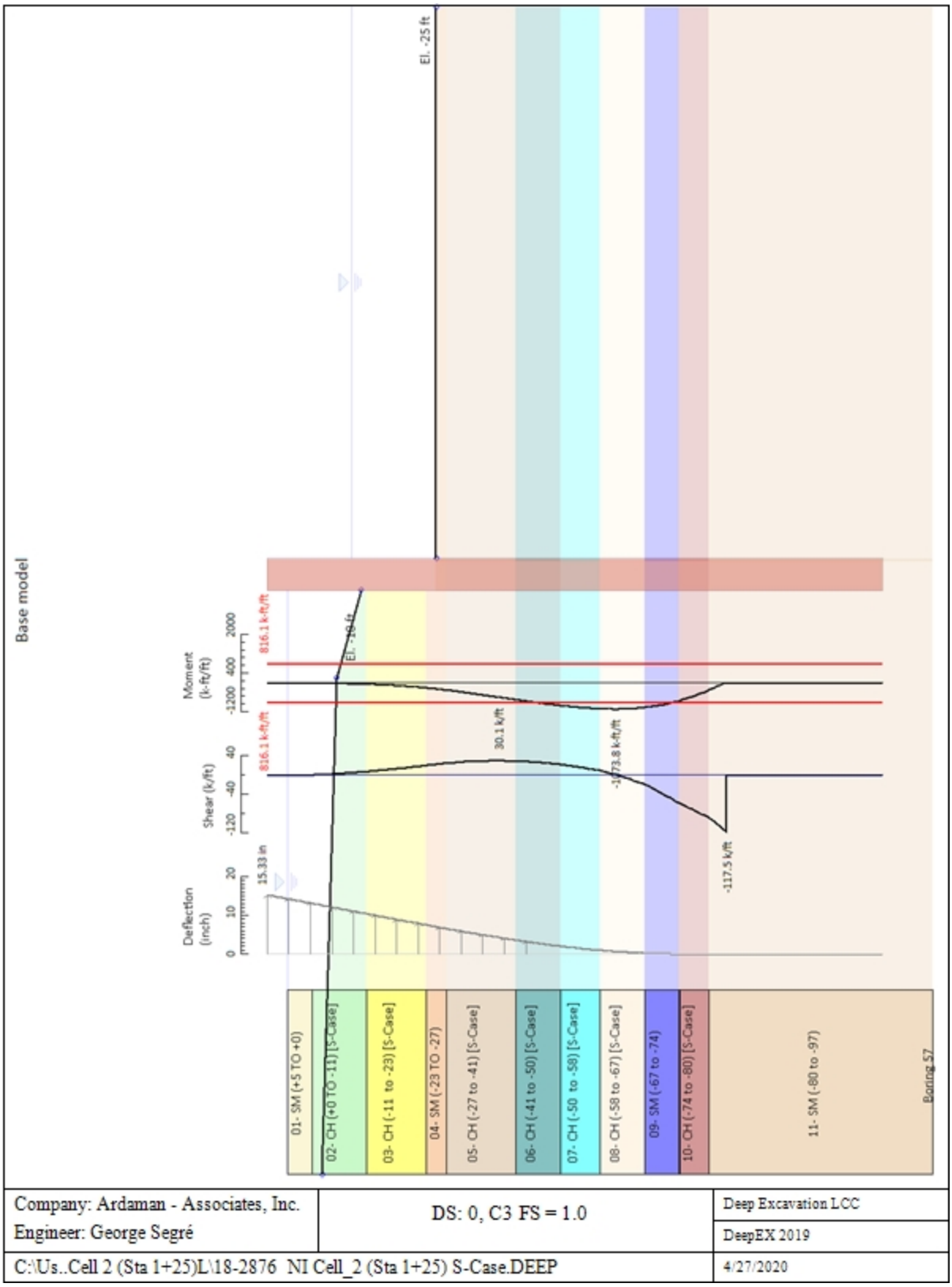


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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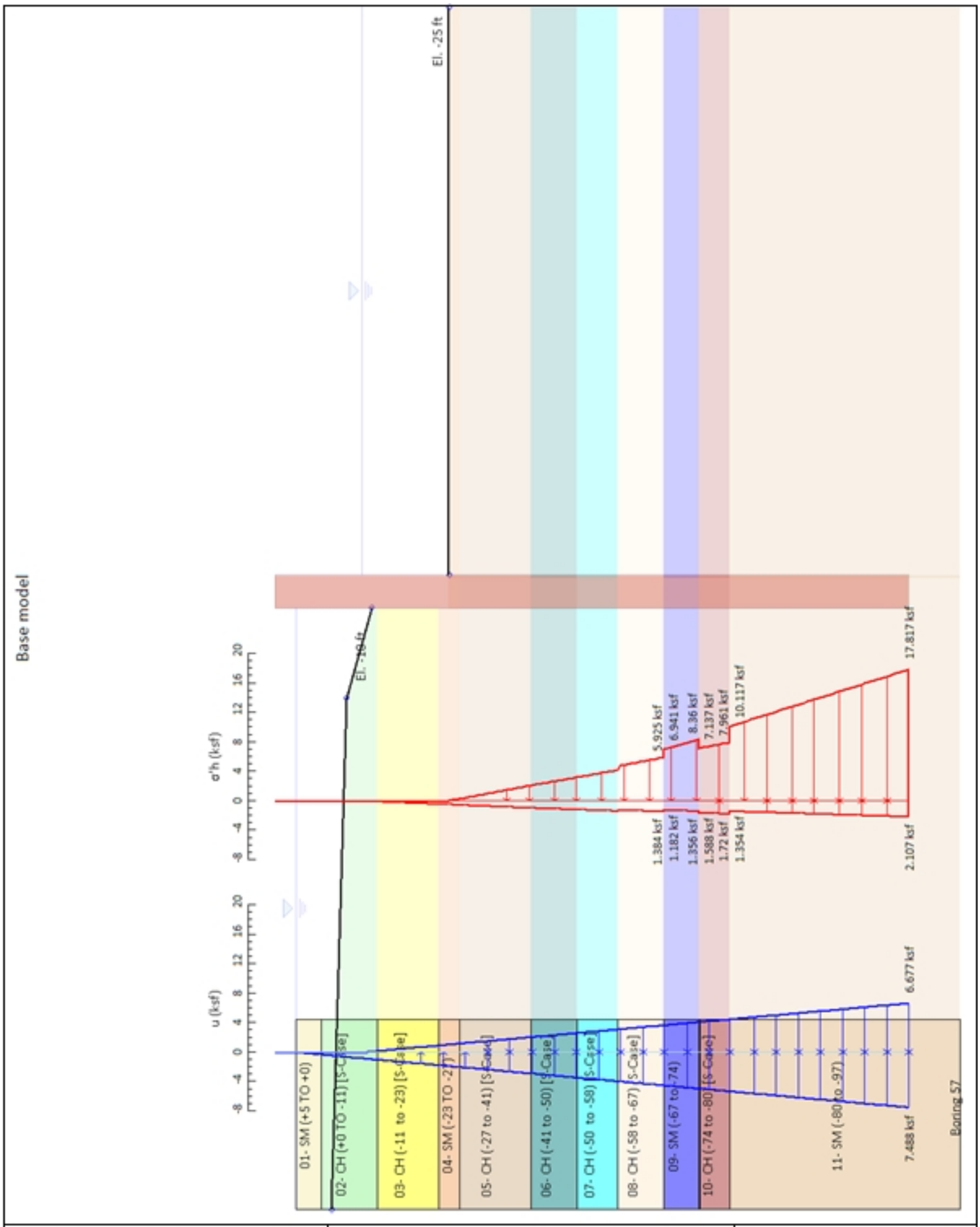
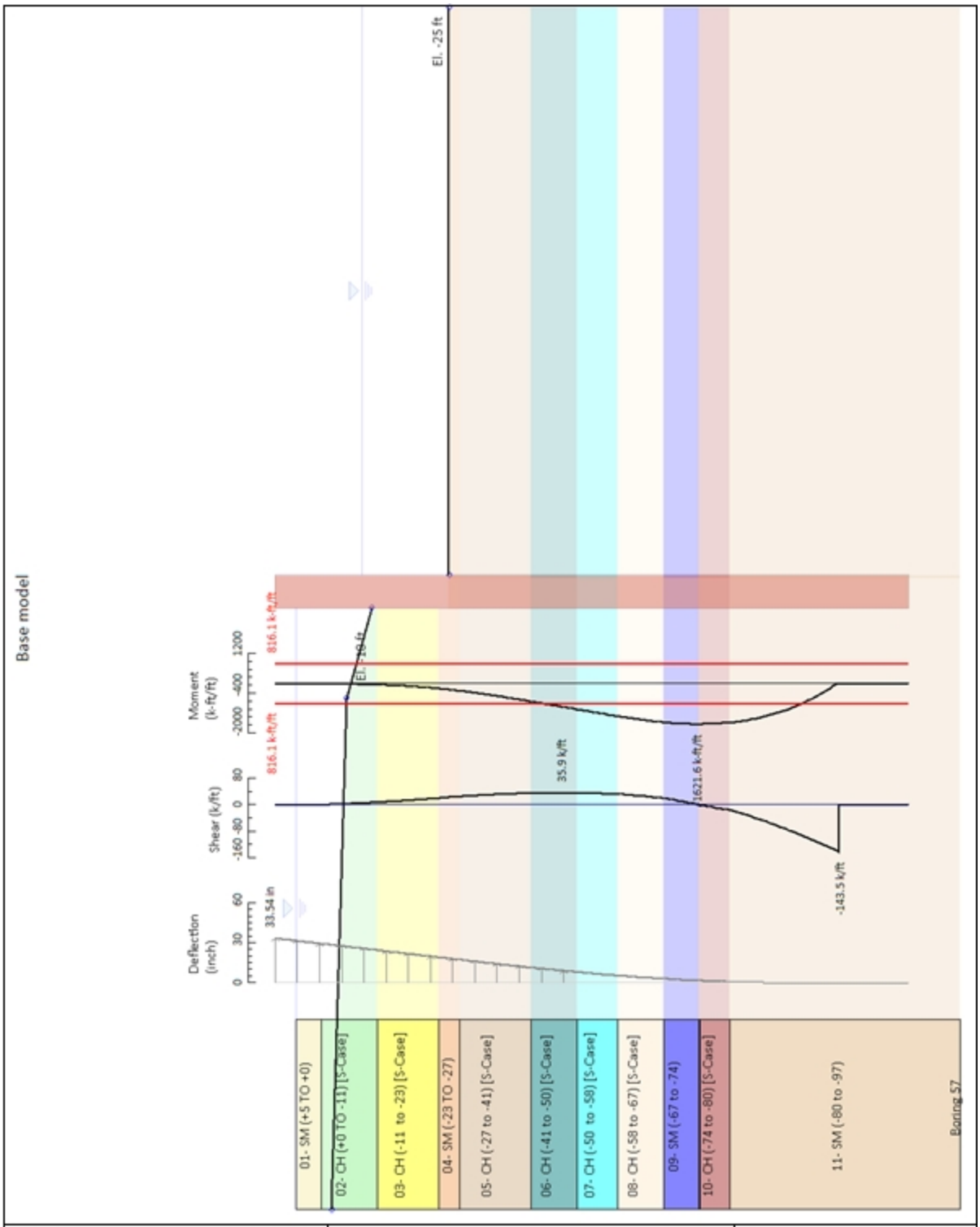


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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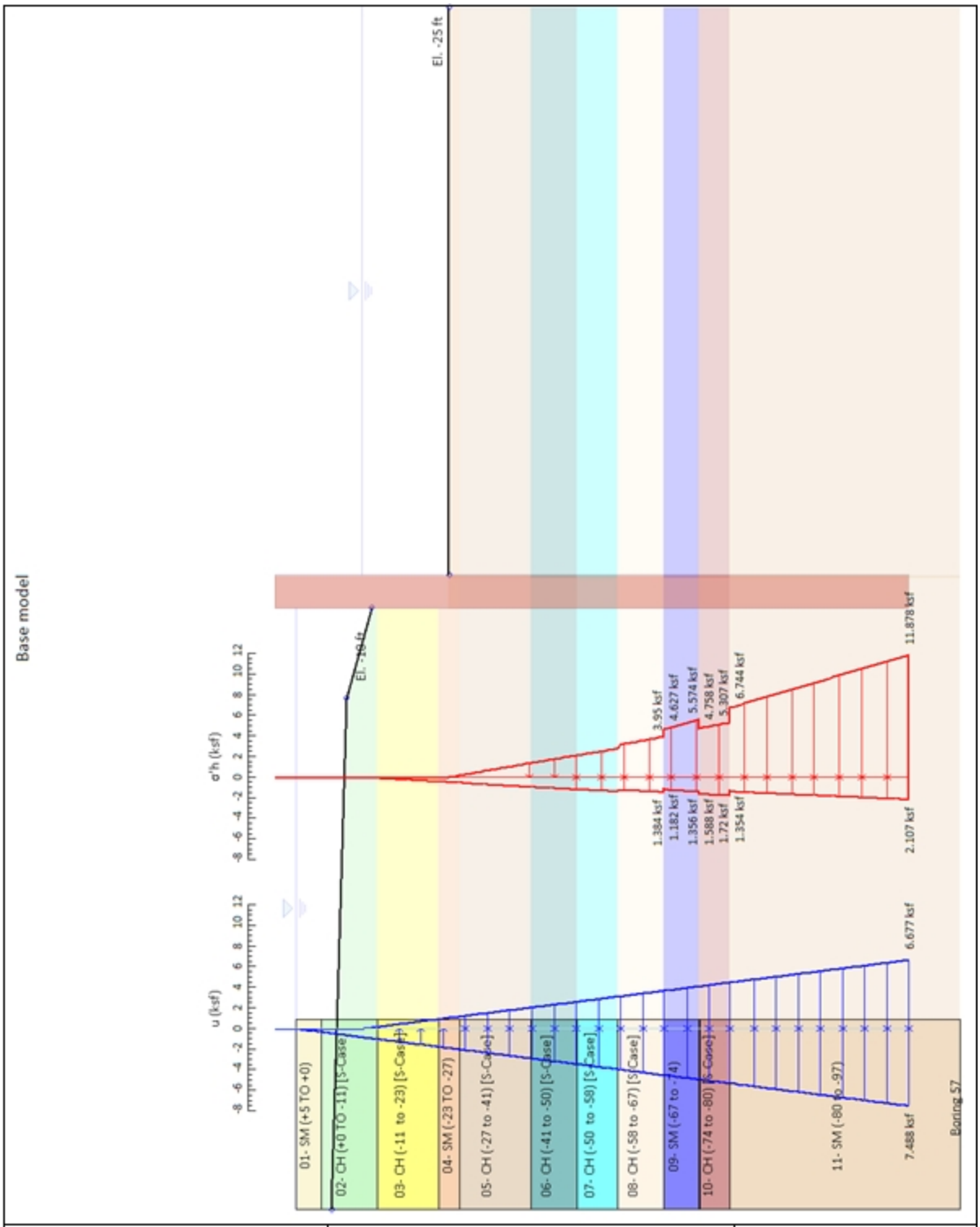

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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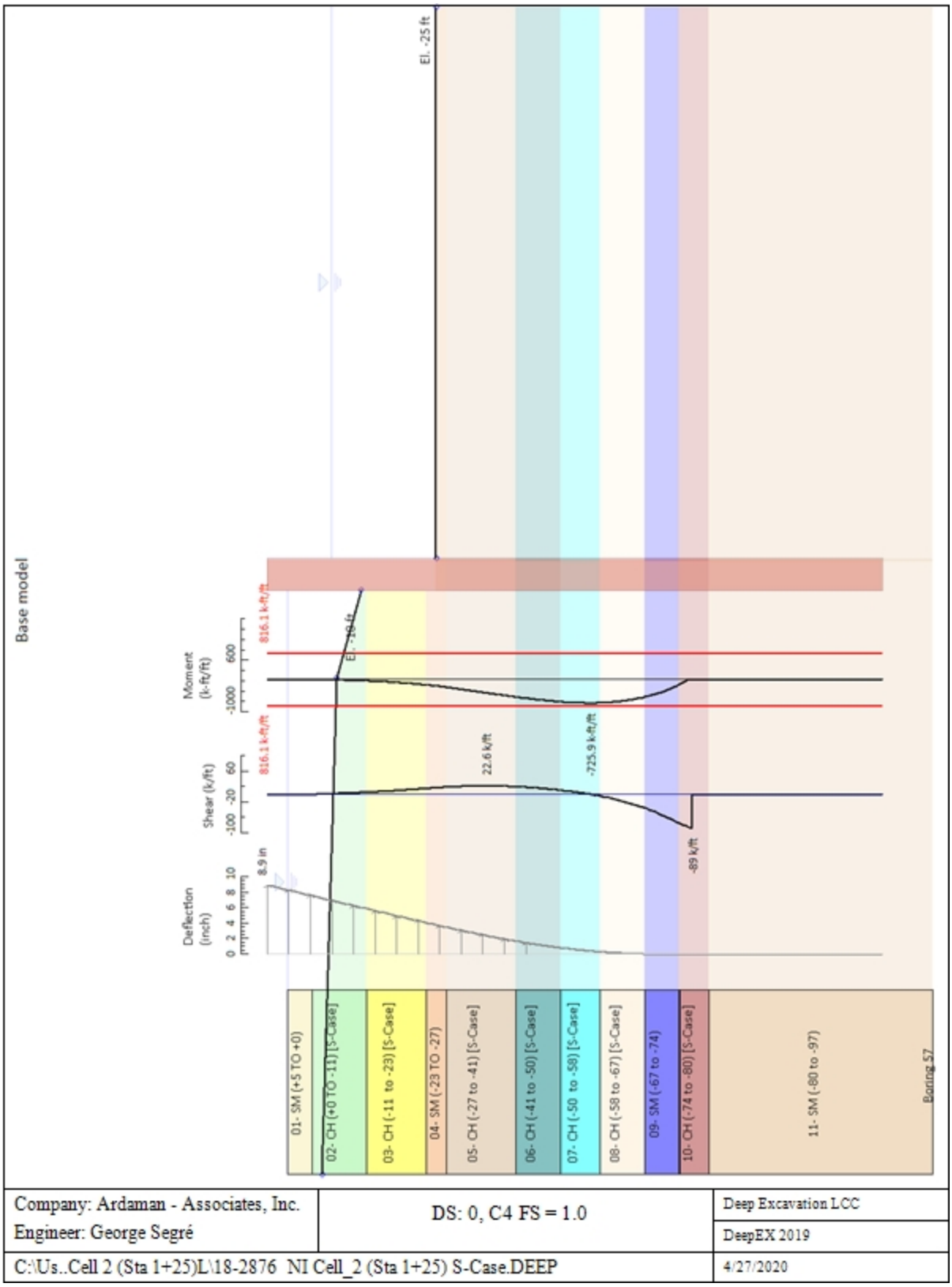

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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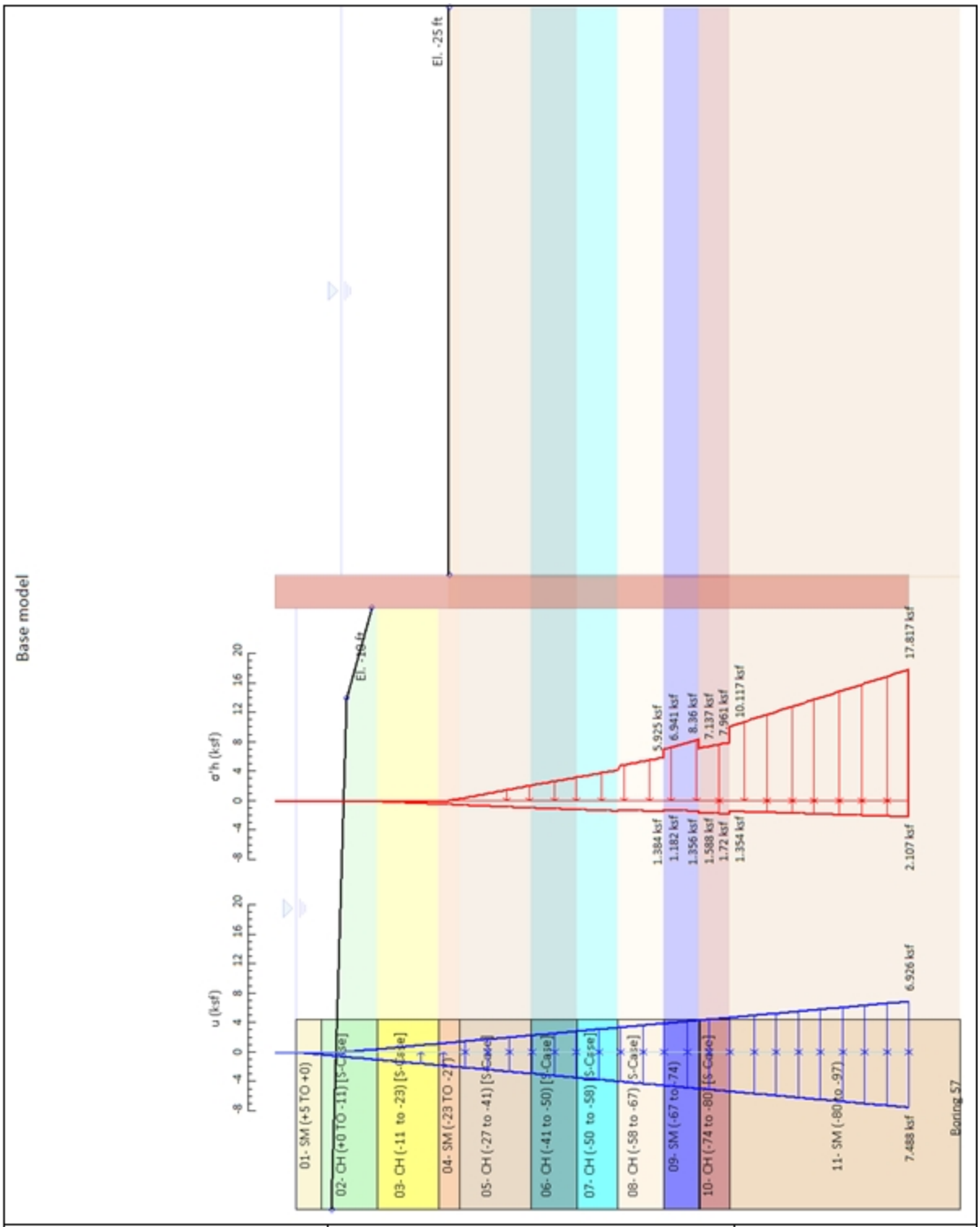

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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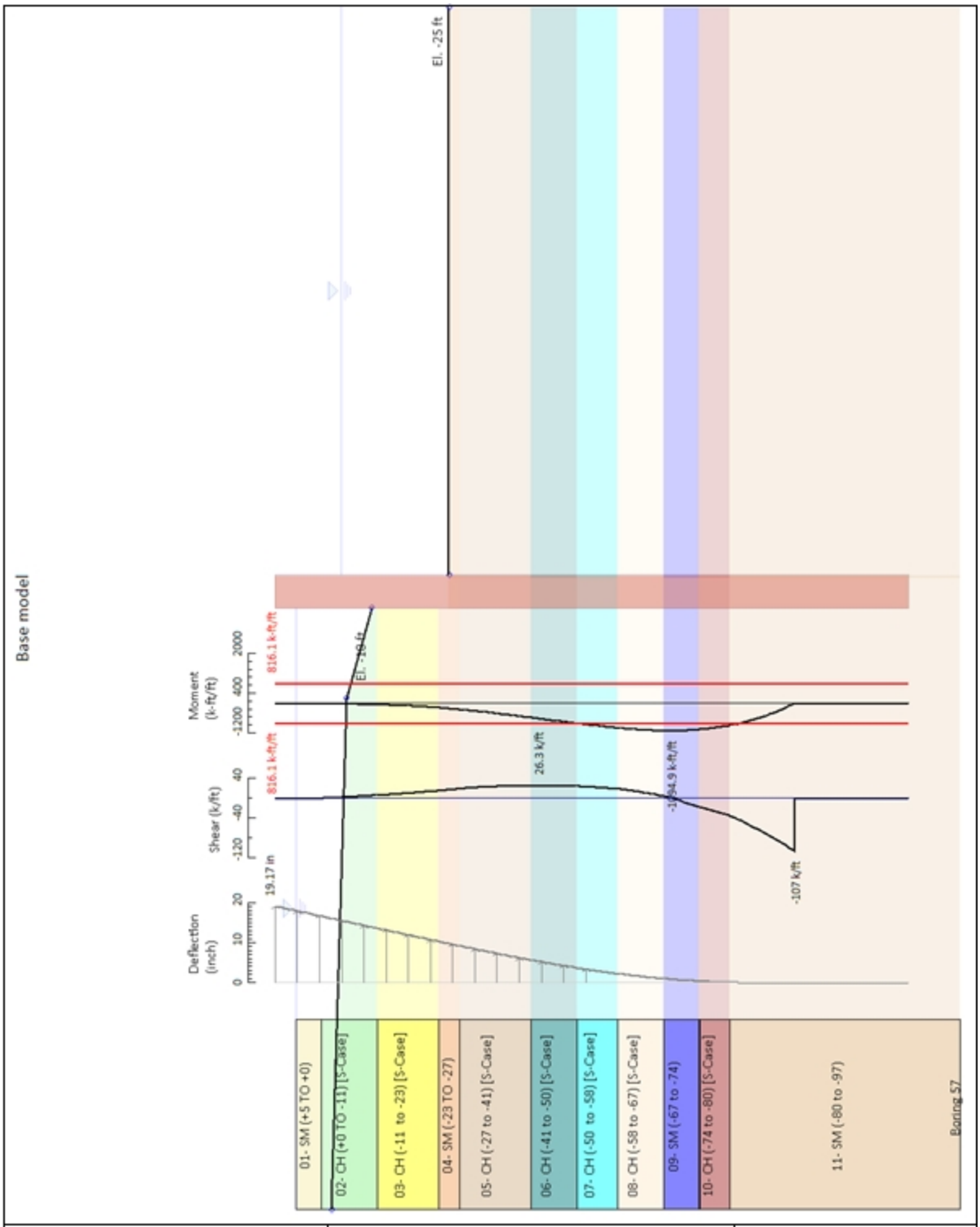
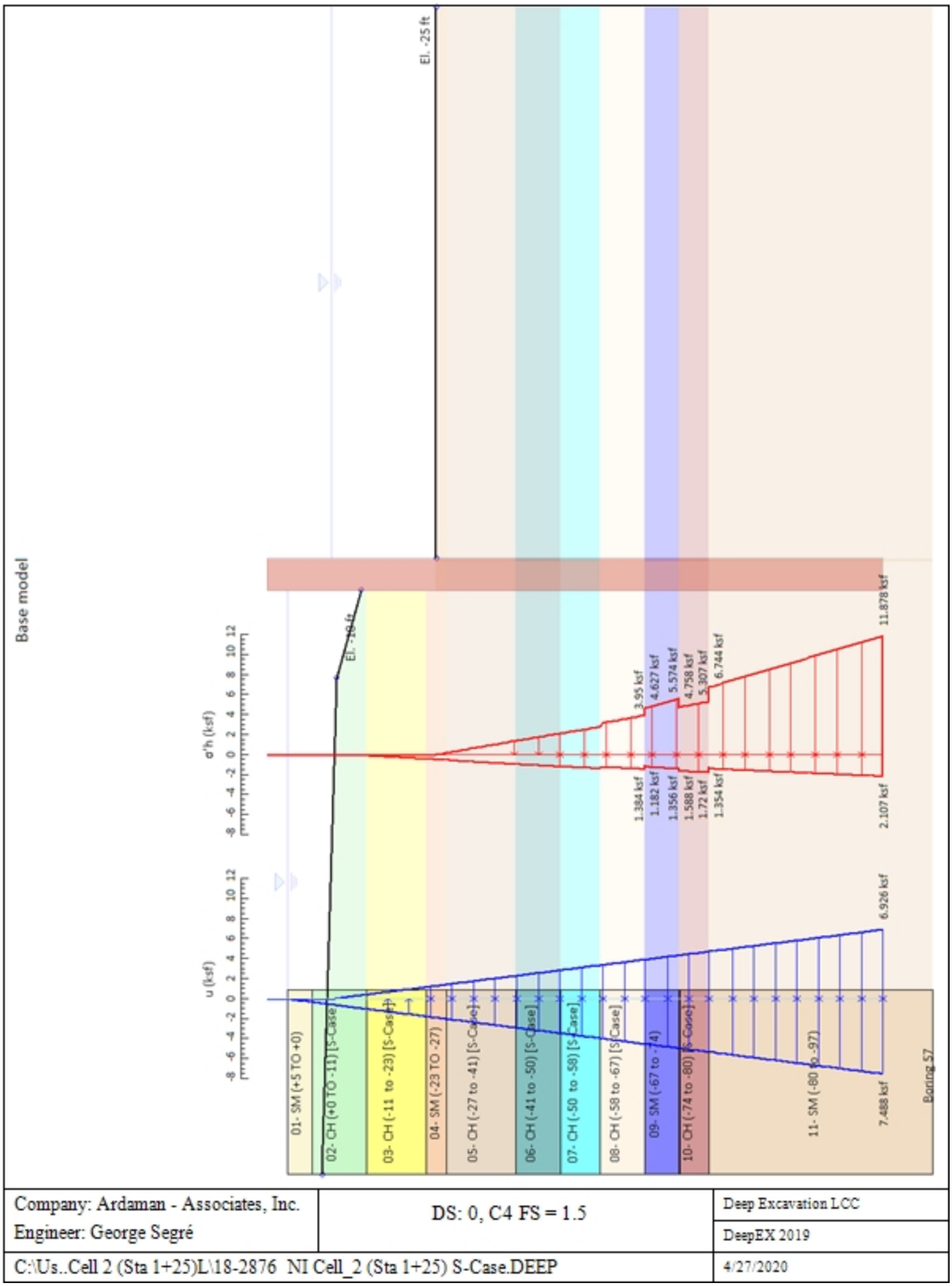


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..Cell 2 (Sta 1+25)L\18-2876 NI Cell_2 (Sta 1+25) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+25 Right Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -85.86 ft., NAVD88

Length of Sheetting = 94.86 ft.

Use = 95.0 ft.

Design Tip Elev. = -86.0 ft., NAVD88

Design Length of Sheeting = 95.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-24.97	64.06	13.82	0.11
		Open excavation - degraded	9	-8	1.00	1.25	-28.13	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-22.20	50.70	15.79	0.08
		Open excavation - degraded	9	-4	1.00	1.25	-23.78	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-19.44	17.82	7.39	0.02
		Open excavation - degraded	5	-8	1.00	1.50	-20.23	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-17.07	9.56	7.18	0.01
		Open excavation - degraded	5	-4	1.00	1.50	-17.46	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-75.32	951.97	108.78	11.83
		Open excavation - degraded	9	-8	1.00	1.25	-85.86	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-69.12	709.50	82.32	7.58
		Open excavation - degraded	9	-4	1.00	1.25	-79.04	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-66.02	555.89	66.53	5.35
		Open excavation - degraded	5	-8	1.00	1.50	-85.86	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-59.20	379.06	48.93	2.96
		Open excavation - degraded	5	-4	1.00	1.50	-76.56	--	--	--
						Governing Value:	-85.86	951.97	108.78	11.83

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:18:49 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

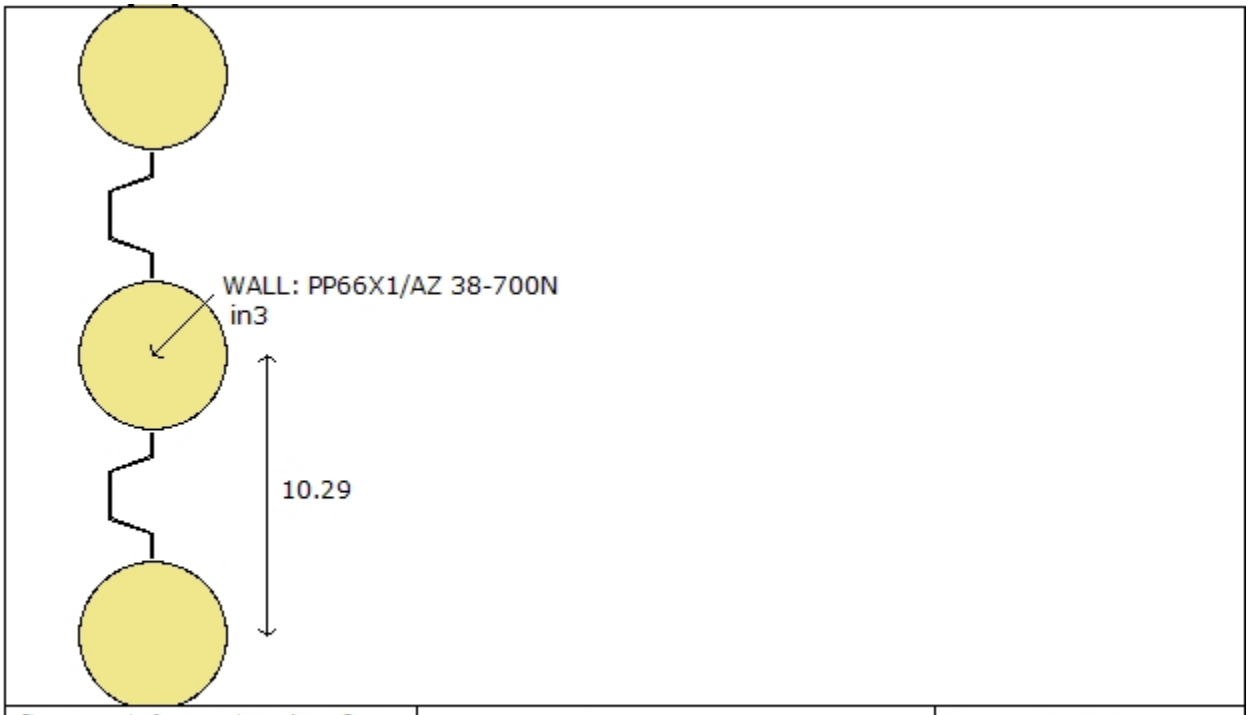
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	3.201	3.754	3.201
Stage 1	Simple span	N/A	1.6	2.588	3.026	2.588
Stage 2	Simple span	N/A	1.6	3.323	3.953	3.323
Stage 3	Simple span	N/A	1.6	2.692	3.2	2.692
Stage 4	Simple span	N/A	1.6	3.577	4.631	3.577
Stage 5	Simple span	N/A	1.6	2.435	3.134	2.435
Stage 6	Simple span	N/A	1.6	3.714	4.877	3.714
Stage 7	Simple span	N/A	1.6	2.538	3.328	2.538

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

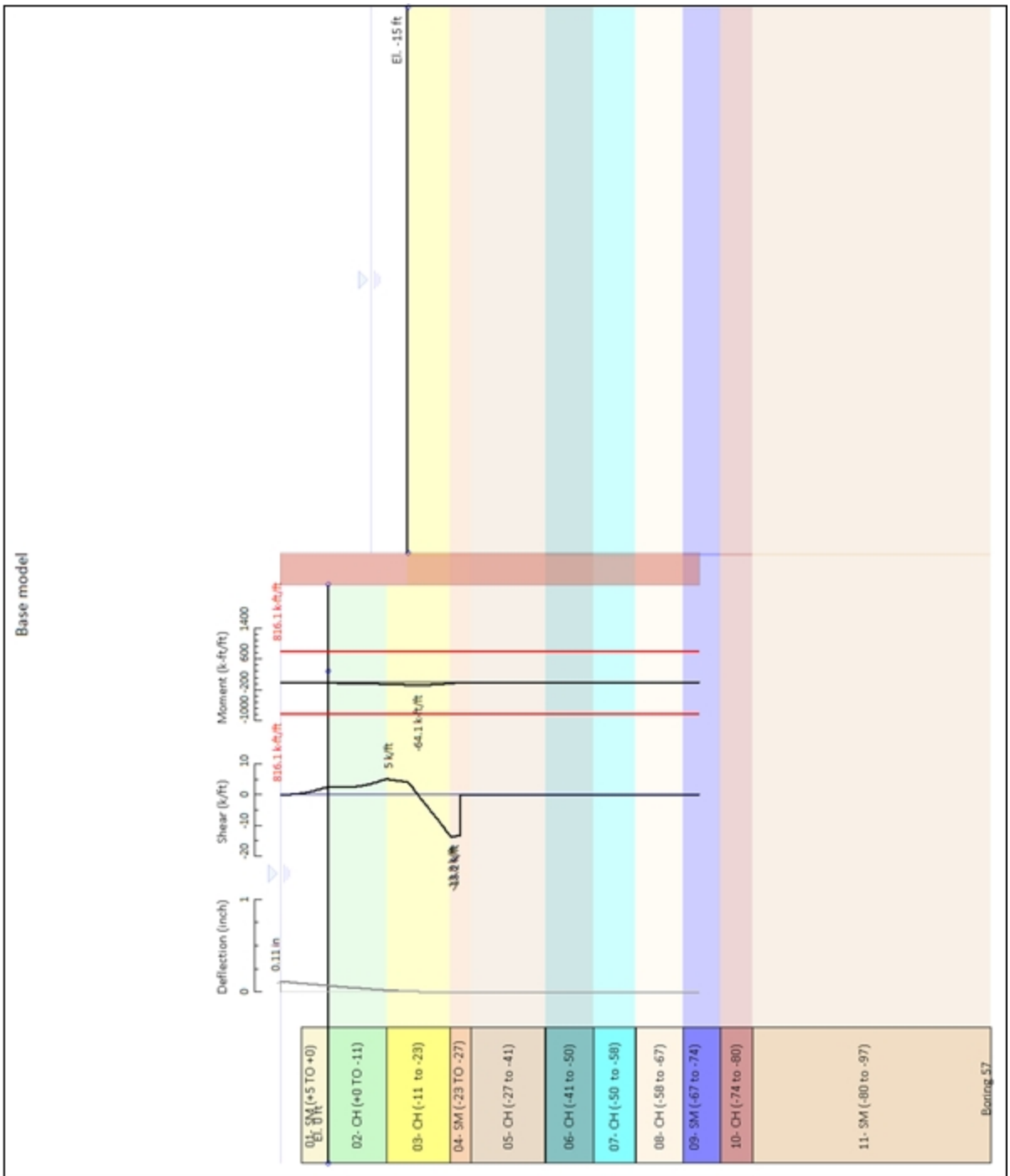
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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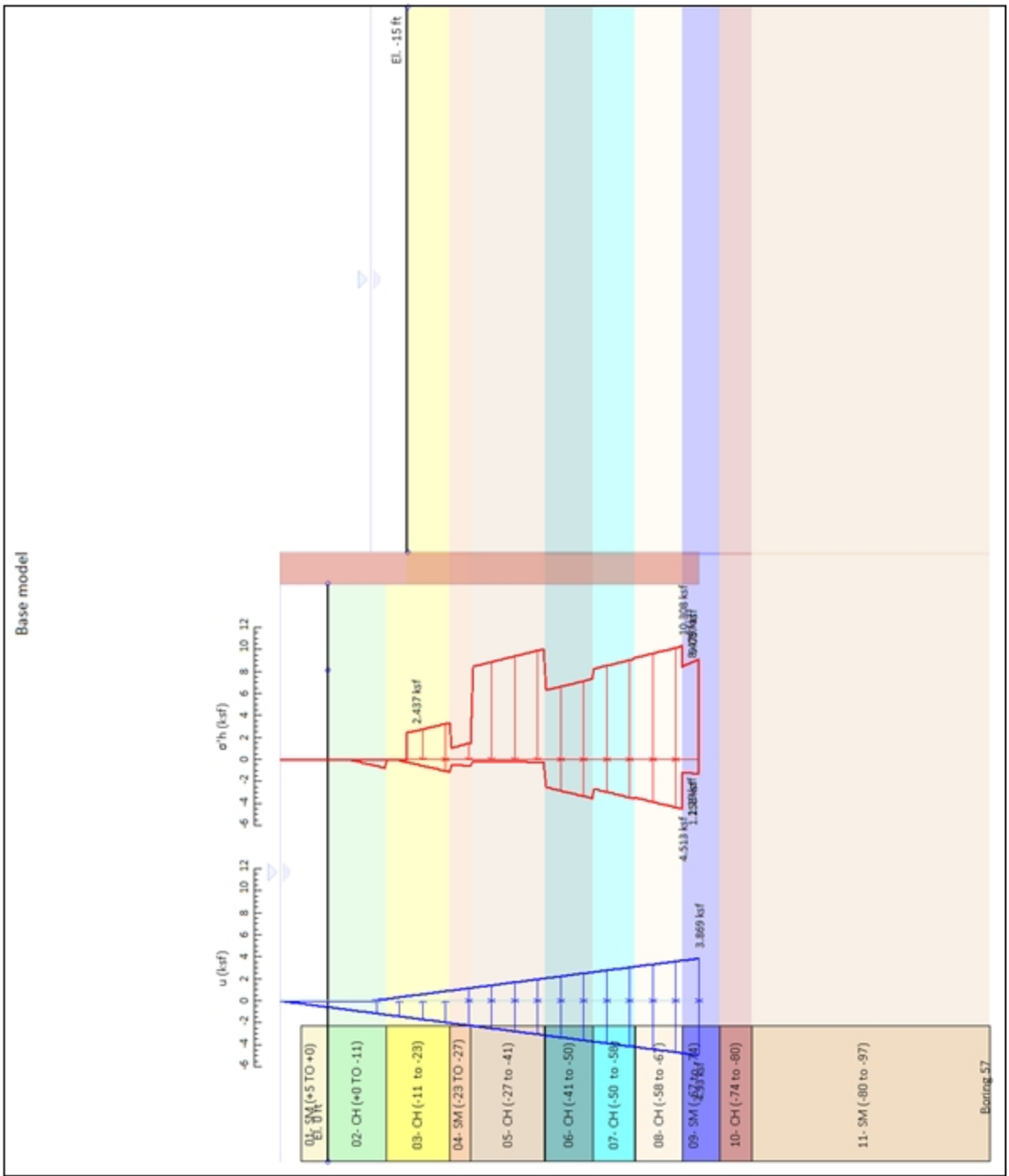

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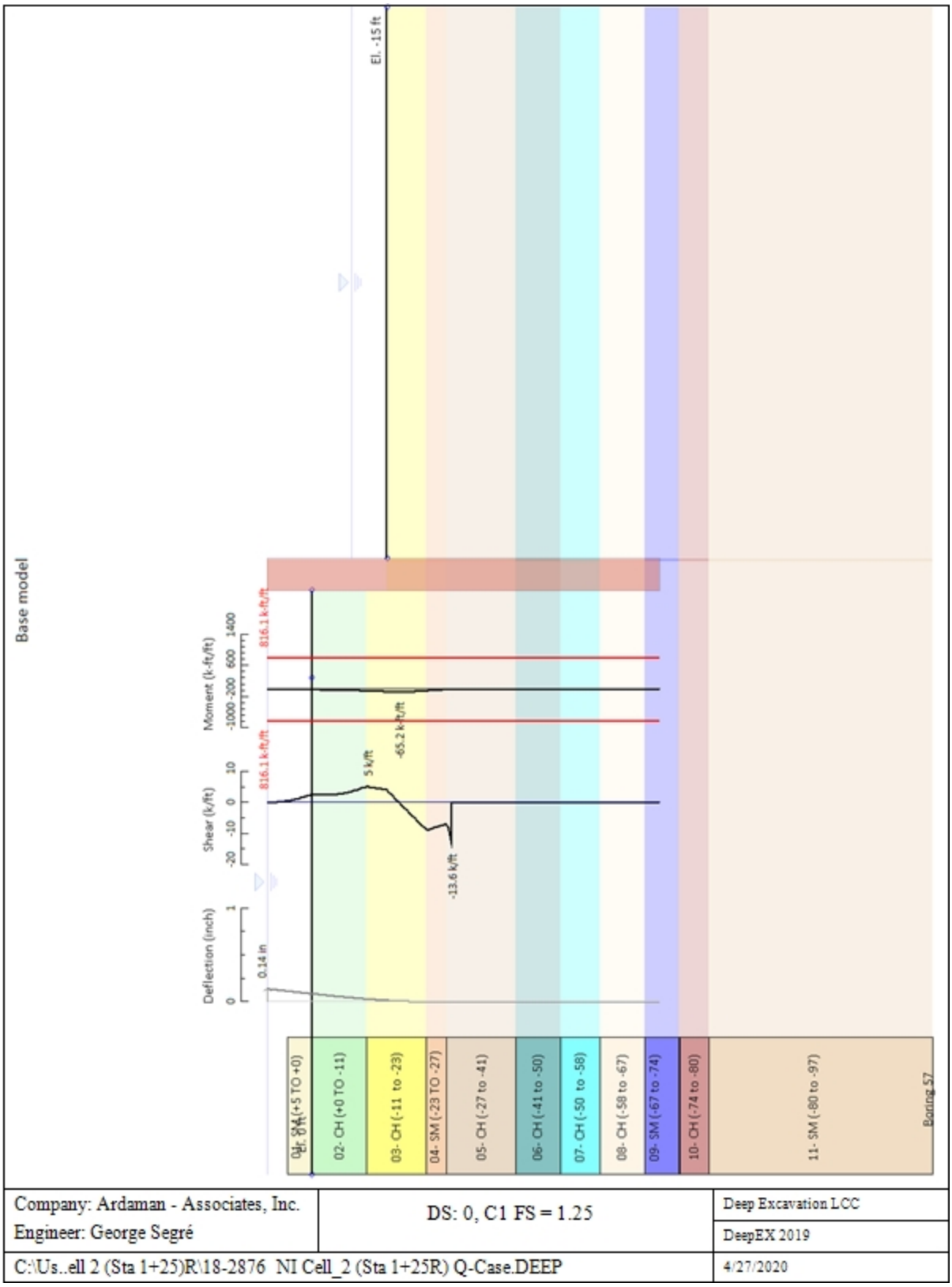

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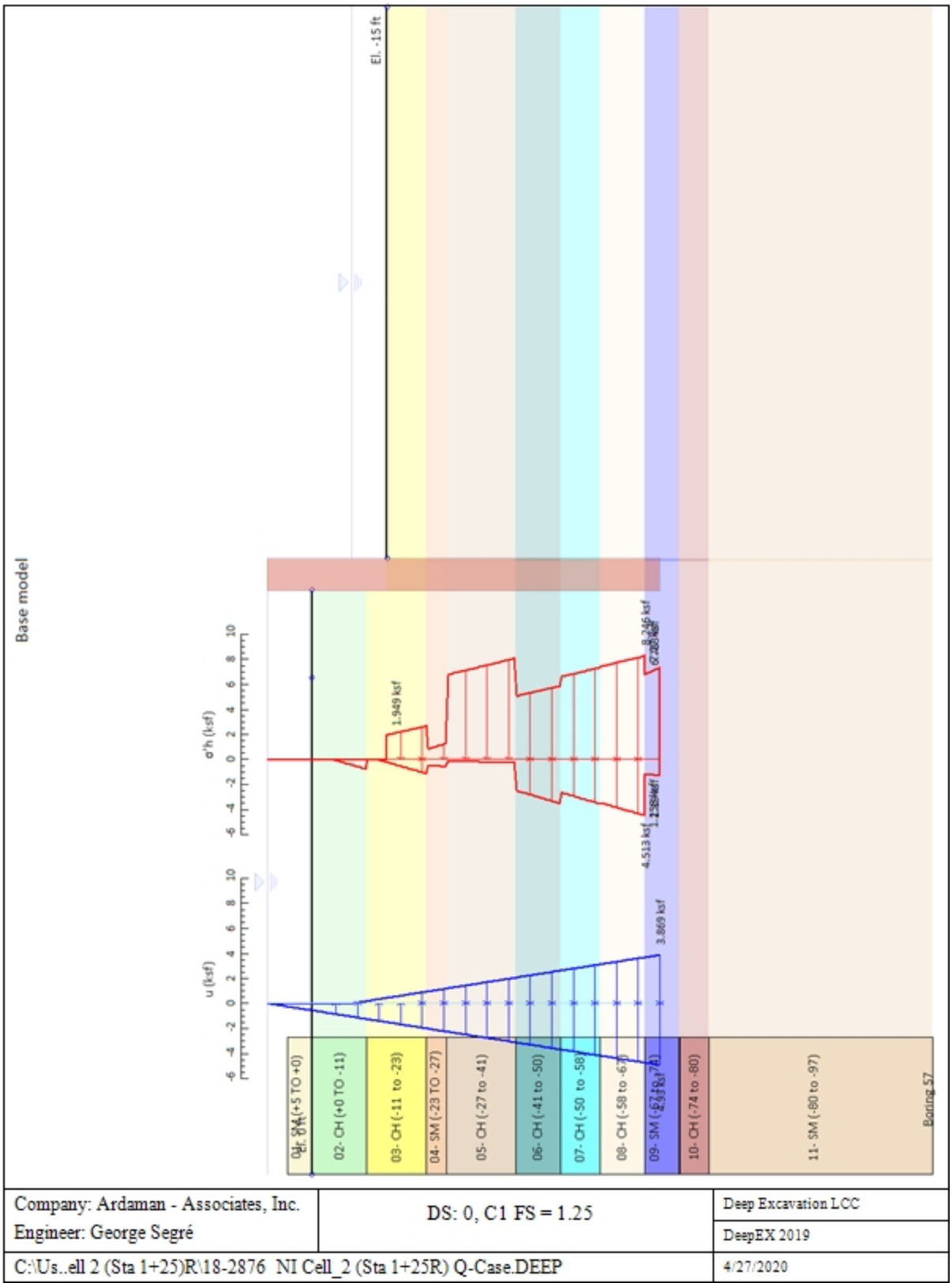
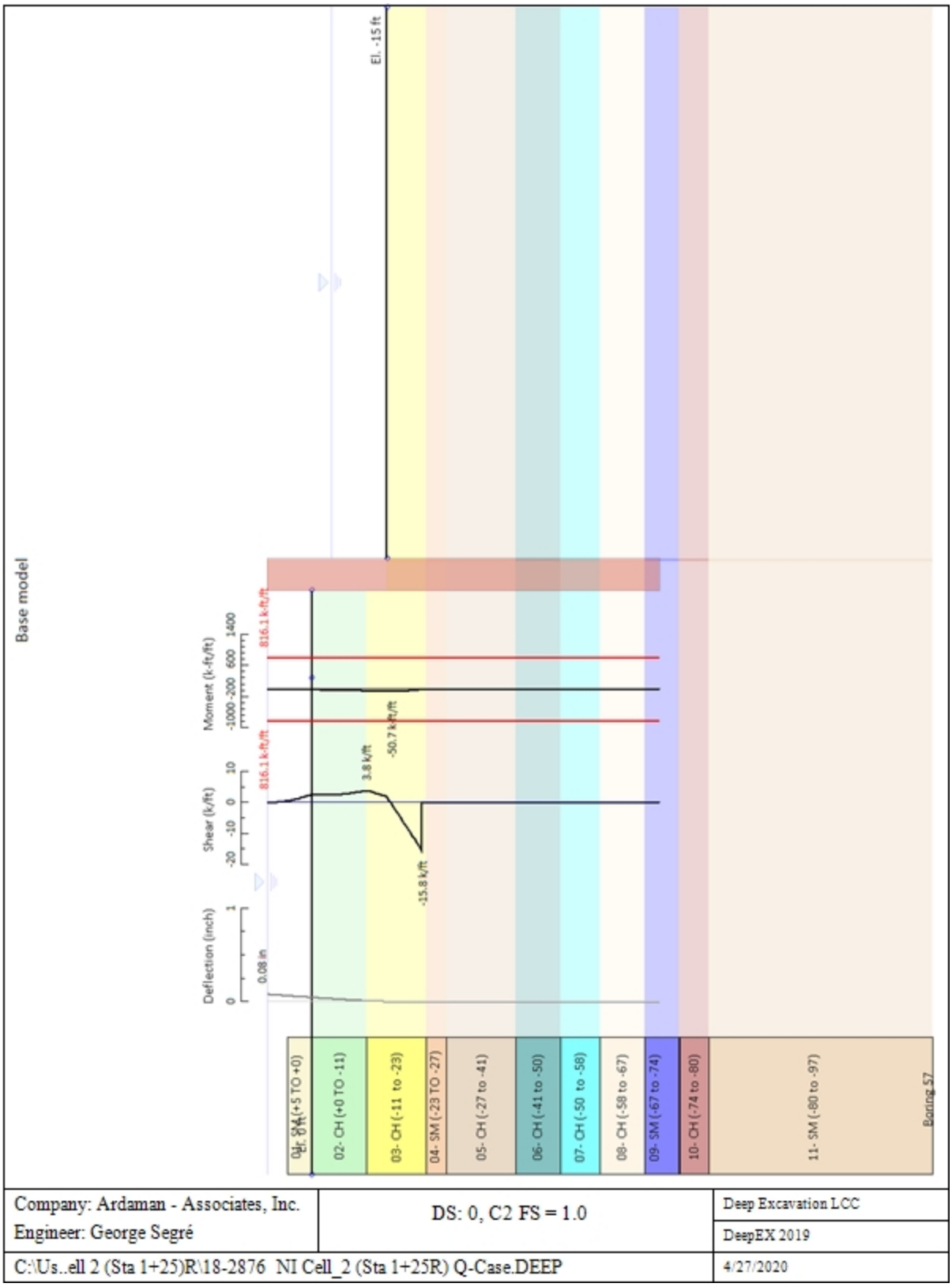
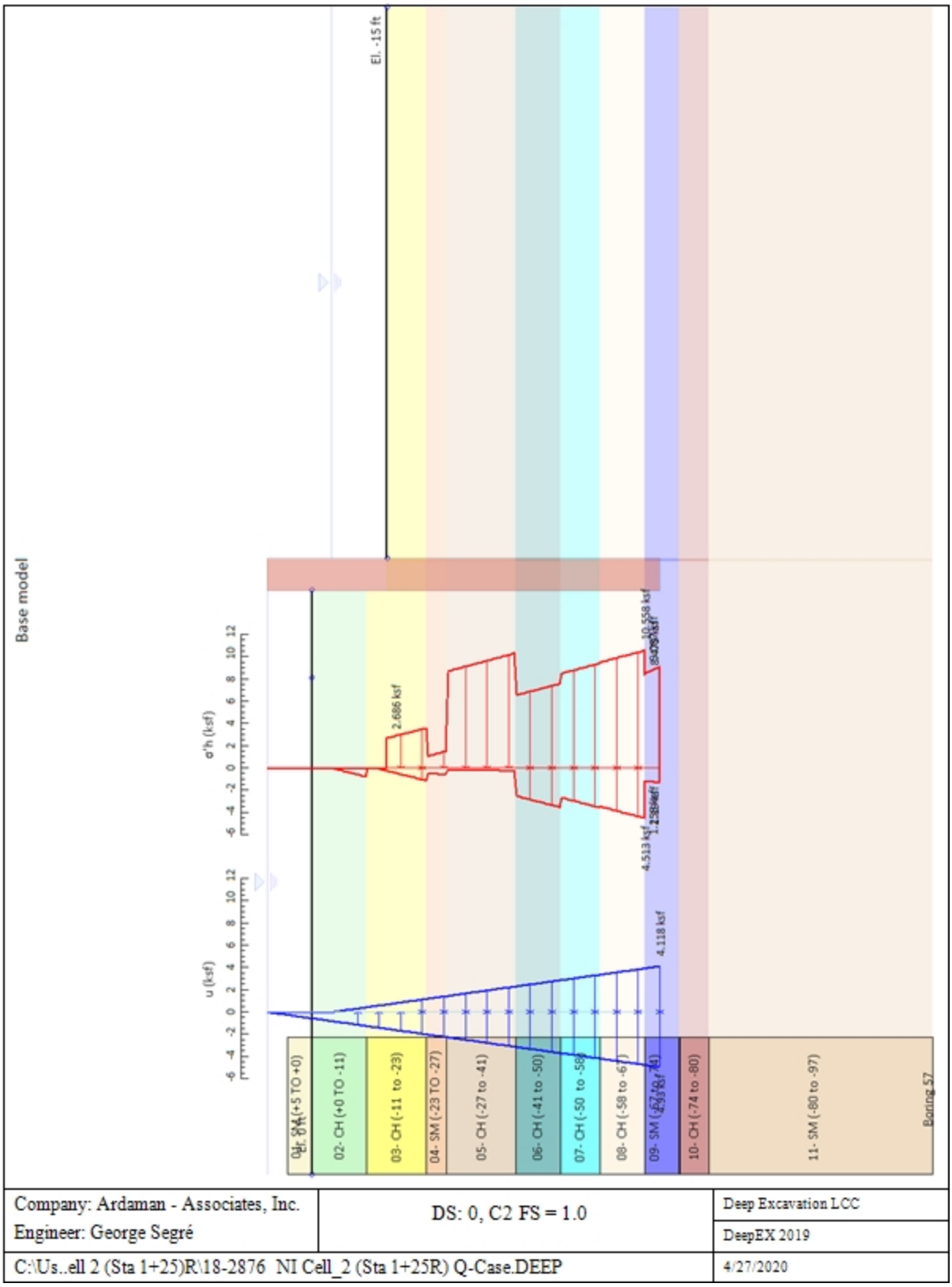
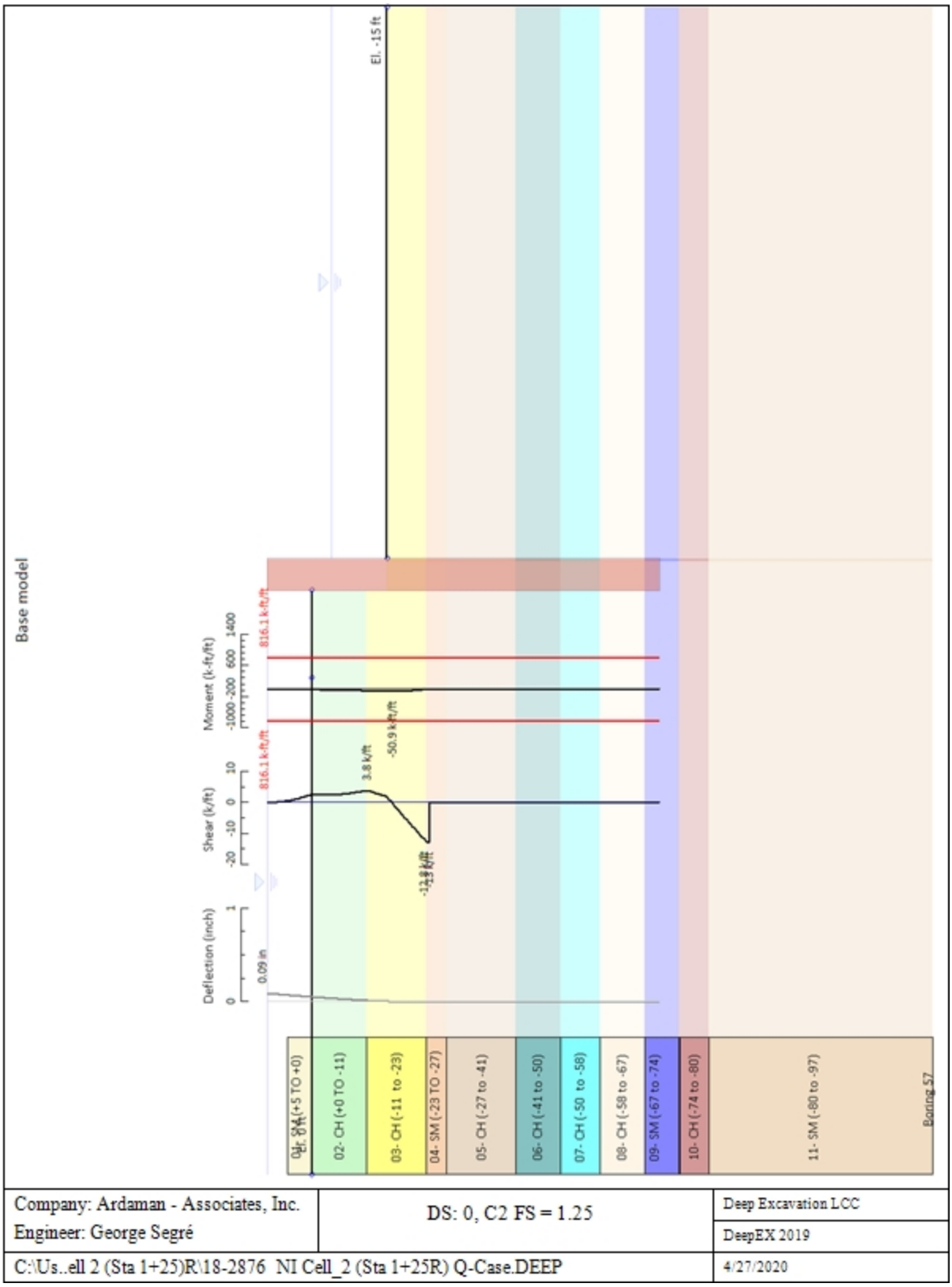
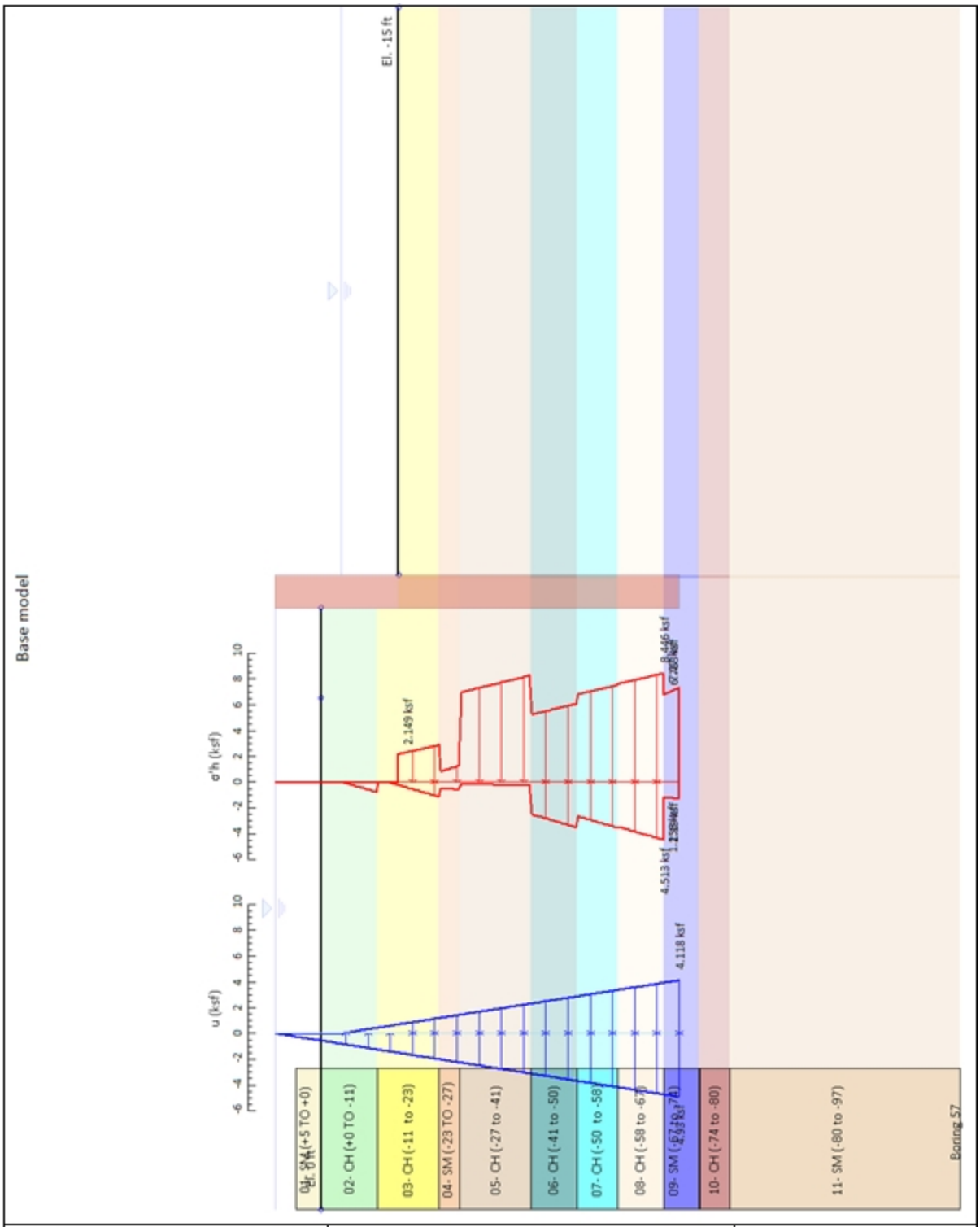


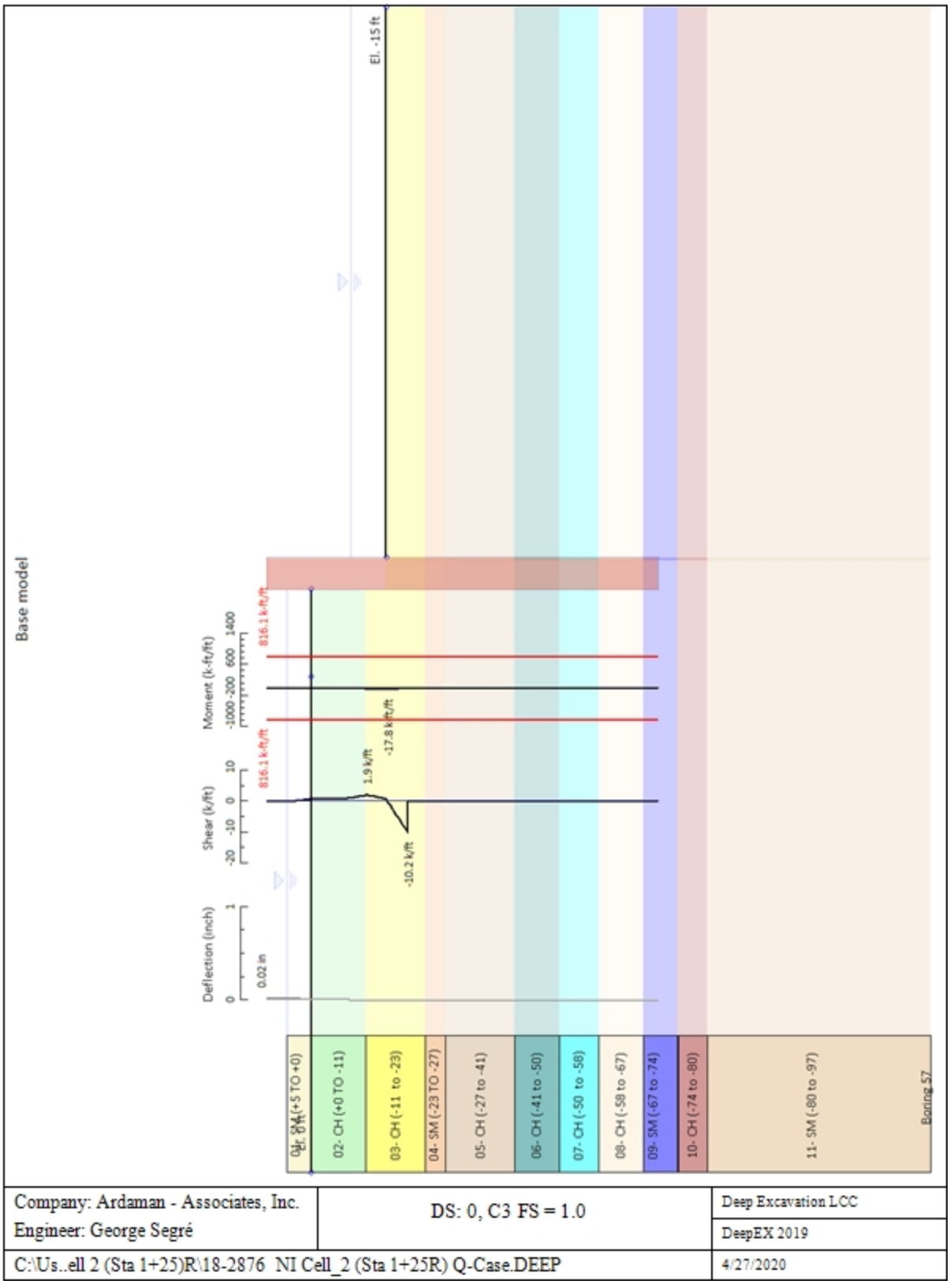
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP		4/27/2020

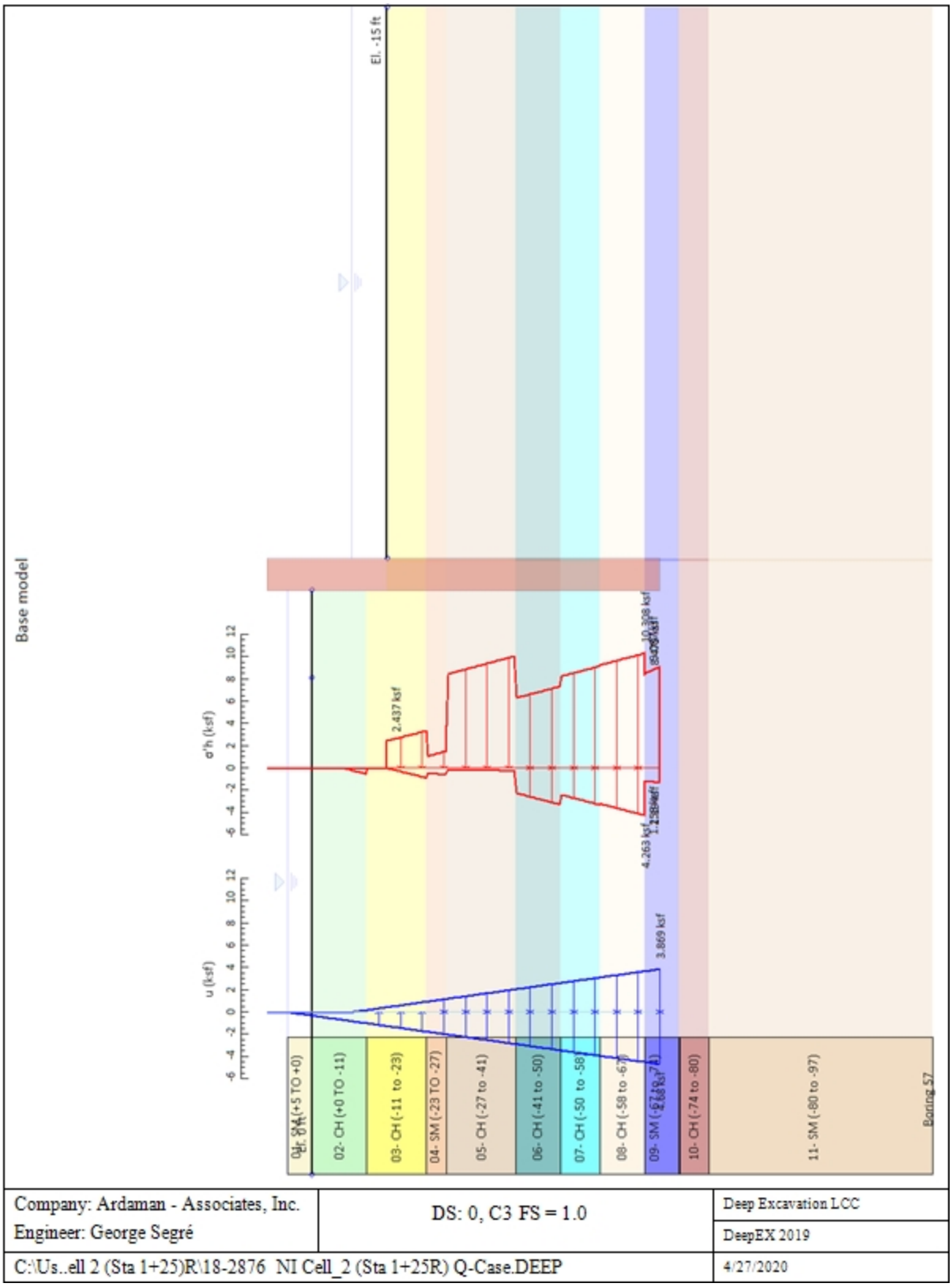

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-50.7 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.8 k/ft
-15.8 k/ft
Deflection (inch)
0 1
0.08 in
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

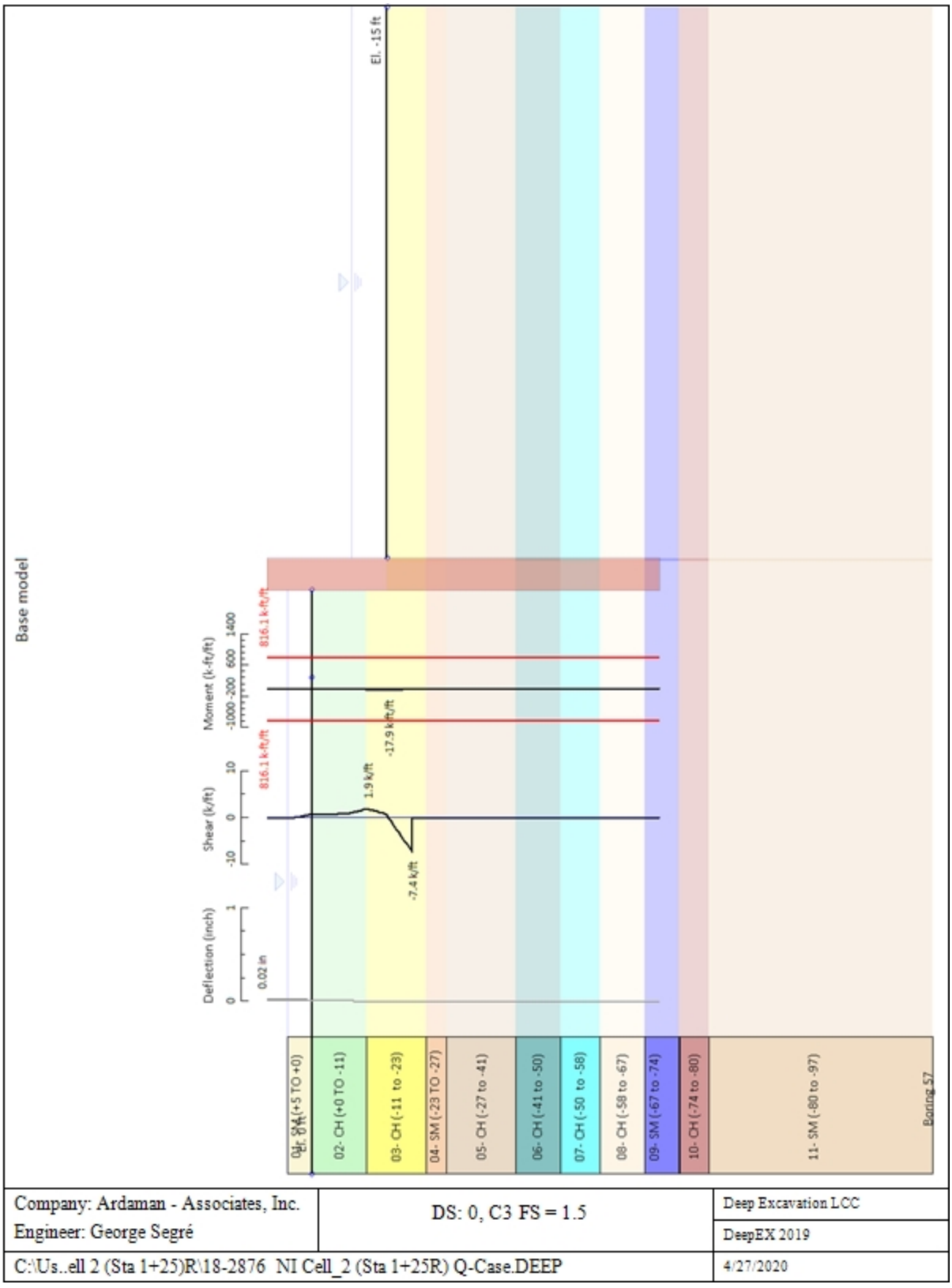

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.513 ksf
4.118 ksf
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

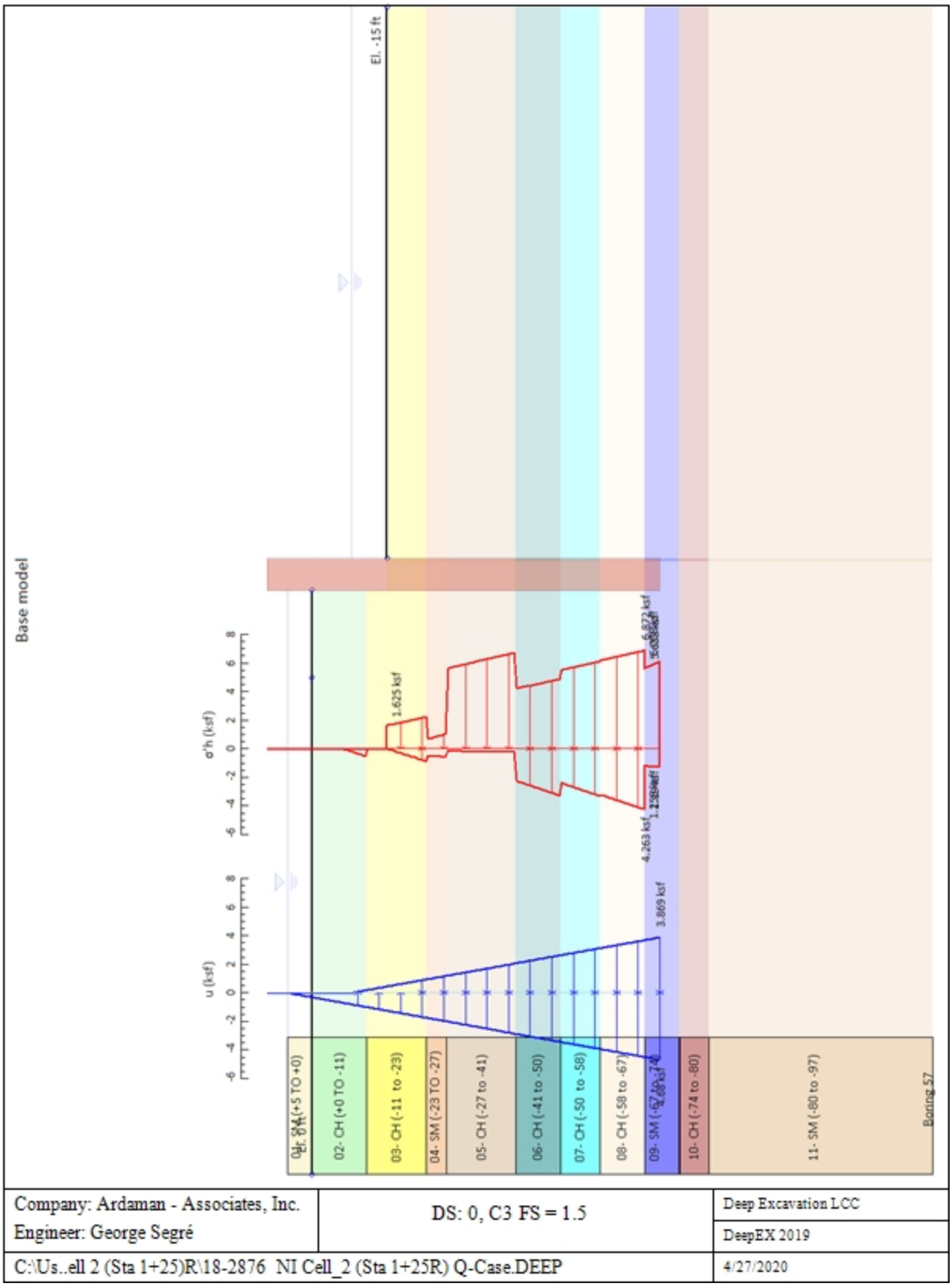

Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-50.9 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.8 k/ft
Deflection (inch)
0 1
0.09 in
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

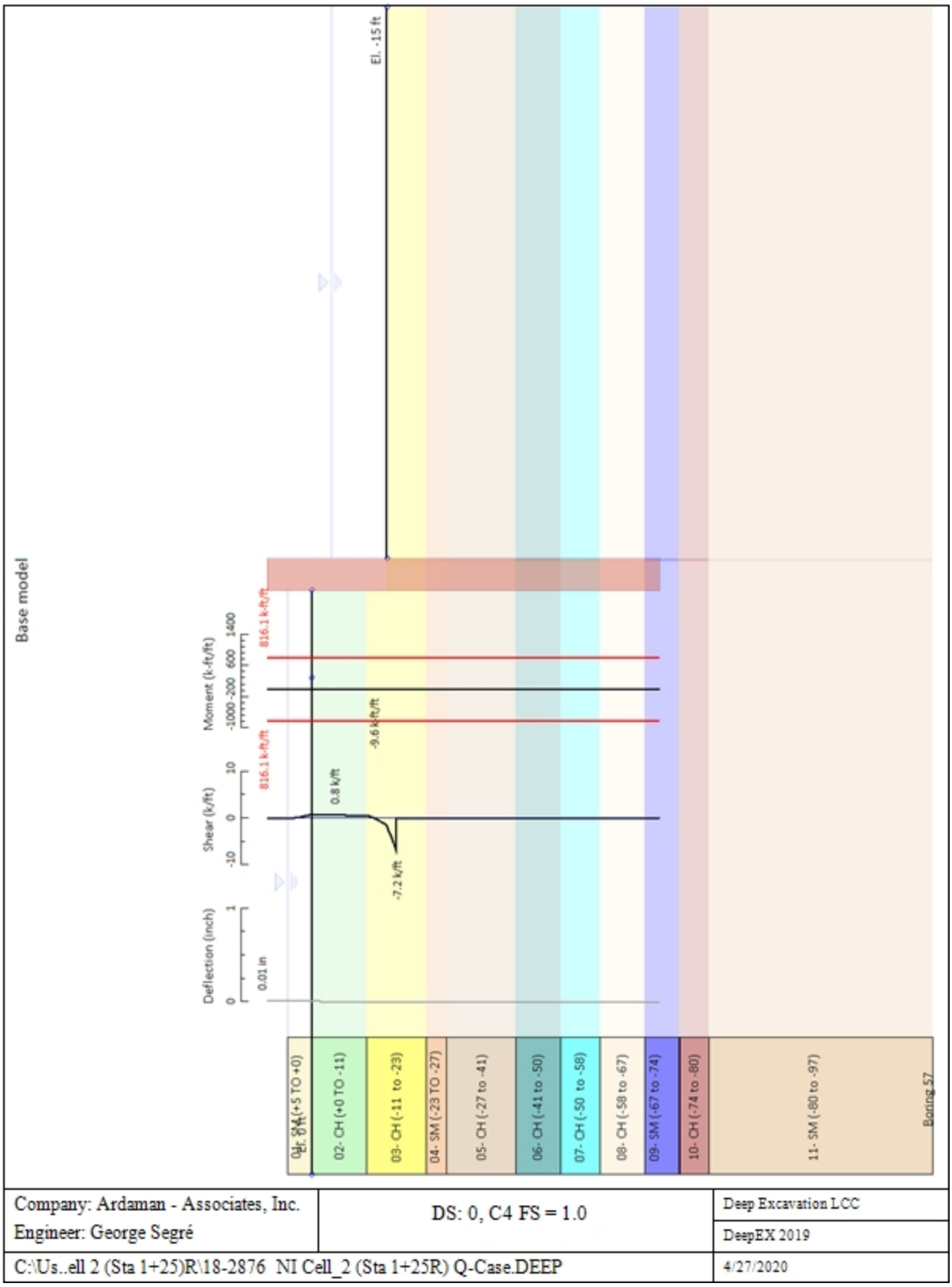

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.149 ksf
4.513 ksf
4.118 ksf
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.02 in
Shear (k/ft)
-20
-10
0
10
1.9 k/ft
-10.2 k/ft
Moment (k-ft/ft)
-1000
-200
600
1400
816.1 k-ft/ft
816.1 k-ft/ft
-17.8 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

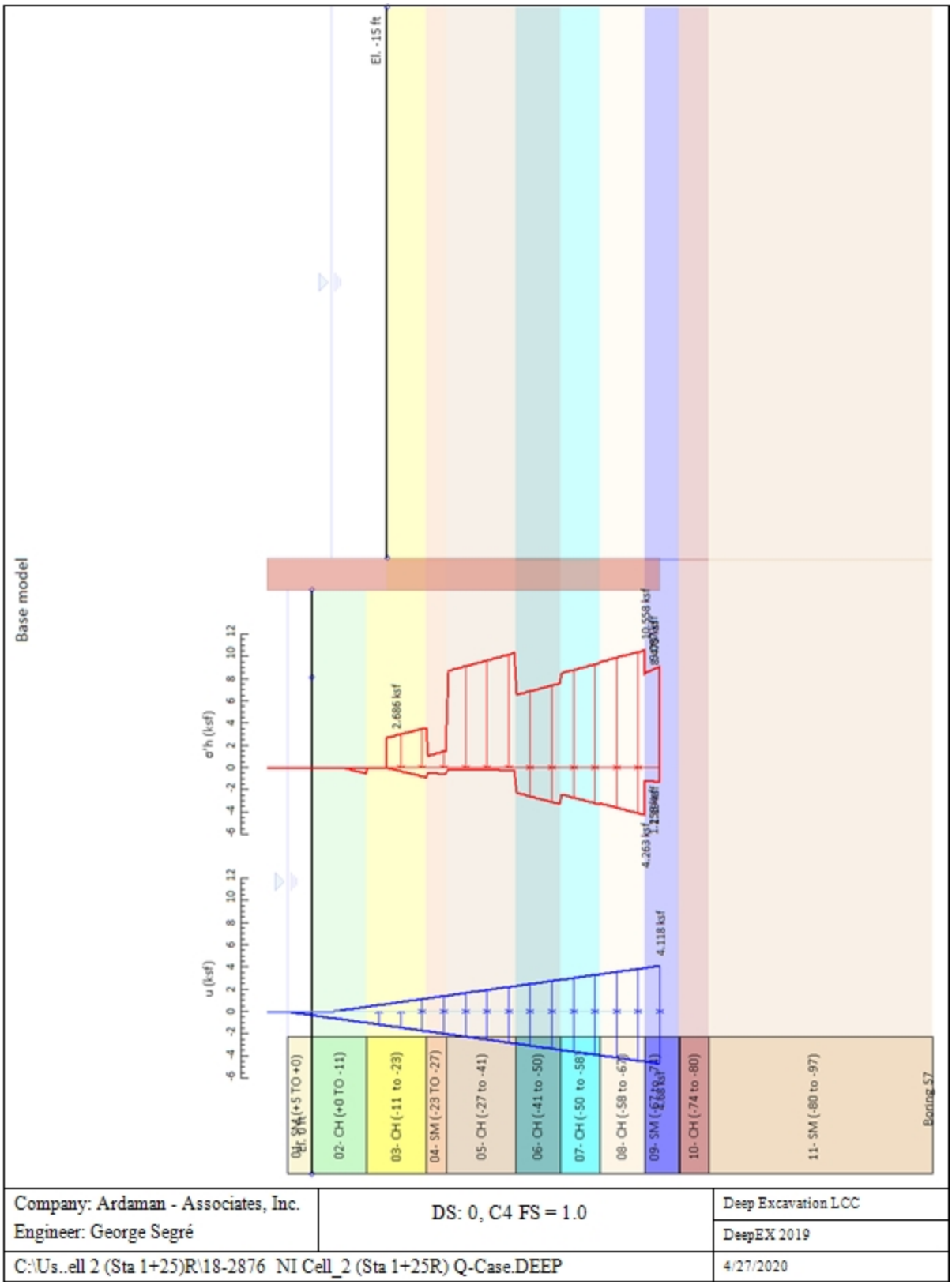

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.437 ksf
4.263 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

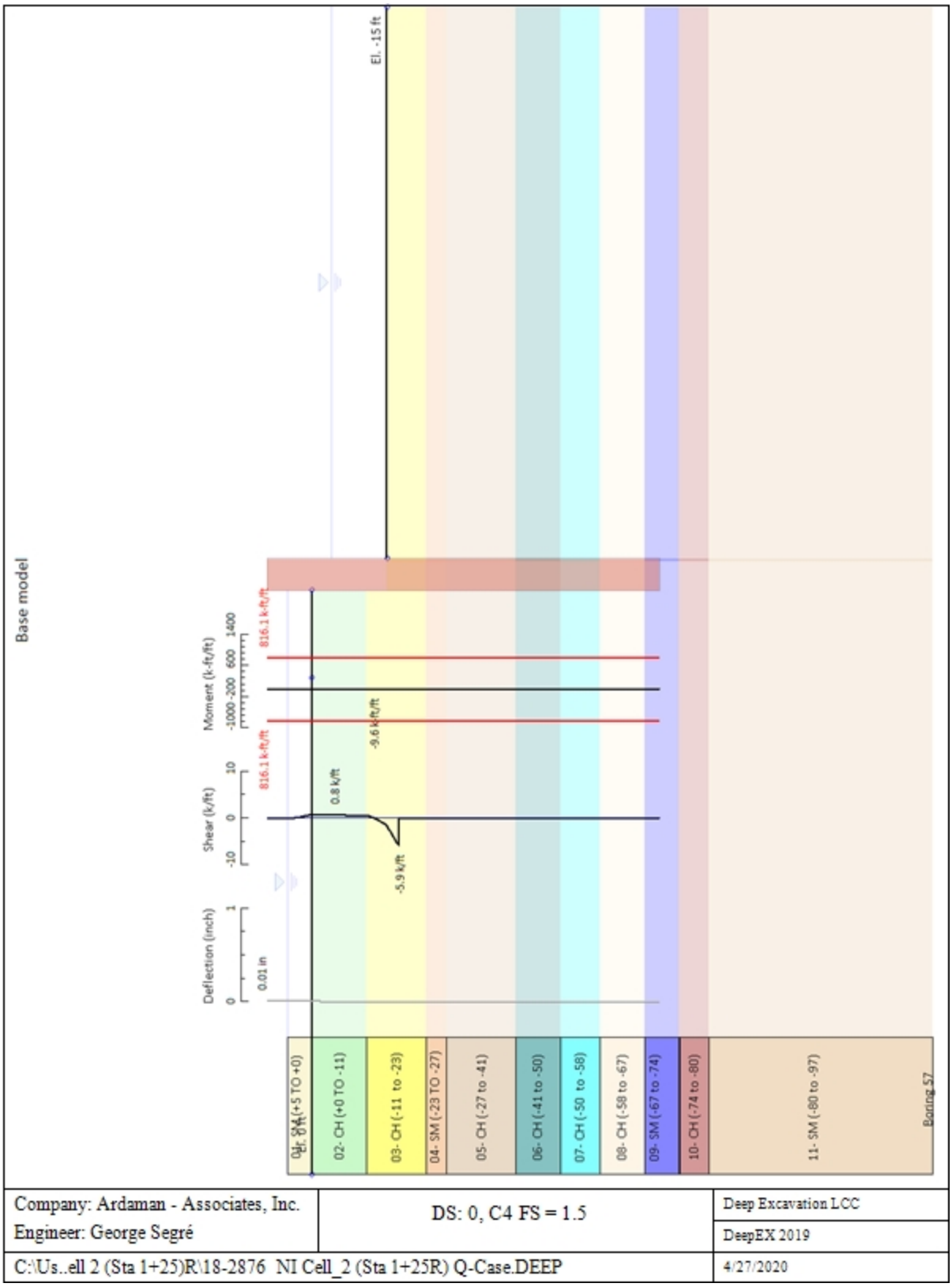

Base model
El. -15 ft
Deflection (inch)
0
1
0.02 in
Shear (k/ft)
-10
0
10
1.9 k/ft
-7.4 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-17.9 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

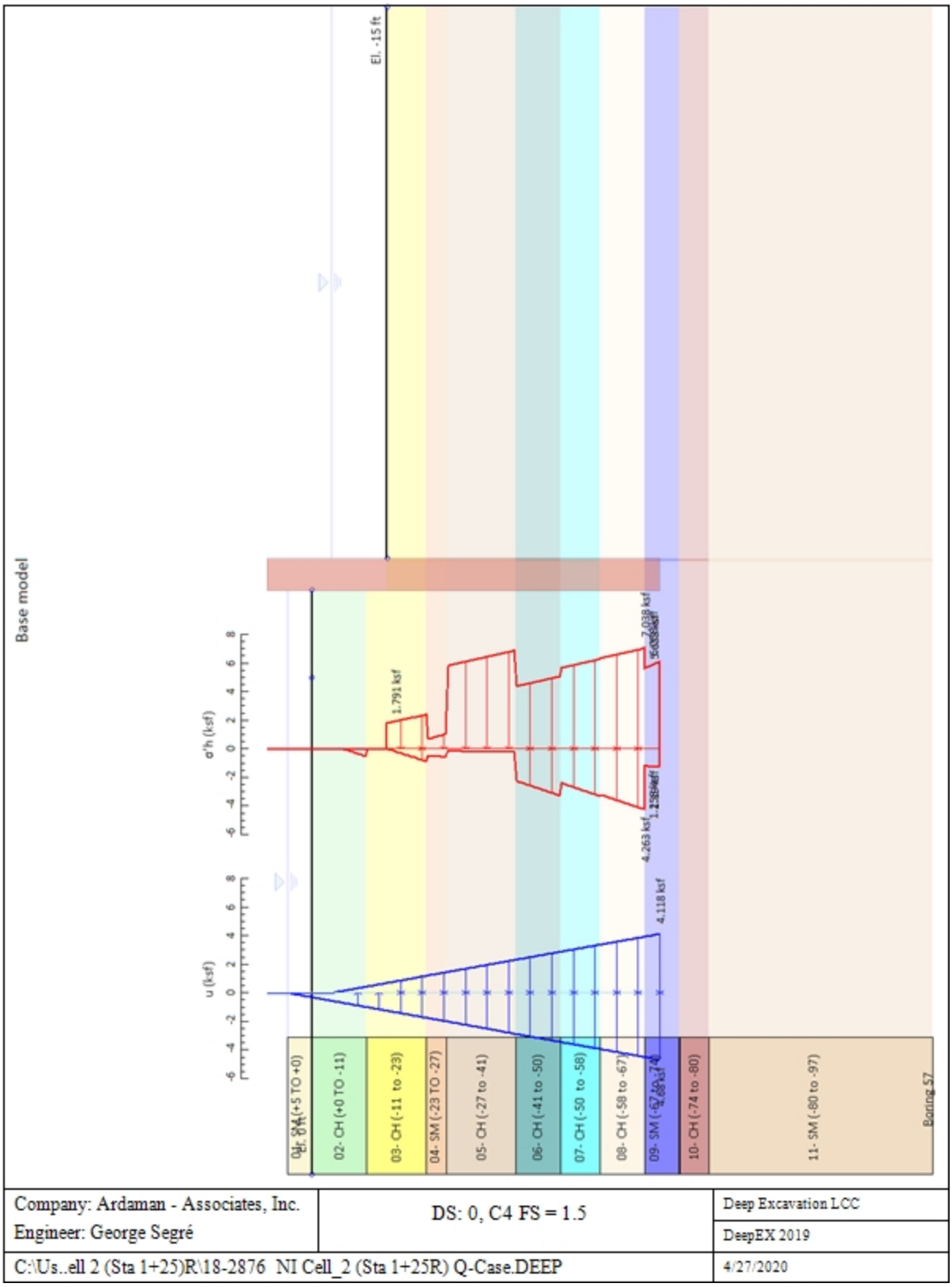

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.625 ksf
4.263 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP		4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
2.686 ksf
10.558 ksf
4.263 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
Deflection (inch)
0
1
0.01 in
Shear (k/ft)
-10
0
10
0.8 k/ft
-5.9 k/ft
Moment (k-ft/ft)
-1000
-200
600
1400
816.1 k-ft/ft
-9.6 k-ft/ft
816.1 k-ft/ft
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020


Base model
El. -15 ft
σ'h (ksf)
u (ksf)
1.791 ksf
7.038 ksf
4.263 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:22:53 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

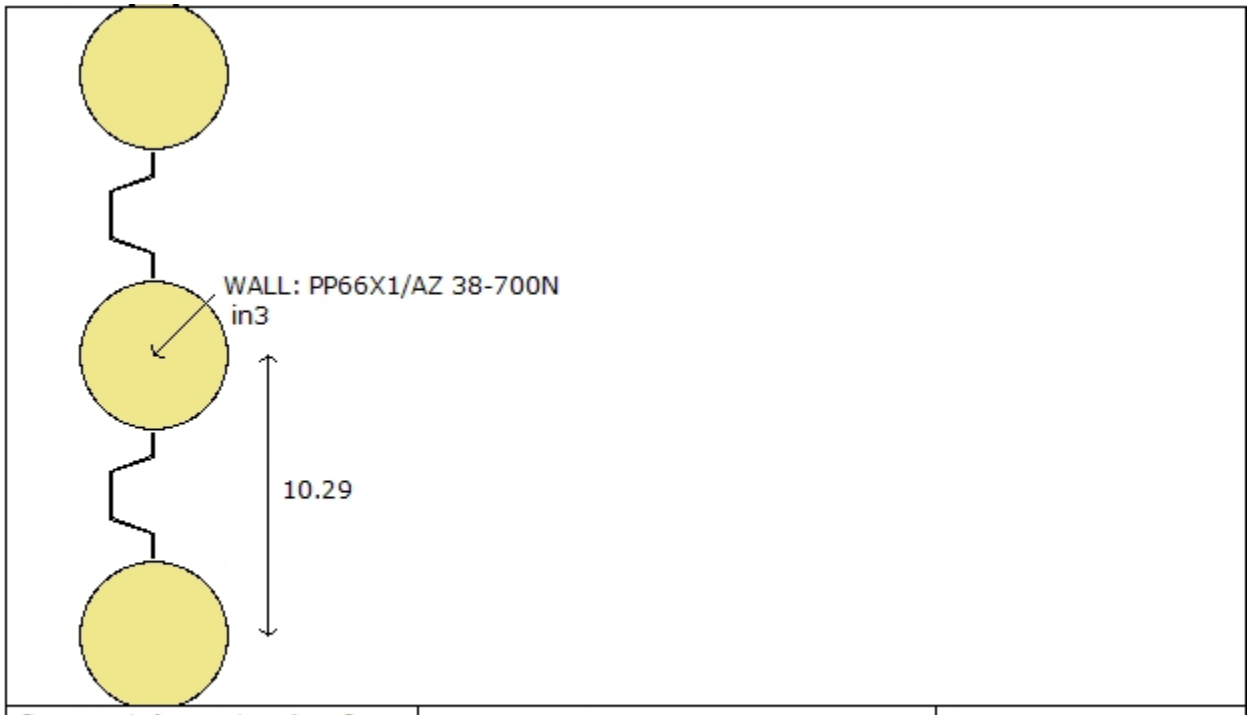
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -115 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.504	1.504	1.958
Stage 1	Simple span	N/A	1.6	1.304	1.304	1.684
Stage 2	Simple span	N/A	1.6	1.563	1.563	2.003
Stage 3	Simple span	N/A	1.6	1.364	1.364	1.729
Stage 4	Simple span	N/A	1.6	1.624	1.624	2.061
Stage 5	Simple span	N/A	1.6	1.265	1.265	1.581
Stage 6	Simple span	N/A	1.6	1.688	1.688	2.108
Stage 7	Simple span	N/A	1.6	1.329	1.329	1.628

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

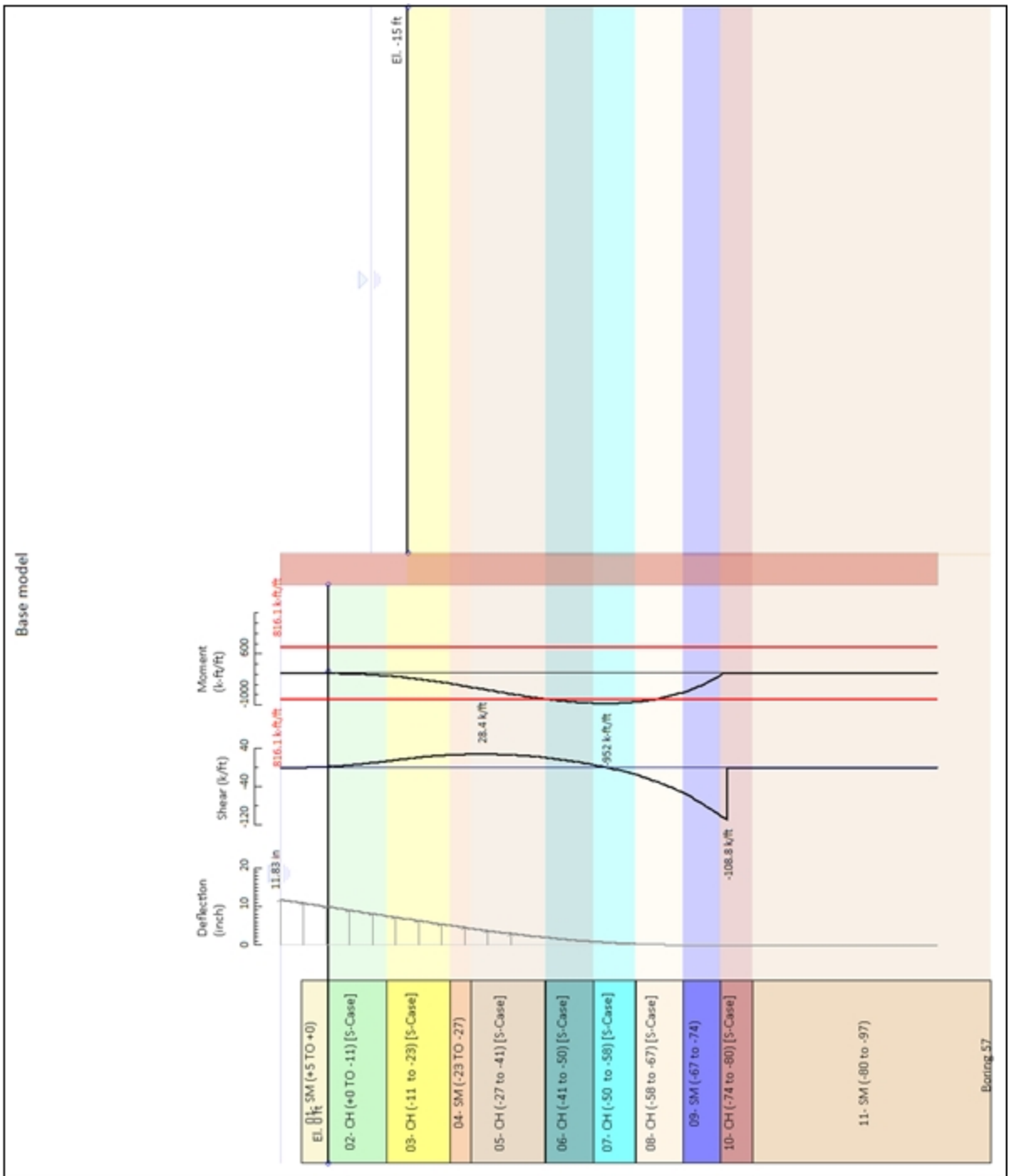
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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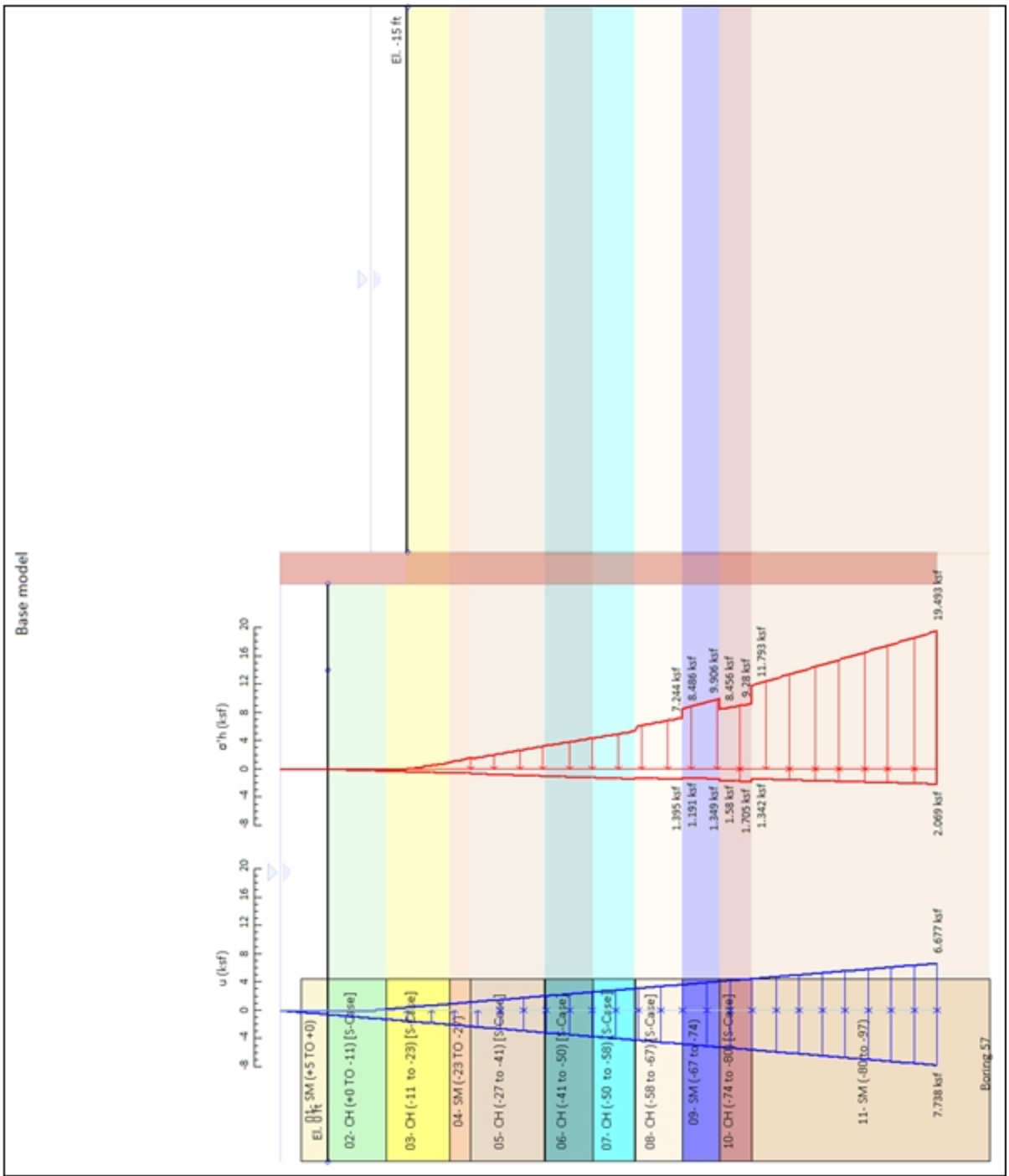

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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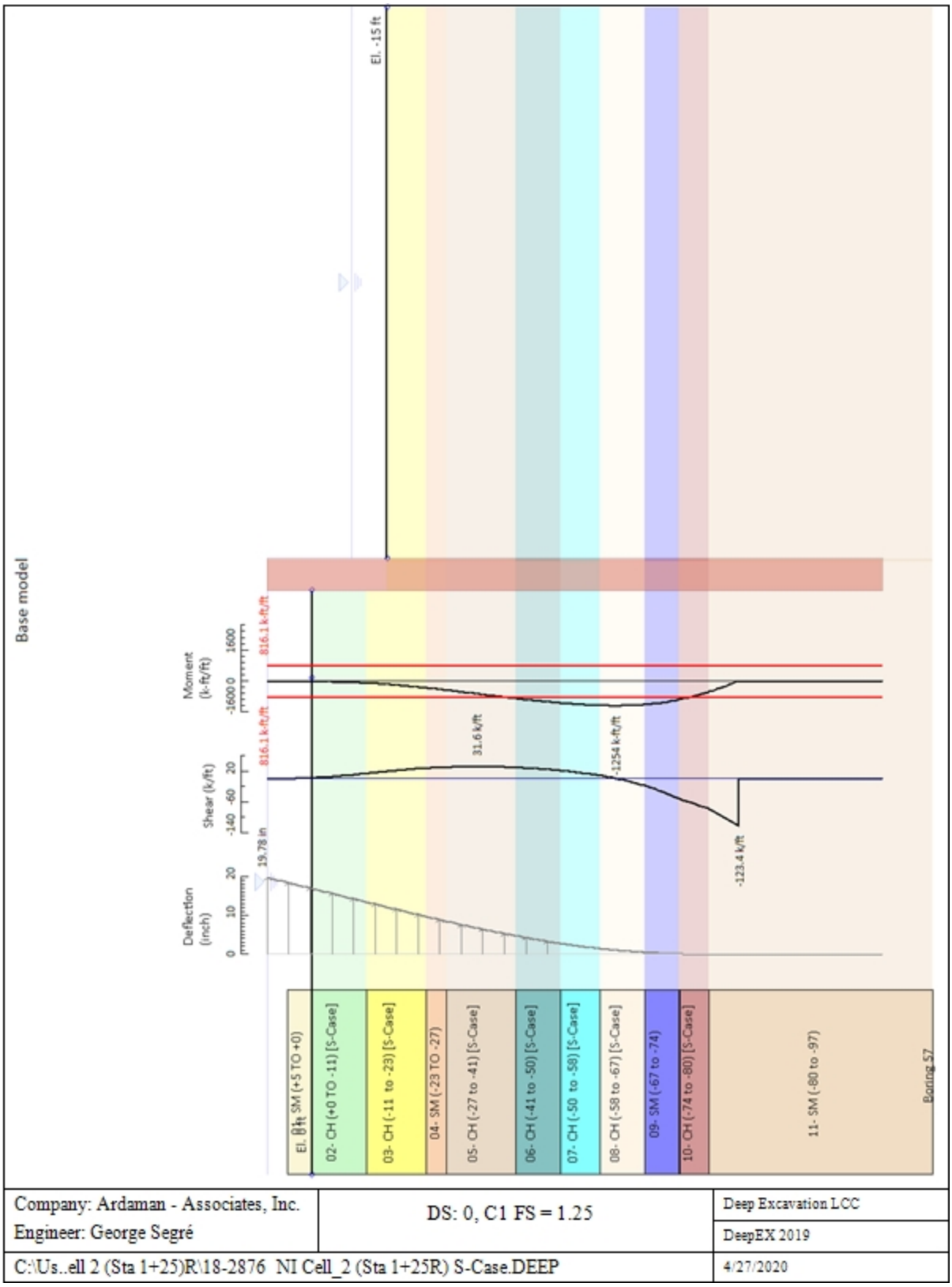

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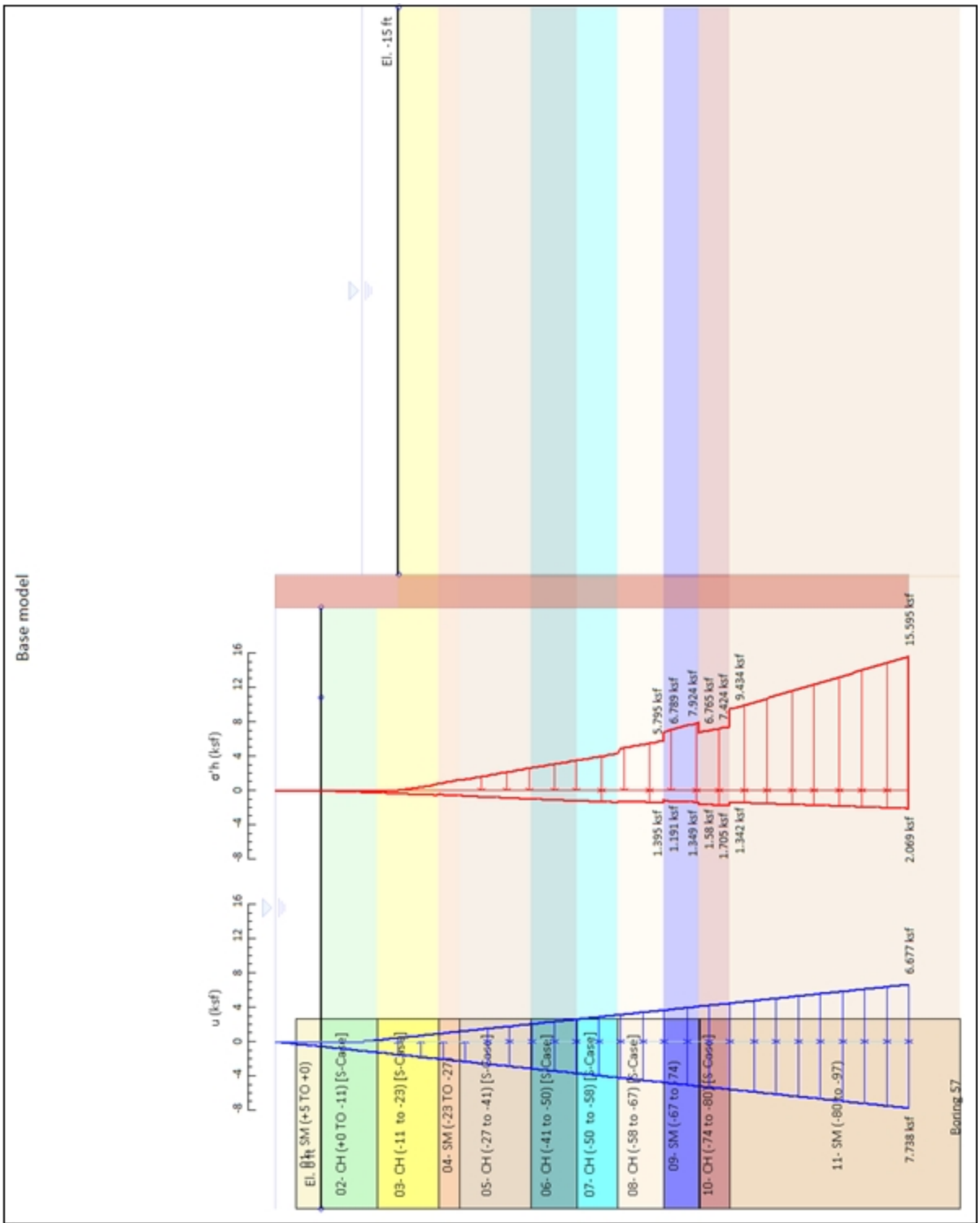

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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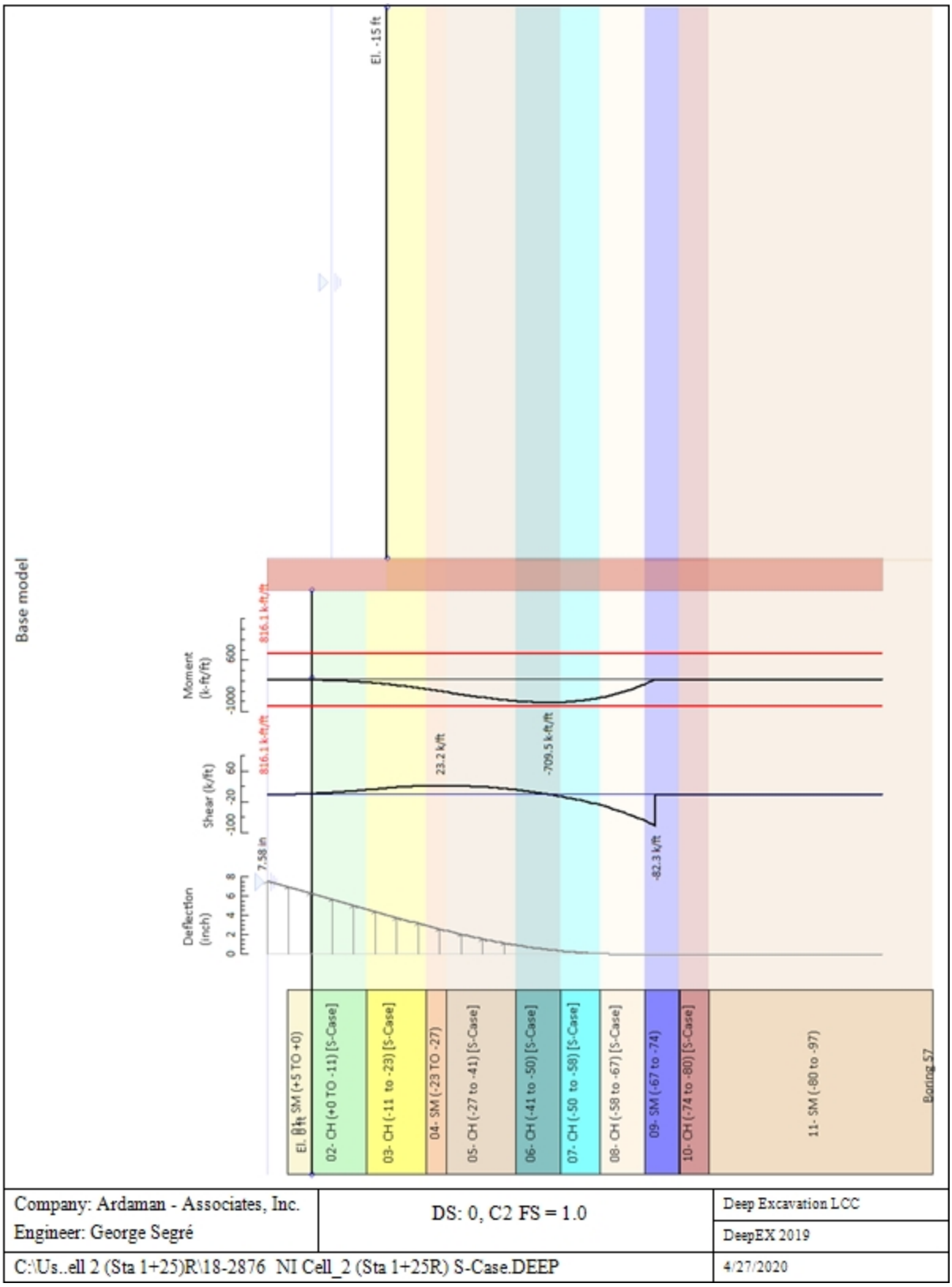

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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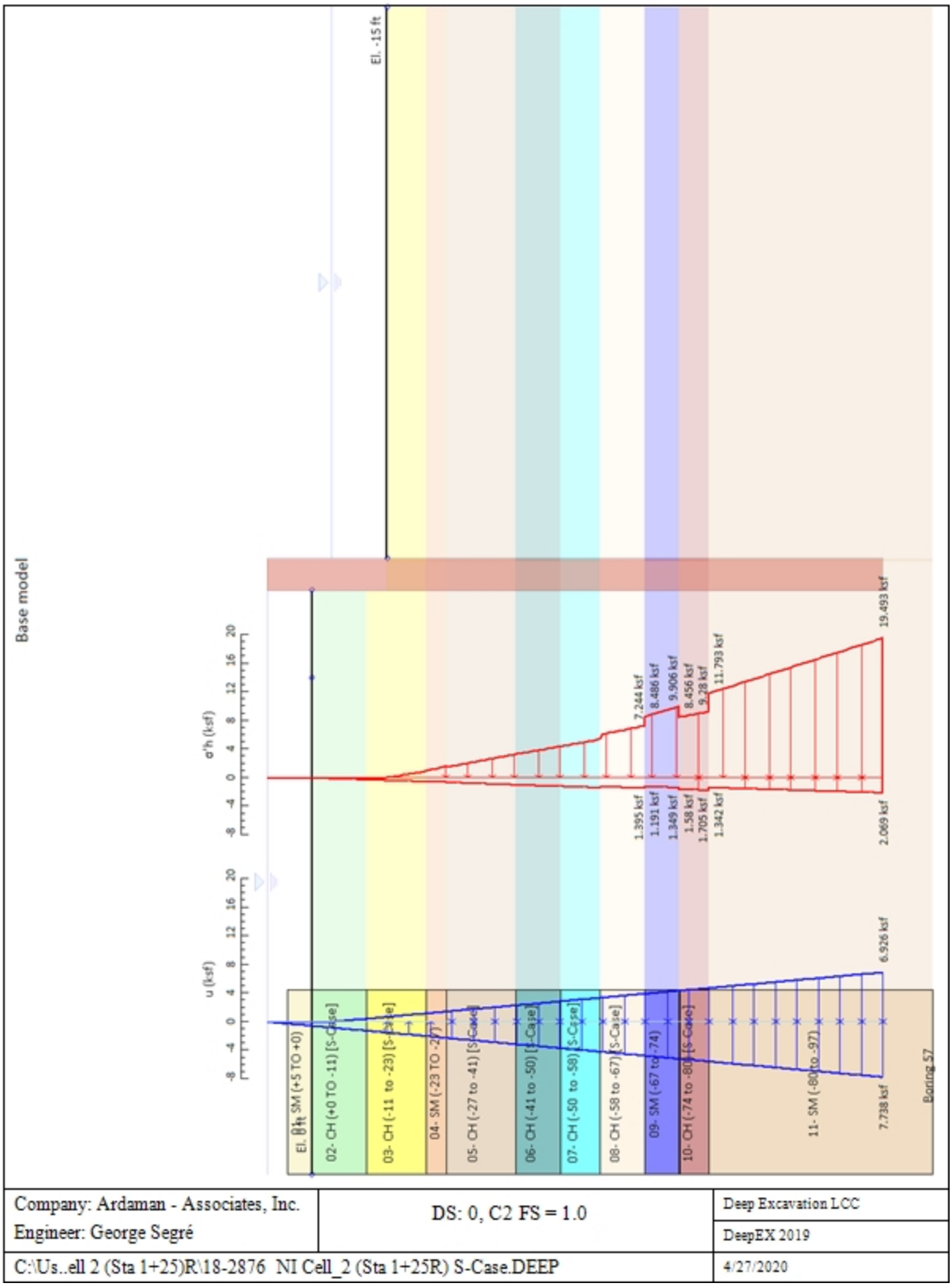

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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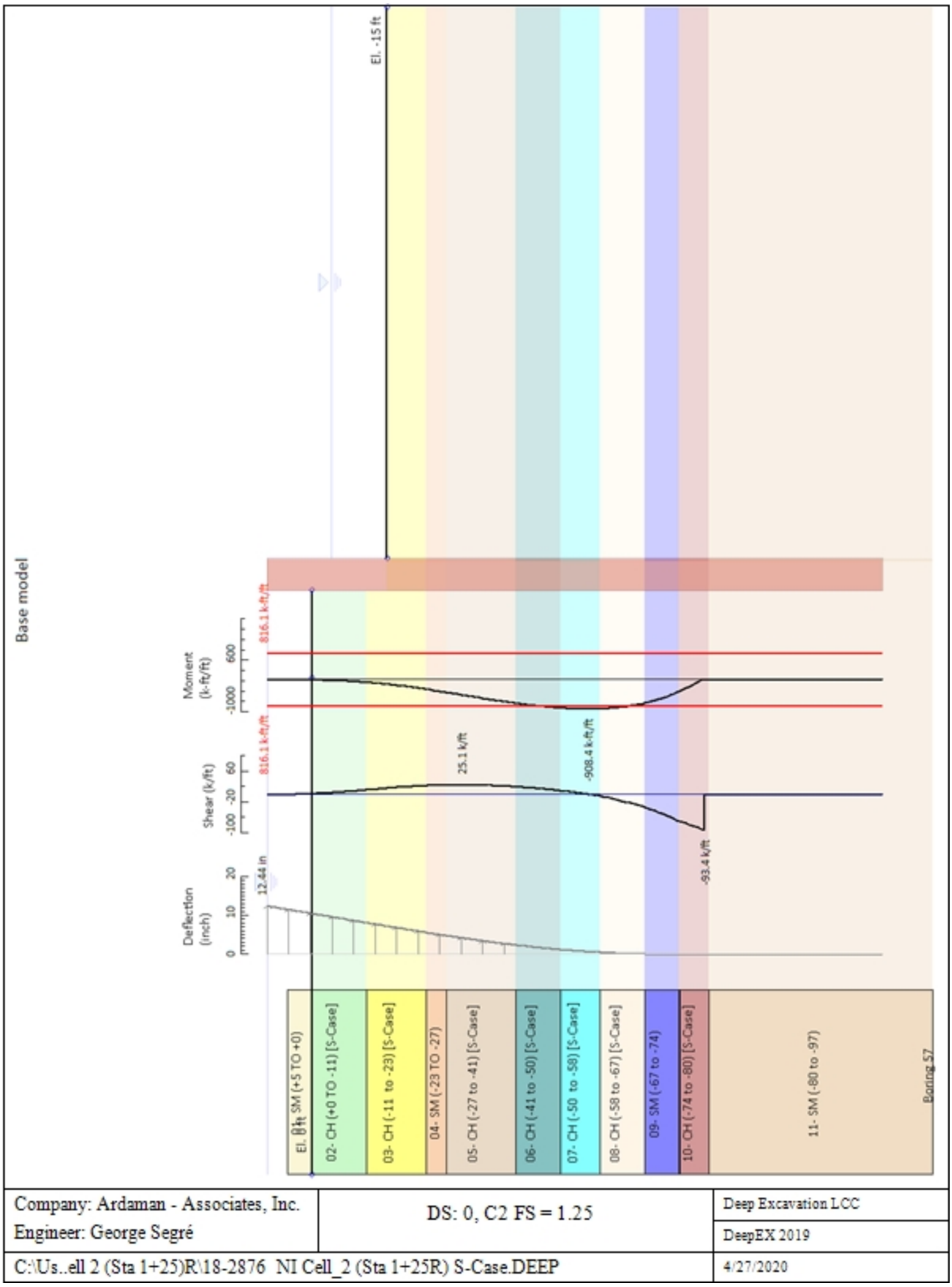

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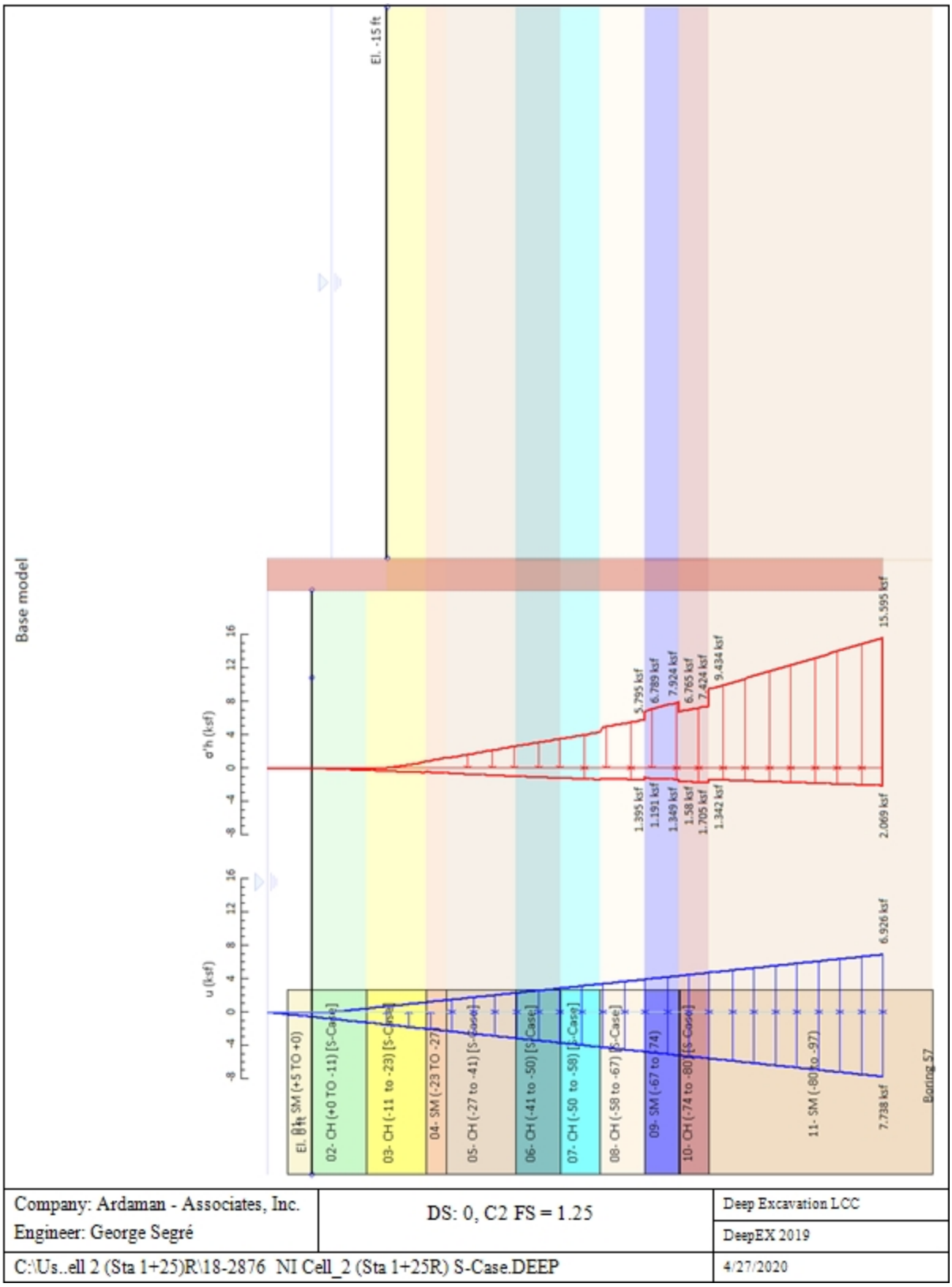

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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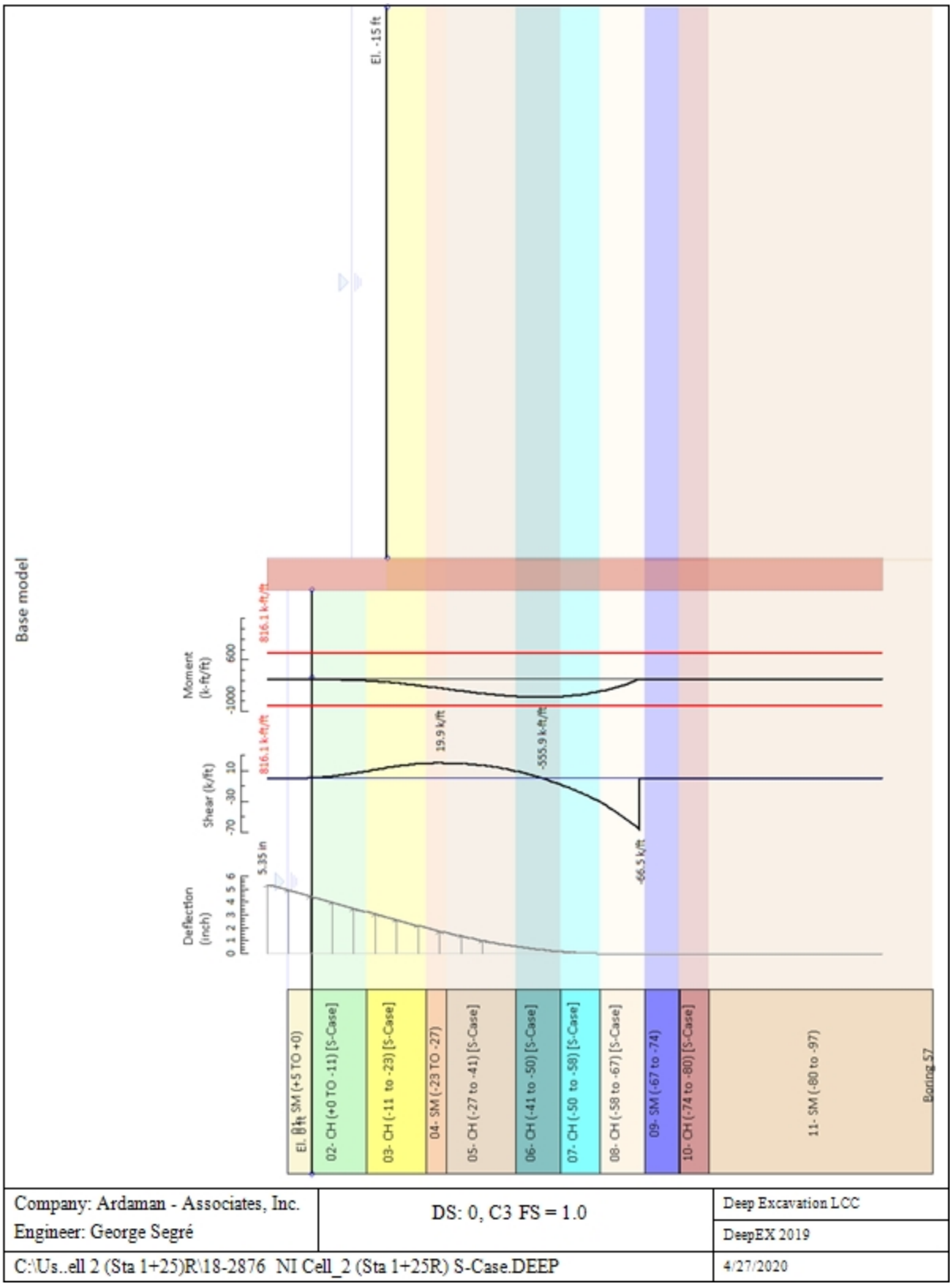

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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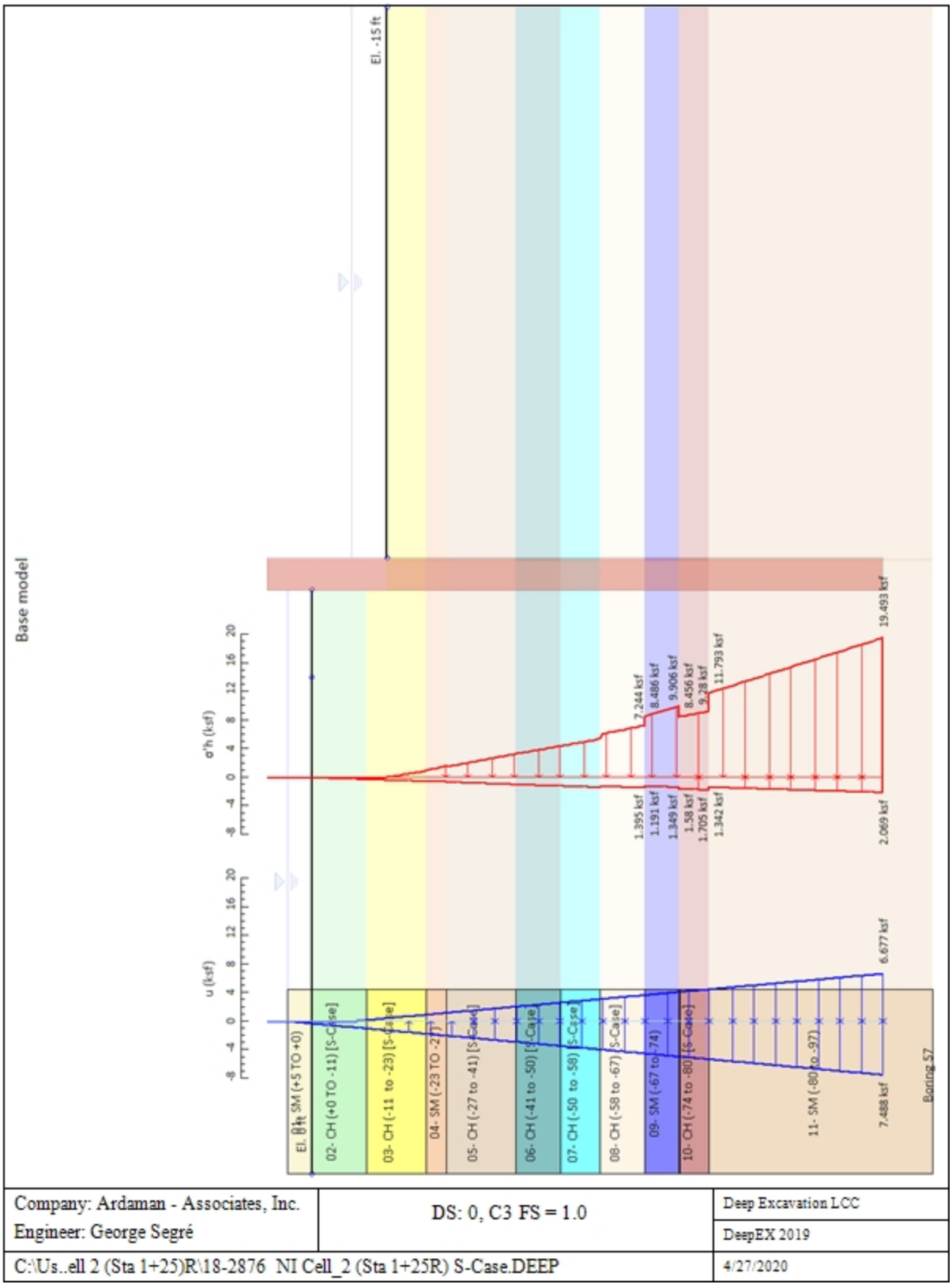
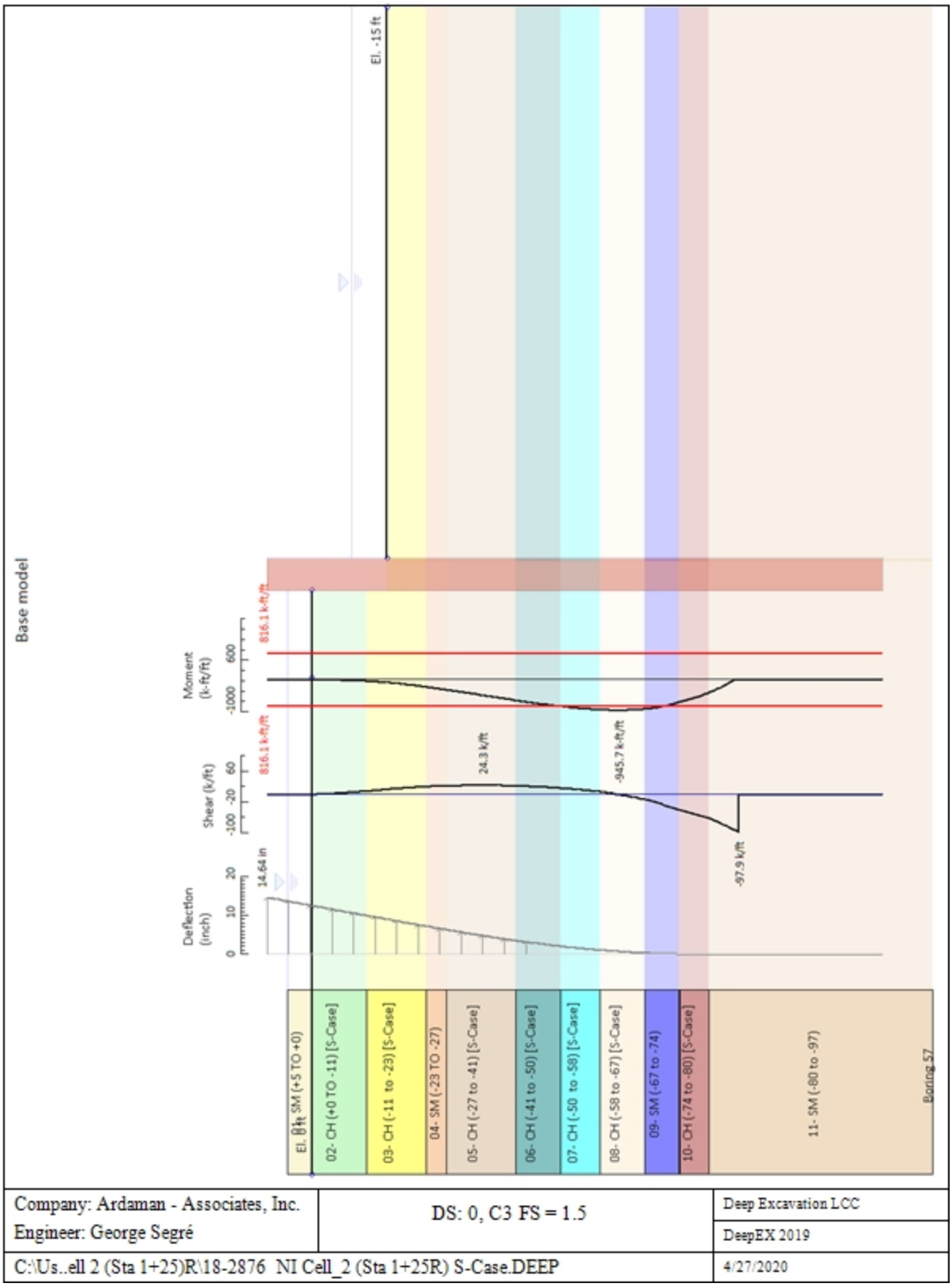


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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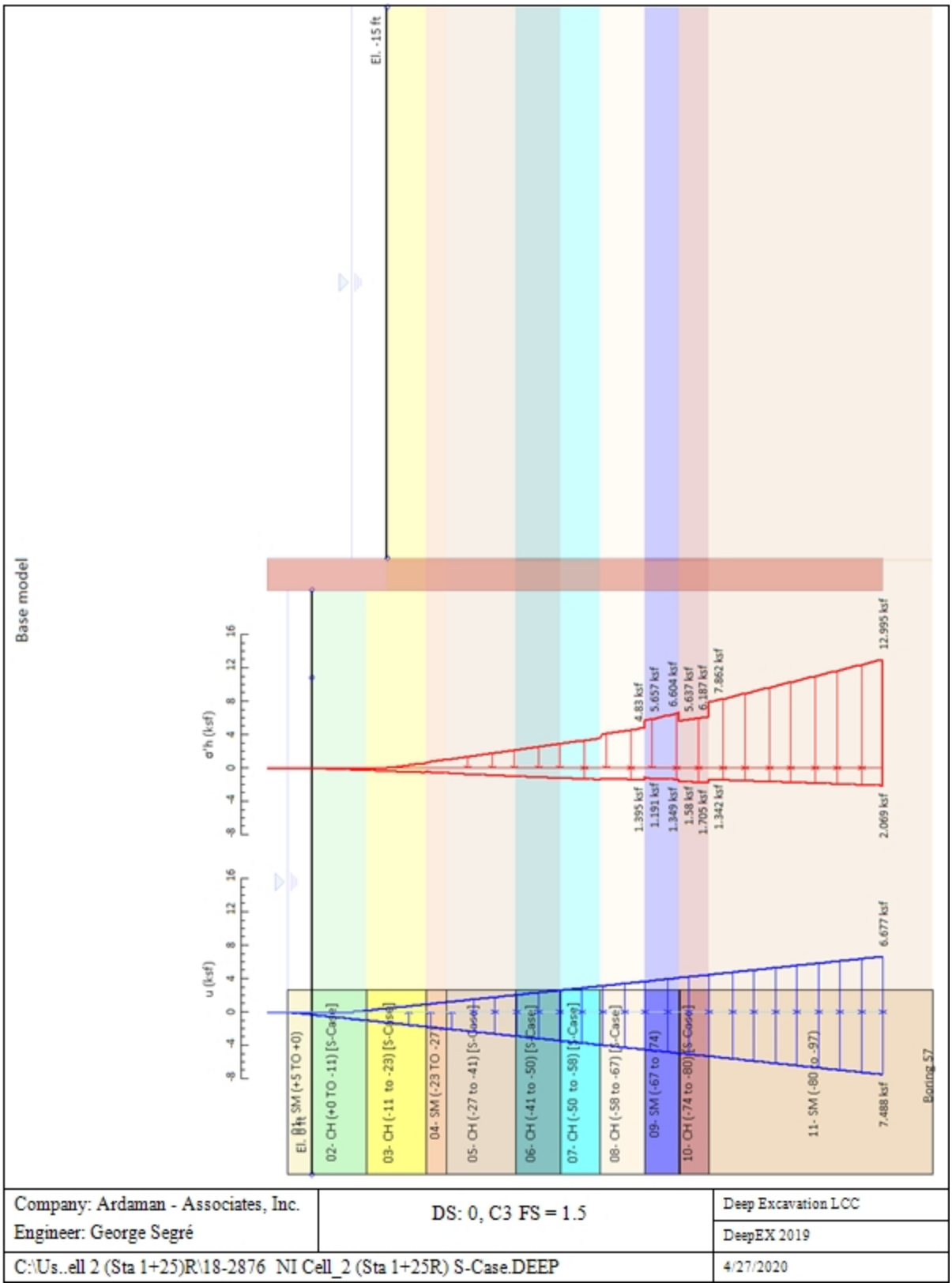

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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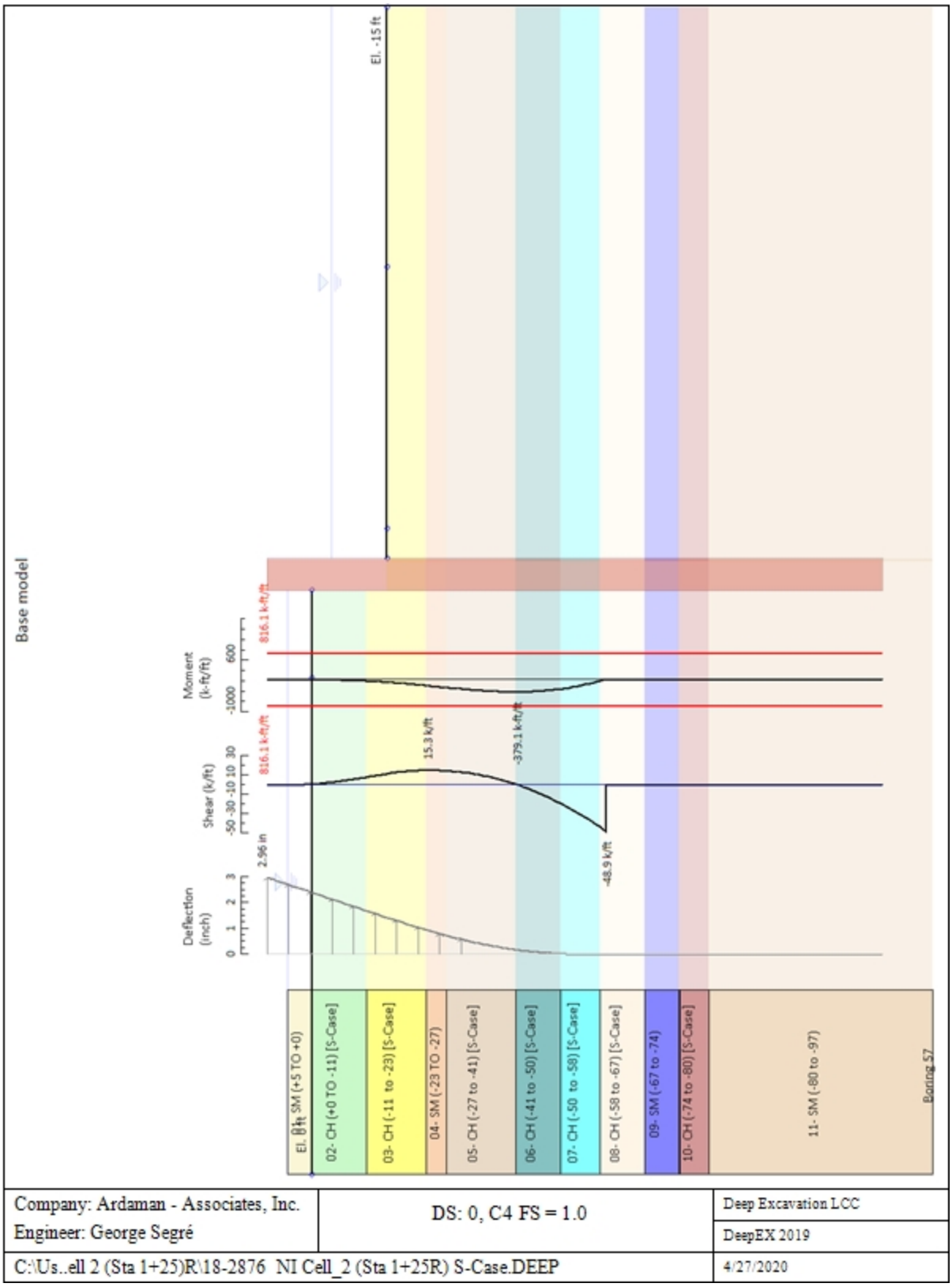
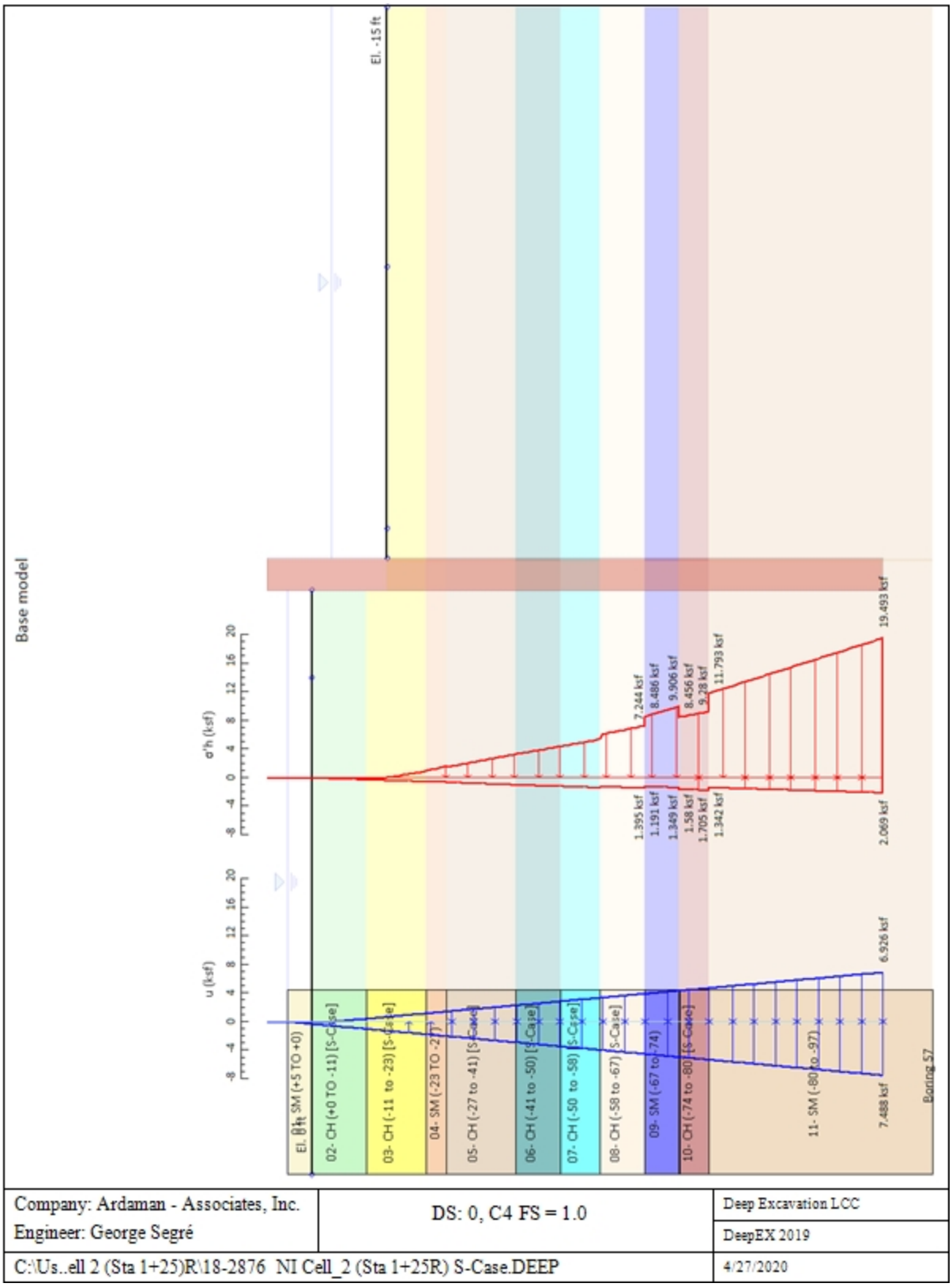

Base model
El. -15 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
30
10
-10
-30
-50
15.3 k/ft
-379.1 k-ft/ft
-48.9 k/ft
Deflection (inch)
0
1
2
3
2.96 in
El. 0 ft
SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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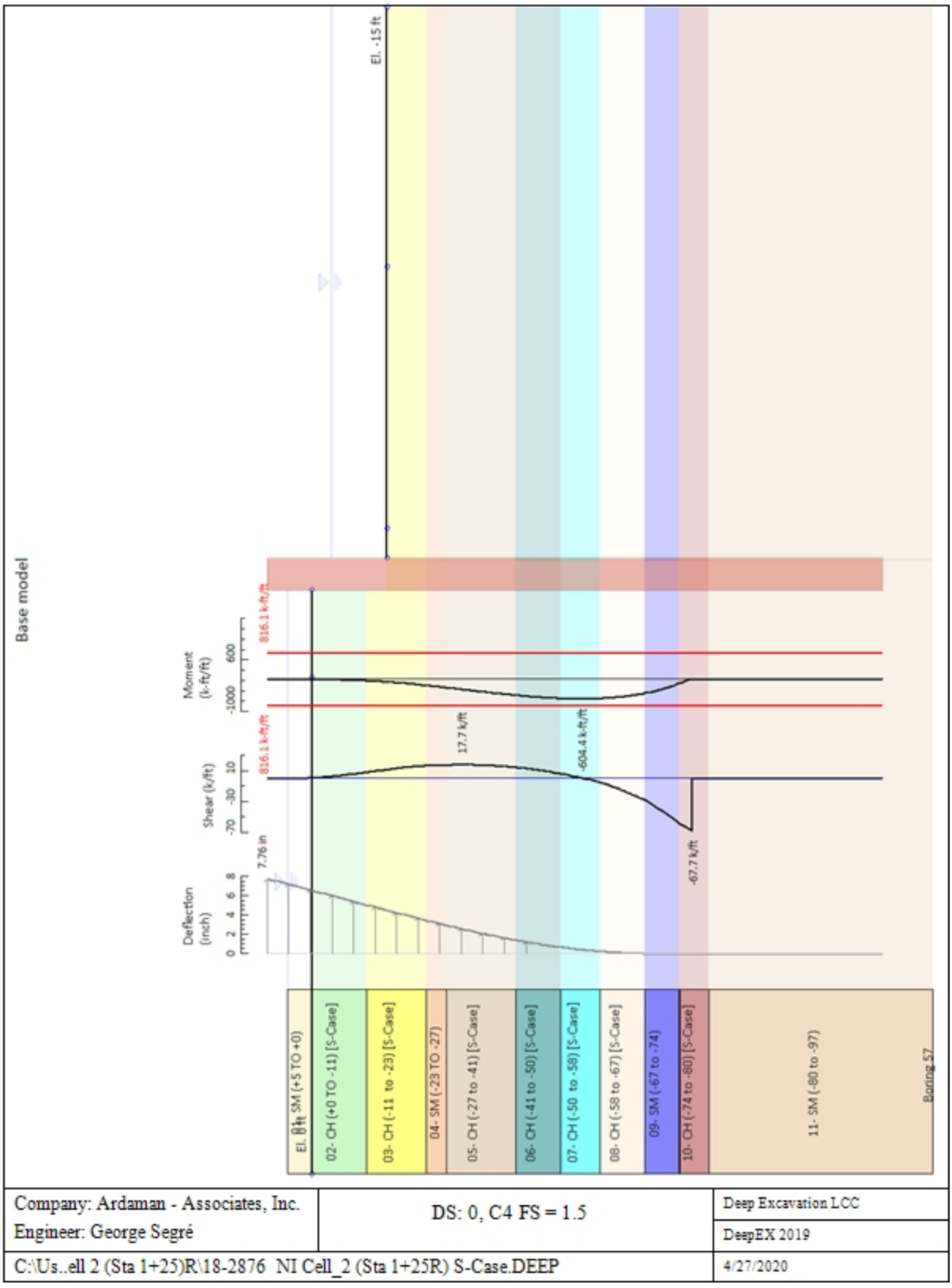

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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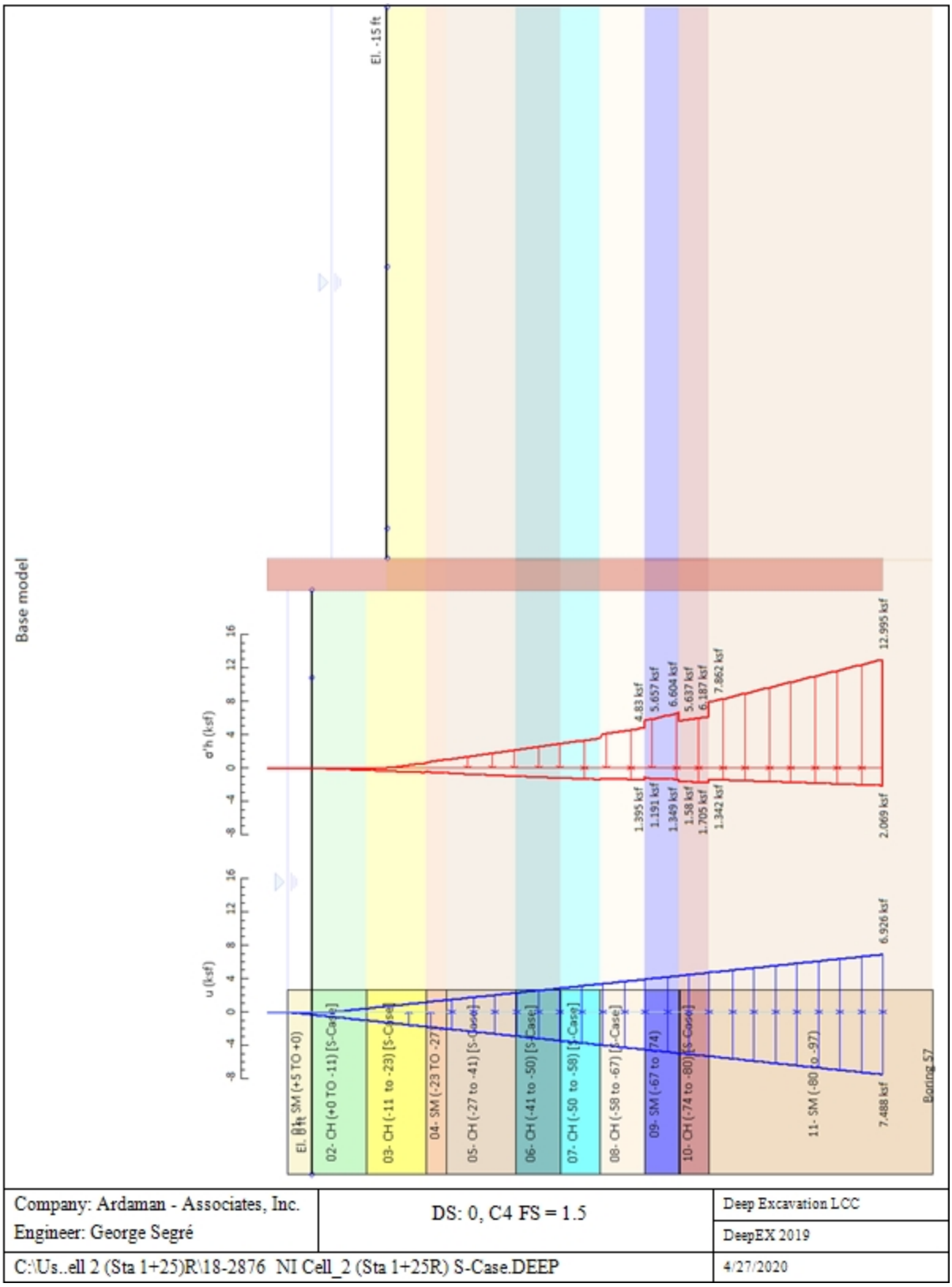

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 2 (Sta 1+25)R\18-2876 NI Cell_2 (Sta 1+25R) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 1+75)

Top of Wall =	9.0	ft., NAVD88	Design Tip Elev. =	-101.0 ft., NAVD88
Governing Tip Elev. =	-99.29	ft., NAVD88	Design Length of Sheeting =	110.0 ft.
Length of Sheetting =	108.29	ft.		
Use =	110.0	ft.		

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-35.63	203.81	60.20	0.66
		Open excavation - degraded	9	-8	1.00	1.25	-36.82	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-33.66	142.66	49.96	0.47
		Open excavation - degraded	9	-4	1.00	1.25	-34.84	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-32.08	76.38	36.39	0.23
		Open excavation - degraded	5	-8	1.00	1.50	-33.26	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-29.31	48.11	19.46	0.11
		Open excavation - degraded	5	-4	1.00	1.50	-29.71	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-89.77	1,595.96	161.53	26.51
		Open excavation - degraded	9	-8	1.00	1.25	-99.29	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-83.82	1,193.32	126.25	17.56
		Open excavation - degraded	9	-4	1.00	1.25	-92.74	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-81.44	996.98	108.99	13.67
		Open excavation - degraded	5	-8	1.00	1.50	-98.69	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-74.30	671.11	84.14	7.87
		Open excavation - degraded	5	-4	1.00	1.50	-90.36	--	--	--
						Governing Value:	-99.29	1,595.96	161.53	26.51

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:29:20 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

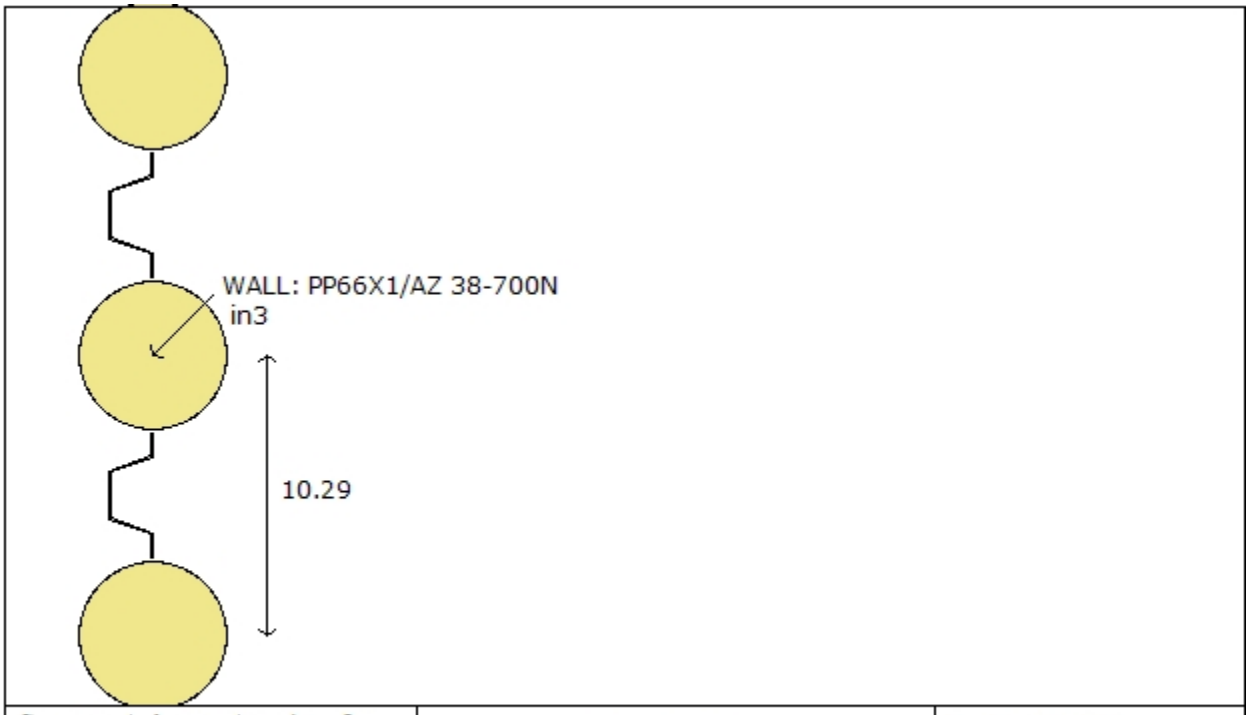
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	3.097	3.248	3.097
Stage 1	Simple span	N/A	1.6	2.517	2.645	2.517
Stage 2	Simple span	N/A	1.6	3.231	3.455	3.231
Stage 3	Simple span	N/A	1.6	2.634	2.834	2.634
Stage 4	Simple span	N/A	1.6	3.507	4.106	3.507
Stage 5	Simple span	N/A	1.6	2.412	2.836	2.412
Stage 6	Simple span	N/A	1.6	3.658	4.368	3.658
Stage 7	Simple span	N/A	1.6	2.532	3.06	2.532

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

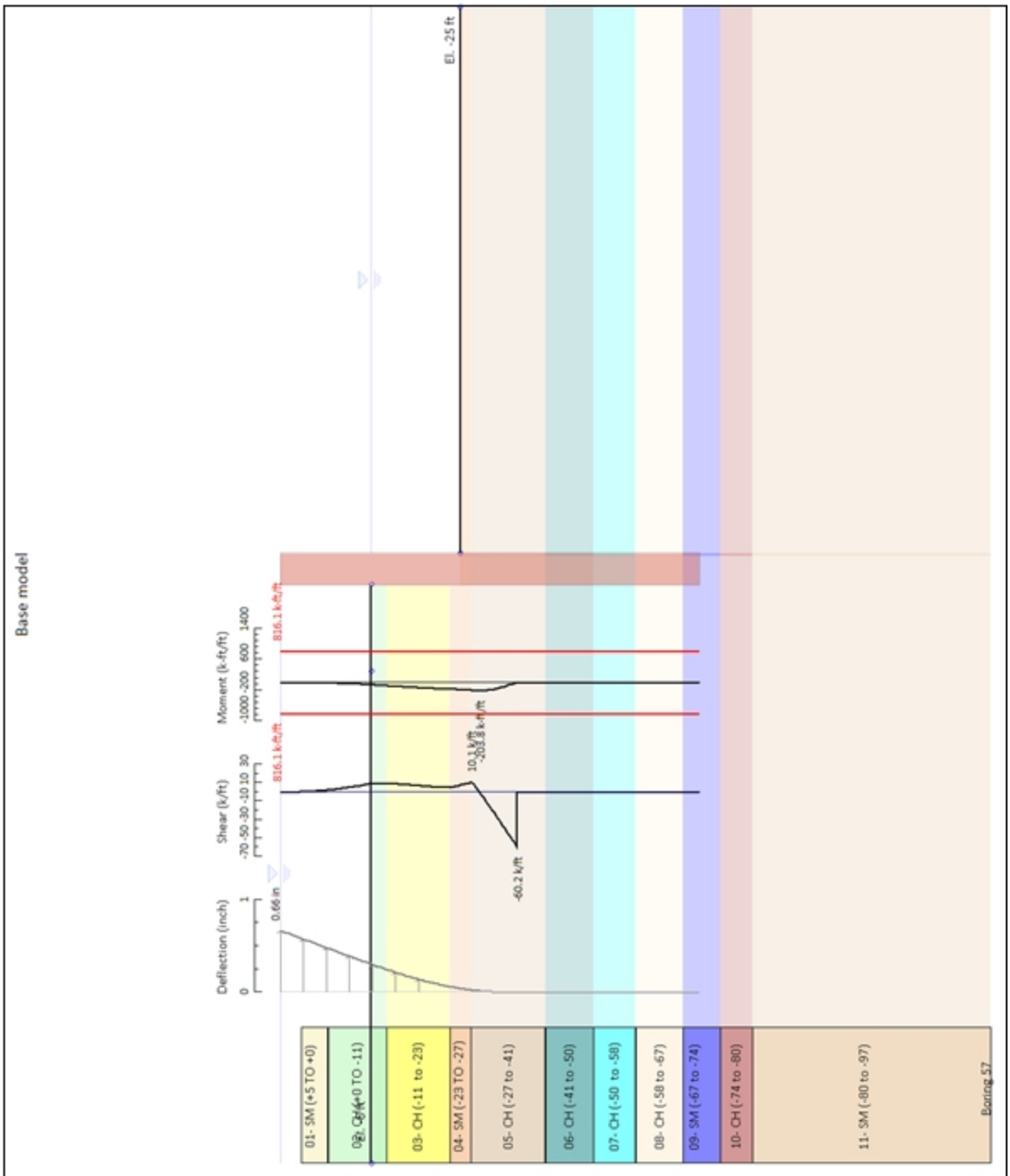
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

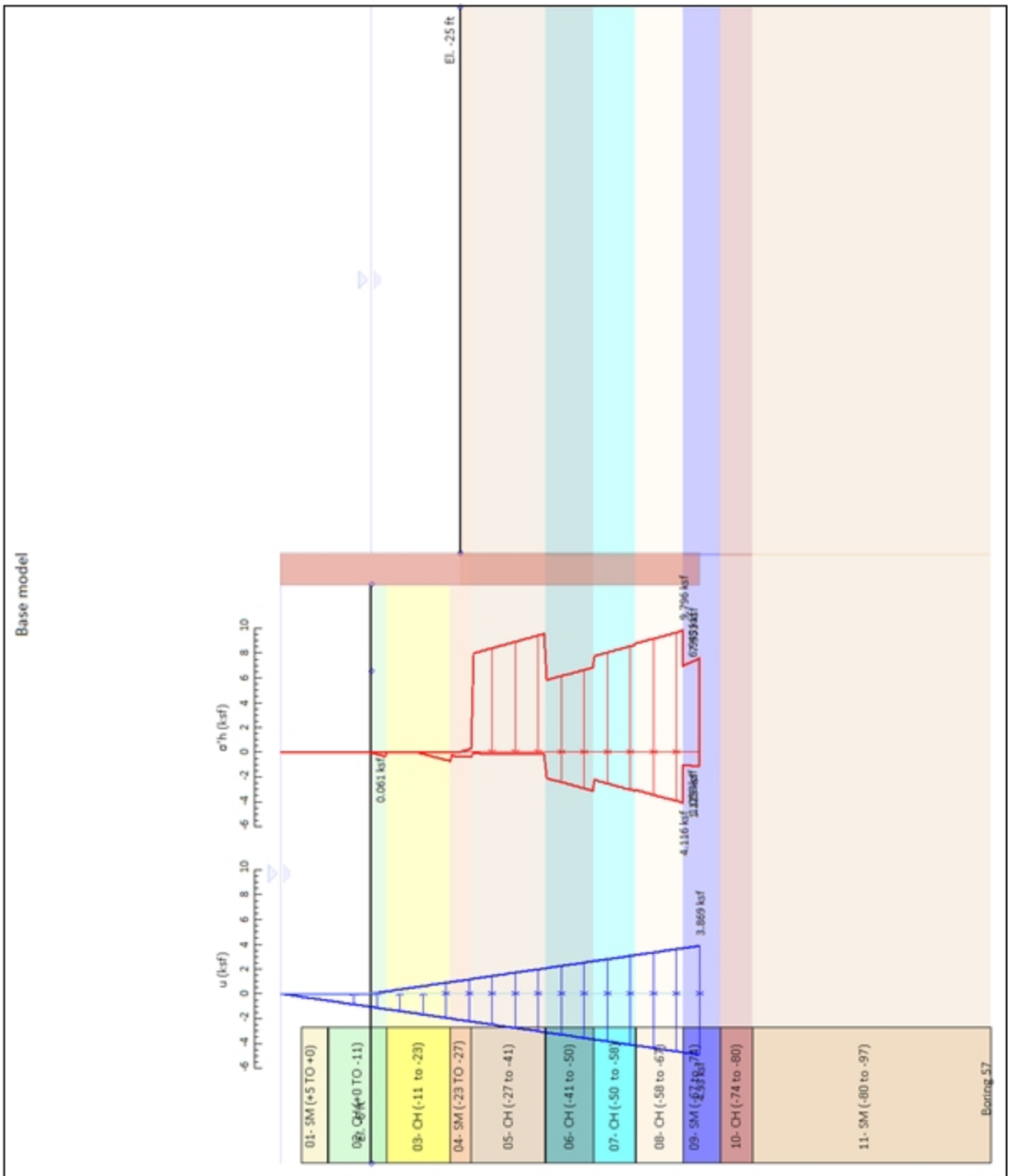
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

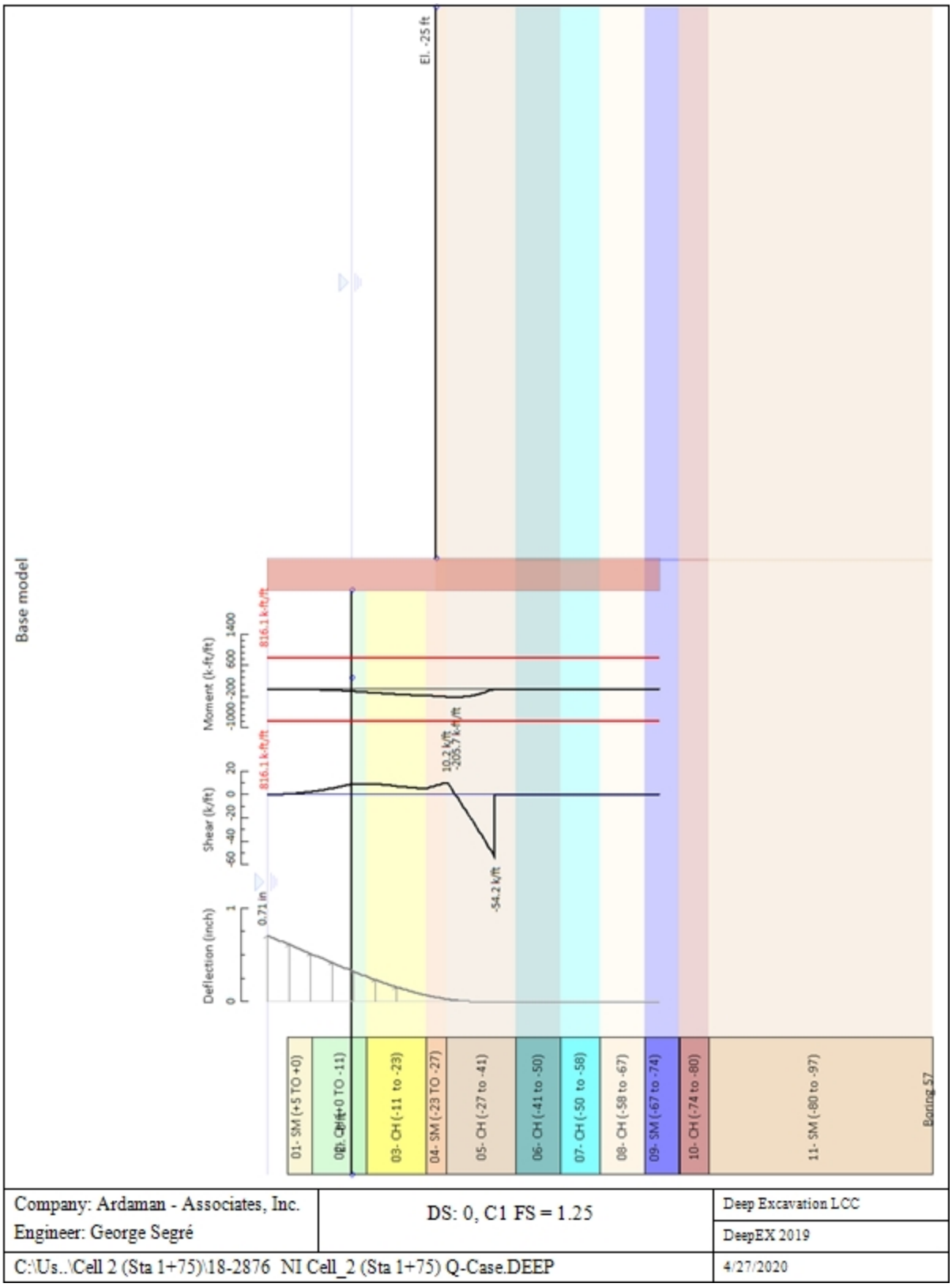
EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported

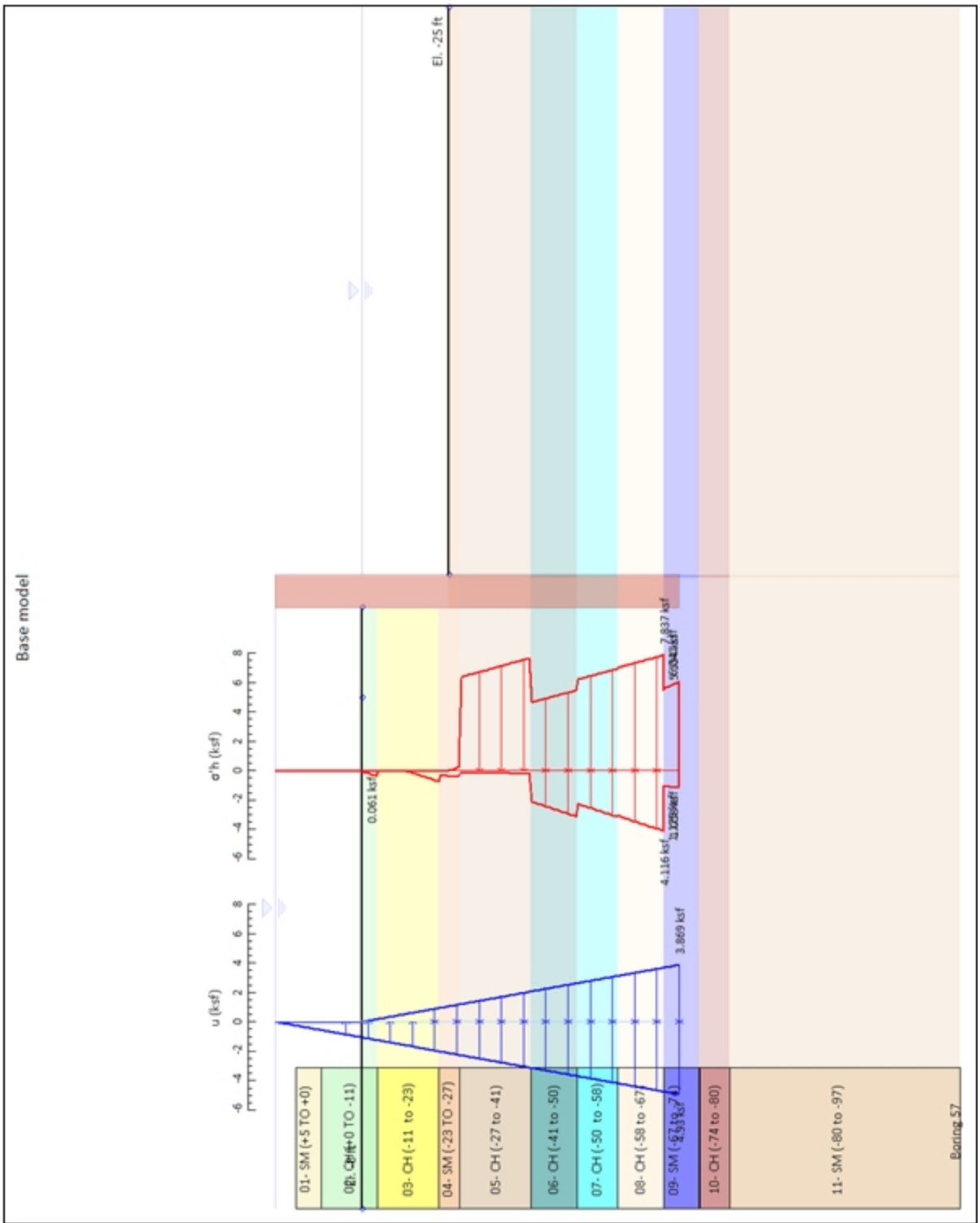


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP		4/27/2020

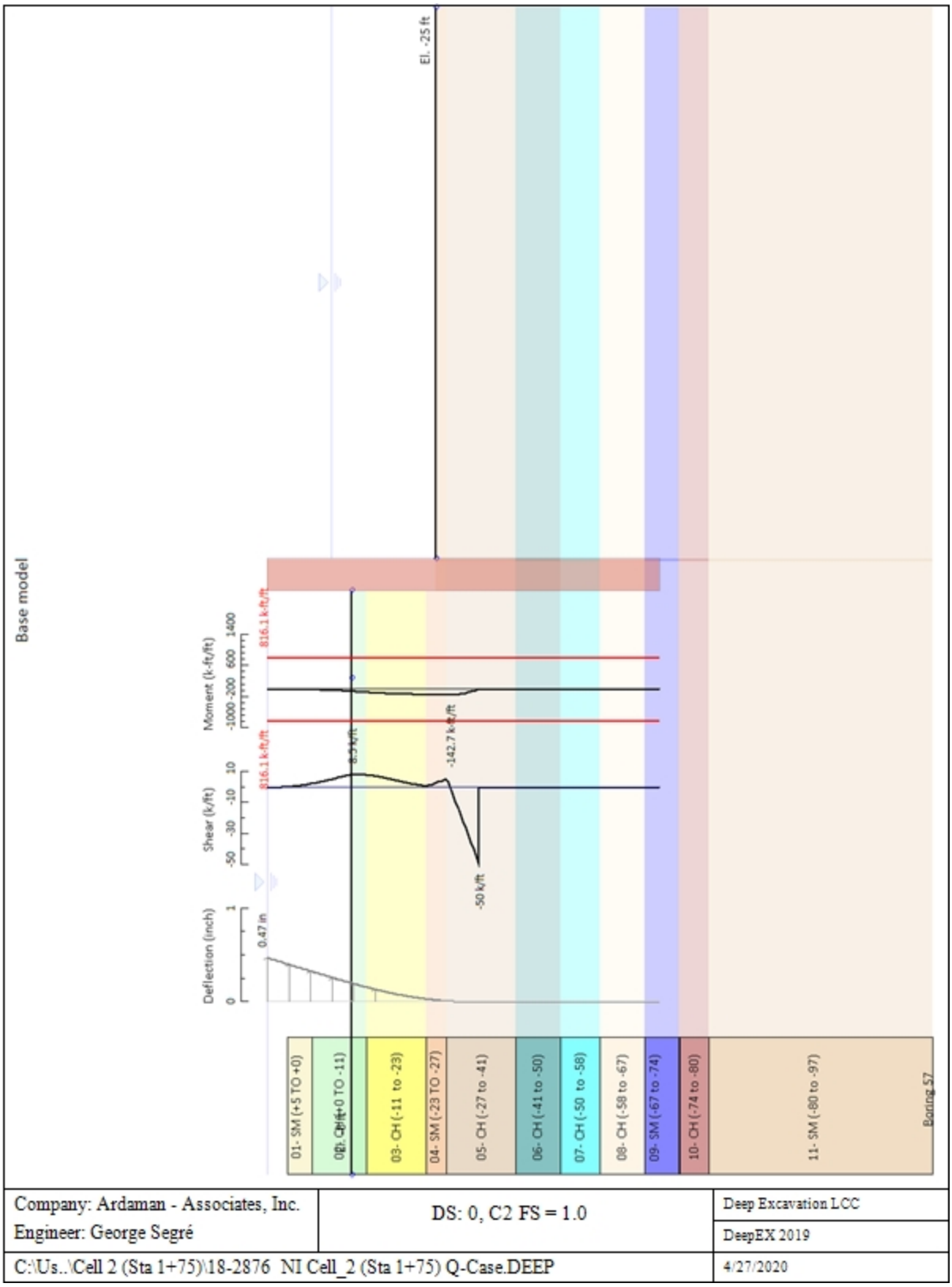

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
0.061 ksf
9.796 ksf
4.116 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020

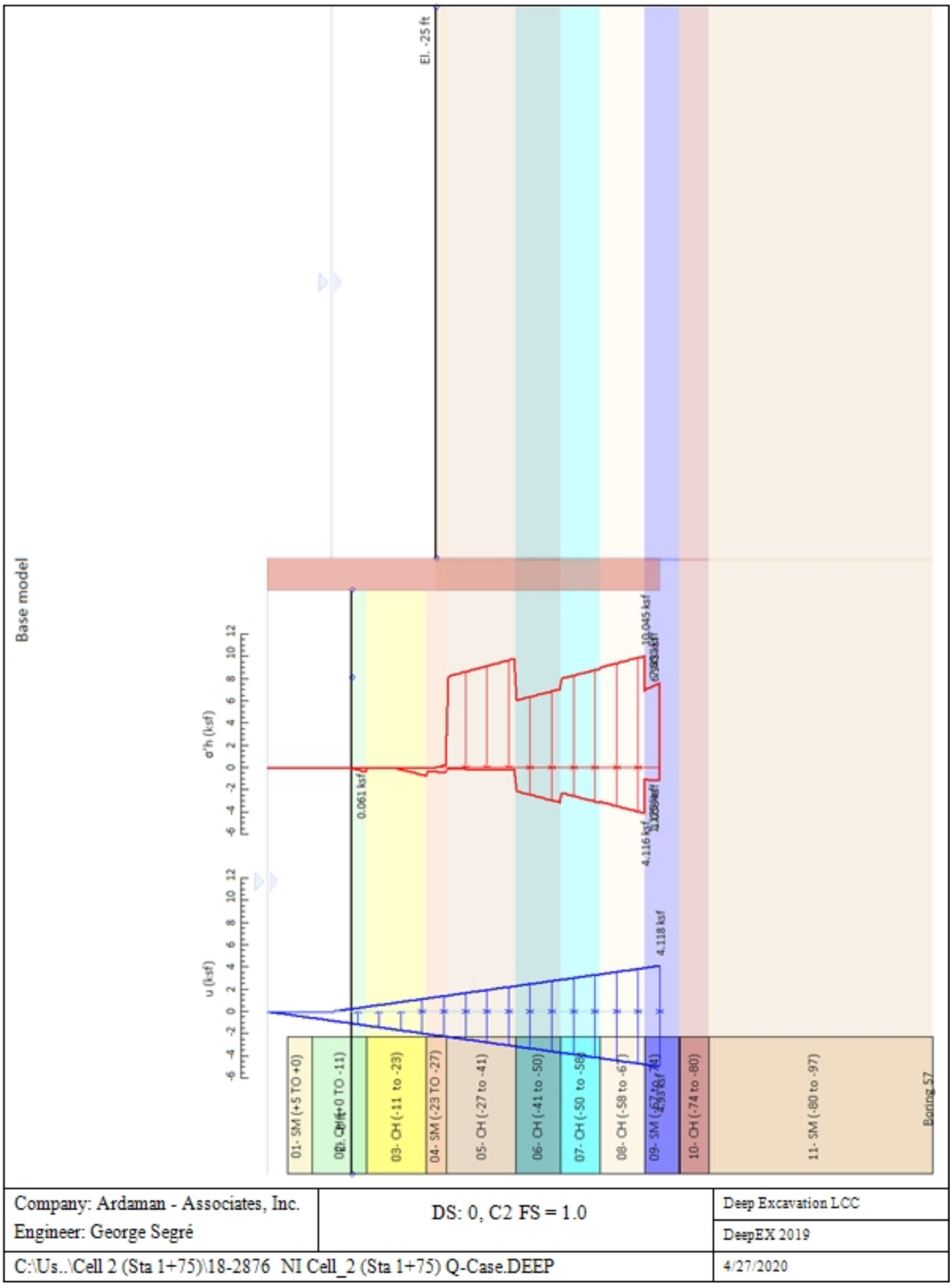


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP		4/27/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-142.7 k-ft/ft
Shear (k/ft)
-50 -30 -10 10
8.3 k/ft
-50 k/ft
Deflection (inch)
0 1
0.47 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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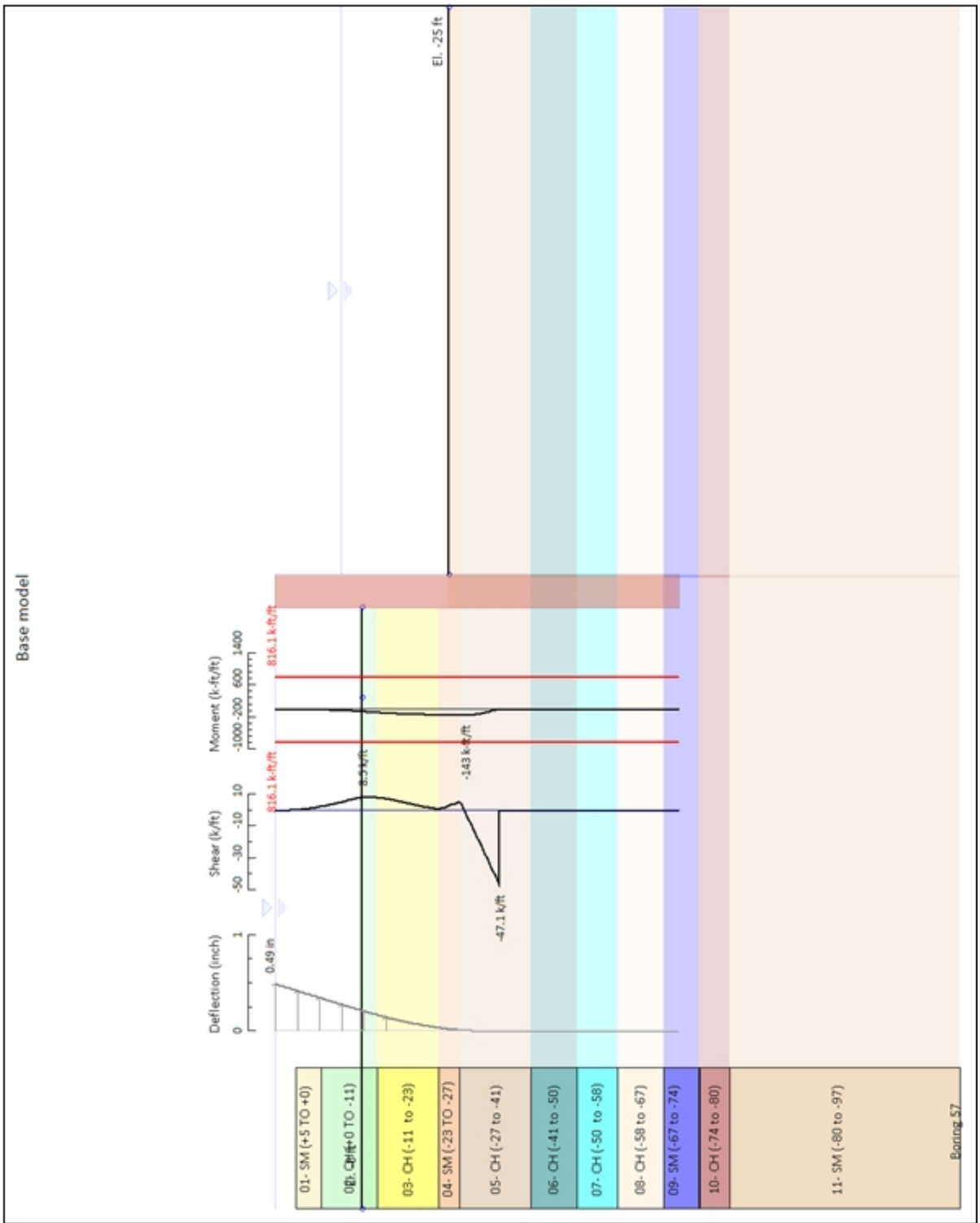

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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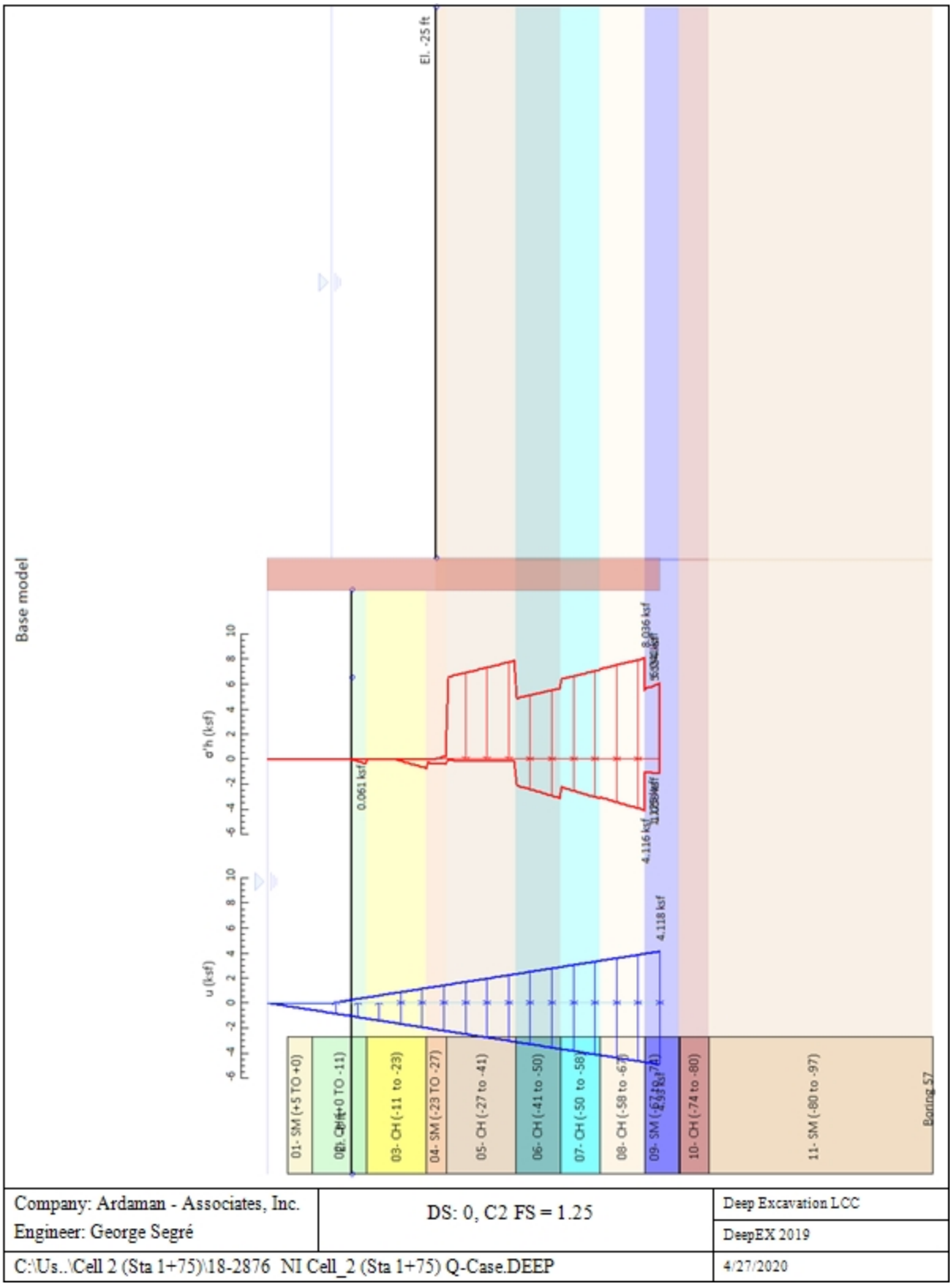

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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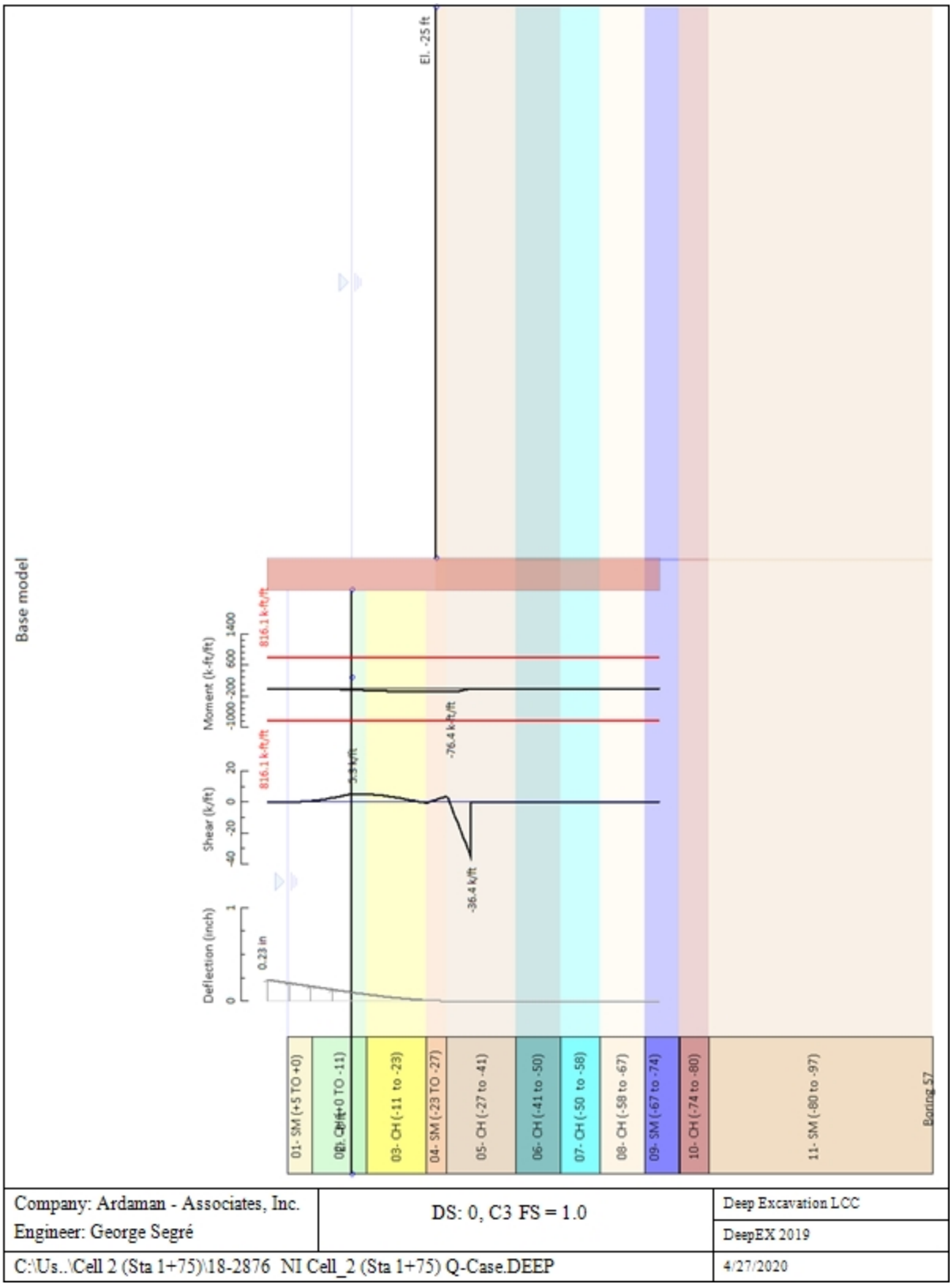

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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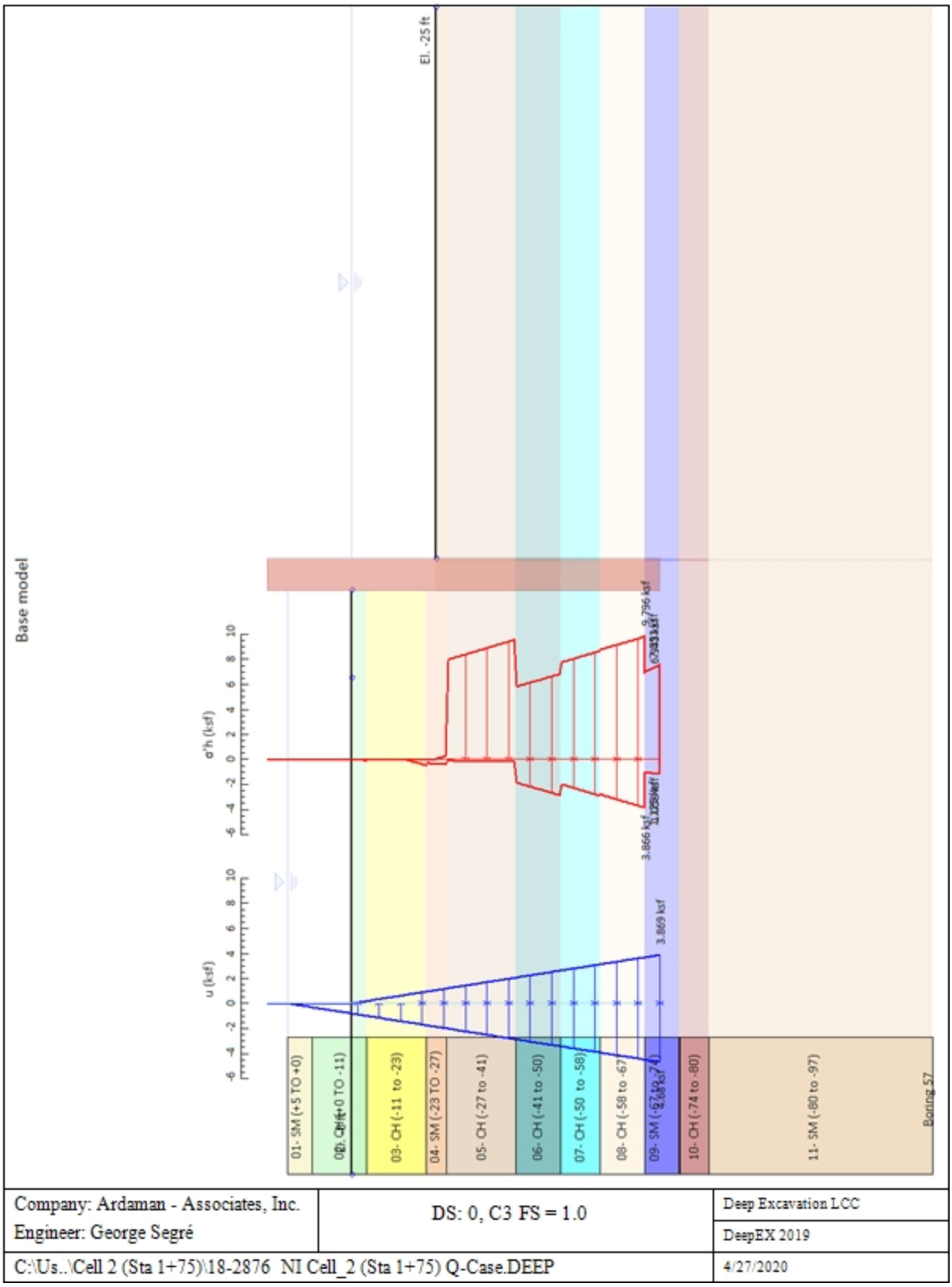
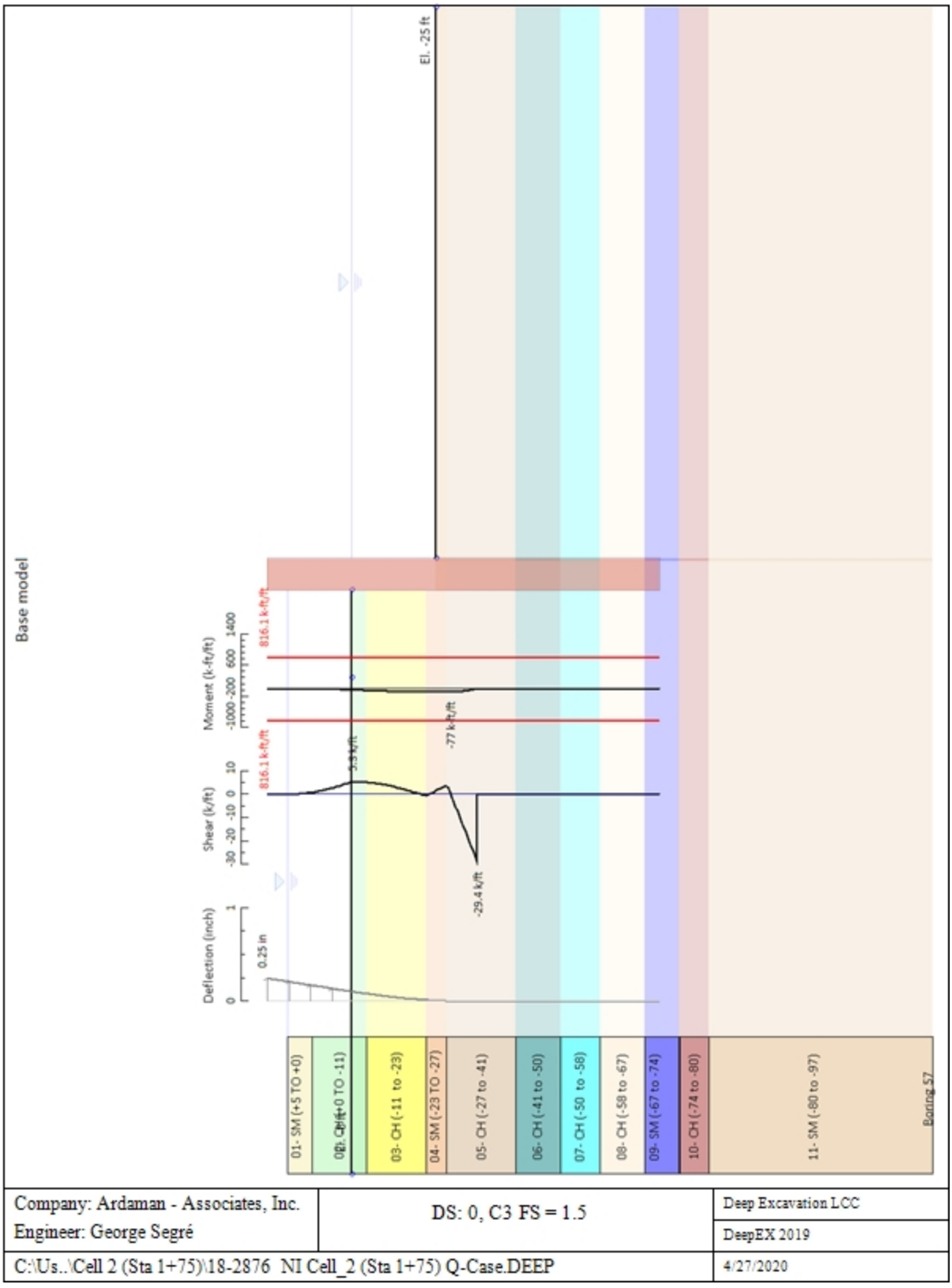
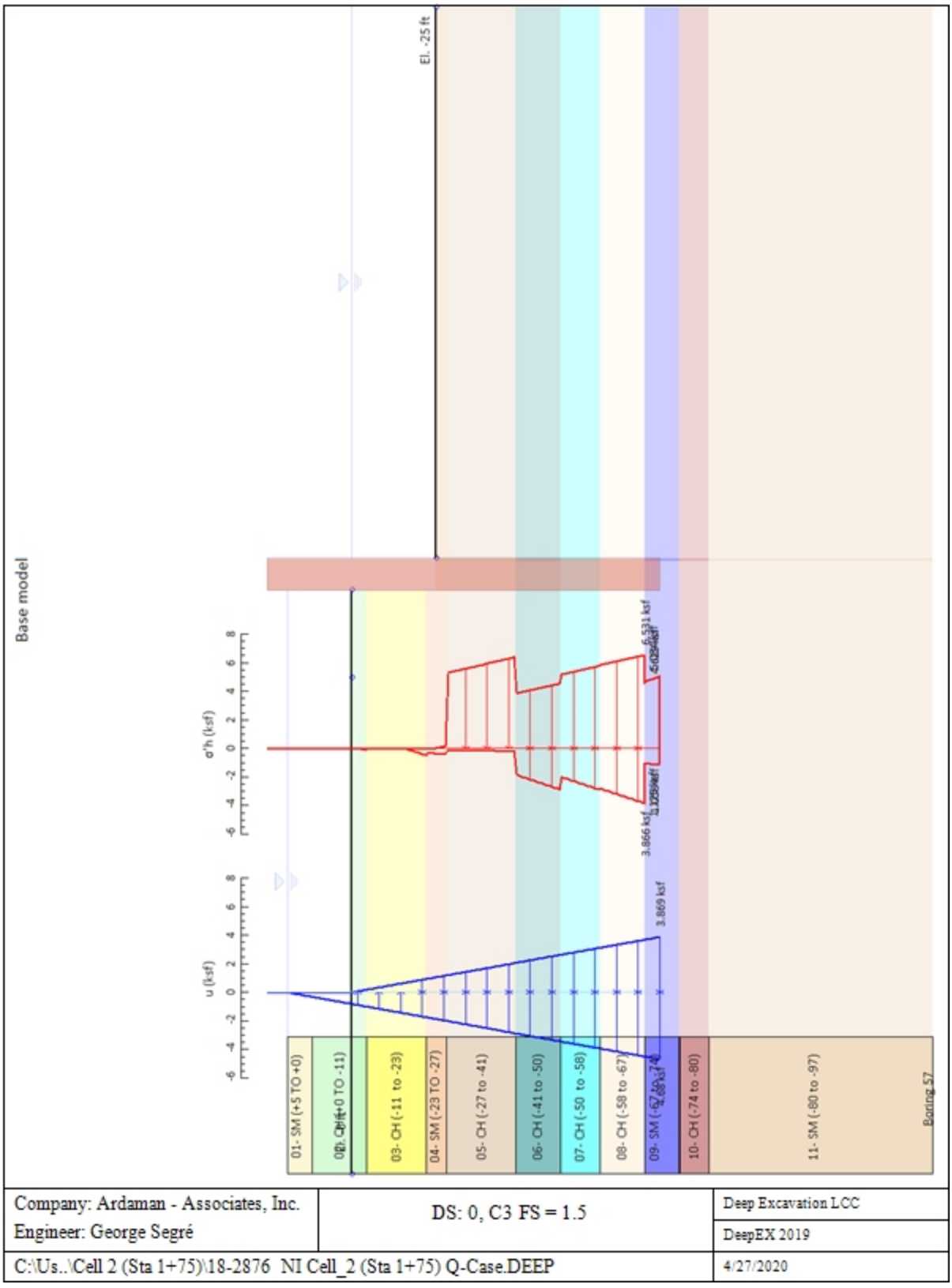
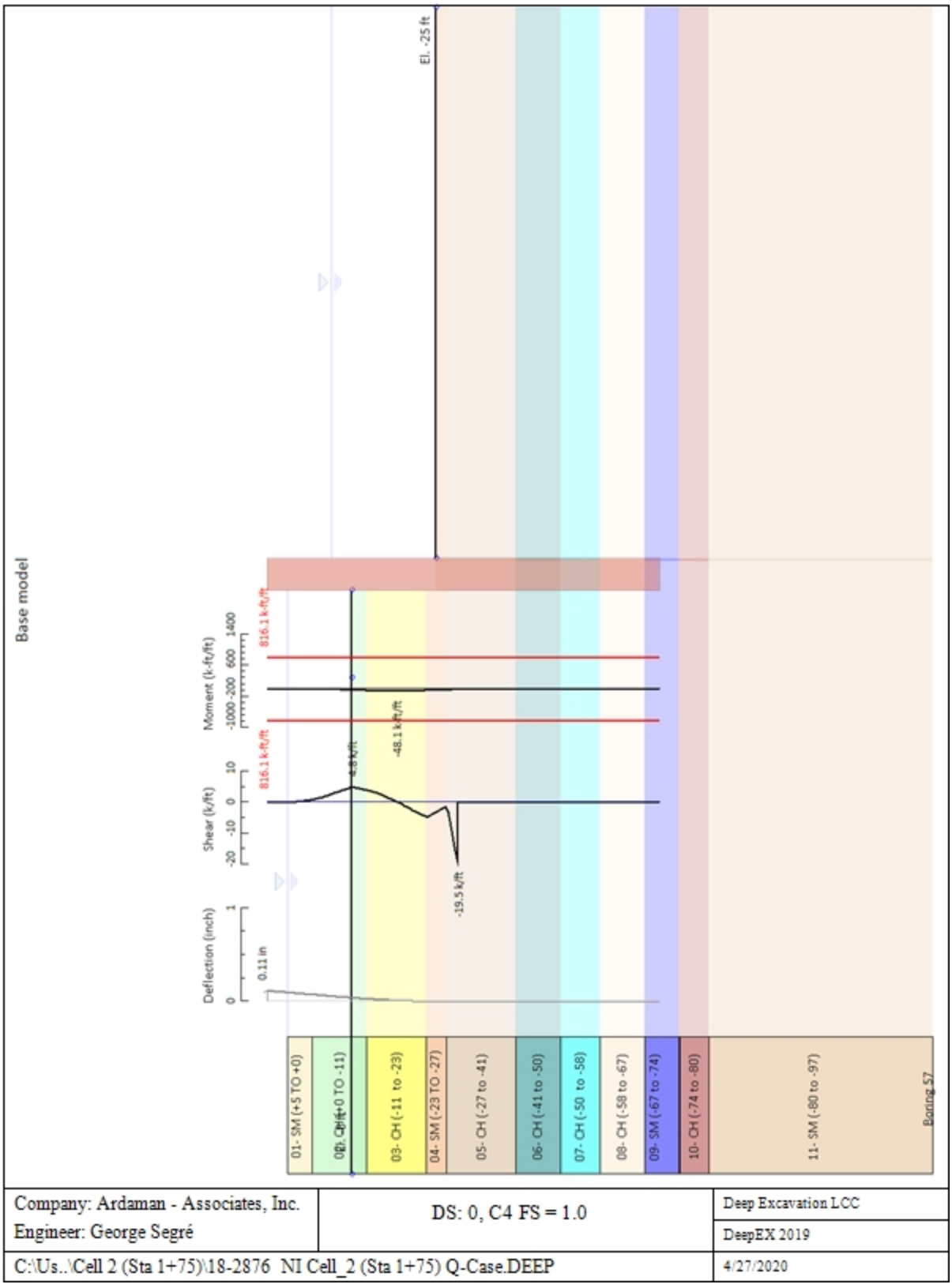

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10
9.796 ksf
3.866 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-77 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
3.3 k/ft
-29.4 k/ft
Deflection (inch)
0 1
0.25 in
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
6.531 ksf
3.866 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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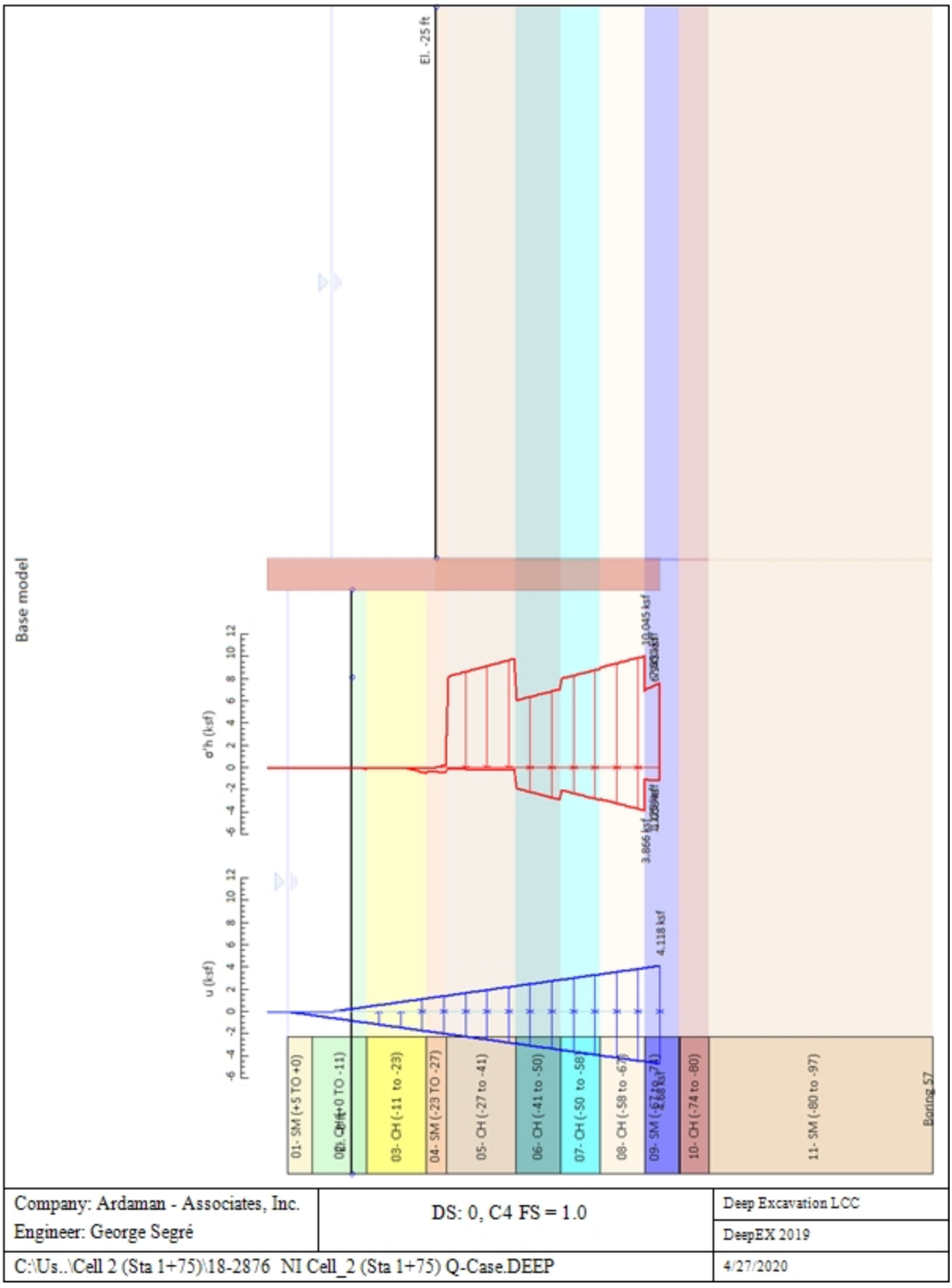
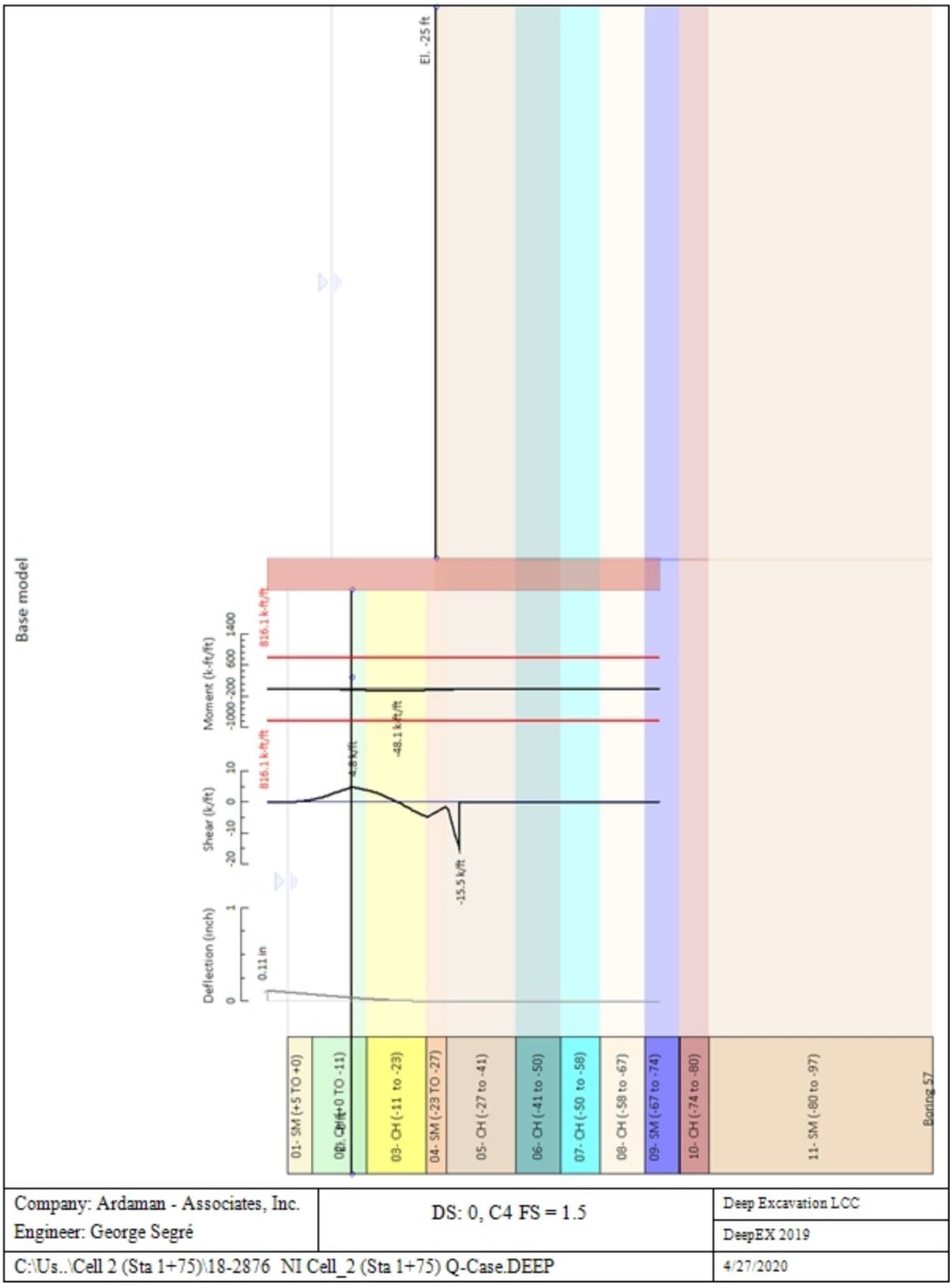
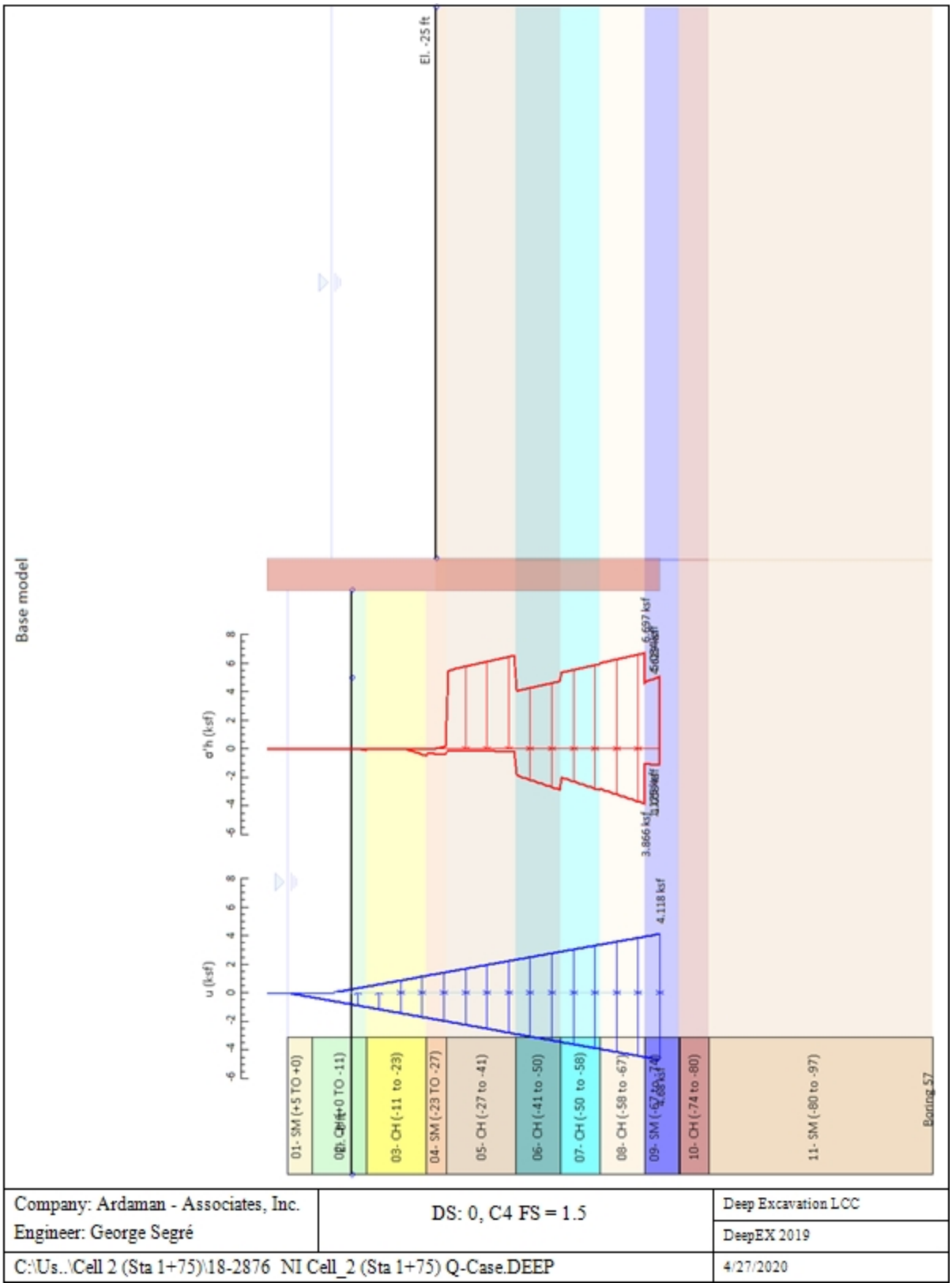


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP		4/27/2020


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
6.697 ksf
3.866 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 9:57:12 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

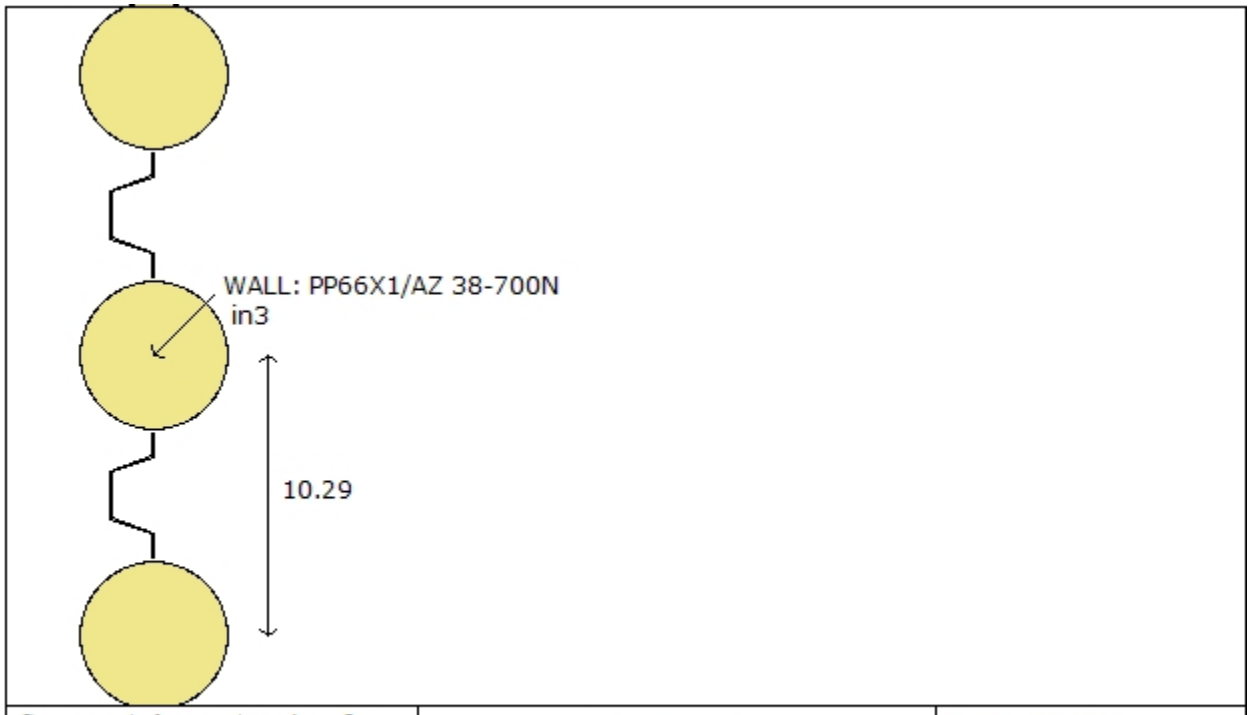
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -110 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.265	1.265	1.726
Stage 1	Simple span	N/A	1.6	1.116	1.116	1.5
Stage 2	Simple span	N/A	1.6	1.329	1.329	1.774
Stage 3	Simple span	N/A	1.6	1.18	1.18	1.548
Stage 4	Simple span	N/A	1.6	1.376	1.376	1.824
Stage 5	Simple span	N/A	1.6	1.106	1.106	1.426
Stage 6	Simple span	N/A	1.6	1.445	1.445	1.874
Stage 7	Simple span	N/A	1.6	1.175	1.175	1.477

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

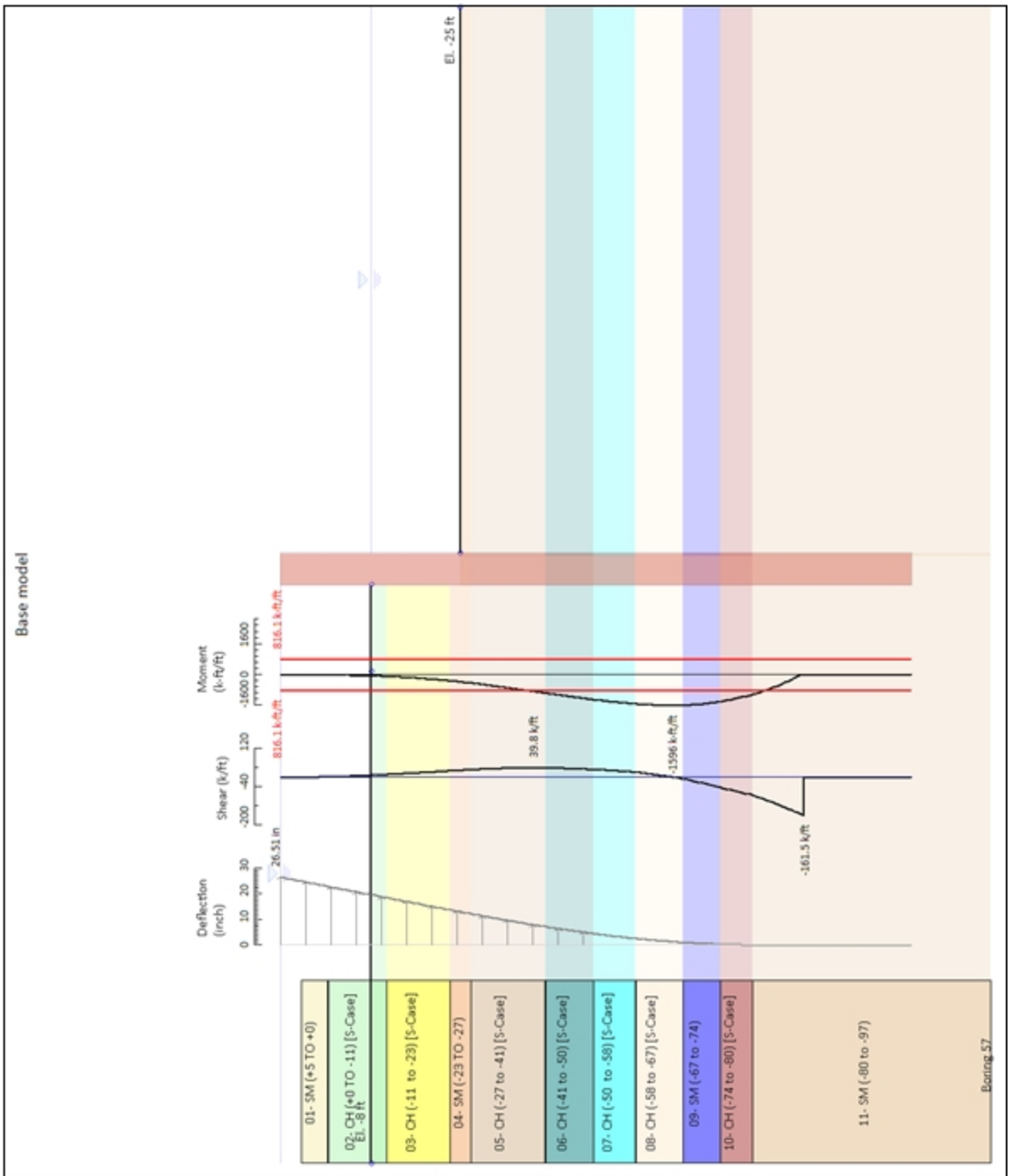
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

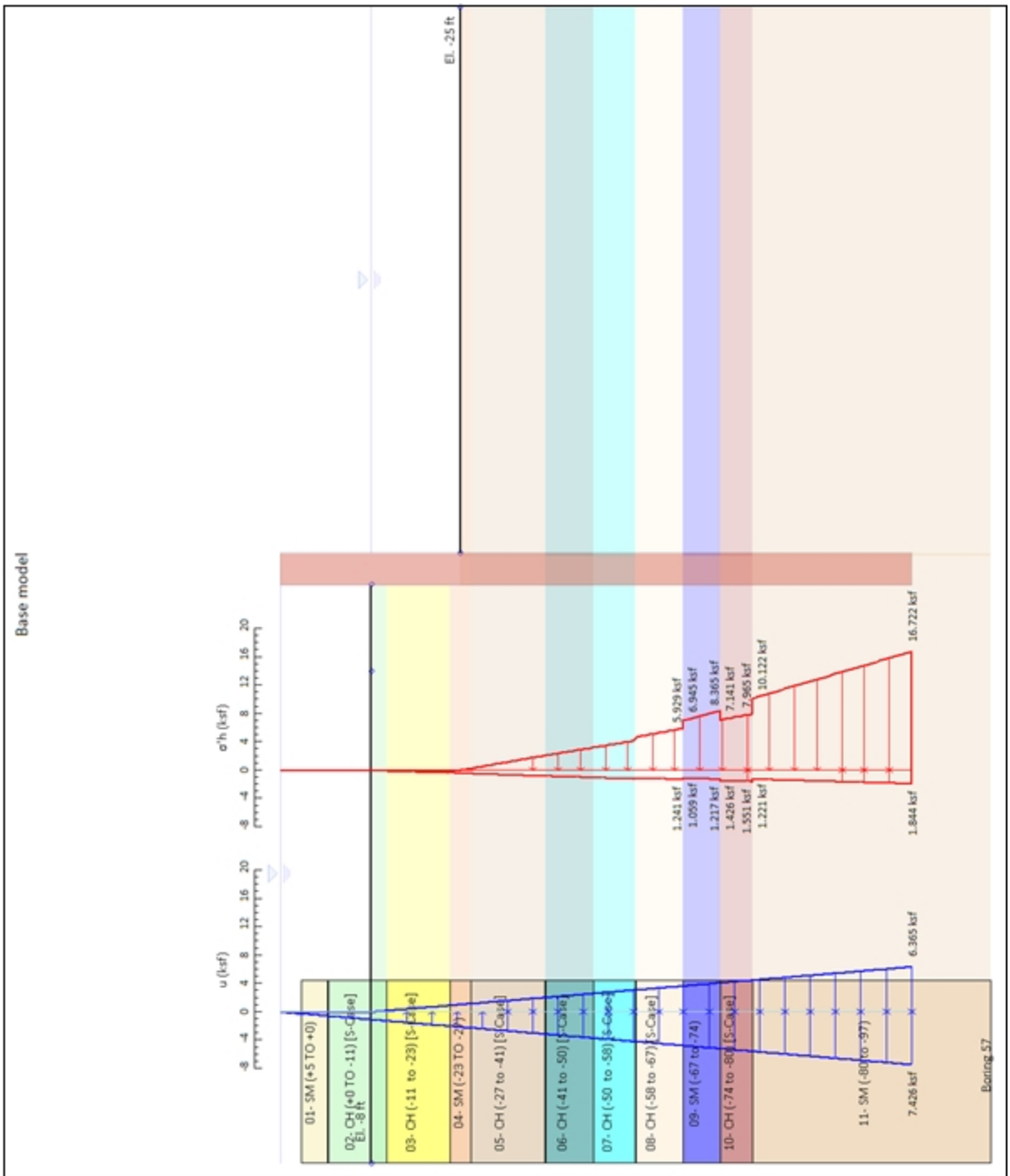
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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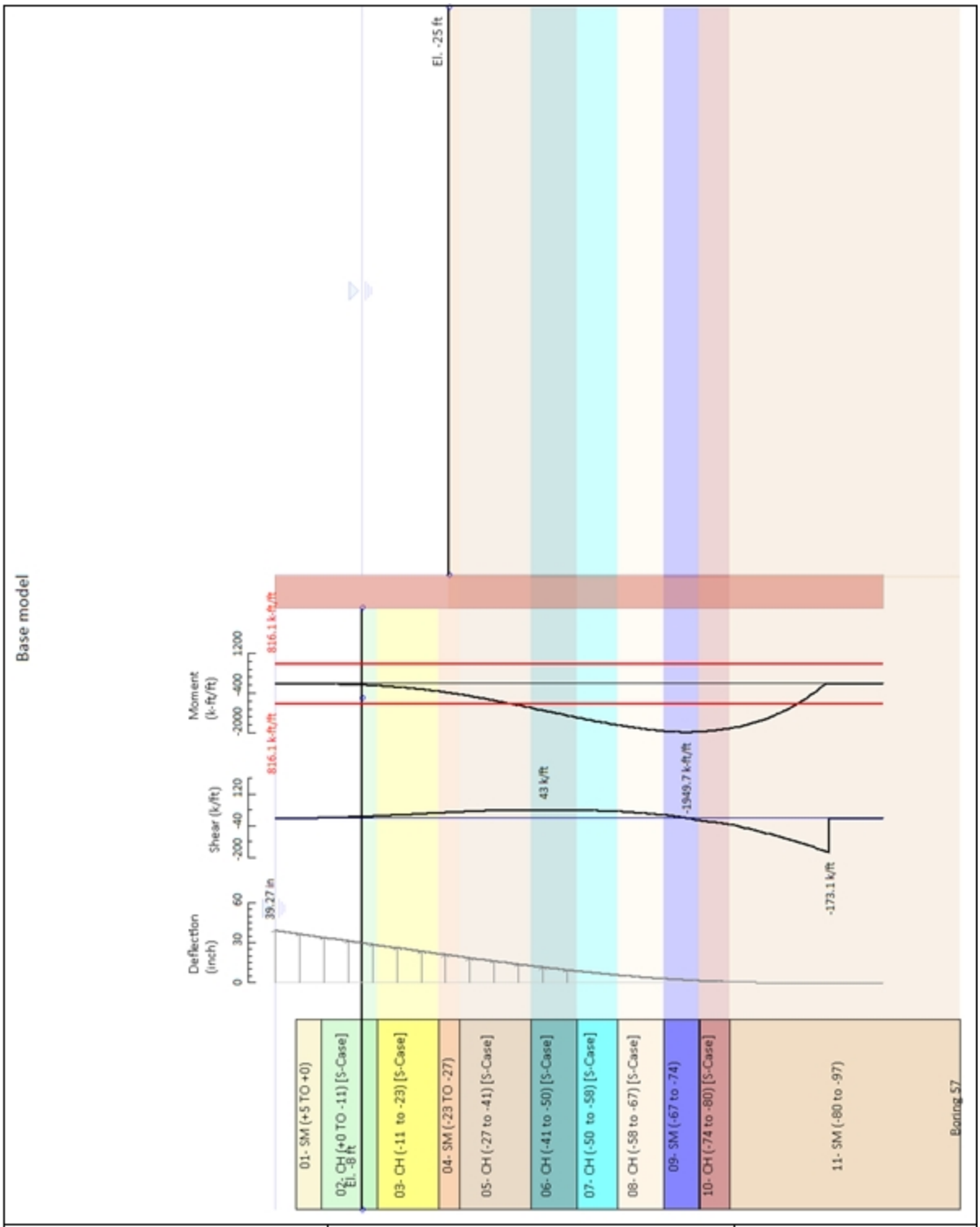

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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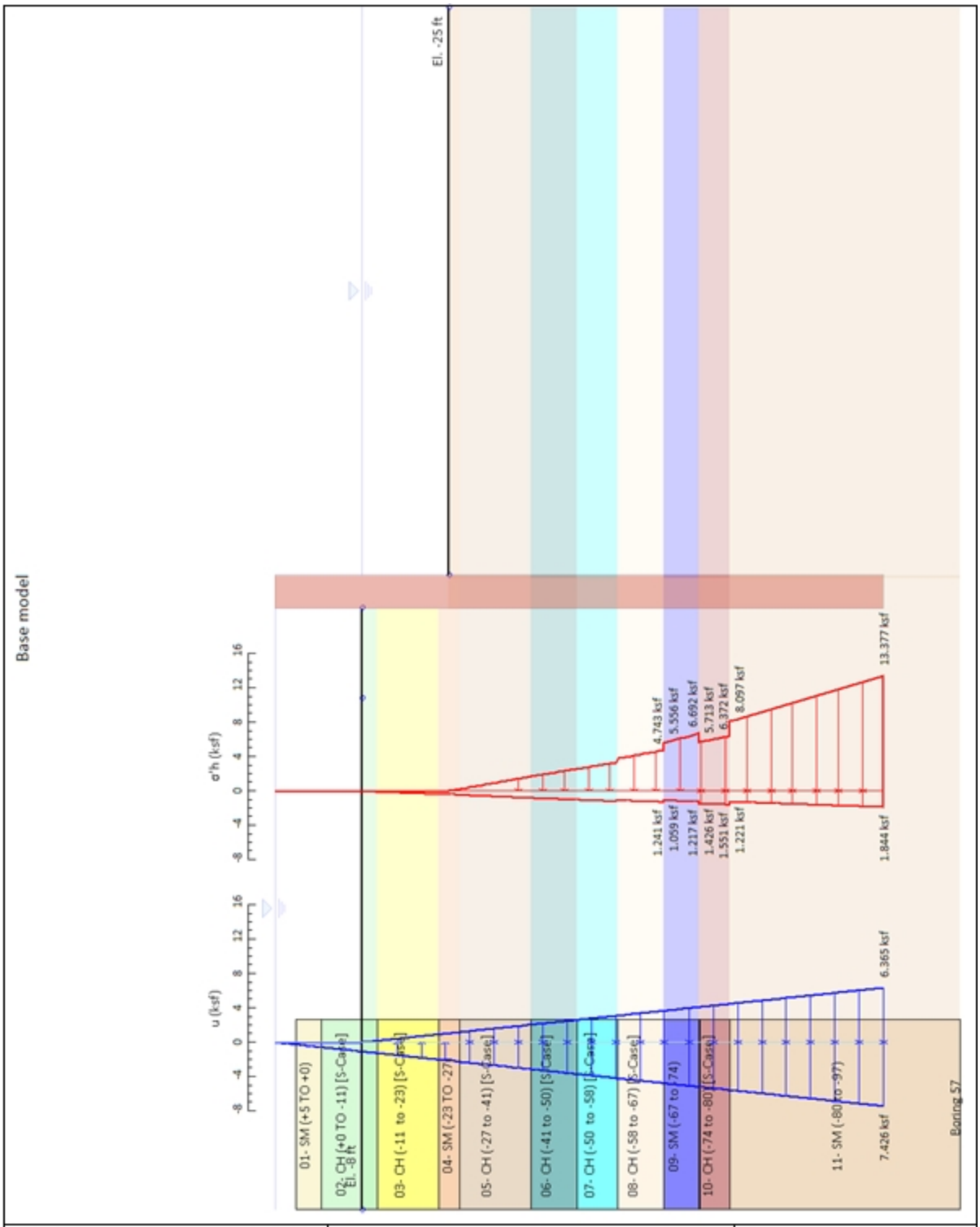
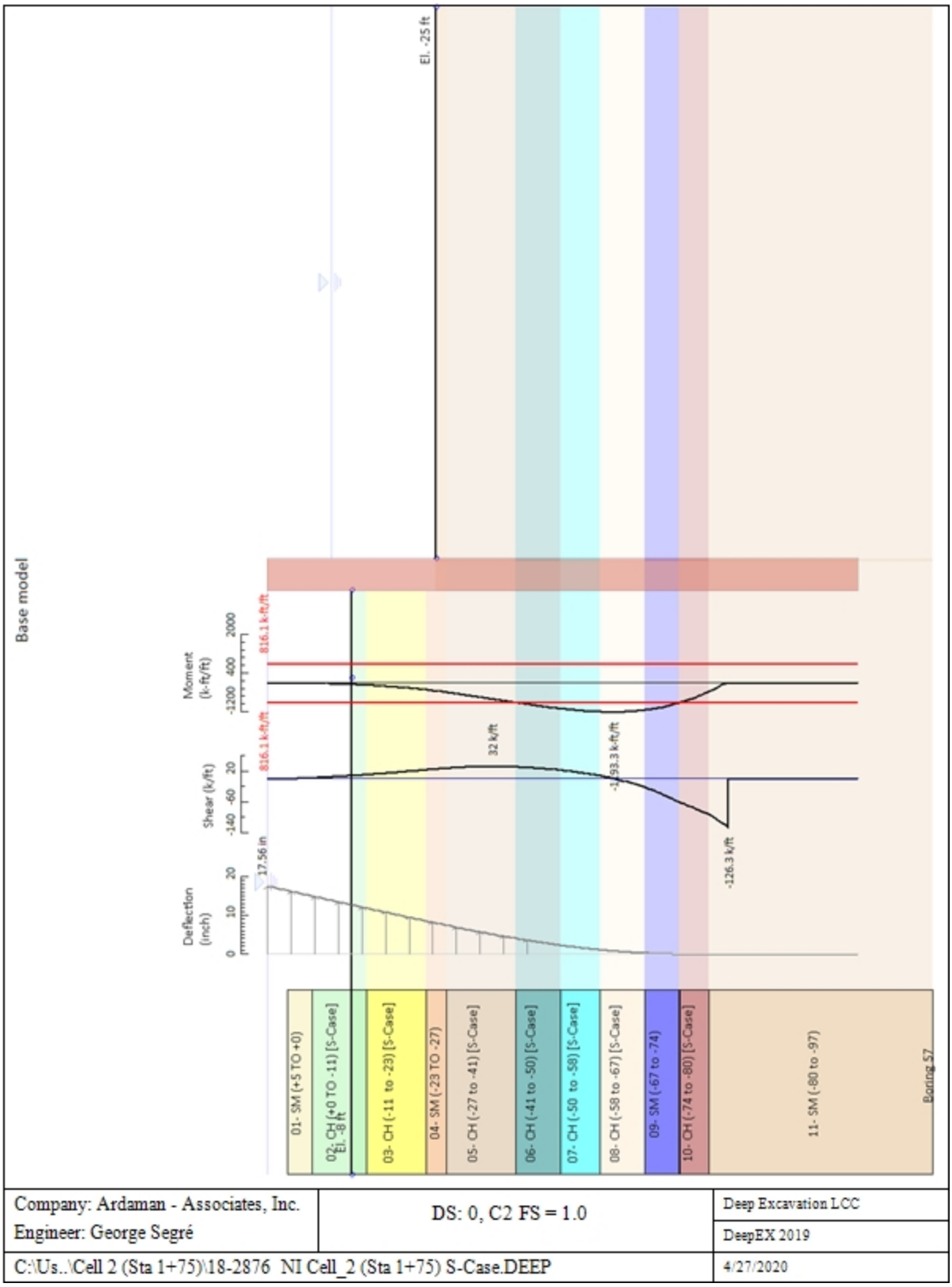
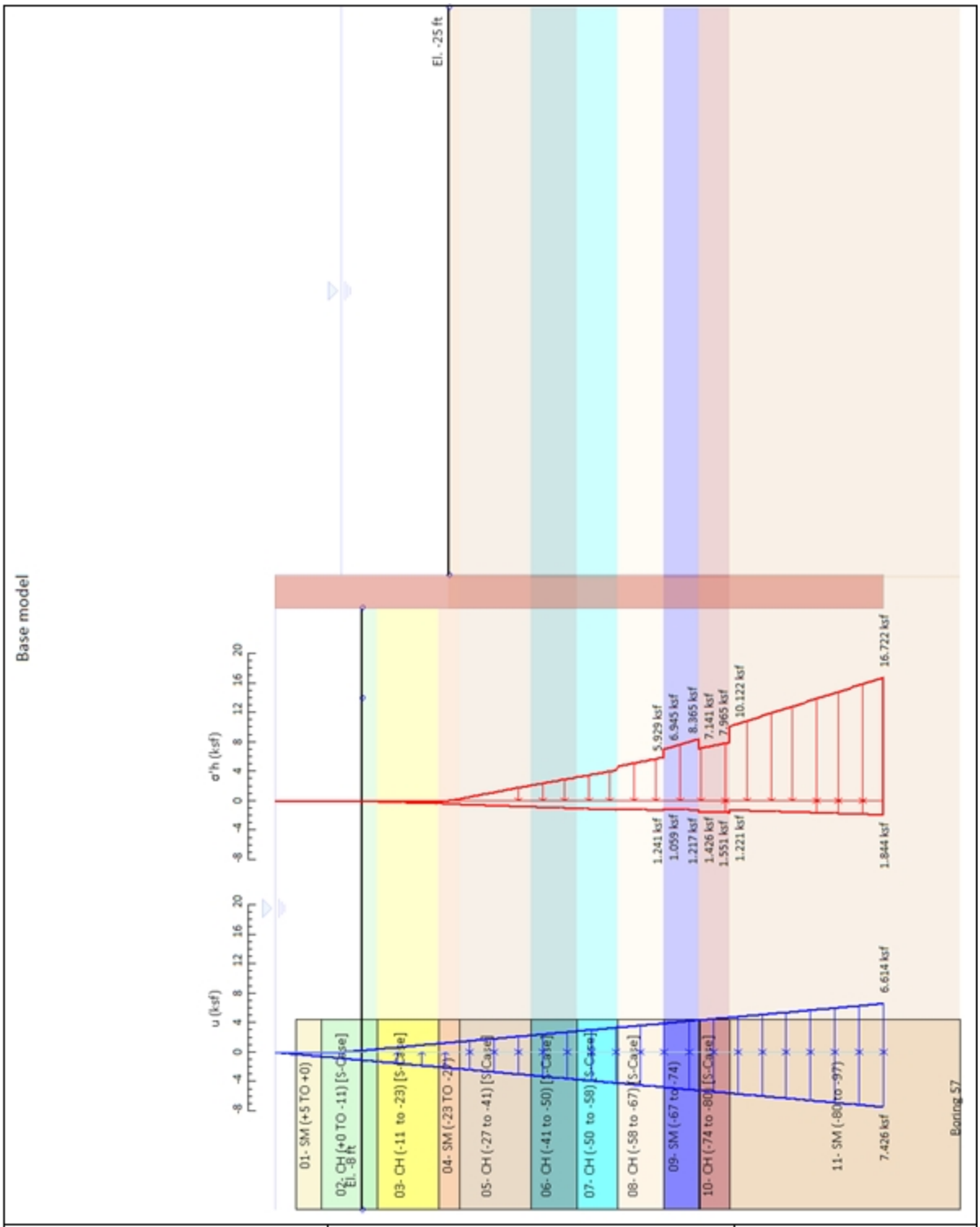
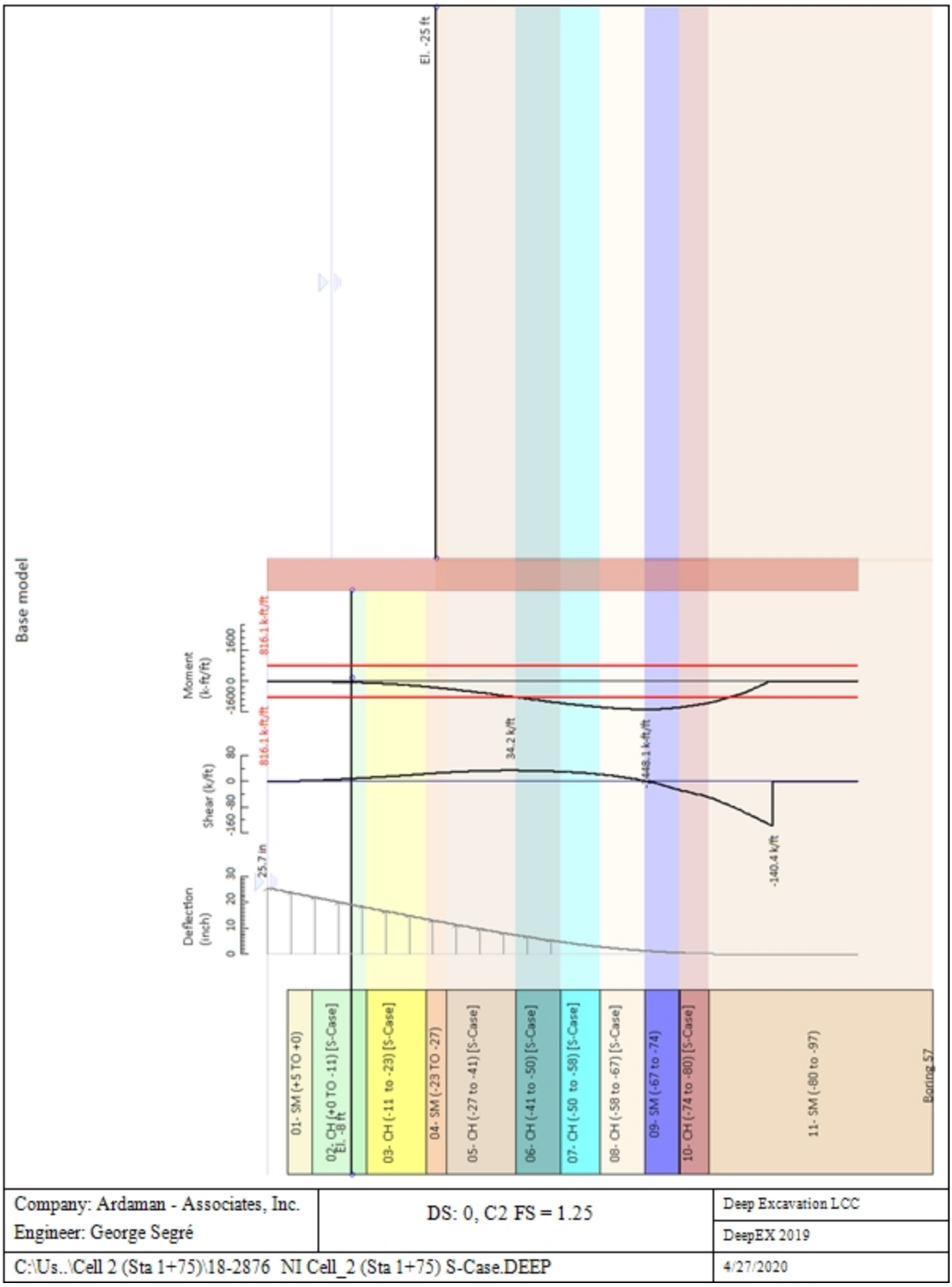


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-3200 400 2000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-140 -60 20
32 k/ft
-193.3 k-ft/ft
-126.3 k/ft
Deflection (inch)
0 10 20
17.56 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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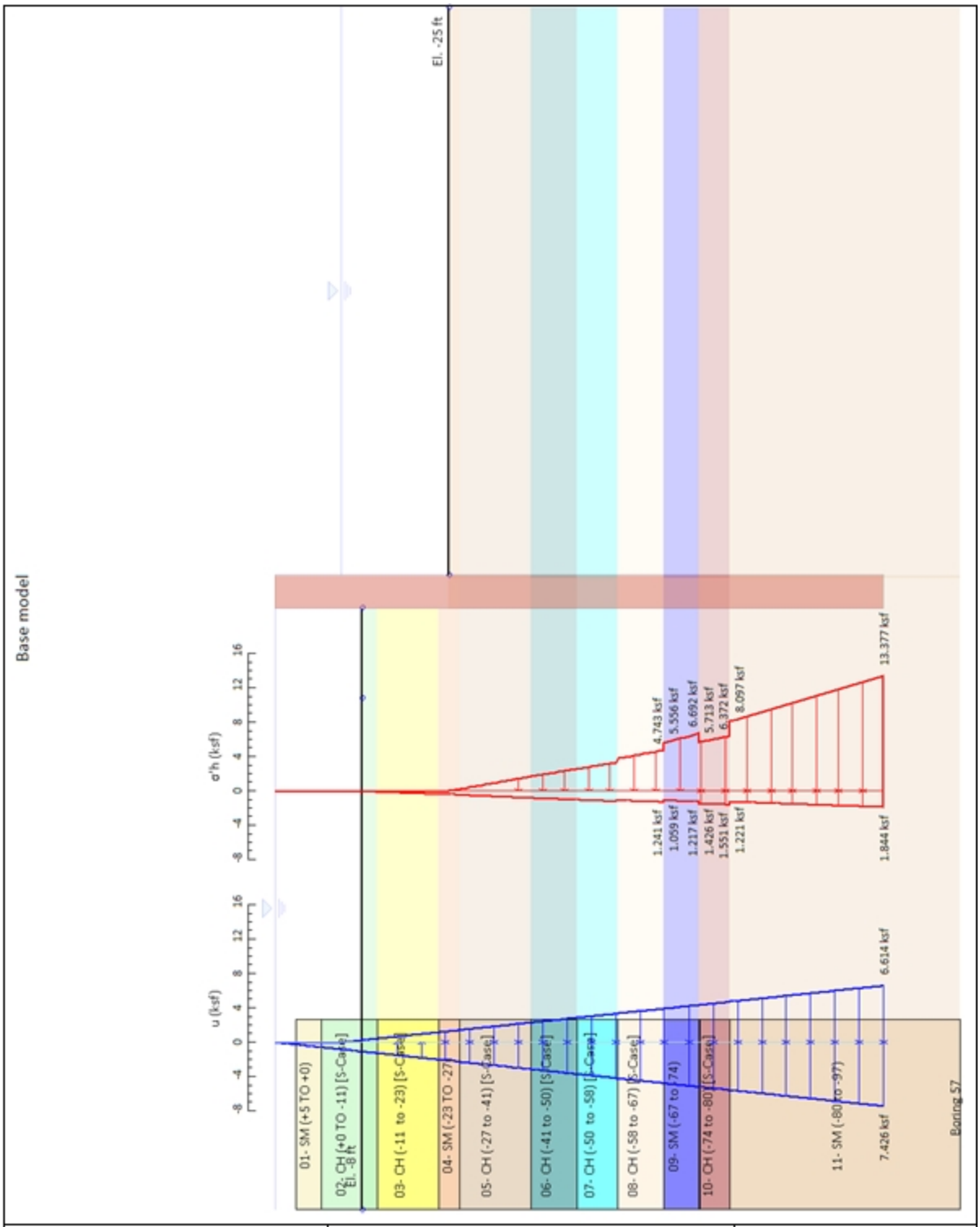
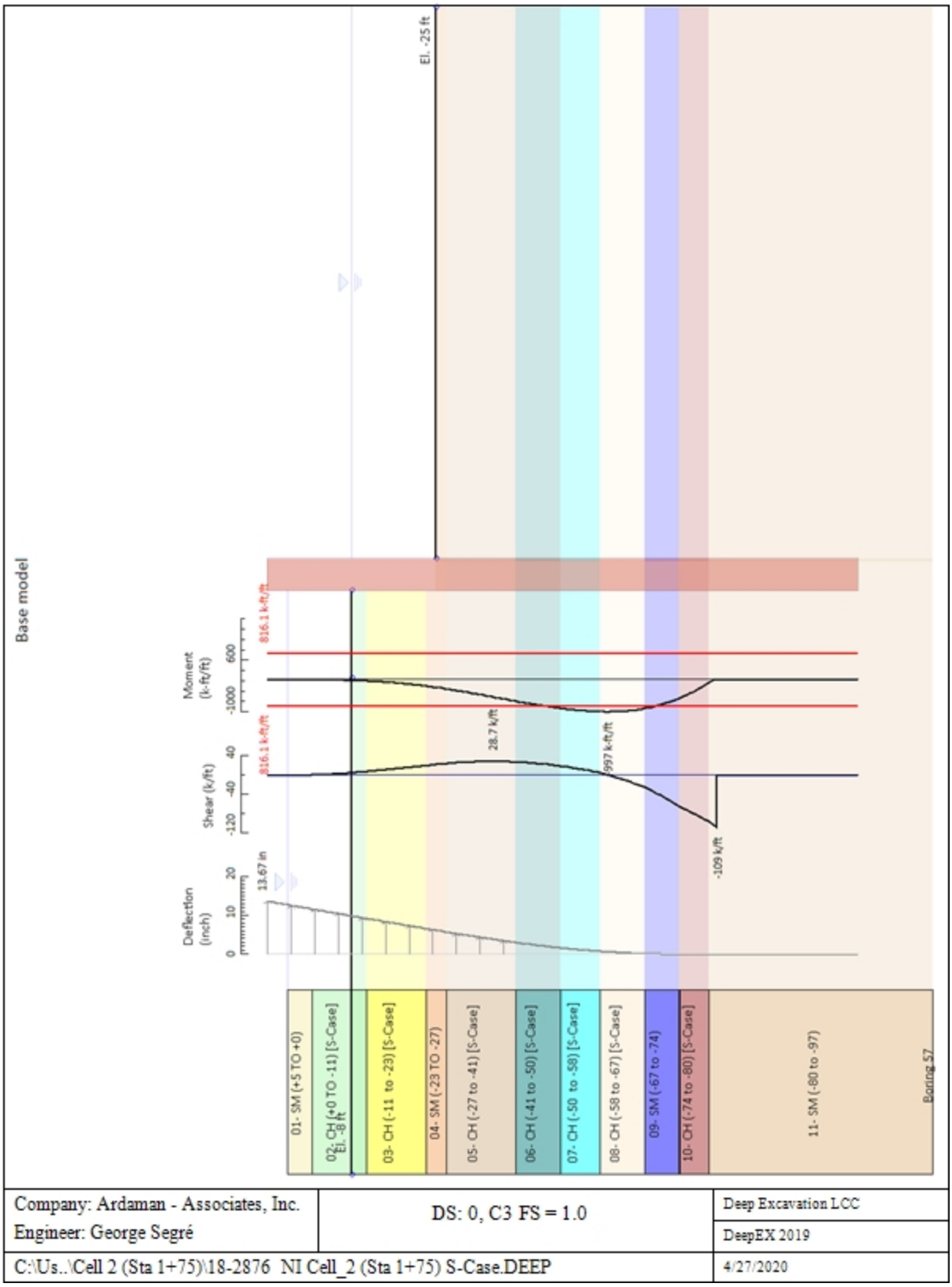
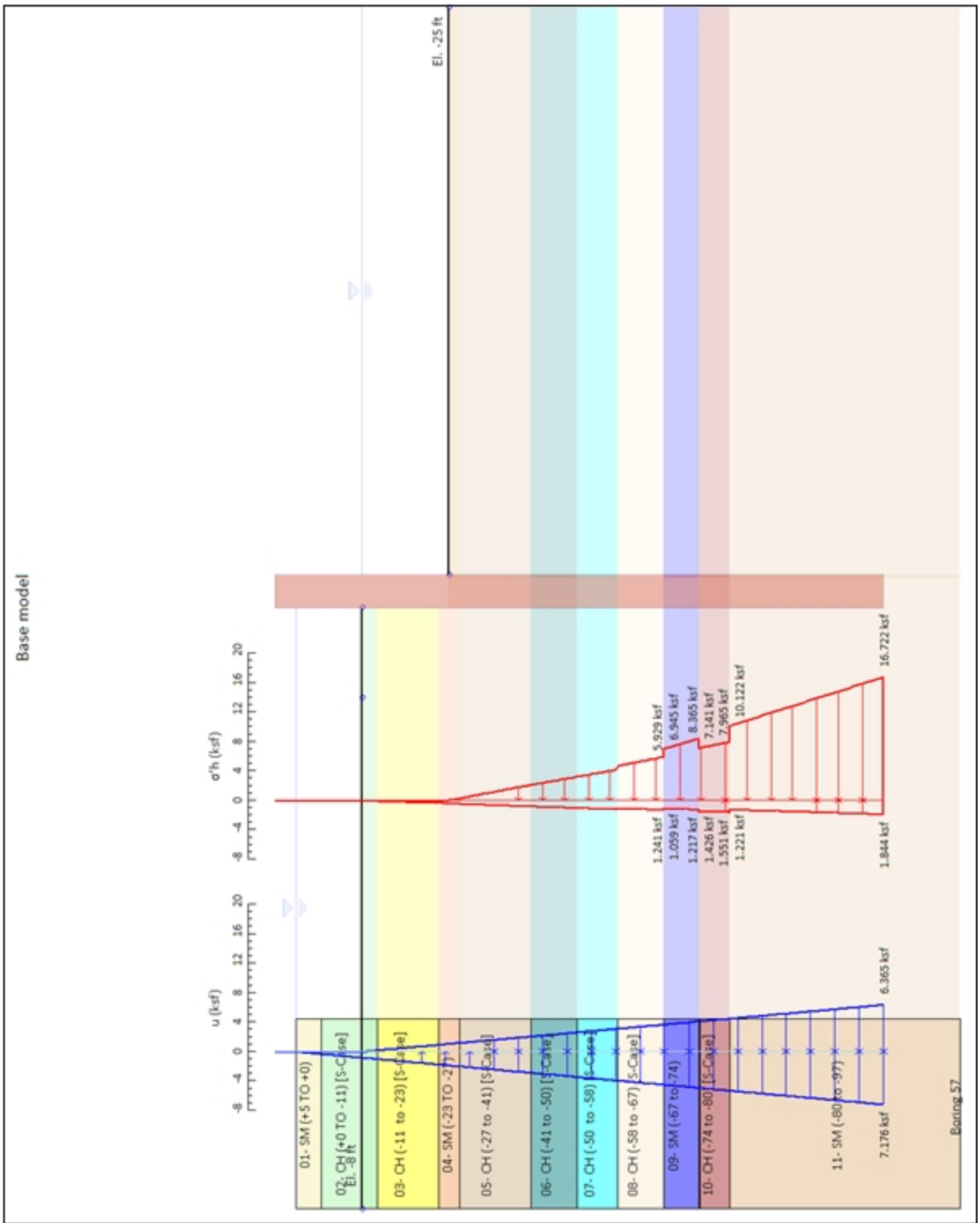


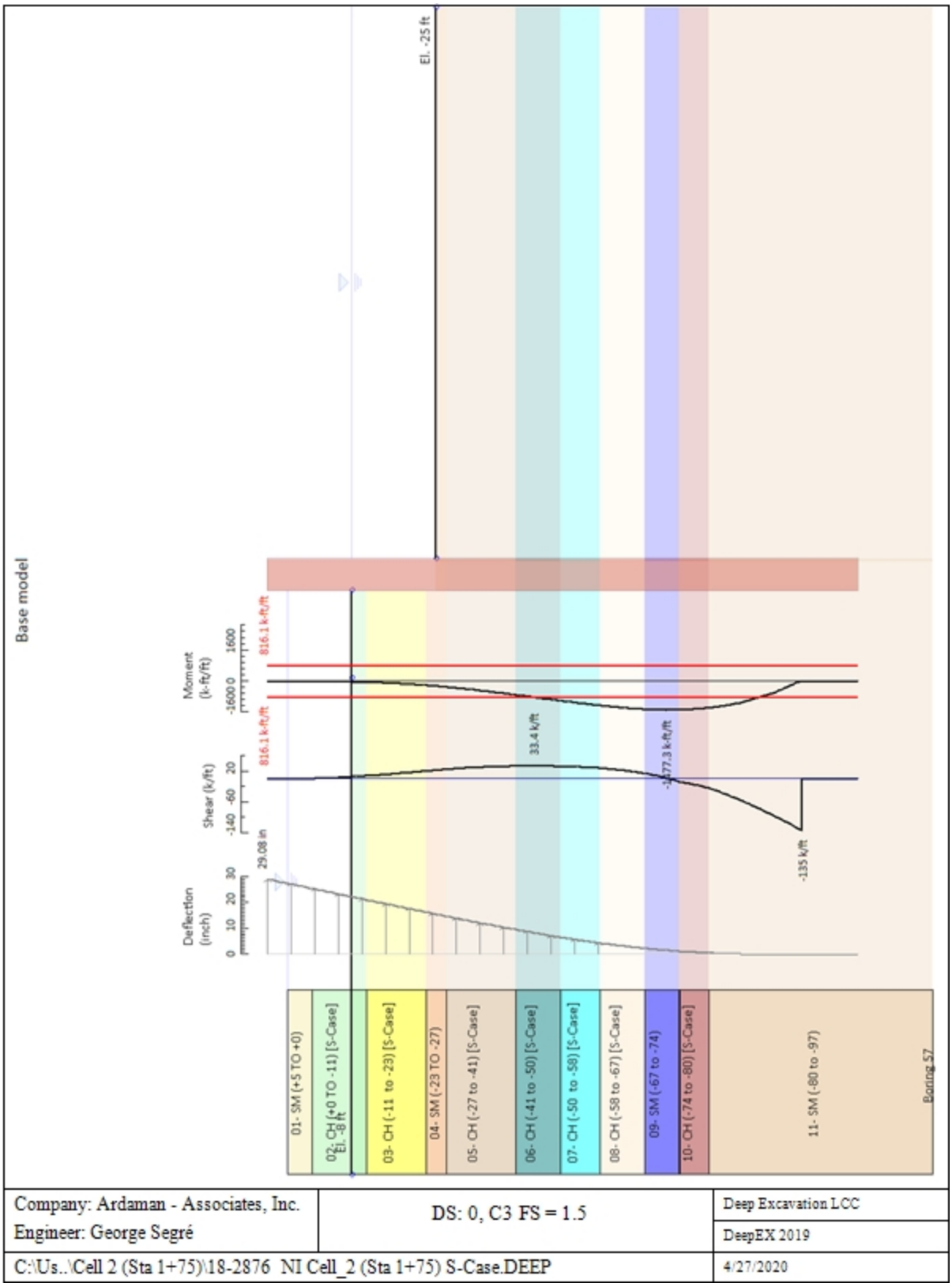
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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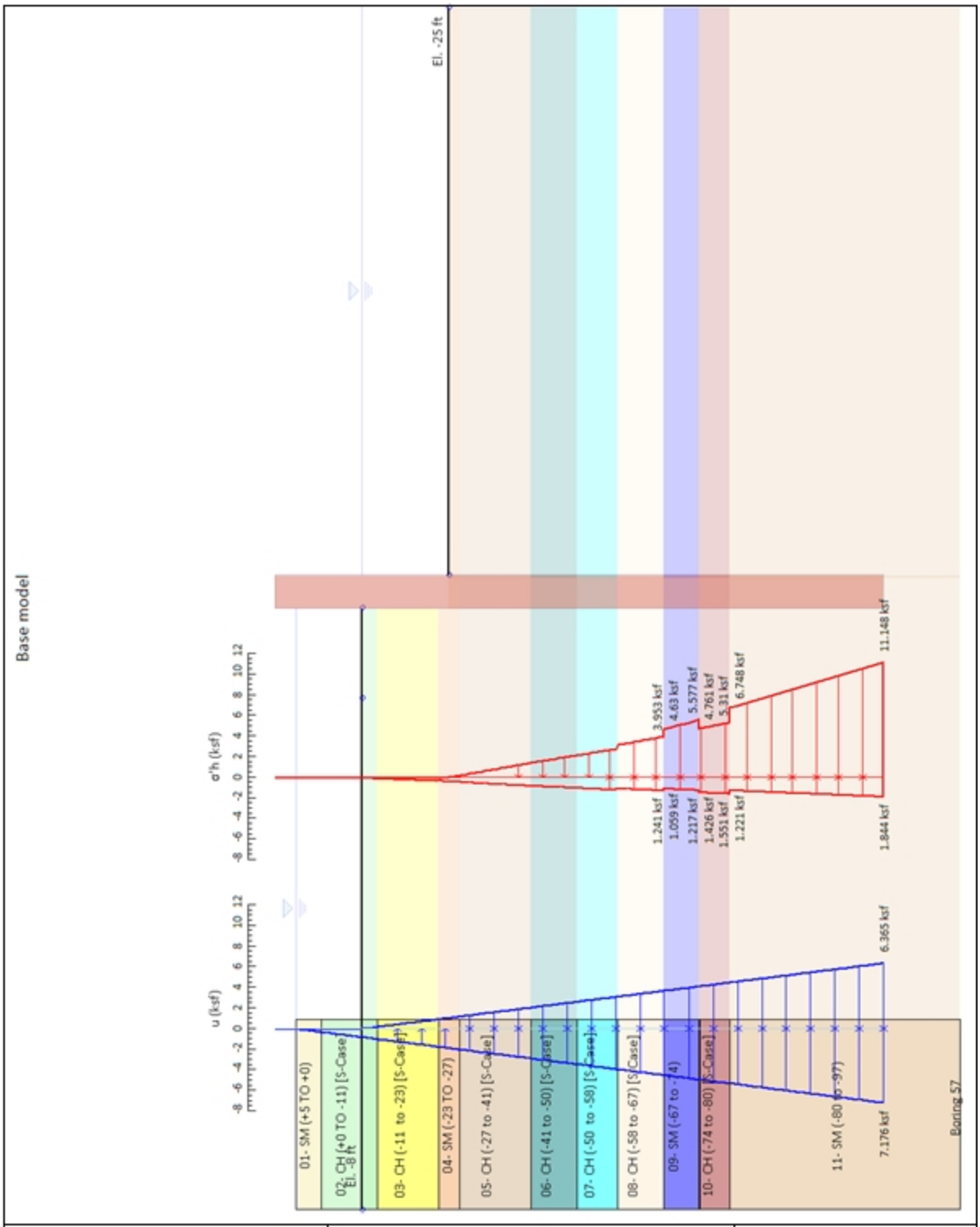
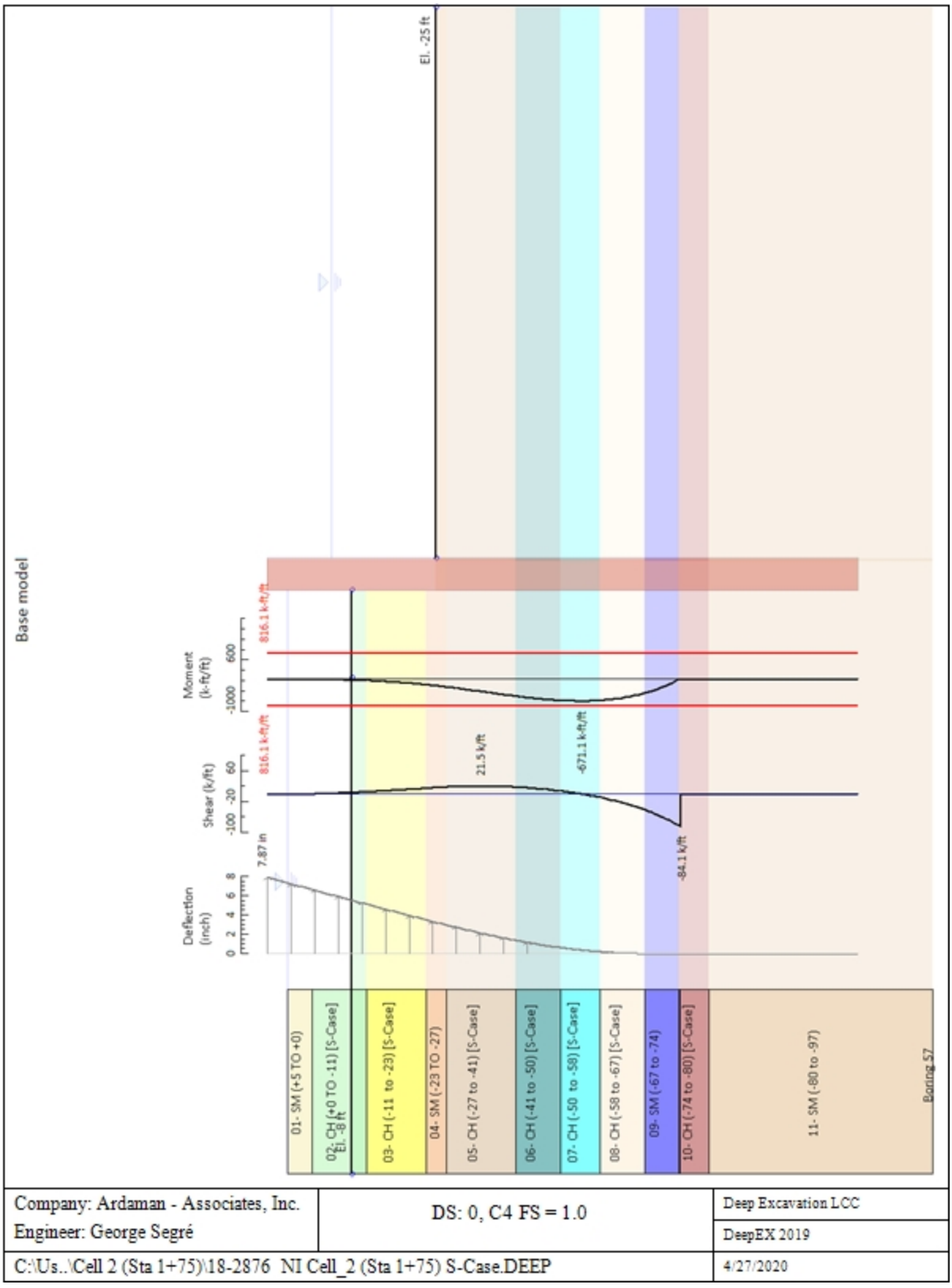


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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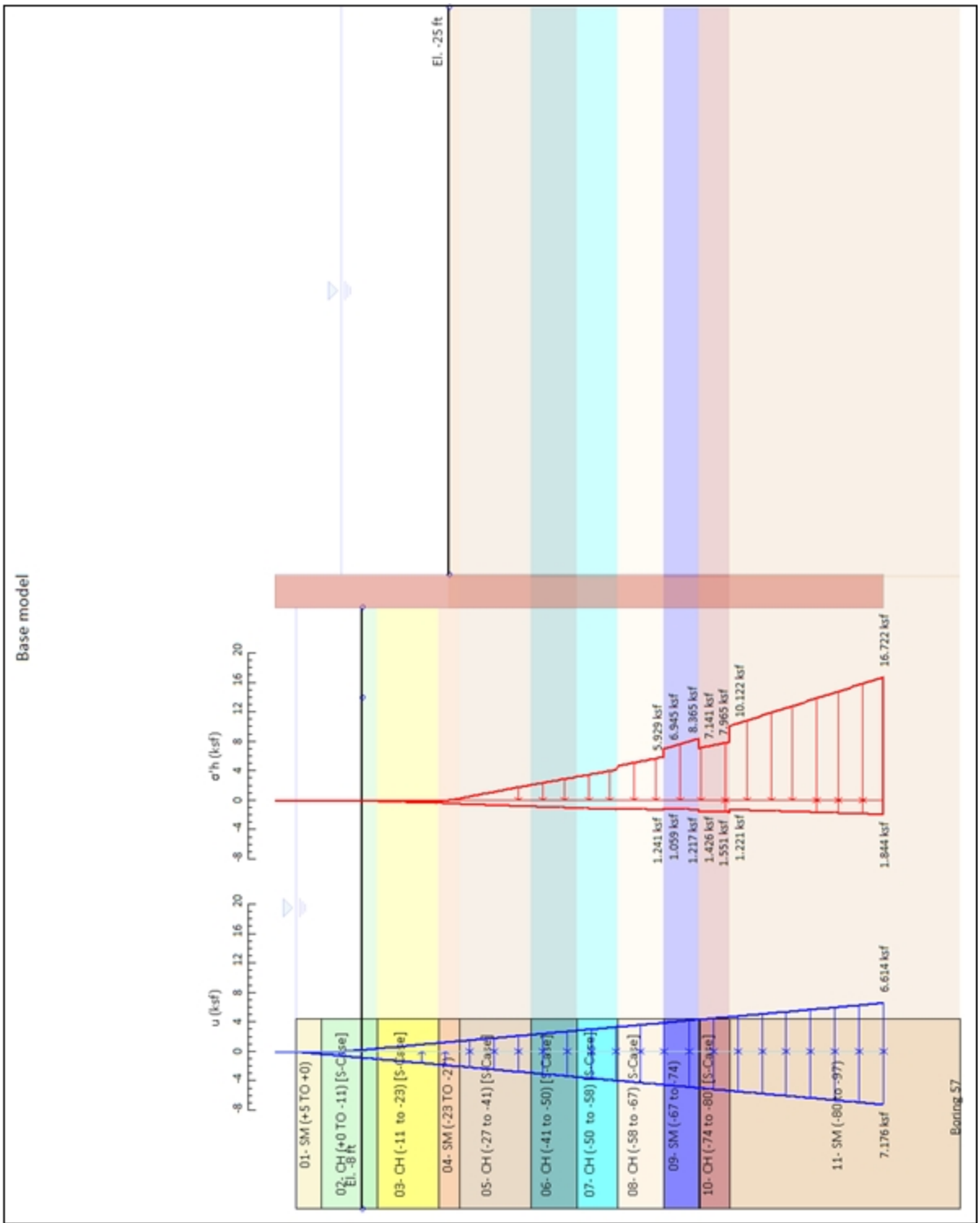

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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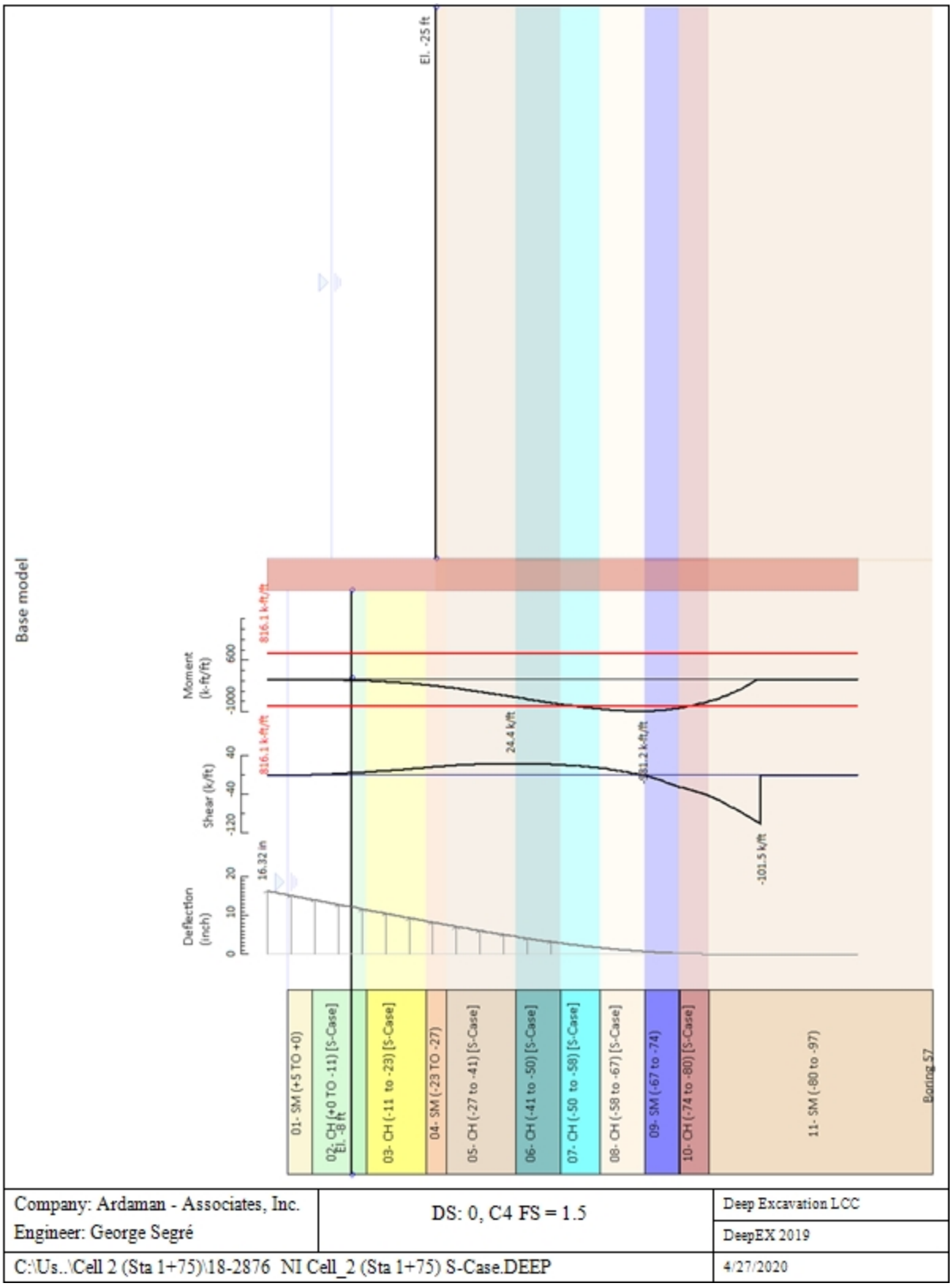
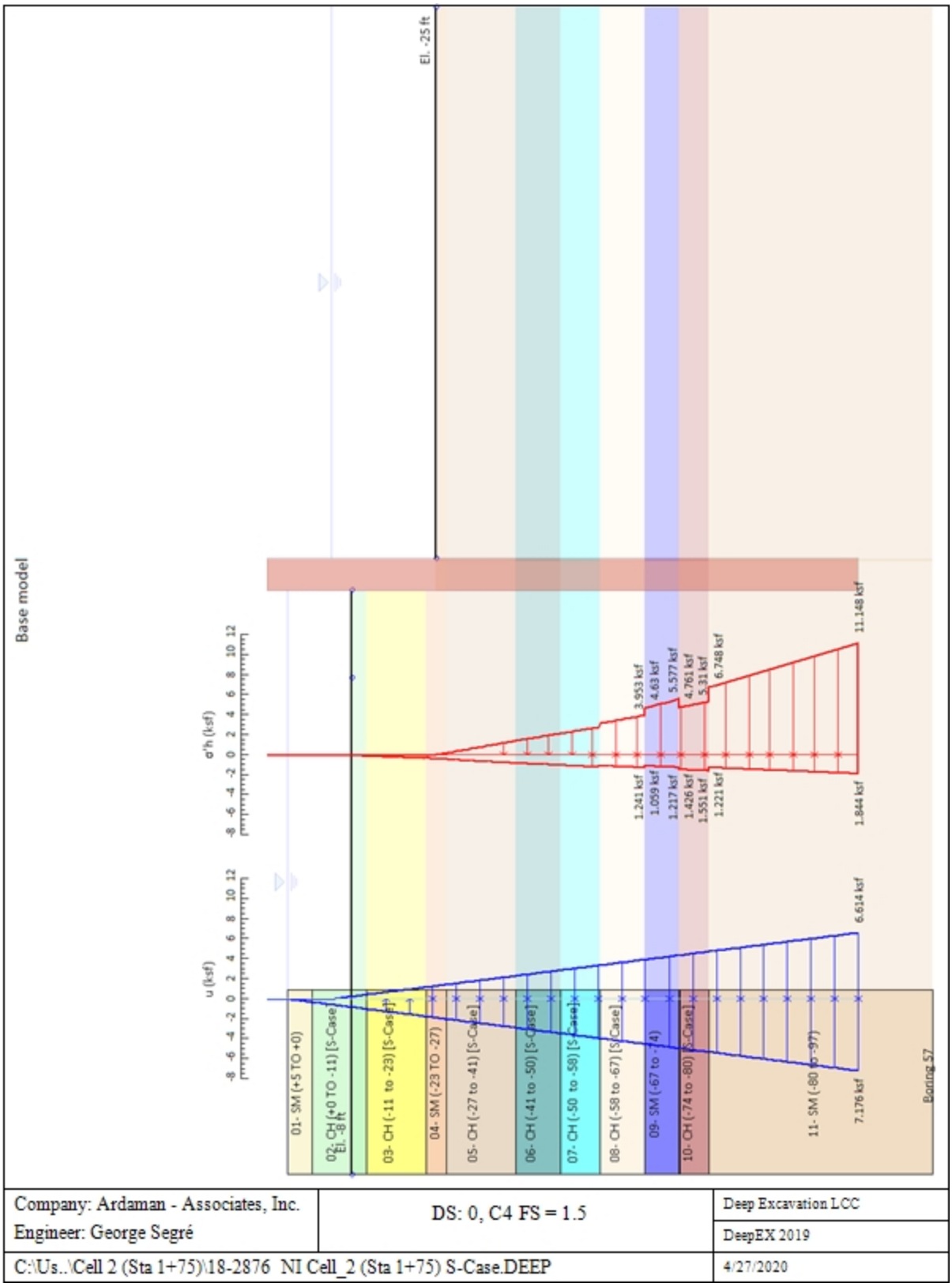


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 2 (Sta 1+75)\18-2876 NI Cell_2 (Sta 1+75) S-Case.DEEP		4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 2+00 Right Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -92.92 ft., NAVD88

Length of Sheetting = 101.92 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-19.44	46.54	16.91	0.06
		Open excavation - degraded	9	-8	1.00	1.25	-20.23	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-18.25	40.41	16.40	0.05
		Open excavation - degraded	9	-4	1.00	1.25	-19.05	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-16.68	19.53	10.44	0.02
		Open excavation - degraded	5	-8	1.00	1.50	-17.86	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-15.49	14.56	9.60	0.01
		Open excavation - degraded	5	-4	1.00	1.50	-16.28	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-75.47	1,024.22	113.53	12.93
		Open excavation - degraded	9	-8	1.00	1.25	-87.46	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-70.03	781.26	91.33	8.57
		Open excavation - degraded	9	-4	1.00	1.25	-80.92	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-71.11	764.69	92.64	8.51
		Open excavation - degraded	5	-8	1.00	1.50	-92.92	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-64.58	556.22	66.77	5.21
		Open excavation - degraded	5	-4	1.00	1.50	-85.28	--	--	--
						Governing Value:	-92.92	1,024.22	113.53	12.93

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:05:00 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

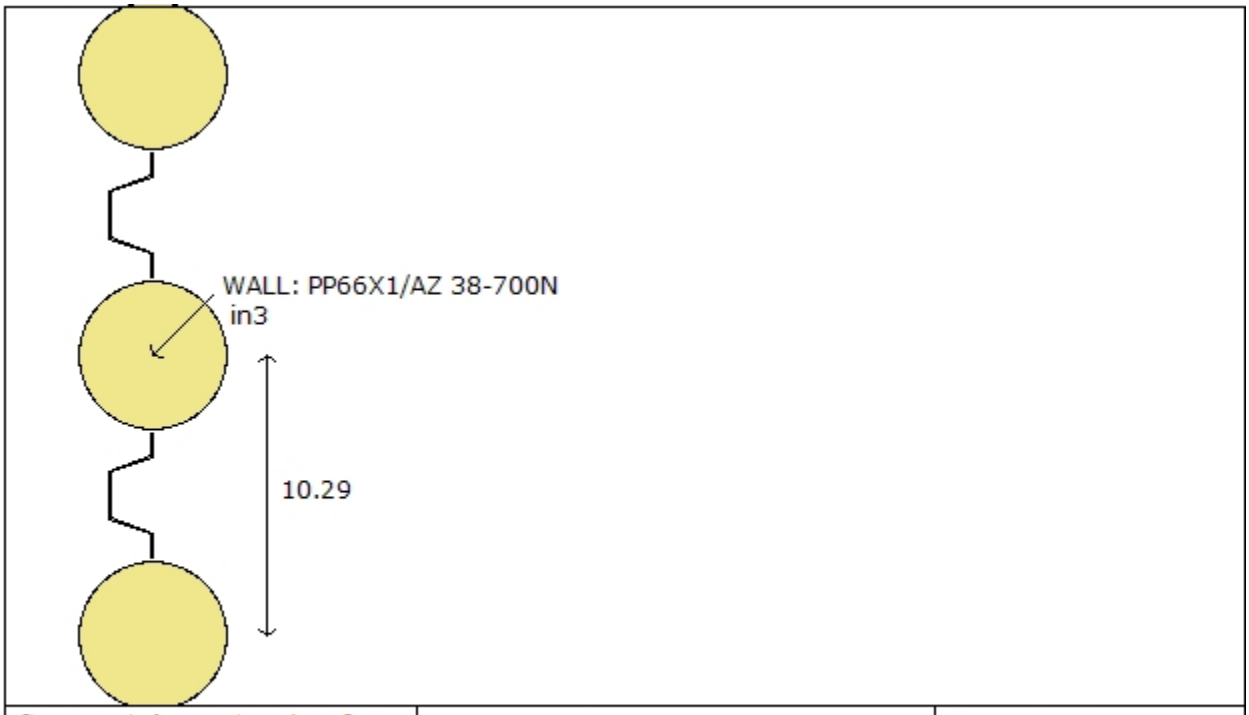
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	7.796	10.927	11.052
Stage 1	Simple span	N/A	1.6	7.047	8.792	8.926
Stage 2	Simple span	N/A	1.6	9.273	11.474	11.459
Stage 3	Simple span	N/A	1.6	8.227	9.259	9.268
Stage 4	Simple span	N/A	1.6	10.618	11.421	10.618
Stage 5	Simple span	N/A	1.6	7.214	7.702	7.214
Stage 6	Simple span	N/A	1.6	11.009	11.993	11.009
Stage 7	Simple span	N/A	1.6	7.501	8.134	7.501

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

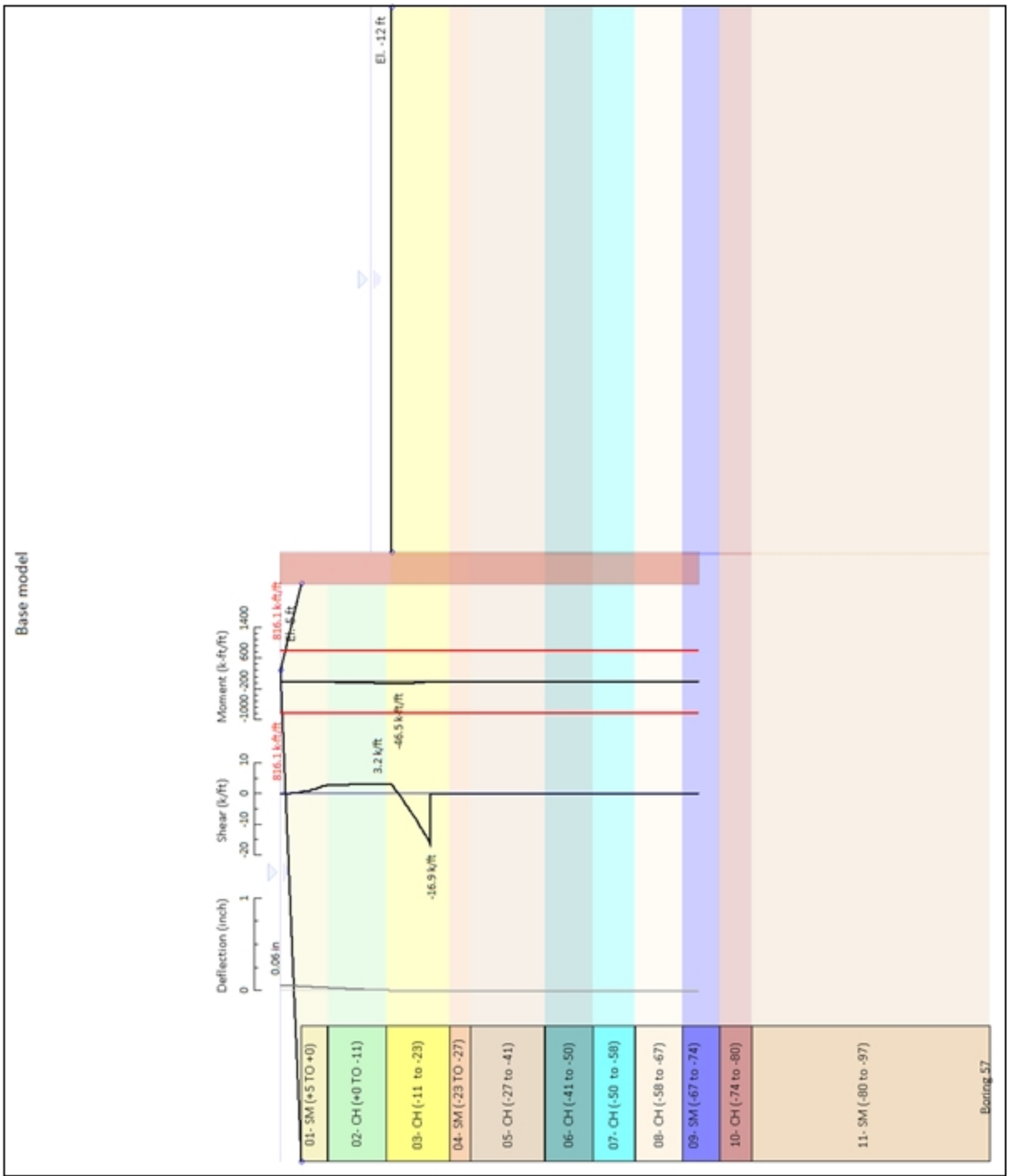
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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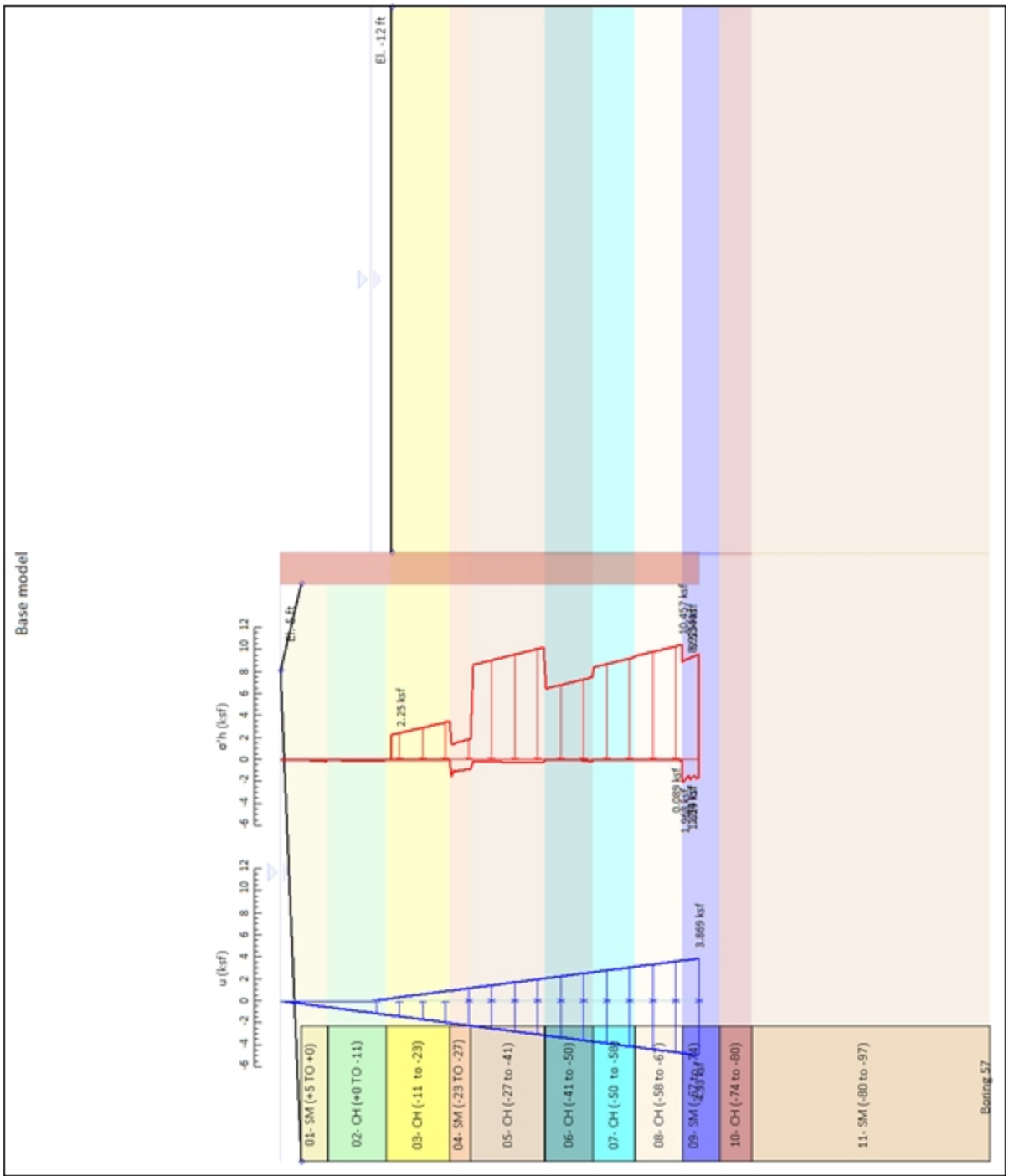

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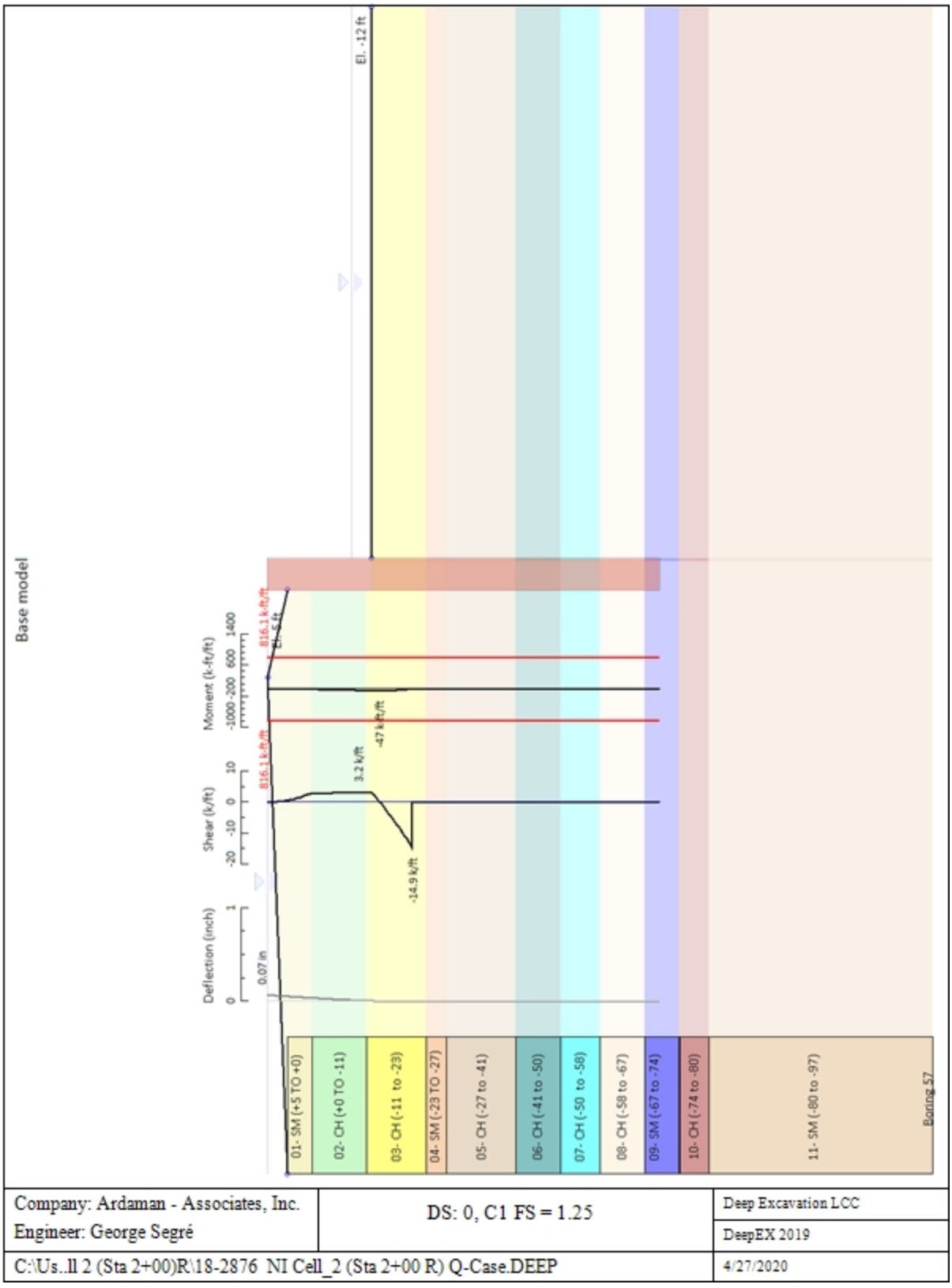

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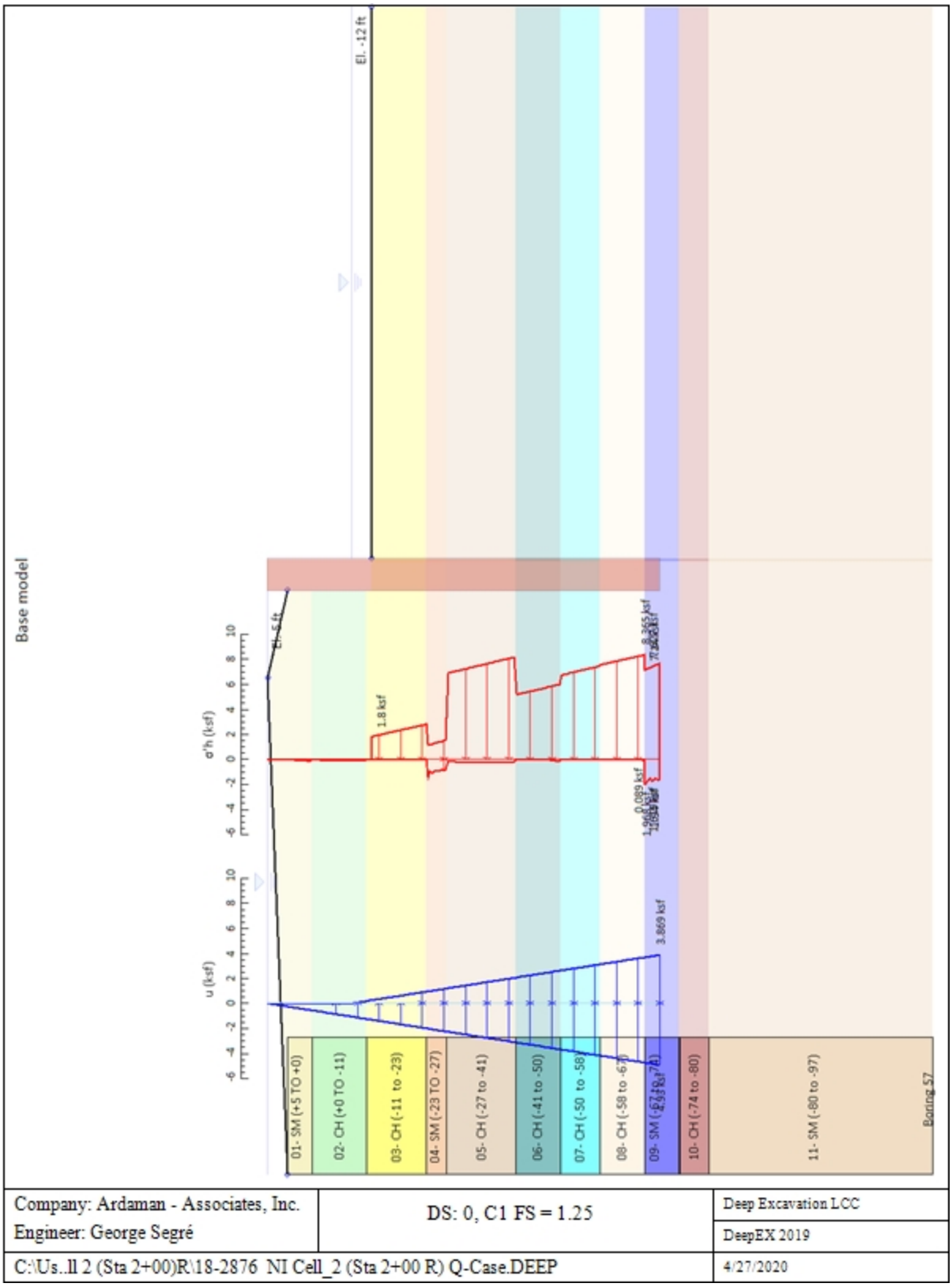

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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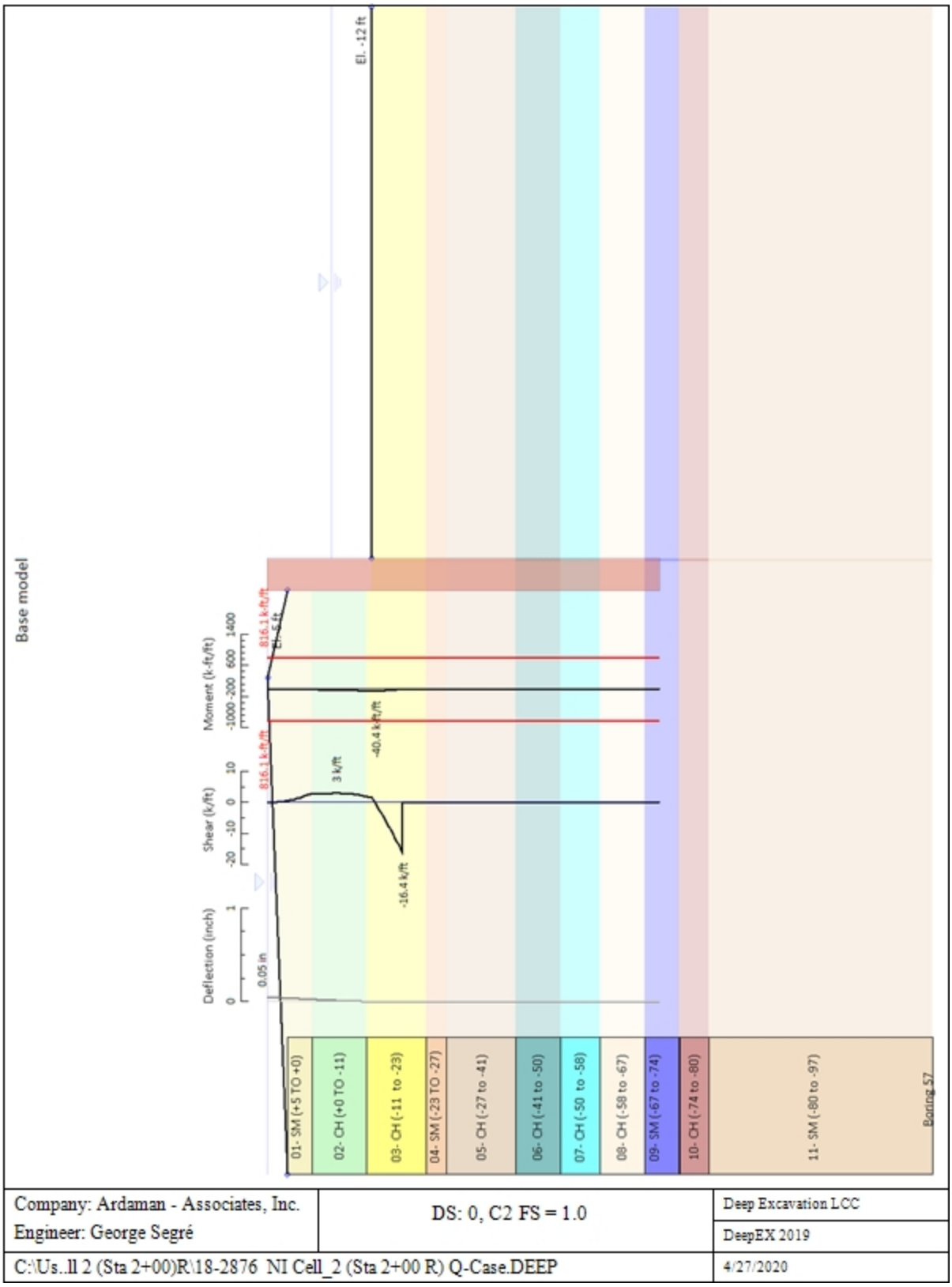

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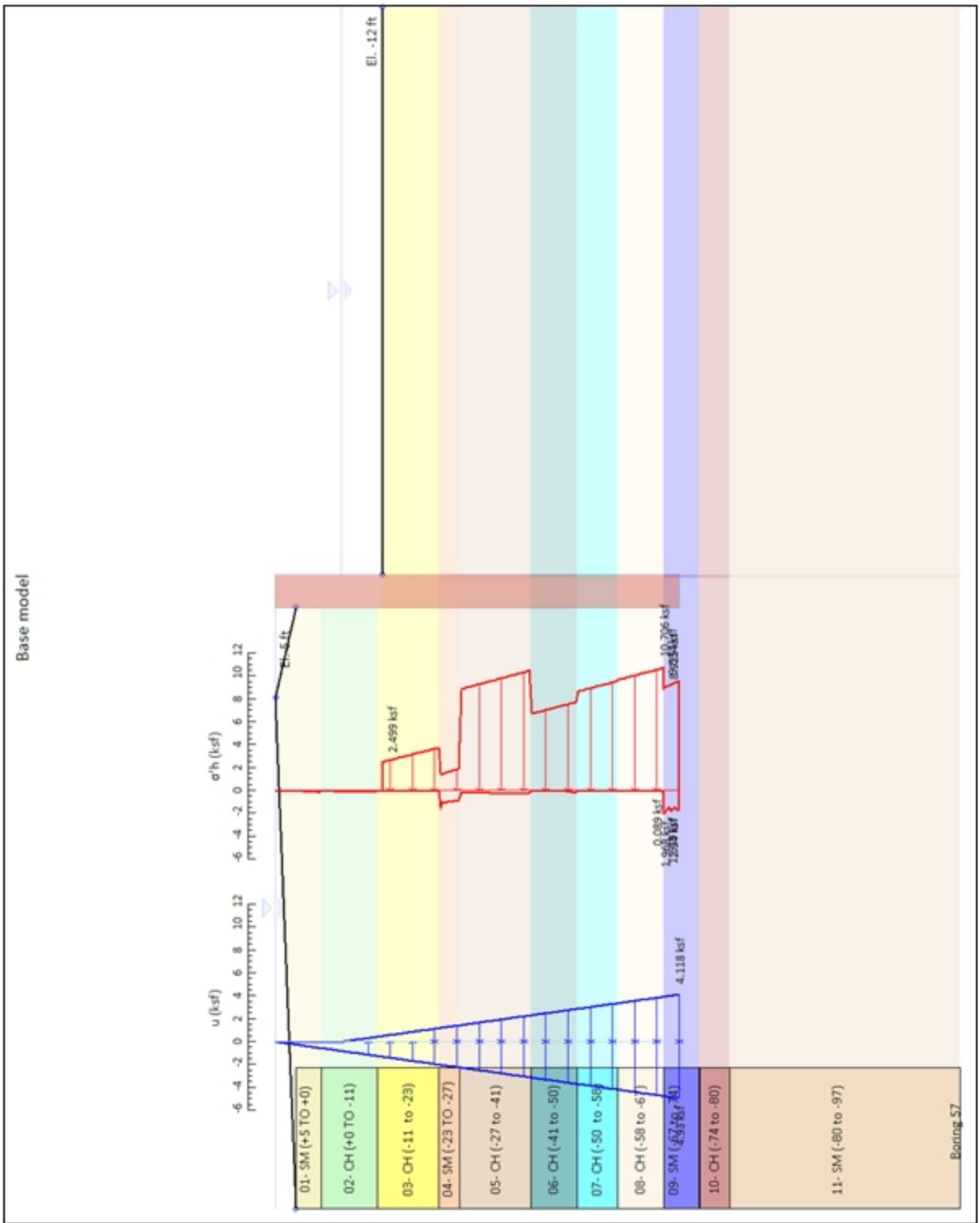

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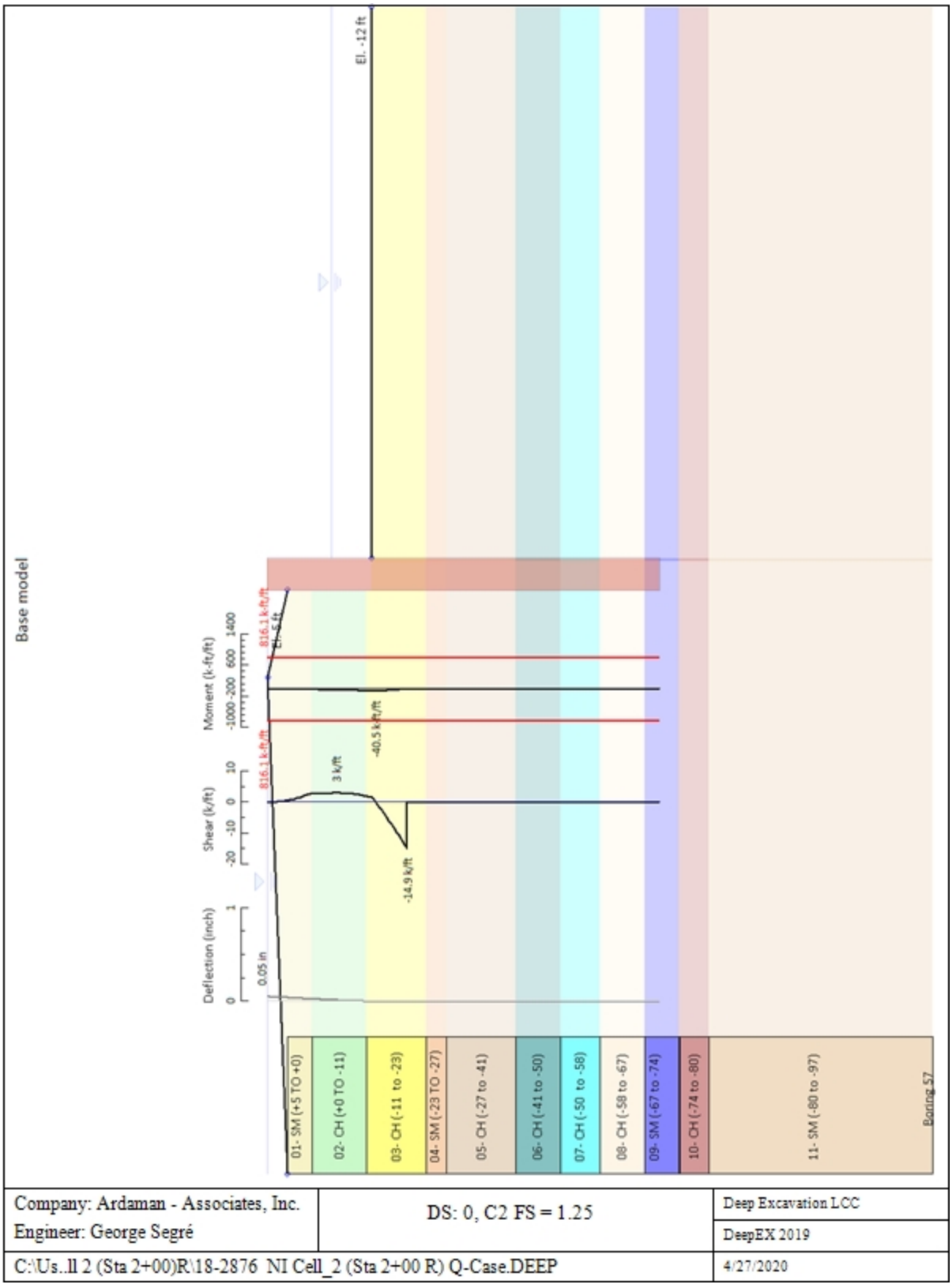

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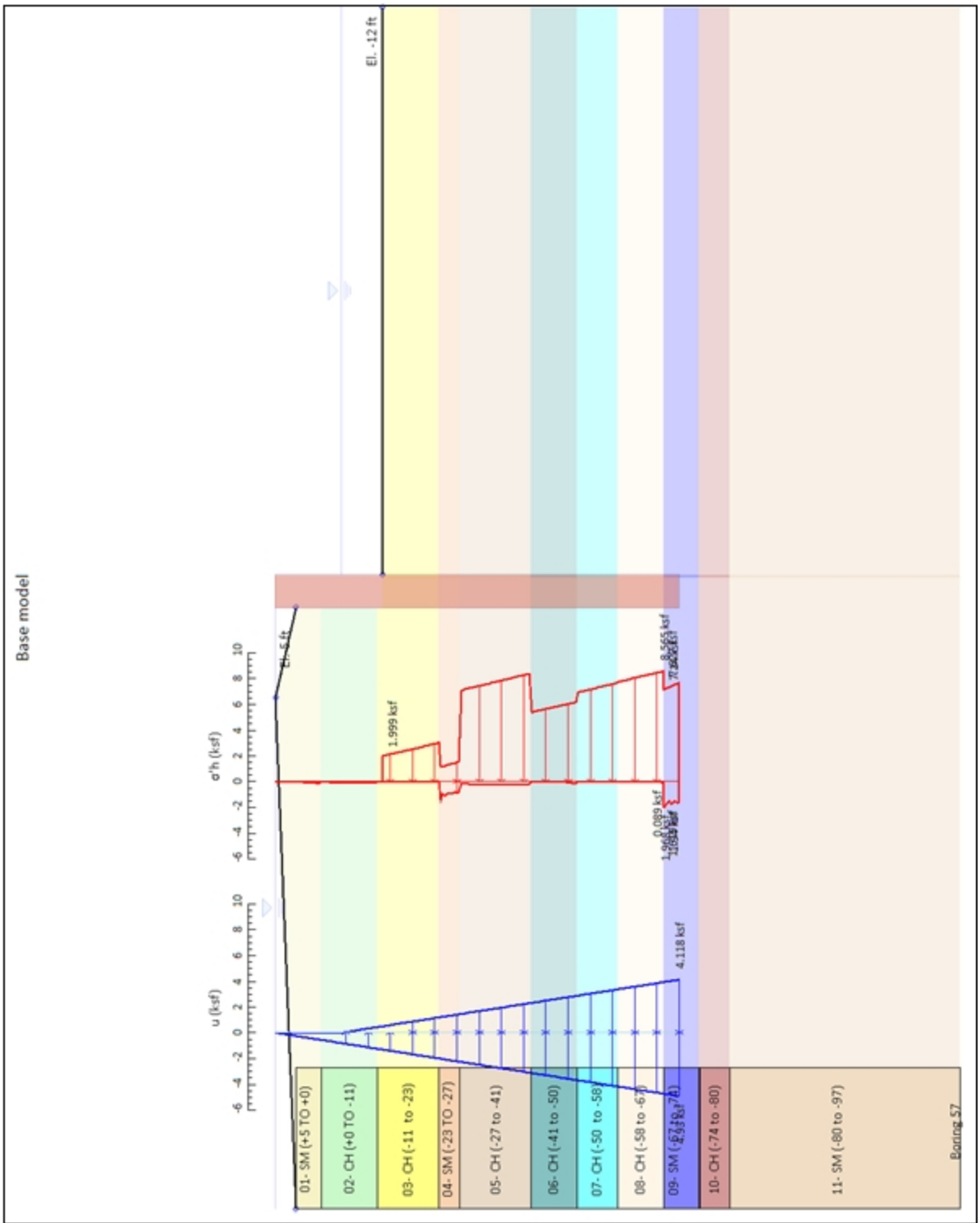
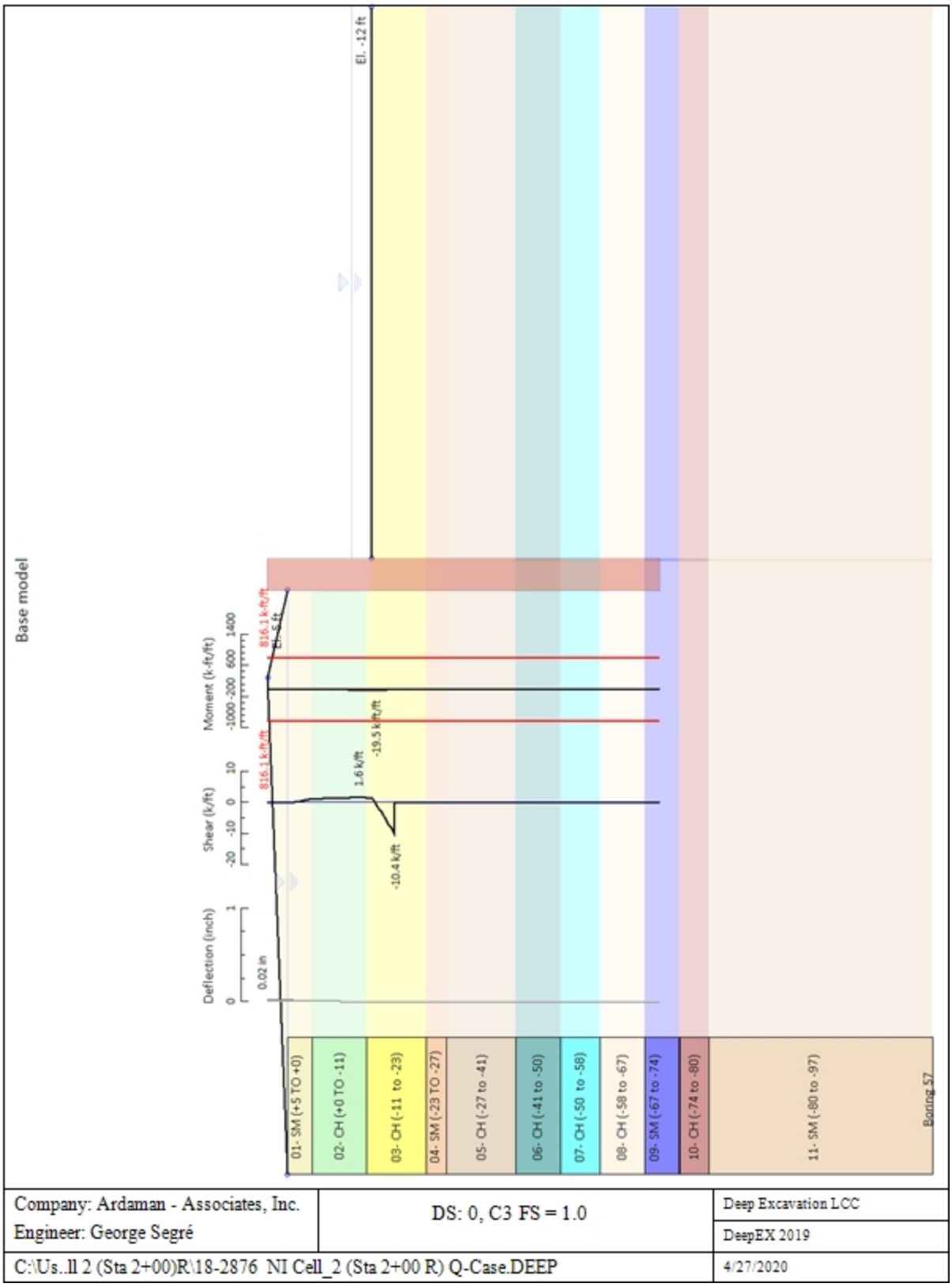

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
1.999 ksf
8.565 ksf
0.039 ksf
4.118 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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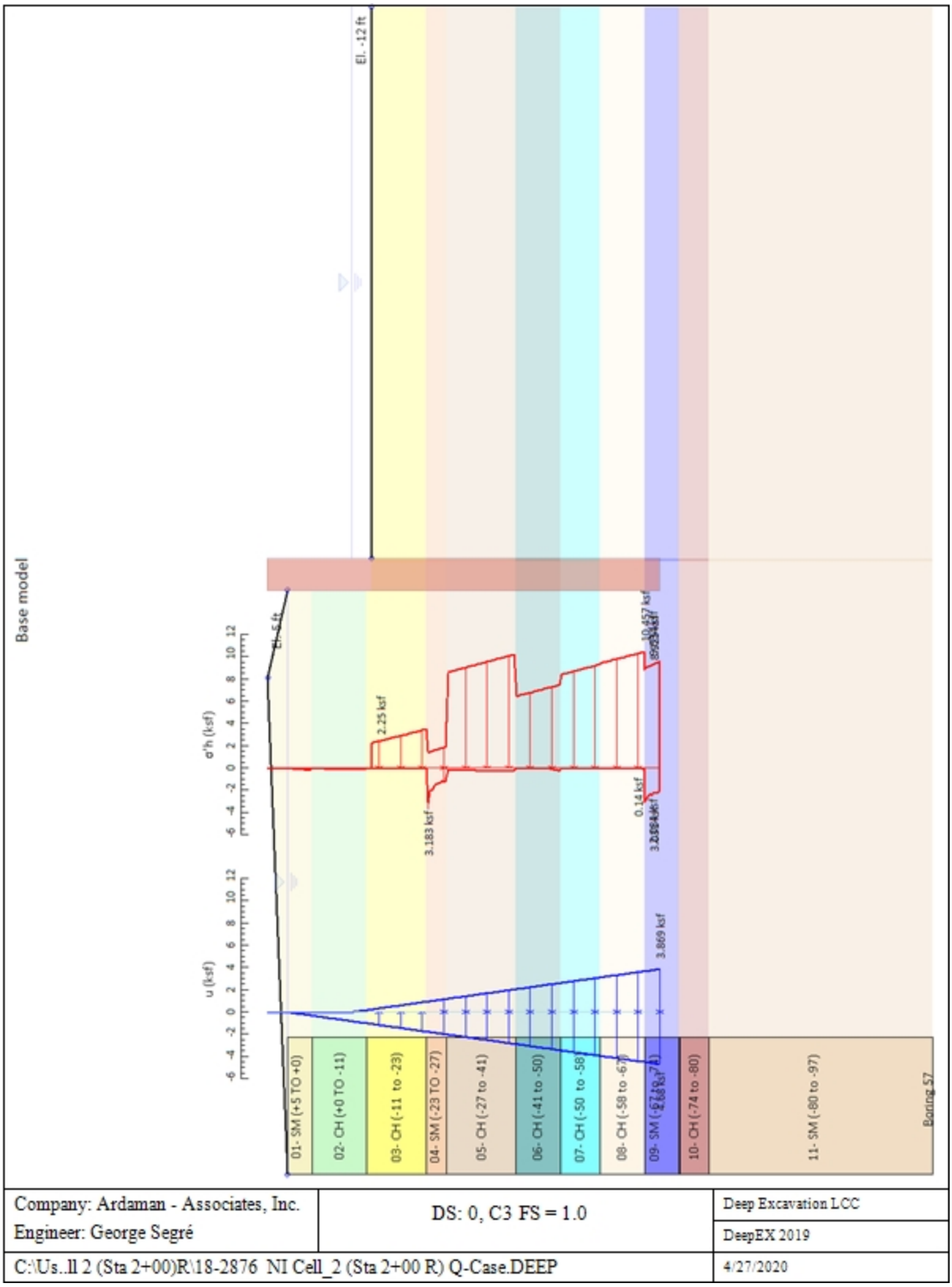
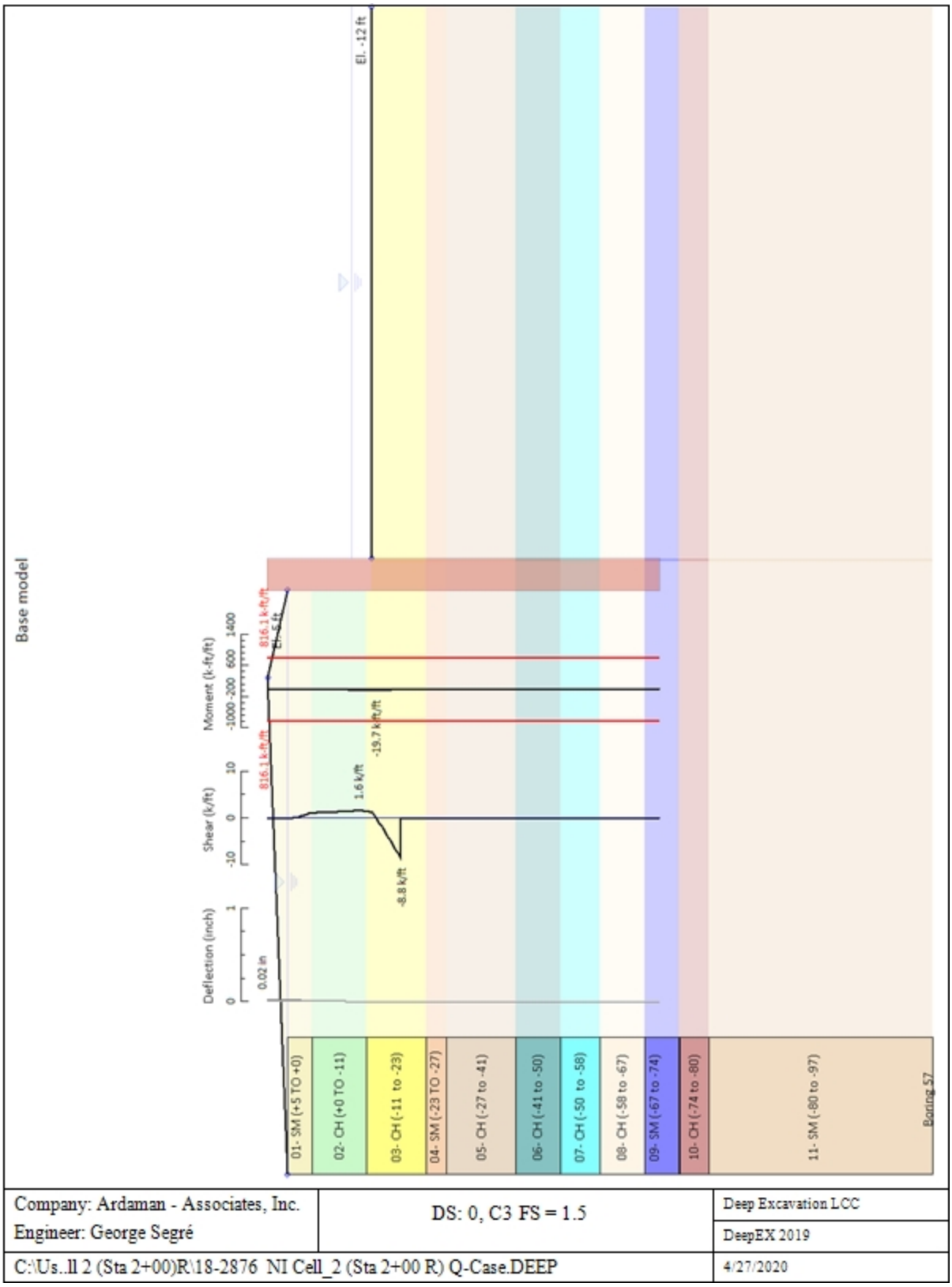
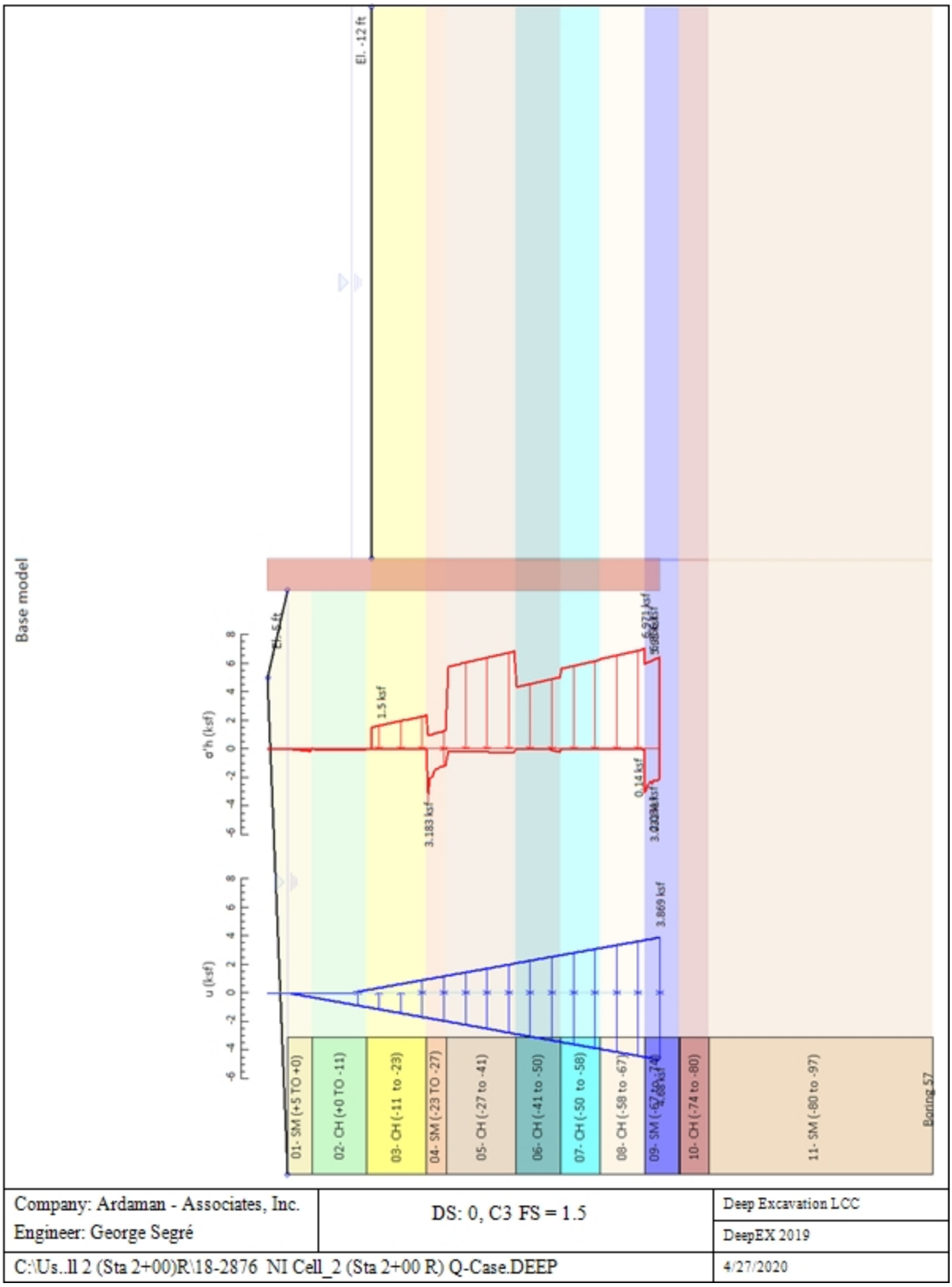
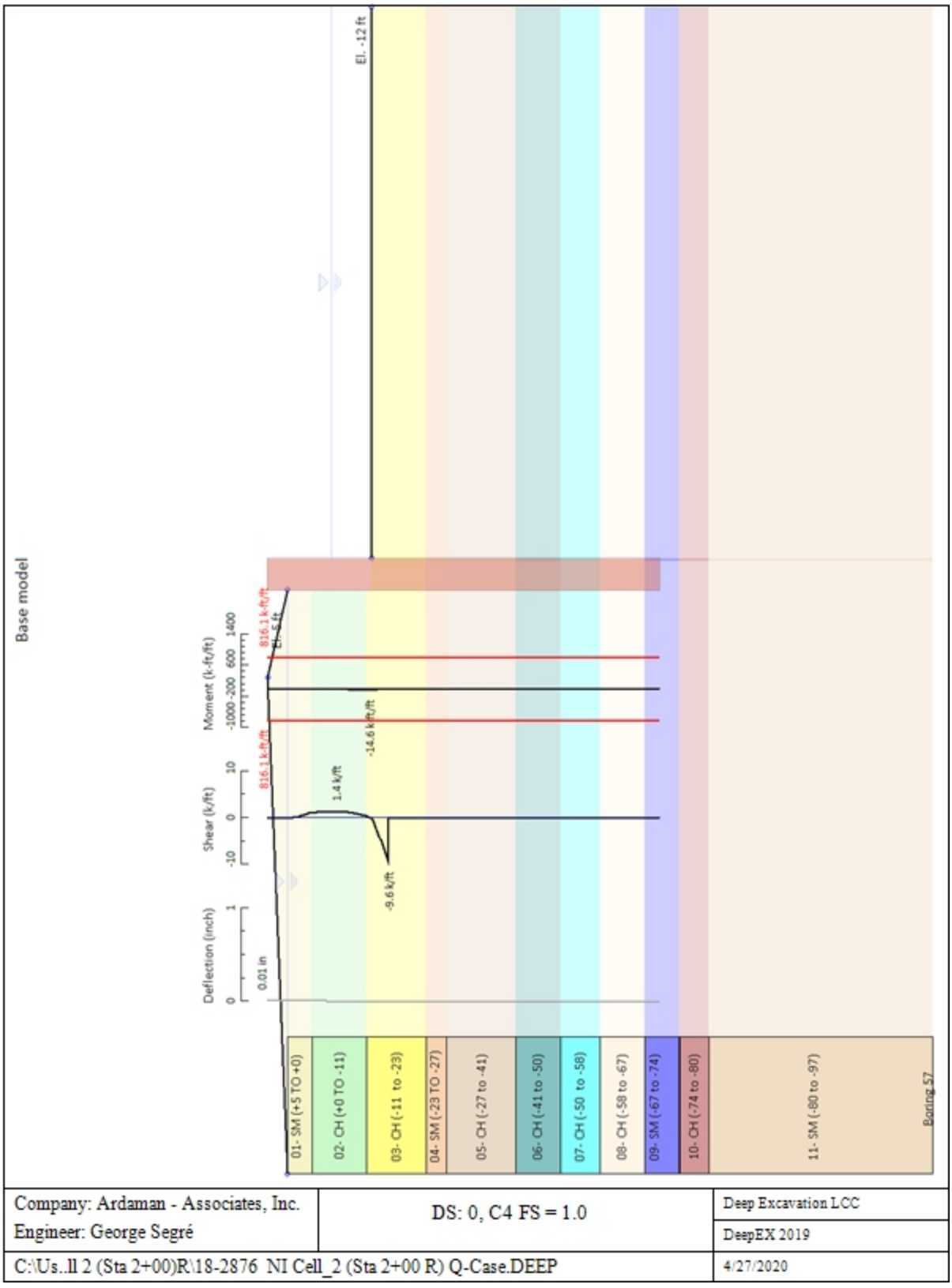
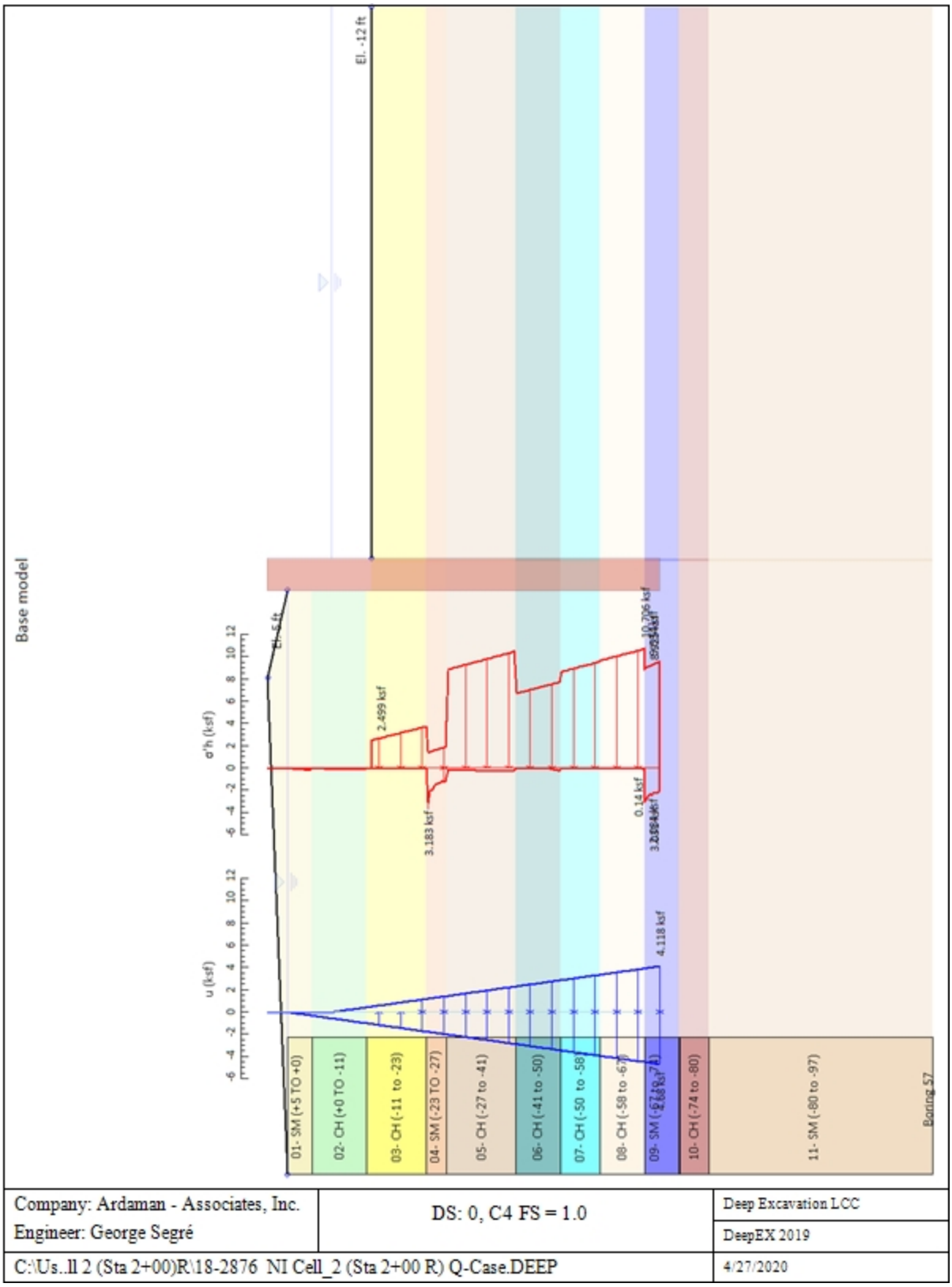

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
2.25 ksf
3.183 ksf
0.14 ksf
10.457 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58
08- CH (-58 to -67
09- SM (-67 to -71)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020


Base model
El. -12 ft
El. 6 ft
816.1 k-ft/ft
816.1 k-ft/ft
-19.7 k-ft/ft
1.6 k/ft
-8.8 k/ft
0.02 in
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-10 0 10
Deflection (inch)
0 1
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020

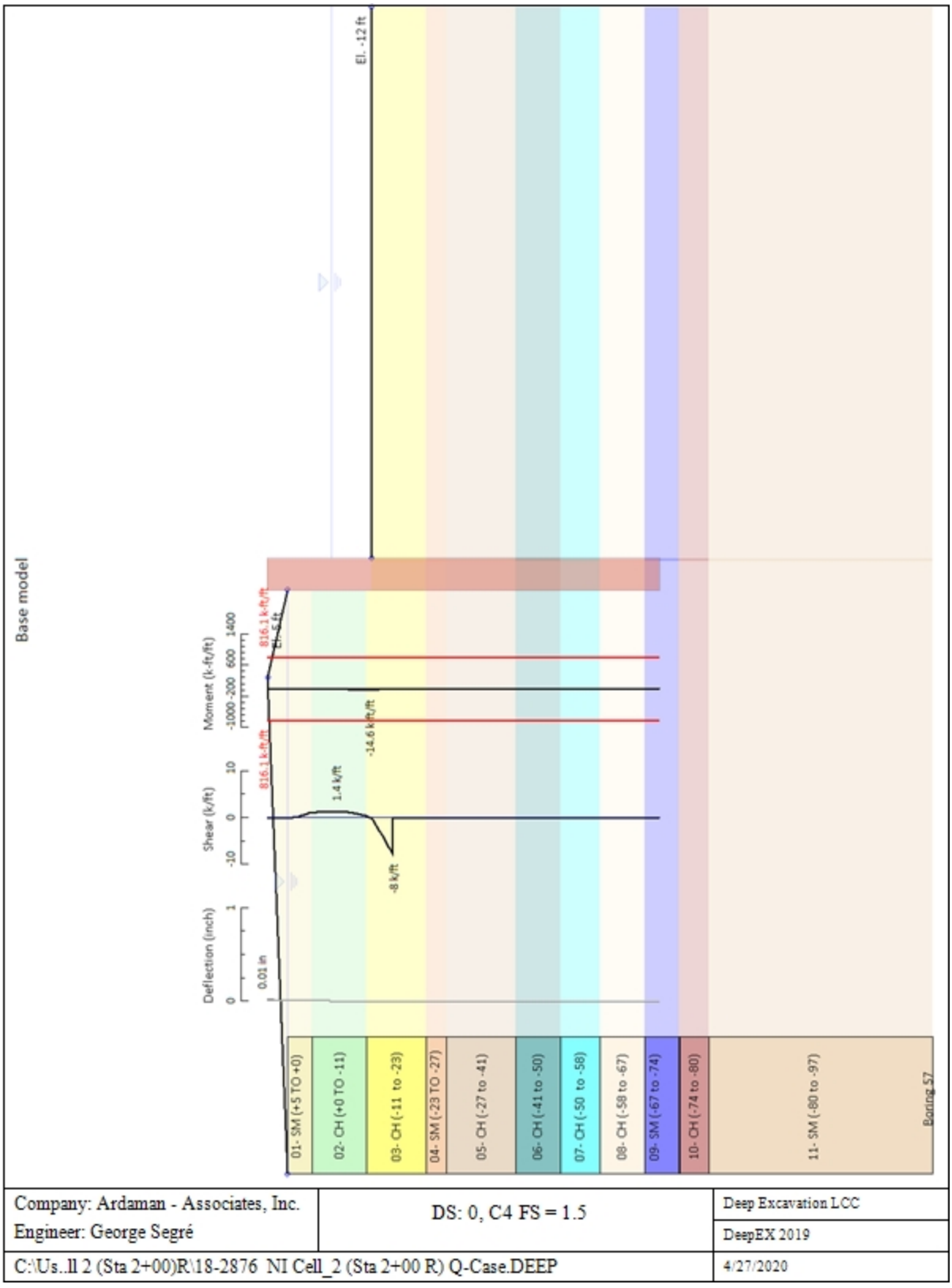

Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
1.5 ksf
3.183 ksf
0.14 ksf
3.869 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
11- SM (-80 to -97)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP		4/27/2020


Base model
El. -12 ft
El. 6 ft
816.1 k-ft/ft
-14.6 k-ft/ft
816.1 k-ft/ft
1.4 k/ft
-8 k/ft
0.01 in
Moment (k-ft/ft)
-1000 -200 600 1400
Shear (k/ft)
-10 0 10
Deflection (inch)
0 1
01- SM (+5 TO +0)
02- CH (+0 TO -11)
03- CH (-11 to -23)
04- SM (-23 TO -27)
05- CH (-27 to -41)
06- CH (-41 to -50)
07- CH (-50 to -58)
08- CH (-58 to -67)
09- SM (-67 to -74)
10- CH (-74 to -80)
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Boring 57
Company: Ardaman - Associates, Inc.
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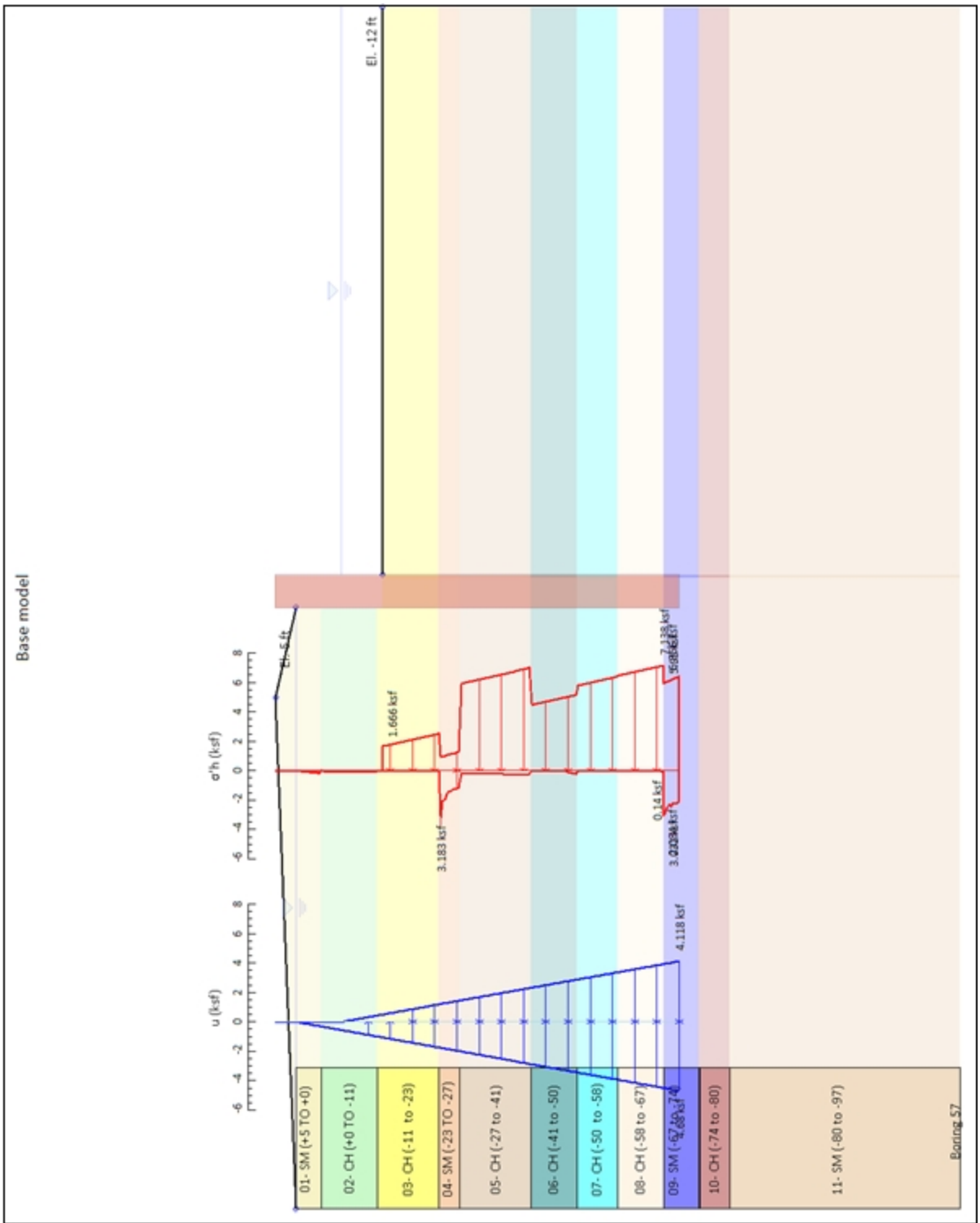

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) Q-Case.DEEP		4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:12:01 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

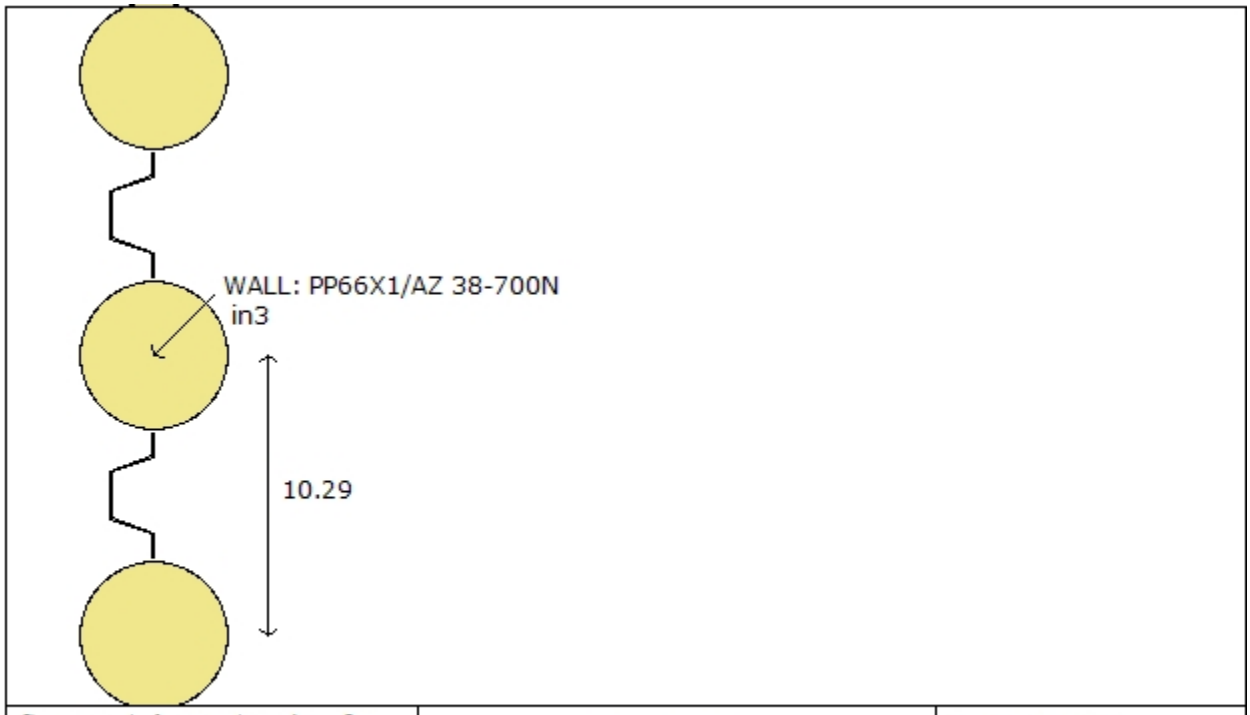
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.31	1.31	1.754
Stage 1	Simple span	N/A	1.6	1.137	1.137	1.51
Stage 2	Simple span	N/A	1.6	1.371	1.371	1.801
Stage 3	Simple span	N/A	1.6	1.197	1.197	1.558
Stage 4	Simple span	N/A	1.6	1.367	1.367	1.802
Stage 5	Simple span	N/A	1.6	1.066	1.066	1.384
Stage 6	Simple span	N/A	1.6	1.43	1.43	1.851
Stage 7	Simple span	N/A	1.6	1.129	1.129	1.433

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

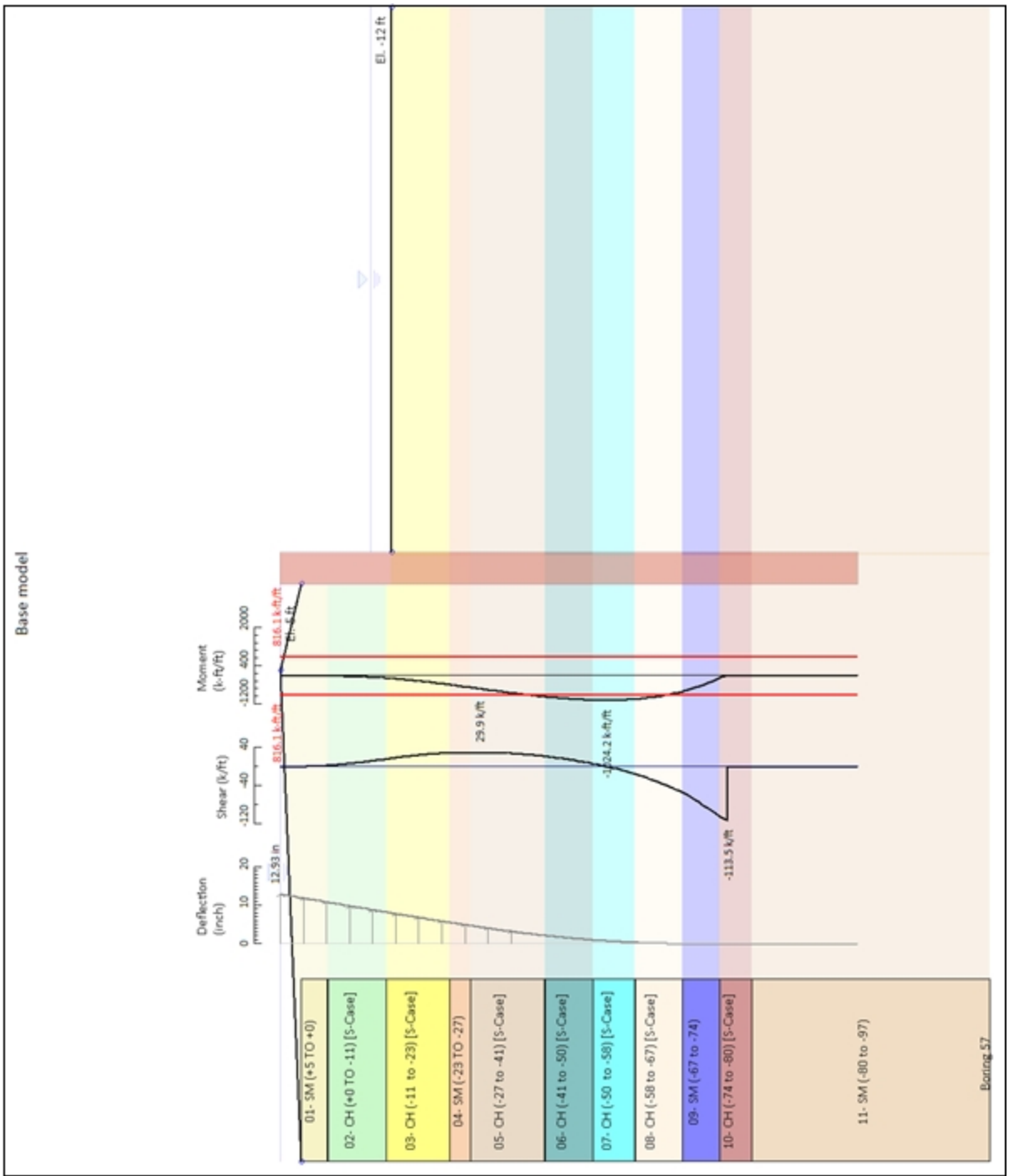
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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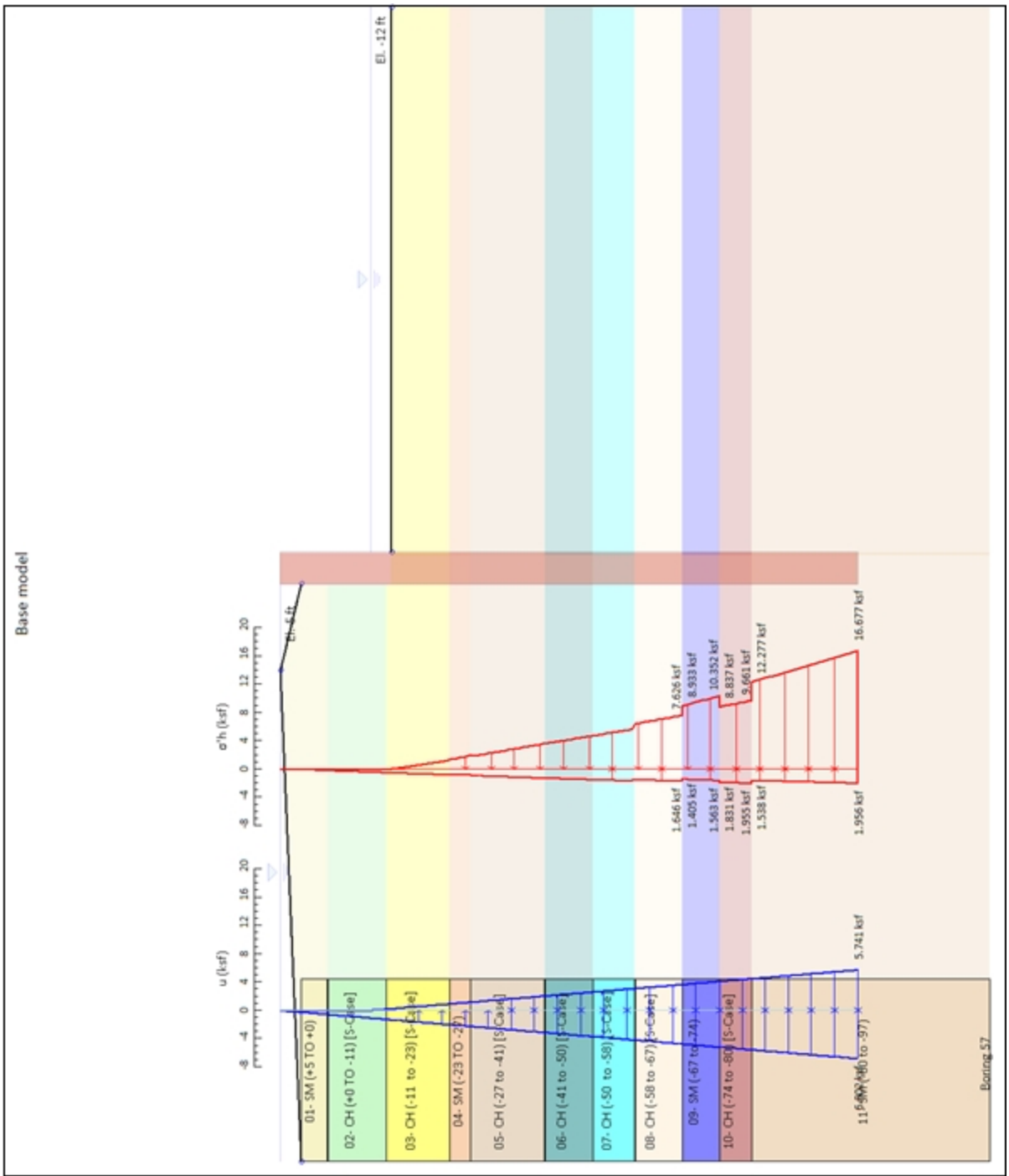

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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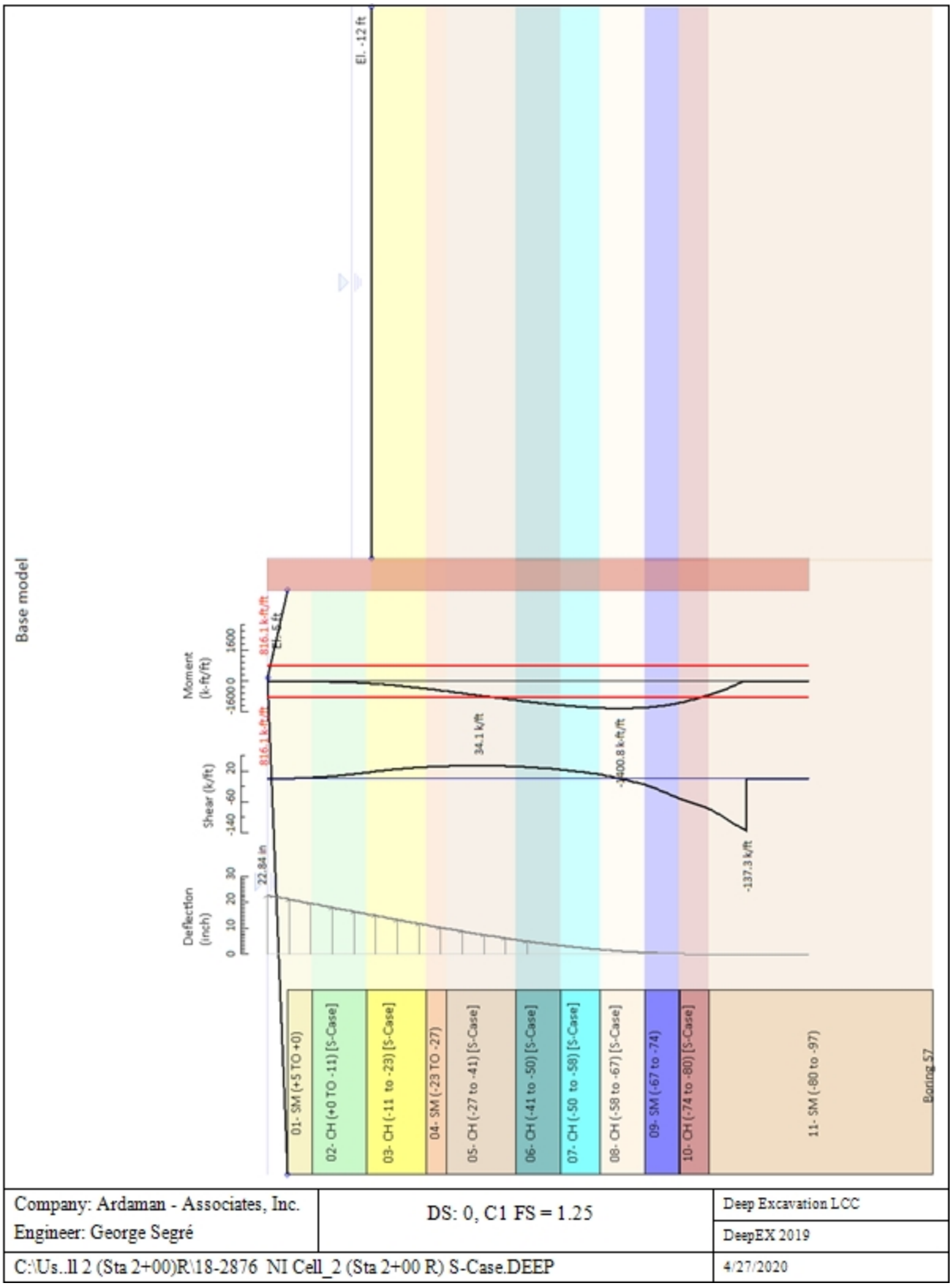

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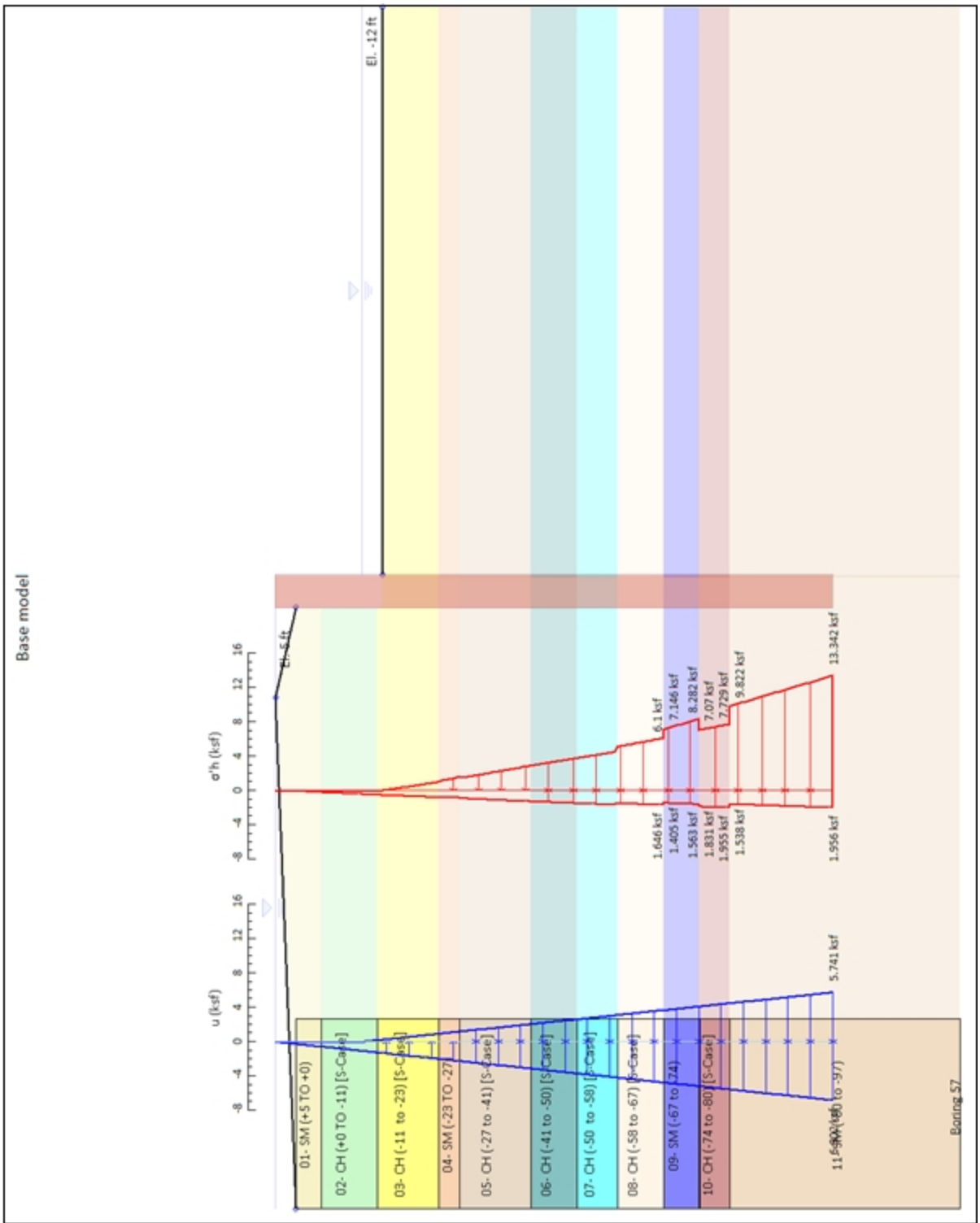

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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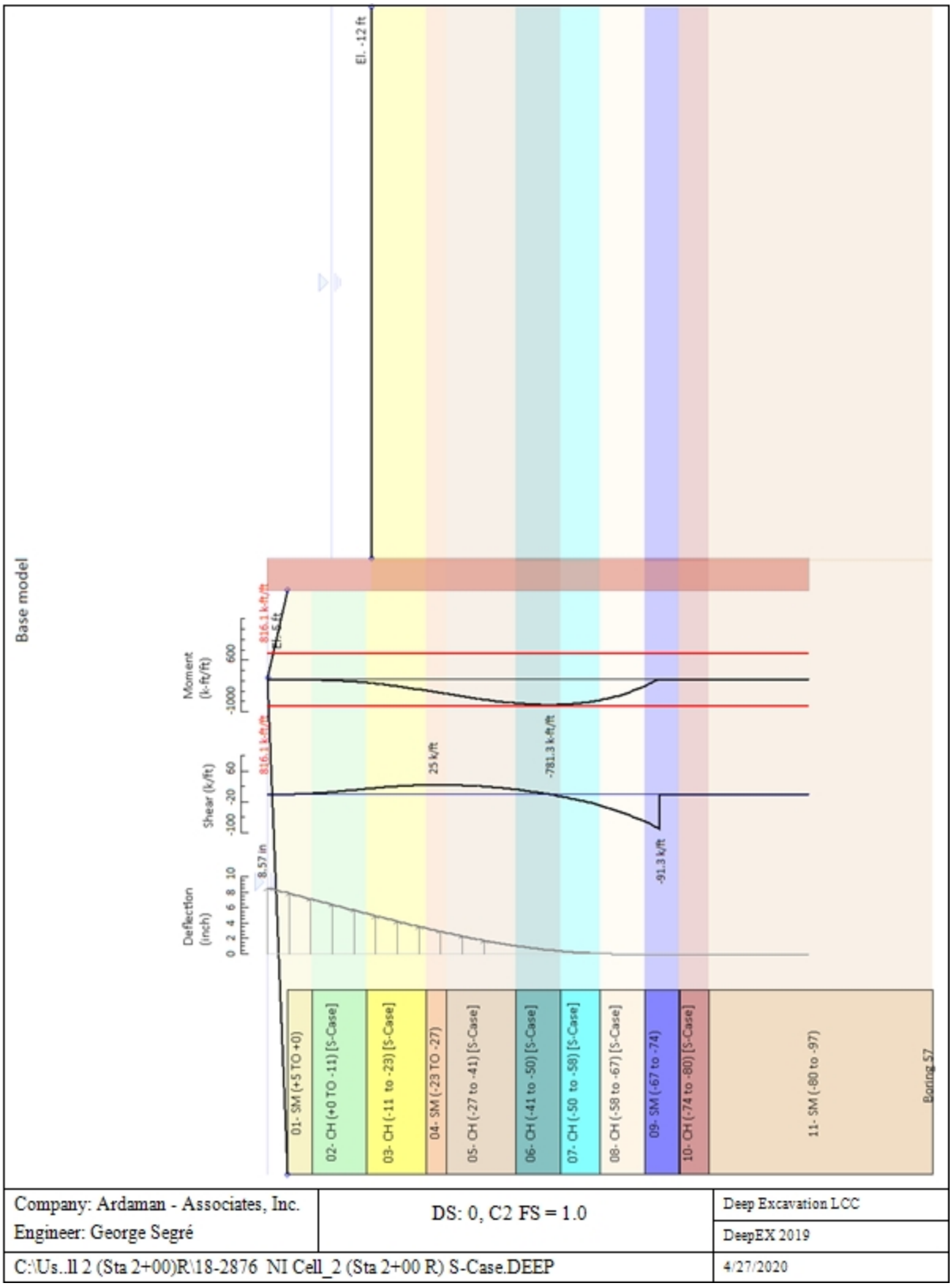

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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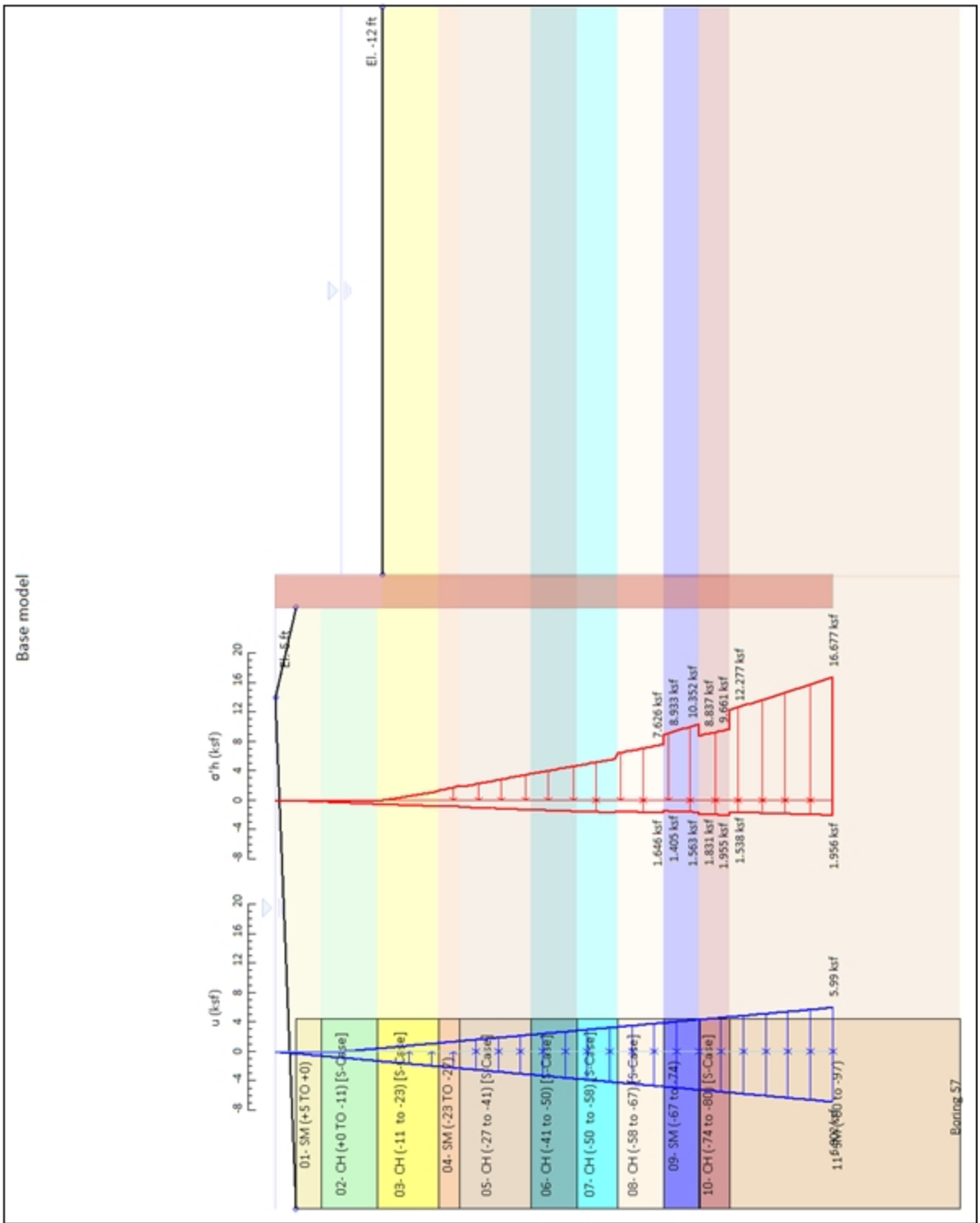

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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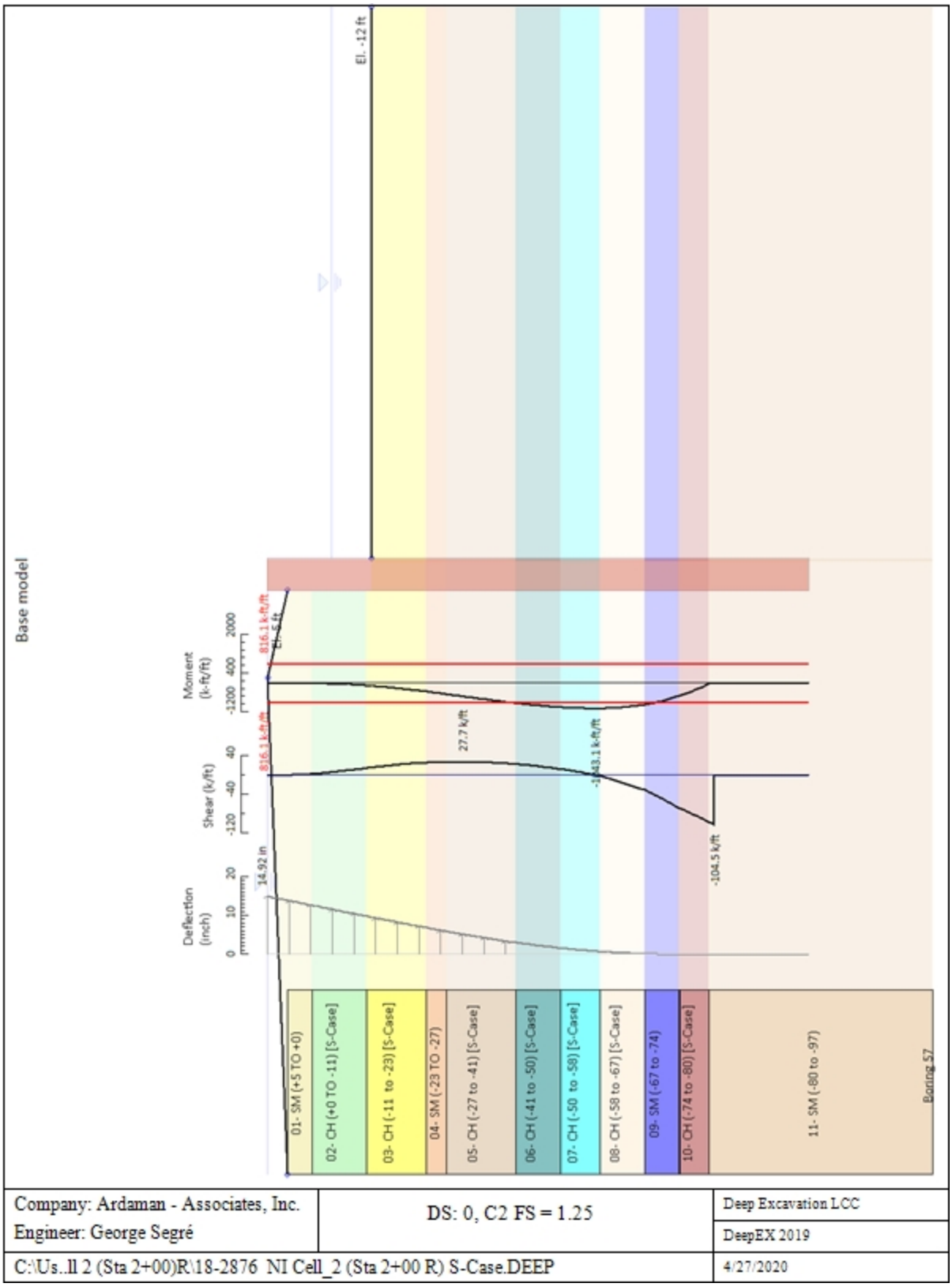

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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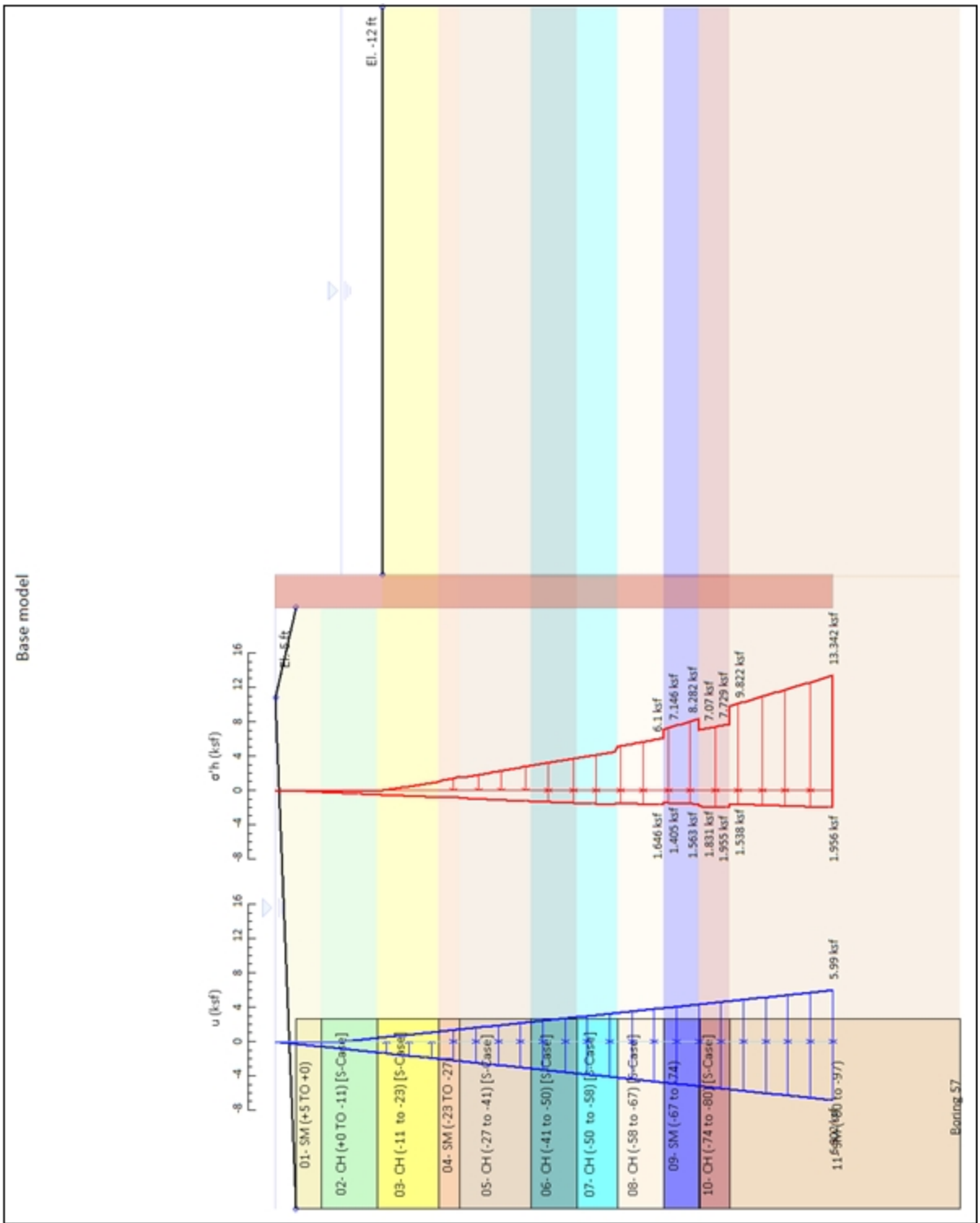

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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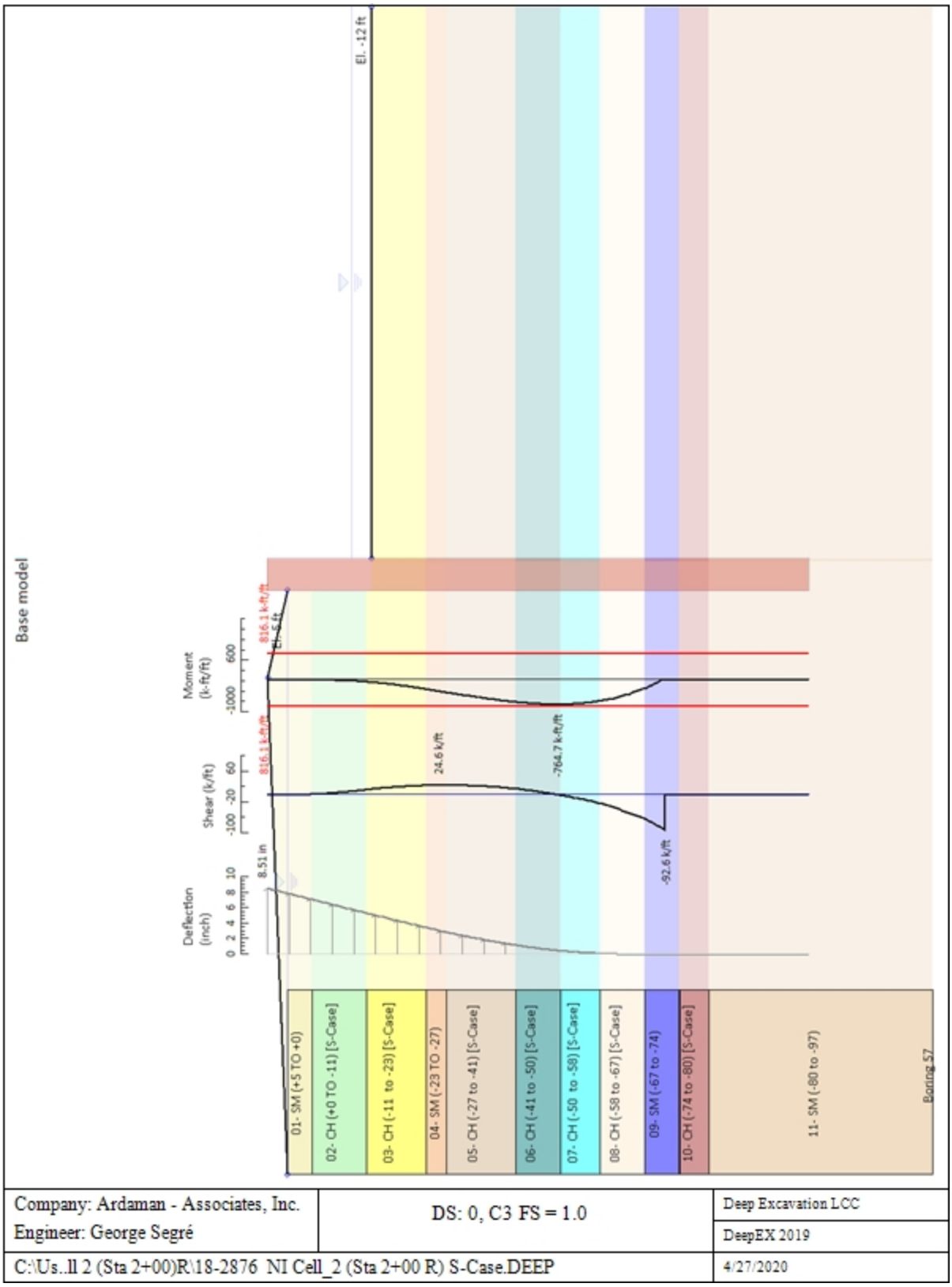
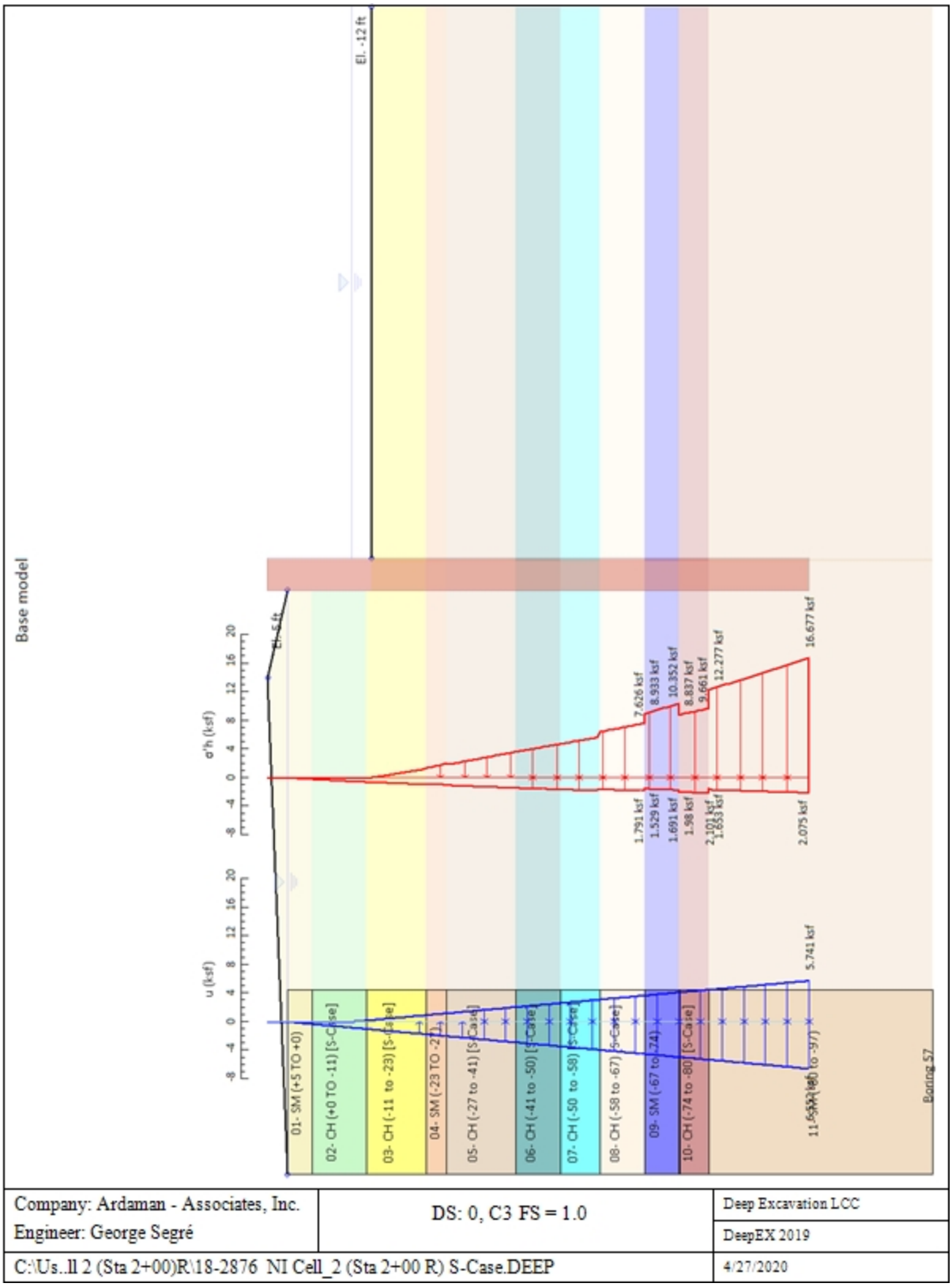
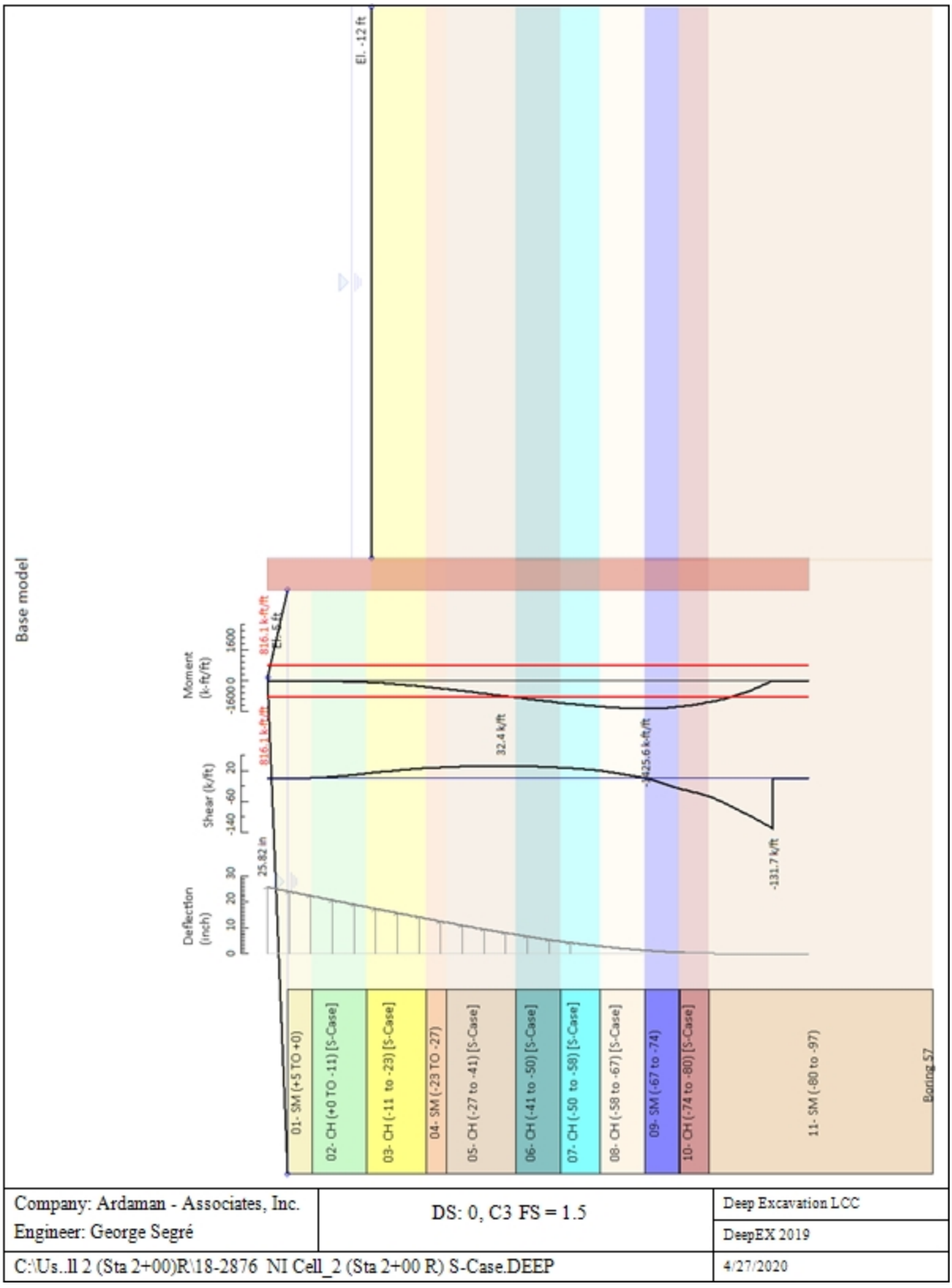
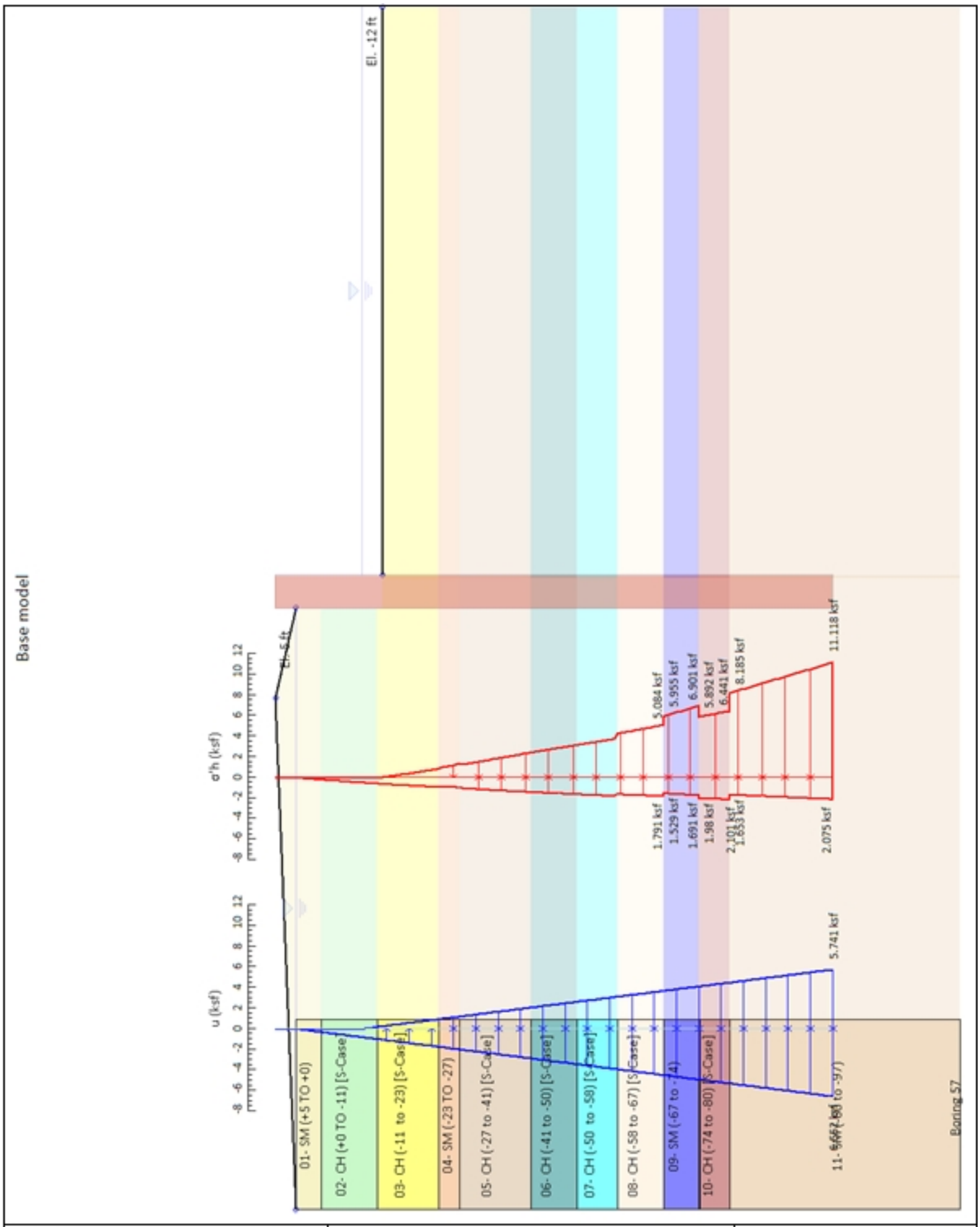

Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
El. -6 ft
Shear (k/ft)
-100
-20
60
816.1 k-ft/ft
24.6 k/ft
-764.7 k-ft/ft
-92.6 k/ft
Deflection (inch)
0 2 4 6 8 10
8.51 in
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring S7
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP
4/27/2020



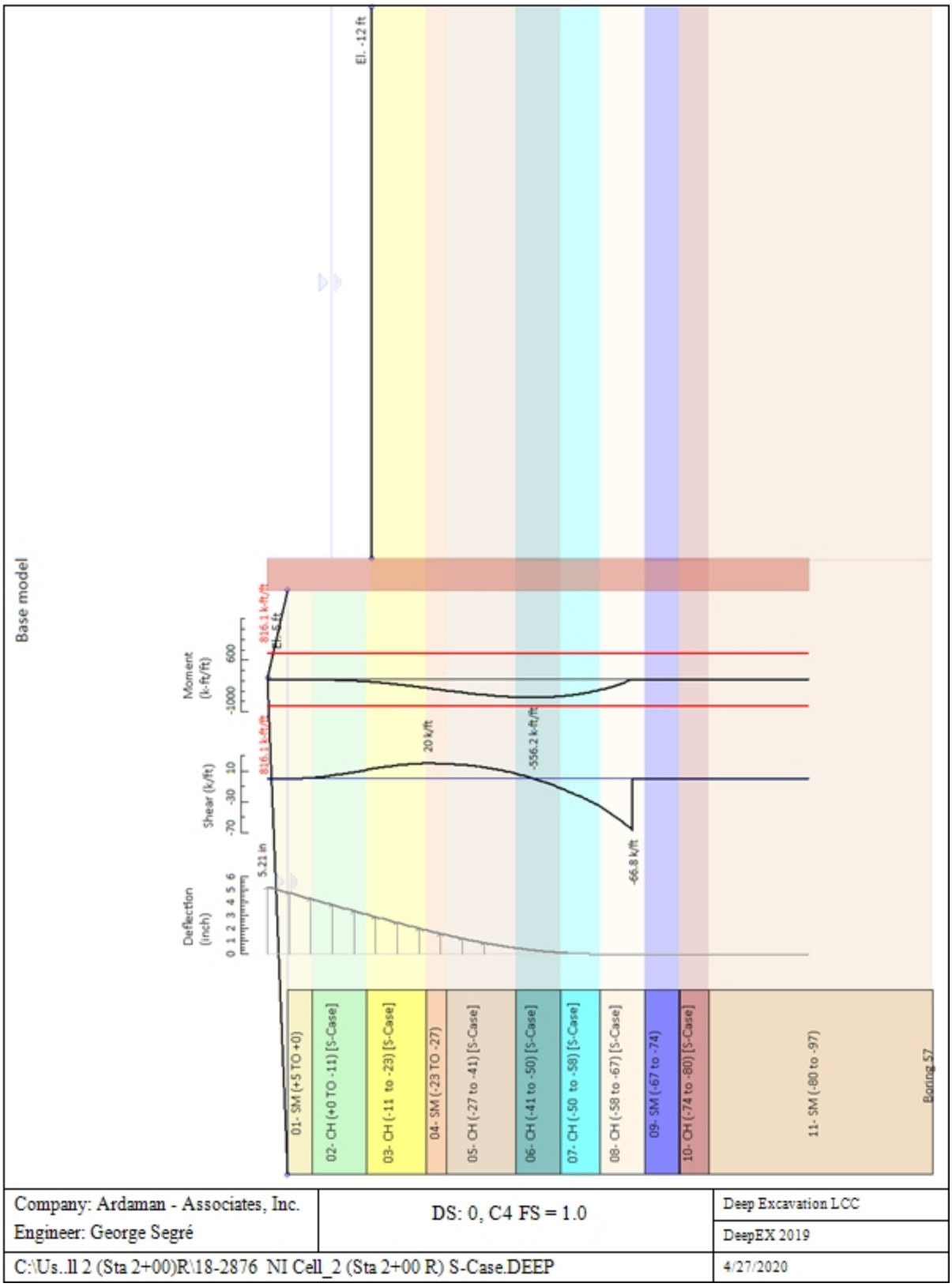
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP		4/27/2020



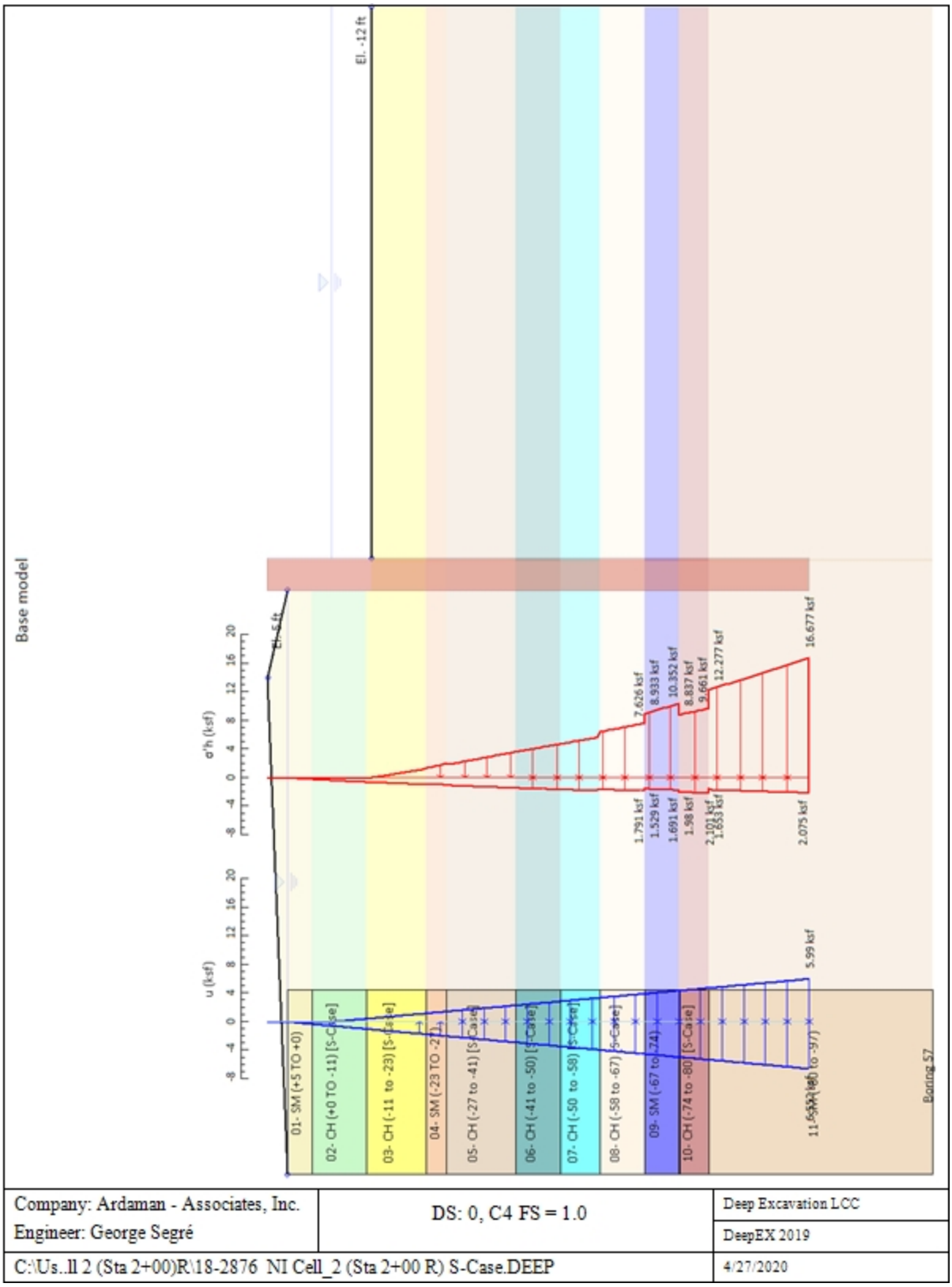
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP		4/27/2020



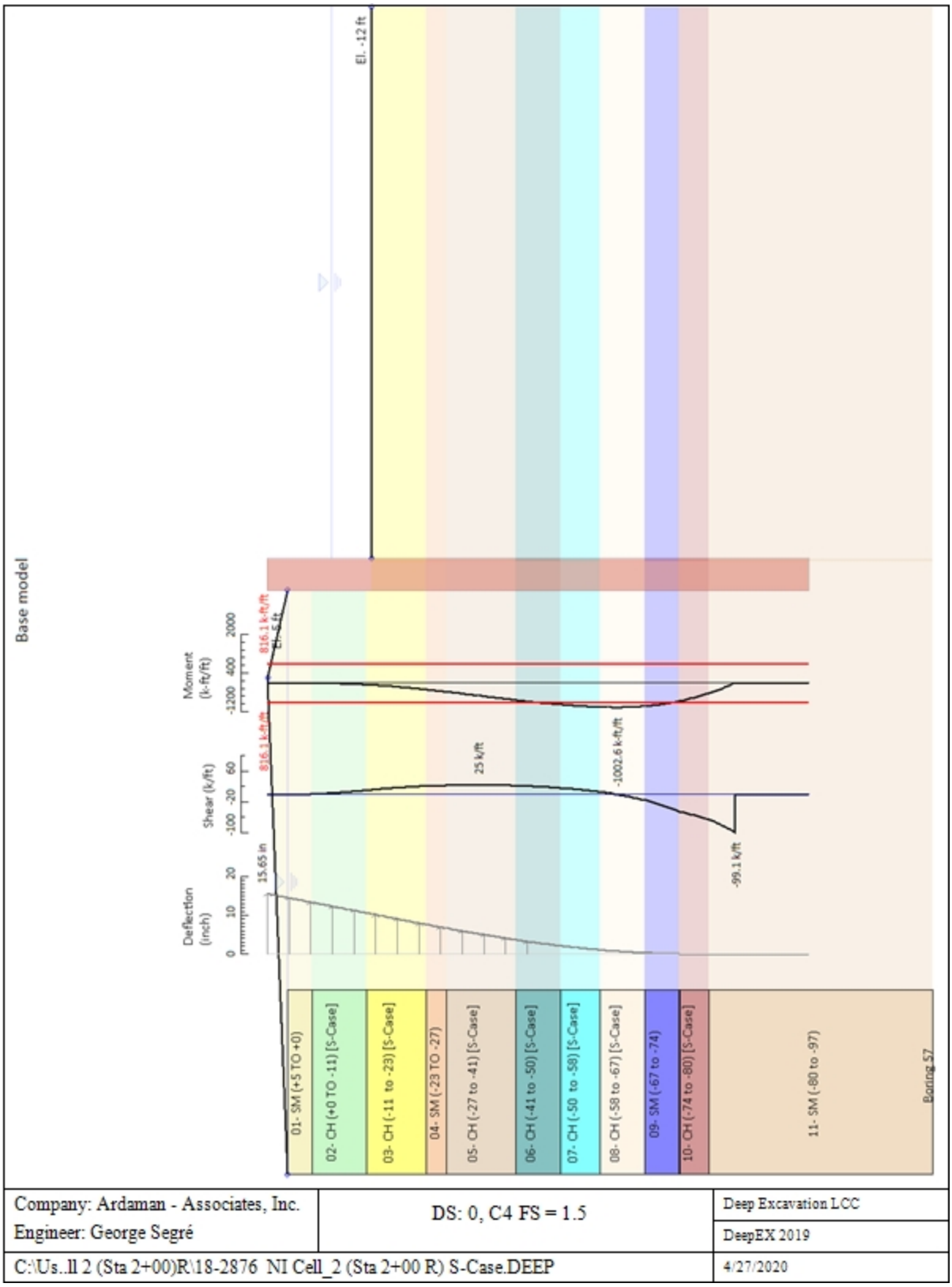
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP		4/27/2020



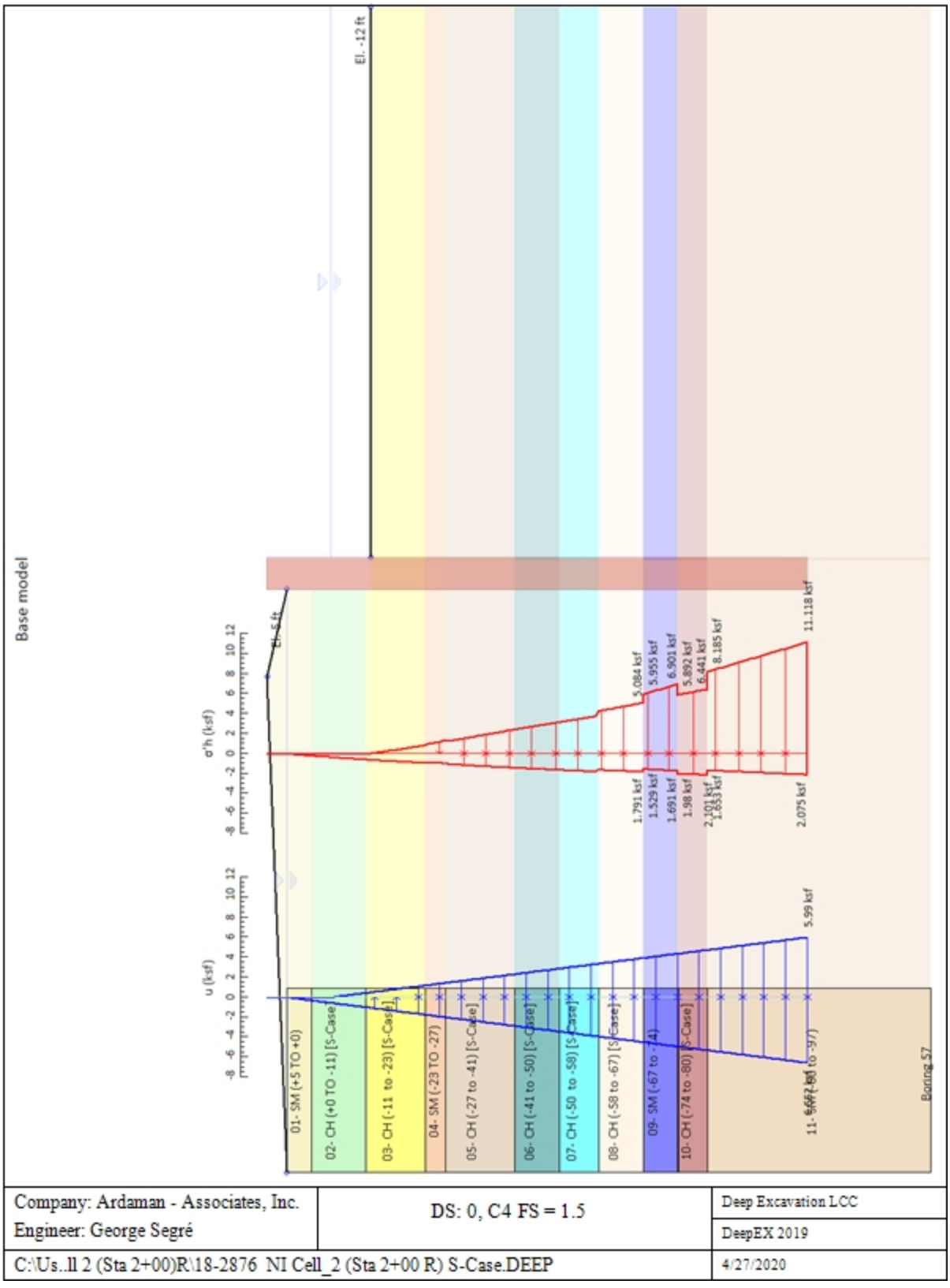
Attachment Figure C.2-303



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP		4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP		4/27/2020


Base model
El. -12 ft
El. 6 ft
σ'h (ksf)
u (ksf)
5.084 ksf
5.955 ksf
6.901 ksf
5.892 ksf
6.441 ksf
8.185 ksf
11.118 ksf
1.791 ksf
1.529 ksf
1.691 ksf
1.98 ksf
2.101 ksf
1.853 ksf
2.075 ksf
5.99 ksf
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ll 2 (Sta 2+00)R\18-2876 NI Cell_2 (Sta 2+00 R) S-Case.DEEP
4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #2 @ Sta. 3+50 Interior Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -58.58 ft., NAVD88

Length of Sheetting = 67.58 ft.

Use = 110.0 ft.

Design Tip Elev. = -101.0 ft., NAVD88

Design Length of Sheeting = 110.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-29.71	111.14	28.86	0.28
		Open excavation - degraded	9	-8	1.00	1.25	-33.66	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-26.94	95.56	17.00	0.20
		Open excavation - degraded	9	-4	1.00	1.25	-30.90	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	--	--	--	--
		Open excavation - degraded	5	-8	1.00	1.50	-29.71	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	--	--	--	--
		Open excavation - degraded	5	-4	1.00	1.50	-24.97	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-49.86	309.70	43.21	1.84
		Open excavation - degraded	9	-8	1.00	1.25	-58.58	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-44.41	231.28	35.70	1.13
		Open excavation - degraded	9	-4	1.00	1.25	-51.49	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-39.51	139.05	24.84	0.54
		Open excavation - degraded	5	-8	1.00	1.50	-53.13	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-34.06	93.37	19.12	0.28
		Open excavation - degraded	5	-4	1.00	1.50	-43.86	--	--	--
						Governing Value:	-58.58	309.70	43.21	1.84

*Note: For Q-Case 3/4 (FS = 1.0), the program could not converge on a solution

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:26:03 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	0	0	500	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-11 t	112	112	0	0	1000	0	0	150	3	1	1	1	1	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	0	0	3300	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-41 to	116	116	0	0	1400	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-50 t	116	116	0	0	1850	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-58 to	116	116	0	0	1900	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	0	0	2000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	0	0	0.95	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	0	0	1	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	0	0	1	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	0	0	1	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

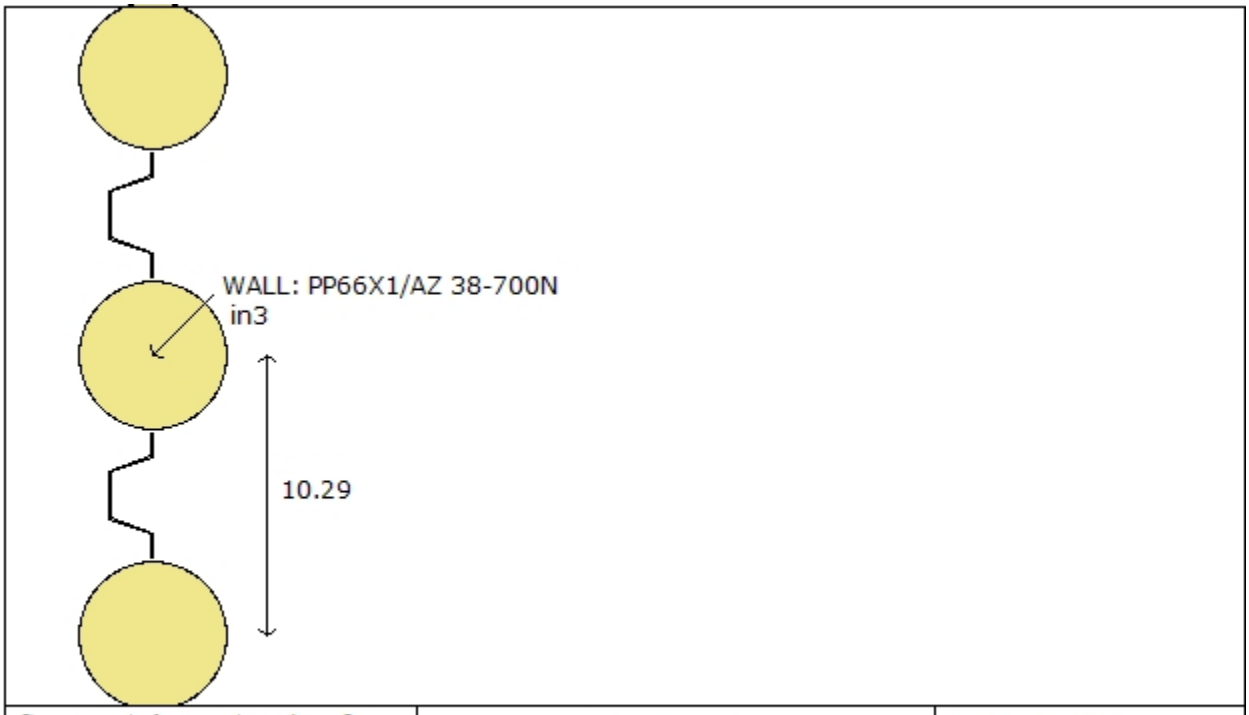
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	1
-11	03- CH (-11 to	1	0.95
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	1
-41	06- CH (-41 to	1	1
-50	07- CH (-50 to	1	1
-58	08- CH (-58 to	1	1
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	1
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1.05	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.111	2.111	2.284
Stage 1	Simple span	N/A	1.6	1.785	1.785	1.948
Stage 2	Simple span	N/A	1.6	2.21	2.21	2.364
Stage 3	Simple span	N/A	1.6	1.883	1.883	2.028
Stage 4	Simple span	N/A	1.6	2.373	2.373	2.44
Stage 5	Simple span	N/A	1.6	1.828	1.828	1.909
Stage 6	Simple span	N/A	1.6	2.198	2.198	2.246
Stage 7	Simple span	N/A	1.6	1.944	1.944	1.998

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

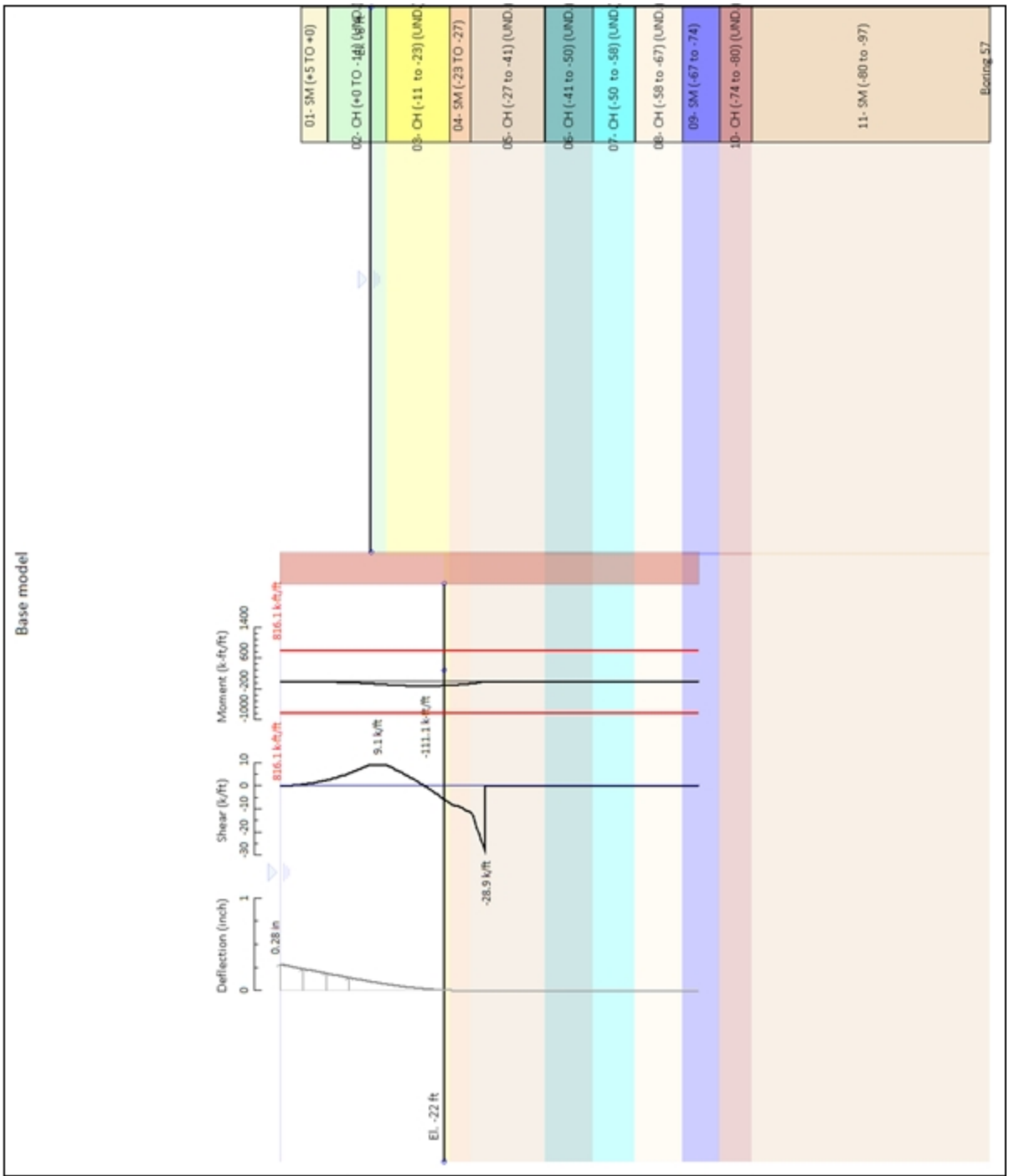
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

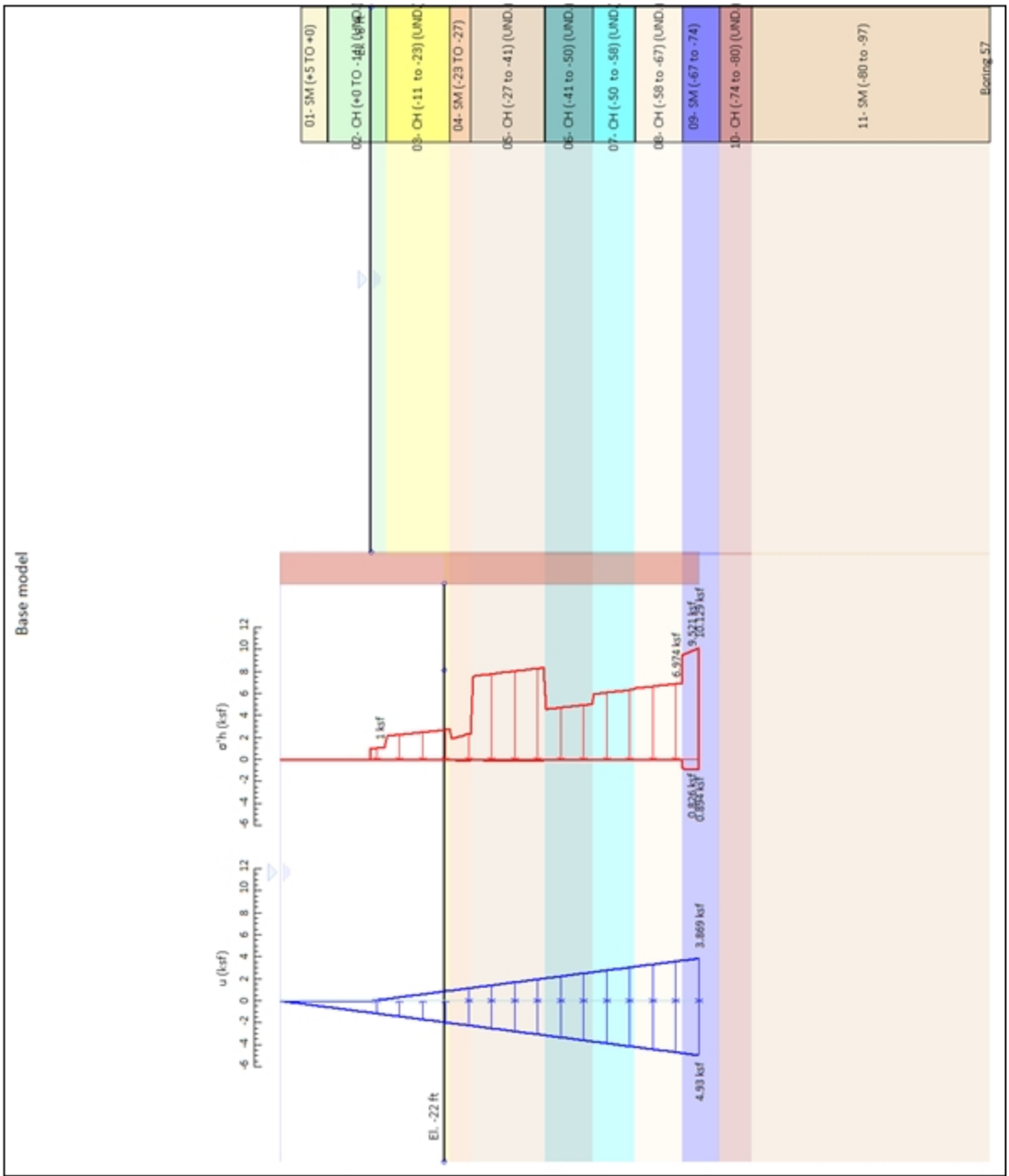
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

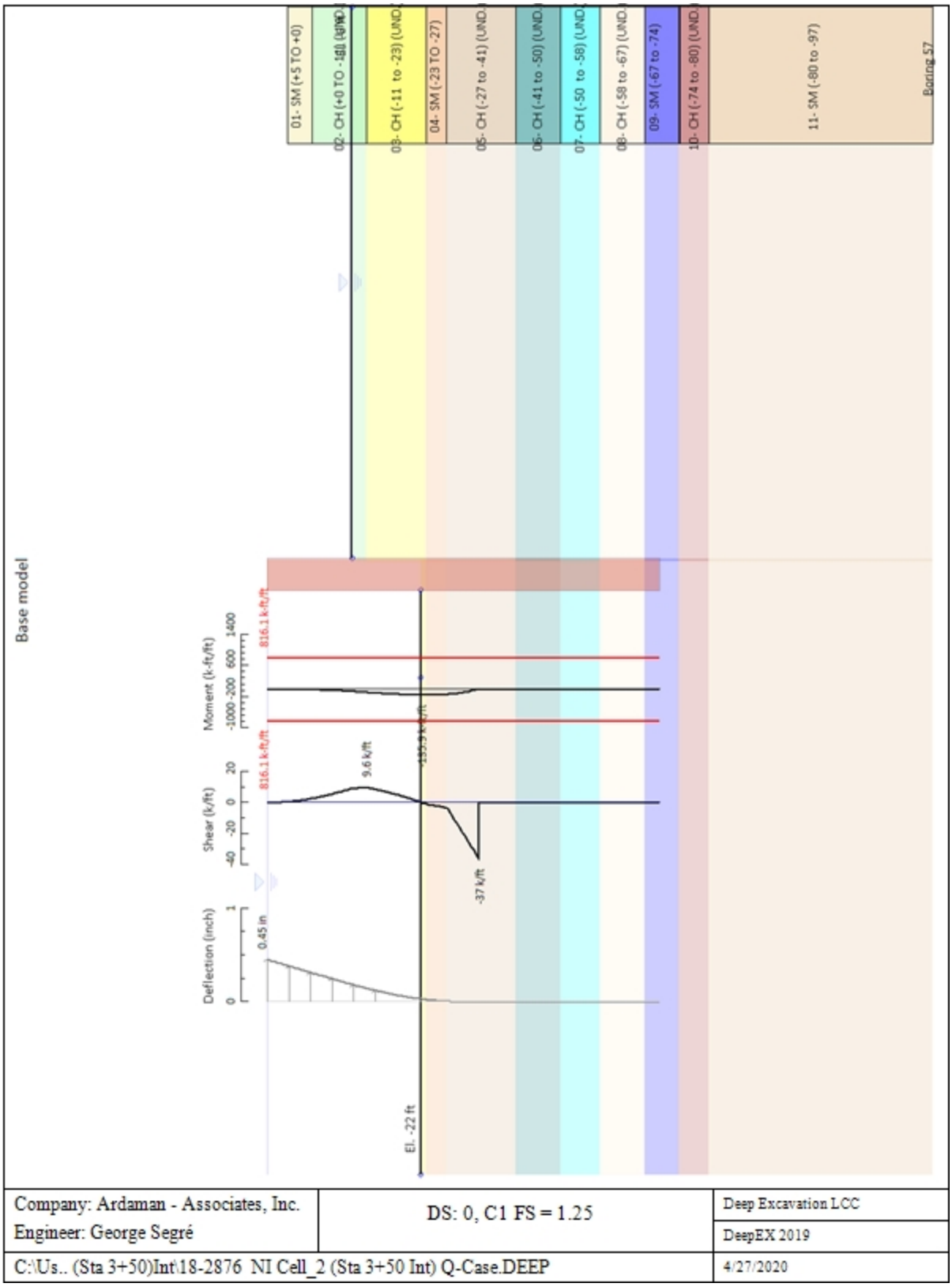
EXCAVATION STAGES SKETCHES

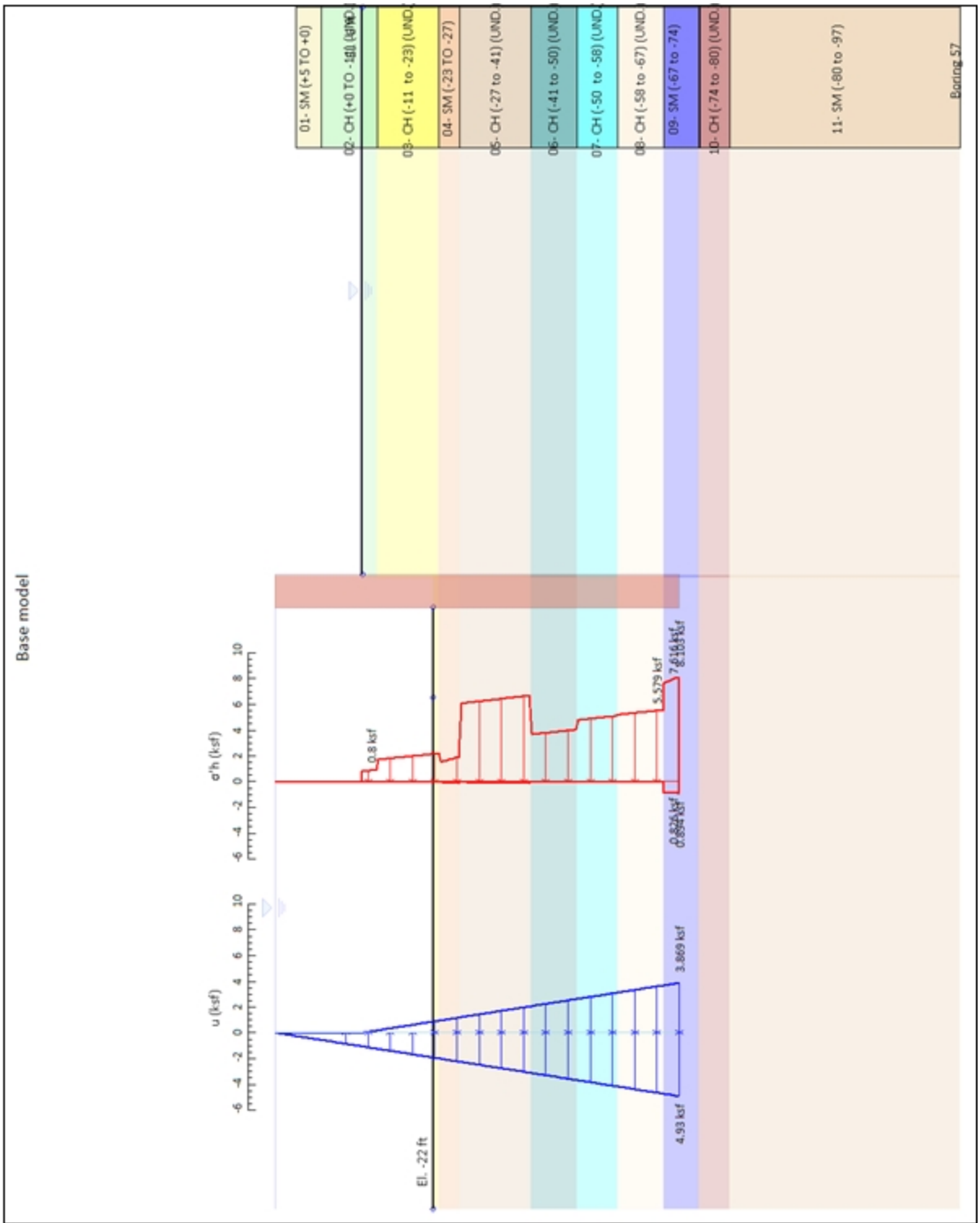
A sequence of figures for each excavation stage is reported

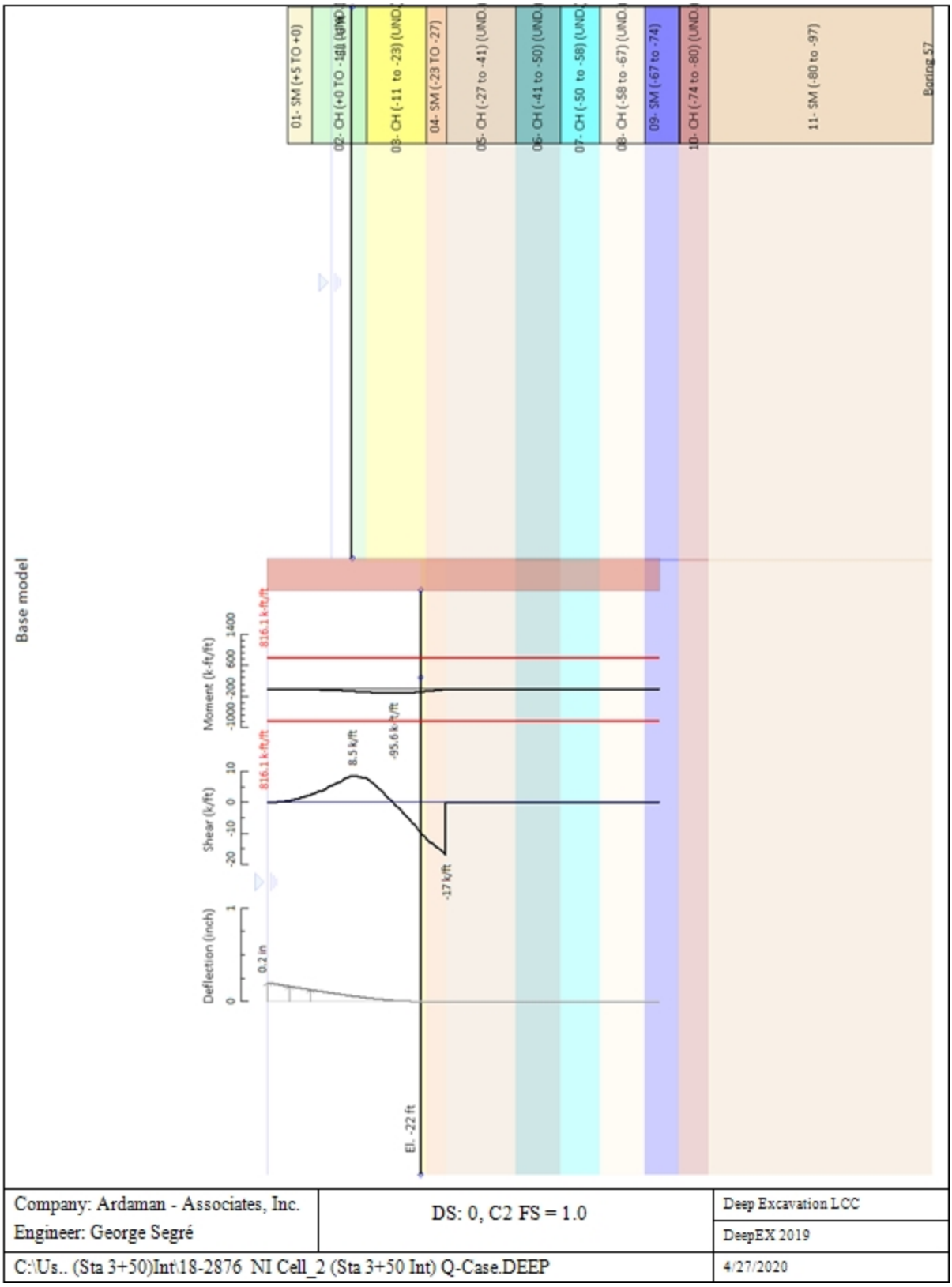


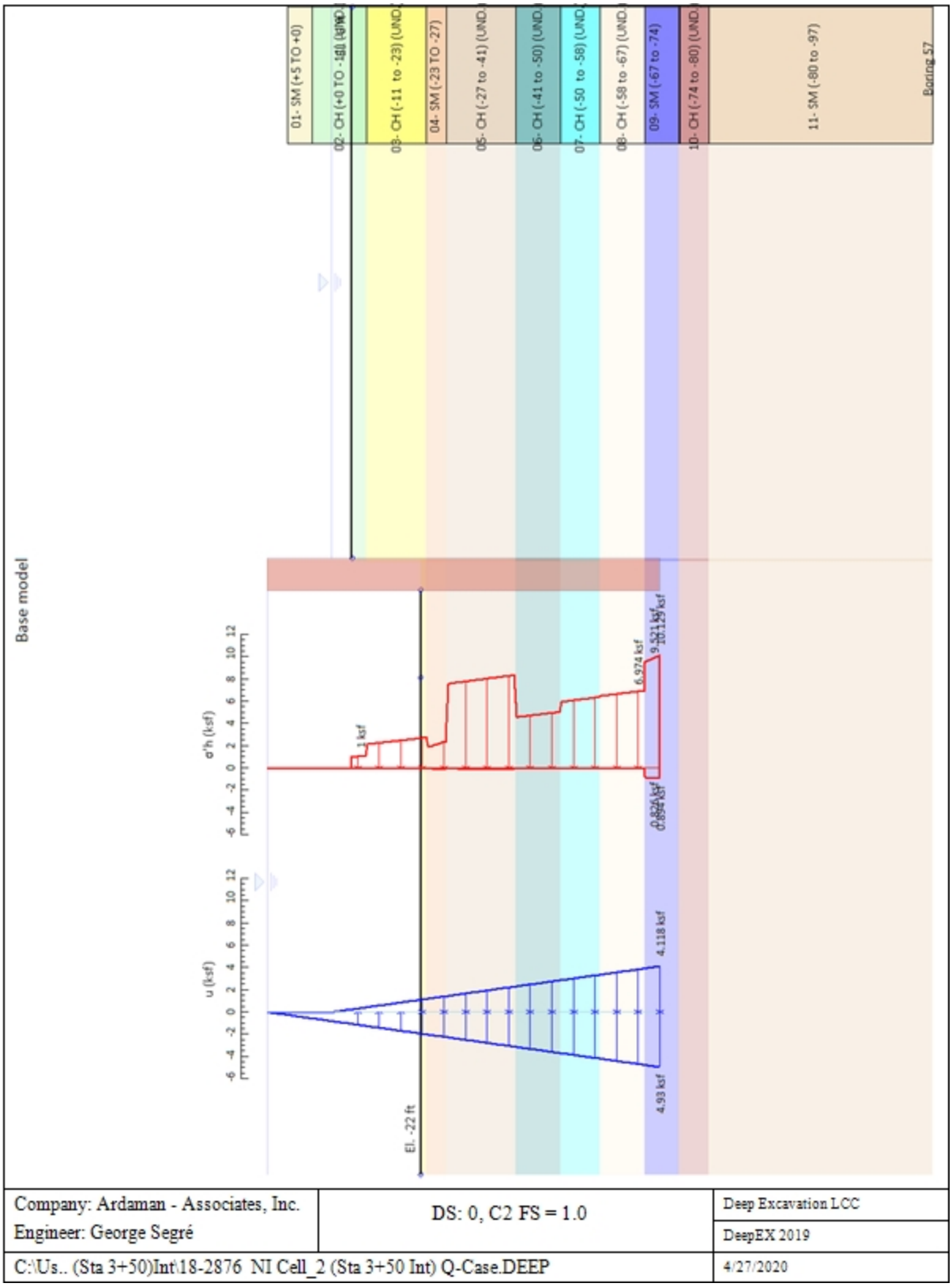
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP		4/27/2020

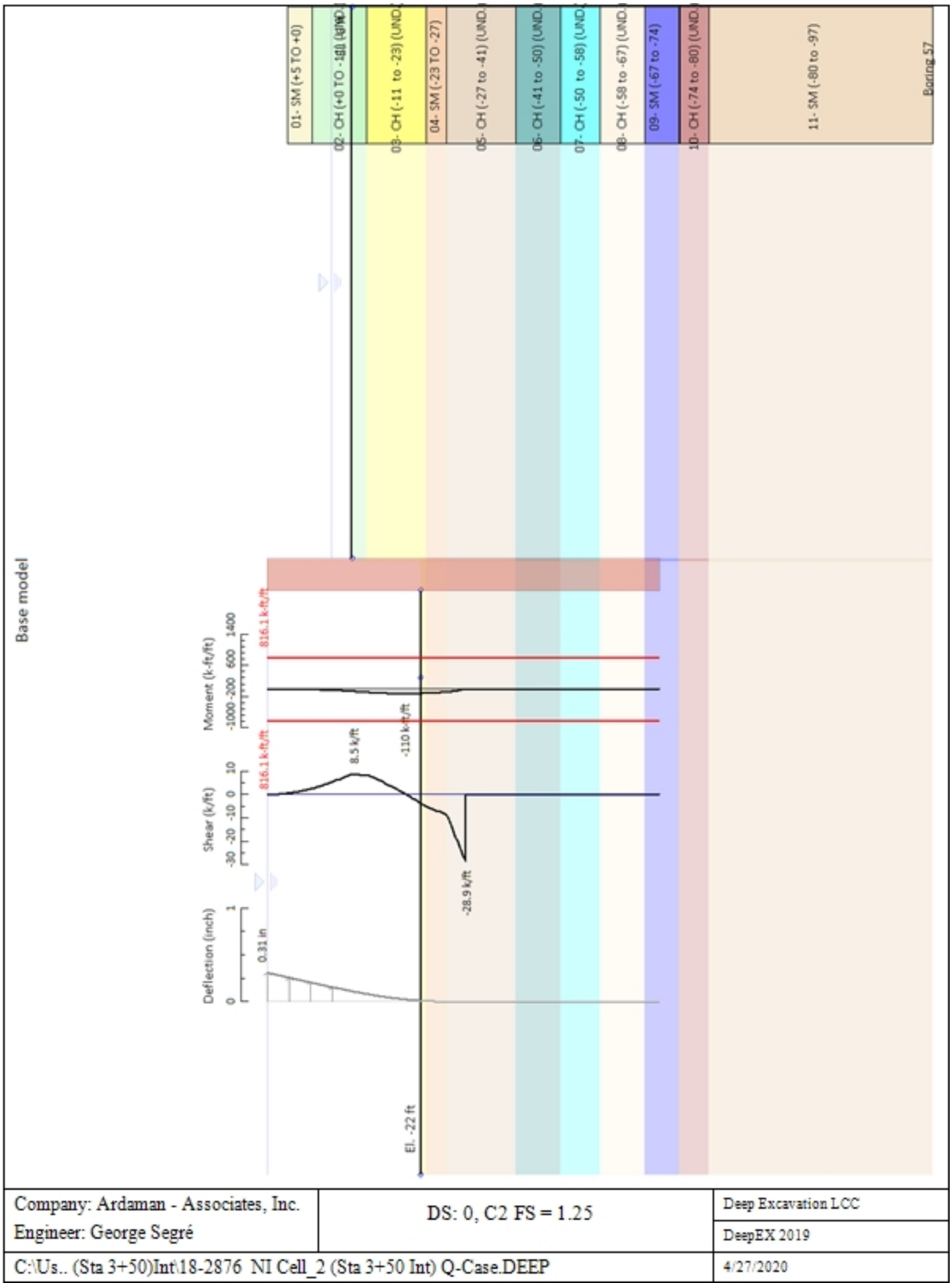

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
1 ksf
6.974 ksf
3.869 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

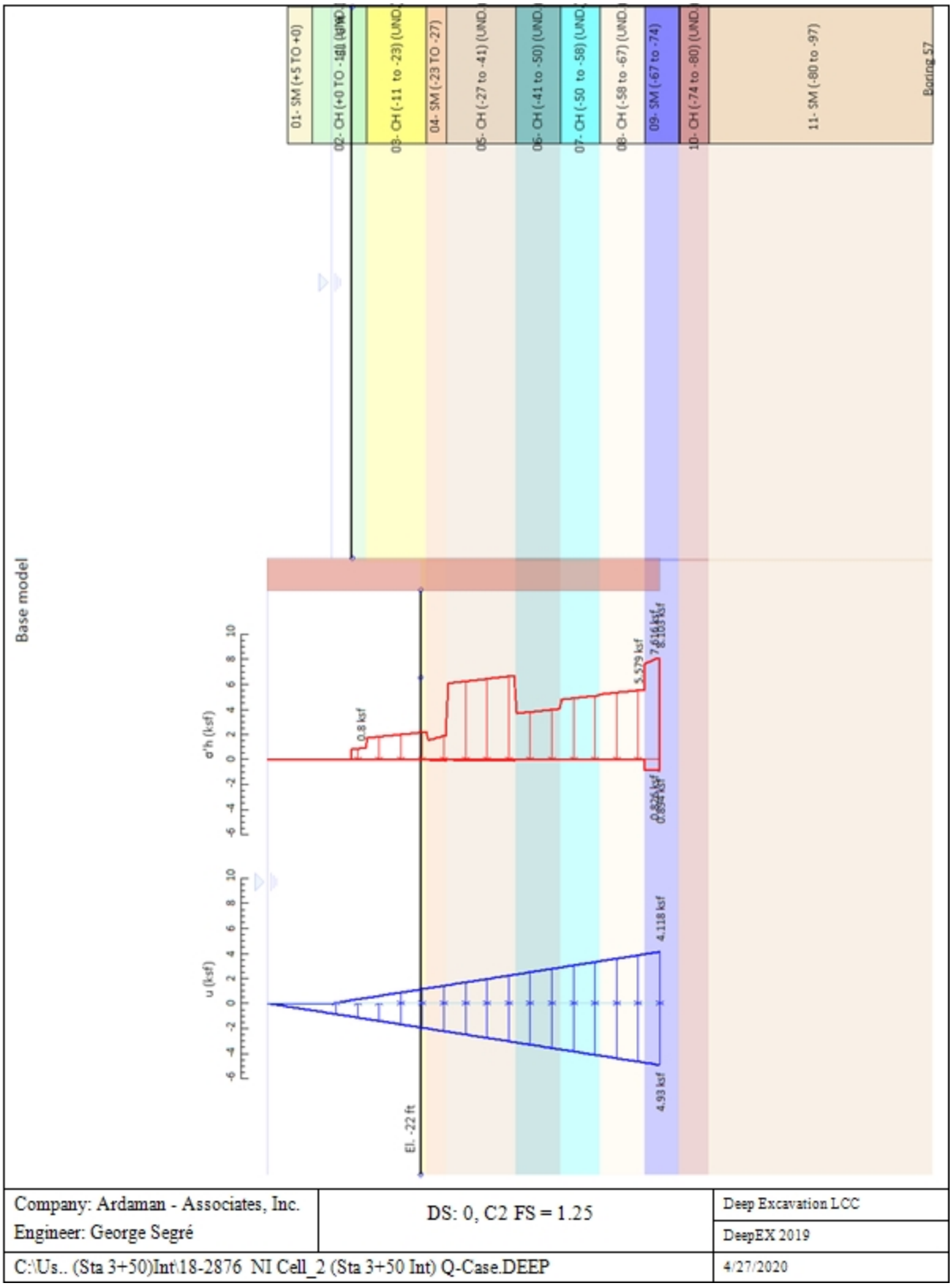

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-135.9 k-ft/ft
Shear (k/ft)
-40 -20 0 20
9.6 k/ft
-37 k/ft
Deflection (inch)
0 1
0.45 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

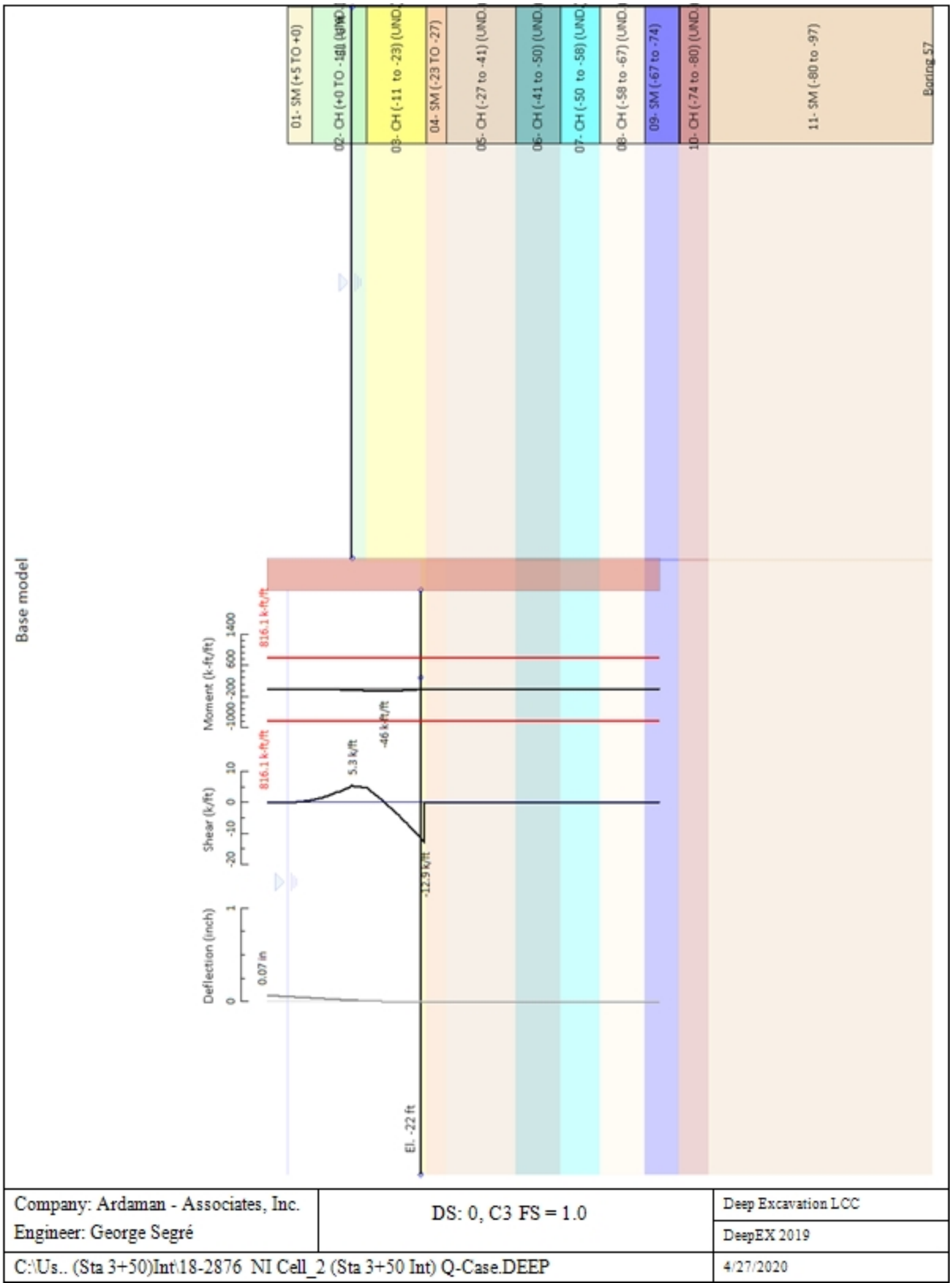

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -18) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
7.616 ksf
3.869 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

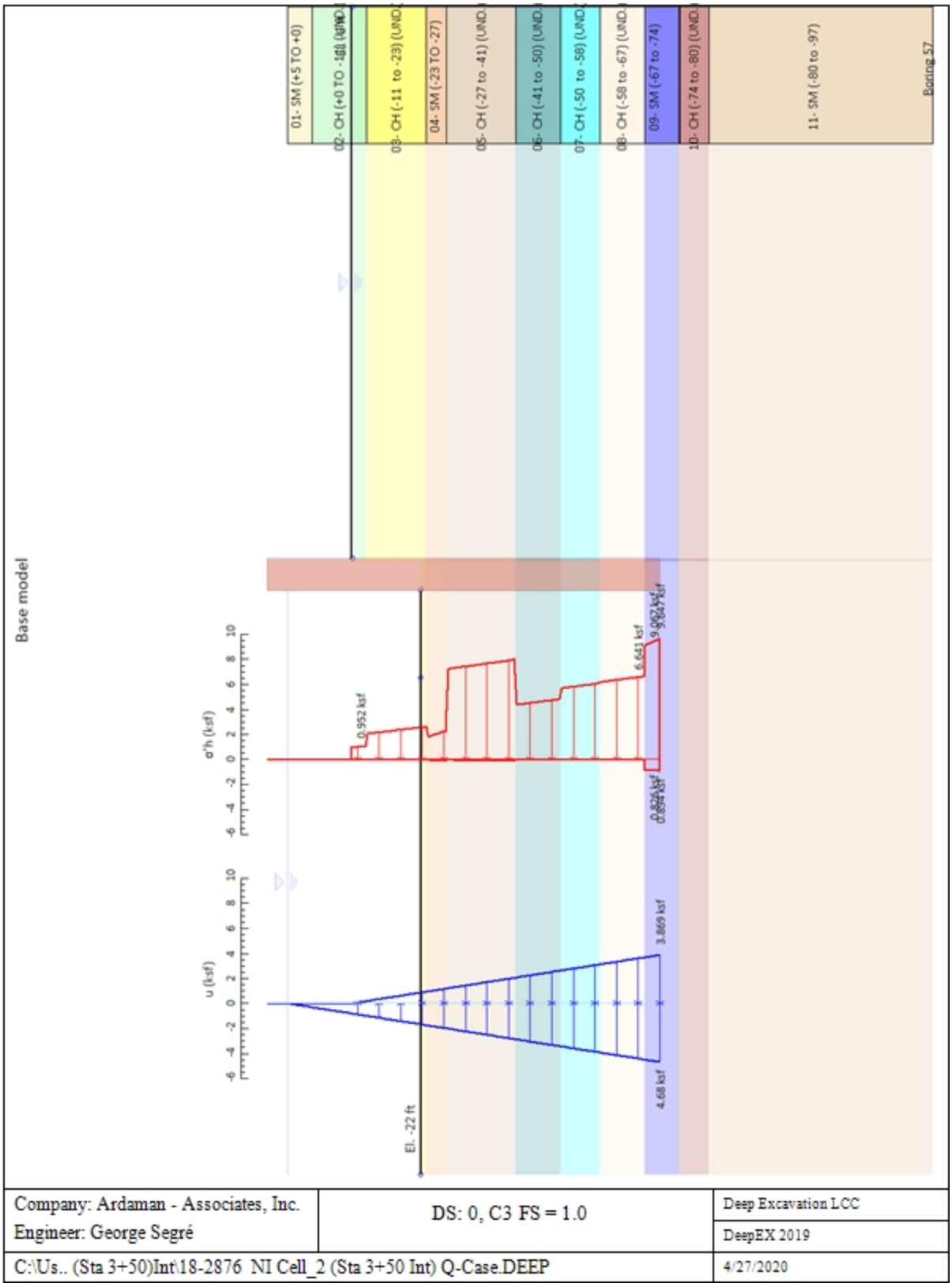

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-95.6 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
8.5 k/ft
-17 k/ft
Deflection (inch)
0 1
0.2 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
1 ksf
6.974 ksf
4.118 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

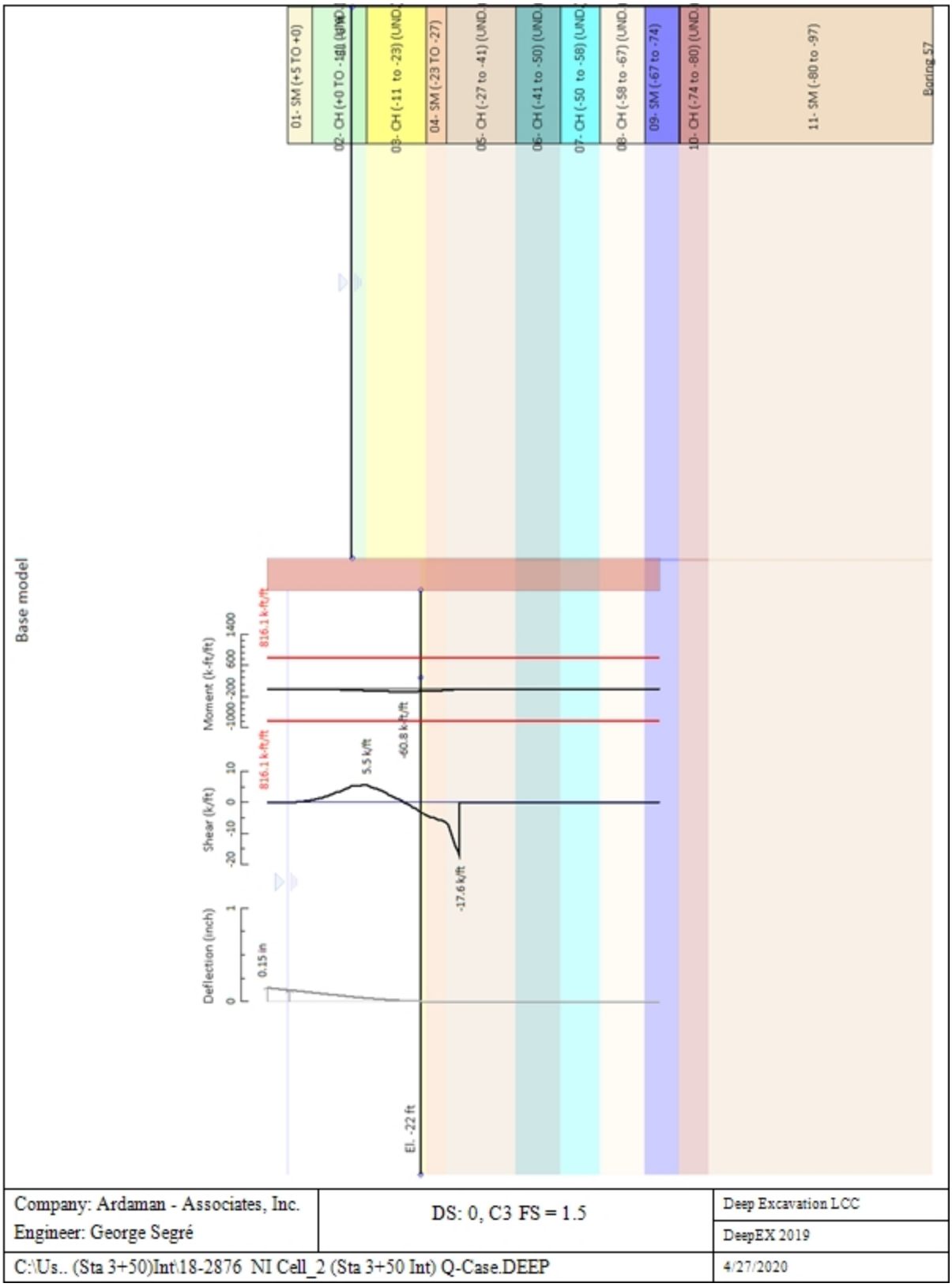

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-110 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
8.5 k/ft
-28.9 k/ft
Deflection (inch)
0 1
0.31 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

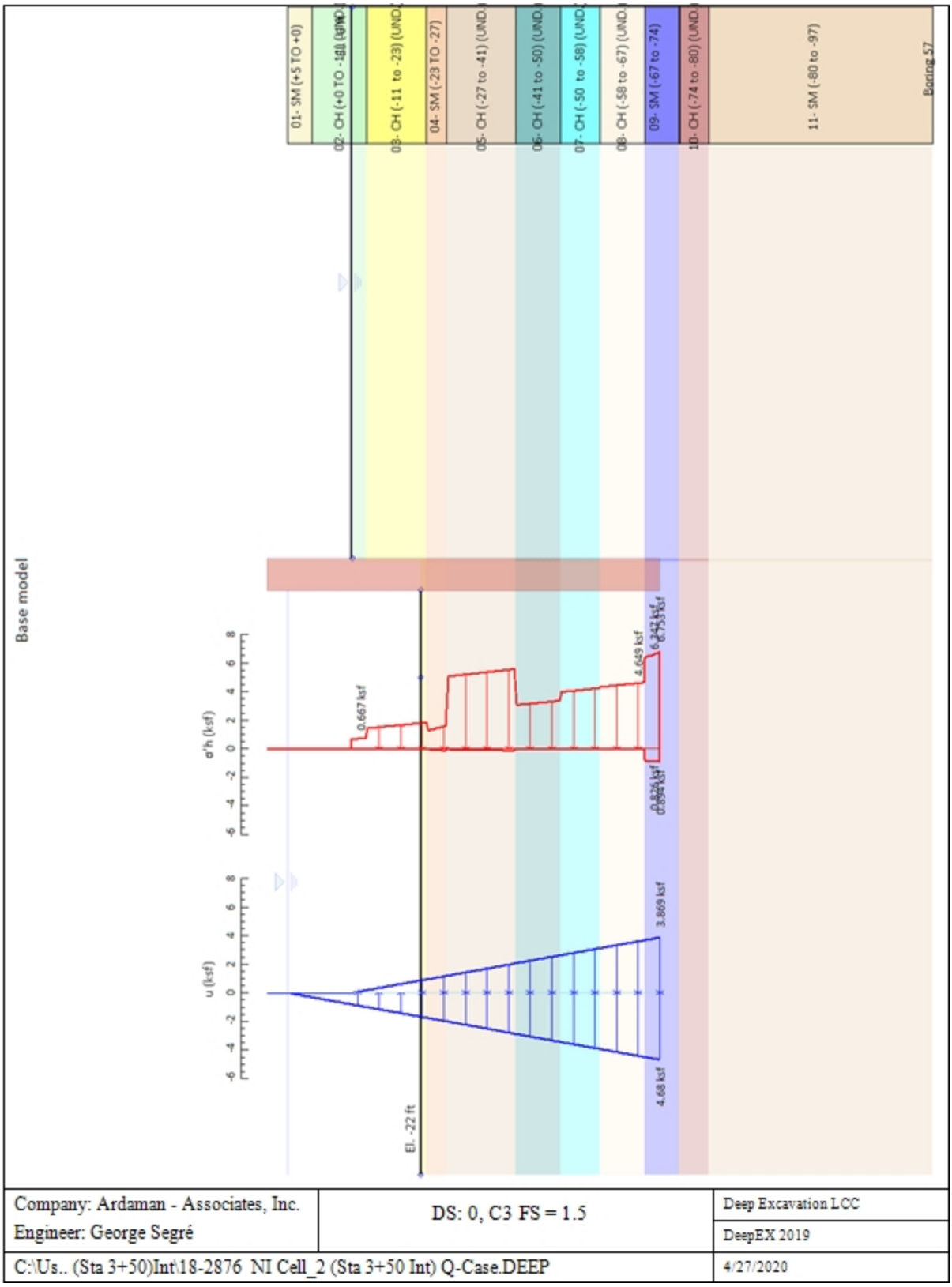

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
4.118 ksf
4.93 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

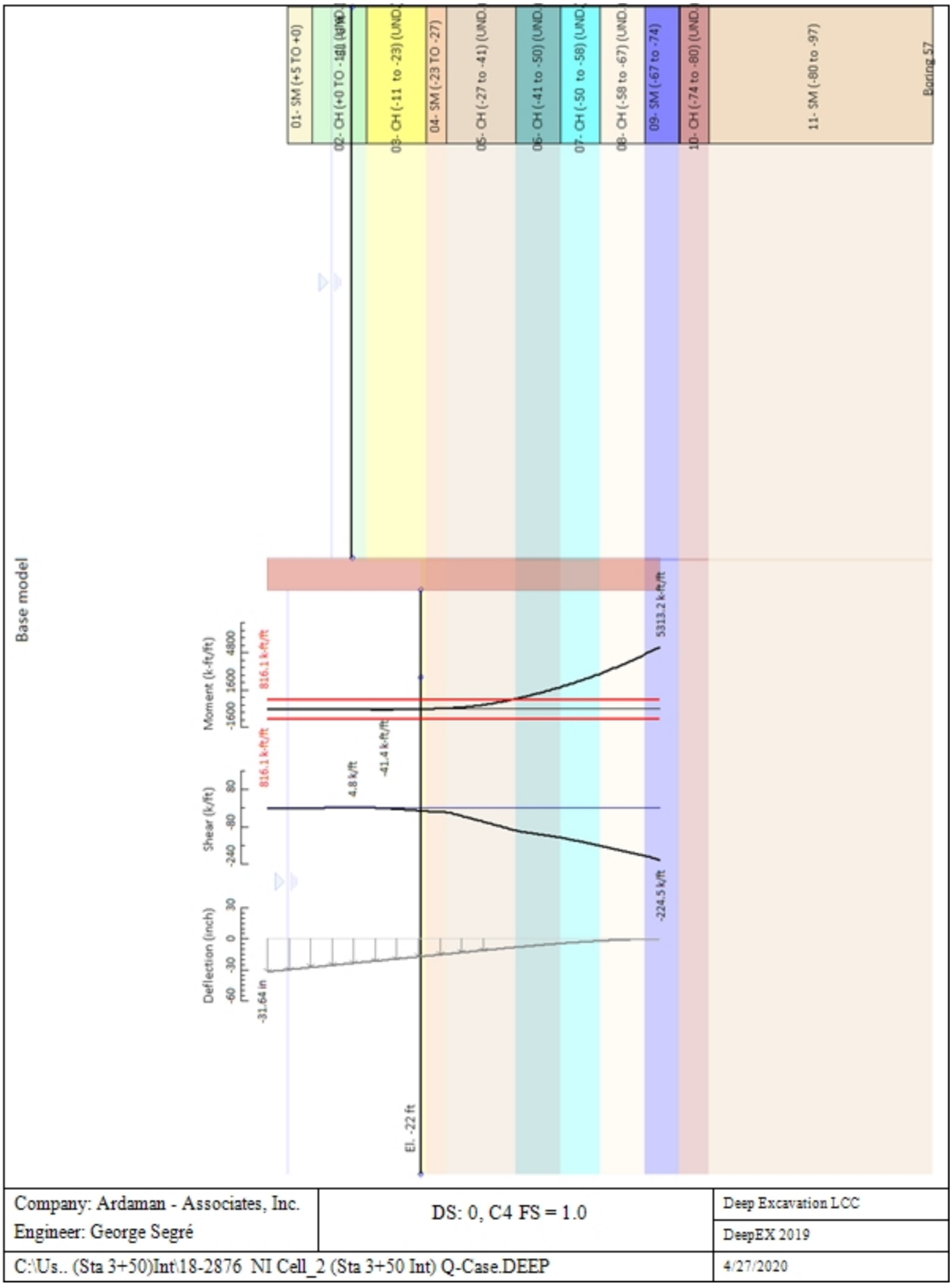

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-46 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
5.3 k/ft
-12.9 k/ft
Deflection (inch)
0 1
0.07 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

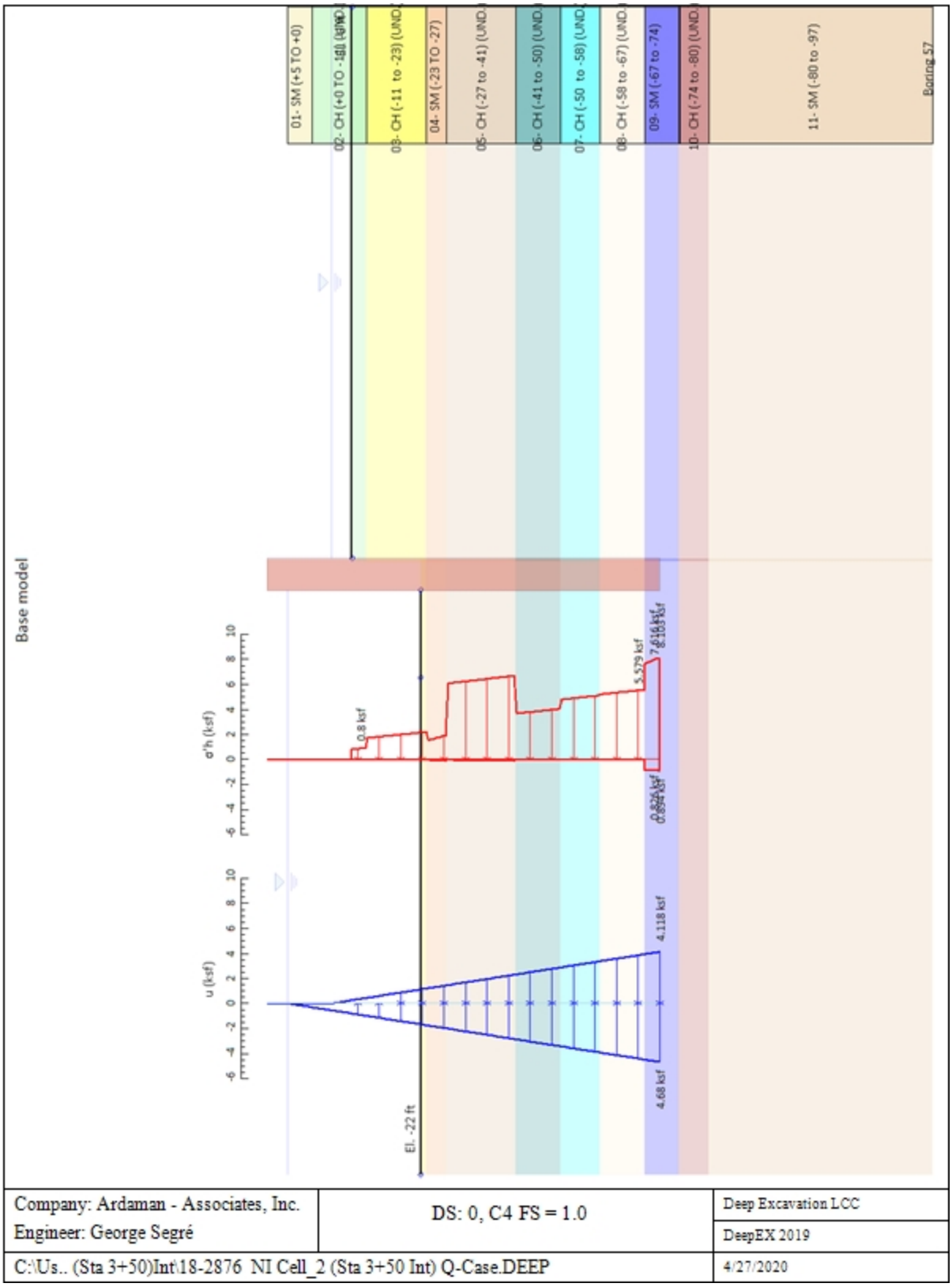


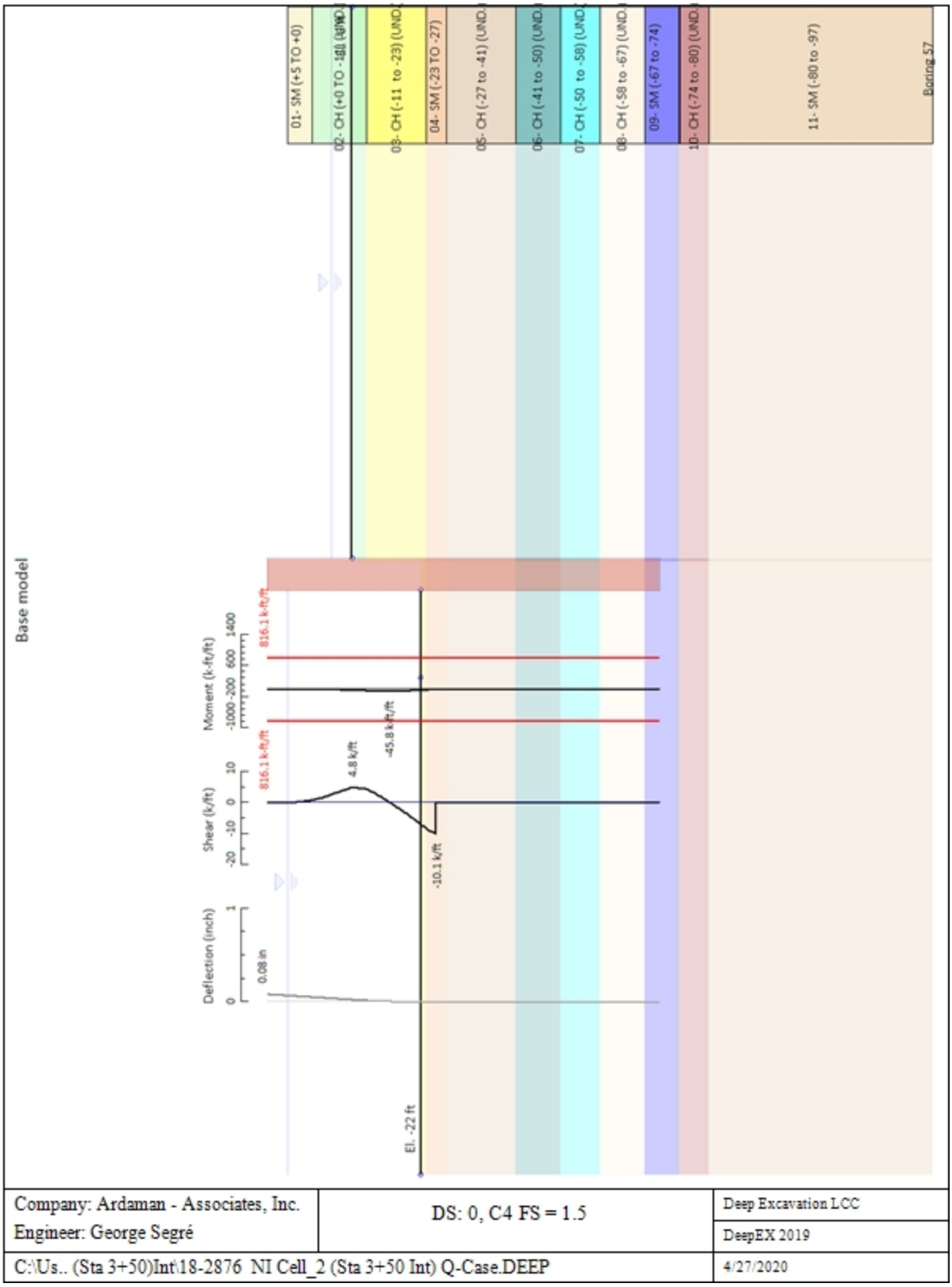
Attachment Figure C.2-326

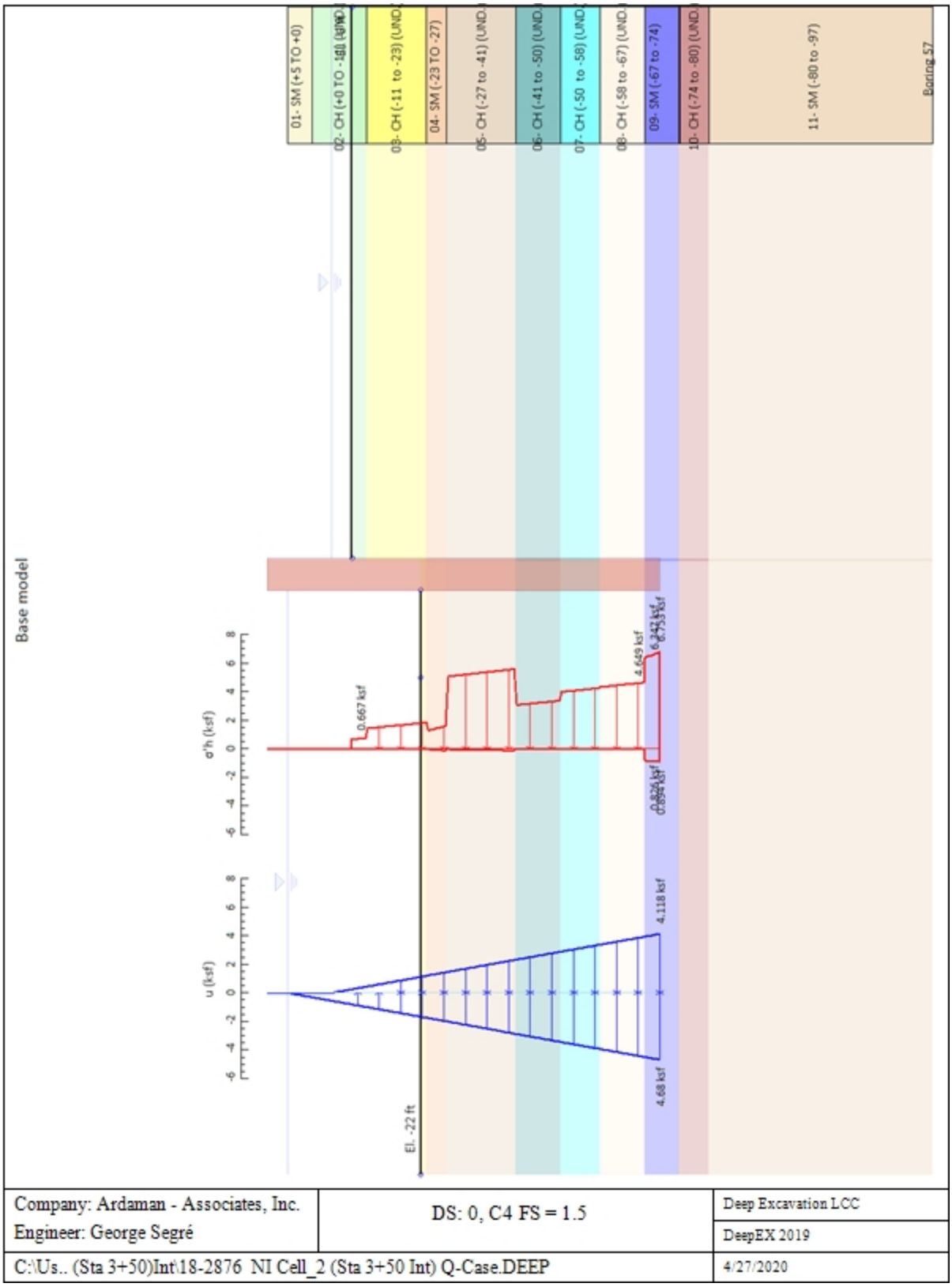

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-60.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
5.5 k/ft
-17.6 k/ft
Deflection (inch)
0 1
0.15 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -18) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.667 ksf
4.649 ksf
3.869 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1600 1600 4800
816.1 k-ft/ft
816.1 k-ft/ft
-41.4 k-ft/ft
5313.2 k-ft/ft
Shear (k/ft)
-240 -80 80
4.8 k/ft
-224.5 k/ft
Deflection (inch)
-60 -30 0 30
-31.64 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.8 ksf
5.579 ksf
4.118 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-45.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-20 -10 0 10
4.8 k/ft
-10.1 k/ft
Deflection (inch)
0 1
0.08 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) (UND.)
03- CH (-11 to -23) (UND.)
04- SM (-23 TO -27)
05- CH (-27 to -41) (UND.)
06- CH (-41 to -50) (UND.)
07- CH (-50 to -58) (UND.)
08- CH (-58 to -67) (UND.)
09- SM (-67 to -74)
10- CH (-74 to -80) (UND.)
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
0.667 ksf
4.649 ksf
4.118 ksf
4.68 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) Q-Case.DEEP
4/27/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/27/2020 10:29:47 PM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 2 Sections\Cell 2 (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- SM (+5 T	120	120	25	0	N/A	N/A	N/A	300	3	0.41	2.46	N/A	N/A	True	EXP	
02- CH (+0 TO	112	112	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- CH (-11 t	112	112	23	0	N/A	N/A	N/A	150	3	0.44	2.28	N/A	N/A	True	Linear	
04- SM (-23 T	120	120	25	0	N/A	N/A	N/A	521.92	3	0.41	2.46	N/A	N/A	True	Linear	
05- CH (-27 to	120	120	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- CH (-41 to	116	116	23	0	N/A	N/A	N/A	626.3	3	0.44	2.28	N/A	N/A	True	Linear	
07- CH (-50 t	116	116	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
08- CH (-58 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
09- SM (-67 t	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- CH (-74 to	116	116	26	0	N/A	N/A	N/A	300	3	0.39	2.56	N/A	N/A	True	Linear	
11- SM (-80 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- SM (+5 T	0.4	-	-	0.577	0.5	1	0	7.2	4.8	20	-
02- CH (+0 TO	0.4	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- CH (-11 t	0.4	-	-	0.609	0.5	-	-	13	8.7	20	-
04- SM (-23 T	0.4	-	-	0.577	0.5	-	-	21.8	14.5	30	-
05- CH (-27 to	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- CH (-41 to	0.35	-	-	0.609	0.5	-	-	29	19.3	70	-
07- CH (-50 t	0.35	-	-	0.609	0.8	-	-	0	0	0	-
08- CH (-58 to	0.3	-	-	0.562	0.8	-	-	0	0	0	-
09- SM (-67 t	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- CH (-74 to	0.35	-	-	0.562	0.8	-	-	0	0	0	-
11- SM (-80 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

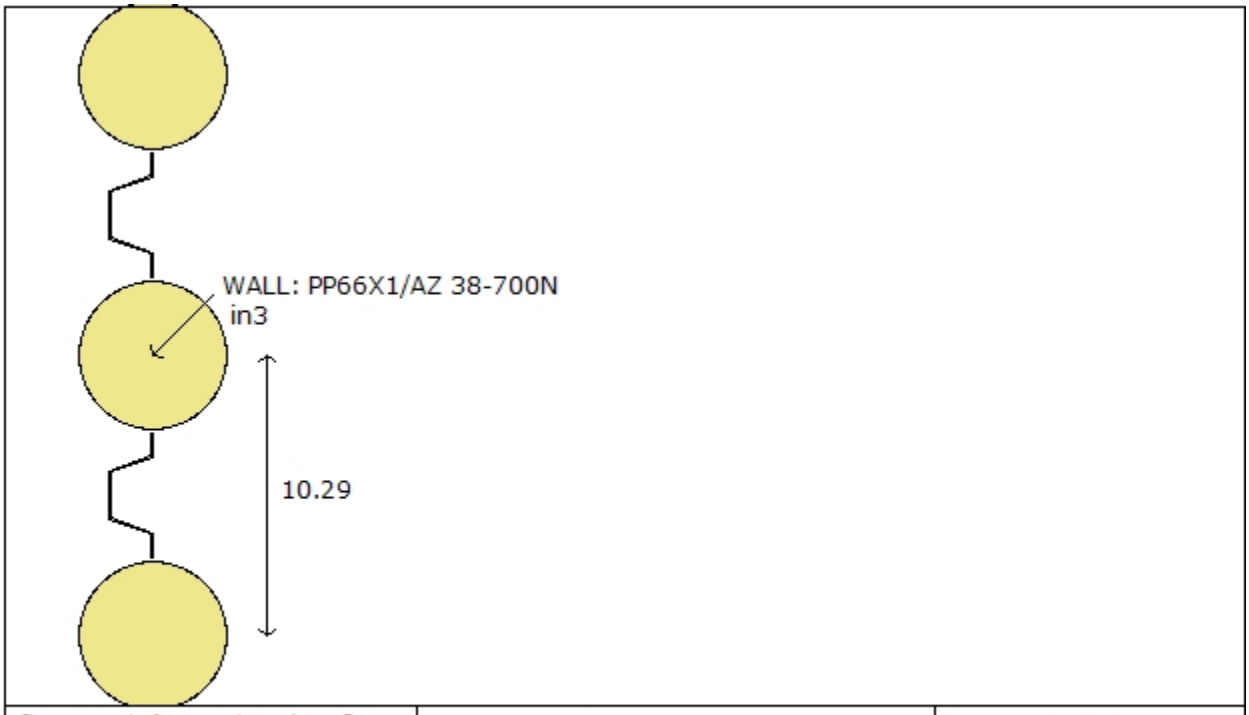
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- SM (+5 TO	1	0.58
0	02- CH (+0 TO	1	0.61
-11	03- CH (-11 to	1	0.61
-23	04- SM (-23 T	1	0.58
-27	05- CH (-27 to	1	0.61
-41	06- CH (-41 to	1	0.61
-50	07- CH (-50 to	1	0.61
-58	08- CH (-58 to	1	0.56
-67	09- SM (-67 to	1	0.5
-74	10- CH (-74 to	1	0.56
-80	11- SM (-80 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.701	1.701	2.113
Stage 1	Simple span	N/A	1.6	1.467	1.467	1.812
Stage 2	Simple span	N/A	1.6	1.773	1.773	2.167
Stage 3	Simple span	N/A	1.6	1.54	1.54	1.867
Stage 4	Simple span	N/A	1.6	1.877	1.877	2.252
Stage 5	Simple span	N/A	1.6	1.447	1.447	1.718
Stage 6	Simple span	N/A	1.6	1.957	1.957	2.31
Stage 7	Simple span	N/A	1.6	1.527	1.527	1.776

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

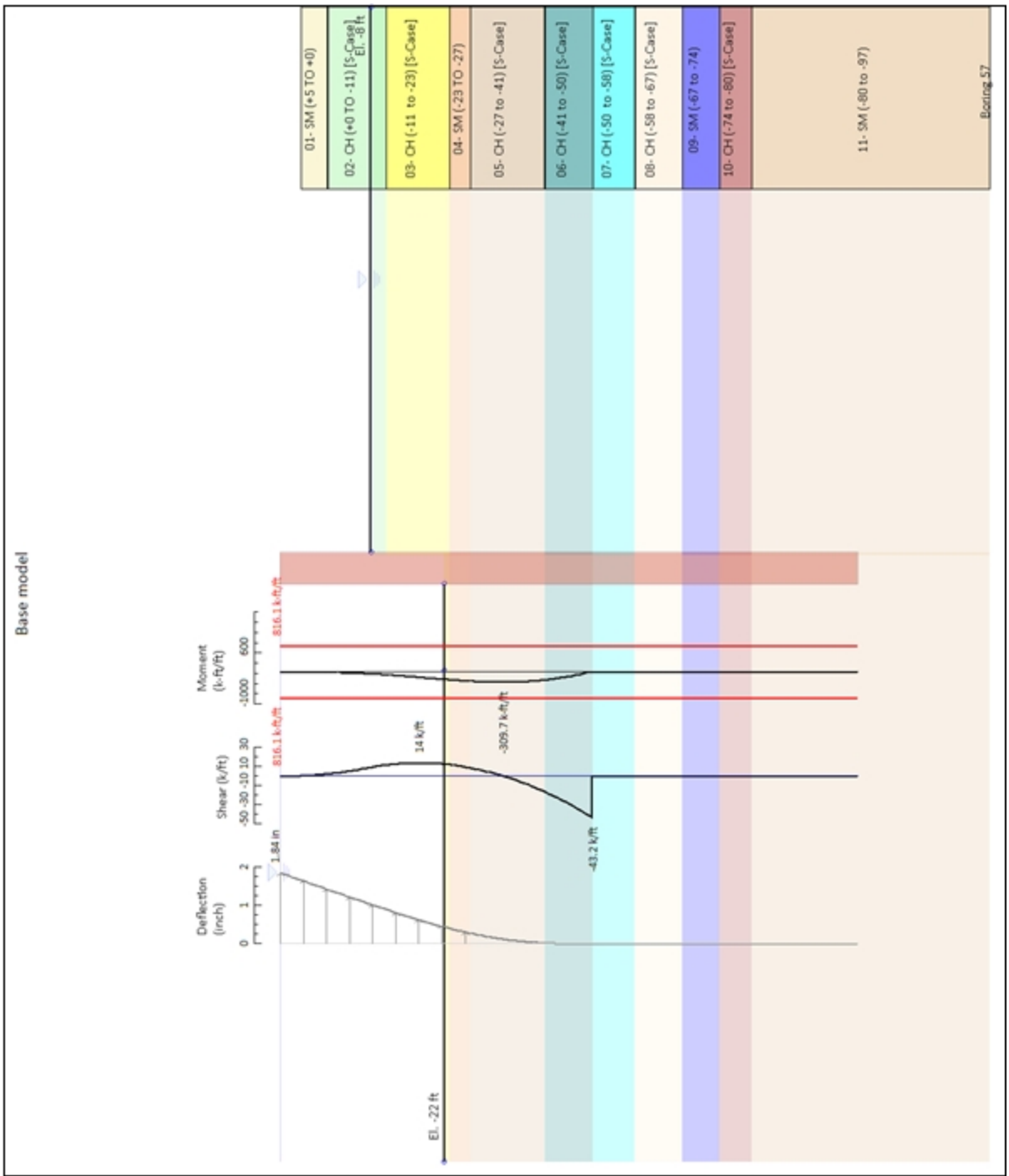
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported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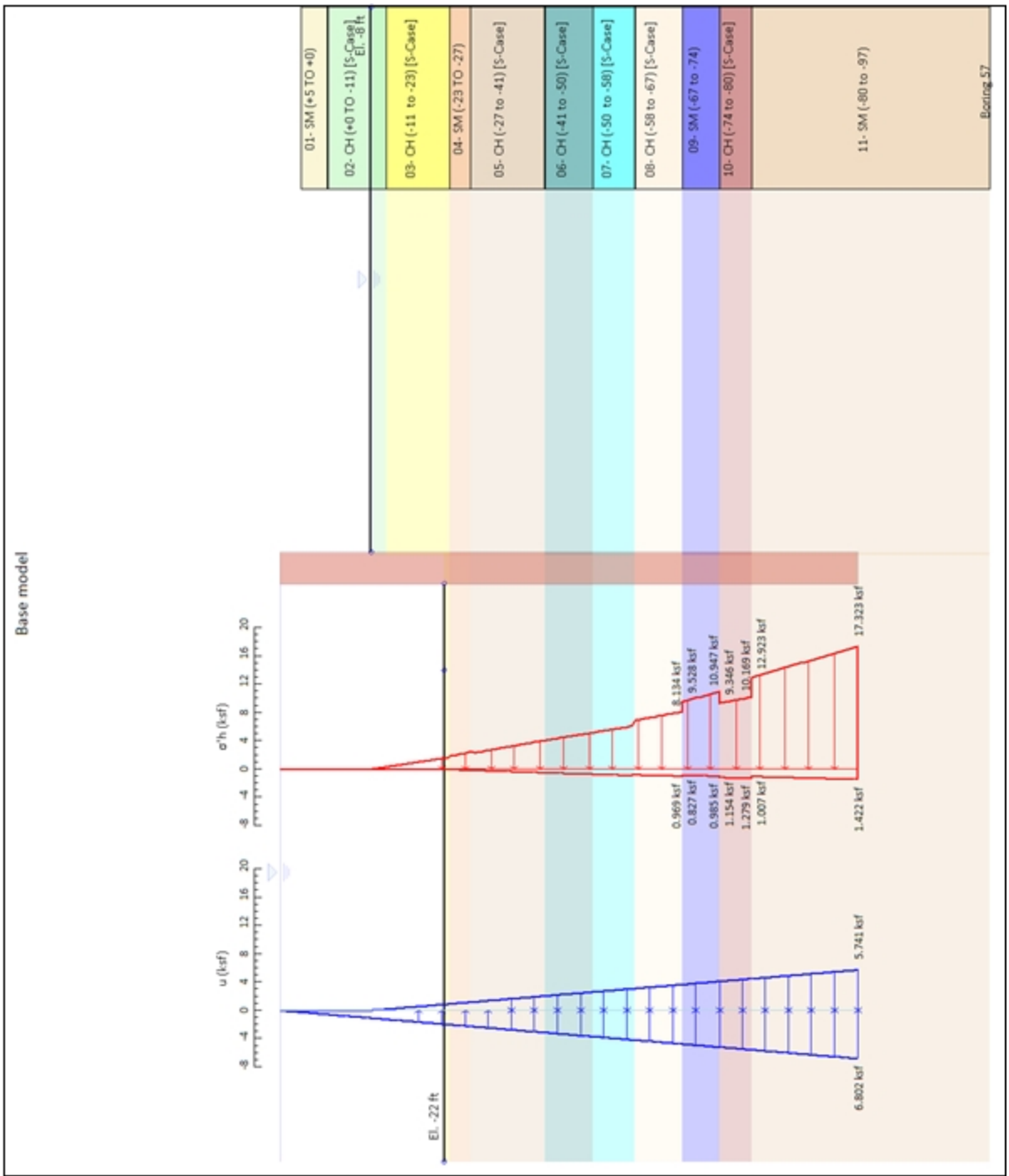
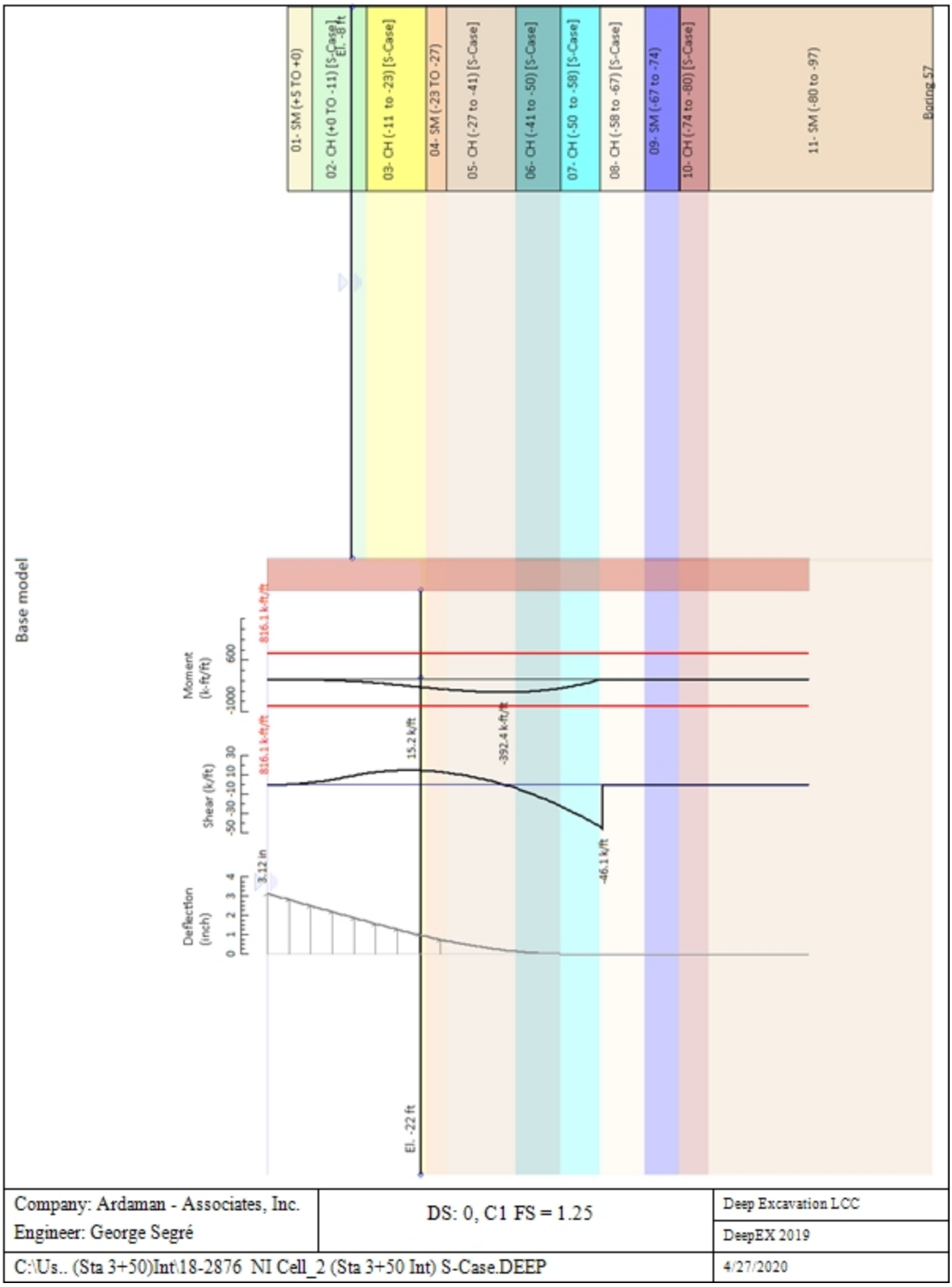
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case] El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
-309.7 k-ft/ft
Shear (k/ft)
30
10
-10
-30
-50
14 k/ft
-43.2 k/ft
Deflection (inch)
0
1
2
1.84 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP		4/27/2020


Base model
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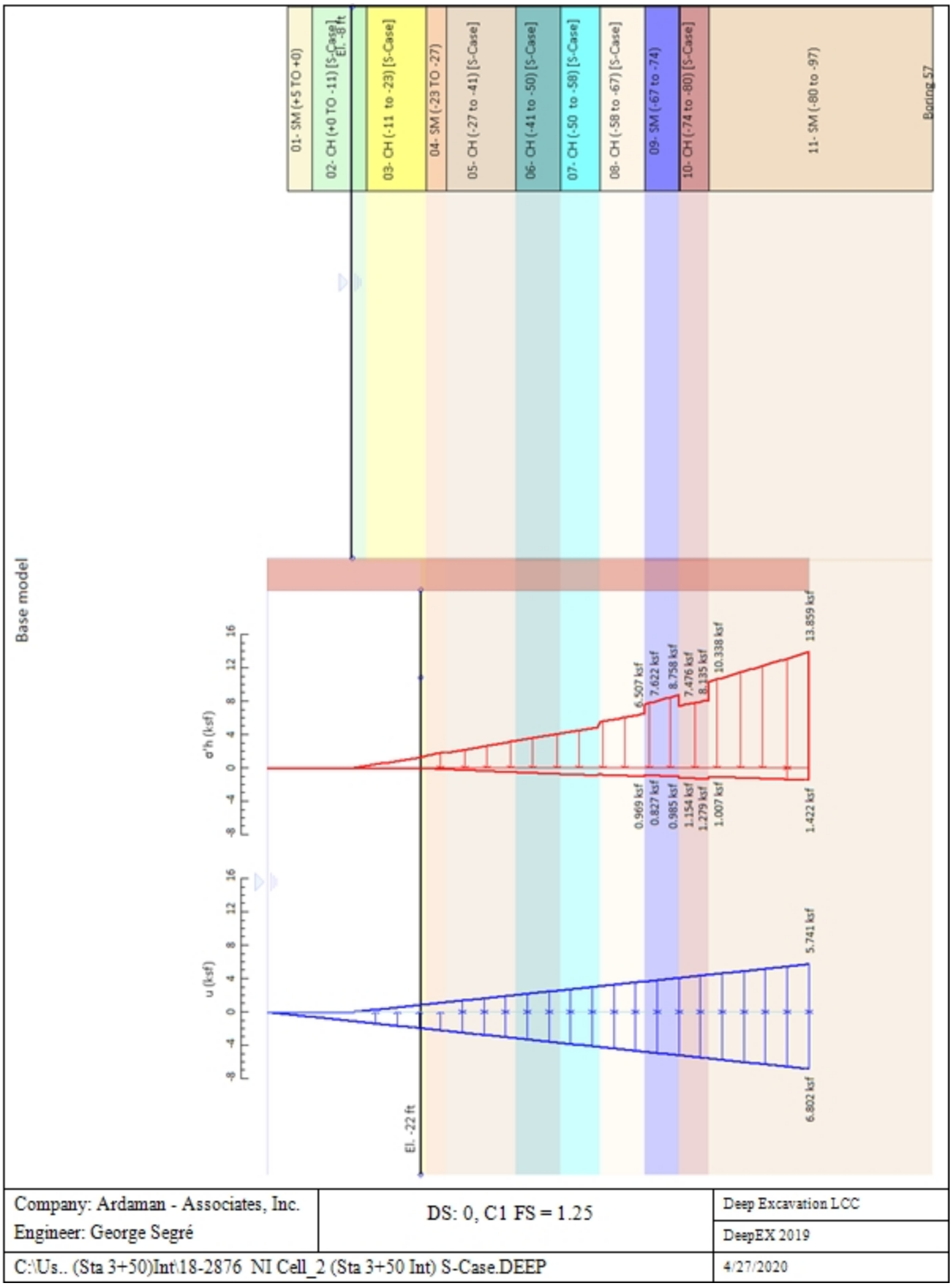
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
15.2 k/ft
-392.4 k-ft/ft
-46.1 k/ft
Deflection (inch)
0 1 2 3 4
3.12 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
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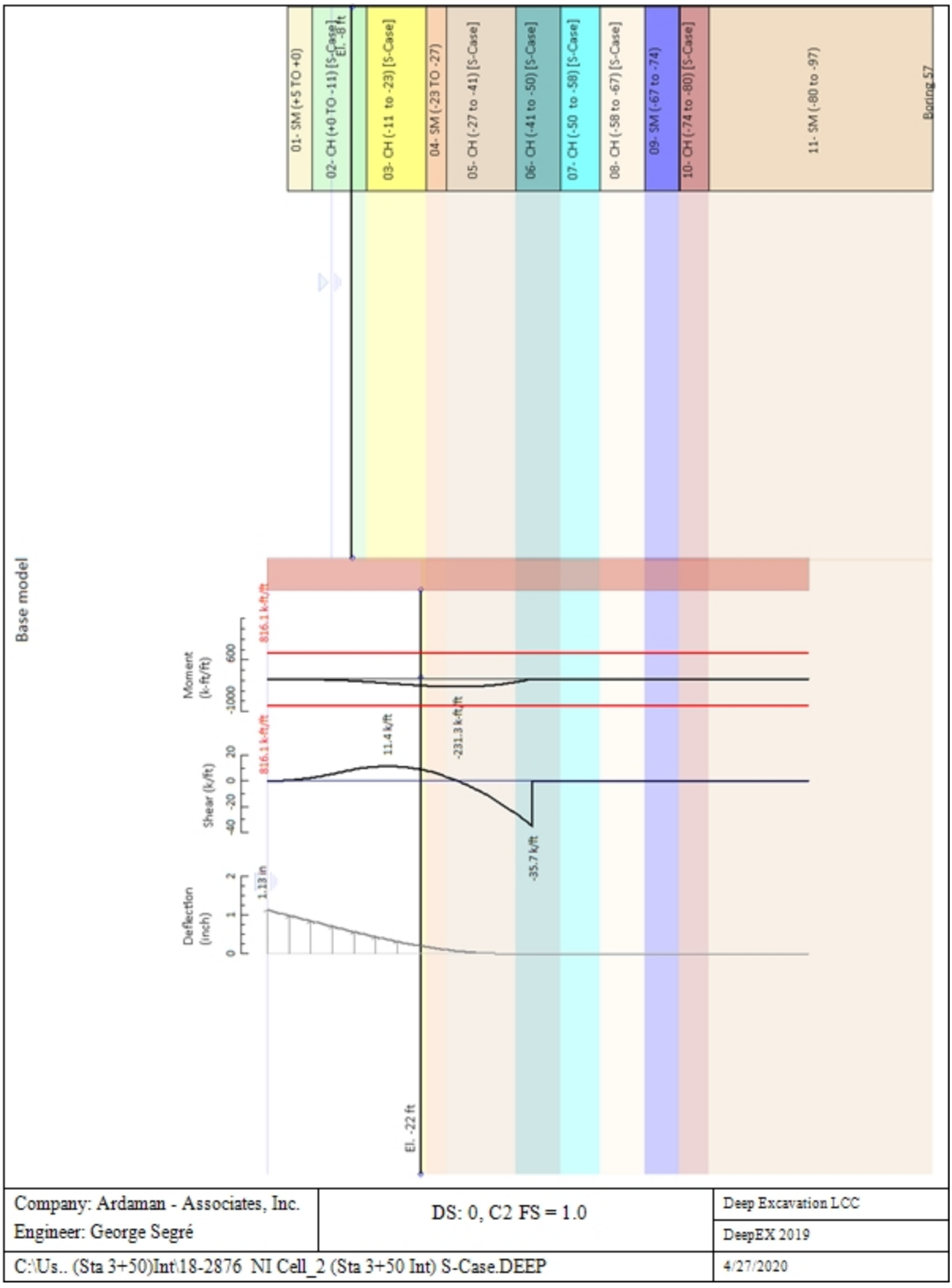
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
6.507 ksf
7.622 ksf
8.758 ksf
7.476 ksf
8.135 ksf
10.338 ksf
13.859 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.741 ksf
6.802 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
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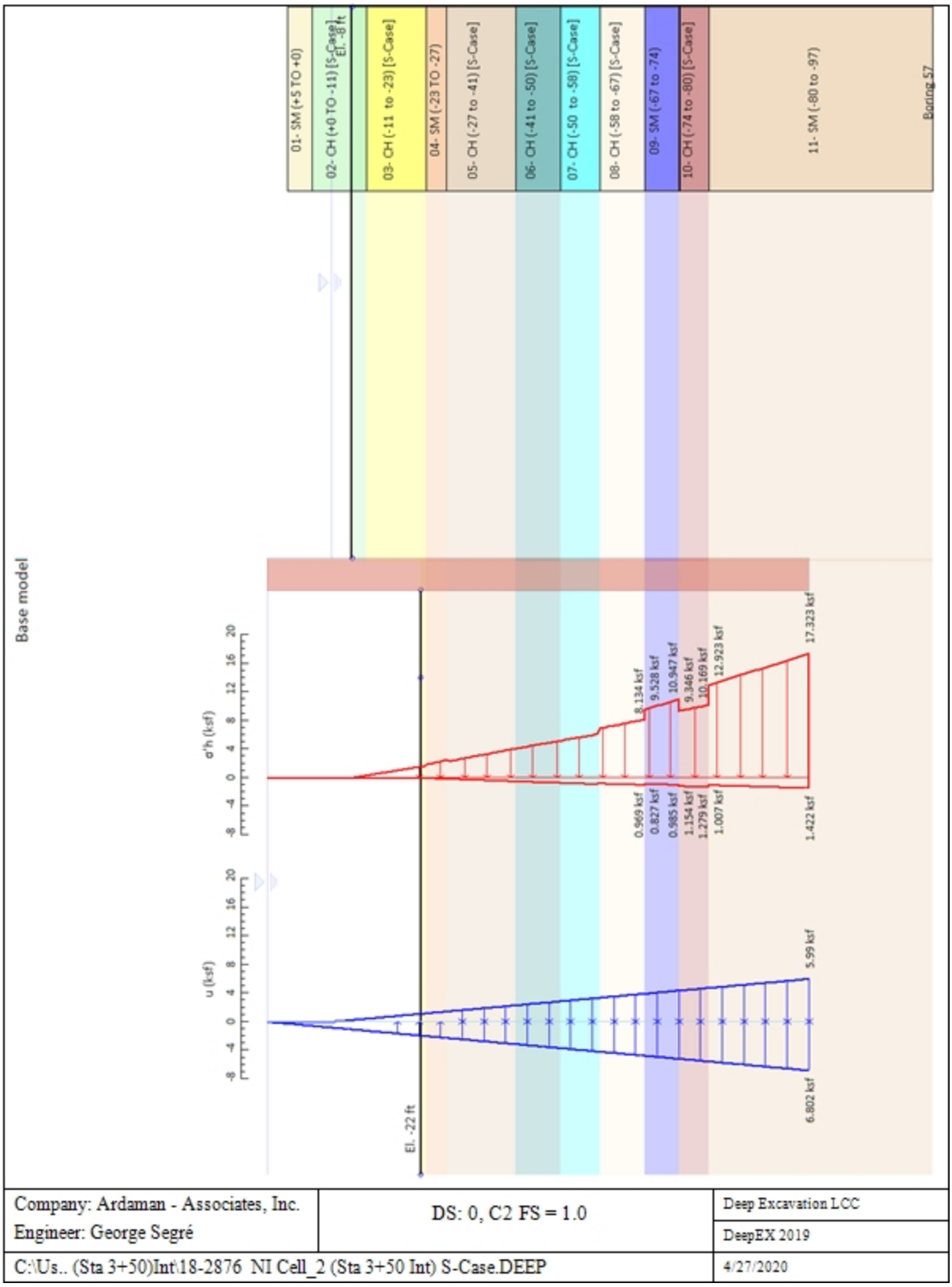
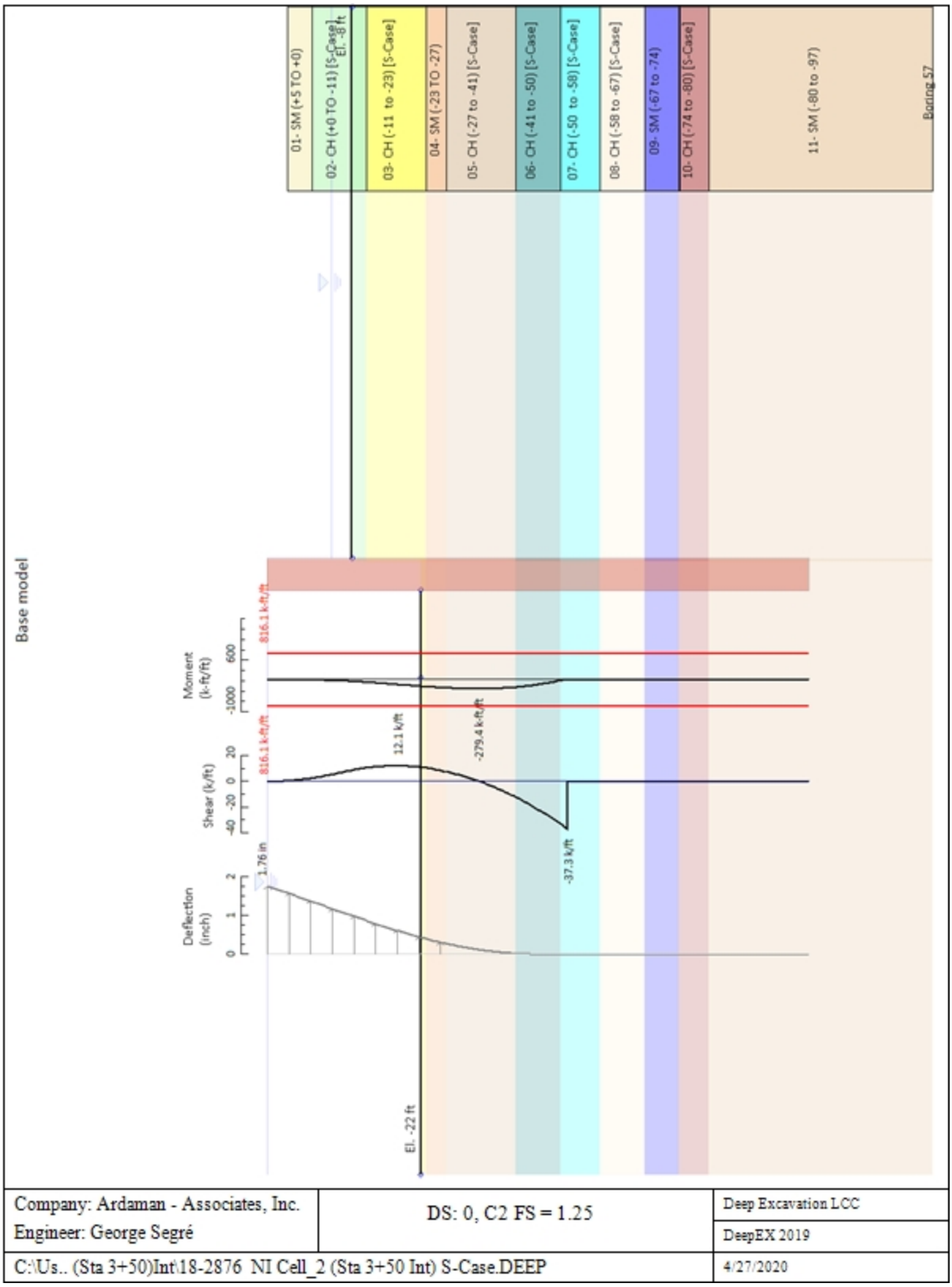
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-231.3 k-ft/ft
Shear (k/ft)
11.4 k/ft
-35.7 k/ft
Deflection (inch)
1.13 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.802 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
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02- CH (+0 TO -11) [S-Case]
El. -8 ft
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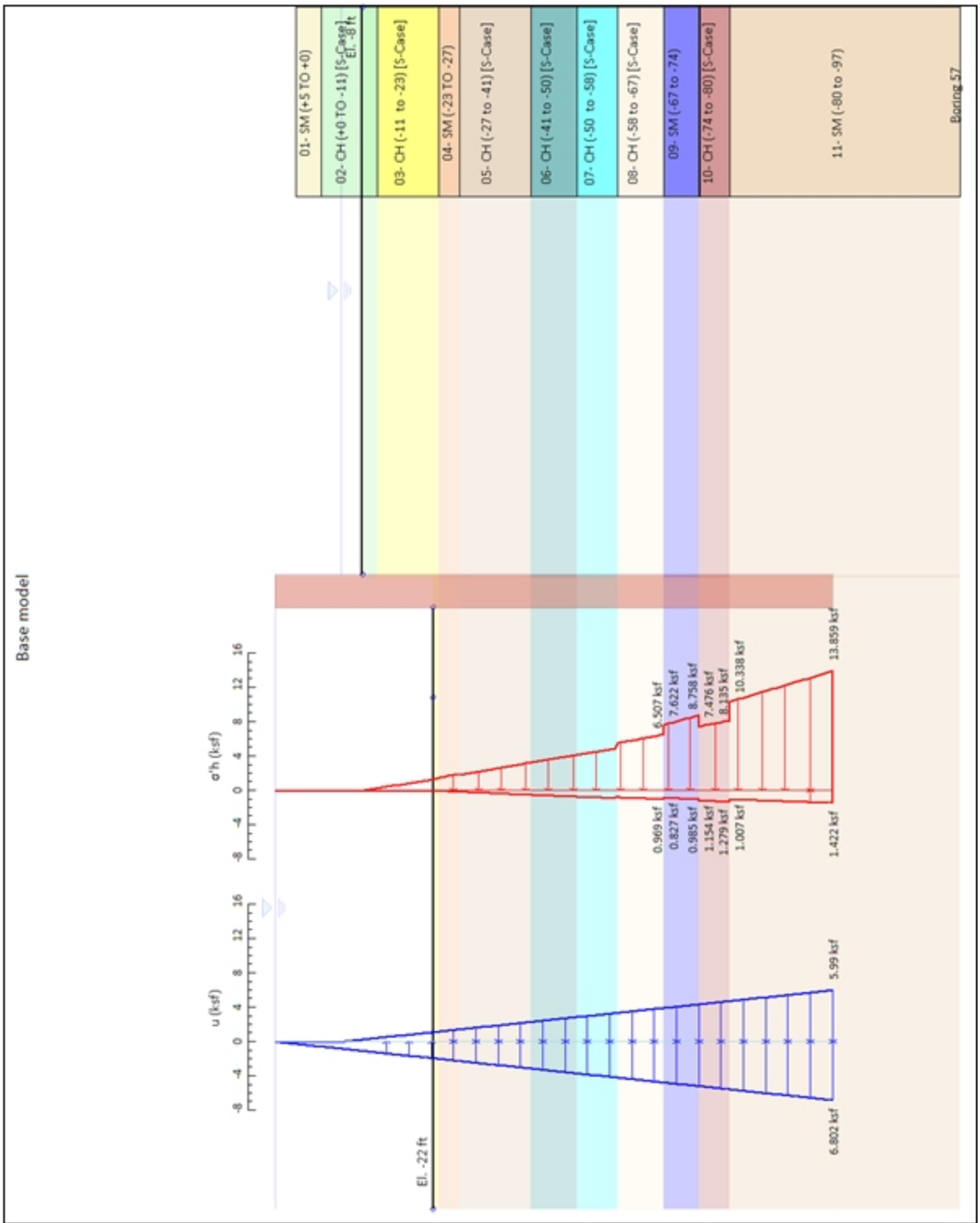
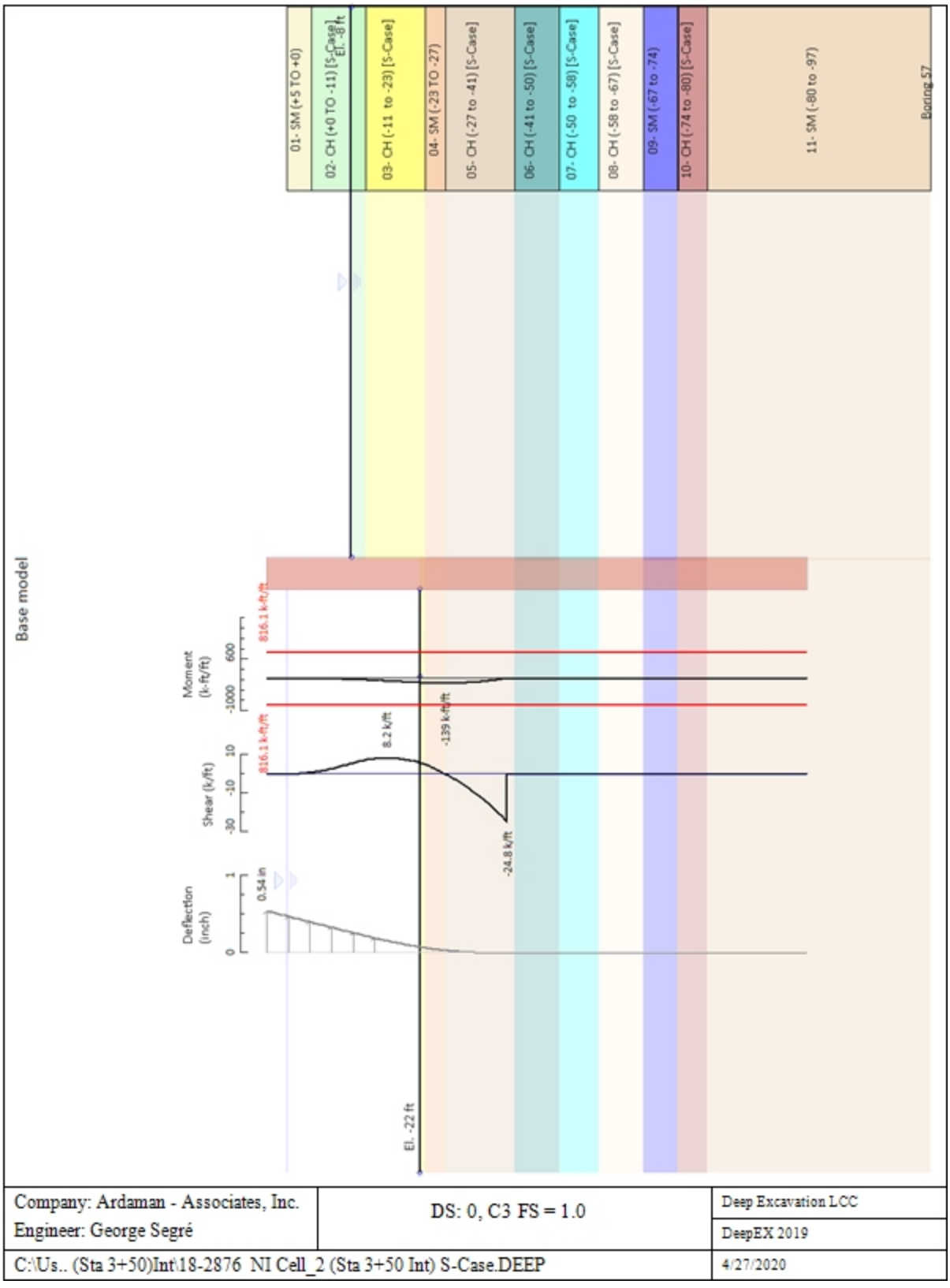
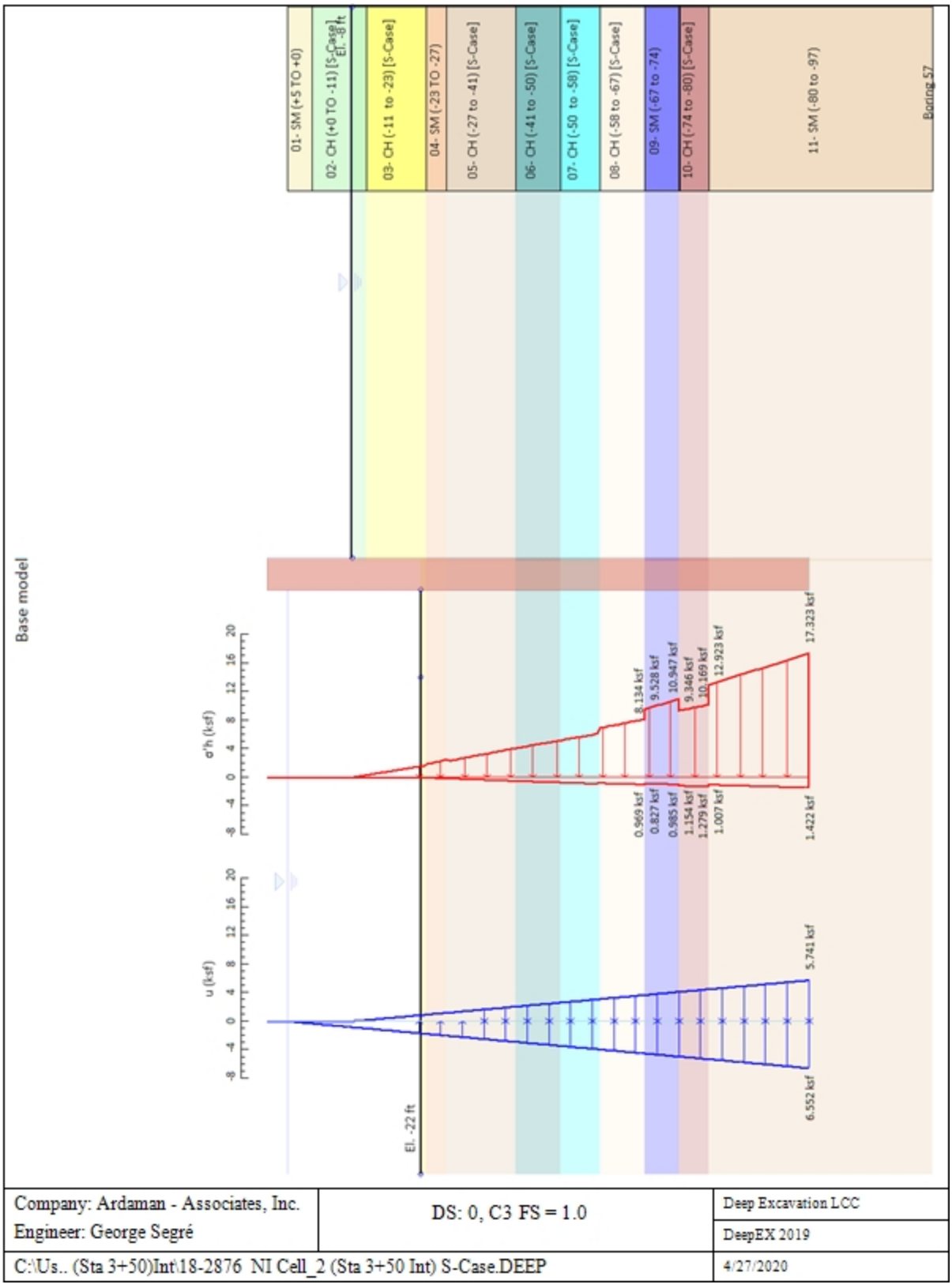
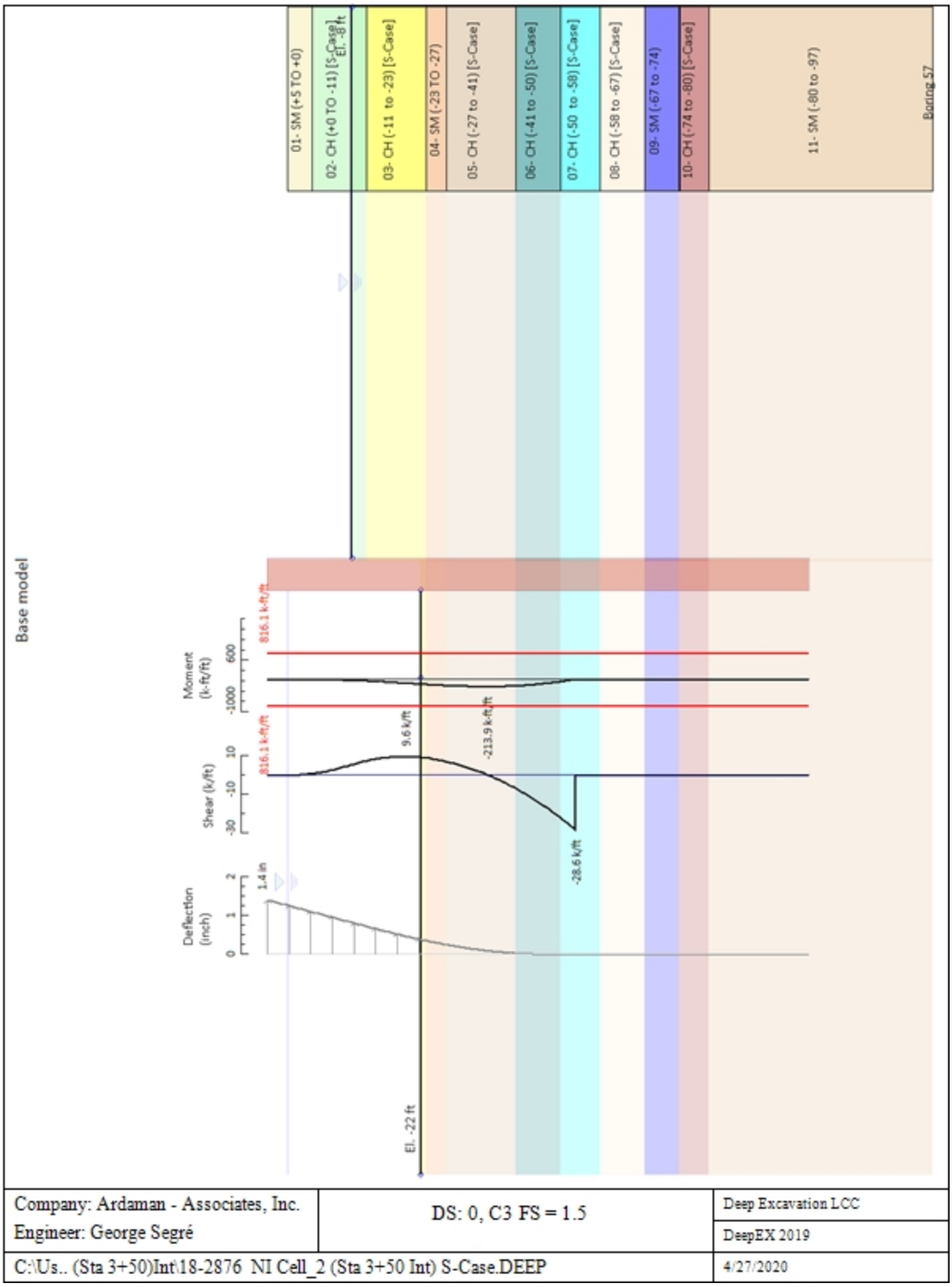
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-279.4 k-ft/ft
Shear (k/ft)
12.1 k/ft
-37.3 k/ft
Deflection (inch)
1.76 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

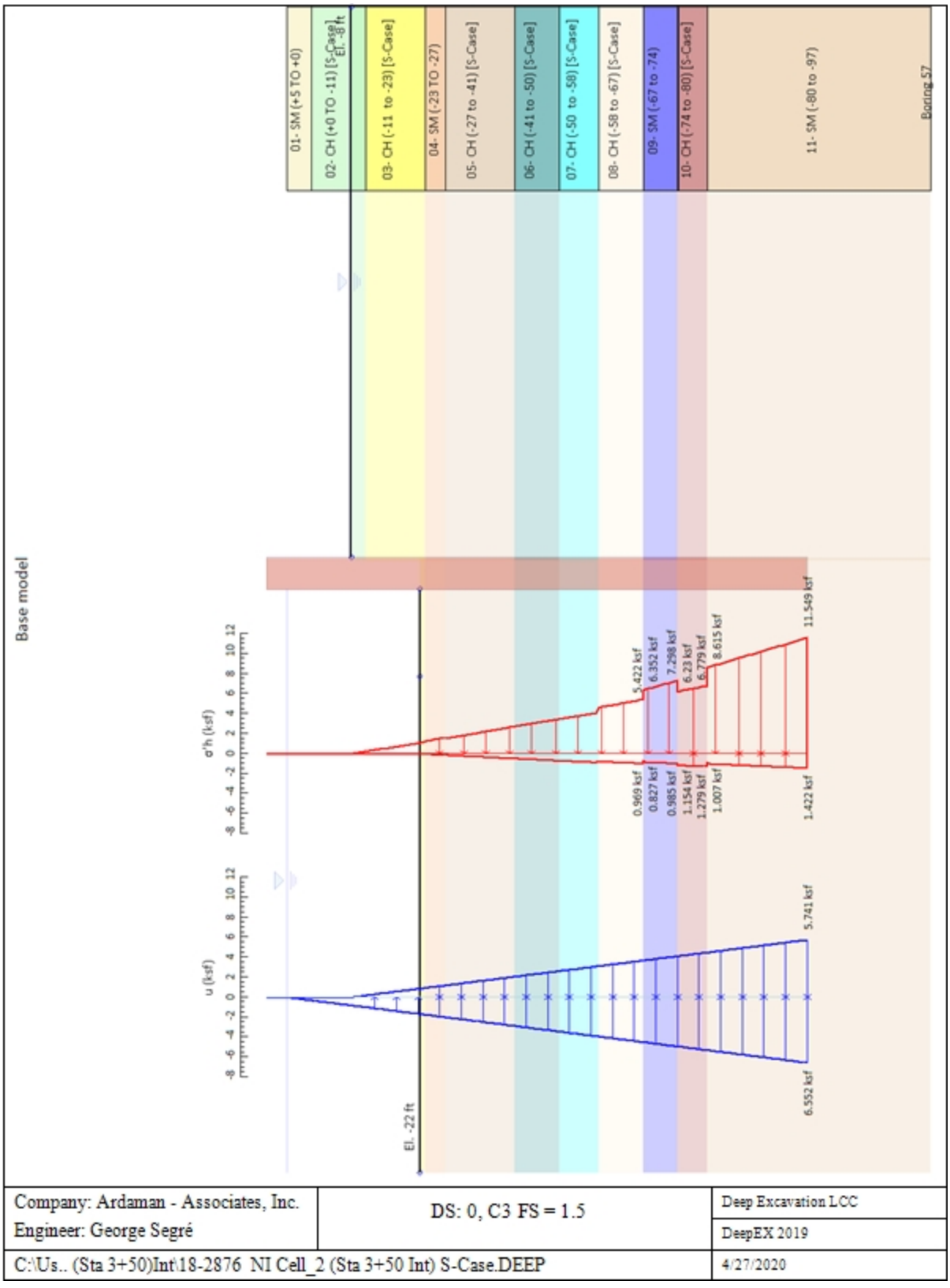


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP		4/27/2020

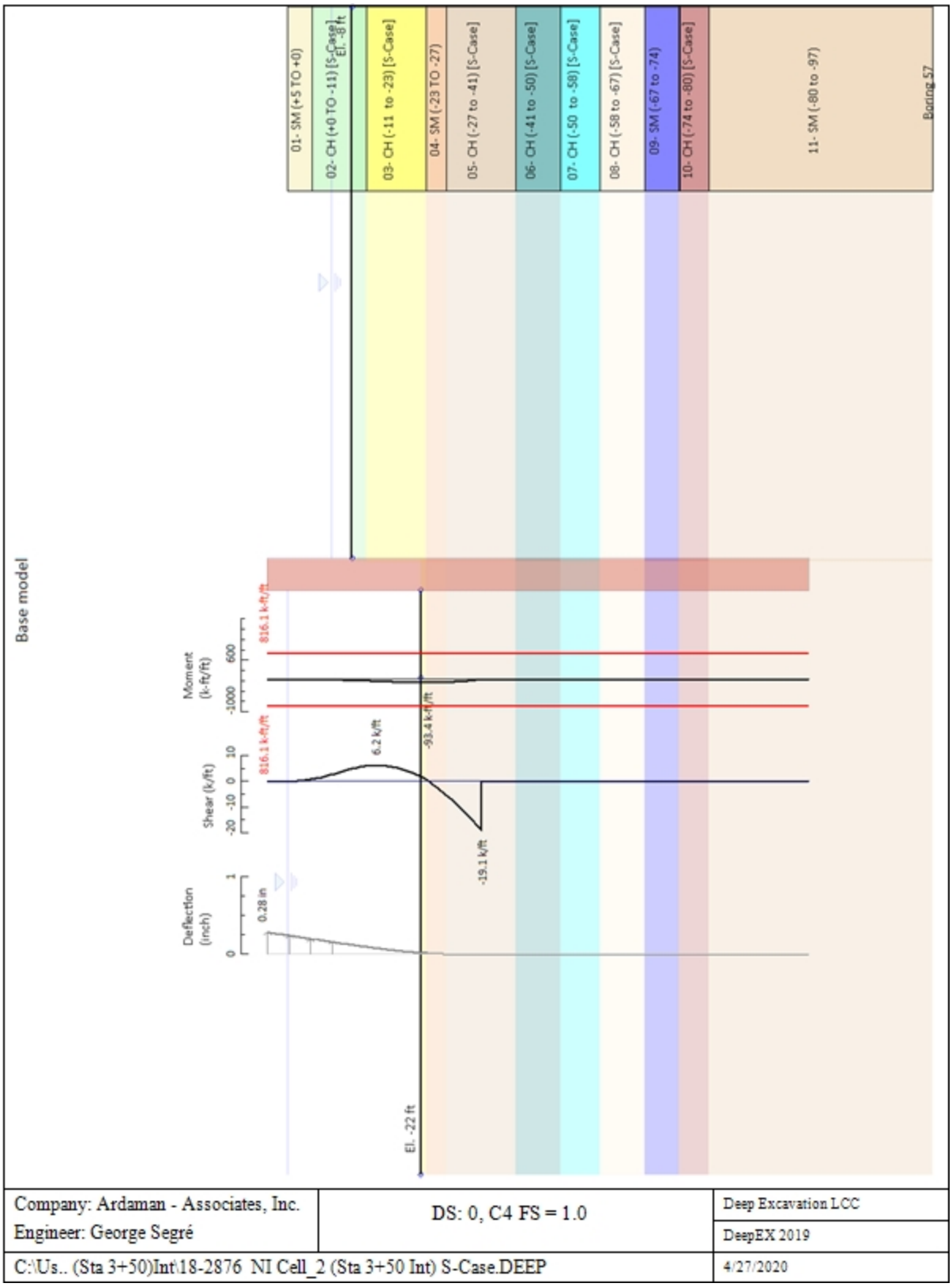

Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
El. -8 ft
El. -22 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
-139 k-ft/ft
Shear (k/ft)
10
-10
-30
8.2 k/ft
-24.8 k/ft
Deflection (inch)
1
0
0.54 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.741 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-213.9 k-ft/ft
Shear (k/ft)
9.6 k/ft
-28.6 k/ft
Deflection (inch)
1.4 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP		4/27/2020


Base model
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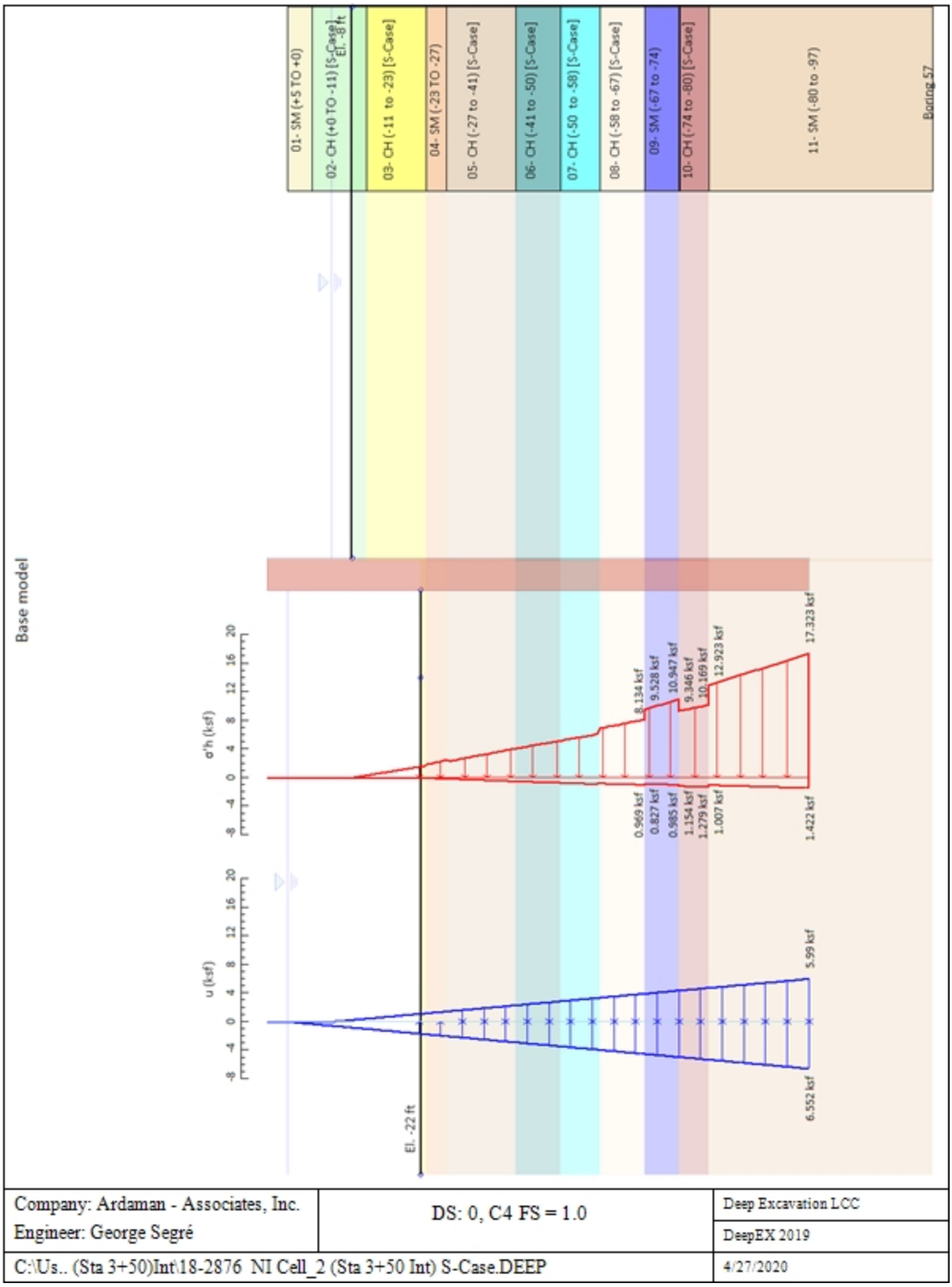
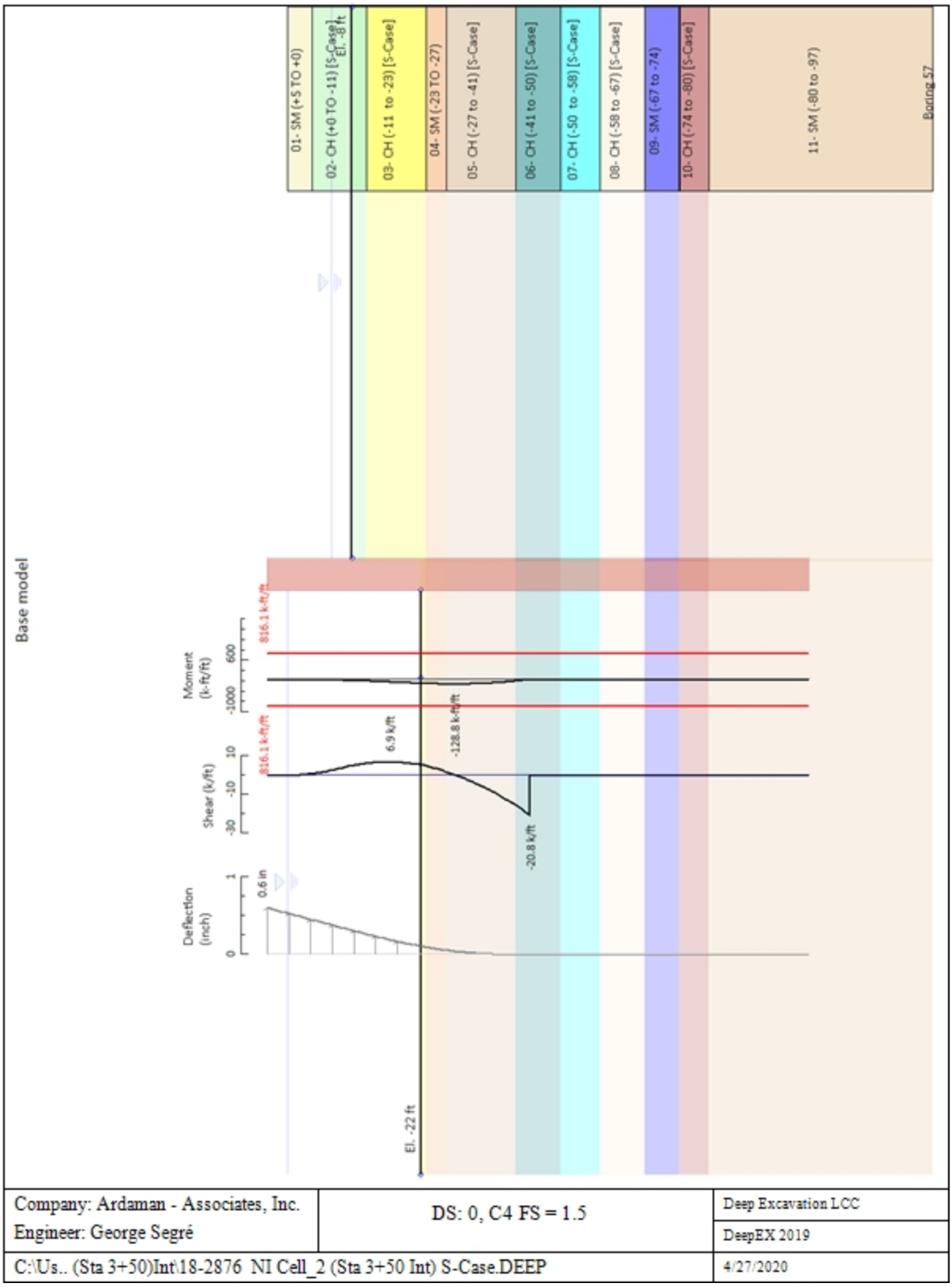
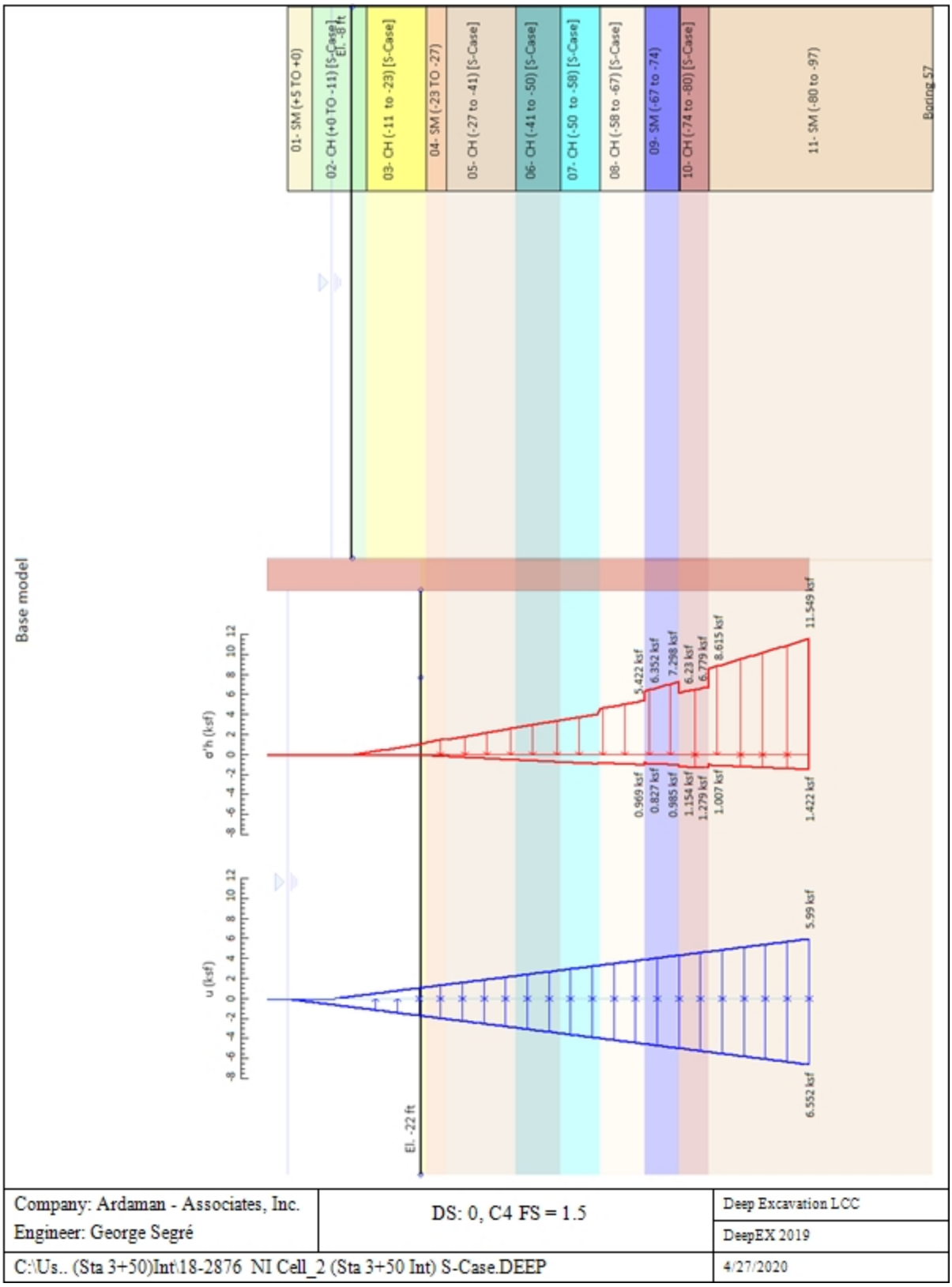
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
816.1 k-ft/ft
-93.4 k-ft/ft
Shear (k/ft)
6.2 k/ft
-19.1 k/ft
Deflection (inch)
0.28 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
8.134 ksf
9.528 ksf
10.947 ksf
9.346 ksf
10.169 ksf
12.923 ksf
17.323 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
-128.8 k-ft/ft
Shear (k/ft)
-30
-10
10
816.1 k-ft/ft
6.9 k/ft
-20.8 k/ft
Deflection (inch)
0
1
0.6 in
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020


Base model
01- SM (+5 TO +0)
02- CH (+0 TO -11) [S-Case]
El. -8 ft
03- CH (-11 to -23) [S-Case]
04- SM (-23 TO -27)
05- CH (-27 to -41) [S-Case]
06- CH (-41 to -50) [S-Case]
07- CH (-50 to -58) [S-Case]
08- CH (-58 to -67) [S-Case]
09- SM (-67 to -74)
10- CH (-74 to -80) [S-Case]
11- SM (-80 to -97)
Boring 57
σ'h (ksf)
u (ksf)
5.422 ksf
6.352 ksf
7.298 ksf
6.23 ksf
6.779 ksf
8.615 ksf
11.549 ksf
0.969 ksf
0.827 ksf
0.985 ksf
1.154 ksf
1.279 ksf
1.007 ksf
1.422 ksf
5.99 ksf
6.552 ksf
El. -22 ft
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us.. (Sta 3+50)Int\18-2876 NI Cell_2 (Sta 3+50 Int) S-Case.DEEP
4/27/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 4+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -94.84 ft., NAVD88

Length of Sheetting = 103.84 ft.

Use = 105.0 ft.

Design Tip Elev. = -96.0 ft., NAVD88

Design Length of Sheeting = 105.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-50.25	436.33	86.88	2.63
		Open excavation - degraded	9	-8	1.00	1.25	-54.20	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-47.48	339.67	68.63	1.78
		Open excavation - degraded	9	-4	1.00	1.25	-51.44	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-44.72	240.69	44.26	1.06
		Open excavation - degraded	5	-8	1.00	1.50	-51.83	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-40.38	167.17	30.45	0.59
		Open excavation - degraded	5	-4	1.00	1.50	-47.88	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-84.53	1,494.78	138.00	22.09
		Open excavation - degraded	9	-8	1.00	1.25	-94.84	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-78.72	1,154.66	115.96	15.06
		Open excavation - degraded	9	-4	1.00	1.25	-87.75	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-76.78	971.76	106.79	11.79
		Open excavation - degraded	5	-8	1.00	1.50	-94.20	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-70.33	690.68	84.55	7.23
		Open excavation - degraded	5	-4	1.00	1.50	-85.17	--	--	--
						Governing Value:	-94.84	1,494.78	138.00	22.09

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:11:52 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	0	0	500	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	0	0	350	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-26 T	124	124	0	0	1250	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-32 to	120	120	0	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	0	0	1730	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-45 t	125	125	0	0	3300	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- ML (-54 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	0	0	3500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
15- CH (-102 t	125	125	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	1	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.741	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

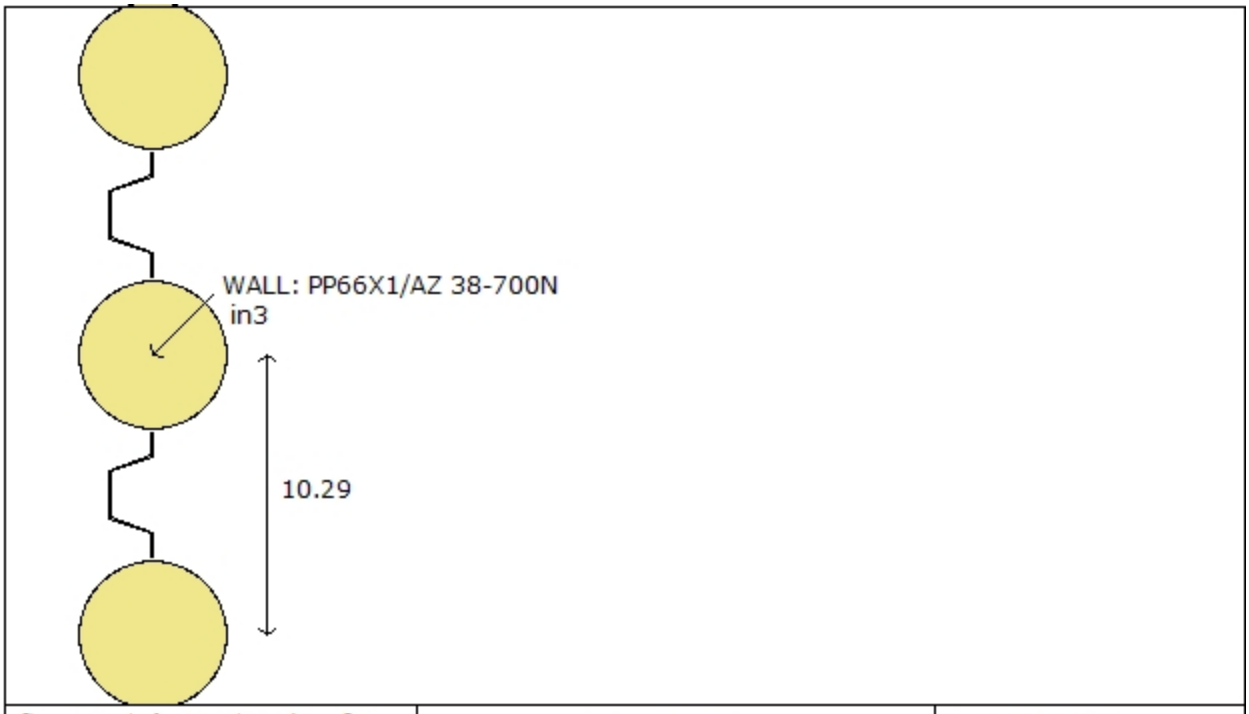
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	1
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	1
-26	04- CH (-26 TO	1	1
-32	05- CH (-32 to	1	1
-40	06- CH (-40 to	1	1
-45	07- CH (-45 to	1	1
-54	08- ML (-54 to	1	0.74
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.74
-68	11- SP (-68 to -	1	1
-71	12- ML (-71 to	1	0.74
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	1
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.66	1.66	2.455
Stage 1	Simple span	N/A	1.6	1.328	1.328	1.964
Stage 2	Simple span	N/A	1.6	1.741	1.741	2.615
Stage 3	Simple span	N/A	1.6	1.393	1.393	2.092
Stage 4	Simple span	N/A	1.6	2.066	2.066	2.891
Stage 5	Simple span	N/A	1.6	1.378	1.378	1.927
Stage 6	Simple span	N/A	1.6	2.172	2.172	3.1
Stage 7	Simple span	N/A	1.6	1.448	1.448	2.066

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

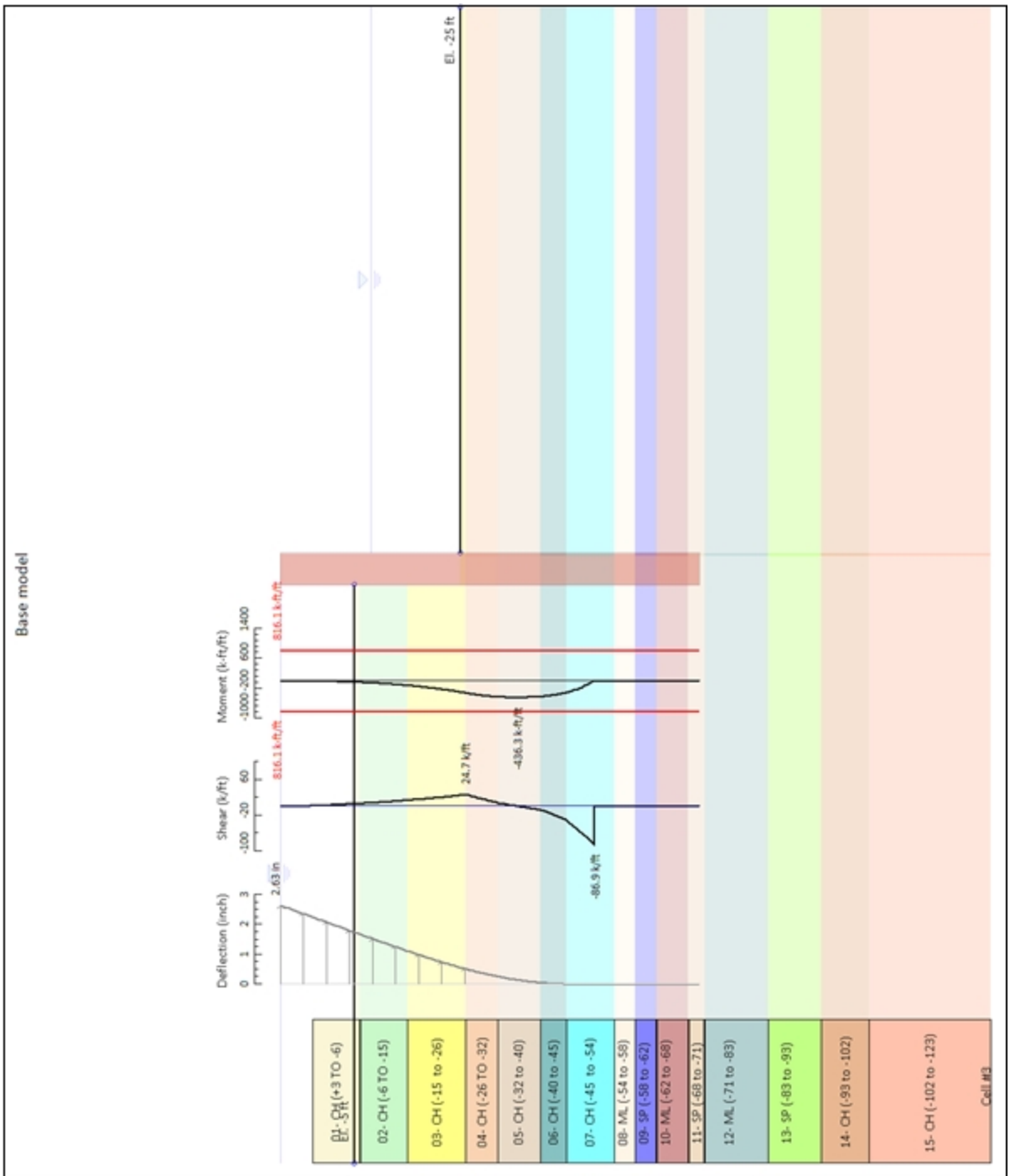
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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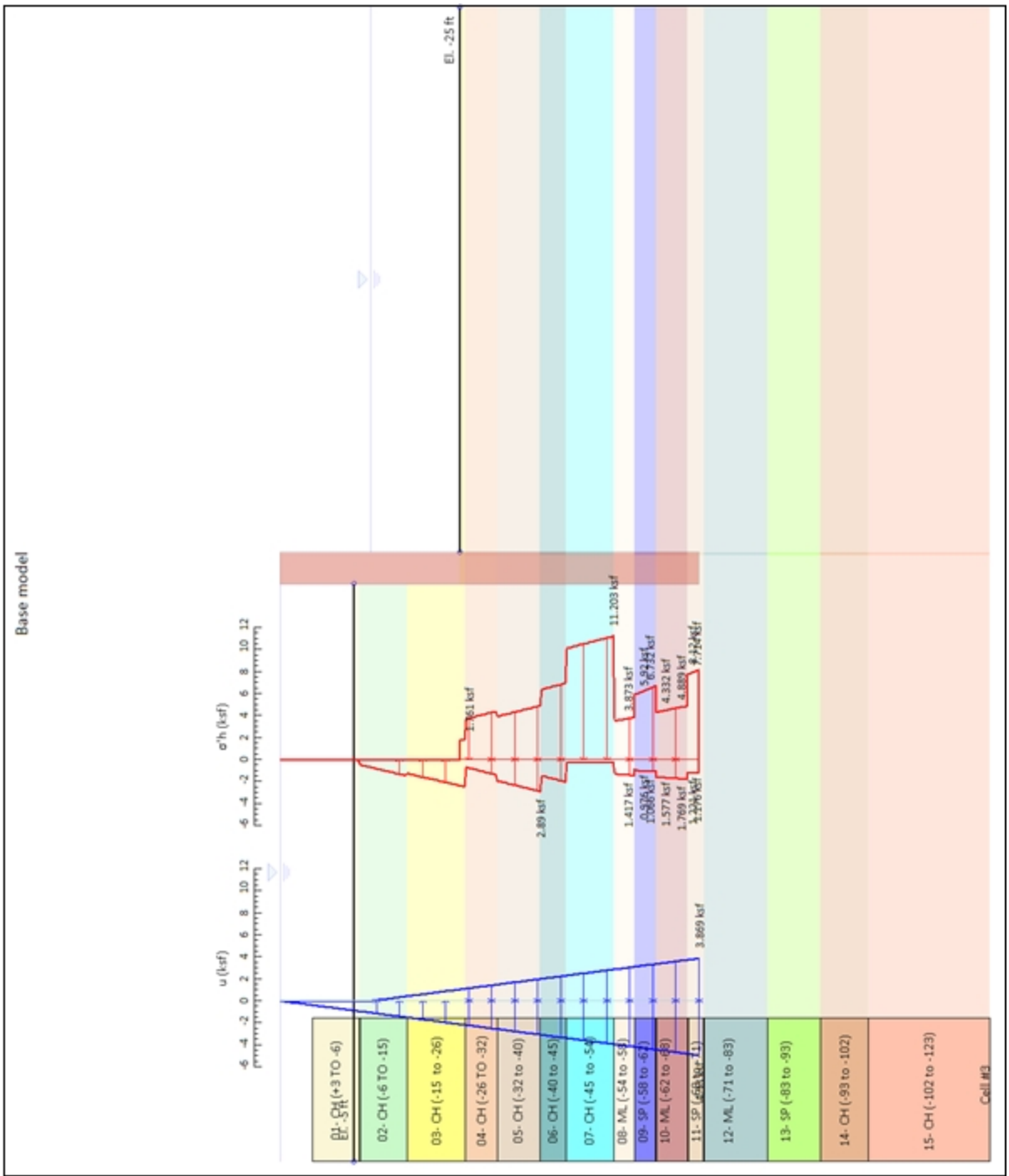
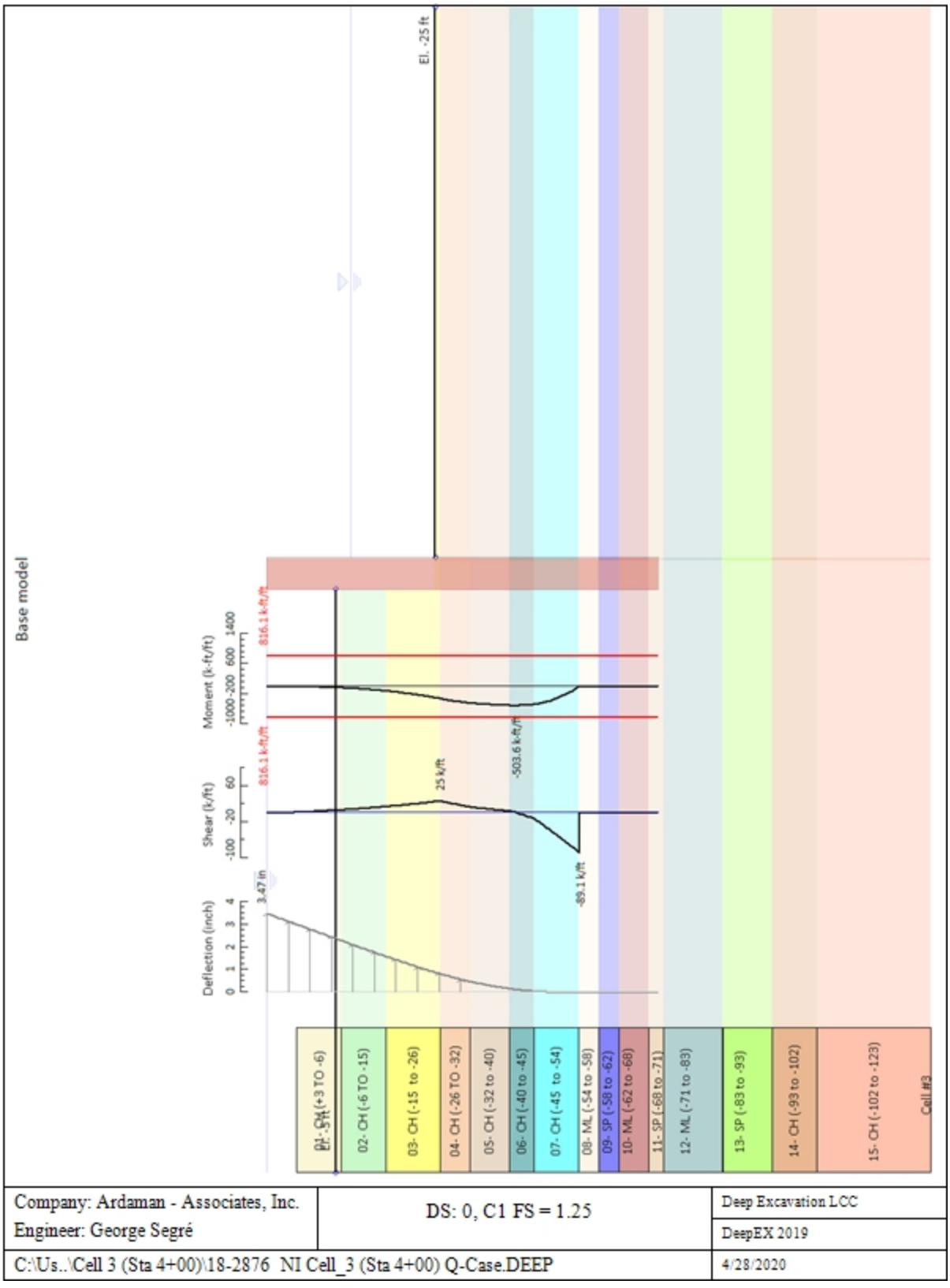
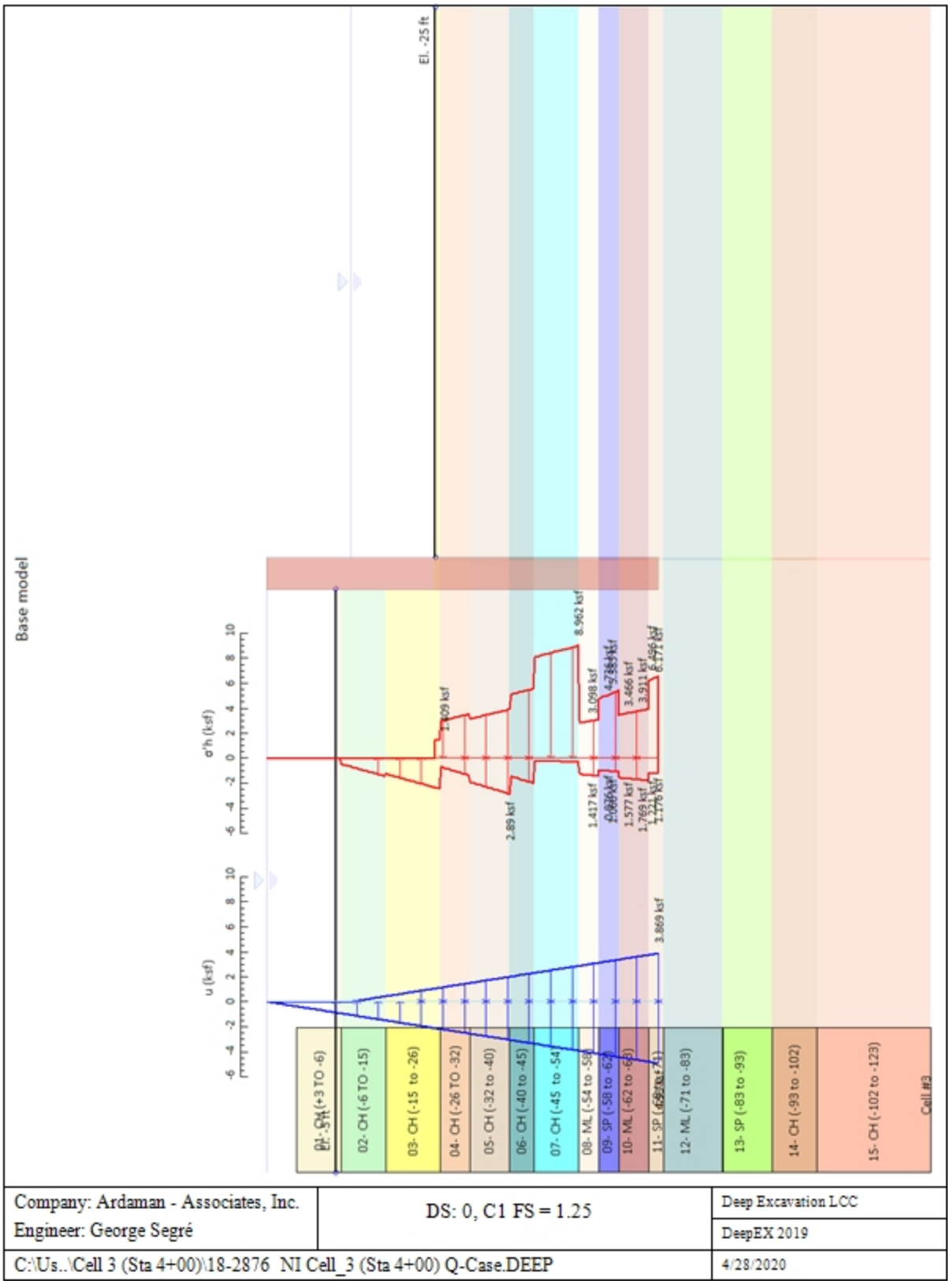
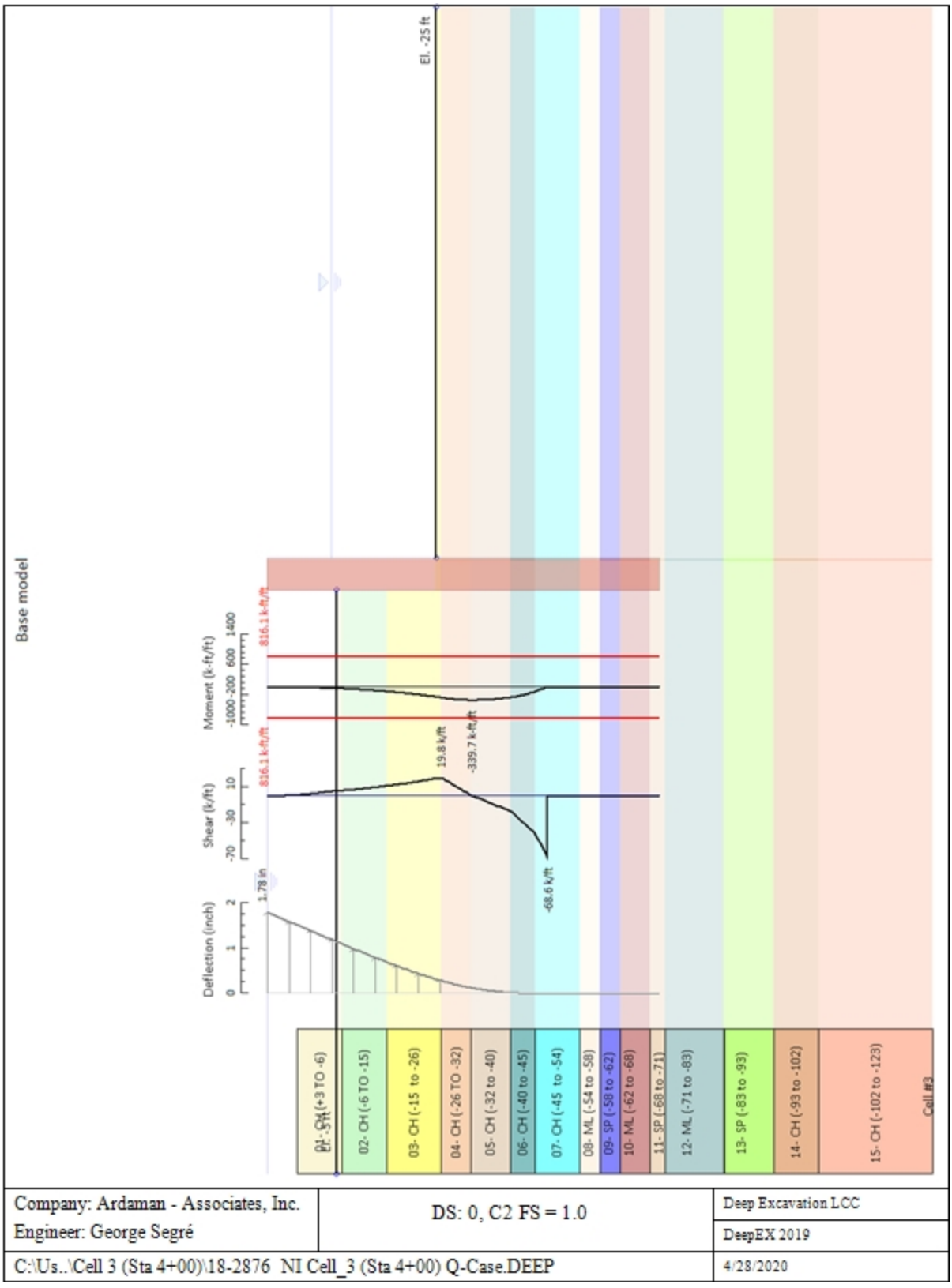


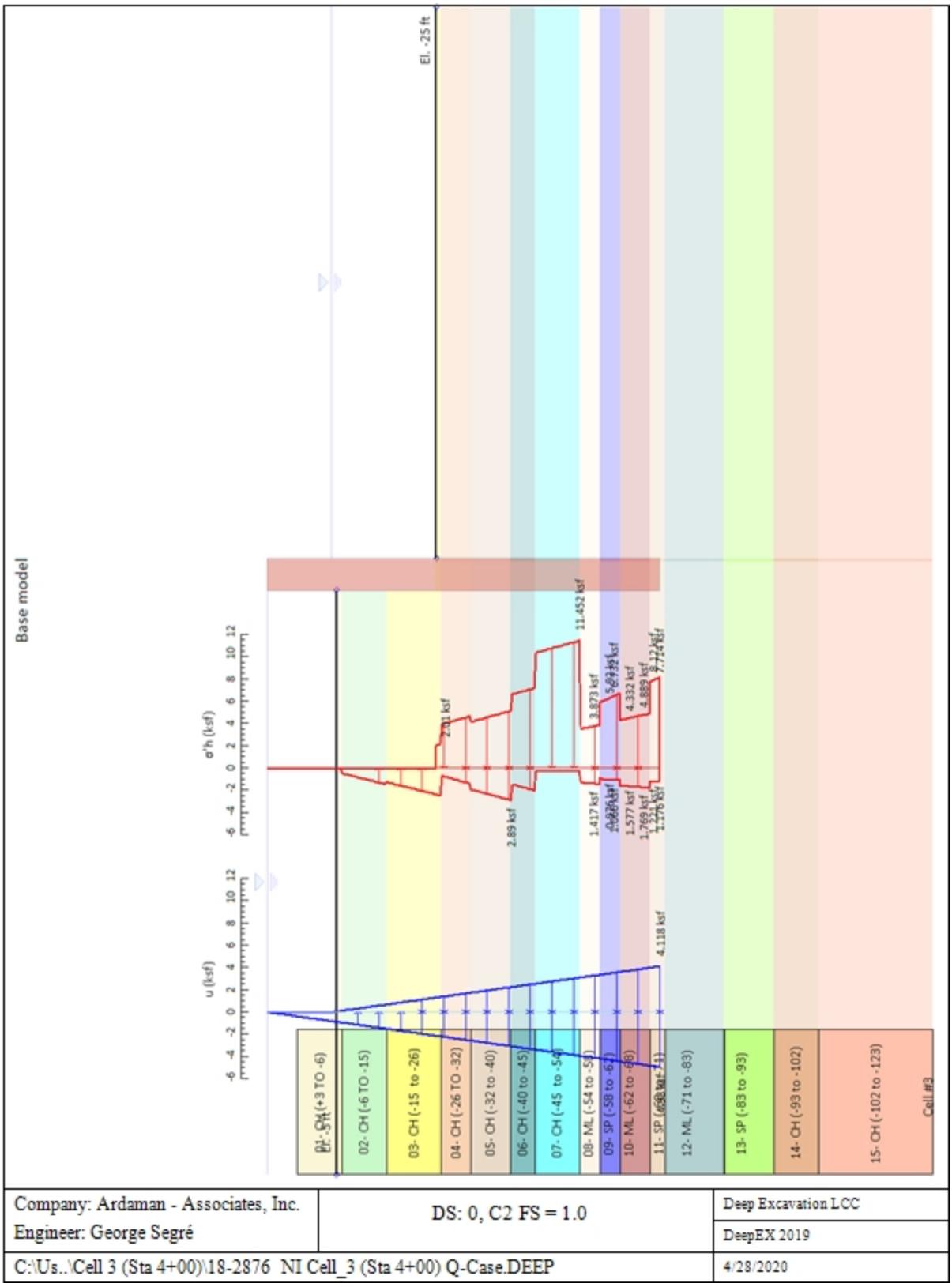
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020

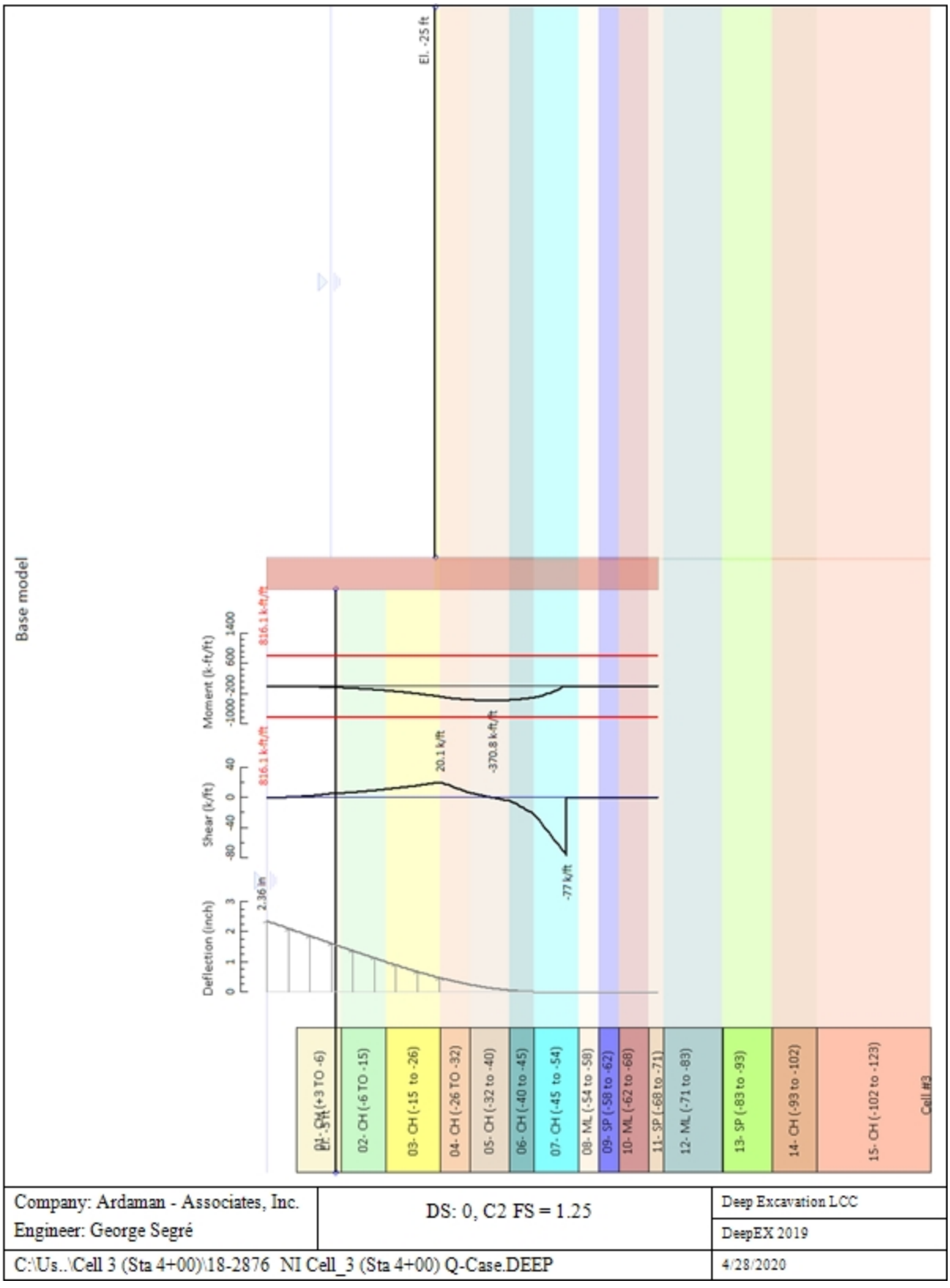

Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-503.6 k-ft/ft
Shear (k/ft)
-100 -20 60
25 k/ft
-89.1 k/ft
Deflection (inch)
0 1 2 3 4
3.47 in
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

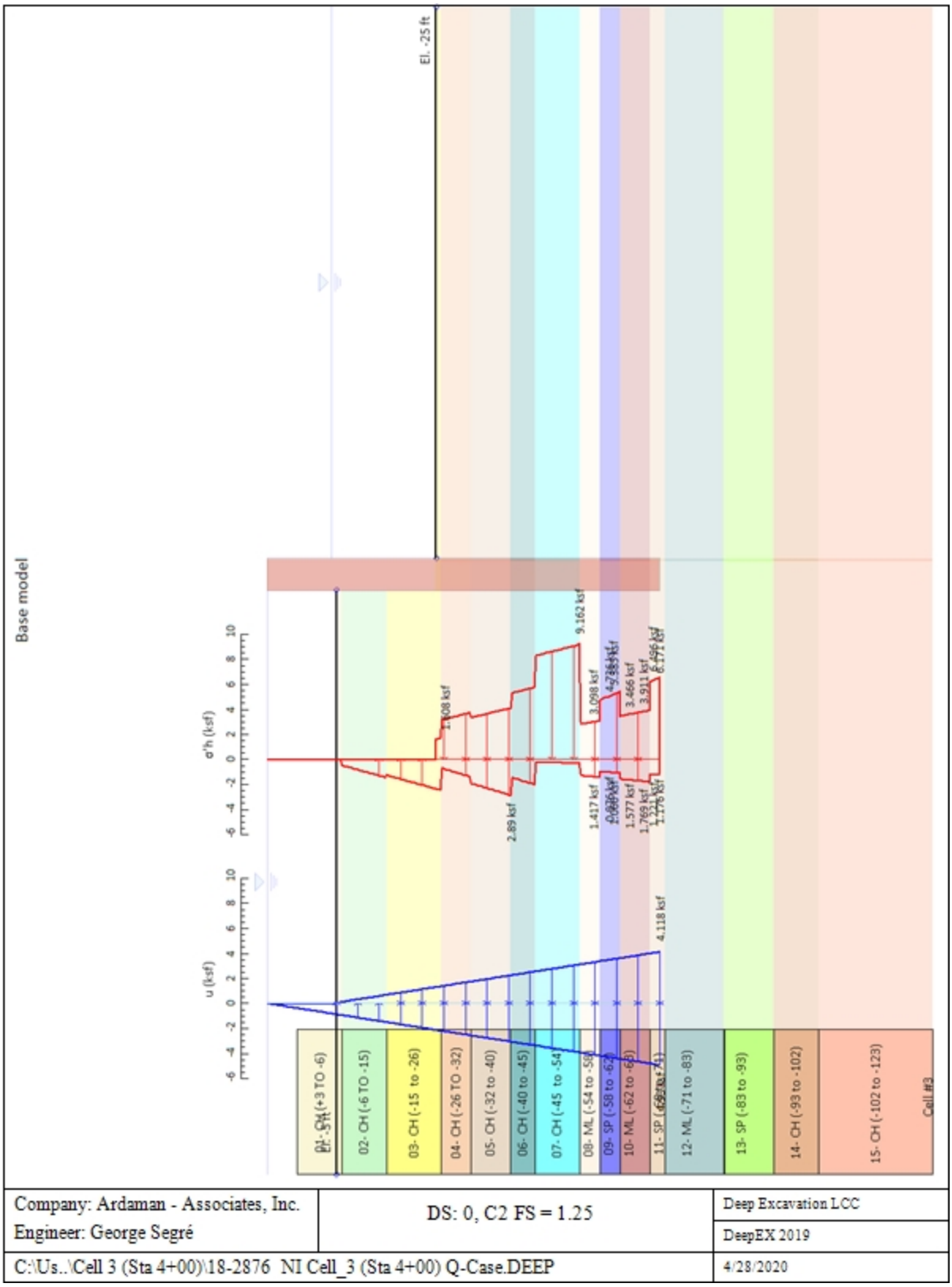

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
8.962 ksf
3.098 ksf
3.466 ksf
3.911 ksf
2.89 ksf
1.417 ksf
1.577 ksf
1.769 ksf
3.869 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

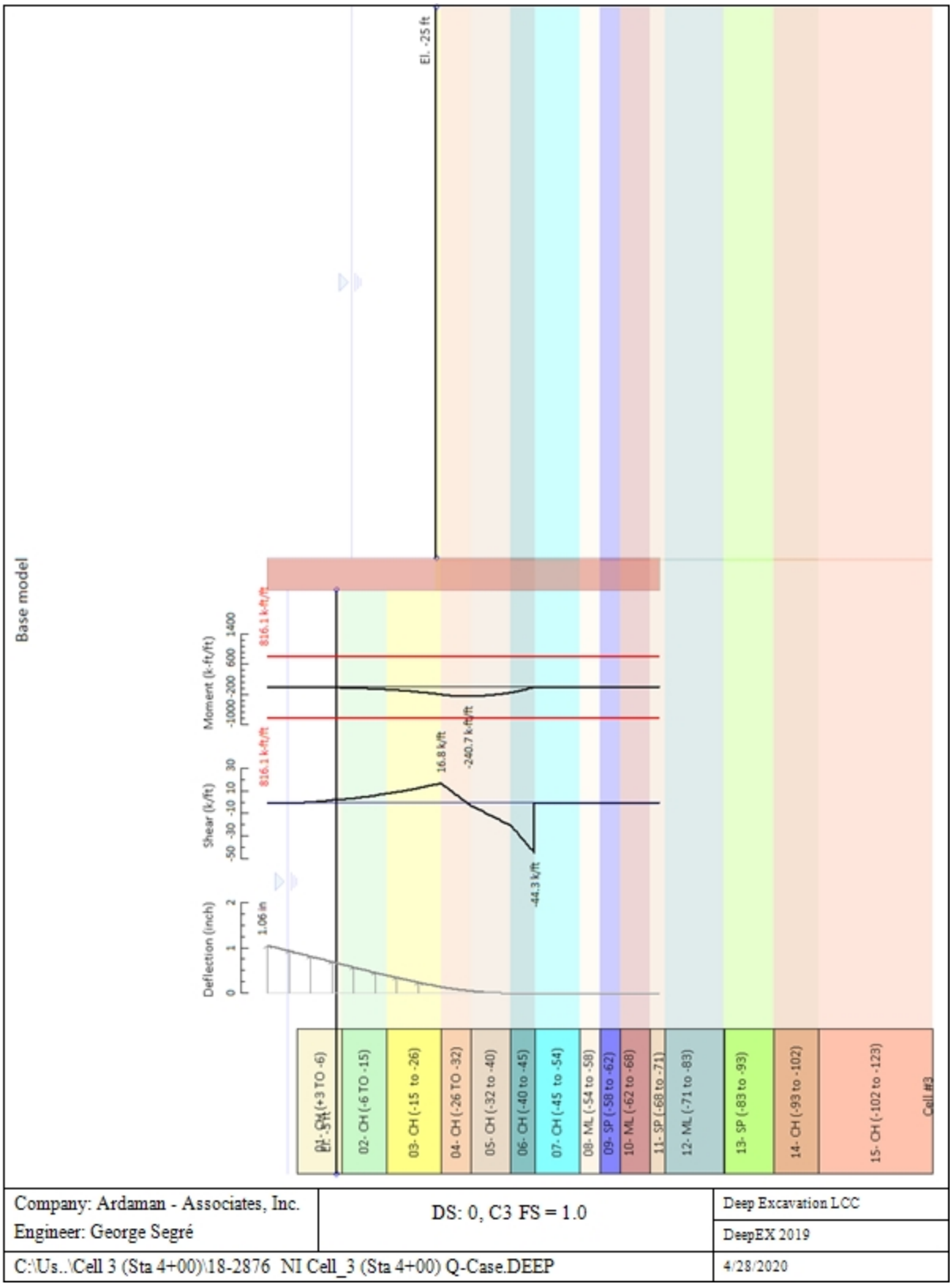


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020

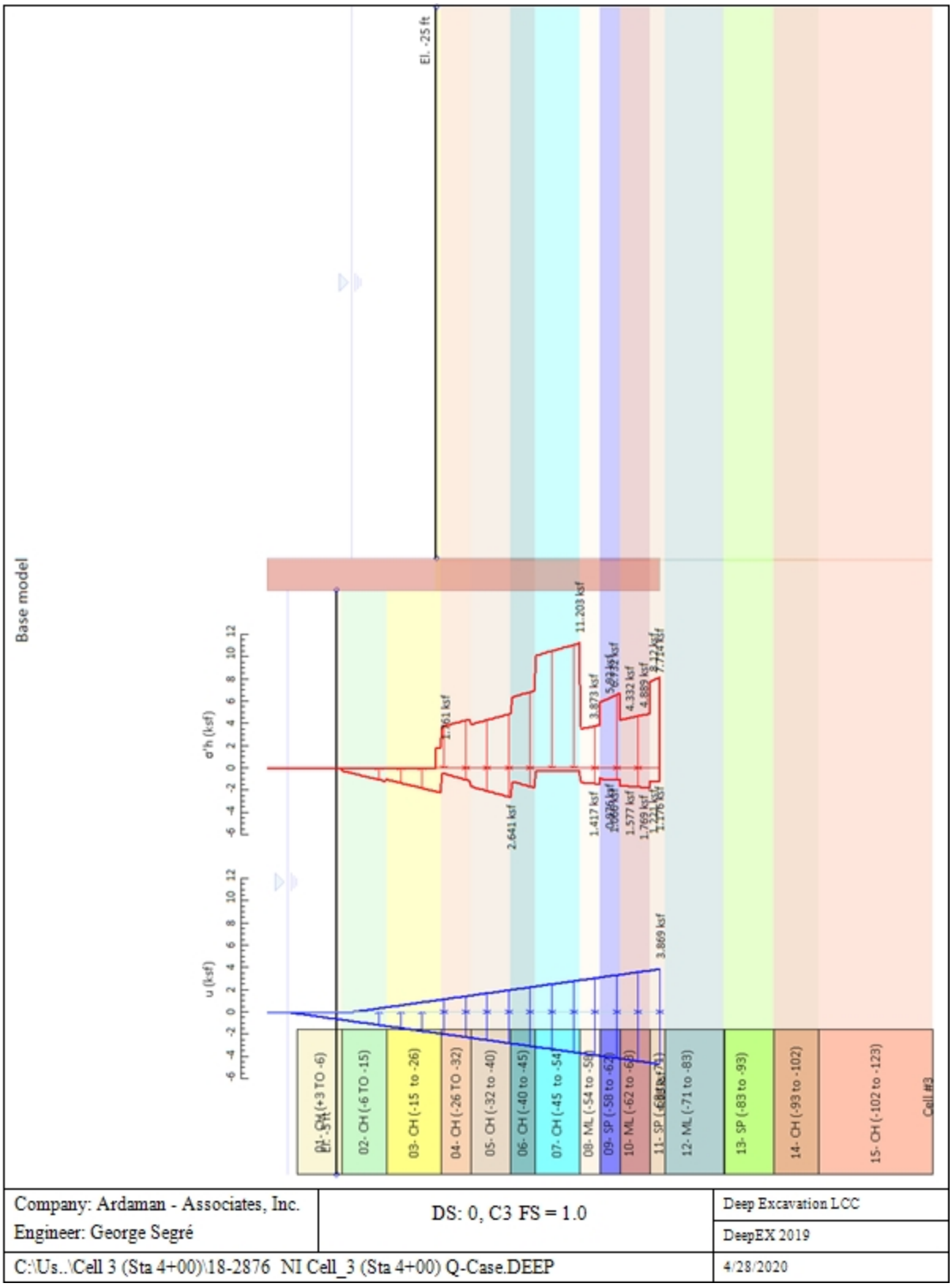

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
-6 -4 -2 0 2 4 6 8 10 12
2.89 ksf
2.01 ksf
11.452 ksf
3.873 ksf
4.332 ksf
4.889 ksf
1.417 ksf
1.577 ksf
1.769 ksf
4.118 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020


Base model
El. -25 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-370.8 k-ft/ft
Shear (k/ft)
-80 -40 0 40
816.1 k-ft/ft
20.1 k/ft
-77 k/ft
Deflection (inch)
0 1 2 3
2.36 in
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020

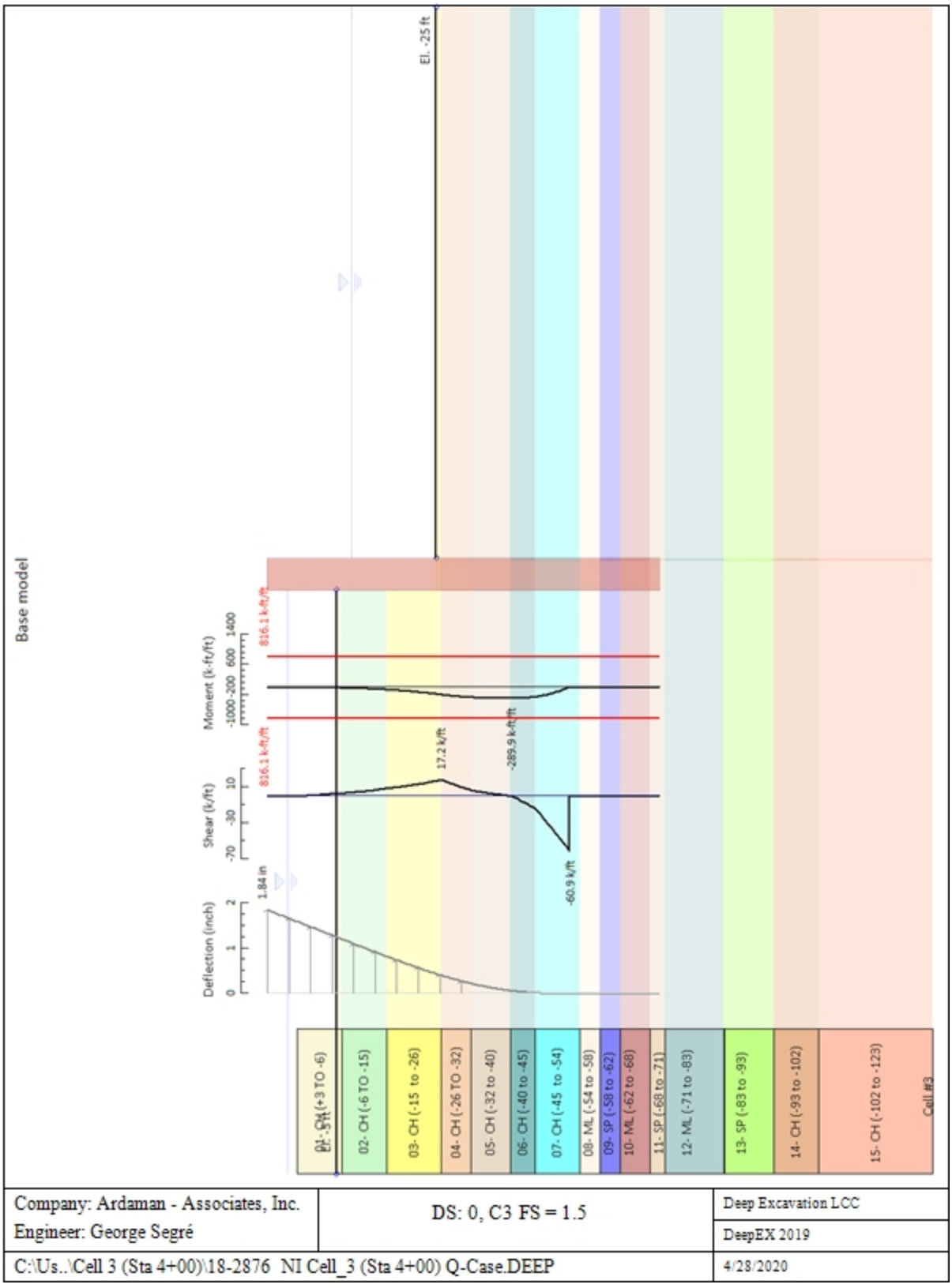

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
9.162 ksf
3.098 ksf
3.466 ksf
3.911 ksf
1.608 ksf
2.89 ksf
1.417 ksf
1.577 ksf
1.769 ksf
4.118 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020



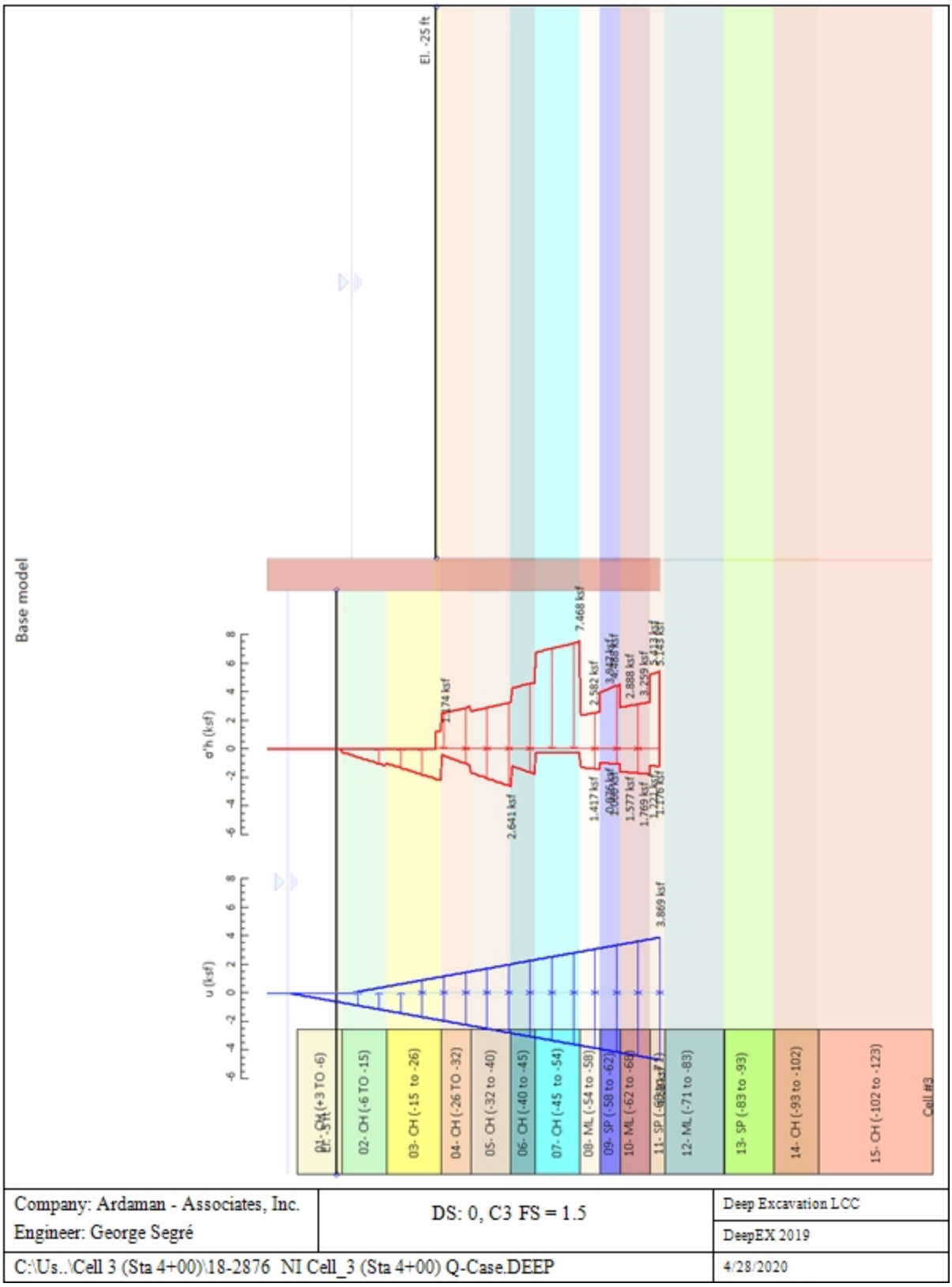
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020

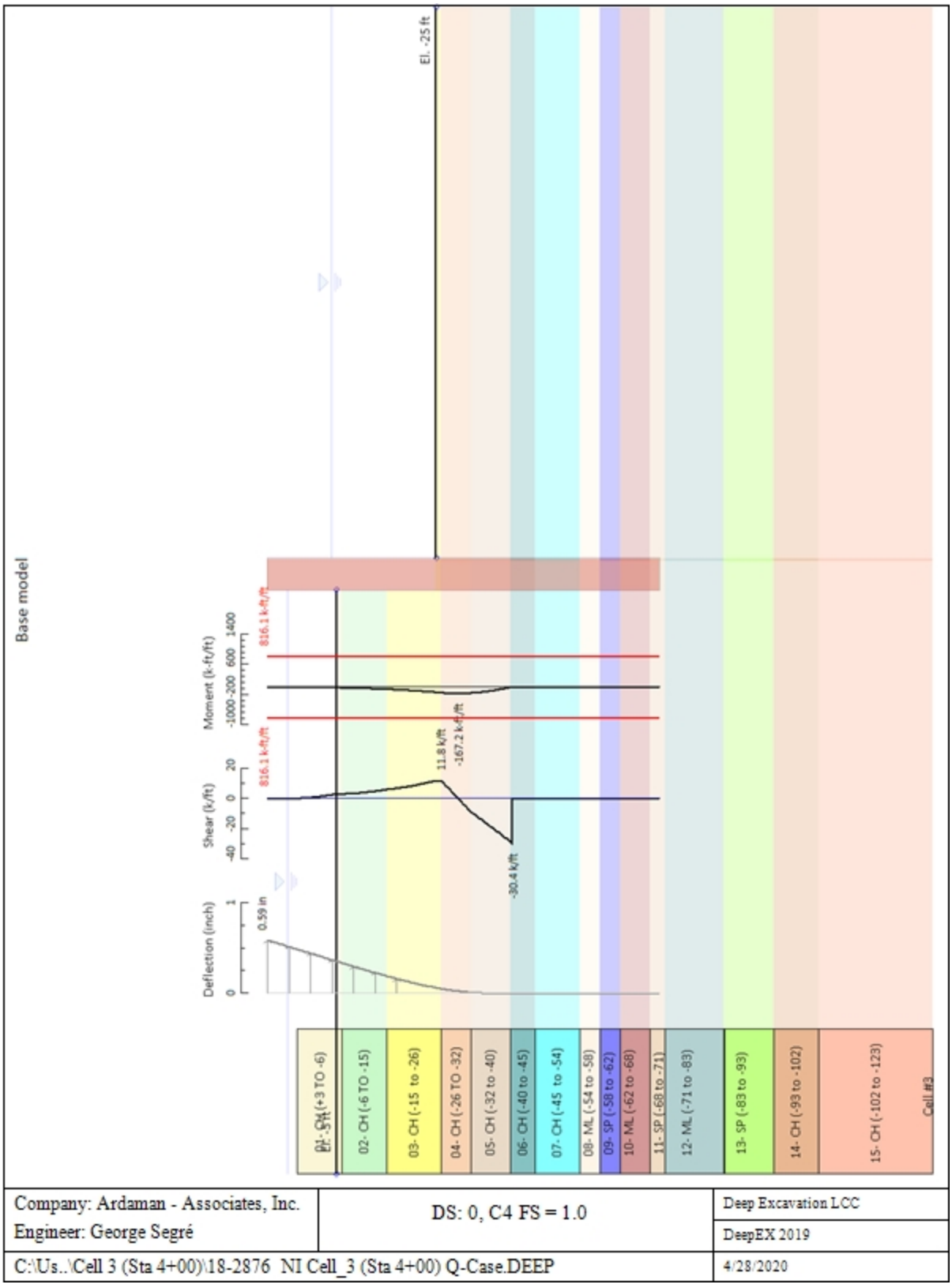


Attachment Figure C.3-21

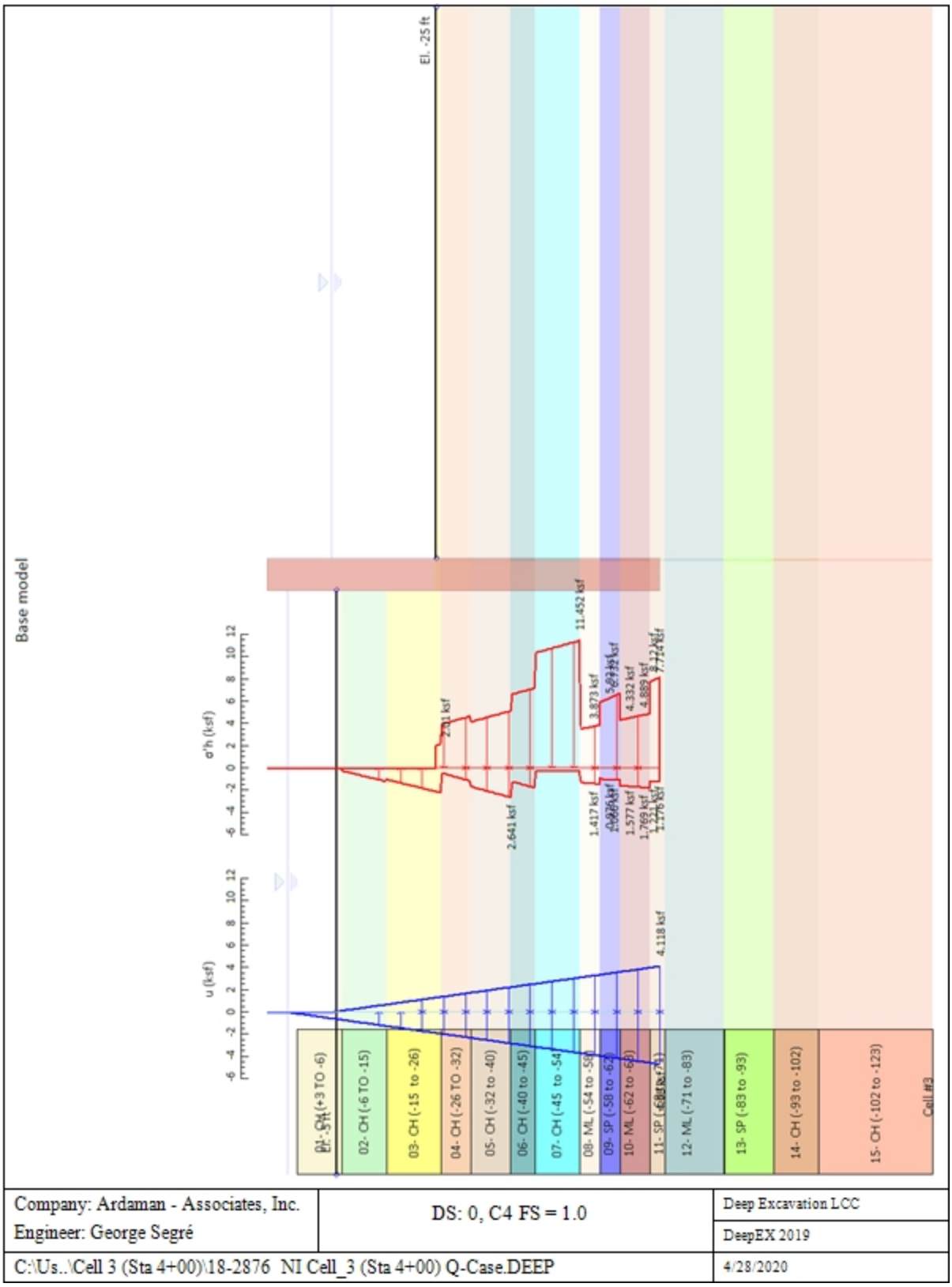


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020

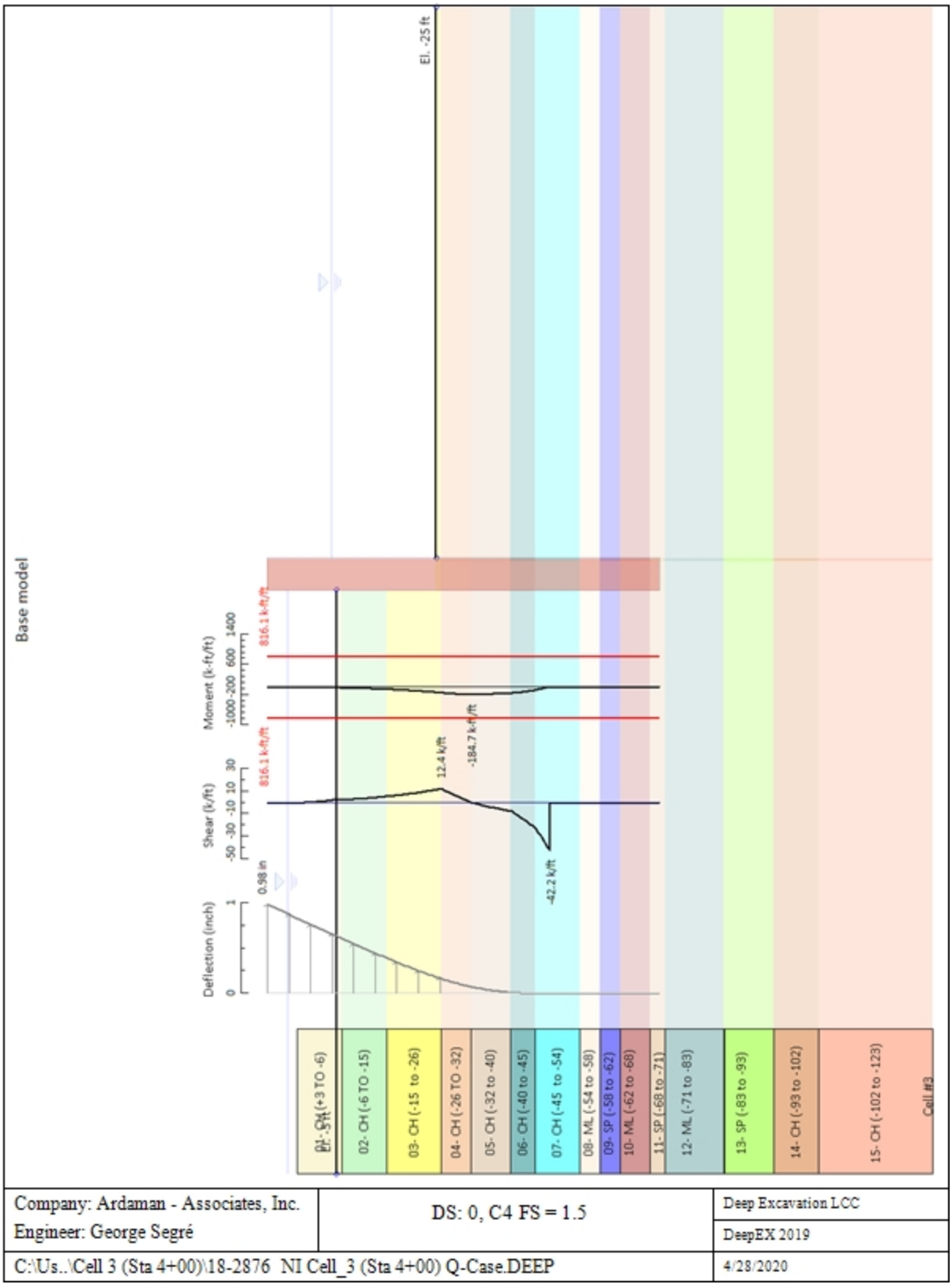

Base model
El. -25 ft
σ'h (ksf)
u (ksf)
7.468 ksf
2.582 ksf
2.888 ksf
3.259 ksf
1.774 ksf
2.641 ksf
1.417 ksf
1.577 ksf
1.769 ksf
3.869 ksf
01- SM (+3 TO -6)
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP
4/28/2020



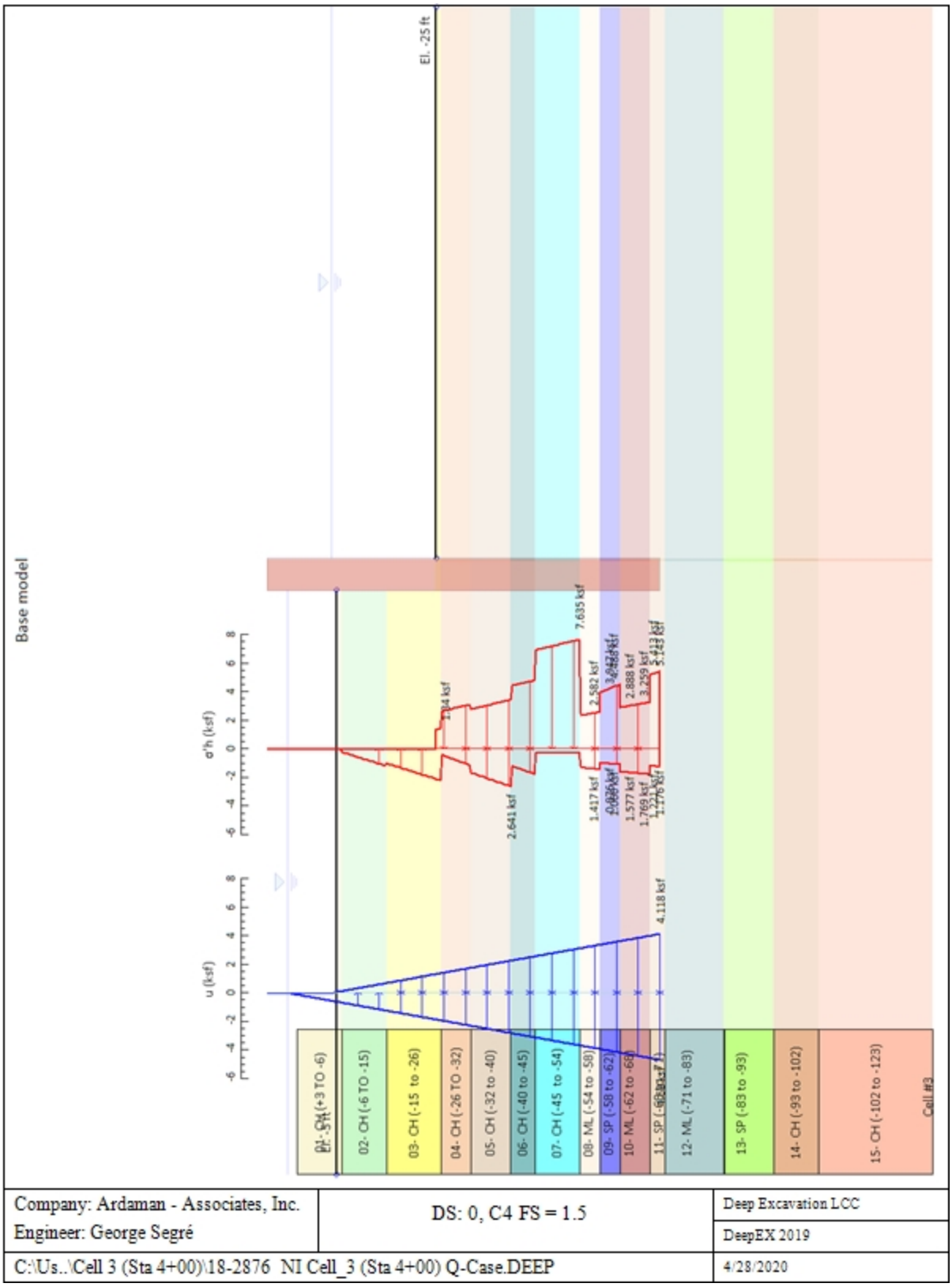
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:15:52 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	23	0	500	23	23	300	3	0.44	2.28	0.44	2.28	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	23	0	350	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-26 T	124	124	26	0	1250	26	26	521.92	3	0.39	2.56	0.39	2.56	True	Linear	
05- CH (-32 to	120	120	26	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	26	0	1730	26	26	626.3	3	0.39	2.56	0.39	2.56	True	Linear	
07- CH (-45 t	125	125	26	0	3300	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- ML (-54 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
15- CH (-102 t	125	125	26	0	4000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	0.609	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	0.562	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.531	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

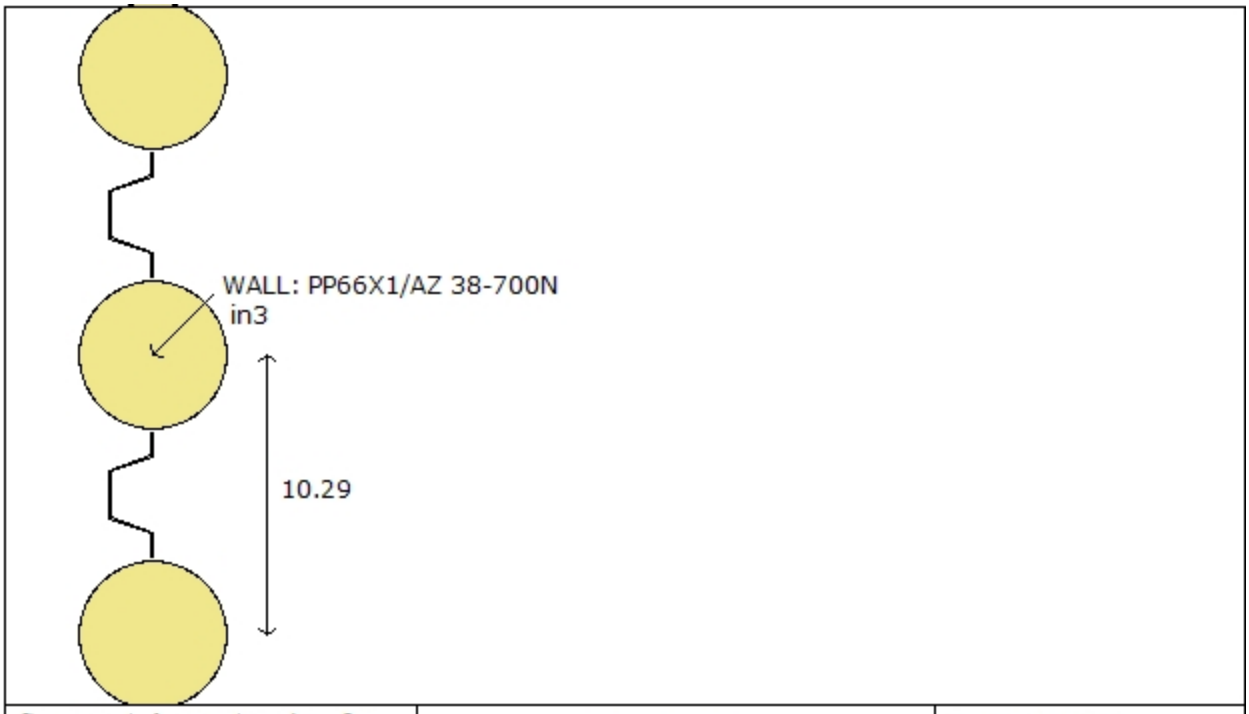
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	0.61
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	0.61
-26	04- CH (-26 TO	1	0.56
-32	05- CH (-32 to	1	0
-40	06- CH (-40 to	1	0.56
-45	07- CH (-45 to	1	0.56
-54	08- ML (-54 to	1	0.53
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.53
-68	11- SP (-68 to -	1	0.5
-71	12- ML (-71 to	1	0.53
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	0.56
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.596	1.799	2.714
Stage 1	Simple span	N/A	1.6	1.36	1.439	2.171
Stage 2	Simple span	N/A	1.6	1.768	2.054	3.036
Stage 3	Simple span	N/A	1.6	1.514	1.643	2.429
Stage 4	Simple span	N/A	1.6	1.835	2.127	3.077
Stage 5	Simple span	N/A	1.6	1.373	1.418	2.052
Stage 6	Simple span	N/A	1.6	2.096	2.493	3.498
Stage 7	Simple span	N/A	1.6	1.579	1.662	2.332

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

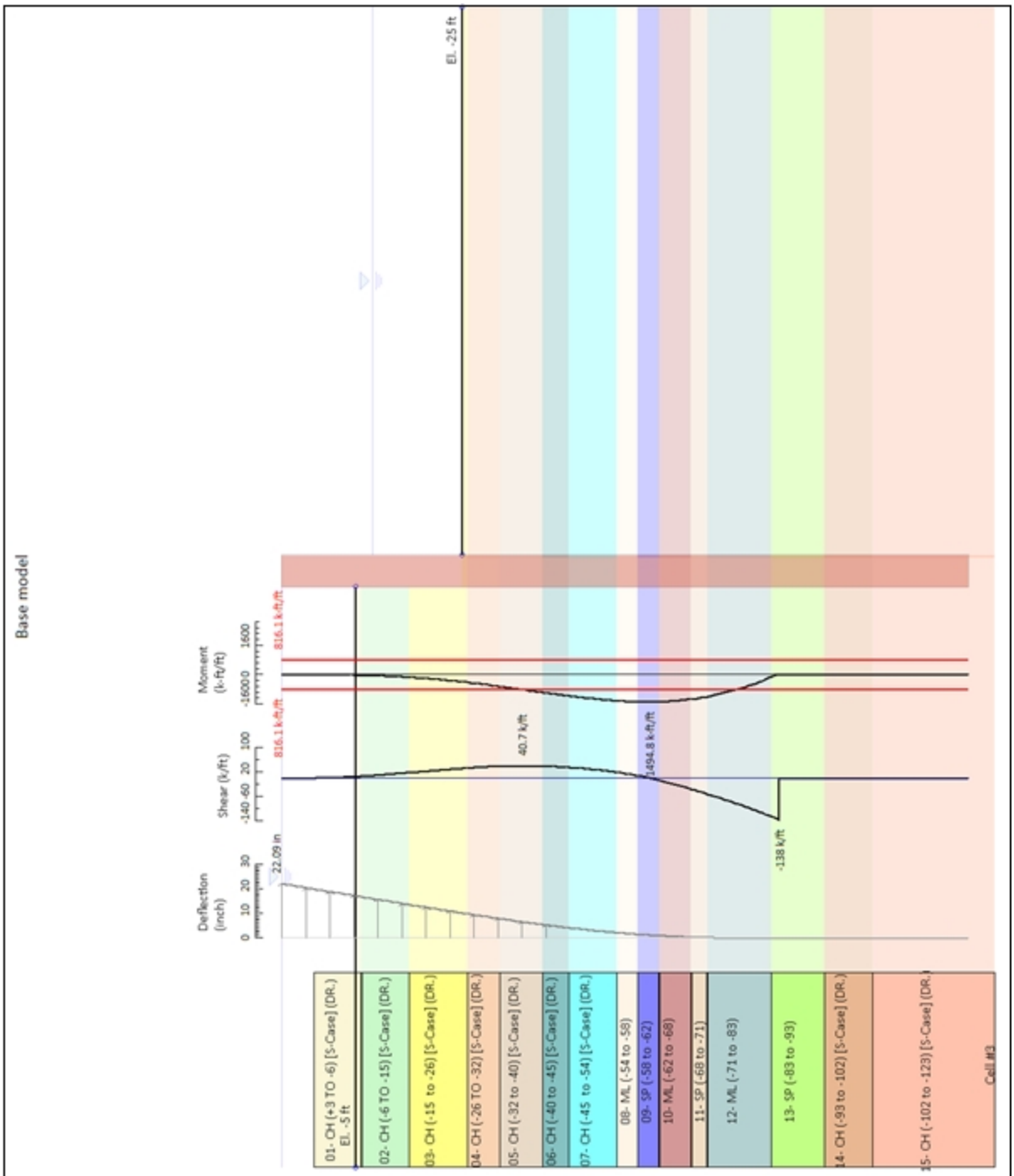
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

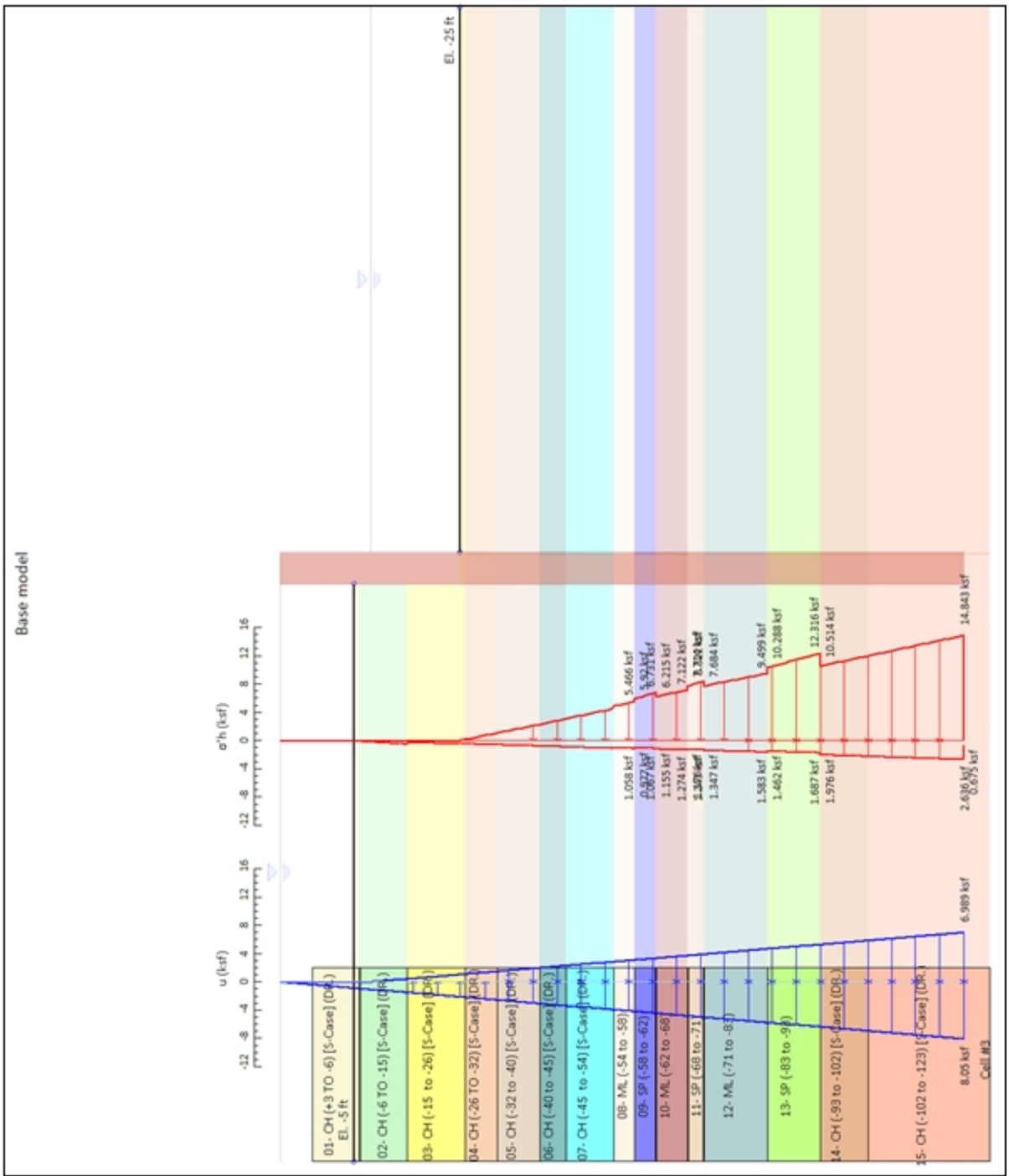
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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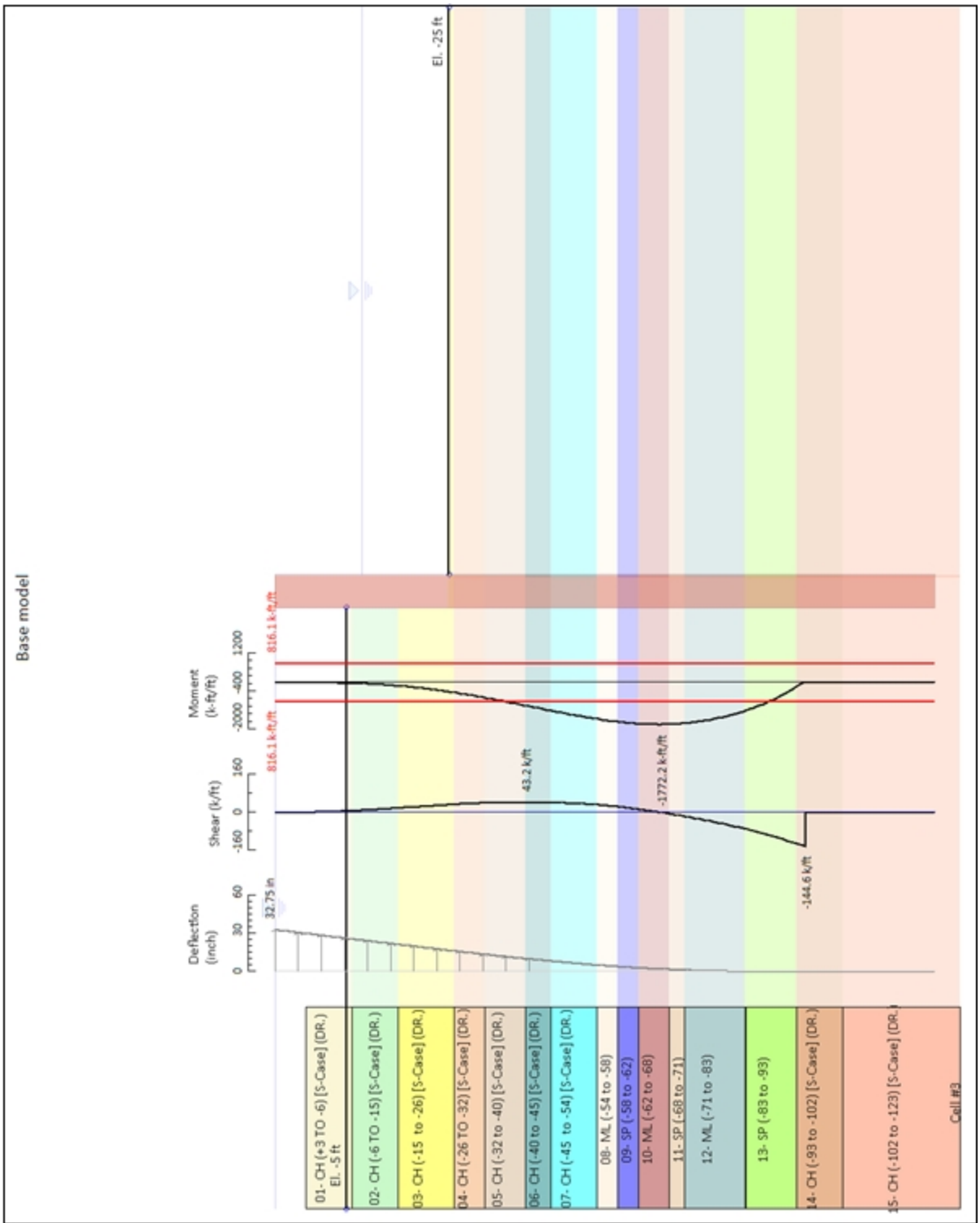

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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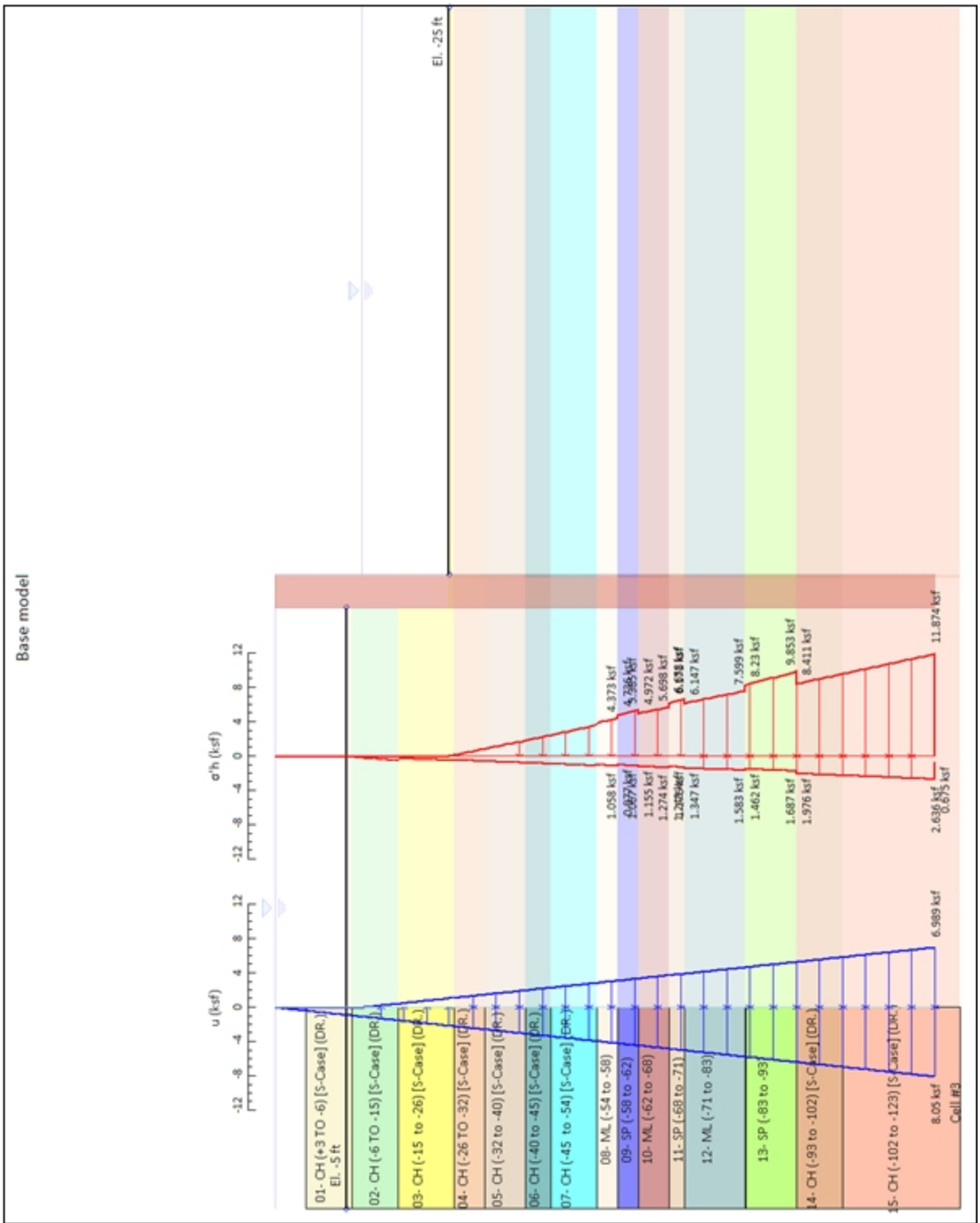
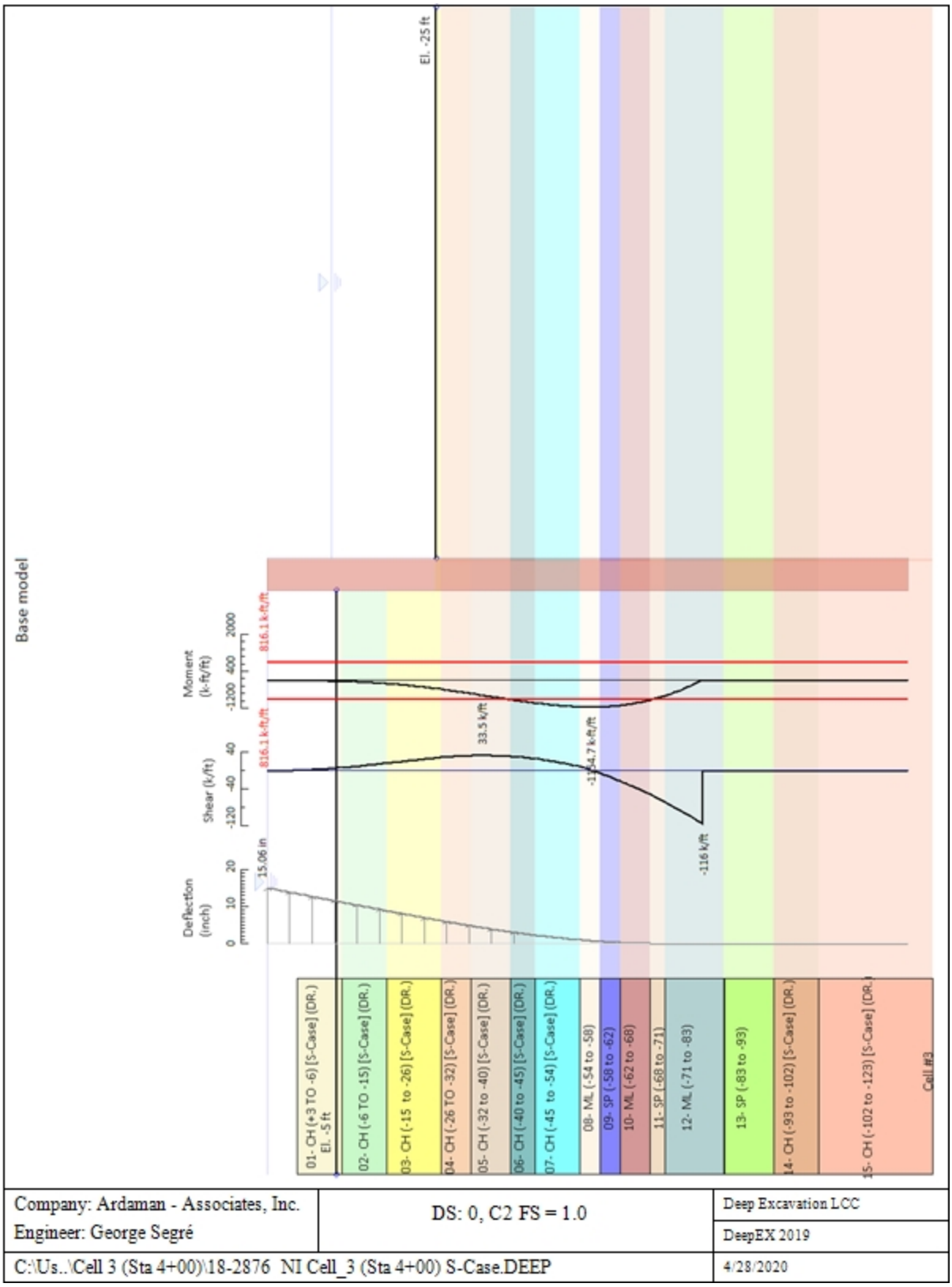


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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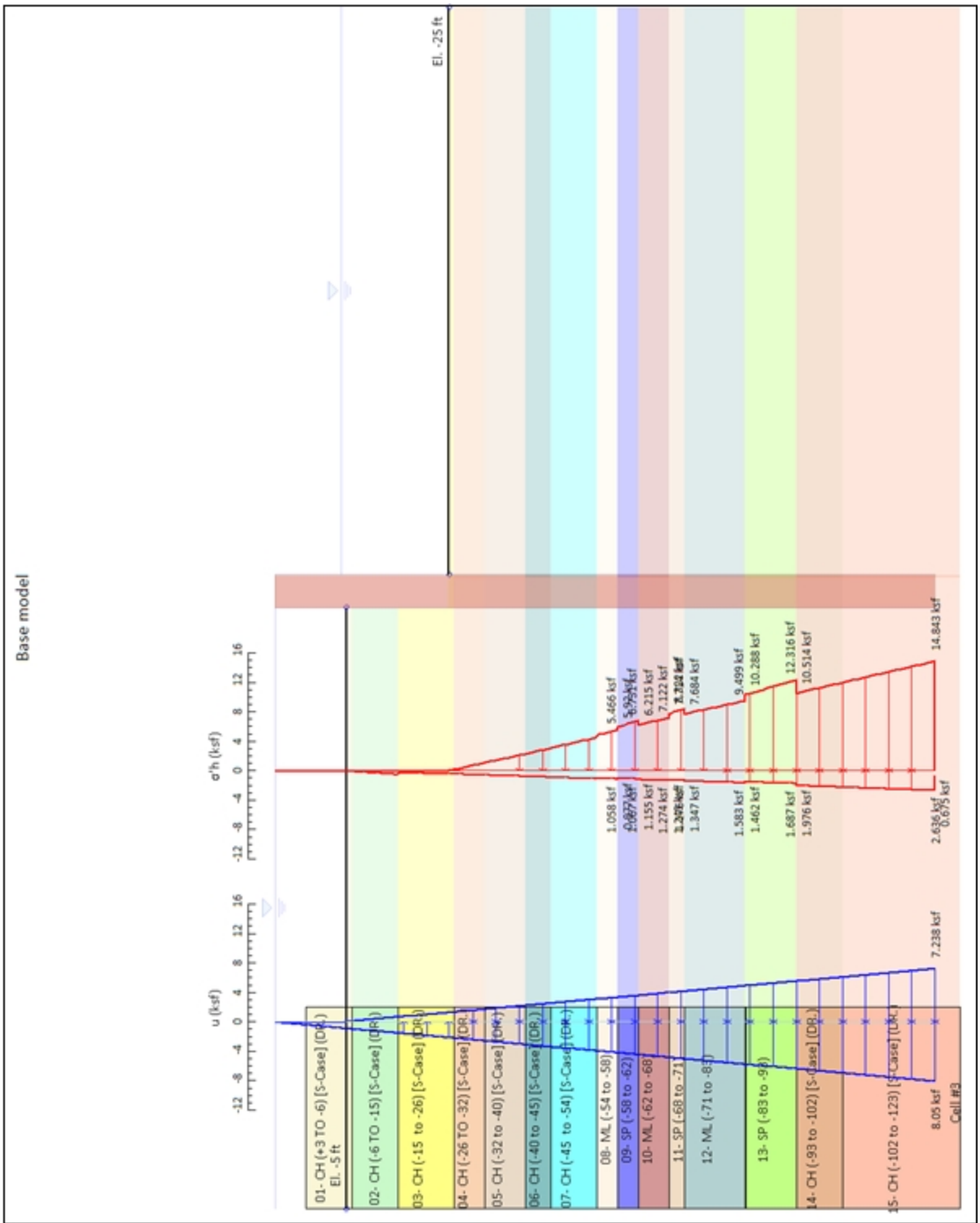

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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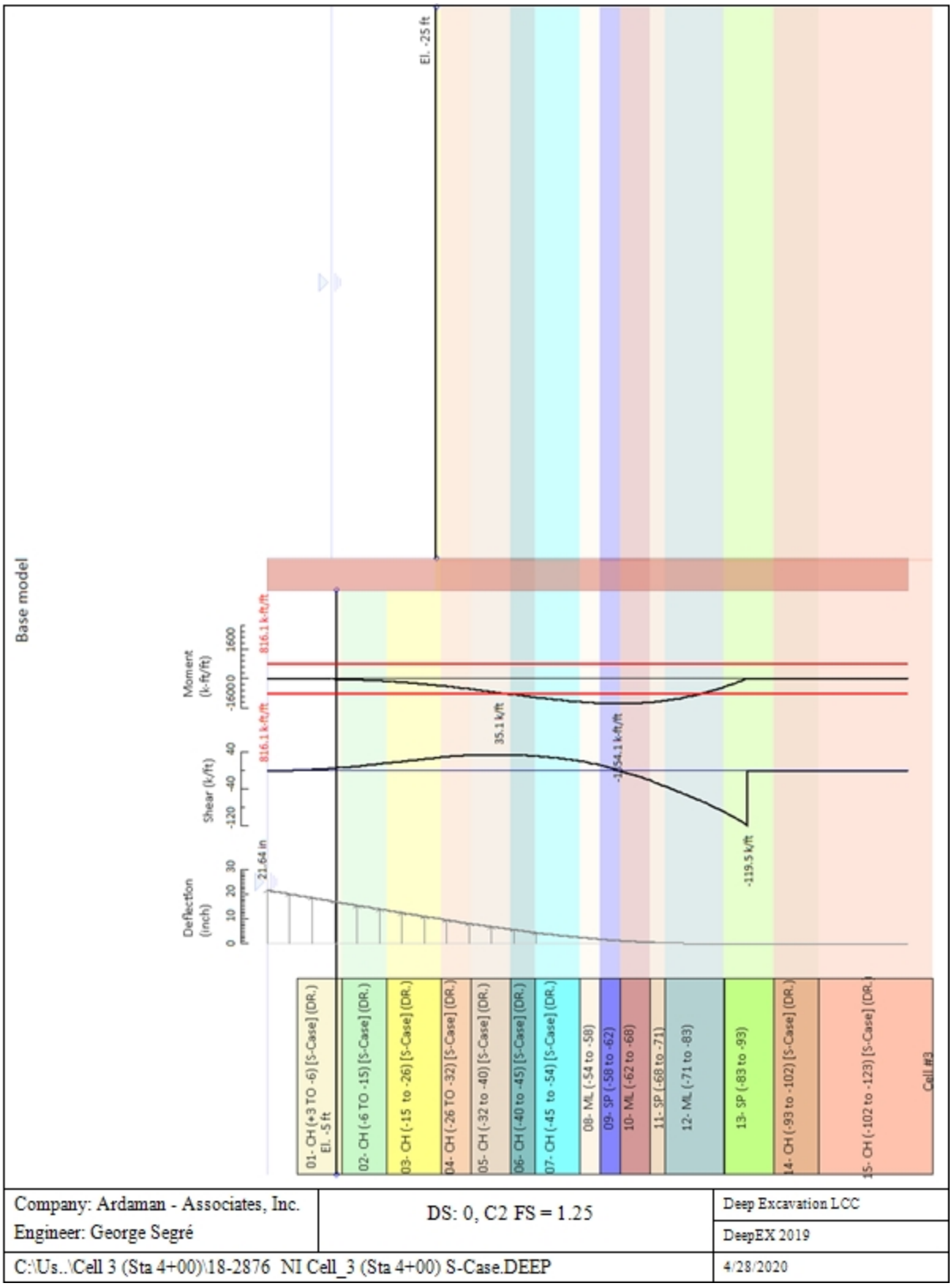

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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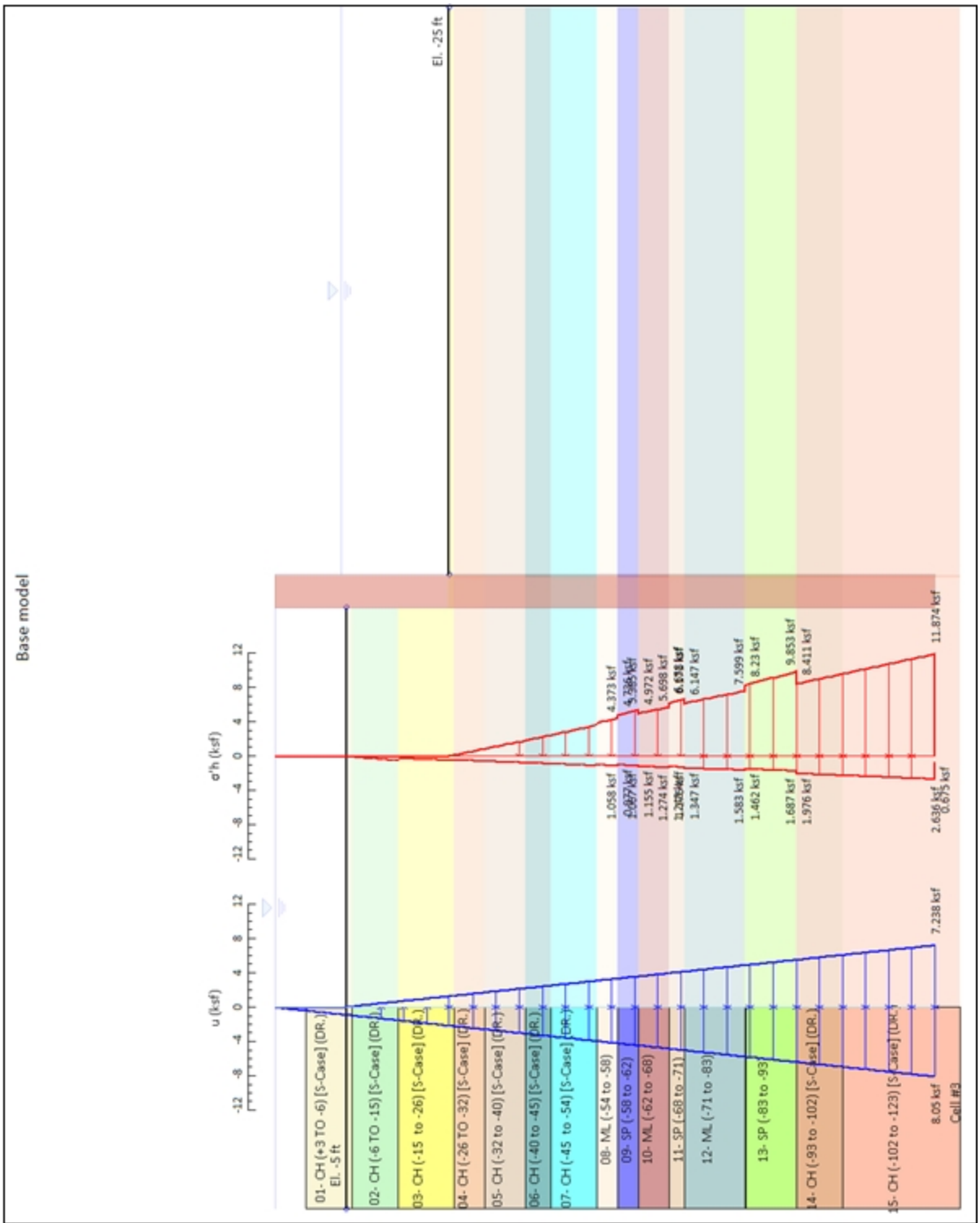

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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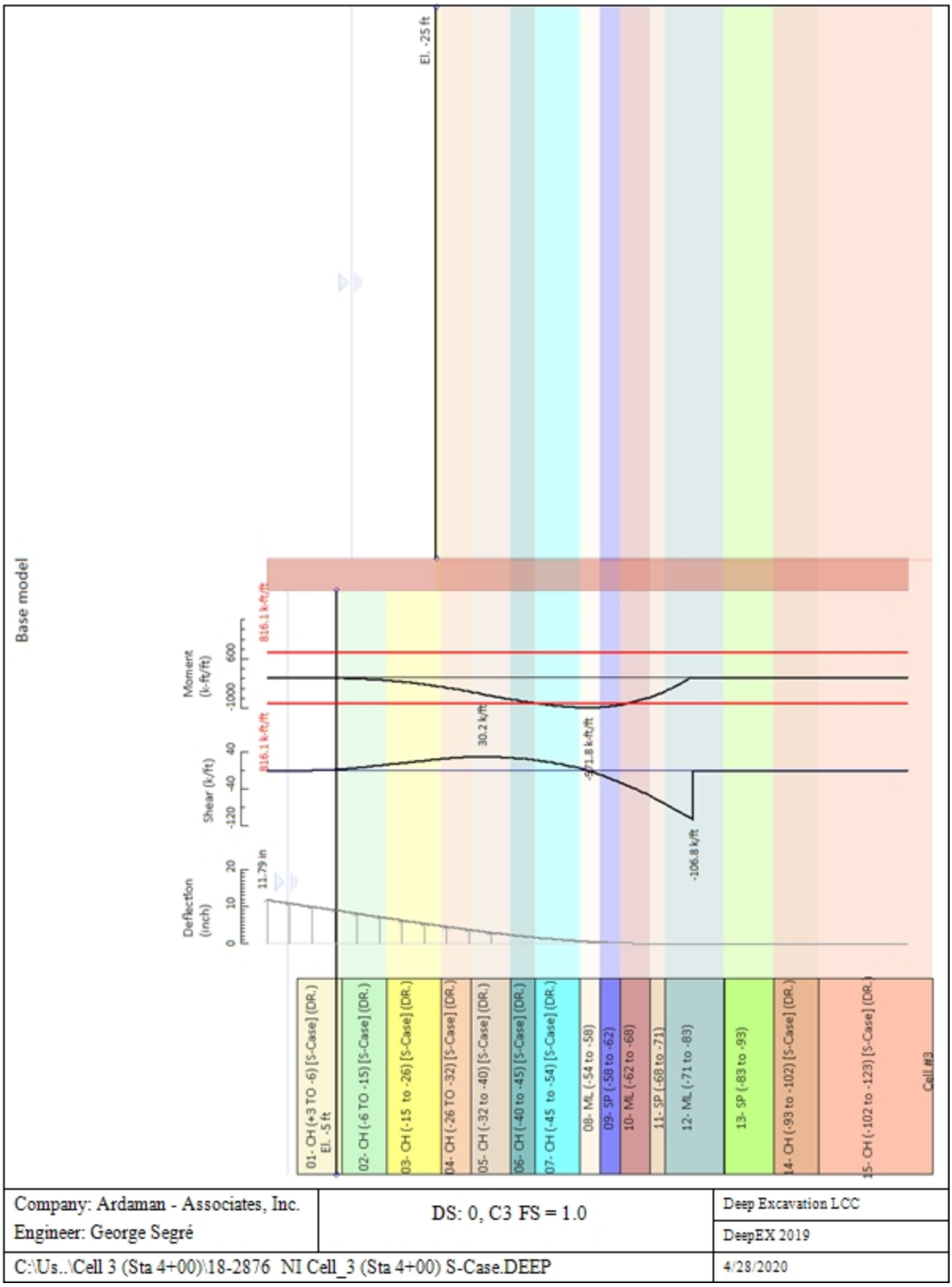

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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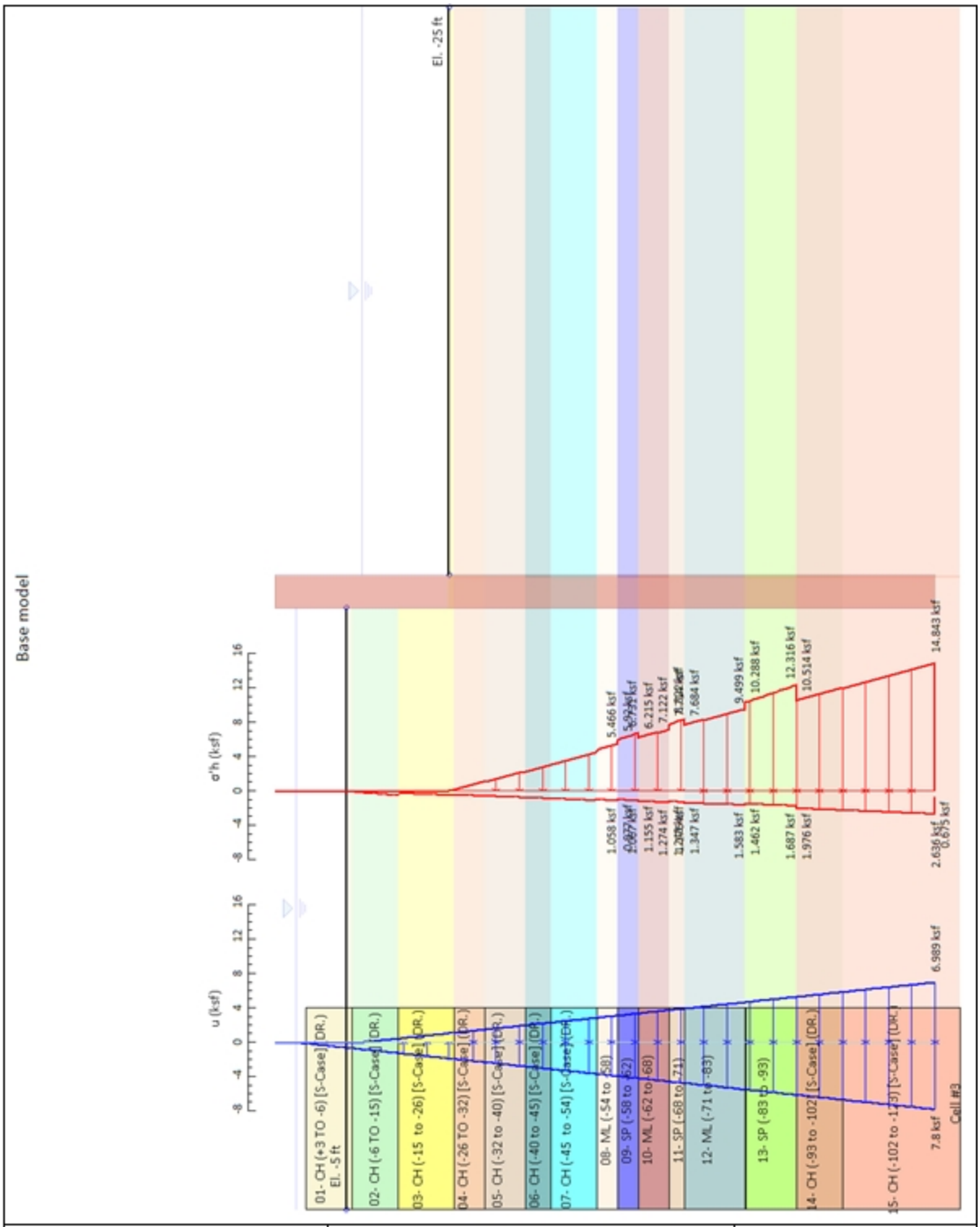

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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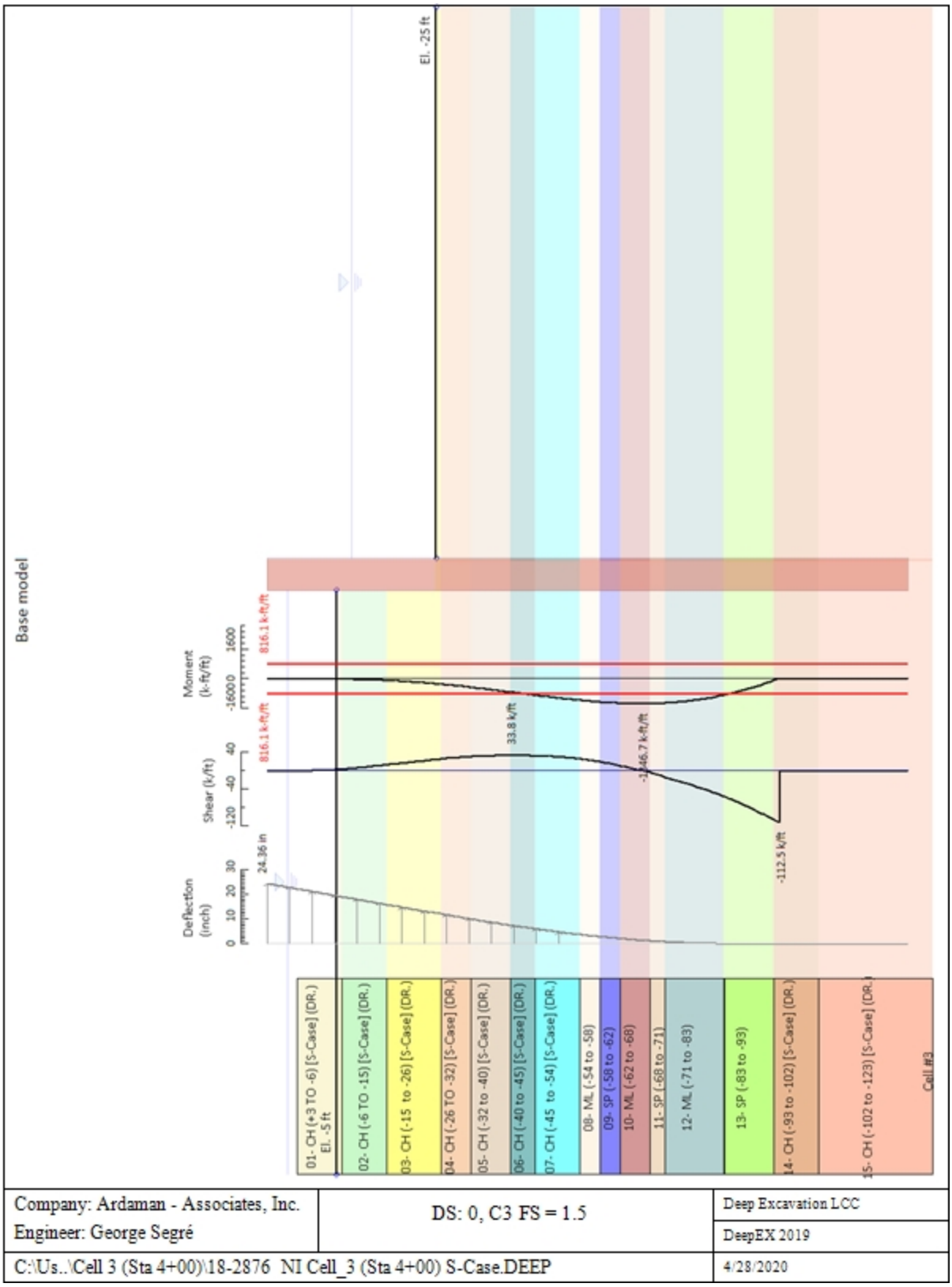

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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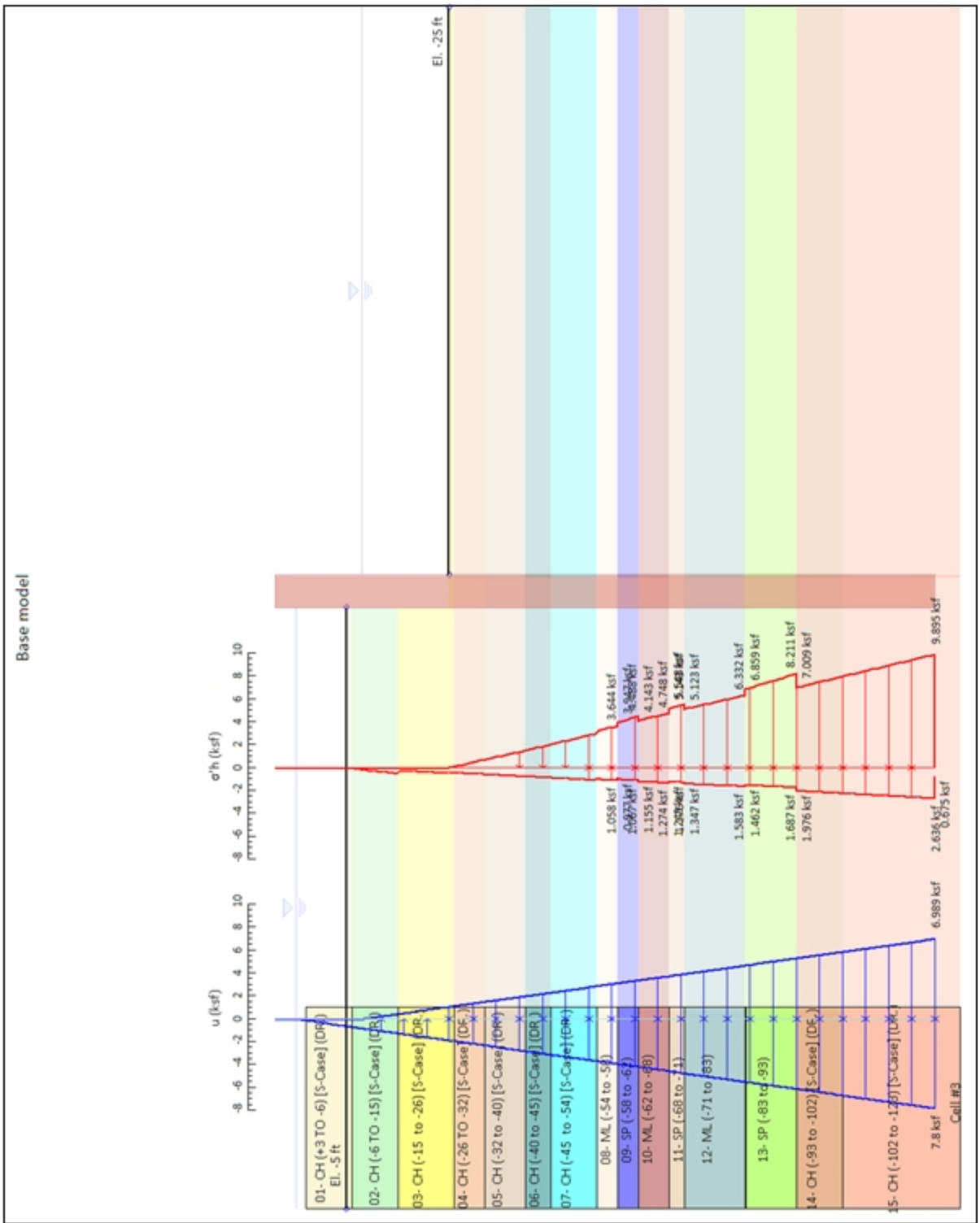

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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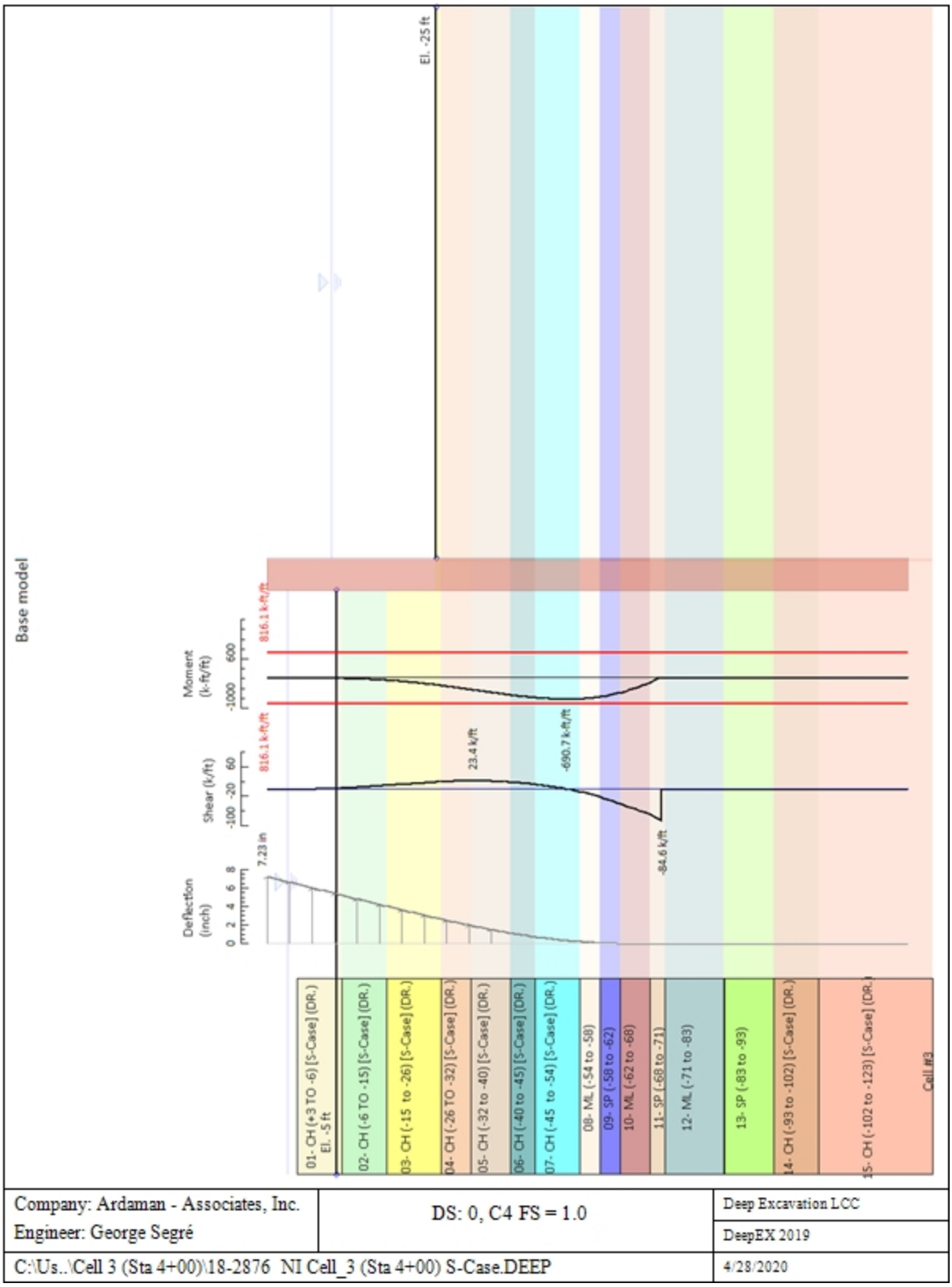

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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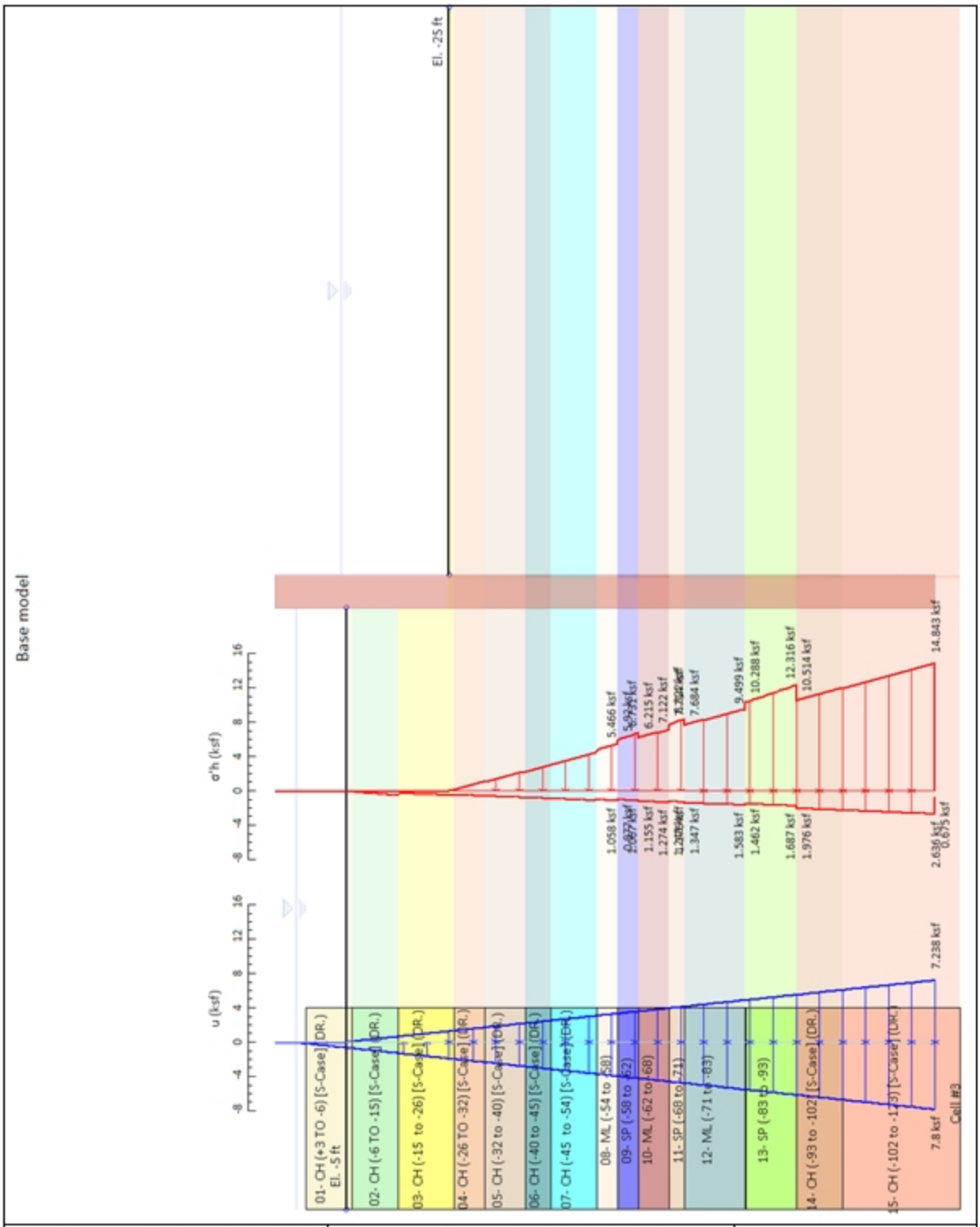

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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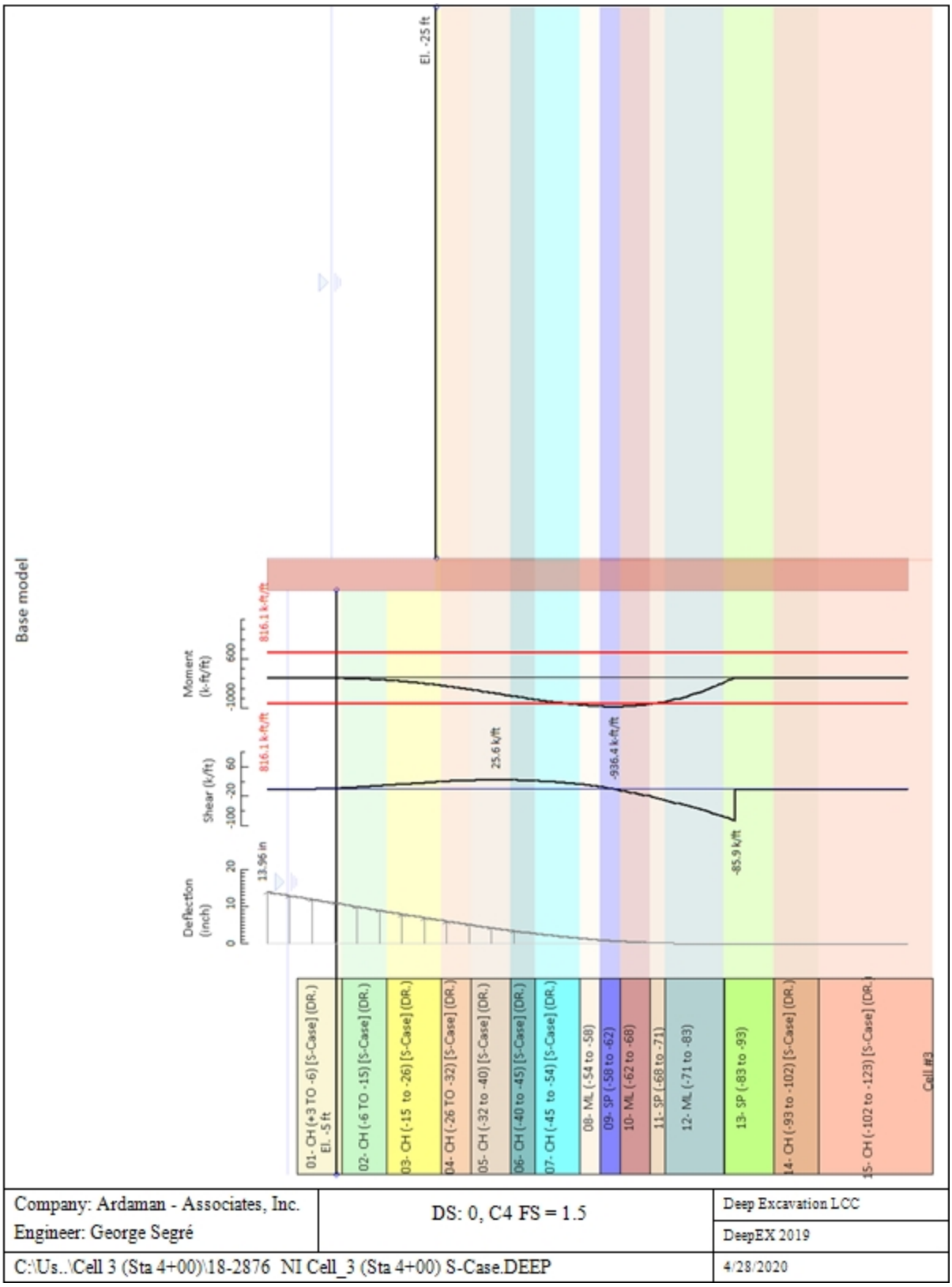

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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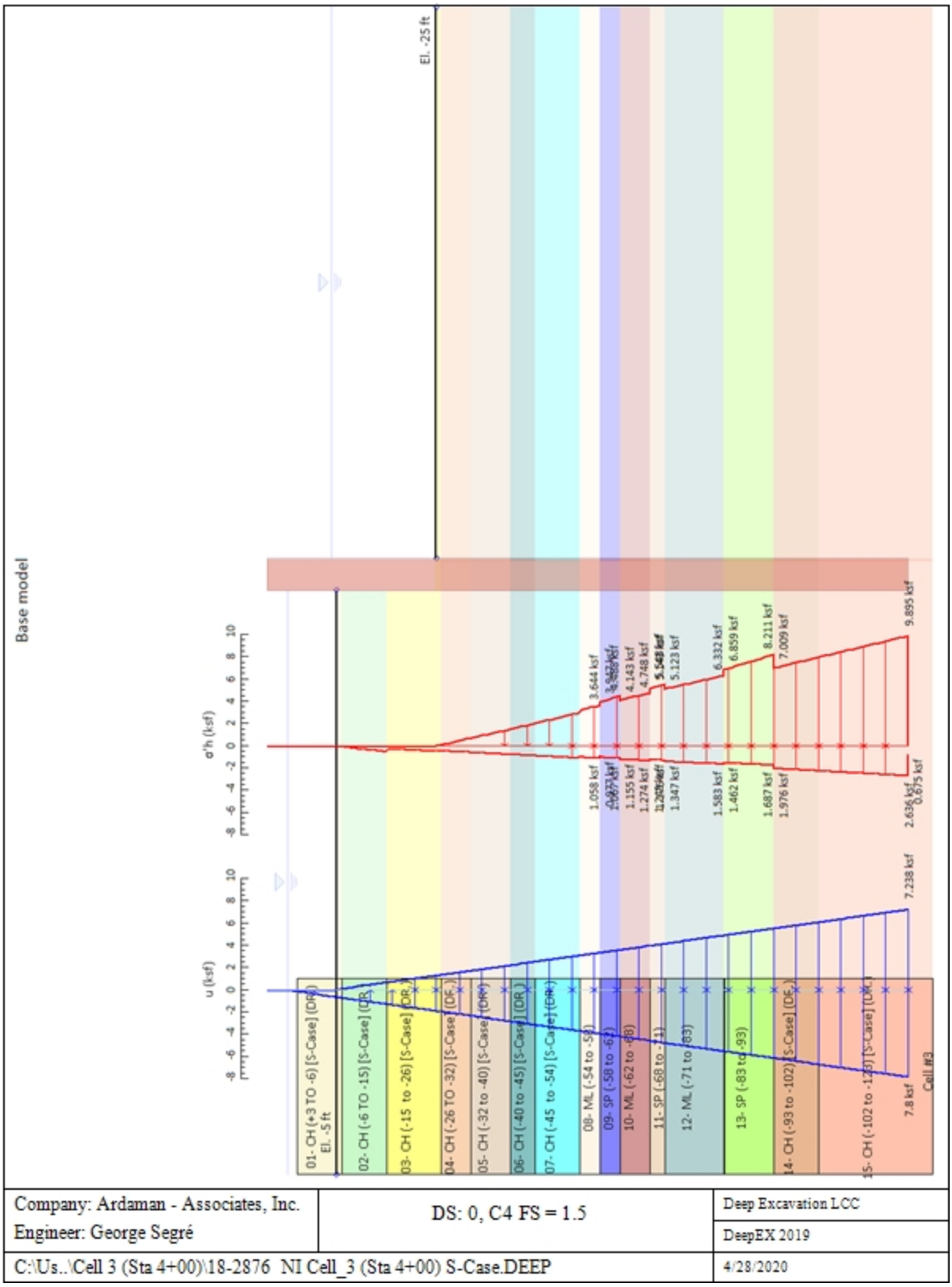

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 4+00)\18-2876 NI Cell_3 (Sta 4+00) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 5+00)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -96.14 ft., NAVD88

Length of Sheetting = 105.14 ft.

Use = 106.0 ft.

Design Tip Elev. = -97.0 ft., NAVD88

Design Length of Sheeting = 106.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-51.04	435.35	91.21	2.65
		Open excavation - degraded	9	-8	1.00	1.25	-54.99	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-47.88	330.78	68.80	1.76
		Open excavation - degraded	9	-4	1.00	1.25	-51.83	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-45.90	249.50	50.46	1.15
		Open excavation - degraded	5	-8	1.00	1.50	-53.41	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-41.56	171.51	32.76	0.62
		Open excavation - degraded	5	-4	1.00	1.50	-49.46	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-85.17	1,533.84	139.59	23.04
		Open excavation - degraded	9	-8	1.00	1.25	-96.14	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-79.36	1,186.64	116.90	15.72
		Open excavation - degraded	9	-4	1.00	1.25	-89.04	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-77.43	1,001.73	107.68	12.36
		Open excavation - degraded	5	-8	1.00	1.50	-95.49	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-71.00	712.90	86.02	7.59
		Open excavation - degraded	5	-4	1.00	1.50	-86.46	--	--	--
						Governing Value:	-96.14	1,533.84	139.59	23.04

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:35:30 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	0	0	500	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	0	0	350	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-26 T	124	124	0	0	1250	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-32 to	120	120	0	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	0	0	1730	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-45 t	125	125	0	0	3300	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- ML (-54 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	0	0	3500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
15- CH (-102 t	125	125	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	1	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.741	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

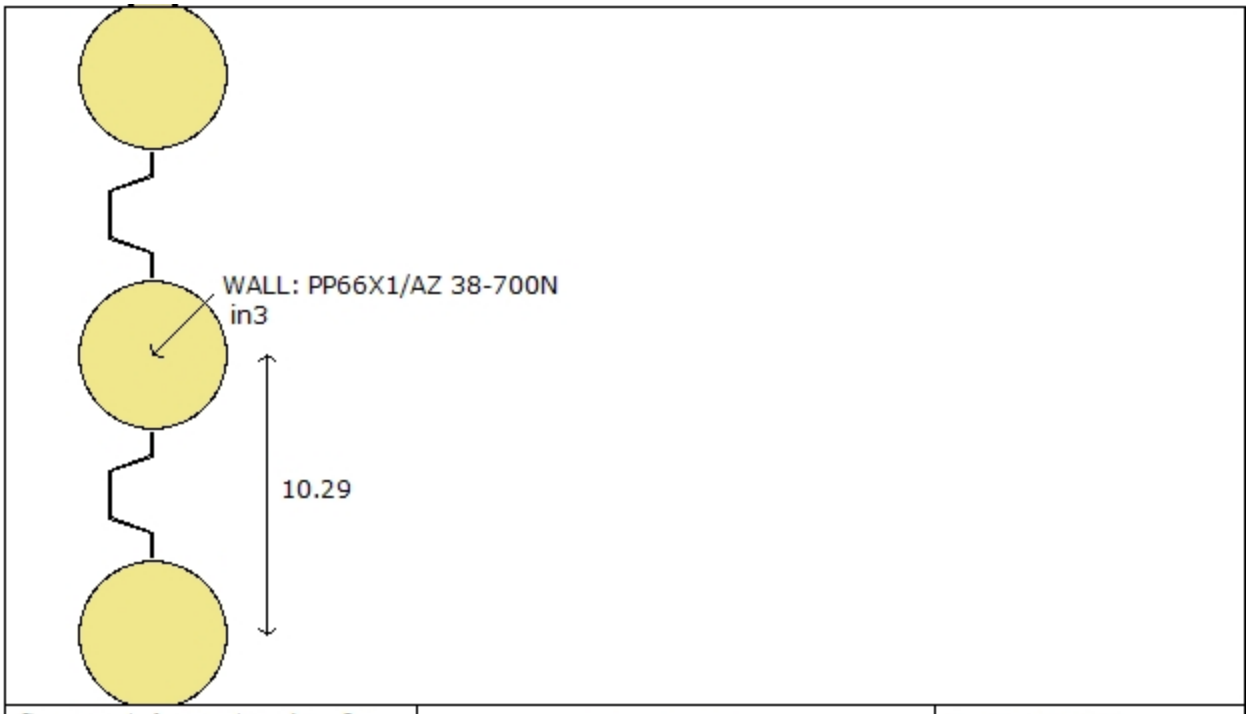
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	1
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	1
-26	04- CH (-26 TO	1	1
-32	05- CH (-32 to	1	1
-40	06- CH (-40 to	1	1
-45	07- CH (-45 to	1	1
-54	08- ML (-54 to	1	0.74
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.74
-68	11- SP (-68 to -	1	1
-71	12- ML (-71 to	1	0.74
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	1
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.596	1.596	2.34
Stage 1	Simple span	N/A	1.6	1.277	1.277	1.872
Stage 2	Simple span	N/A	1.6	1.672	1.672	2.487
Stage 3	Simple span	N/A	1.6	1.338	1.338	1.99
Stage 4	Simple span	N/A	1.6	1.937	1.937	2.714
Stage 5	Simple span	N/A	1.6	1.291	1.291	1.809
Stage 6	Simple span	N/A	1.6	2.034	2.034	2.902
Stage 7	Simple span	N/A	1.6	1.356	1.356	1.935

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

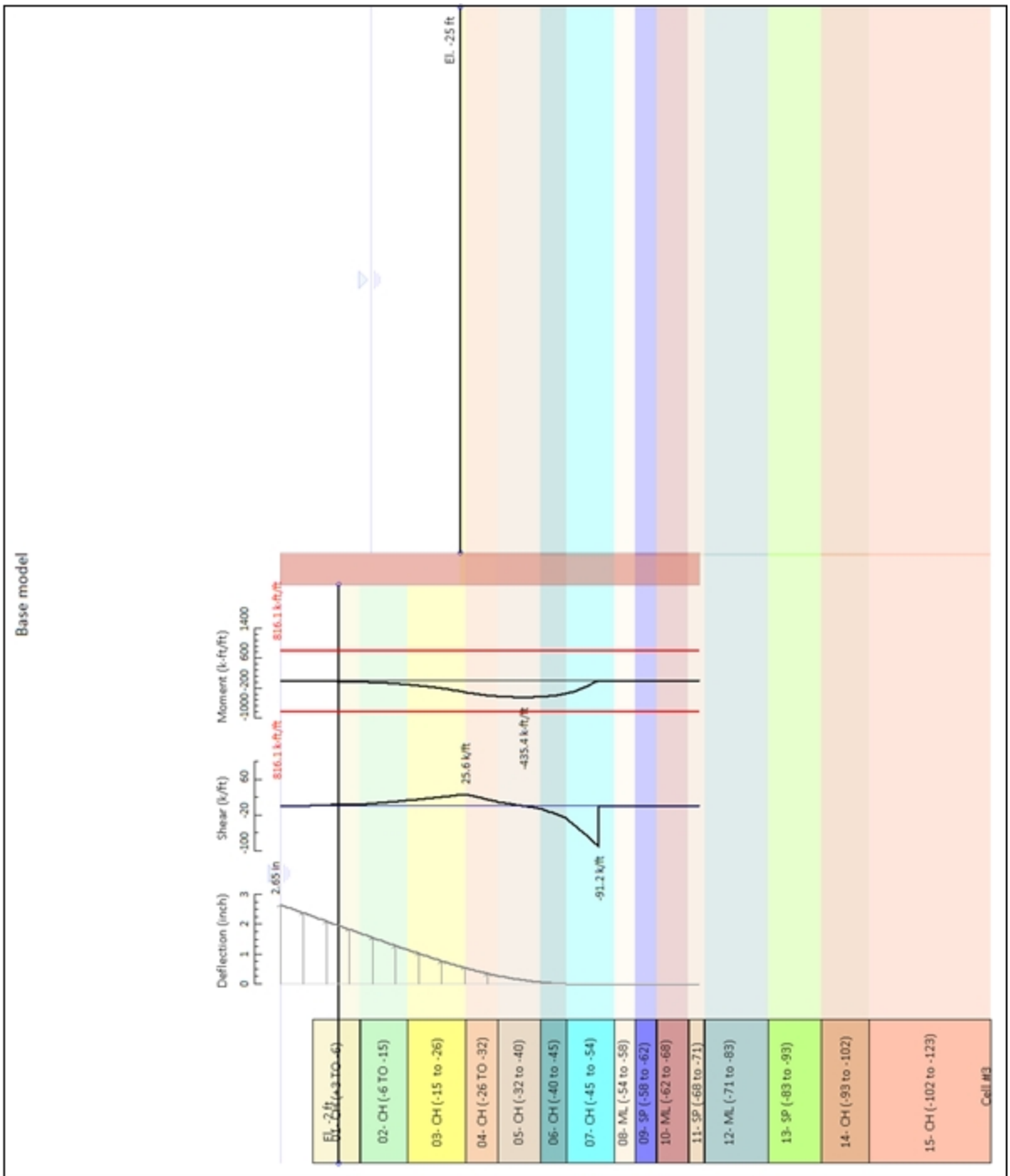
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

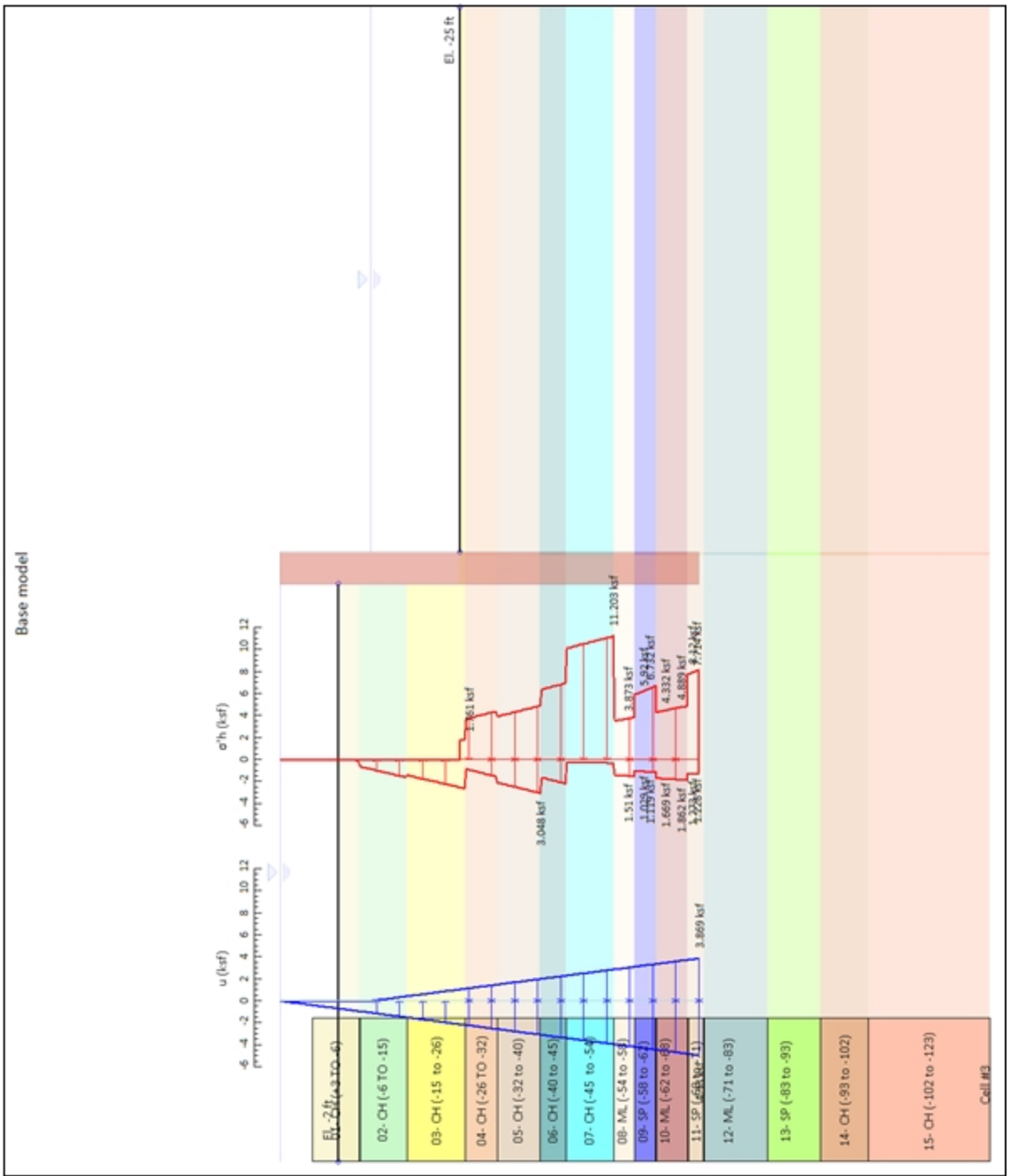
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

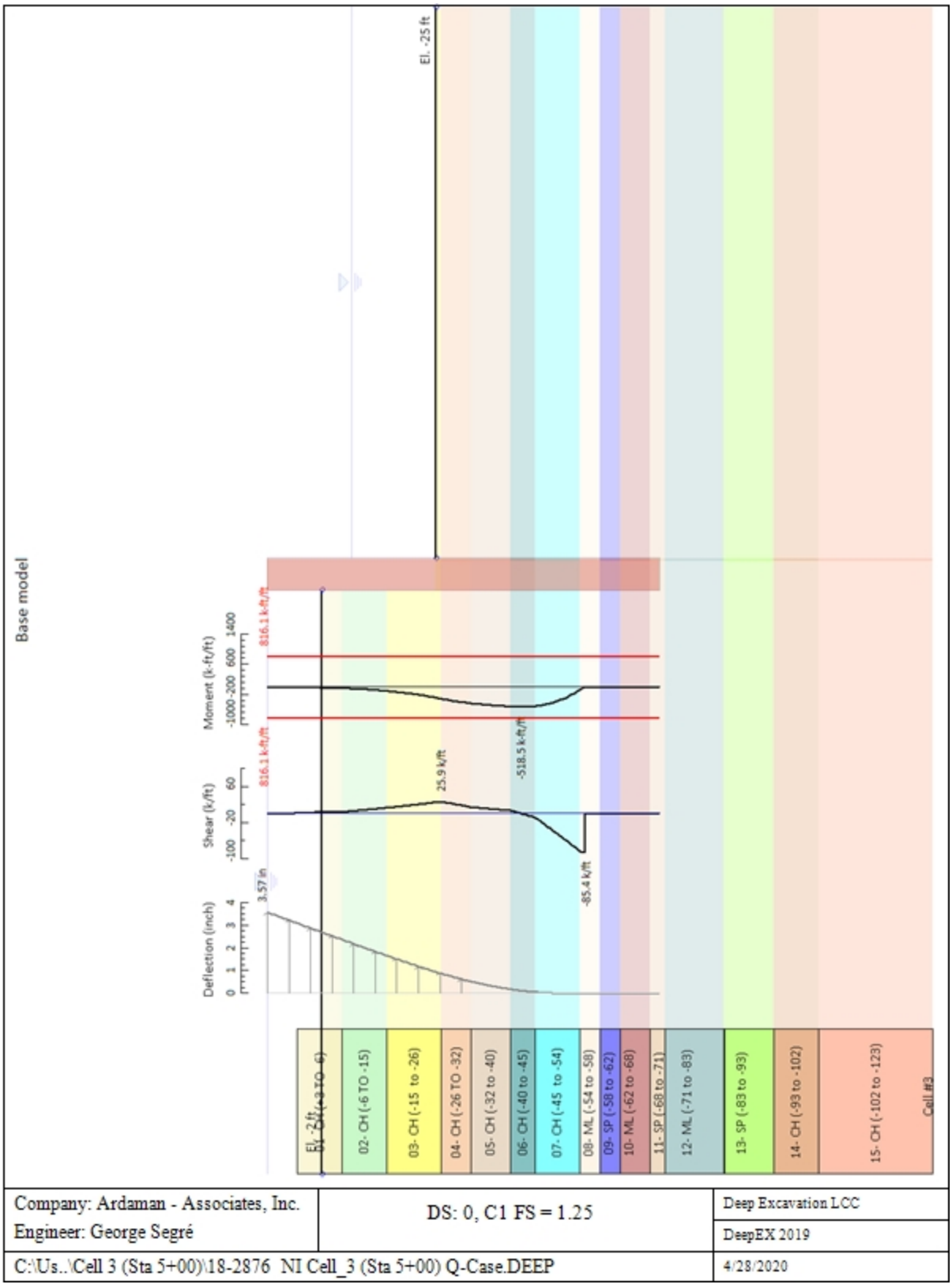
EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported

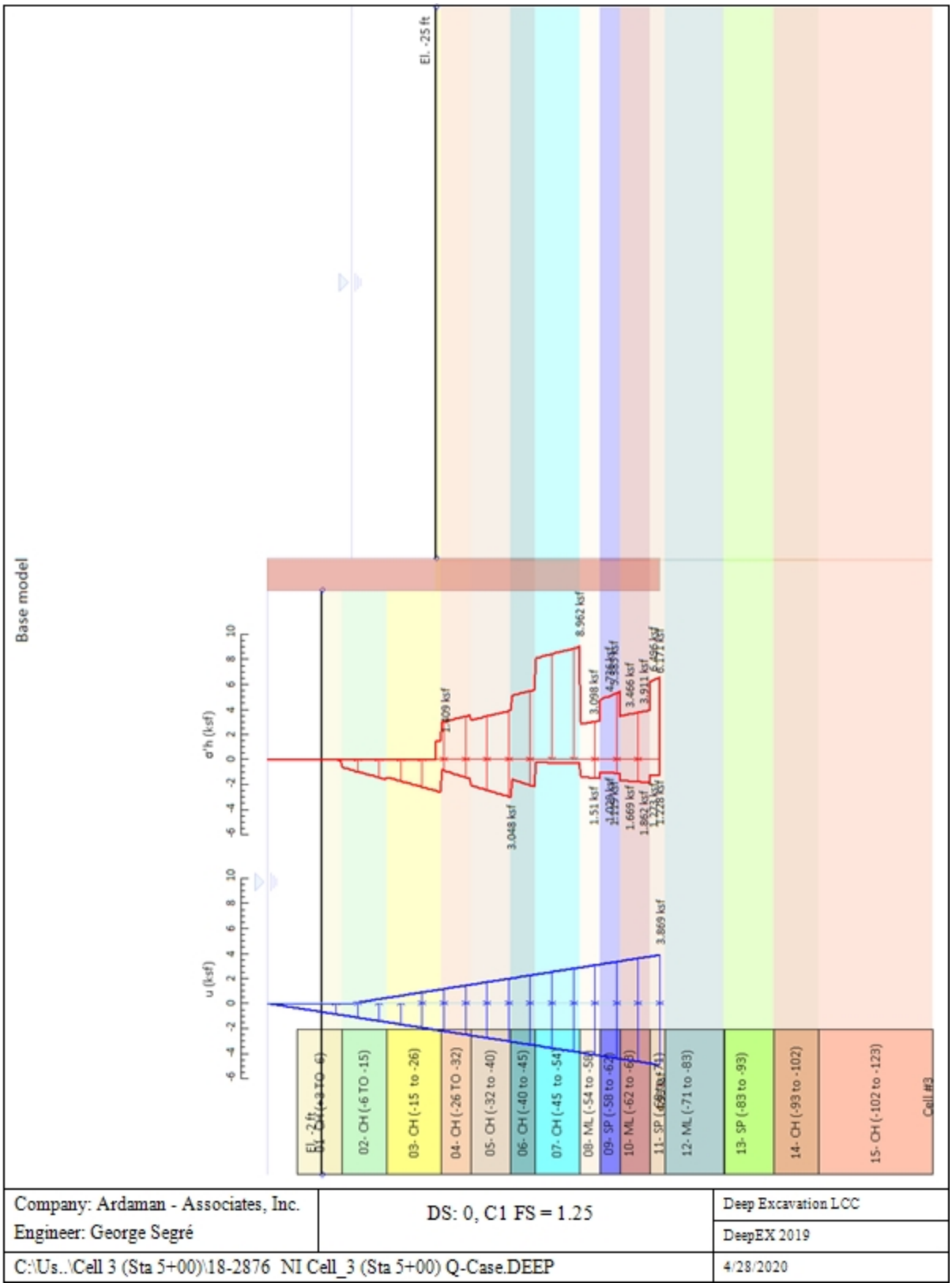


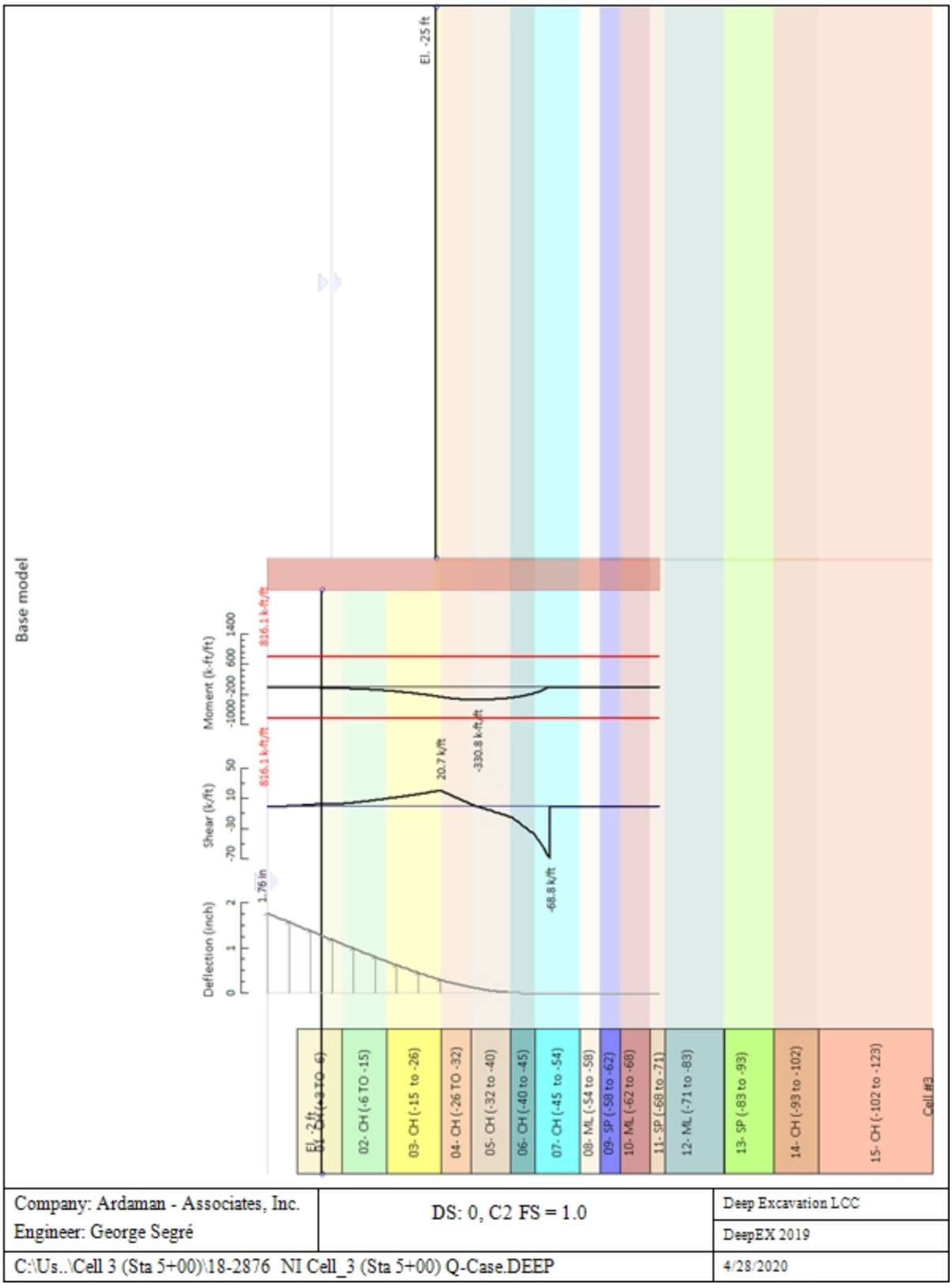
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP		4/28/2020


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
11.203 ksf
3.873 ksf
4.332 ksf
4.889 ksf
3.048 ksf
1.51 ksf
1.669 ksf
1.862 ksf
3.869 ksf
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP		4/28/2020


Base model
El. -25 ft
σ'h (ksf)
u (ksf)
8.962 ksf
3.098 ksf
3.466 ksf
3.911 ksf
3.048 ksf
1.51 ksf
1.669 ksf
1.862 ksf
3.869 ksf
02- CH (-6 TO -15)
03- CH (-15 to -26)
04- CH (-26 TO -32)
05- CH (-32 to -40)
06- CH (-40 to -45)
07- CH (-45 to -54
08- ML (-54 to -58
09- SP (-58 to -62
10- ML (-62 to -68
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102)
15- CH (-102 to -123)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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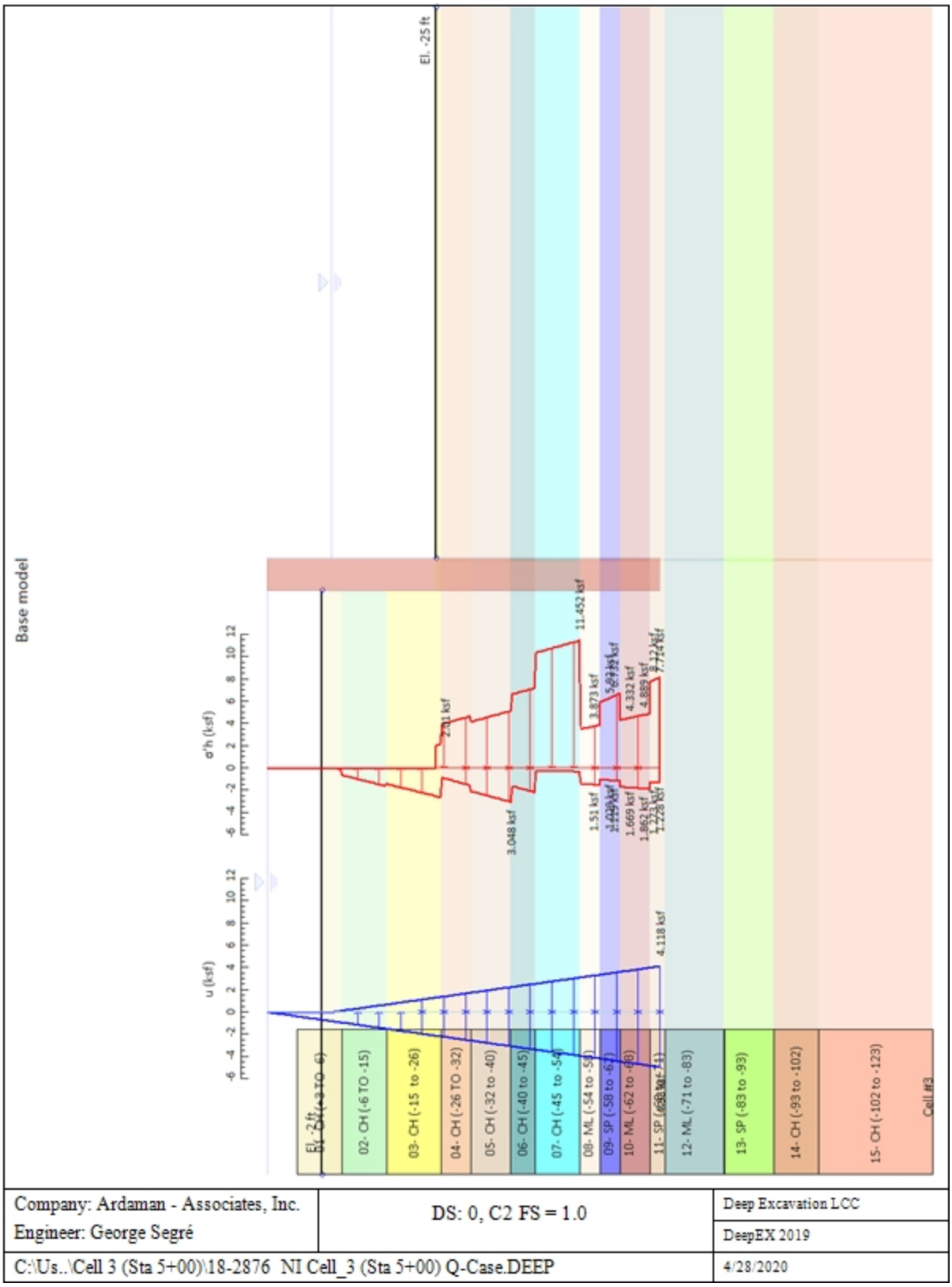

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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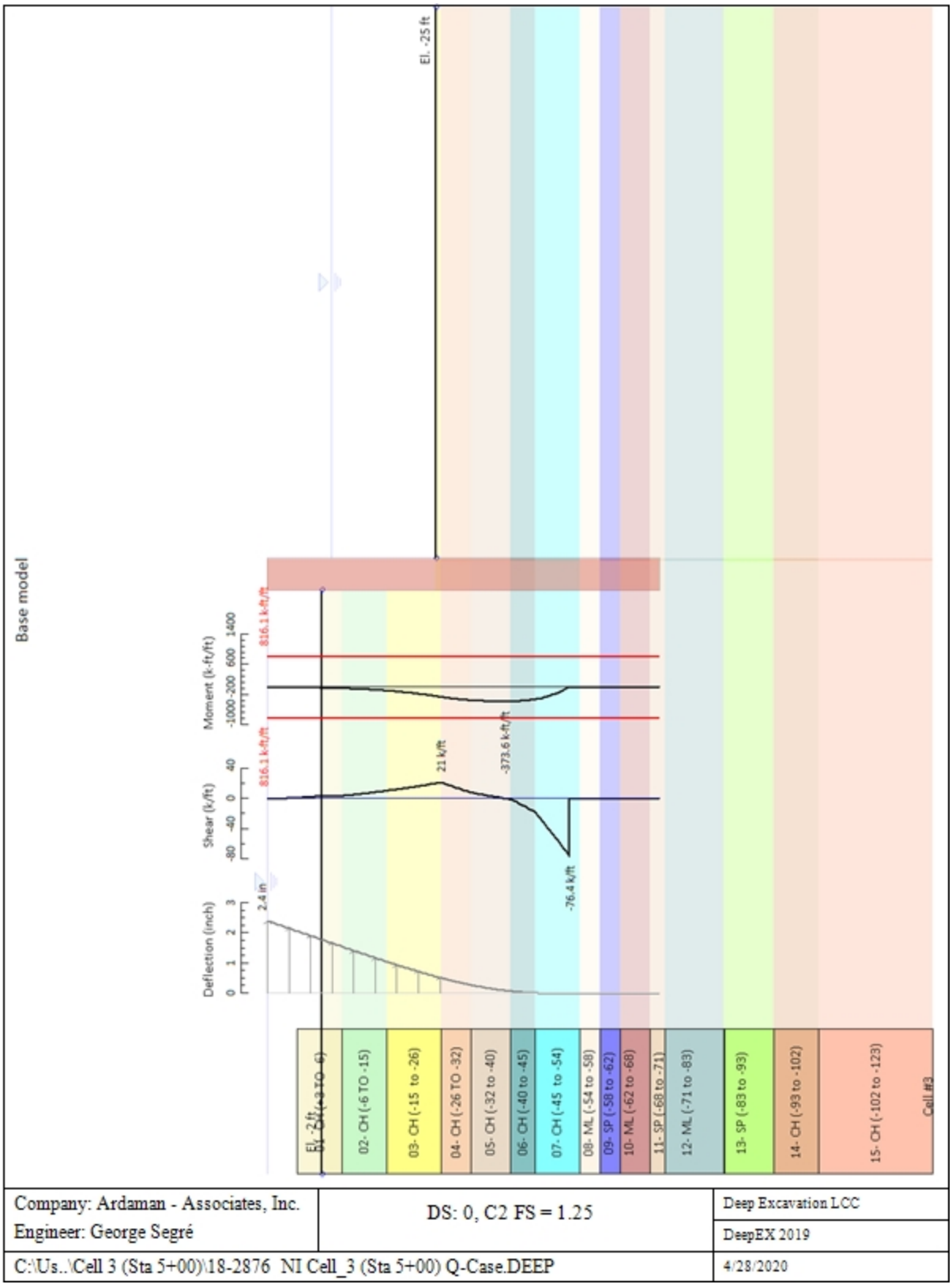

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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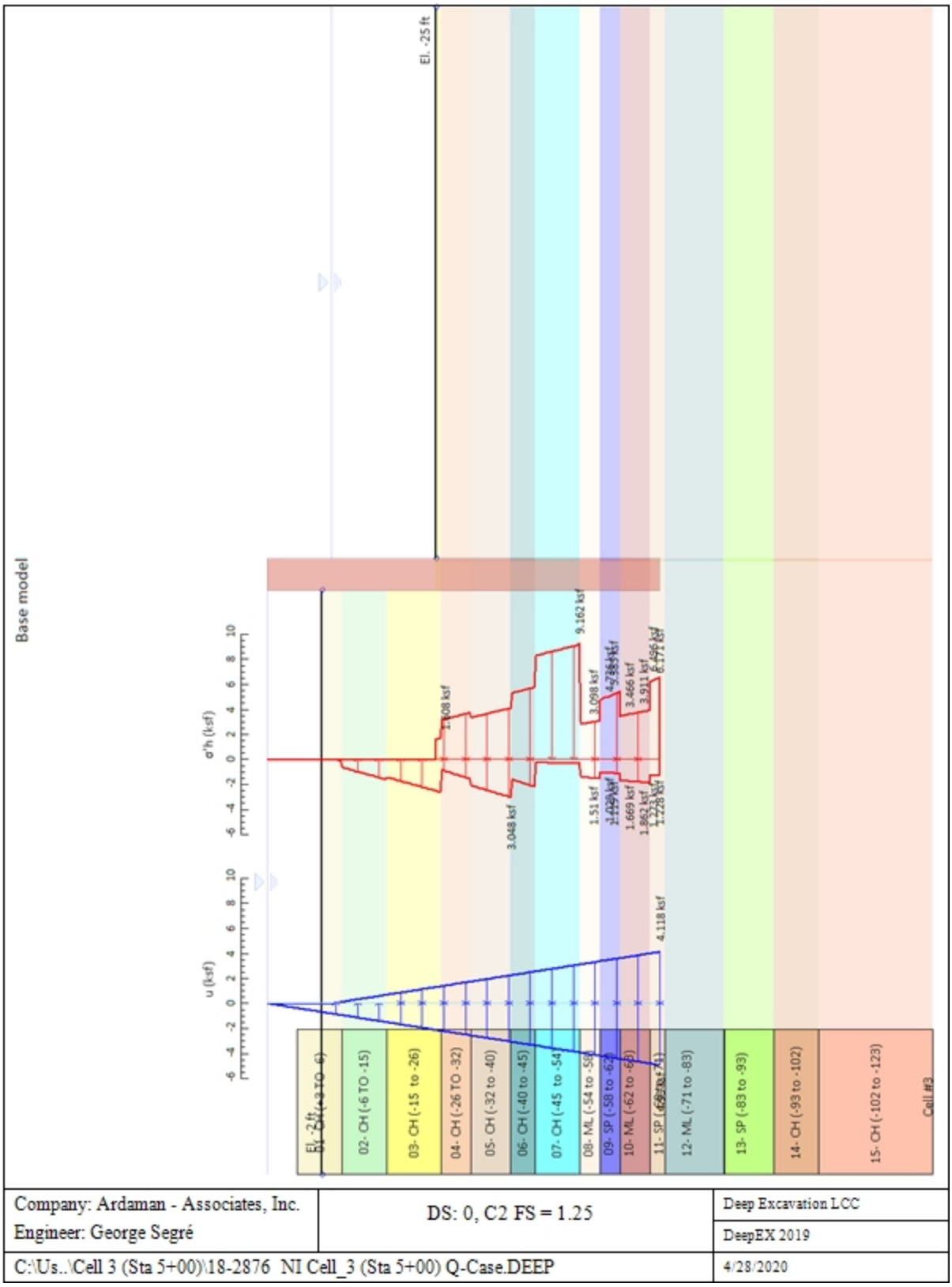
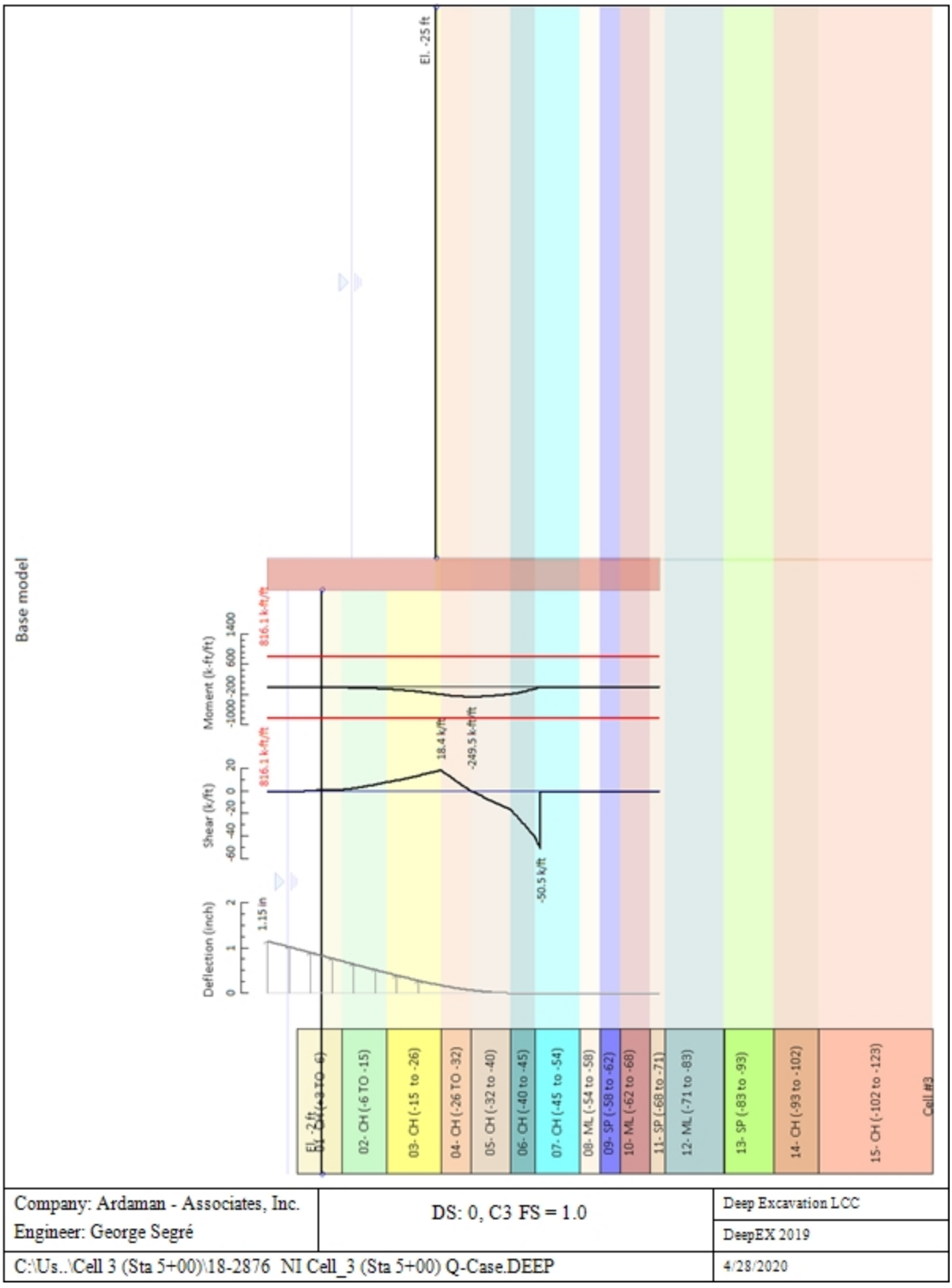


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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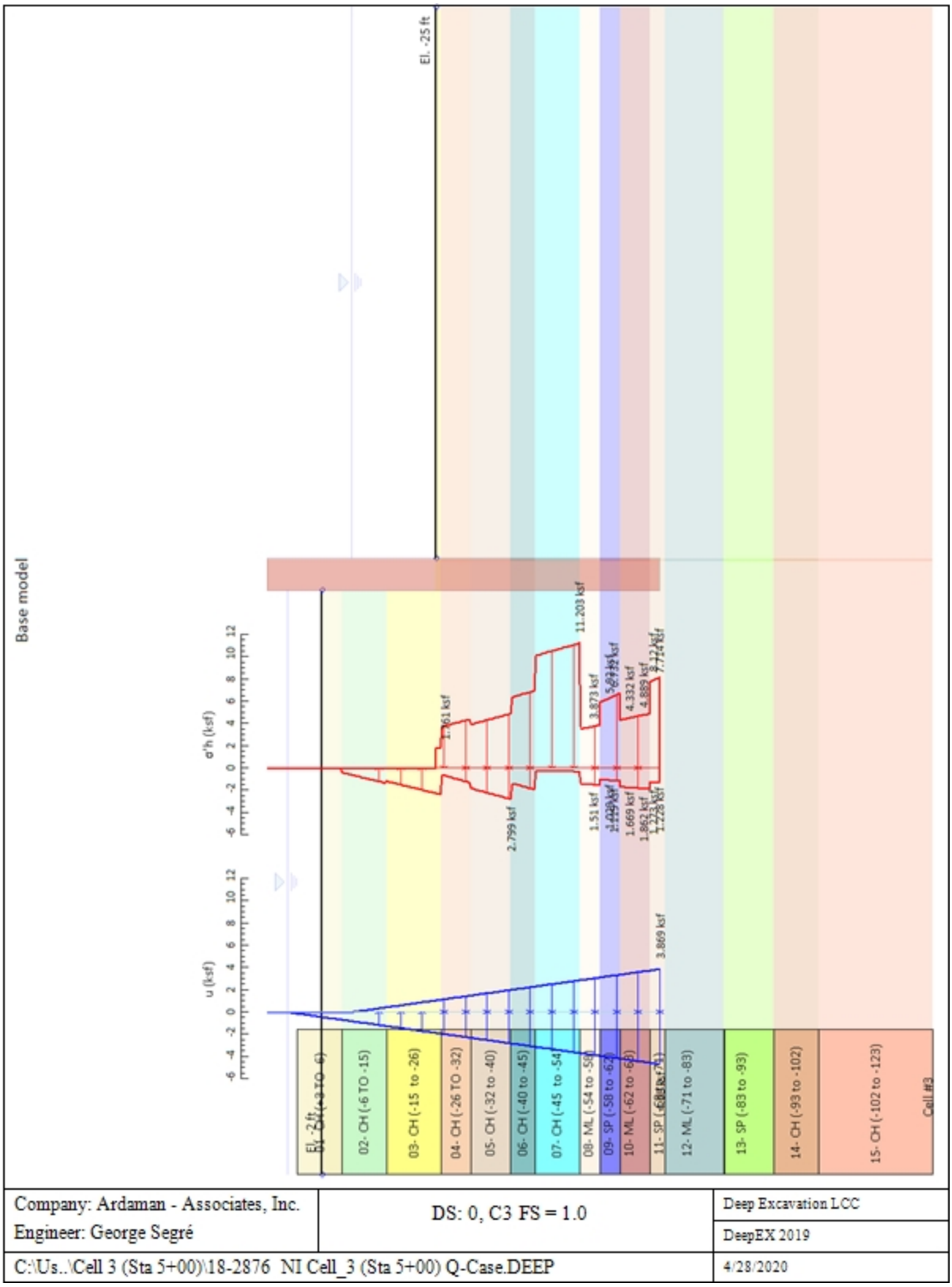
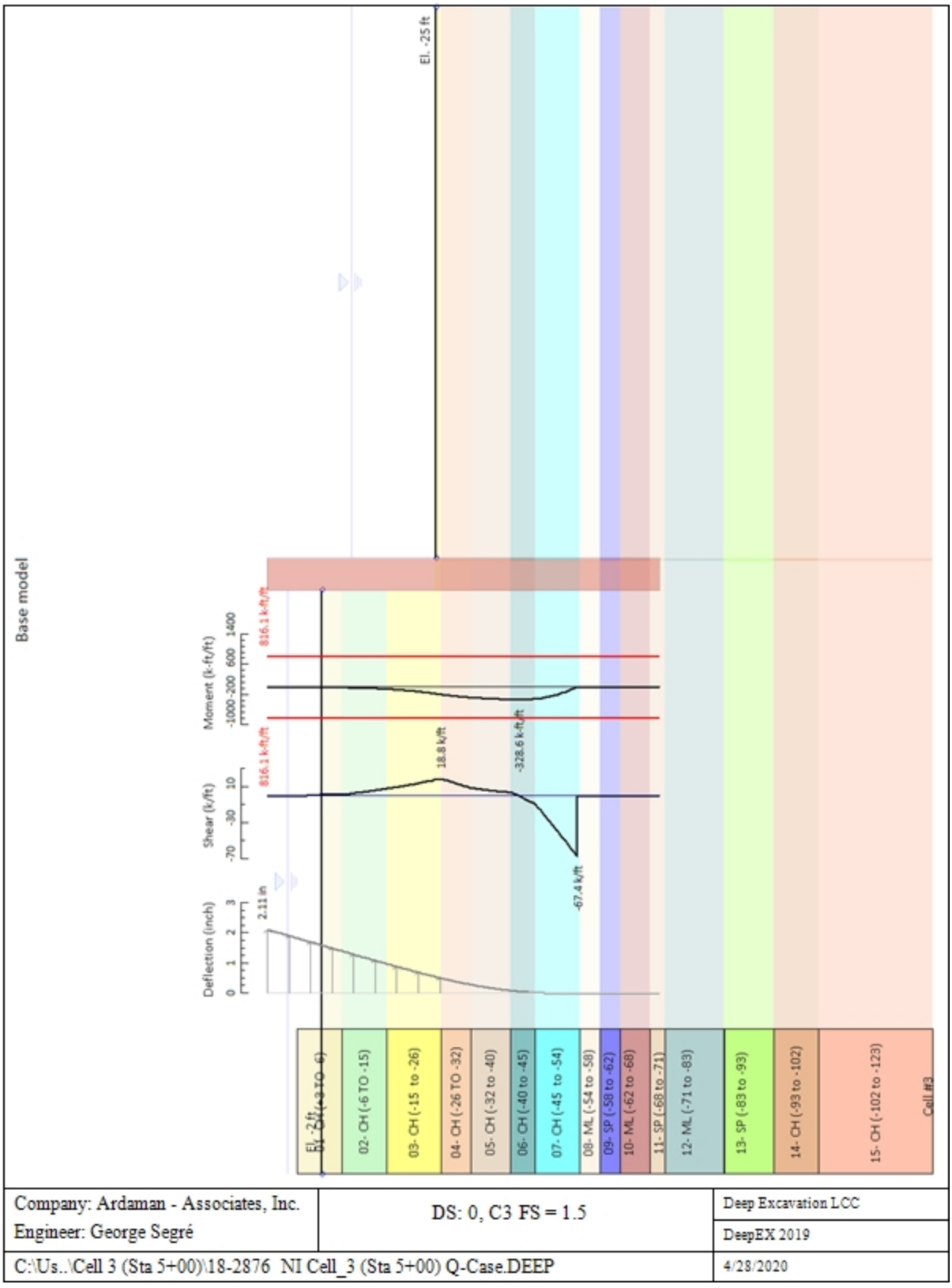


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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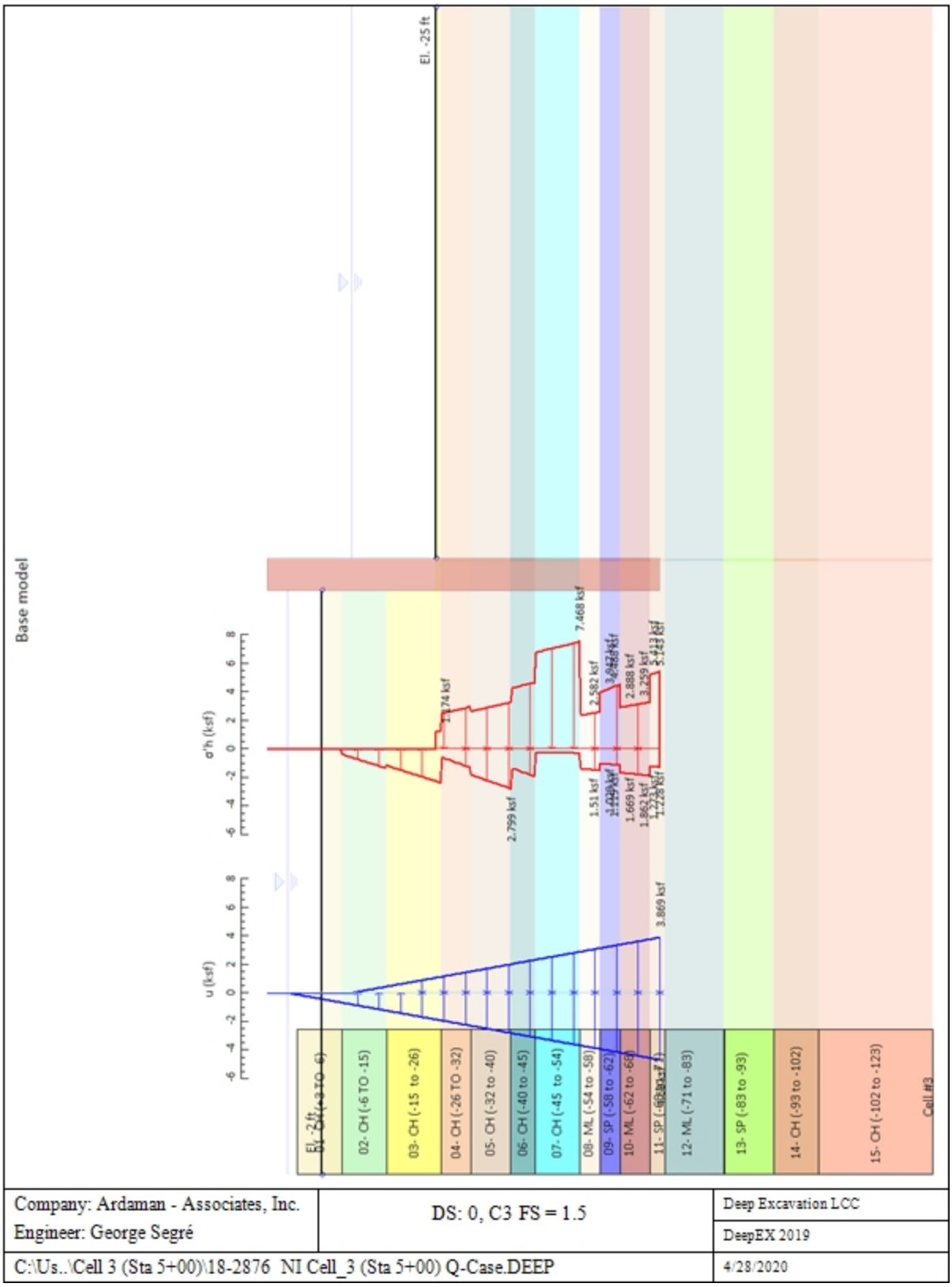

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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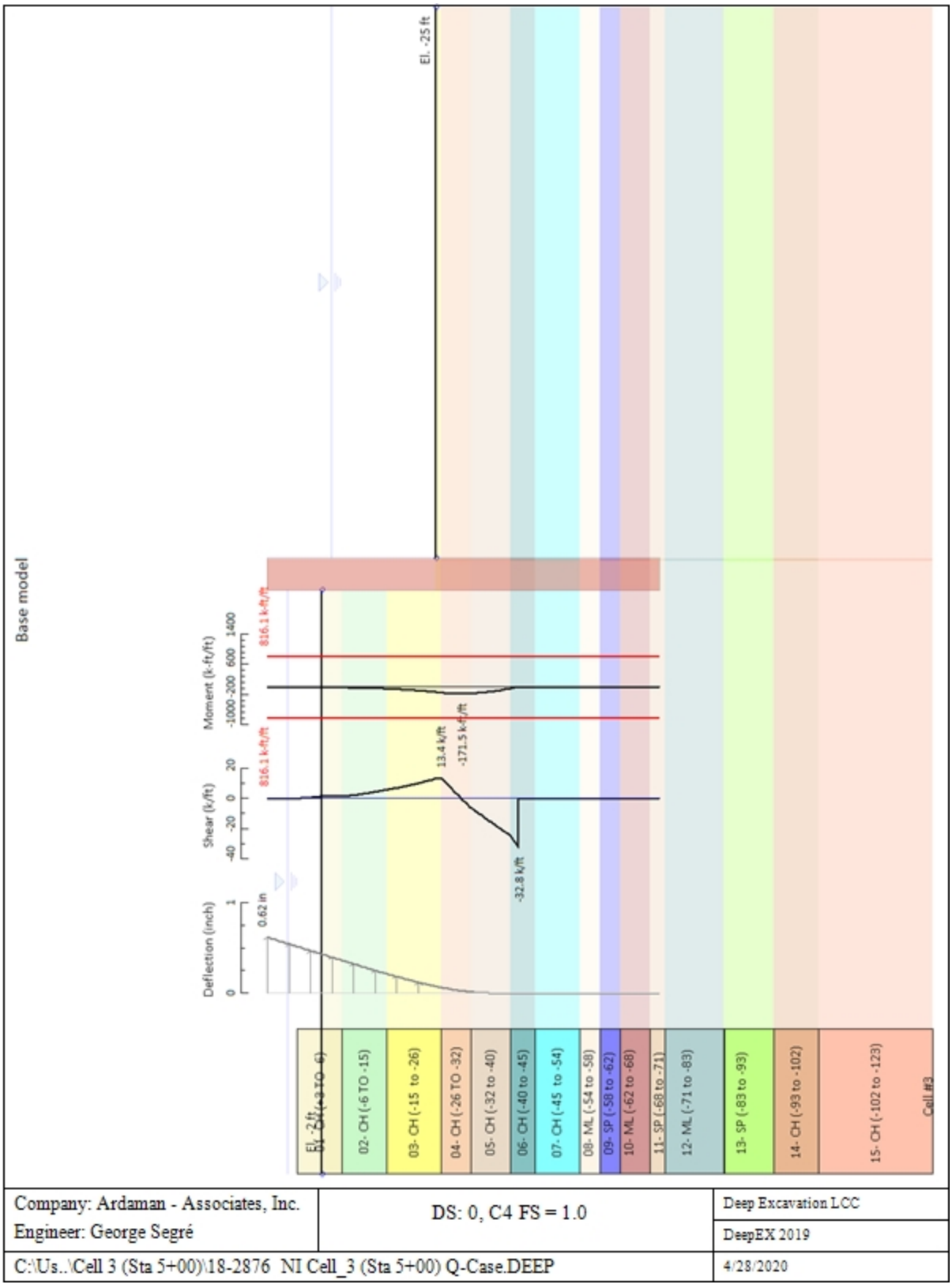

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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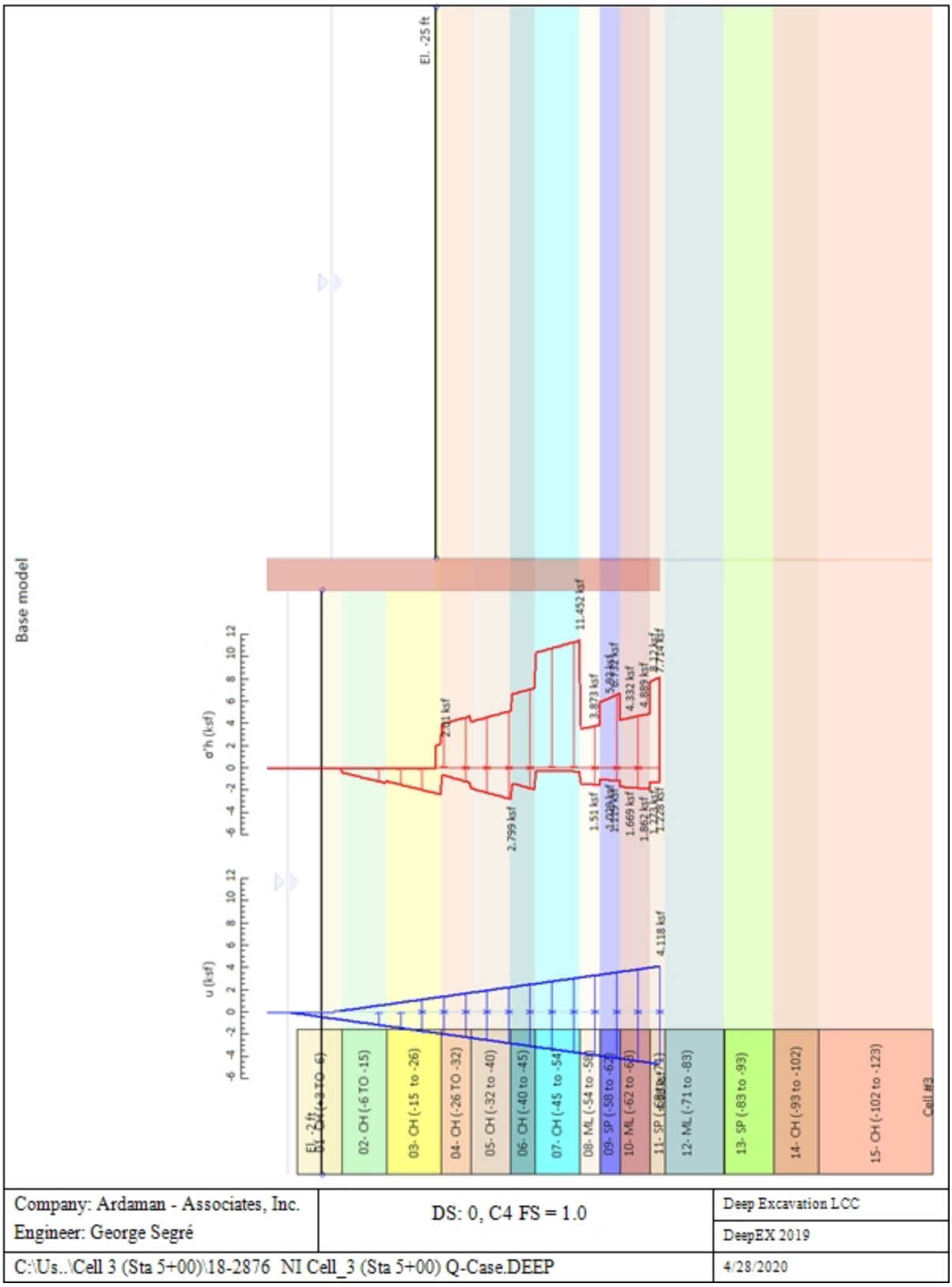

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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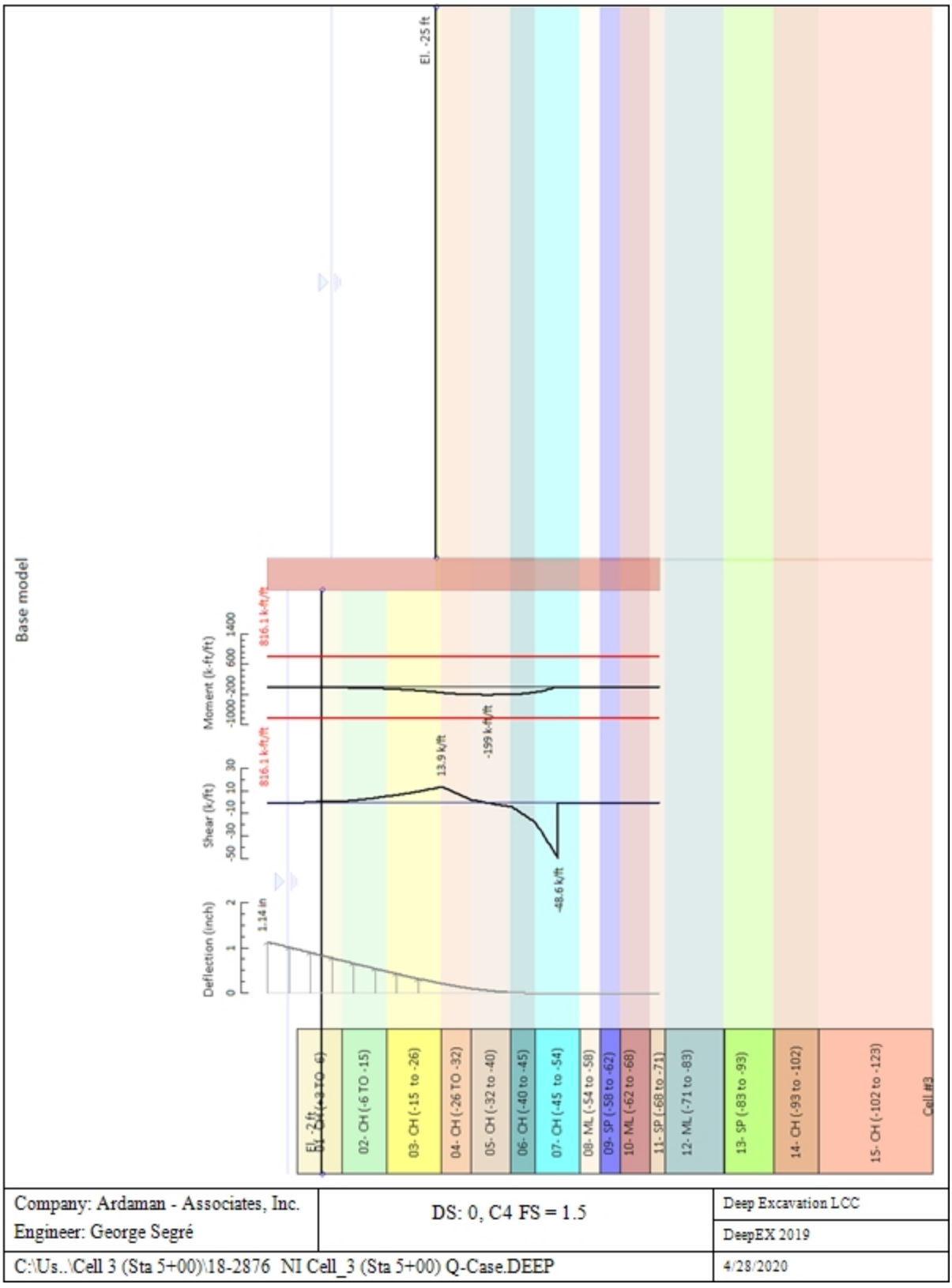

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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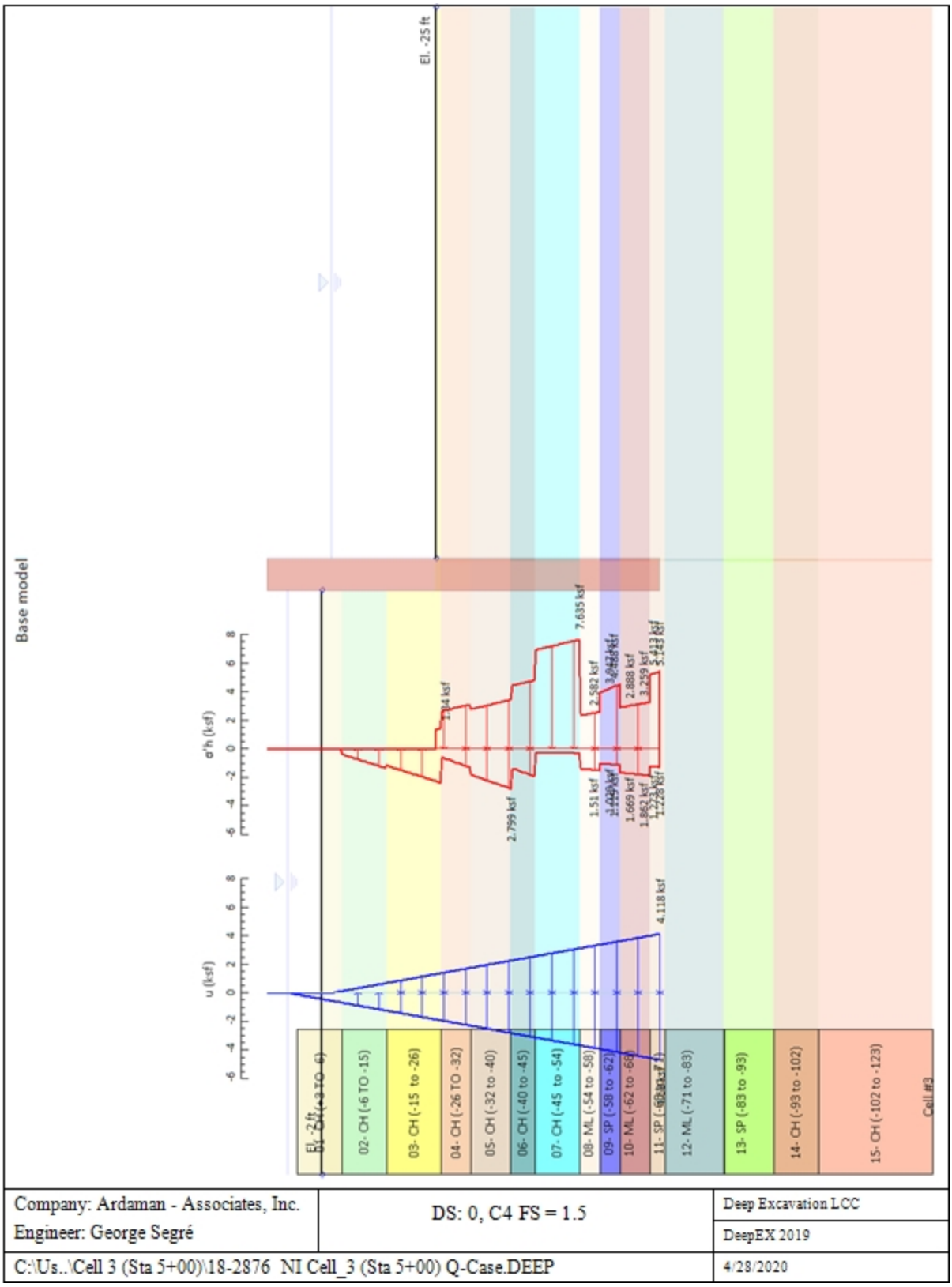

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:39:24 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	23	0	500	23	23	300	3	0.44	2.28	0.44	2.28	True	EXP	
02- CH (-6 TO	110	110	23	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	23	0	350	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-26 T	124	124	26	0	1250	26	26	521.92	3	0.39	2.56	0.39	2.56	True	Linear	
05- CH (-32 to	120	120	26	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	26	0	1730	26	26	626.3	3	0.39	2.56	0.39	2.56	True	Linear	
07- CH (-45 t	125	125	26	0	3300	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- ML (-54 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
15- CH (-102 t	125	125	26	0	4000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	0.609	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	0.562	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.531	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

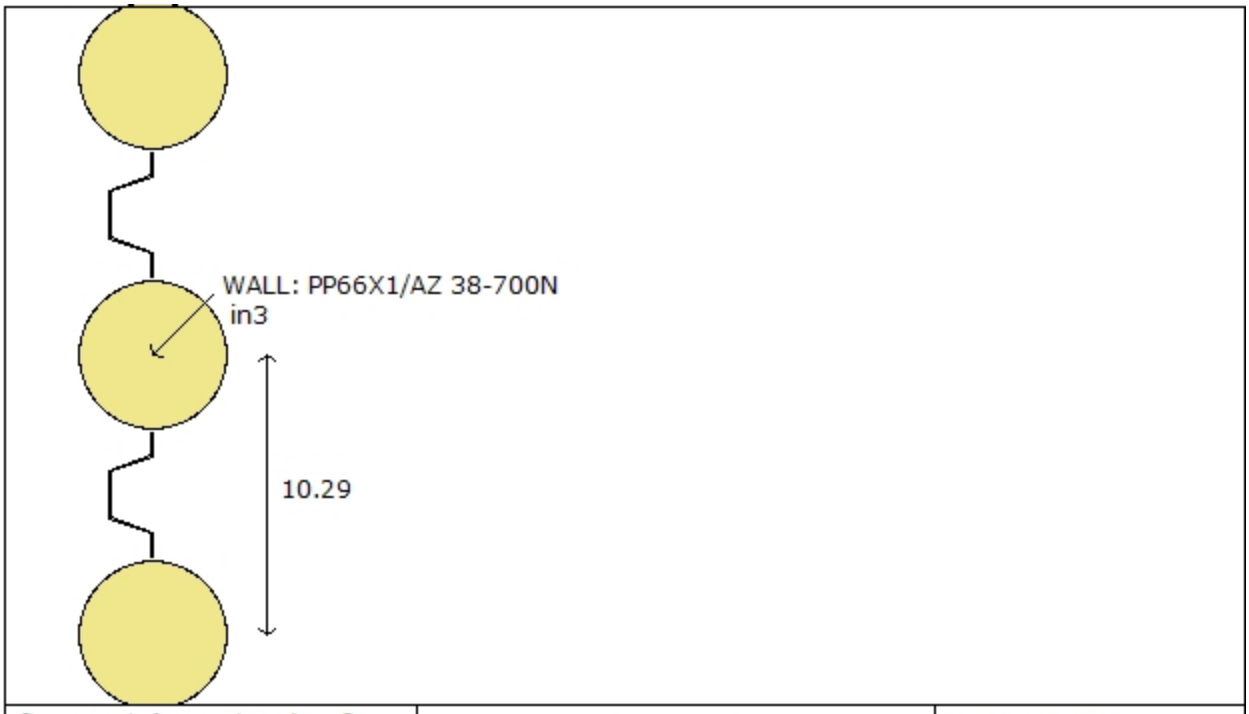
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	0.61
-6	02- CH (-6 TO -	1	0
-15	03- CH (-15 to	1	0.61
-26	04- CH (-26 TO	1	0.56
-32	05- CH (-32 to	1	0
-40	06- CH (-40 to	1	0.56
-45	07- CH (-45 to	1	0.56
-54	08- ML (-54 to	1	0.53
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.53
-68	11- SP (-68 to -	1	0.5
-71	12- ML (-71 to	1	0.53
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	0.56
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.579	1.762	2.657
Stage 1	Simple span	N/A	1.6	1.335	1.409	2.126
Stage 2	Simple span	N/A	1.6	1.747	2.006	2.965
Stage 3	Simple span	N/A	1.6	1.483	1.605	2.372
Stage 4	Simple span	N/A	1.6	1.812	2.075	3.005
Stage 5	Simple span	N/A	1.6	1.348	1.383	2.003
Stage 6	Simple span	N/A	1.6	2.065	2.422	3.405
Stage 7	Simple span	N/A	1.6	1.546	1.615	2.27

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

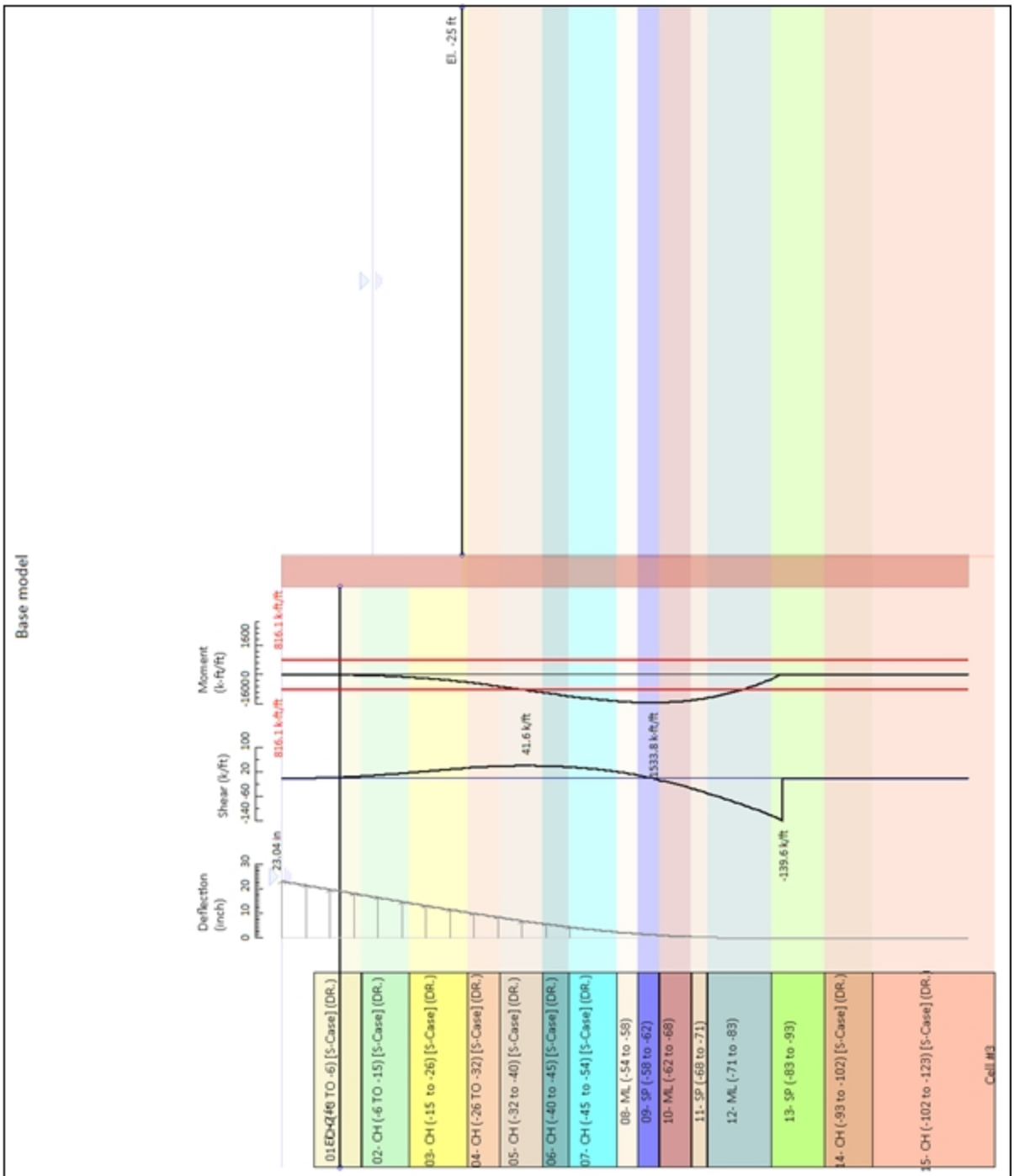
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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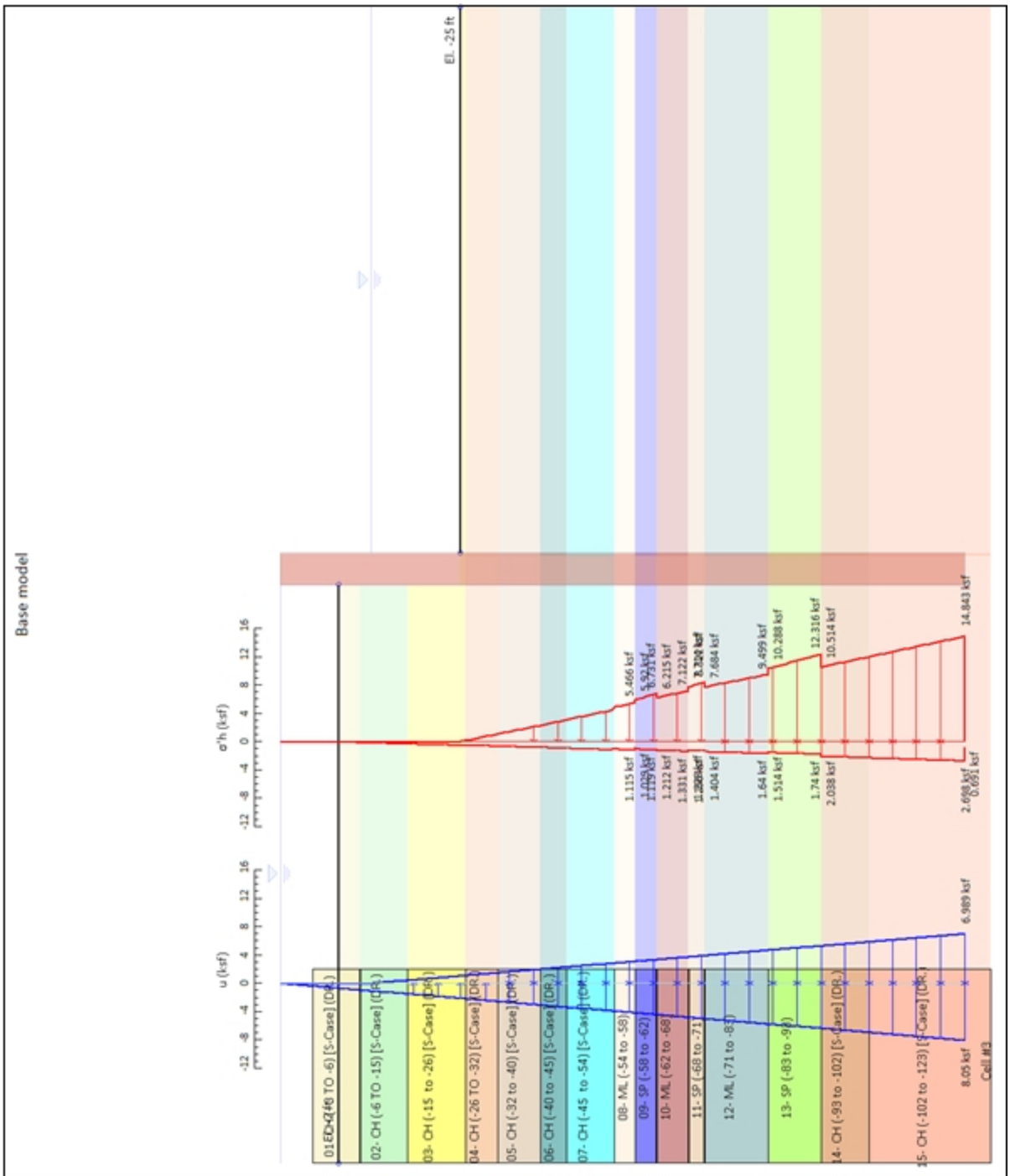

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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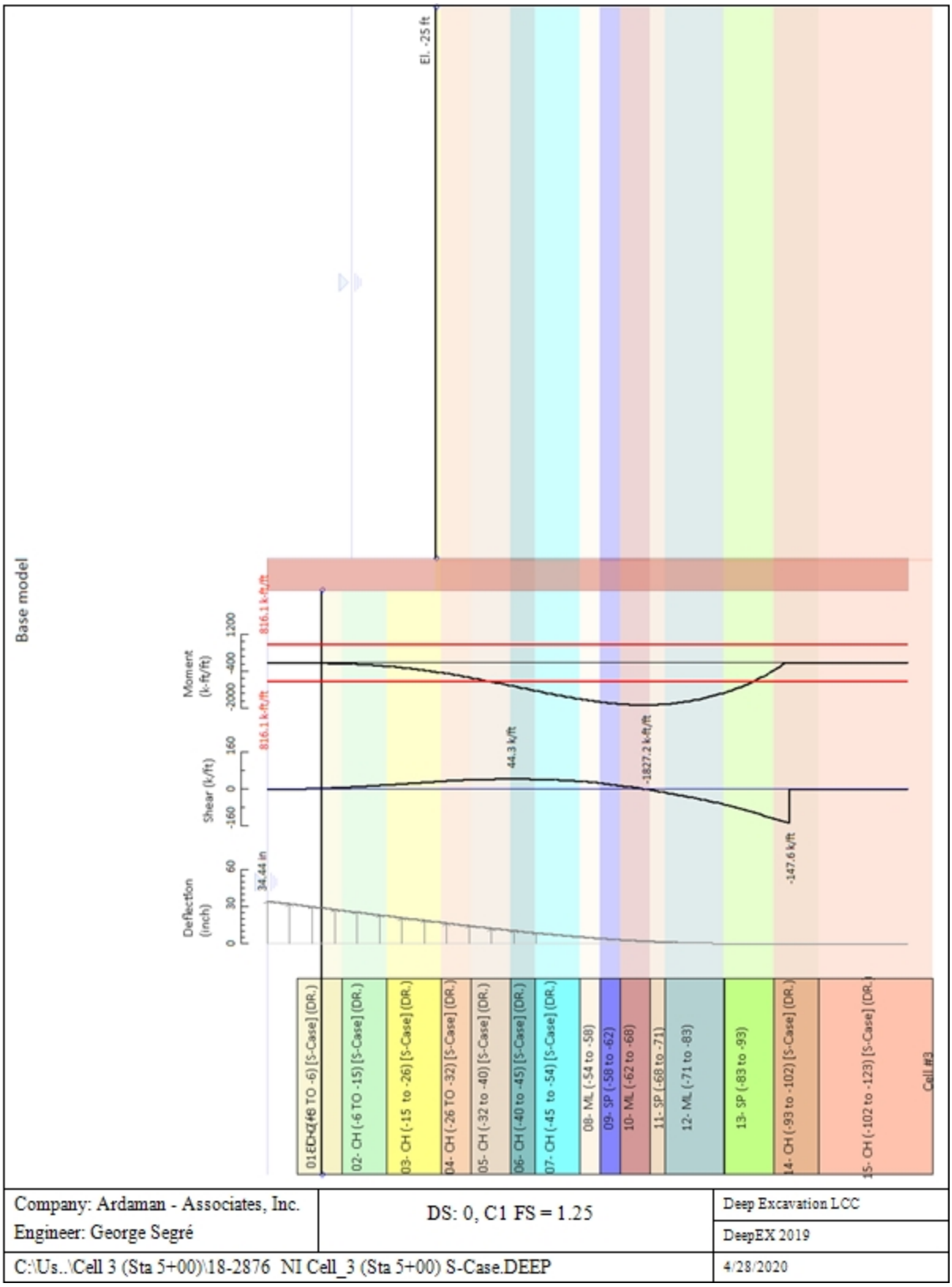

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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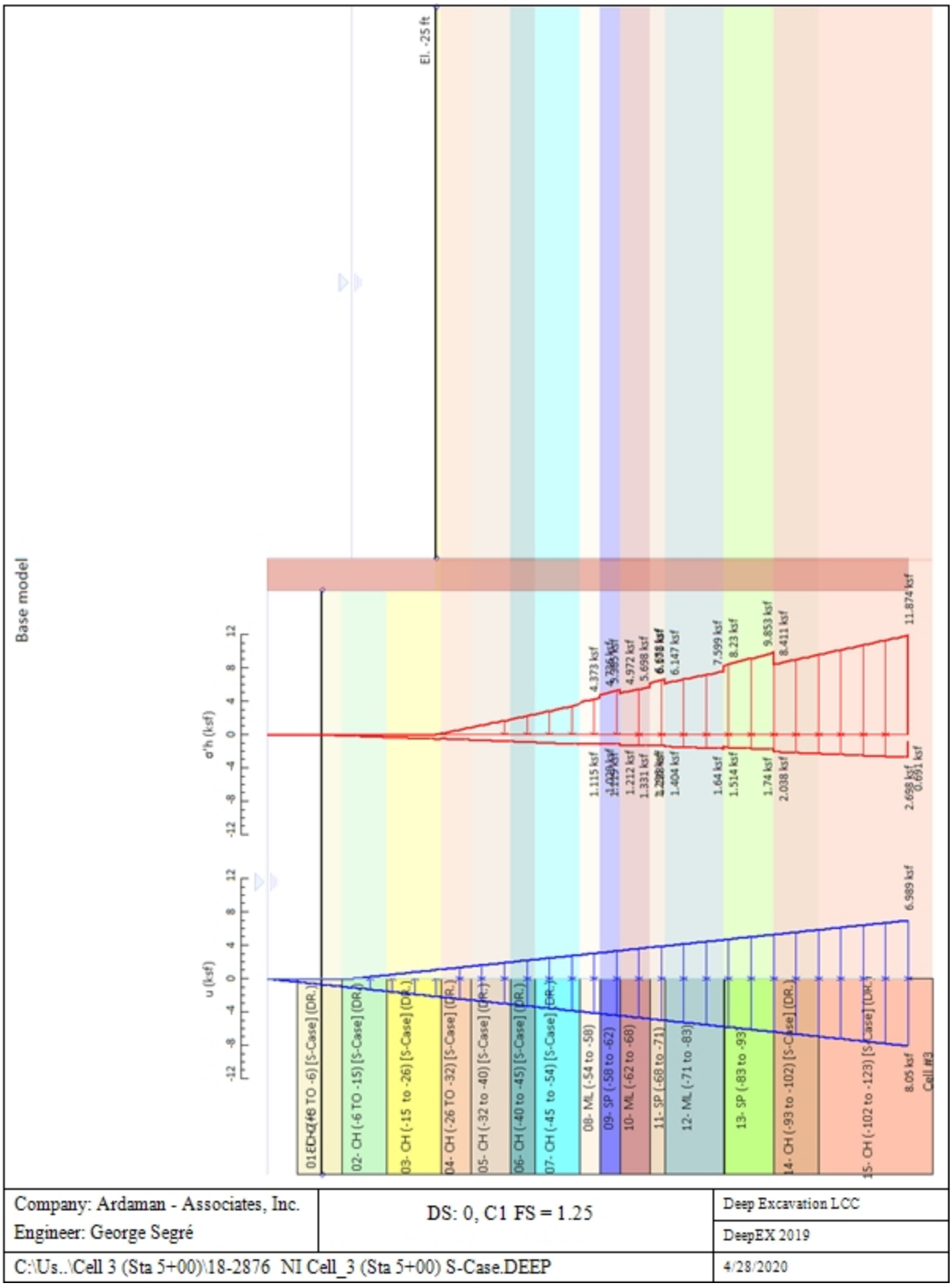

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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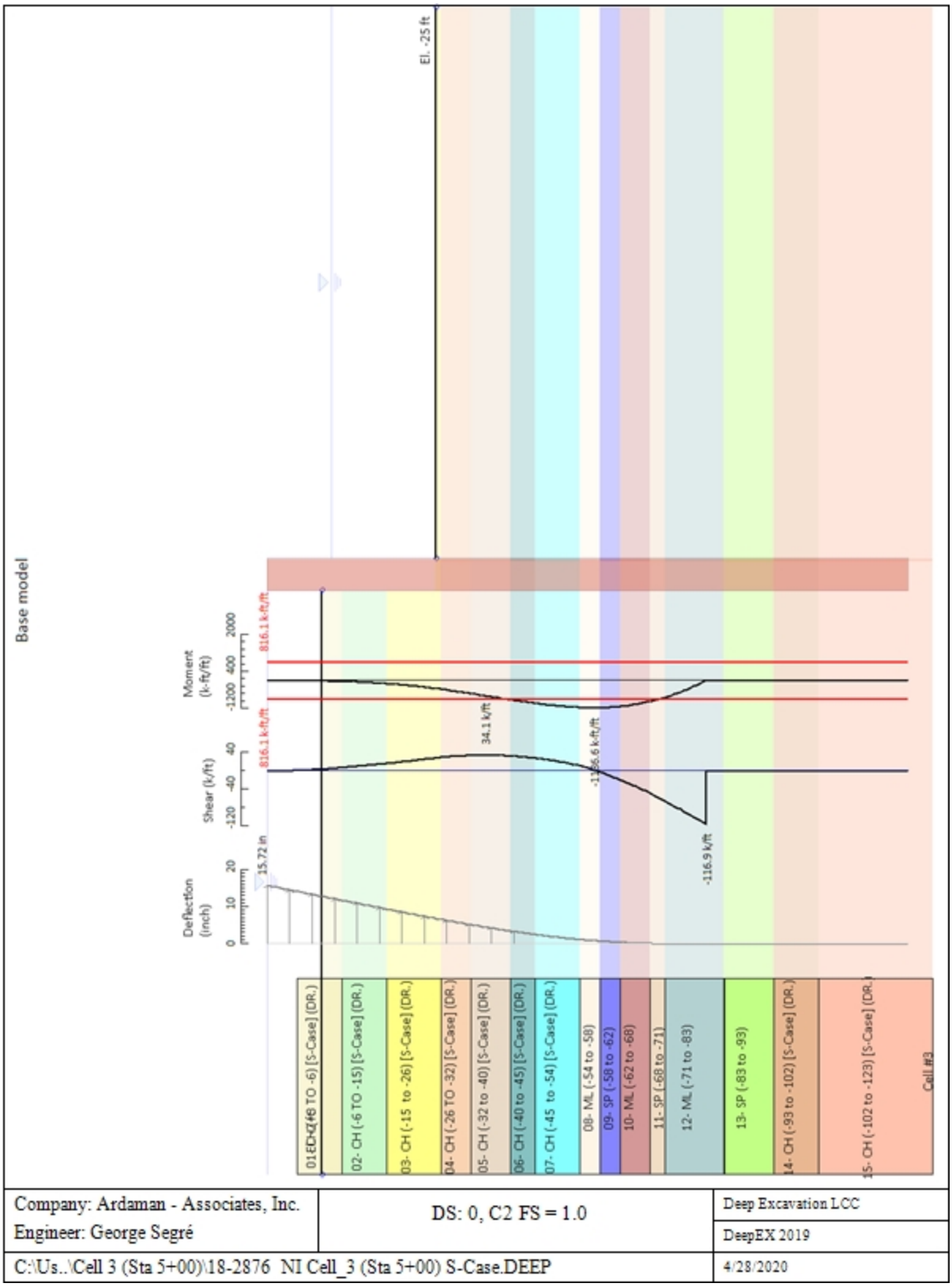

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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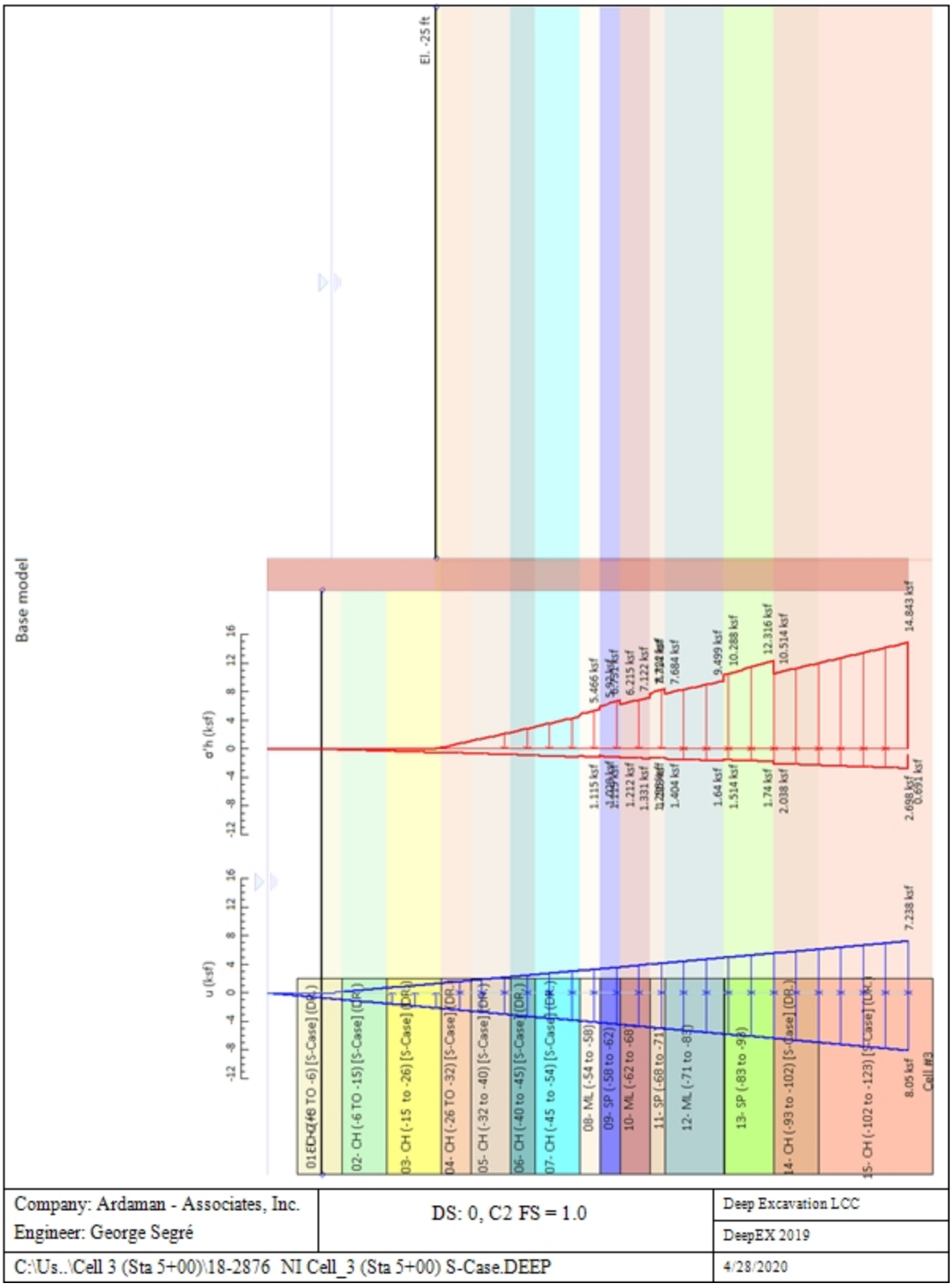

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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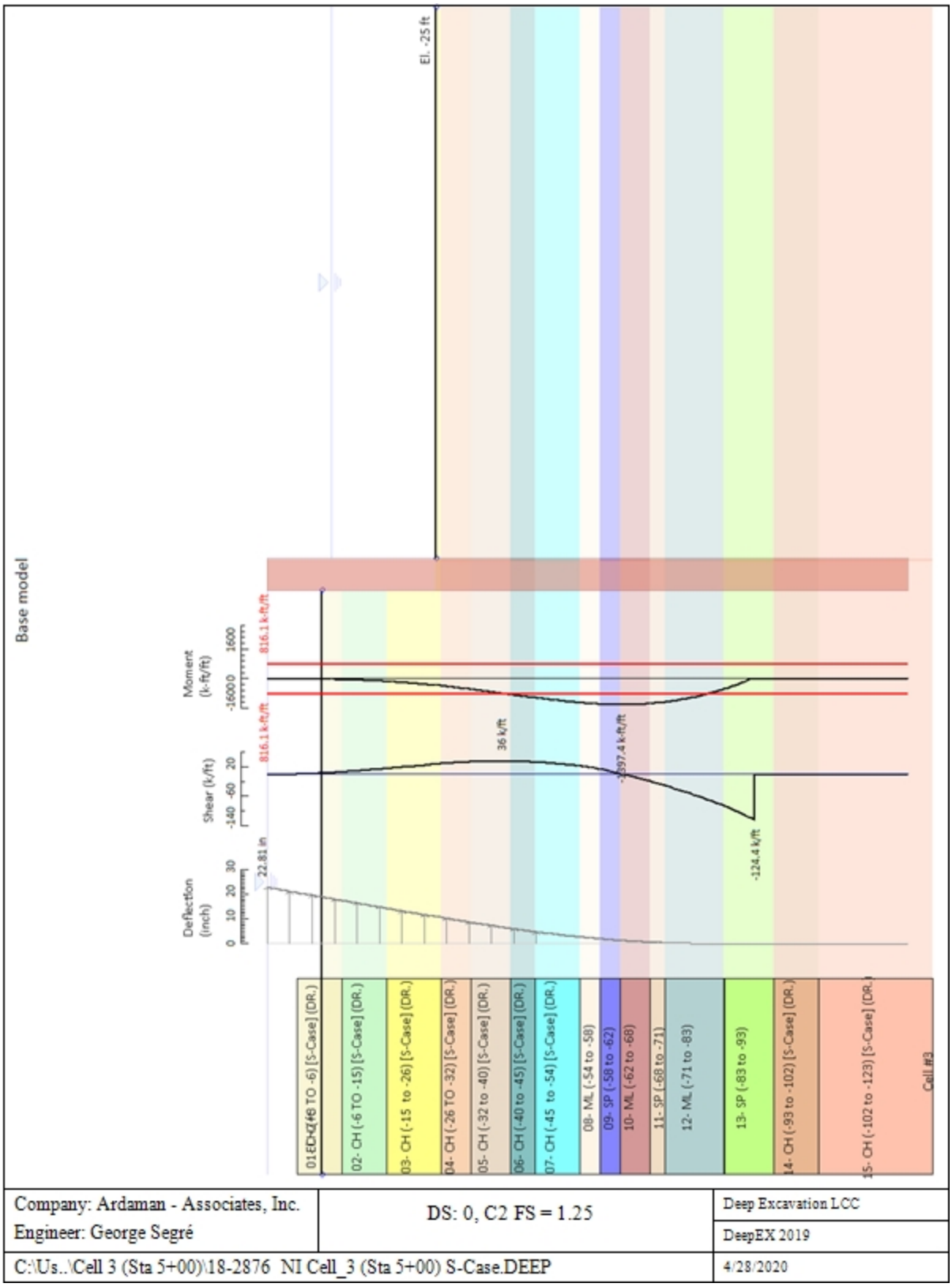

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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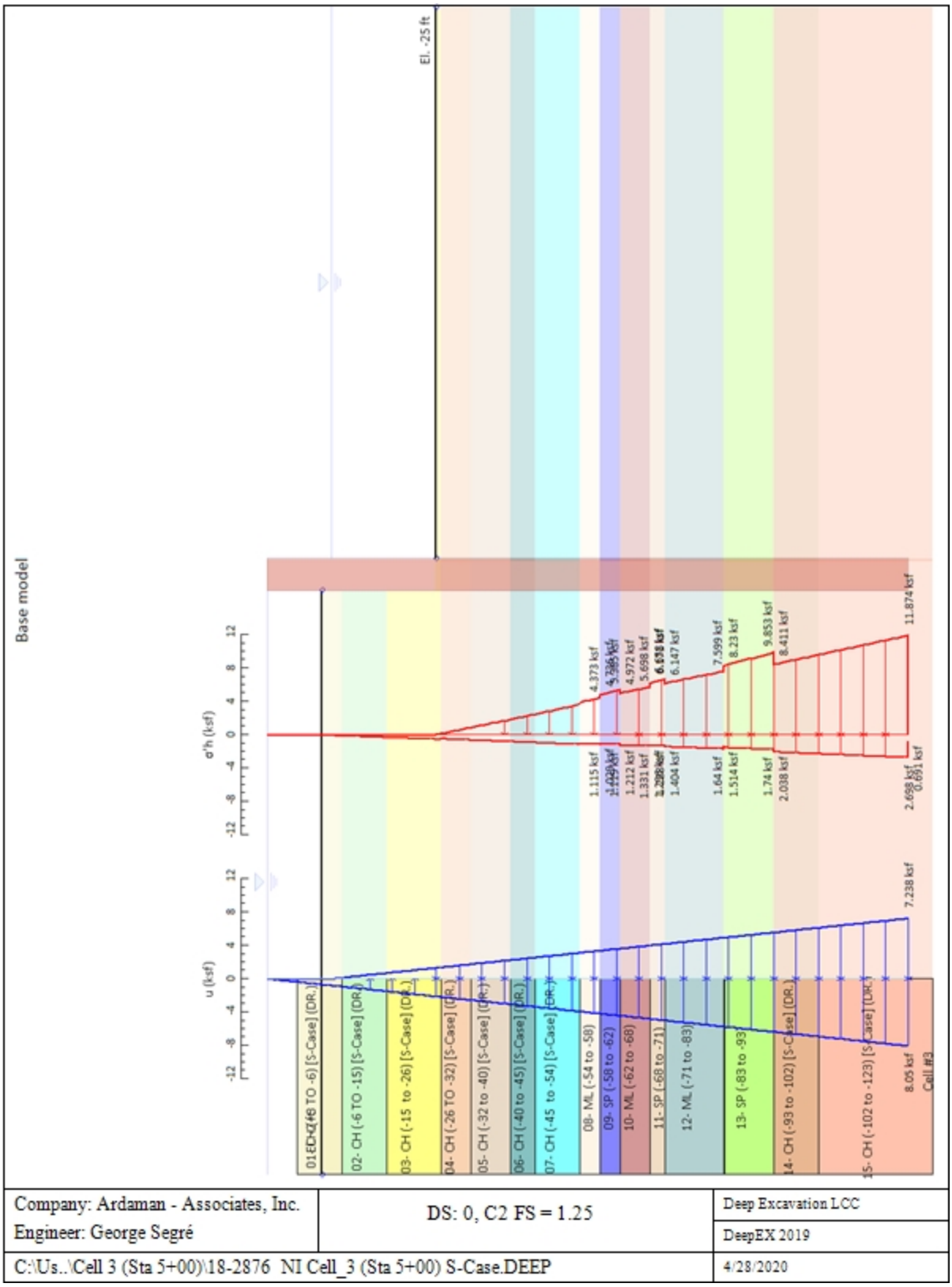

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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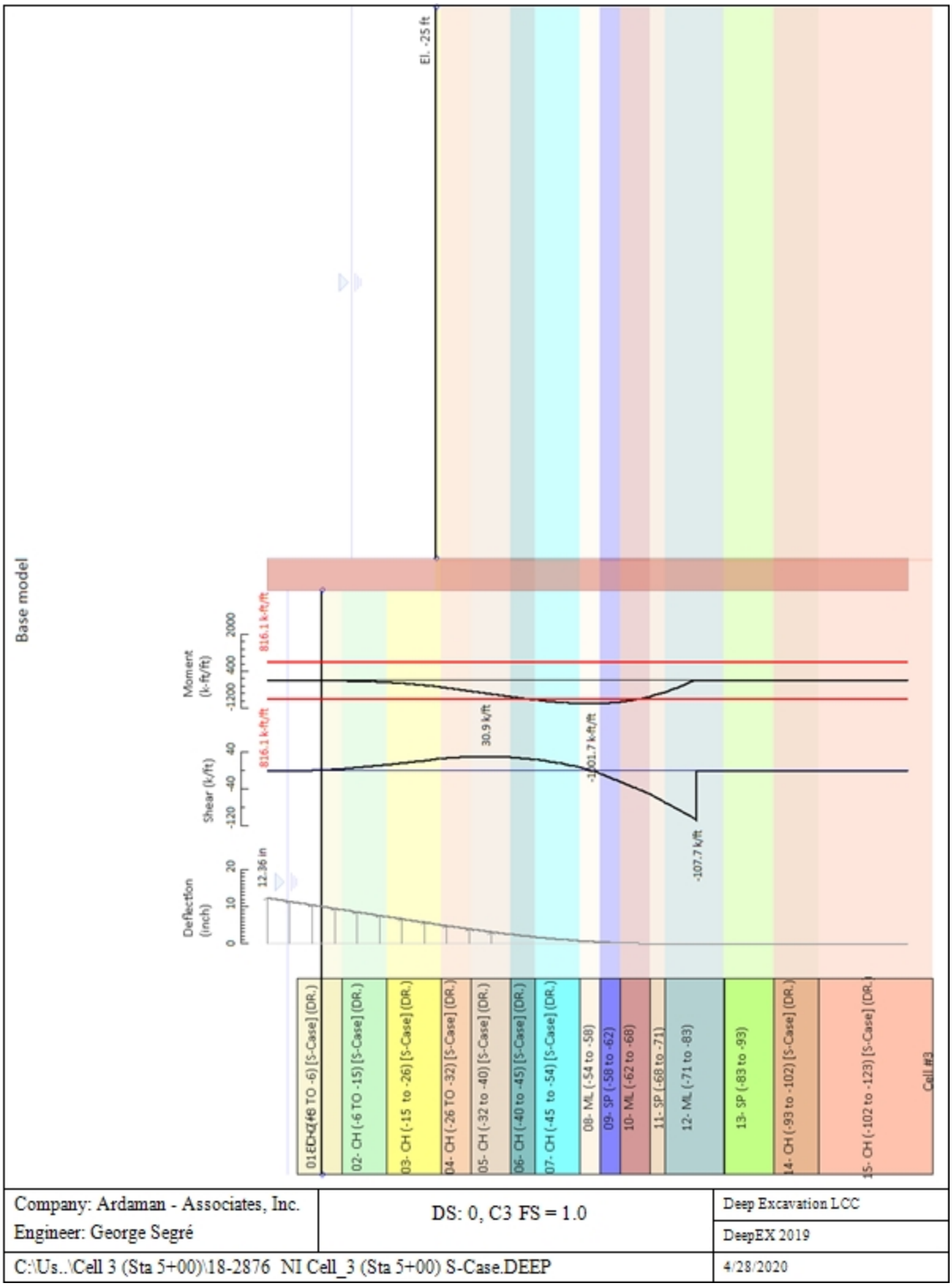

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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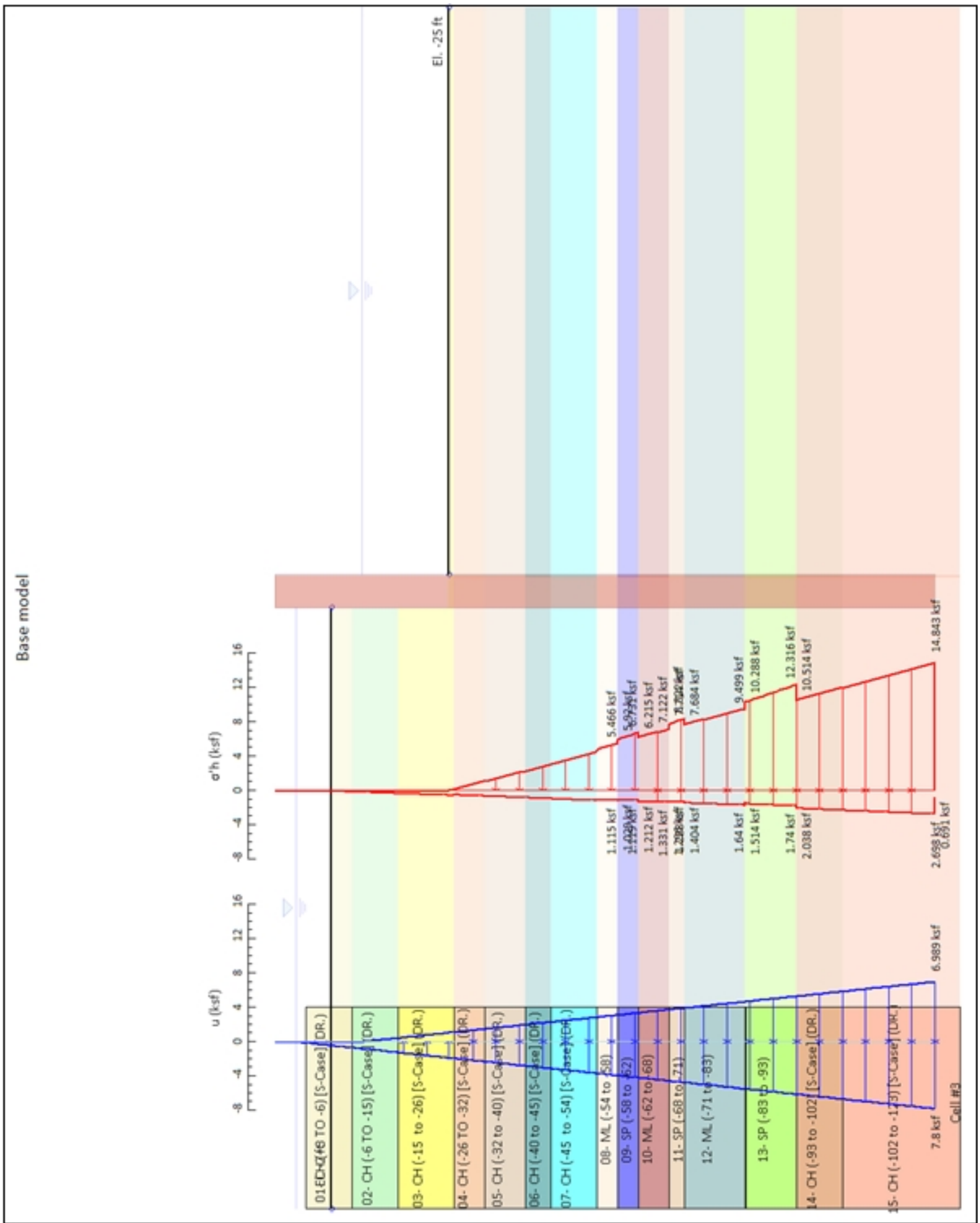

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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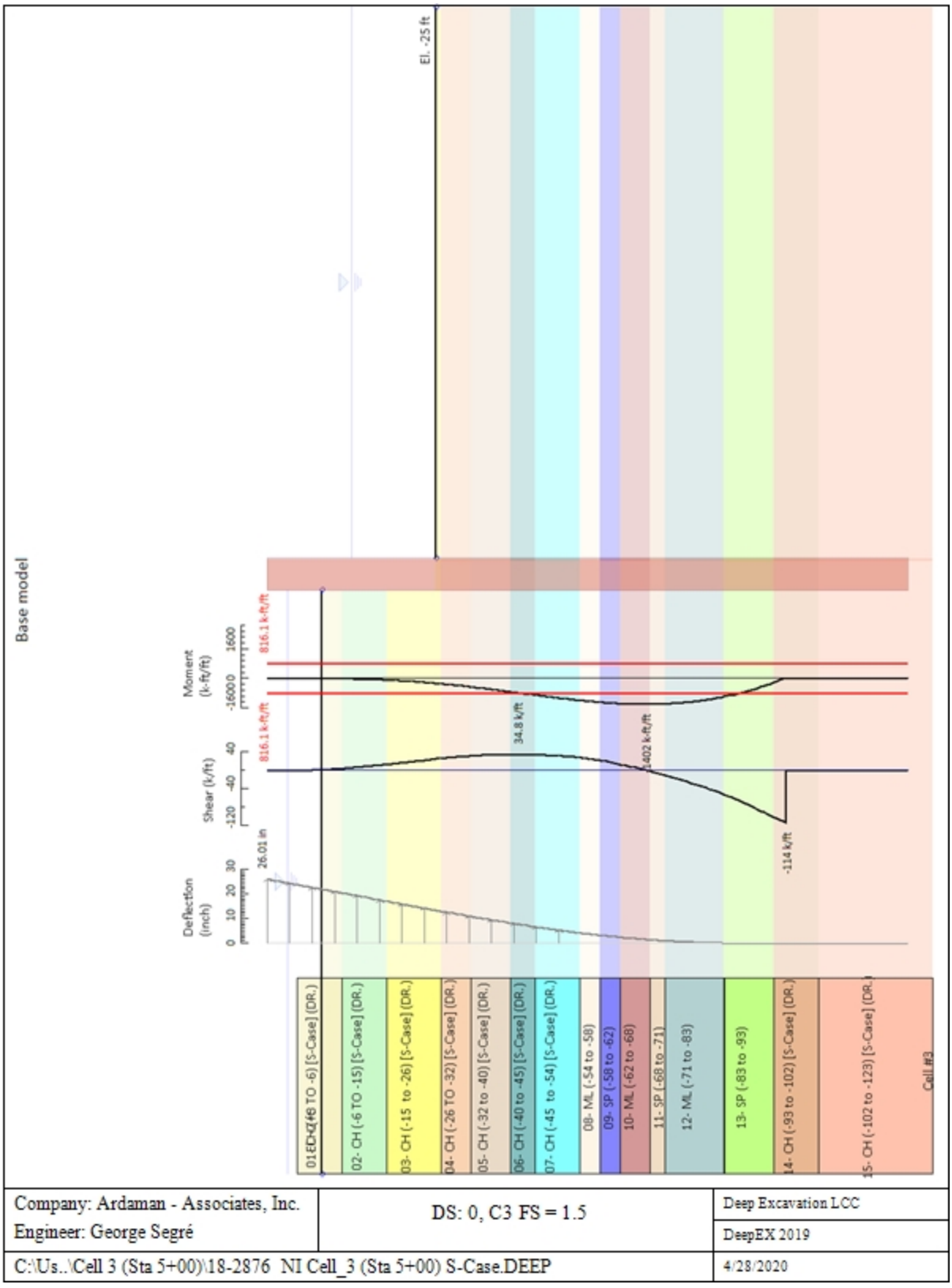

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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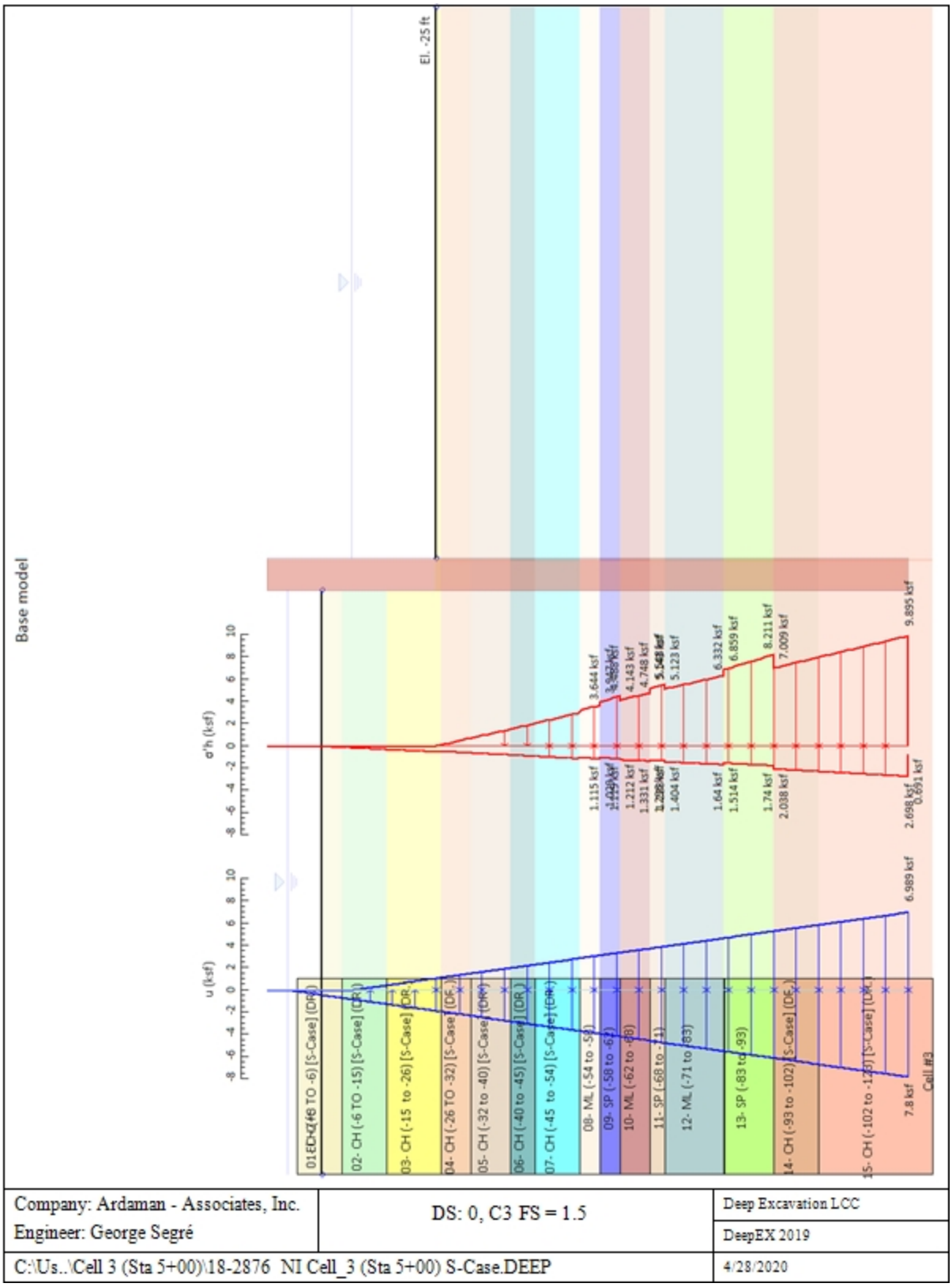

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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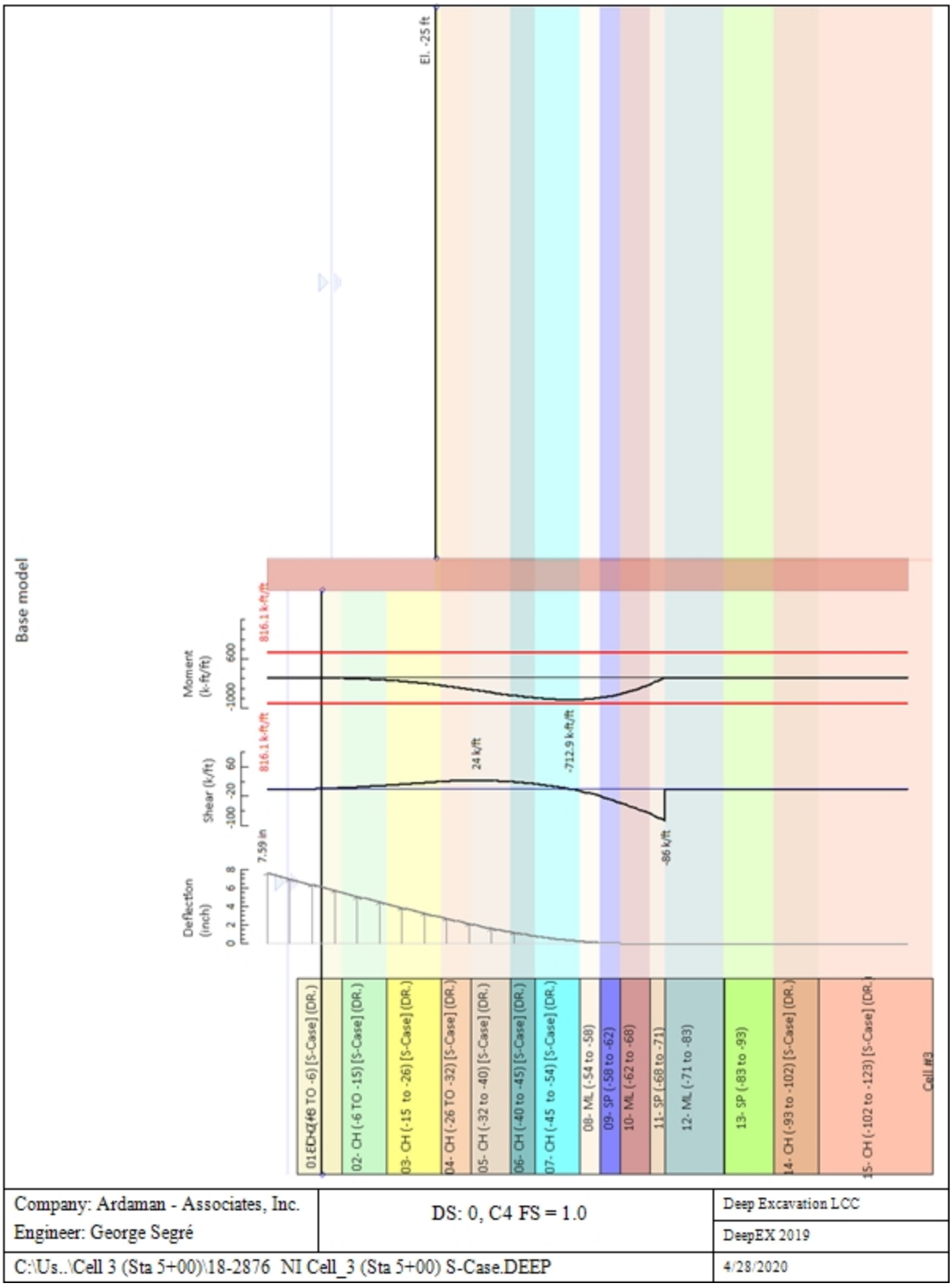

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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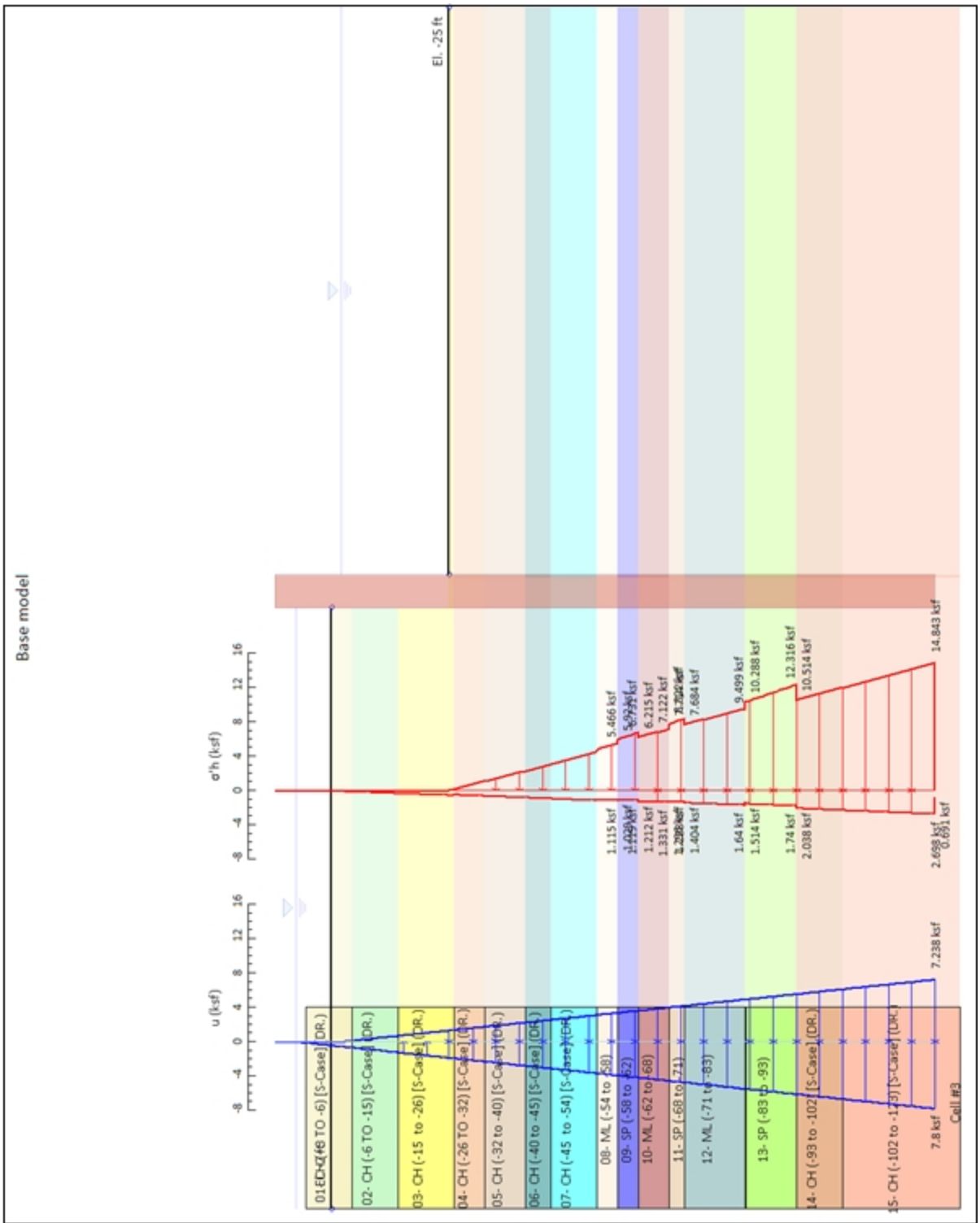

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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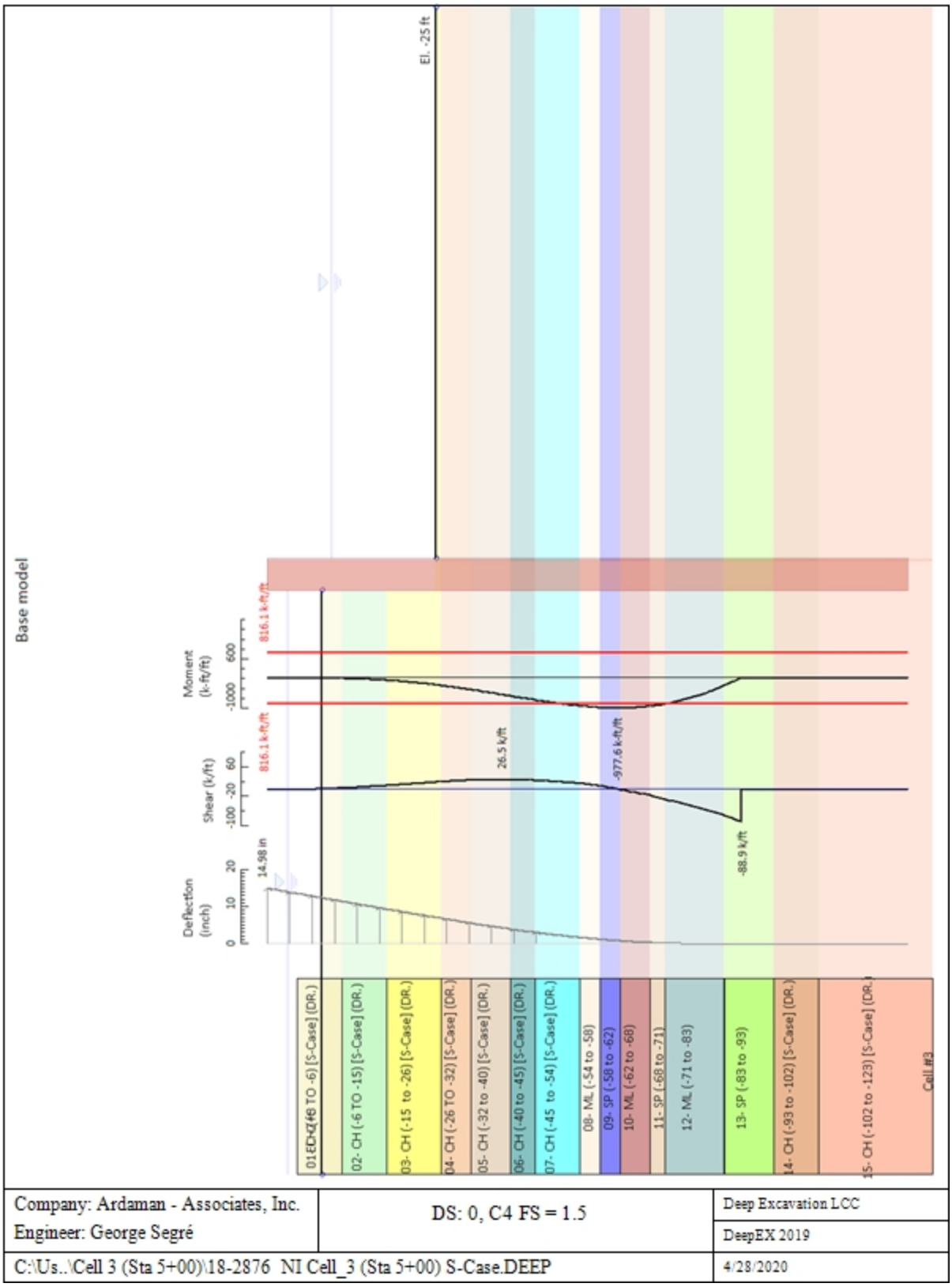

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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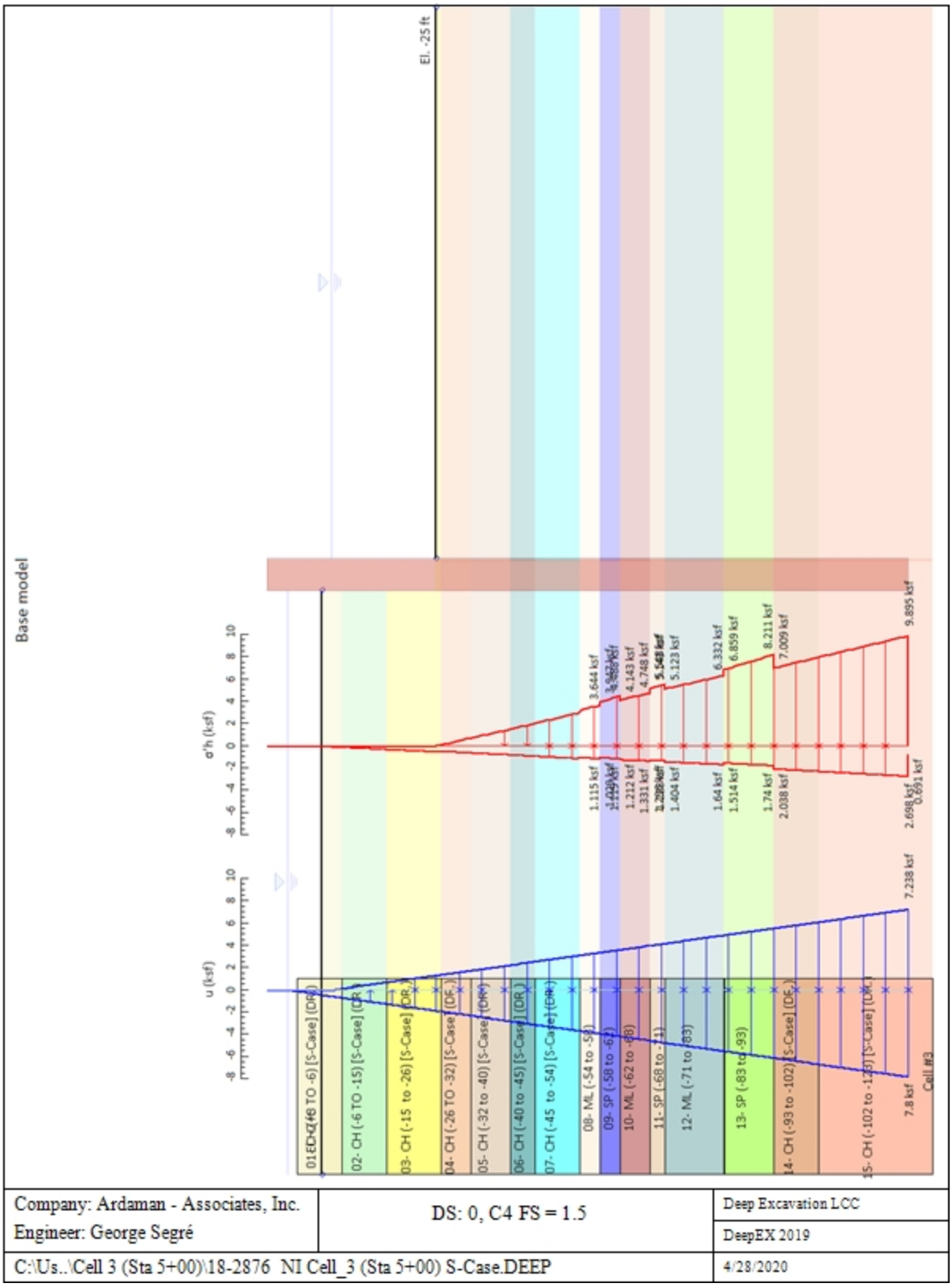

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+00)\18-2876 NI Cell_3 (Sta 5+00) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 5+75 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -116.3 ft., NAVD88

Length of Sheetting = 125.3 ft.

Use = 126.0 ft.

Design Tip Elev. = -117.0 ft., NAVD88

Design Length of Sheeting = 126.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-22	1.00	1.00	-71.00	1,035.89	78.47	10.44
		Open excavation - degraded	9	-22	1.00	1.25	-91.28	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-57.49	635.14	77.60	4.72
		Open excavation - degraded	9	-8	1.00	1.25	-64.58	--	--	--
Q-Case	3	Open excavation - degraded	5	-22	1.00	1.00	-62.00	678.65	73.02	5.34
		Open excavation - degraded	5	-22	1.00	1.50	-95.10	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-51.49	365.06	69.85	2.21
		Open excavation - degraded	5	-8	1.00	1.50	-60.76	--	--	--
S-Case	1	Open excavation - degraded	9	-22	1.00	1.00	-95.30	2,289.37	183.23	42.58
		Open excavation - degraded	9	-22	1.00	1.25	-110.70	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-80.60	1,312.19	127.89	17.80
		Open excavation - degraded	9	-8	1.00	1.25	-90.40	--	--	--
S-Case	3	Open excavation - degraded	5	-22	1.00	1.00	-88.30	1,642.87	150.16	25.85
		Open excavation - degraded	5	-22	1.00	1.50	-116.30	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-72.90	833.35	98.81	9.25
		Open excavation - degraded	5	-8	1.00	1.50	-90.40	--	--	--
						Governing Value:	-116.30	2,289.37	183.23	42.58

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 8:57:44 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	0	0	500	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	0	0	350	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-26 T	124	124	0	0	1250	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-32 to	120	120	0	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	0	0	1730	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-45 t	125	125	0	0	3300	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- ML (-54 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	0	0	3500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
15- CH (-102 t	125	125	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	1	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.741	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

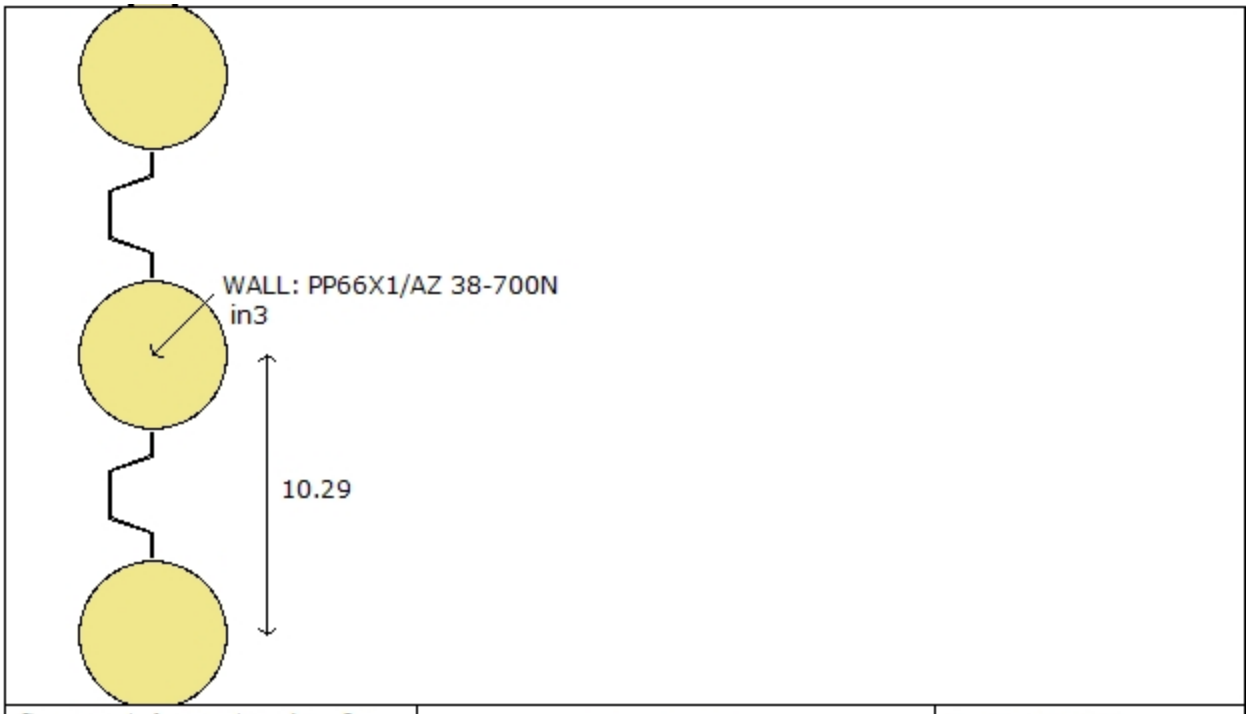
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	1
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	1
-26	04- CH (-26 TO	1	1
-32	05- CH (-32 to	1	1
-40	06- CH (-40 to	1	1
-45	07- CH (-45 to	1	1
-54	08- ML (-54 to	1	0.74
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.74
-68	11- SP (-68 to -	1	1
-71	12- ML (-71 to	1	0.74
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	1
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.369	1.369	1.934
Stage 1	Simple span	N/A	1.6	1.095	1.095	1.547
Stage 2	Simple span	N/A	1.6	1.935	1.935	2.707
Stage 3	Simple span	N/A	1.6	1.548	1.548	2.166
Stage 4	Simple span	N/A	1.6	1.577	1.577	2.155
Stage 5	Simple span	N/A	1.6	1.051	1.051	1.437
Stage 6	Simple span	N/A	1.6	2.379	2.379	3.161
Stage 7	Simple span	N/A	1.6	1.586	1.586	2.108

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

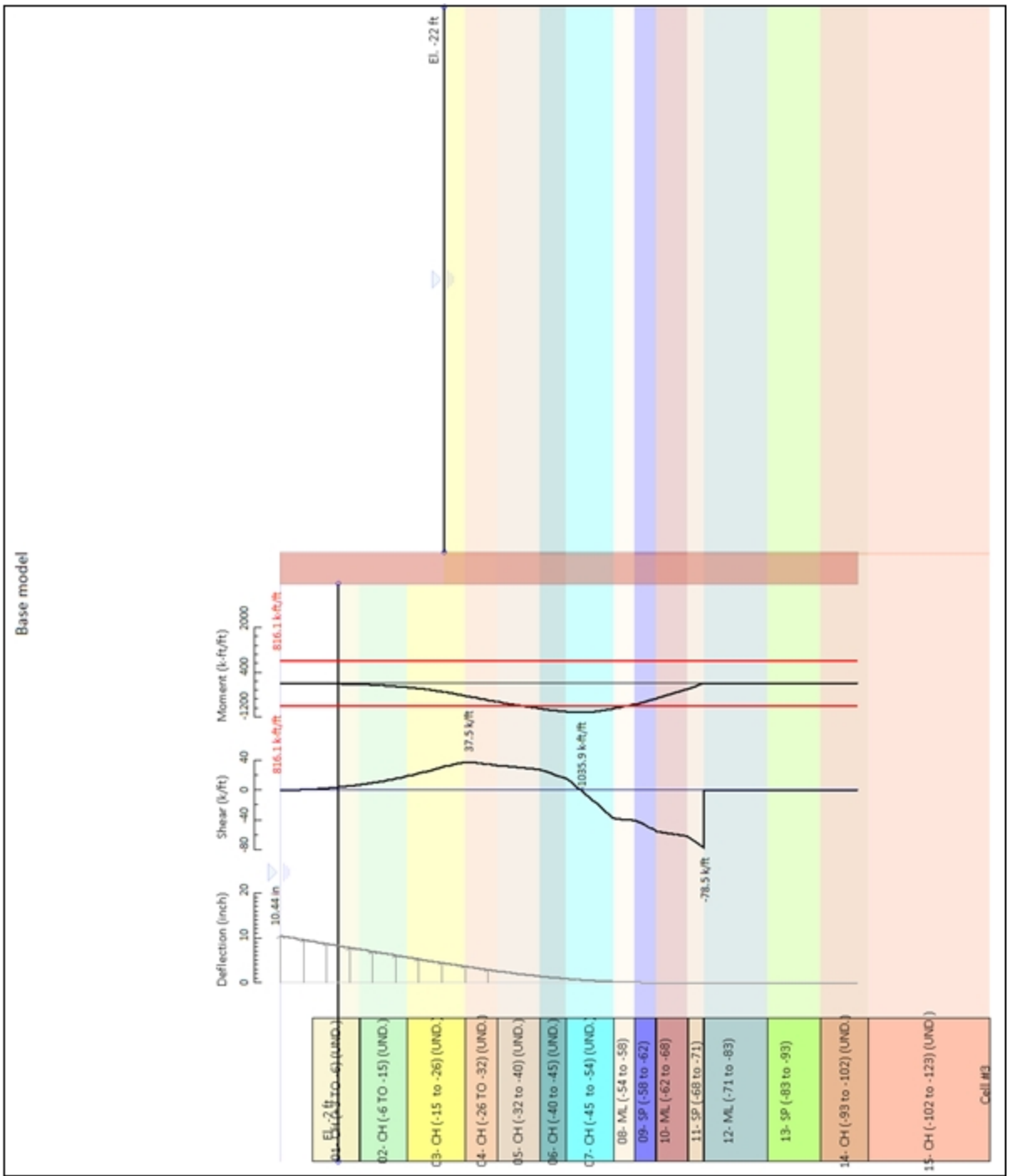
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

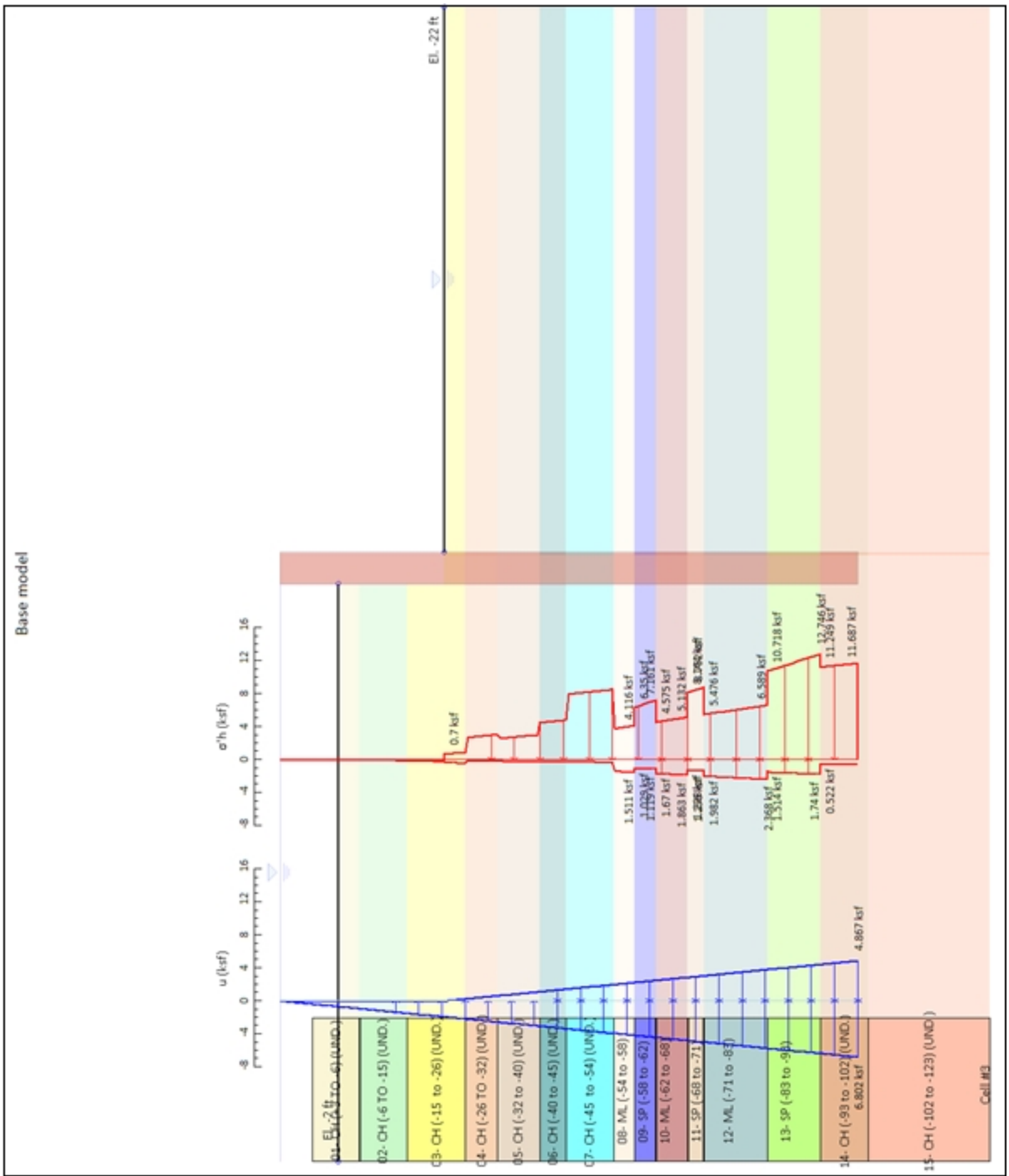
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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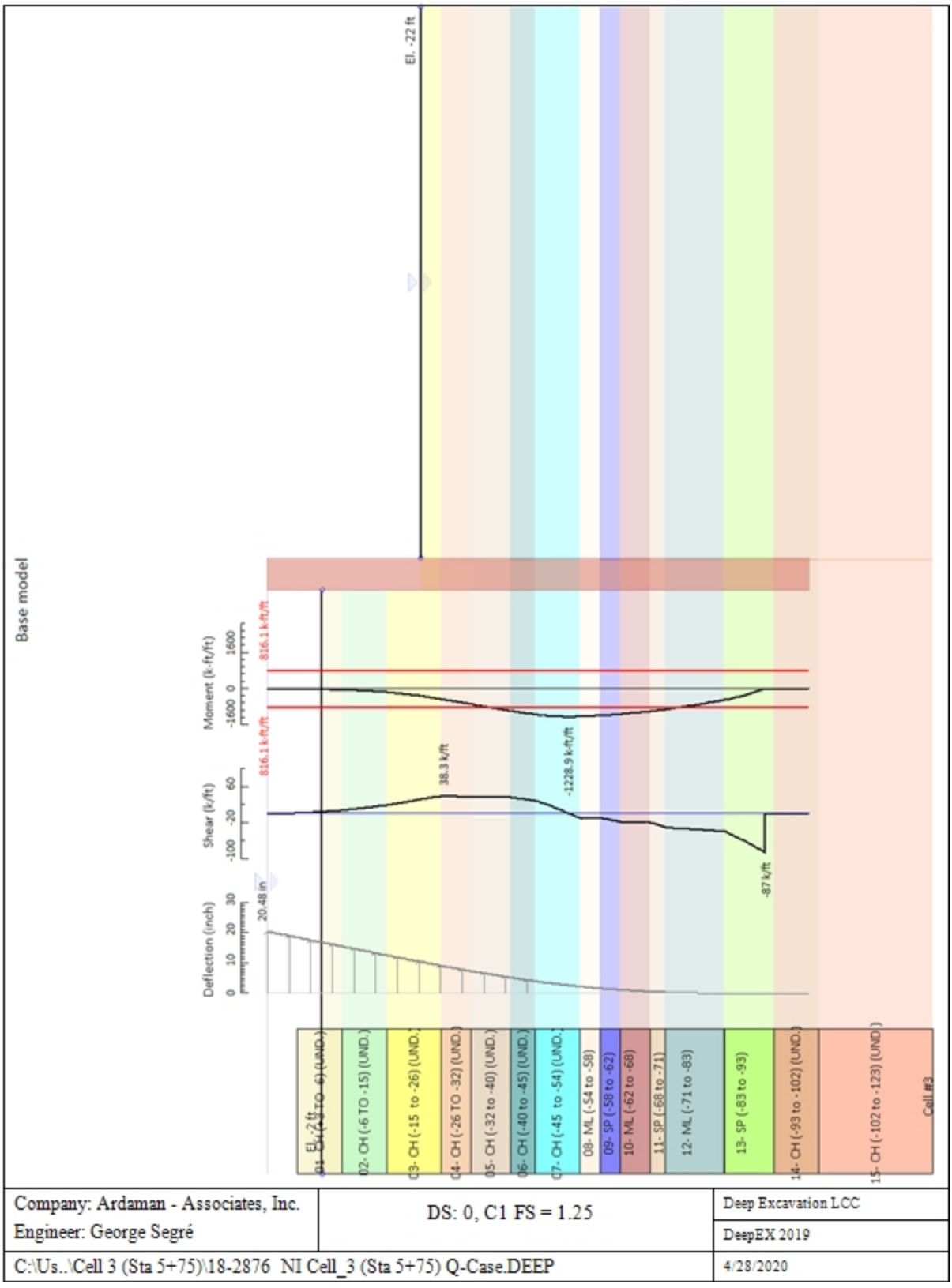
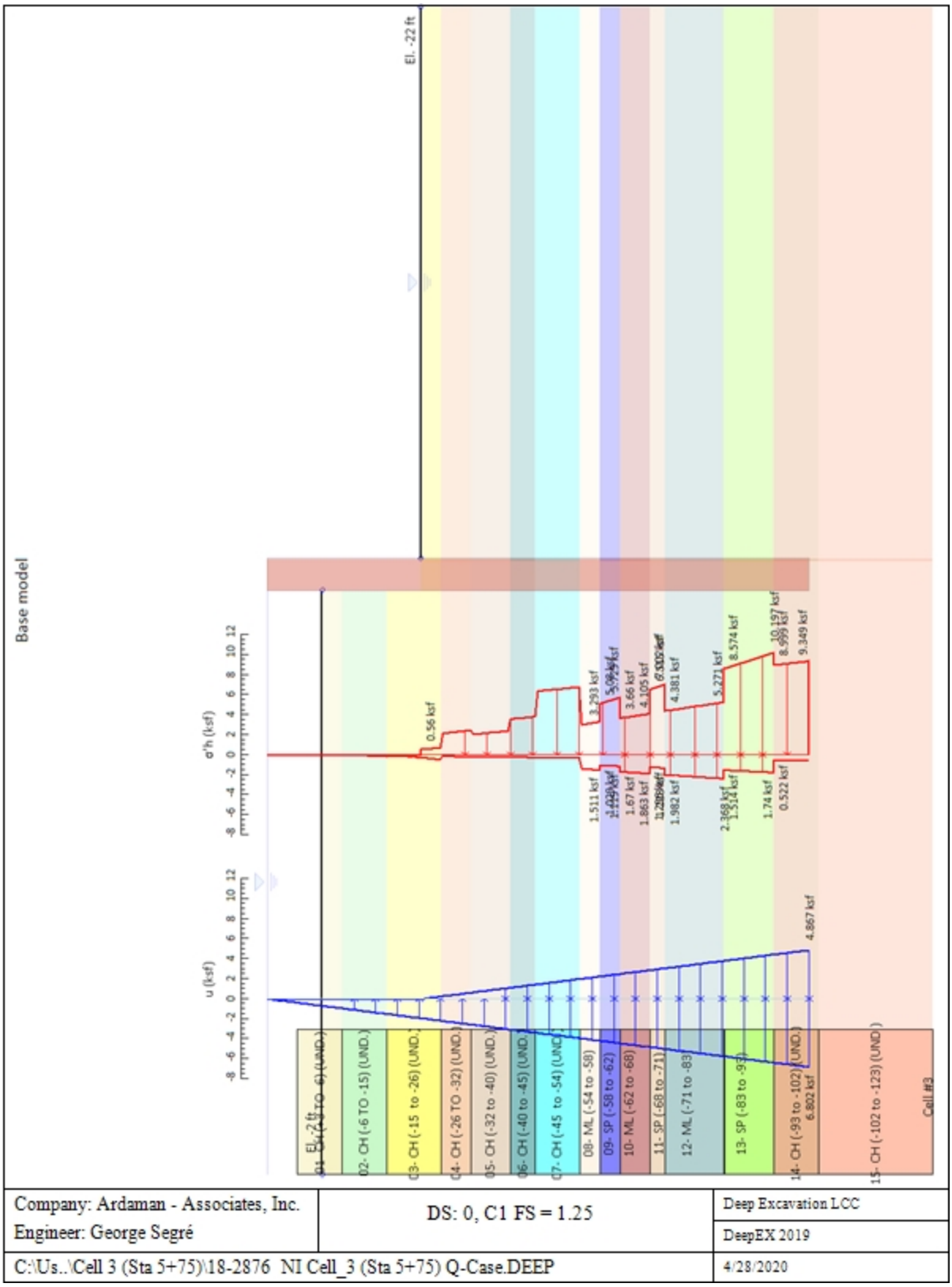

Base model
El. -22 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-100 -20 60
38.3 k/ft
-1228.9 k-ft/ft
-87 k/ft
Deflection (inch)
0 10 20 30
20.48 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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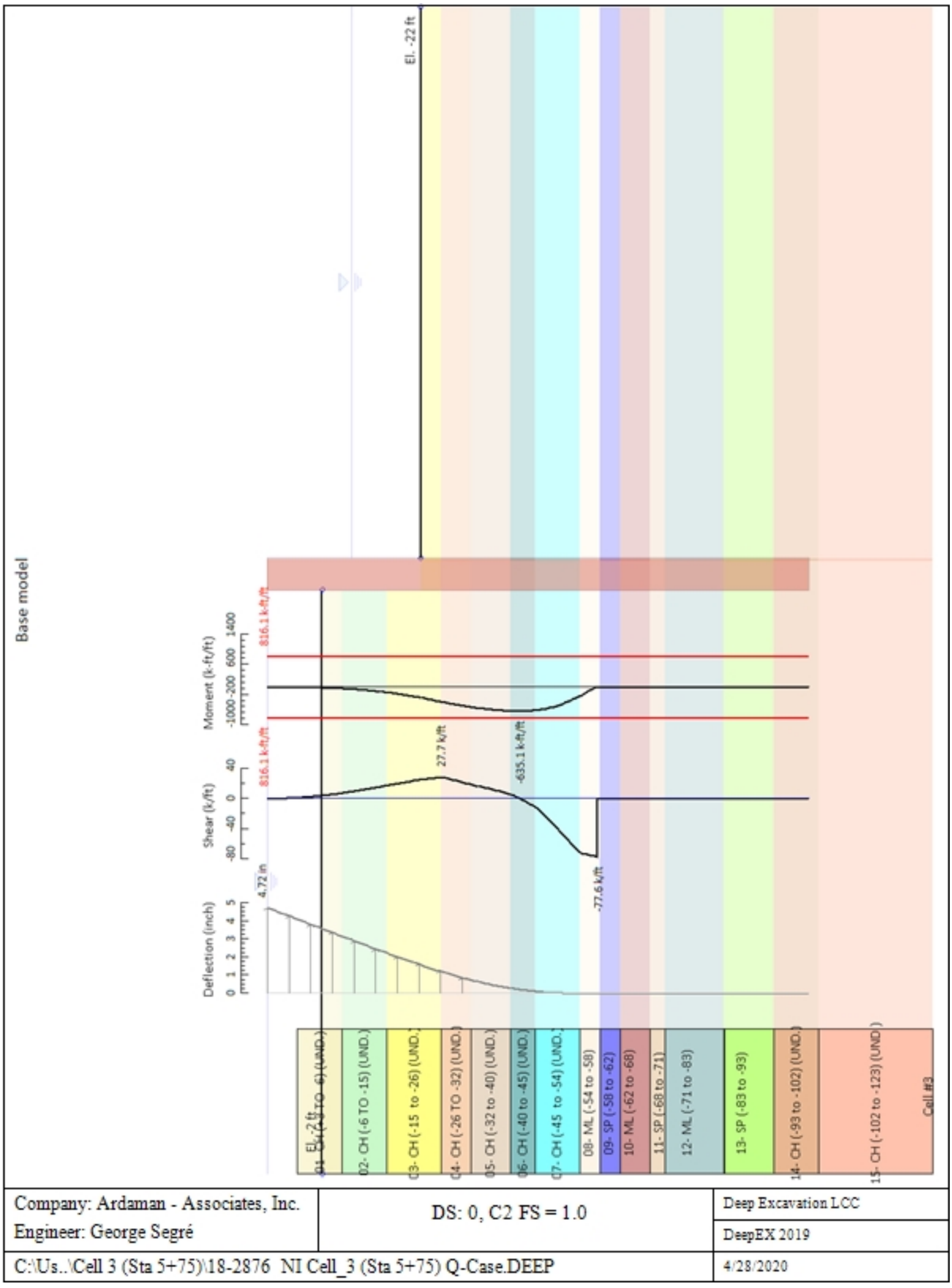

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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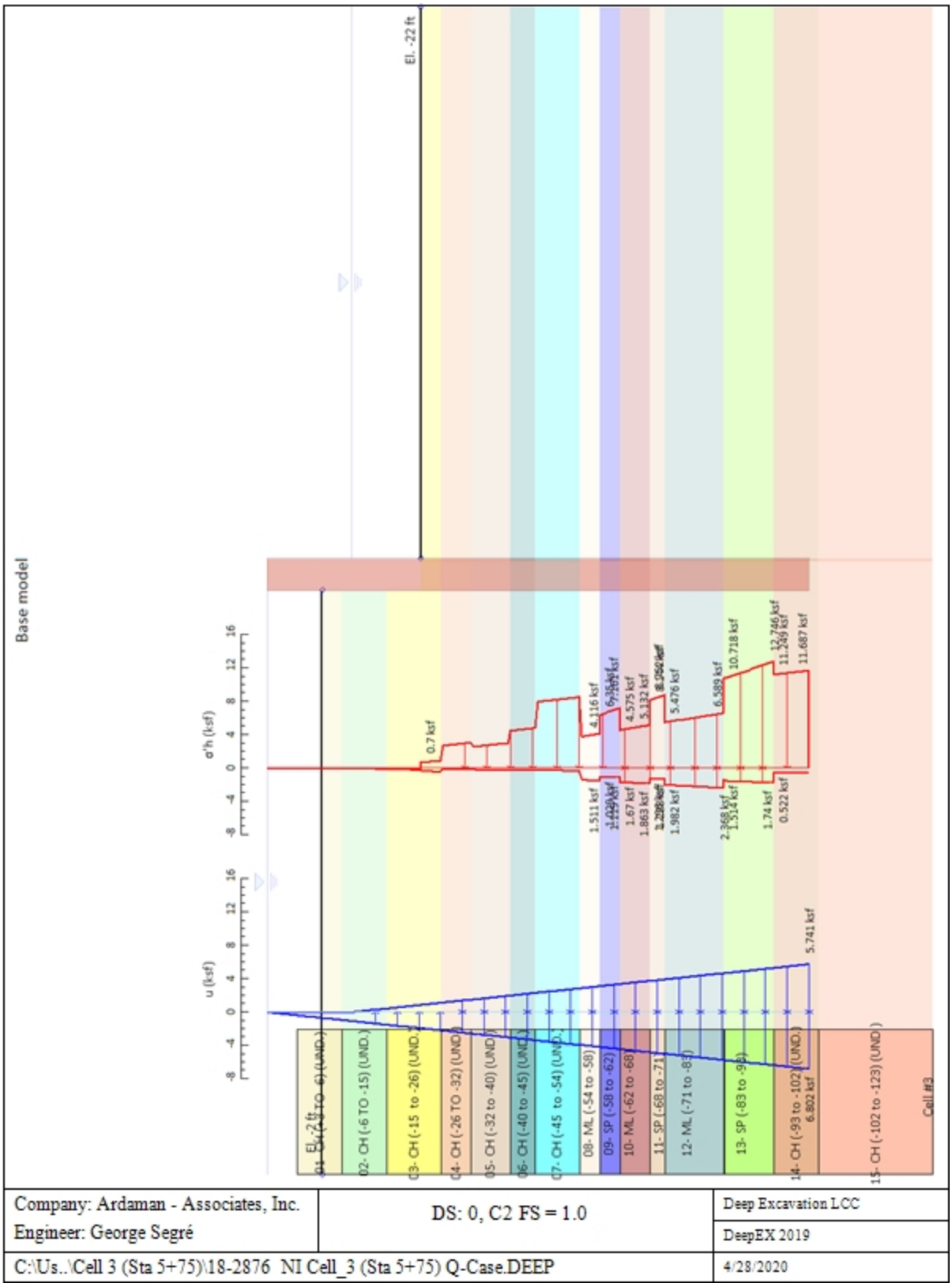

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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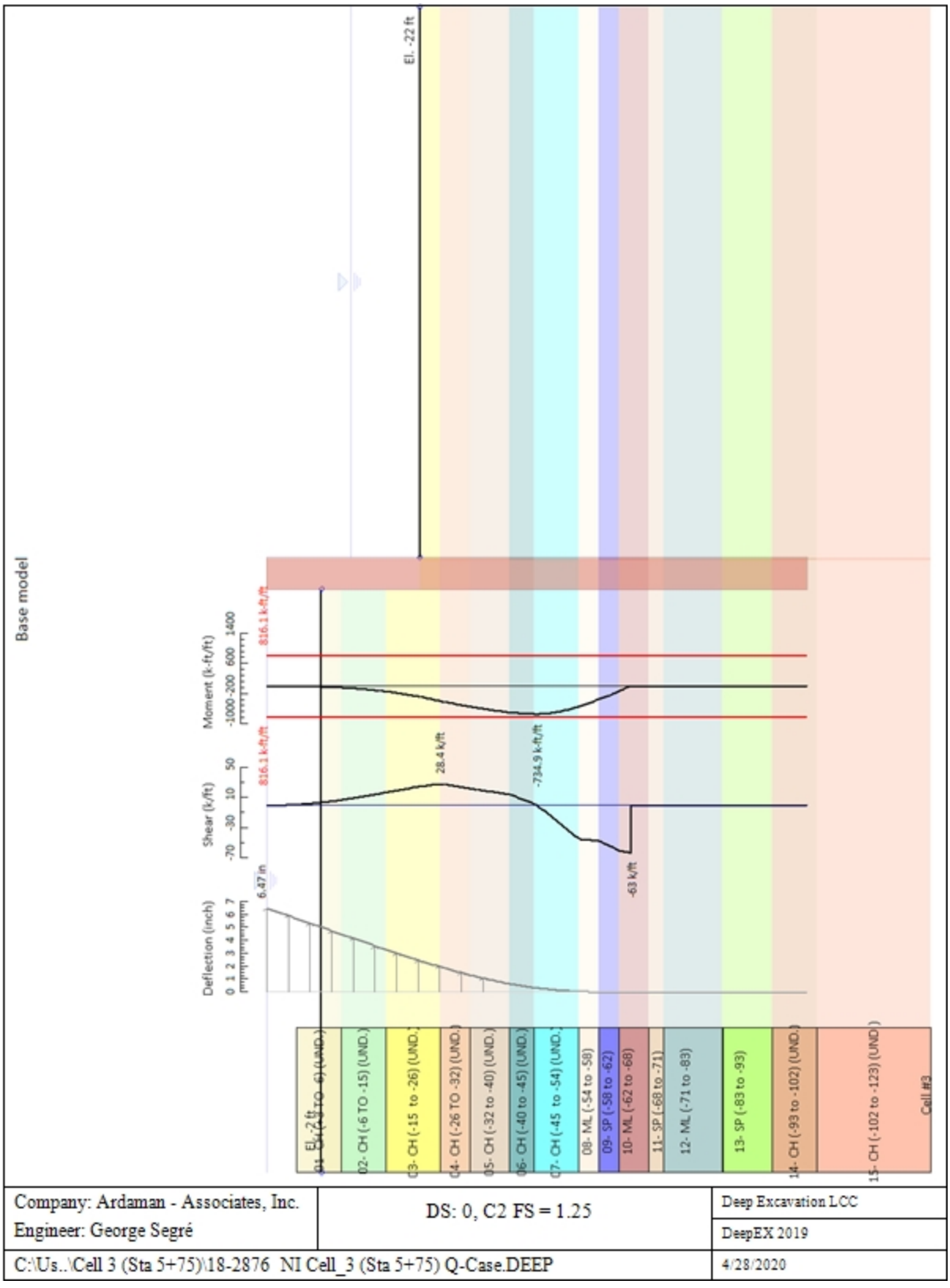

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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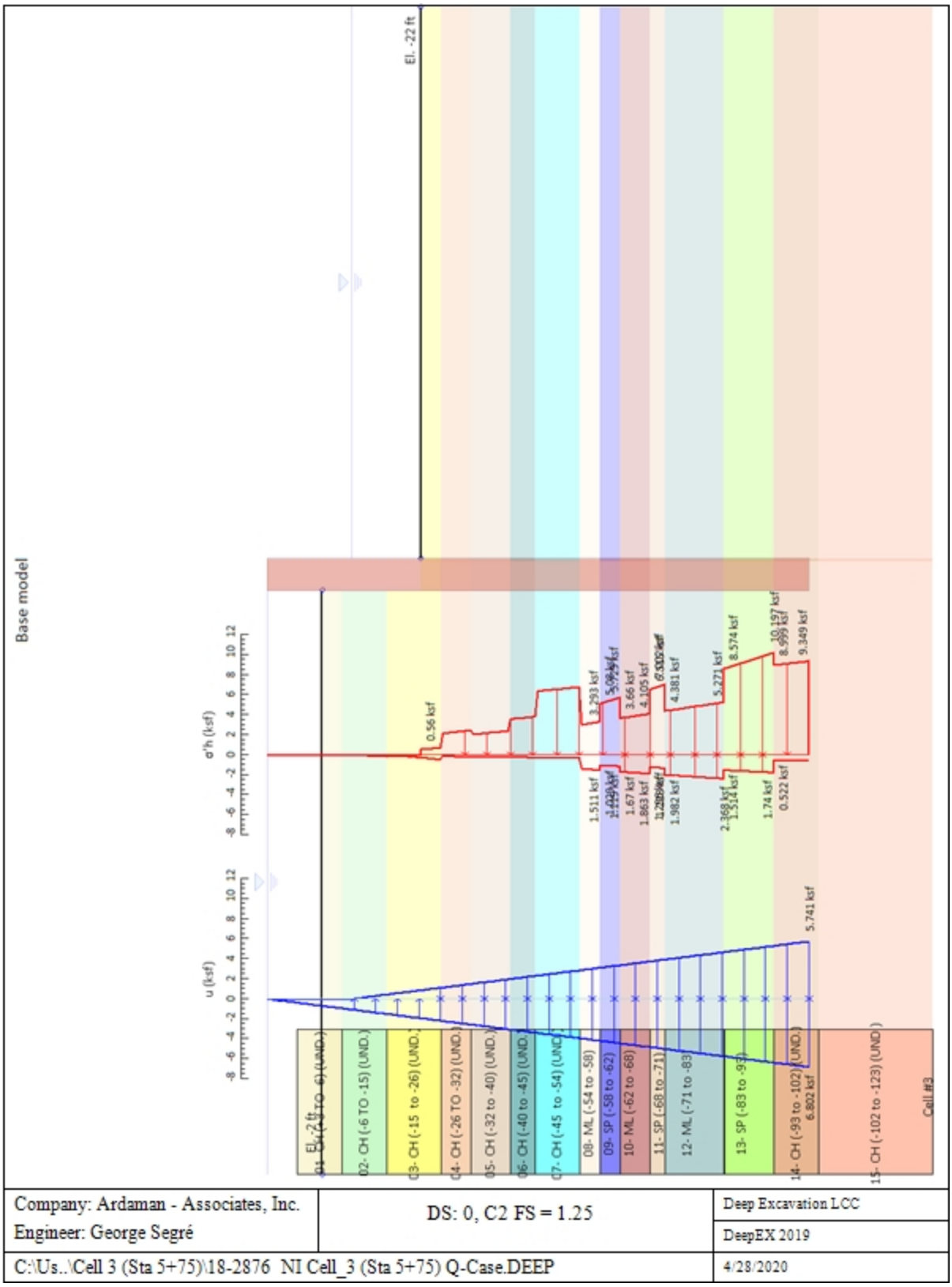

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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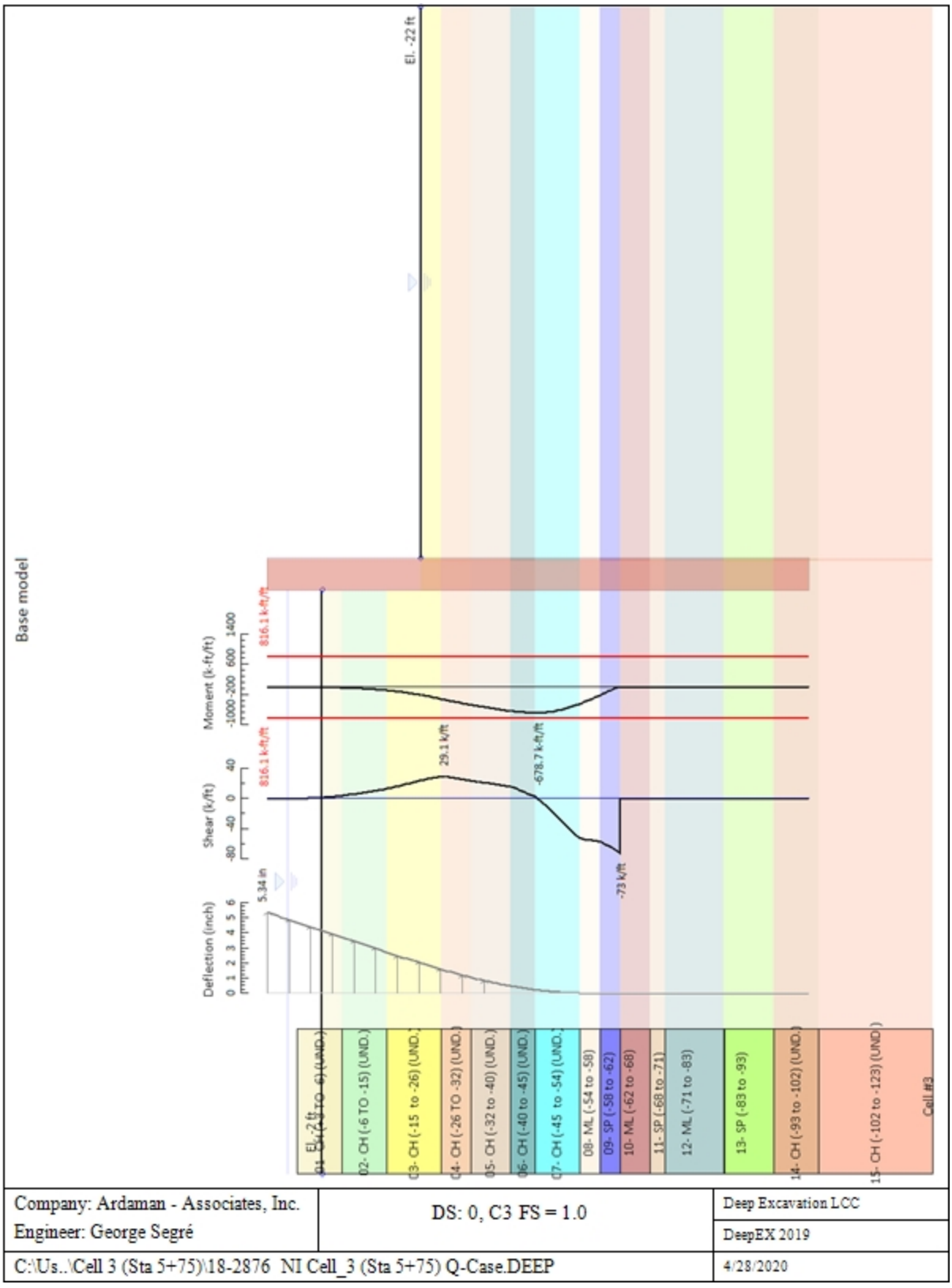

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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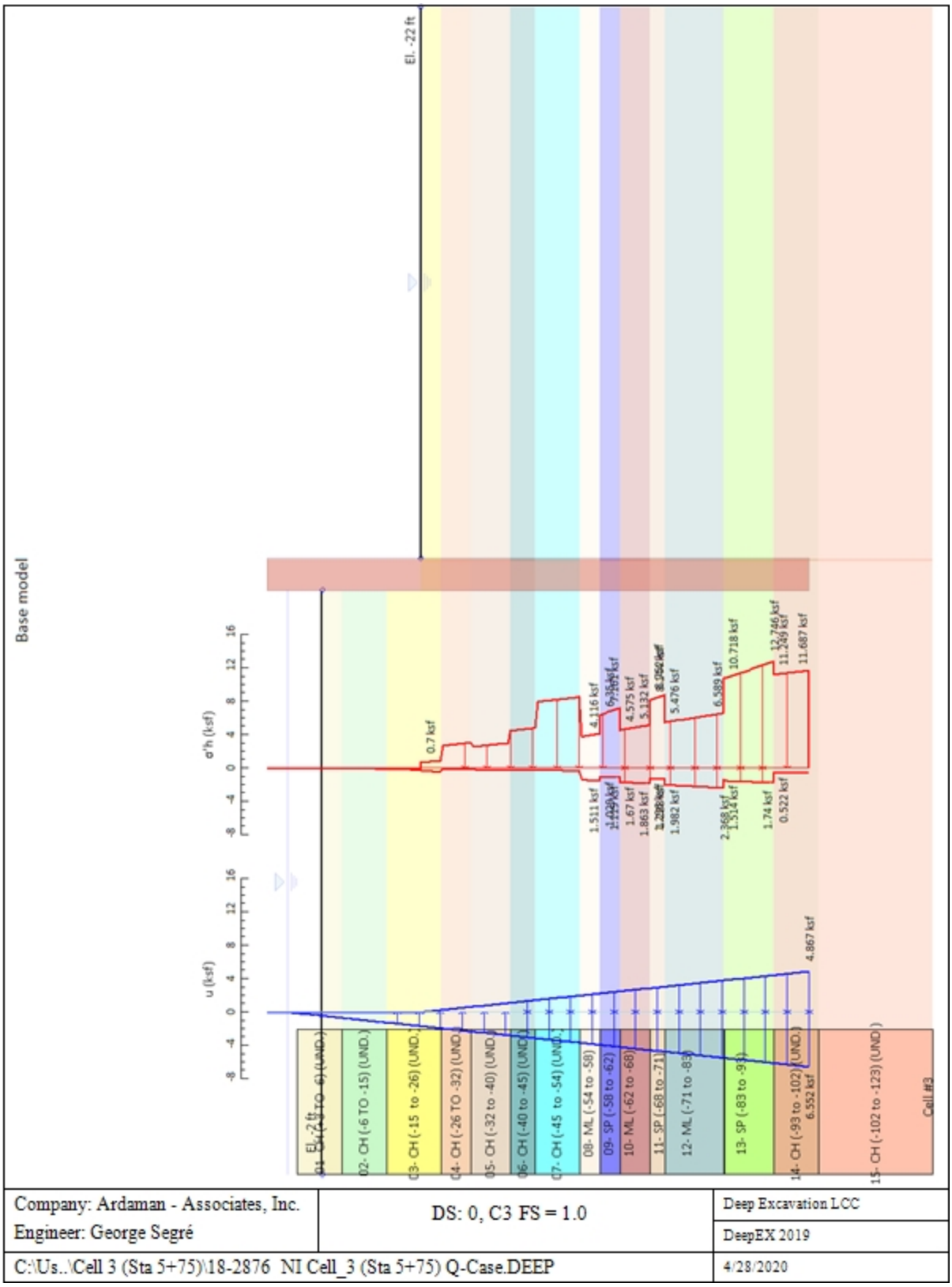

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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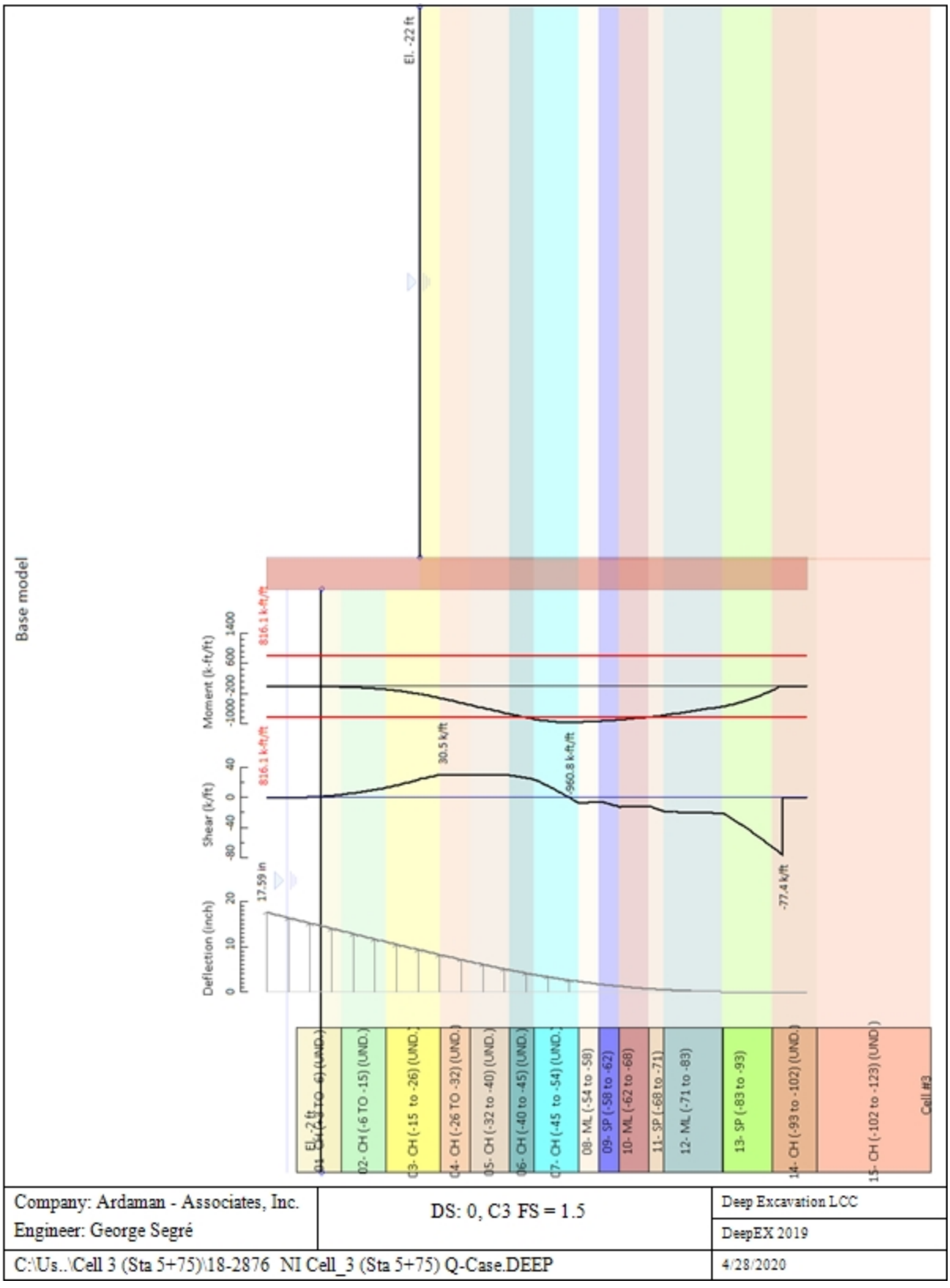

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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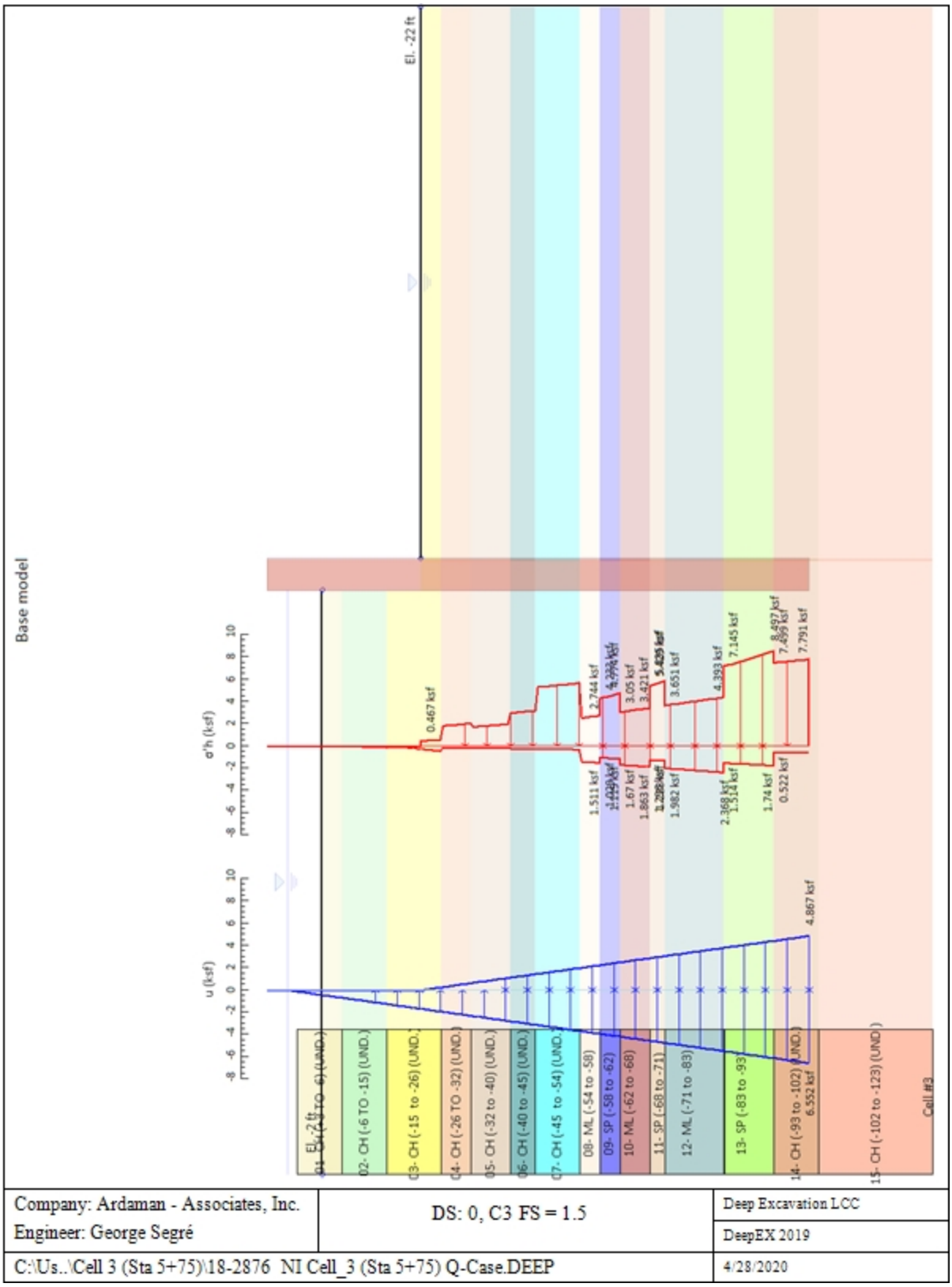

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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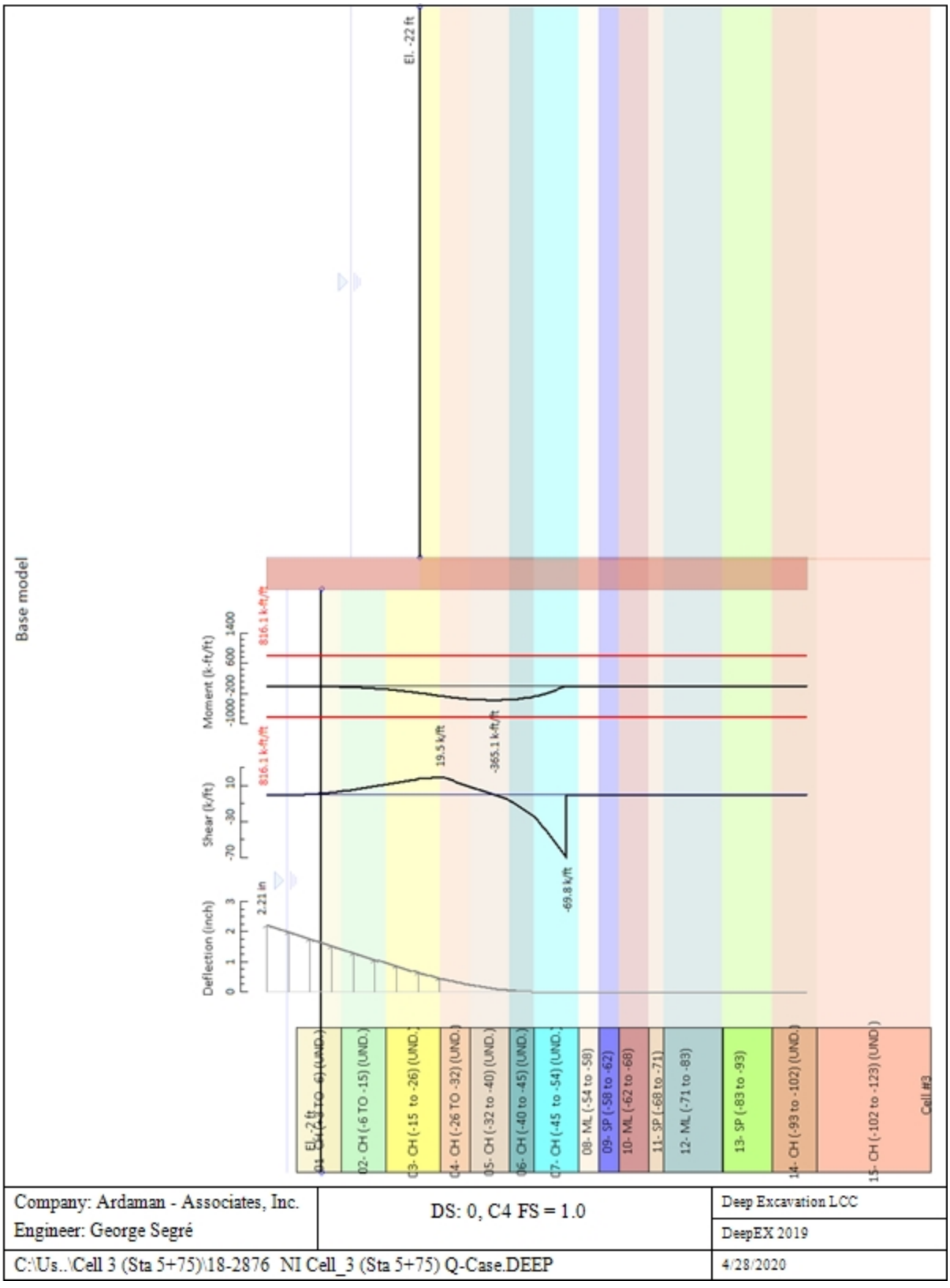
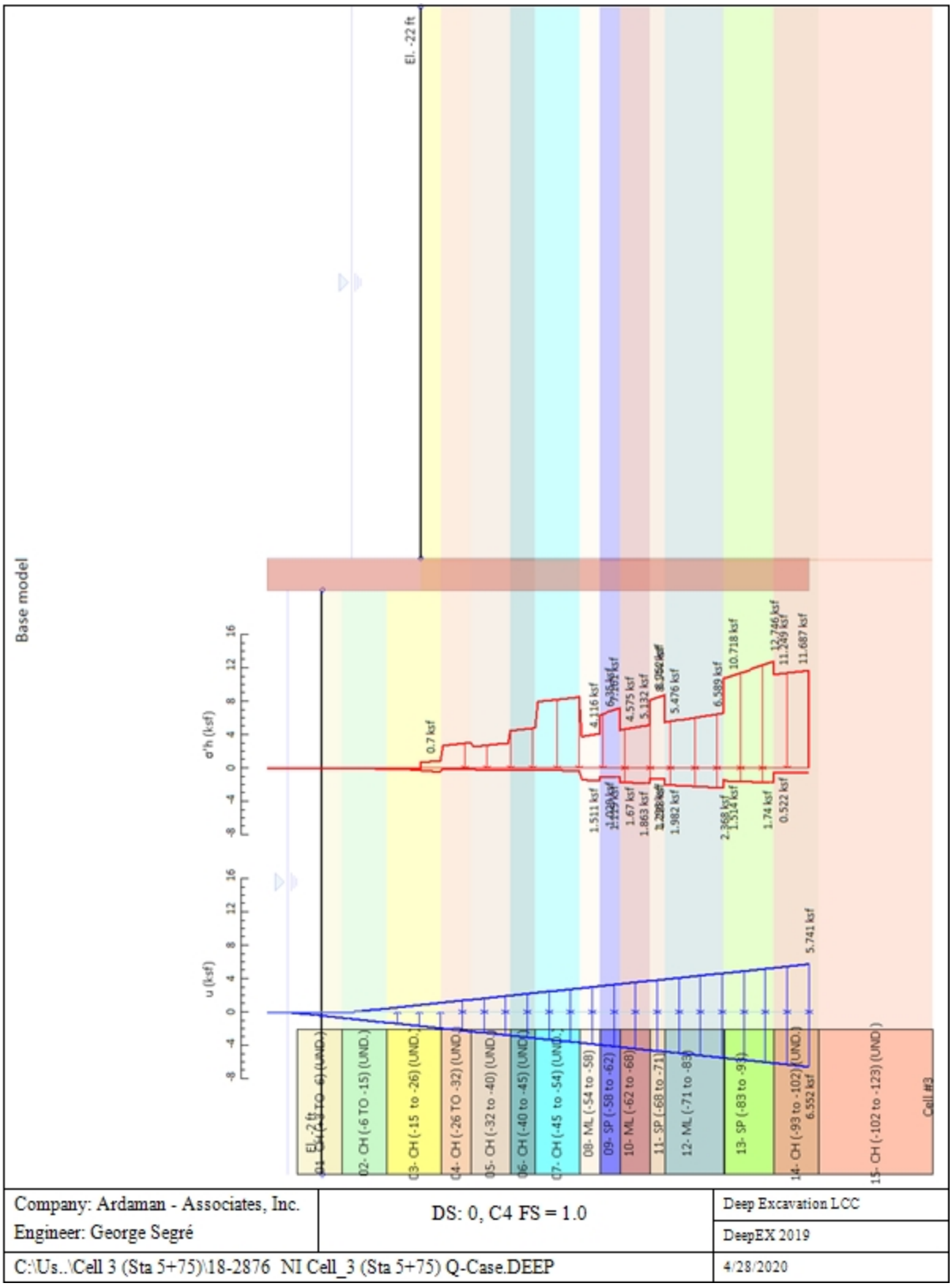

Base model
El. -22 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-70 -30 10
19.5 k/ft
-365.1 k-ft/ft
-69.8 k/ft
Deflection (inch)
0 1 2 3
2.21 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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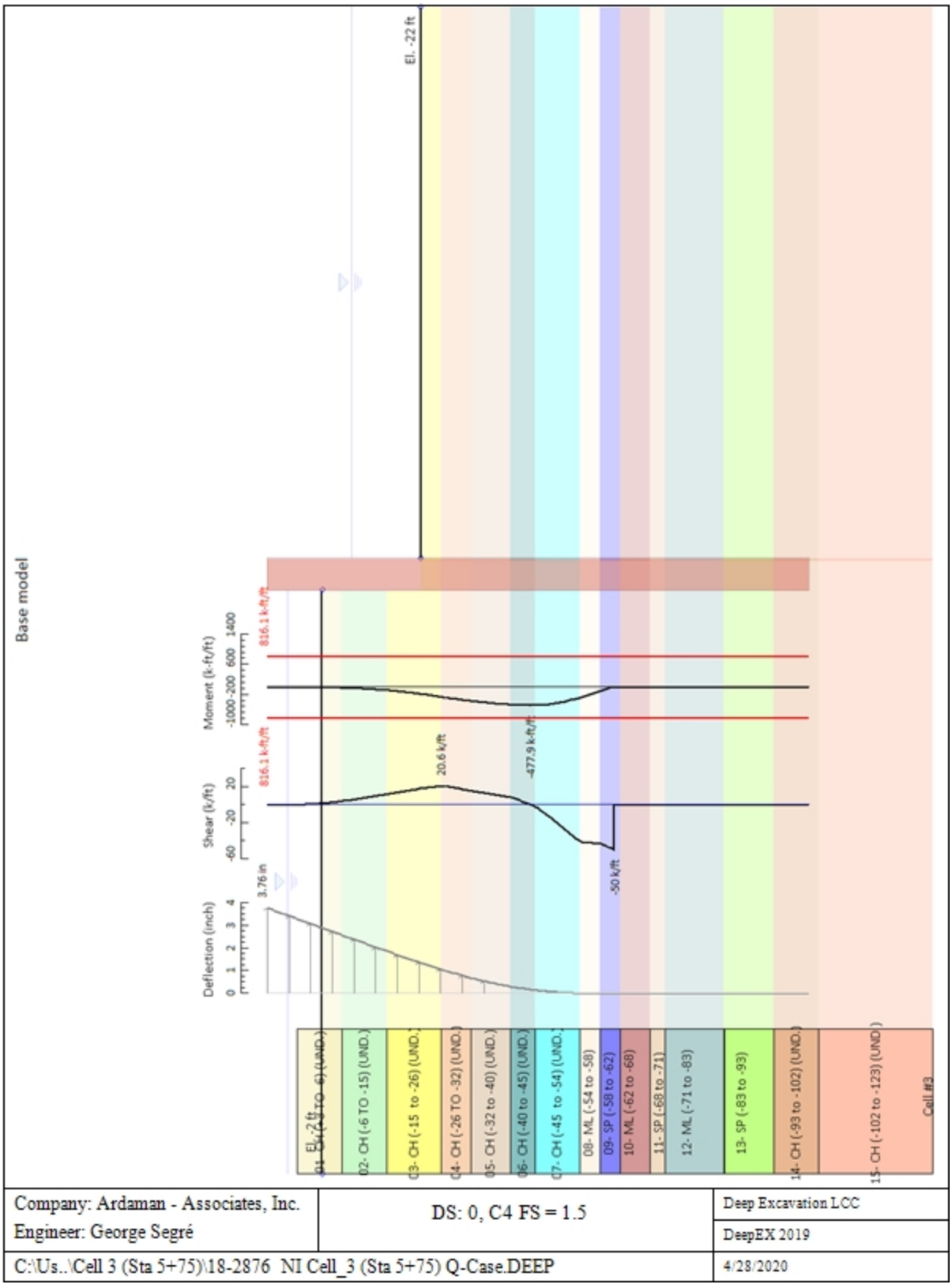

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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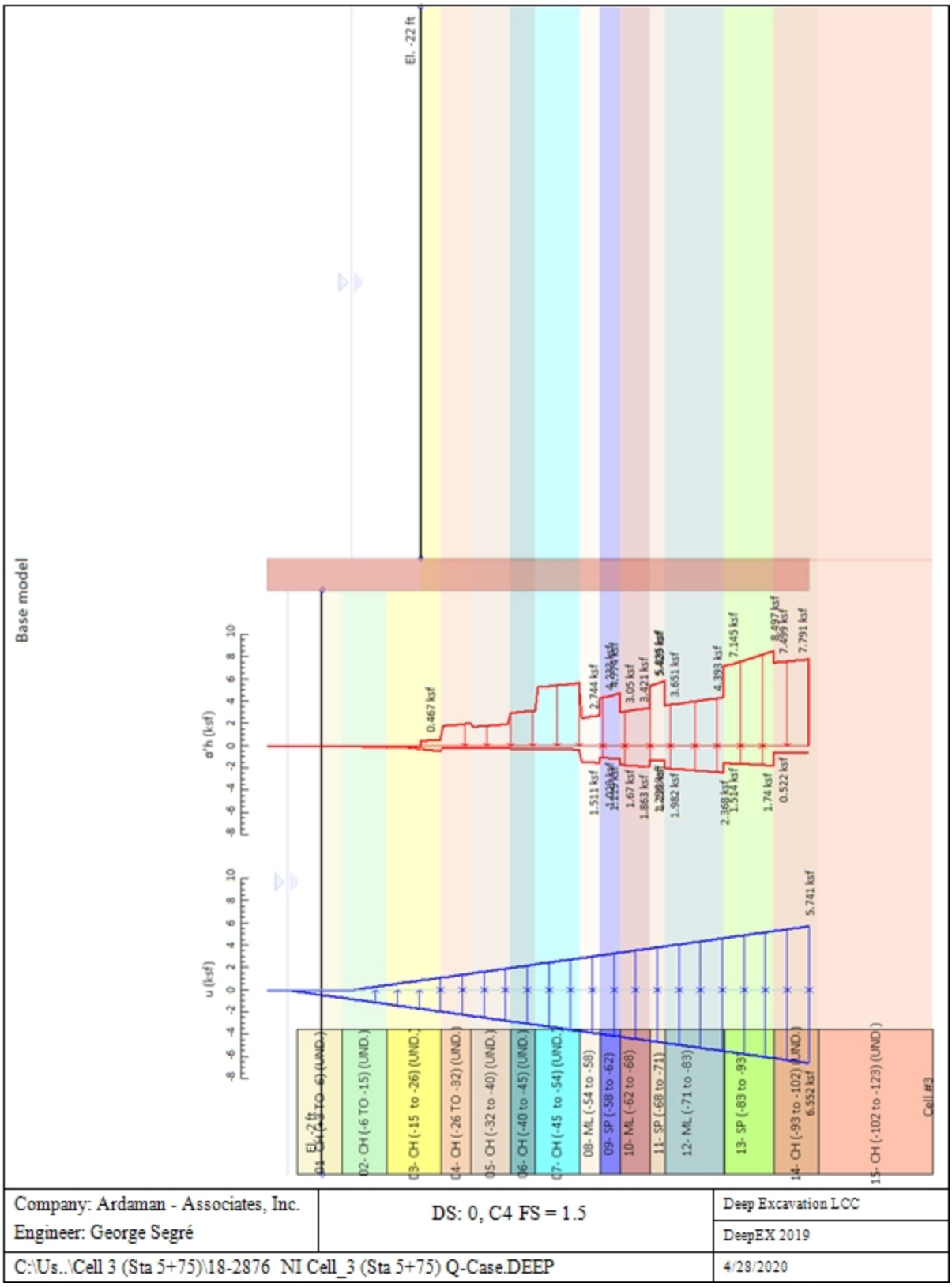

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	23	0	500	23	23	300	3	0.44	2.28	0.44	2.28	True	EXP	
02- CH (-6 TO	110	110	23	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	23	0	350	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-26 T	124	124	26	0	1250	26	26	521.92	3	0.39	2.56	0.39	2.56	True	Linear	
05- CH (-32 to	120	120	26	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	26	0	1730	26	26	626.3	3	0.39	2.56	0.39	2.56	True	Linear	
07- CH (-45 t	125	125	26	0	3300	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- ML (-54 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
15- CH (-102 t	125	125	26	0	4000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	0.609	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	0.562	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.531	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

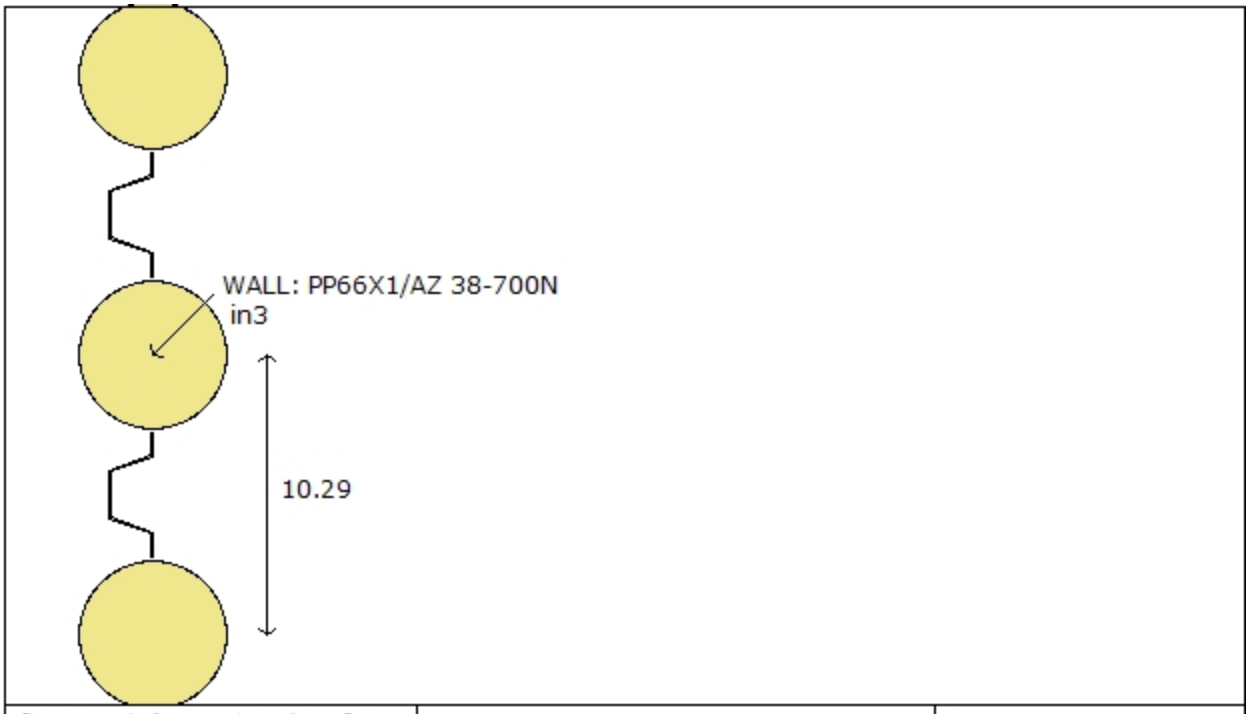
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	0.61
-6	02- CH (-6 TO -	1	0
-15	03- CH (-15 to	1	0.61
-26	04- CH (-26 TO	1	0.56
-32	05- CH (-32 to	1	0
-40	06- CH (-40 to	1	0.56
-45	07- CH (-45 to	1	0.56
-54	08- ML (-54 to	1	0.53
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.53
-68	11- SP (-68 to -	1	0.5
-71	12- ML (-71 to	1	0.53
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	0.56
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -131 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.487	1.542	2.251
Stage 1	Simple span	N/A	1.6	1.229	1.234	1.801
Stage 2	Simple span	N/A	1.6	1.86	2.09	2.972
Stage 3	Simple span	N/A	1.6	1.594	1.672	2.378
Stage 4	Simple span	N/A	1.6	1.644	1.724	2.453
Stage 5	Simple span	N/A	1.6	1.15	1.15	1.635
Stage 6	Simple span	N/A	1.6	2.141	2.439	3.335
Stage 7	Simple span	N/A	1.6	1.594	1.626	2.223

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

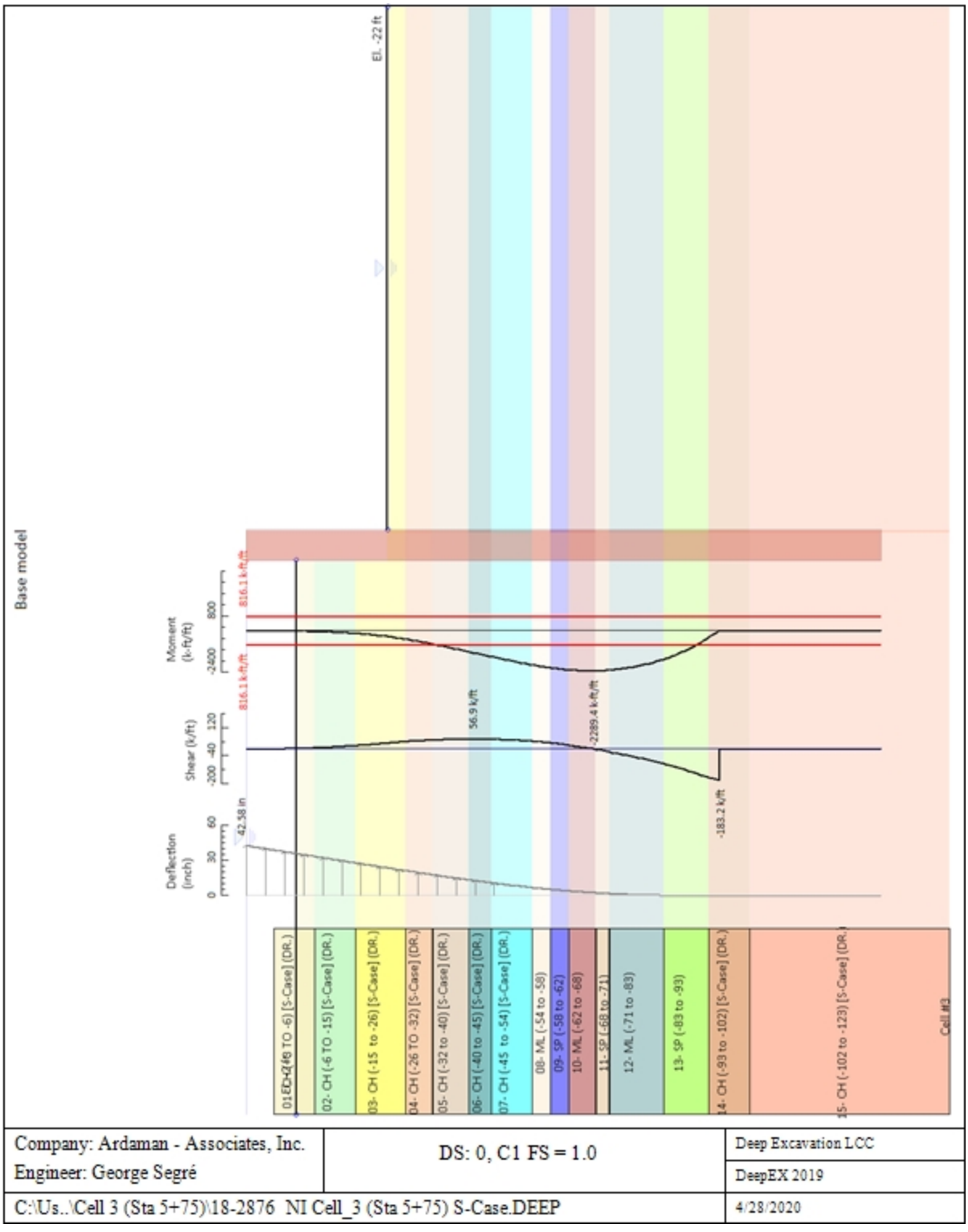
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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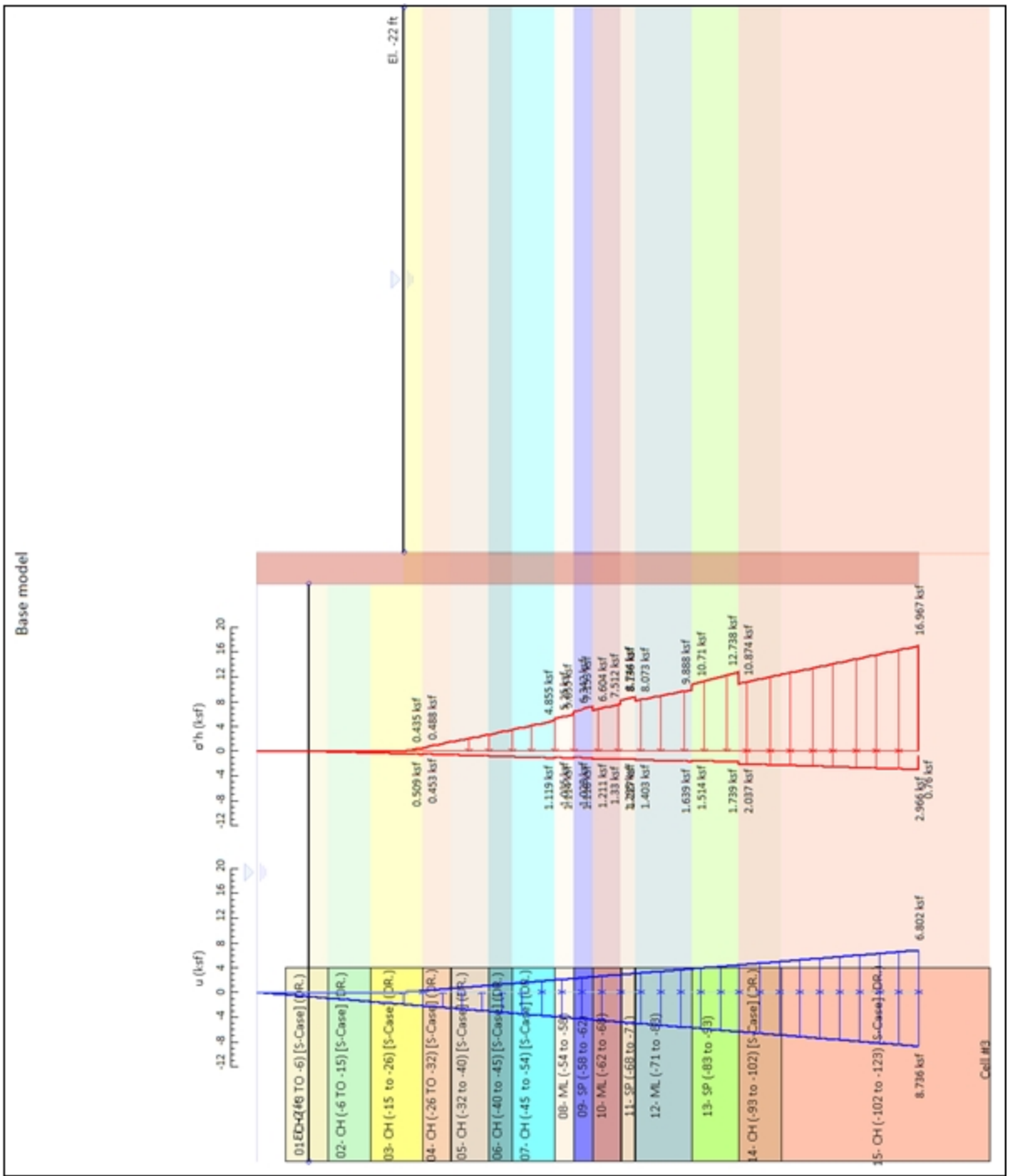

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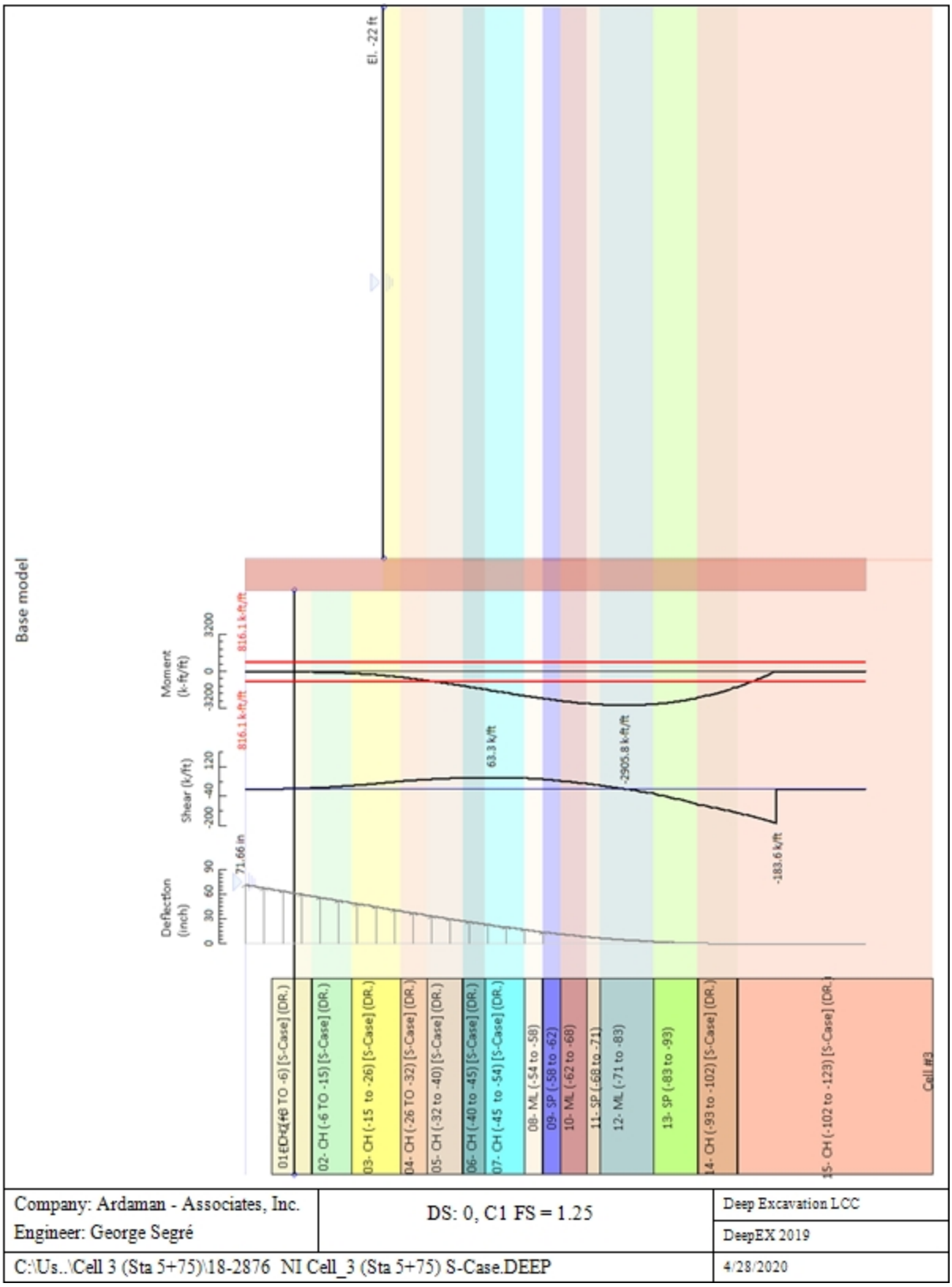

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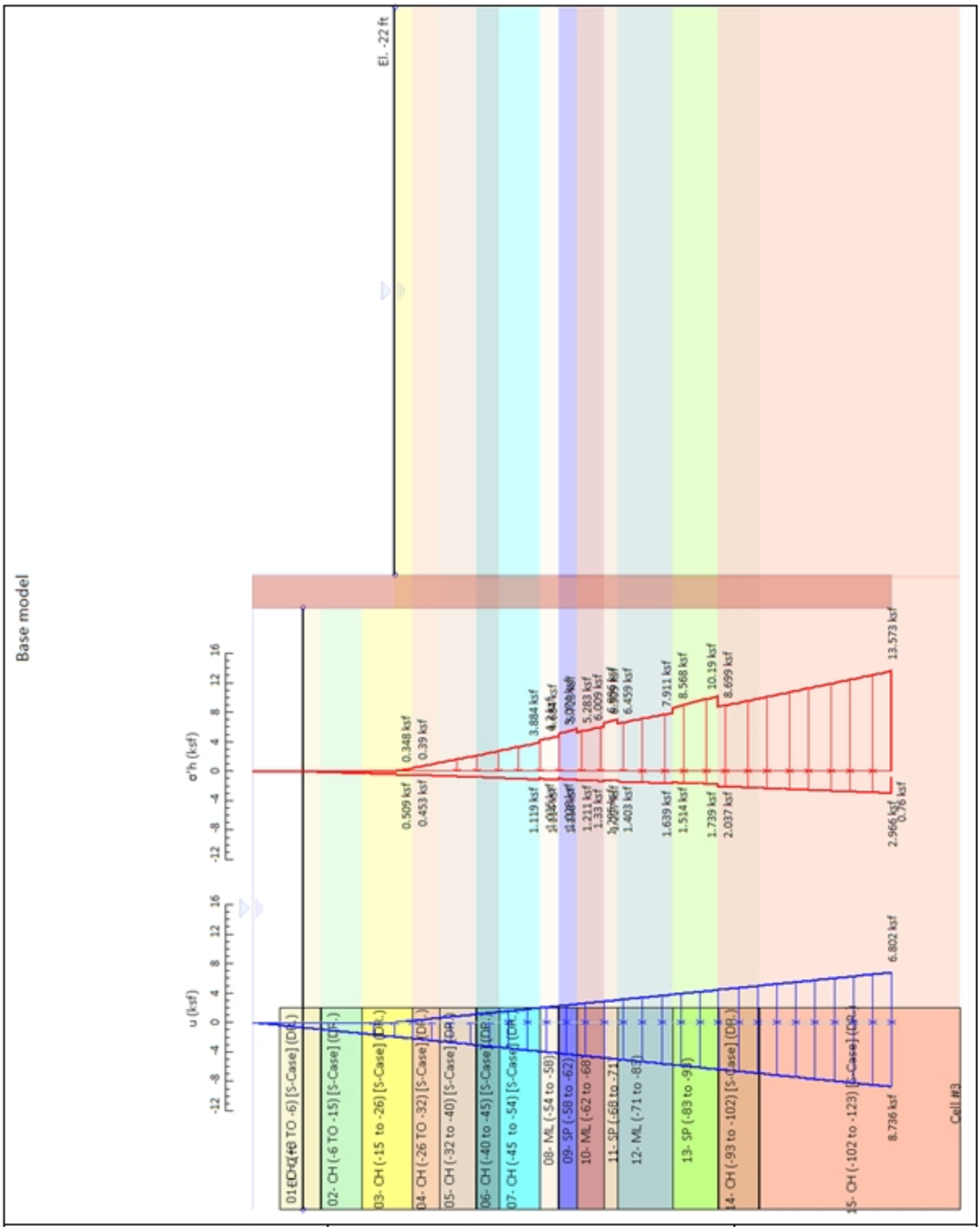

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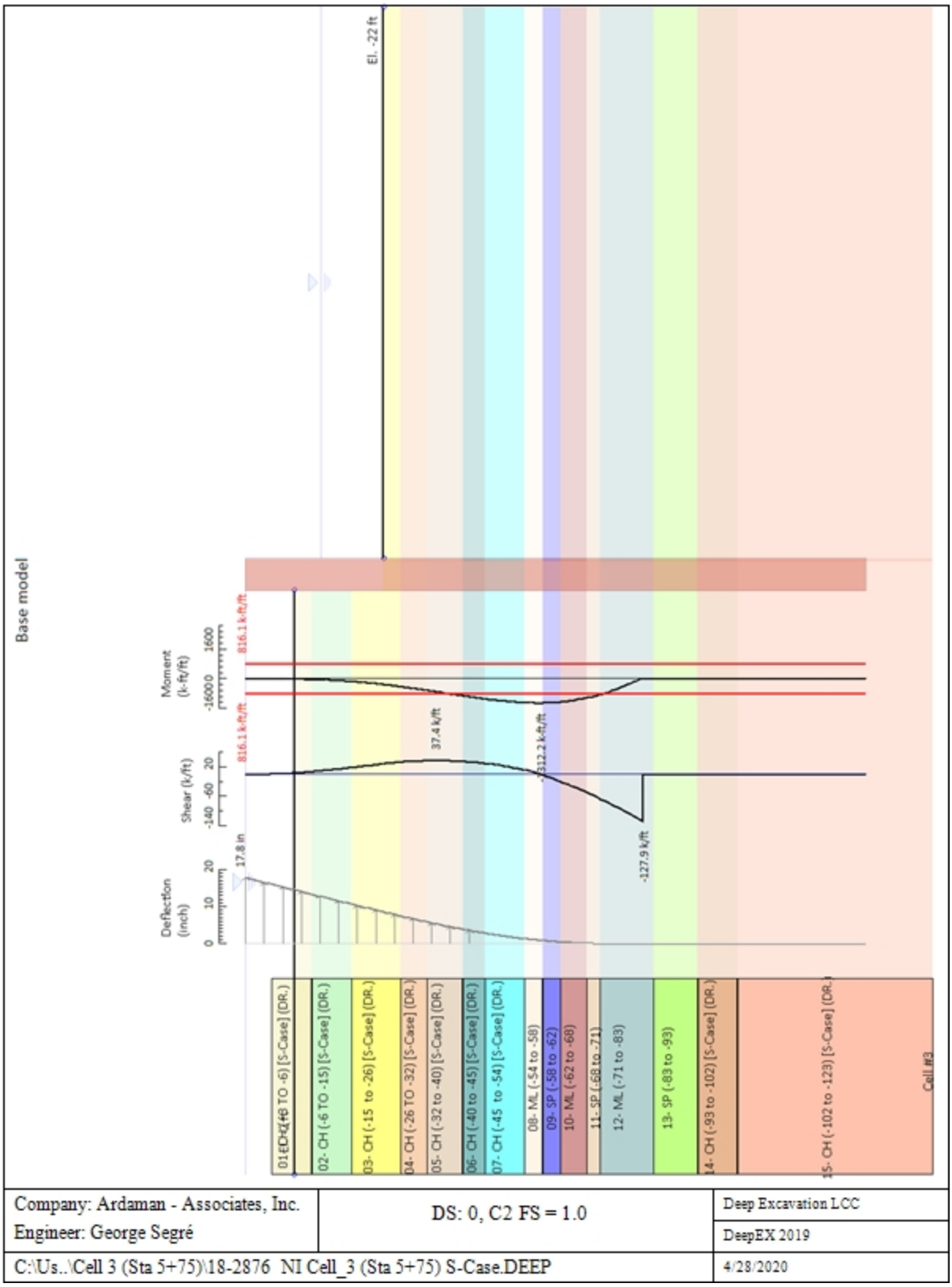

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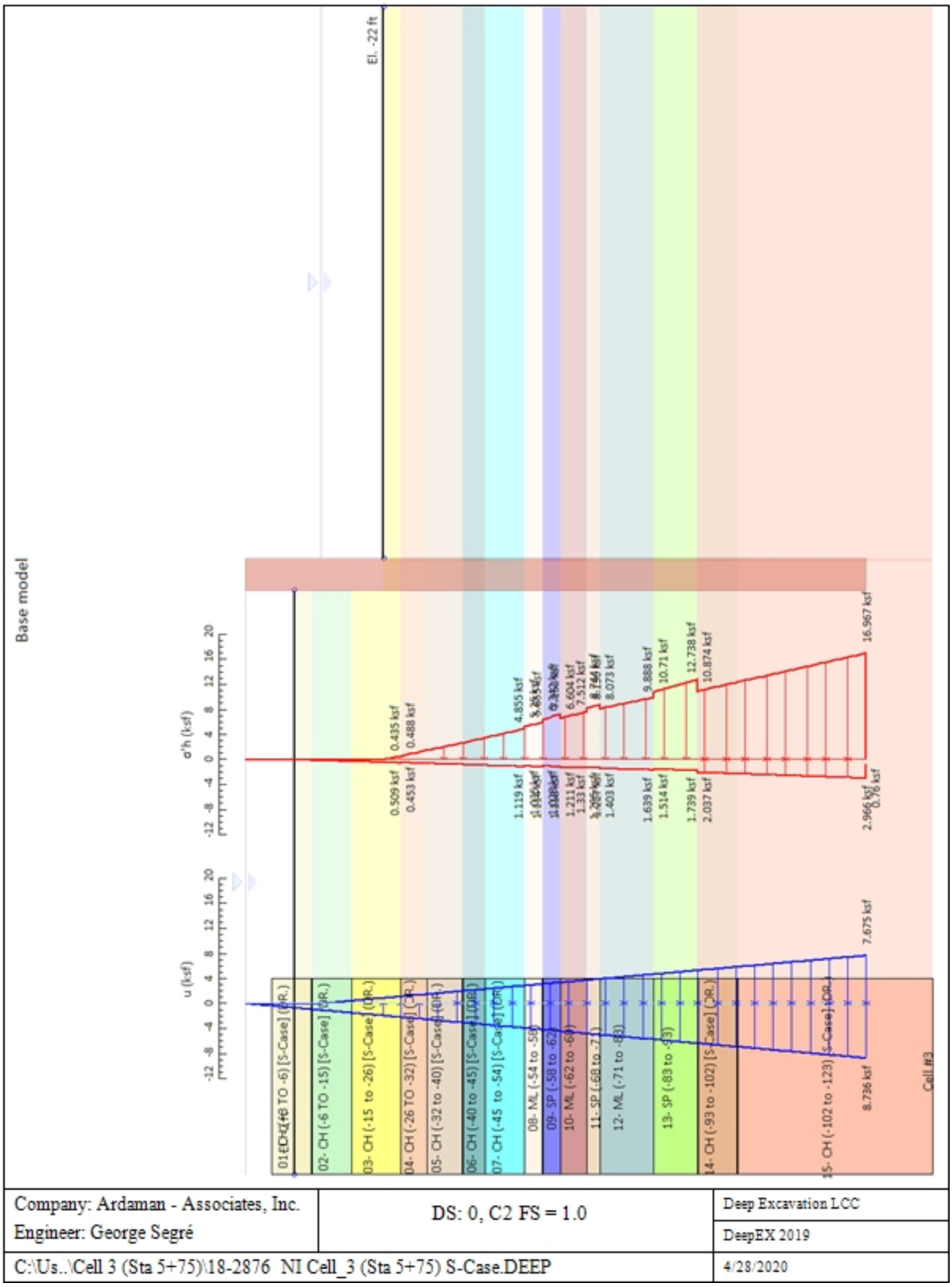

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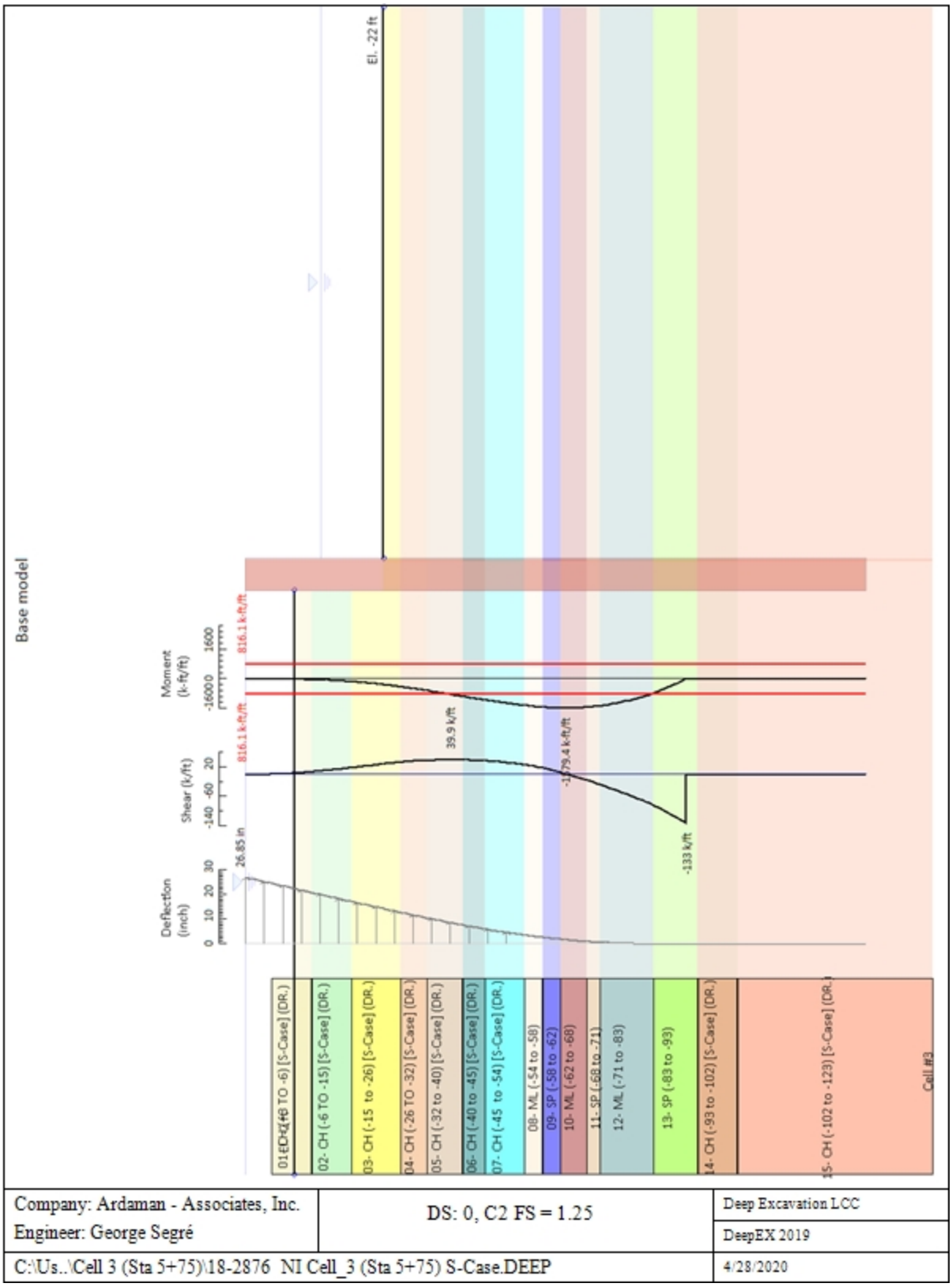

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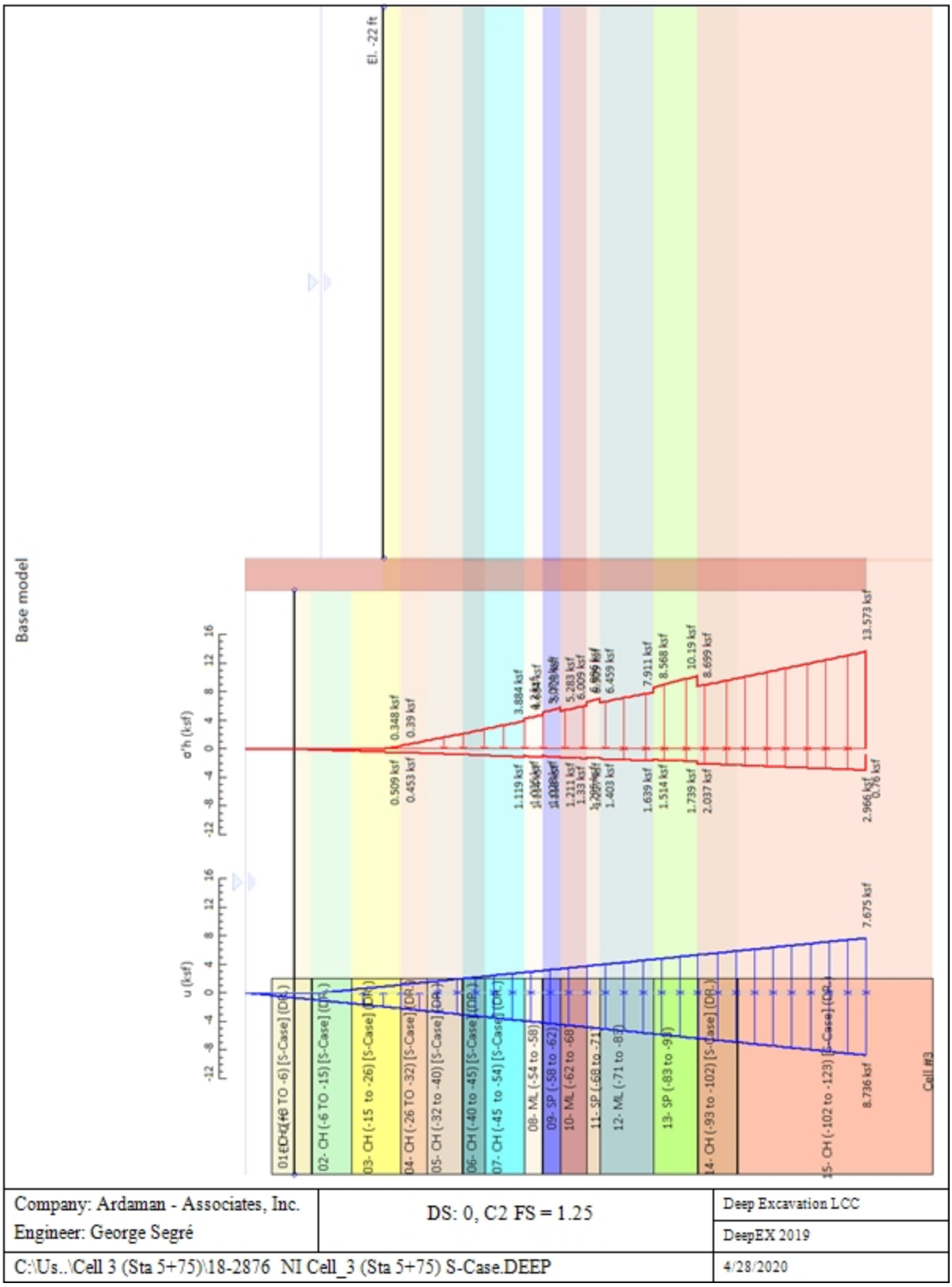

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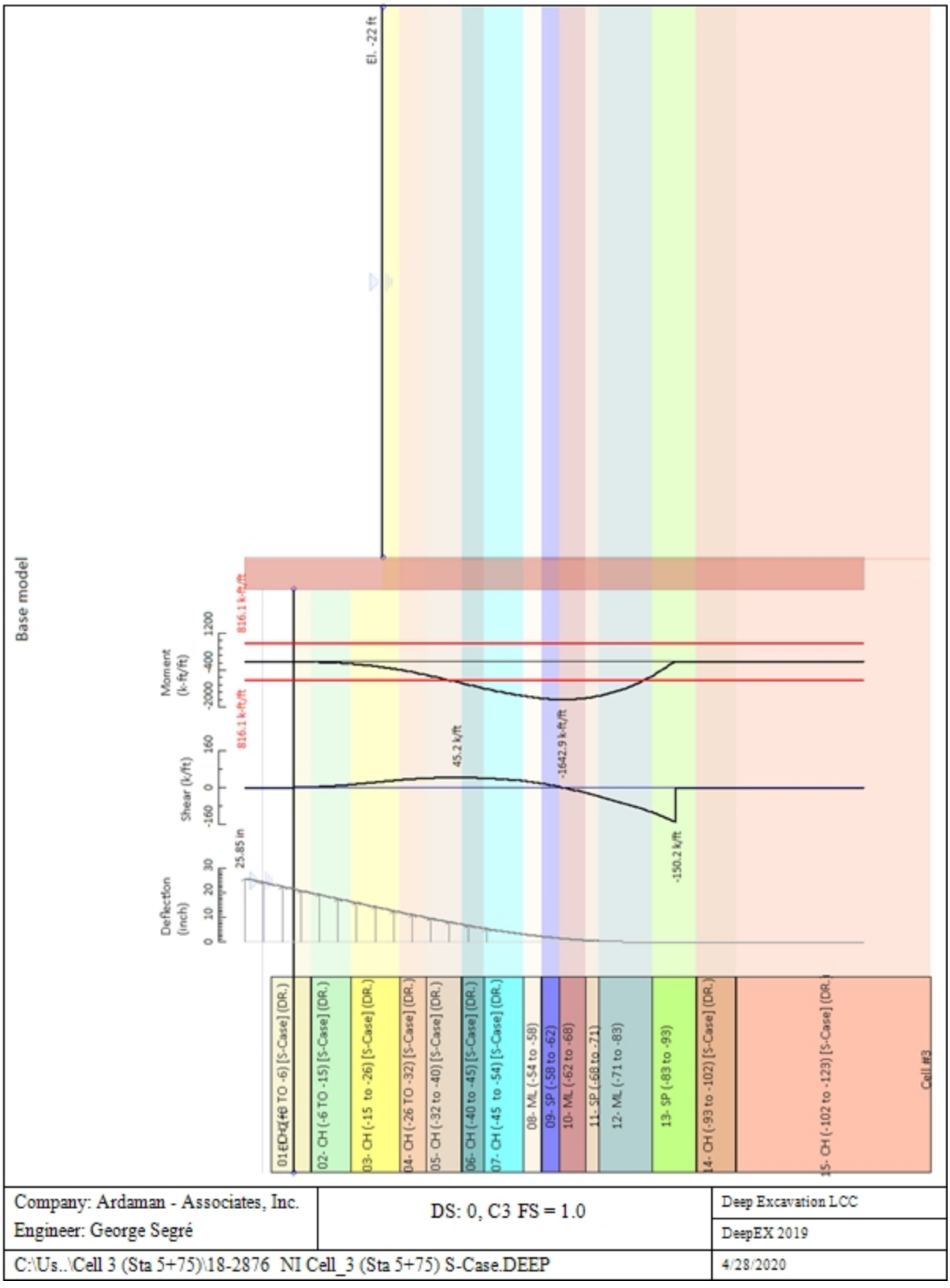

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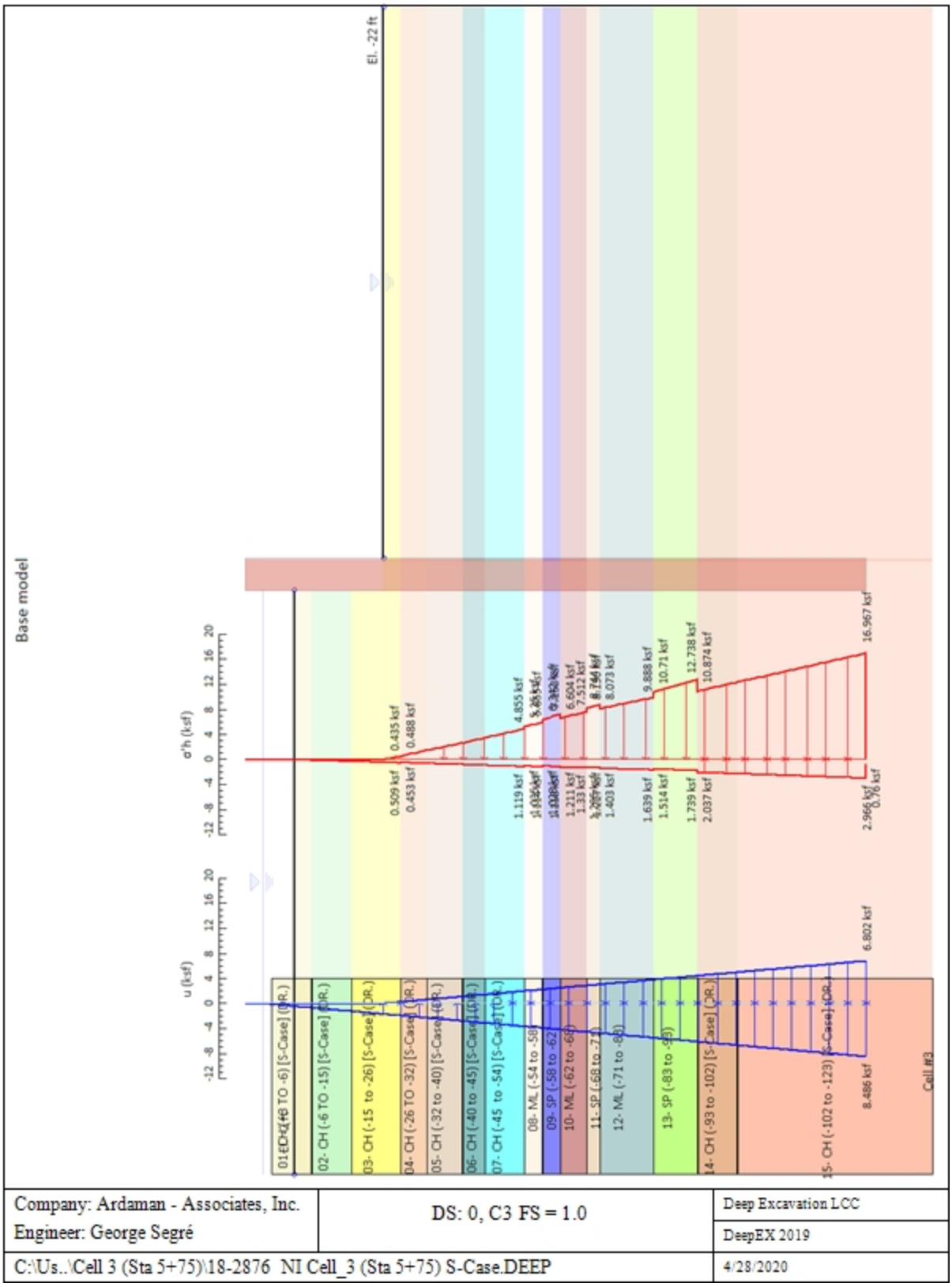

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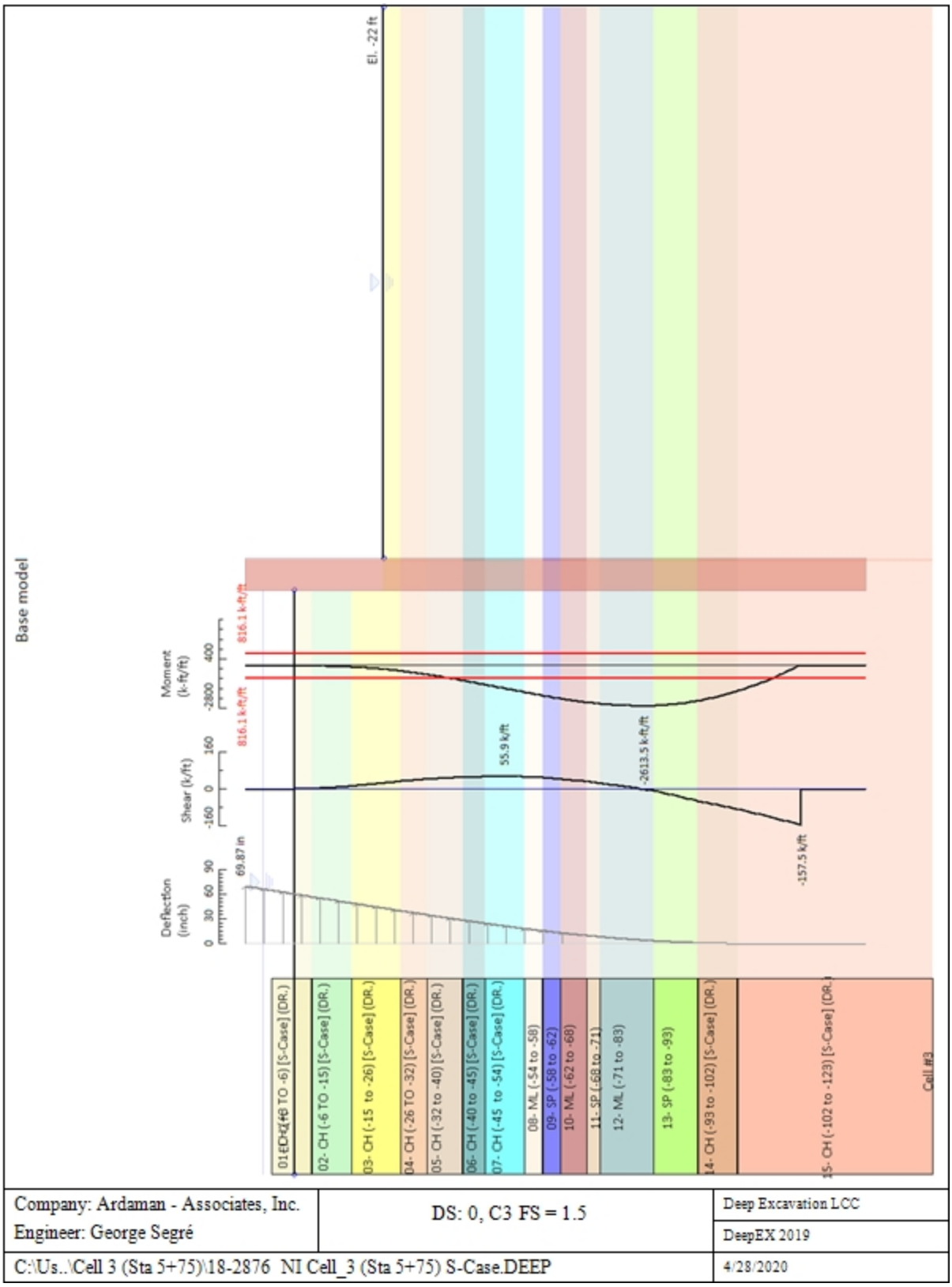

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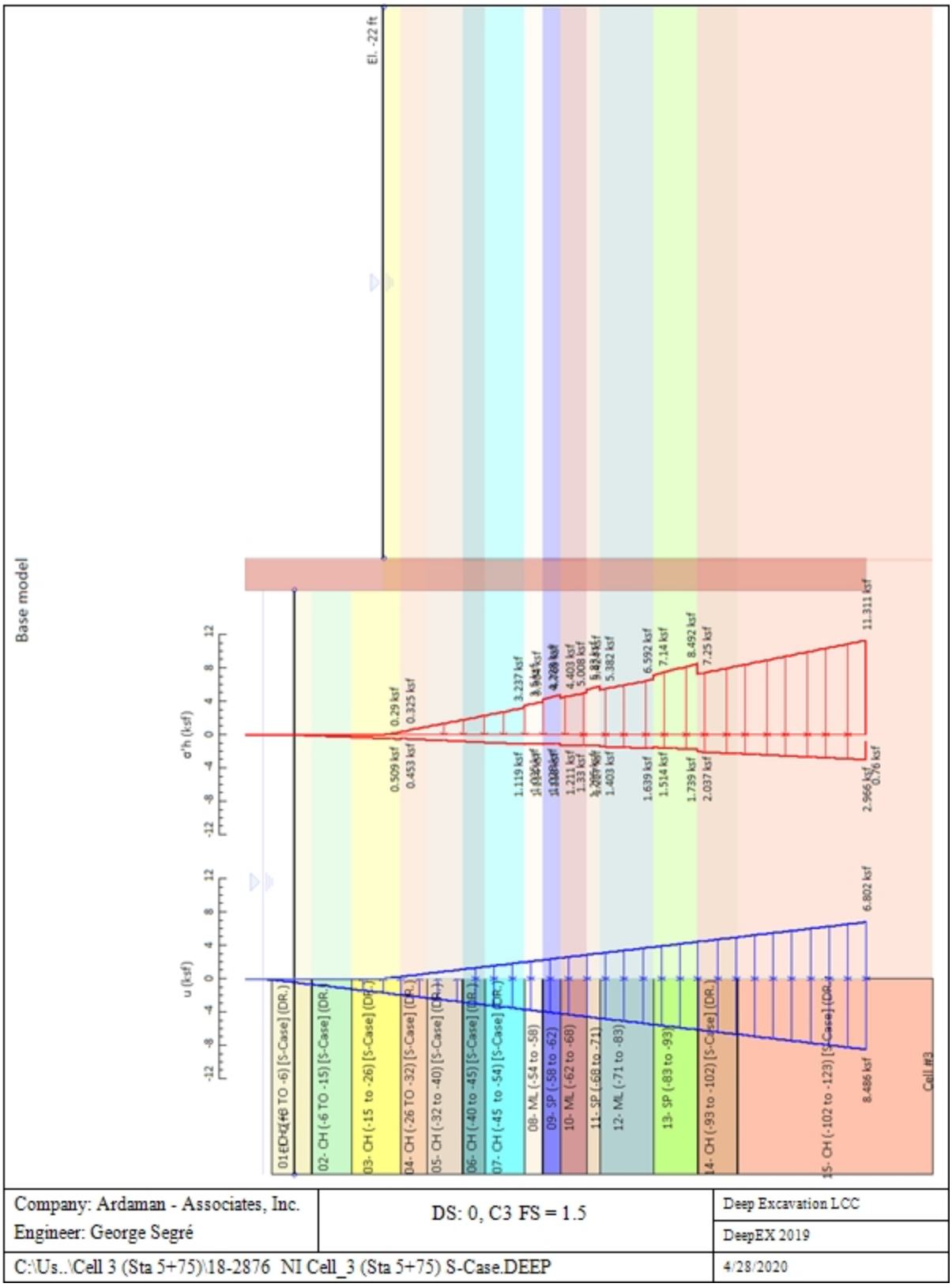

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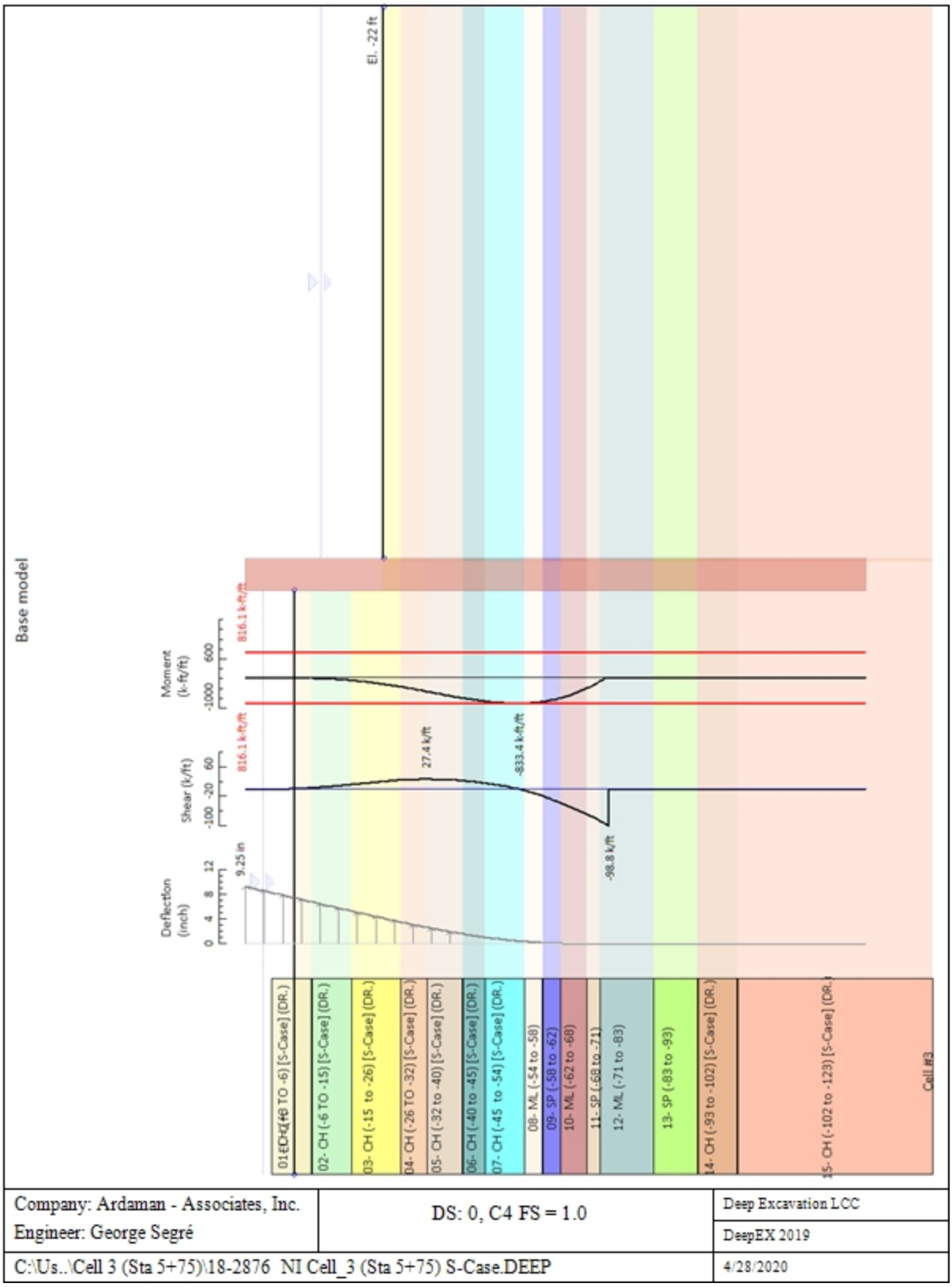

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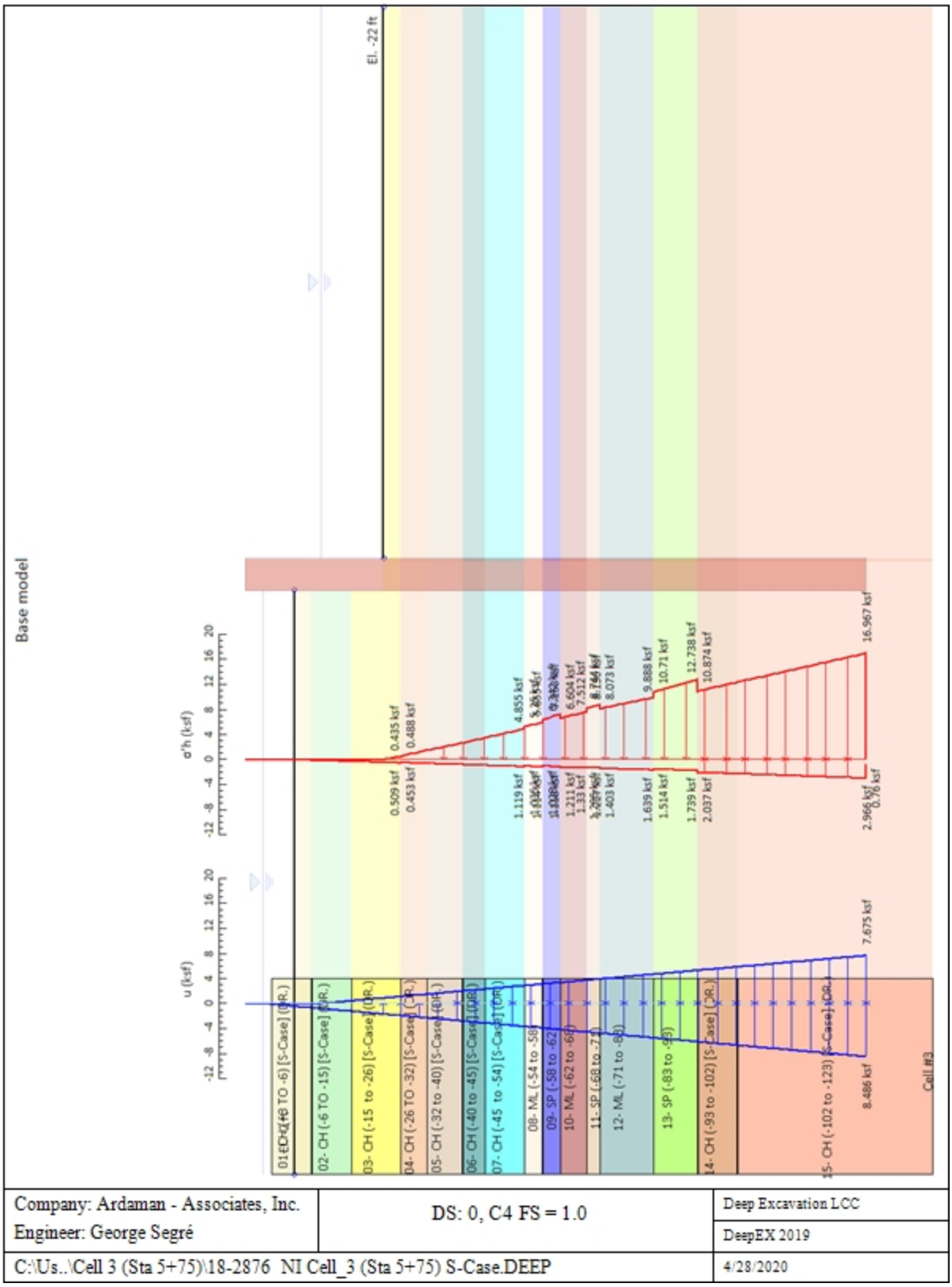

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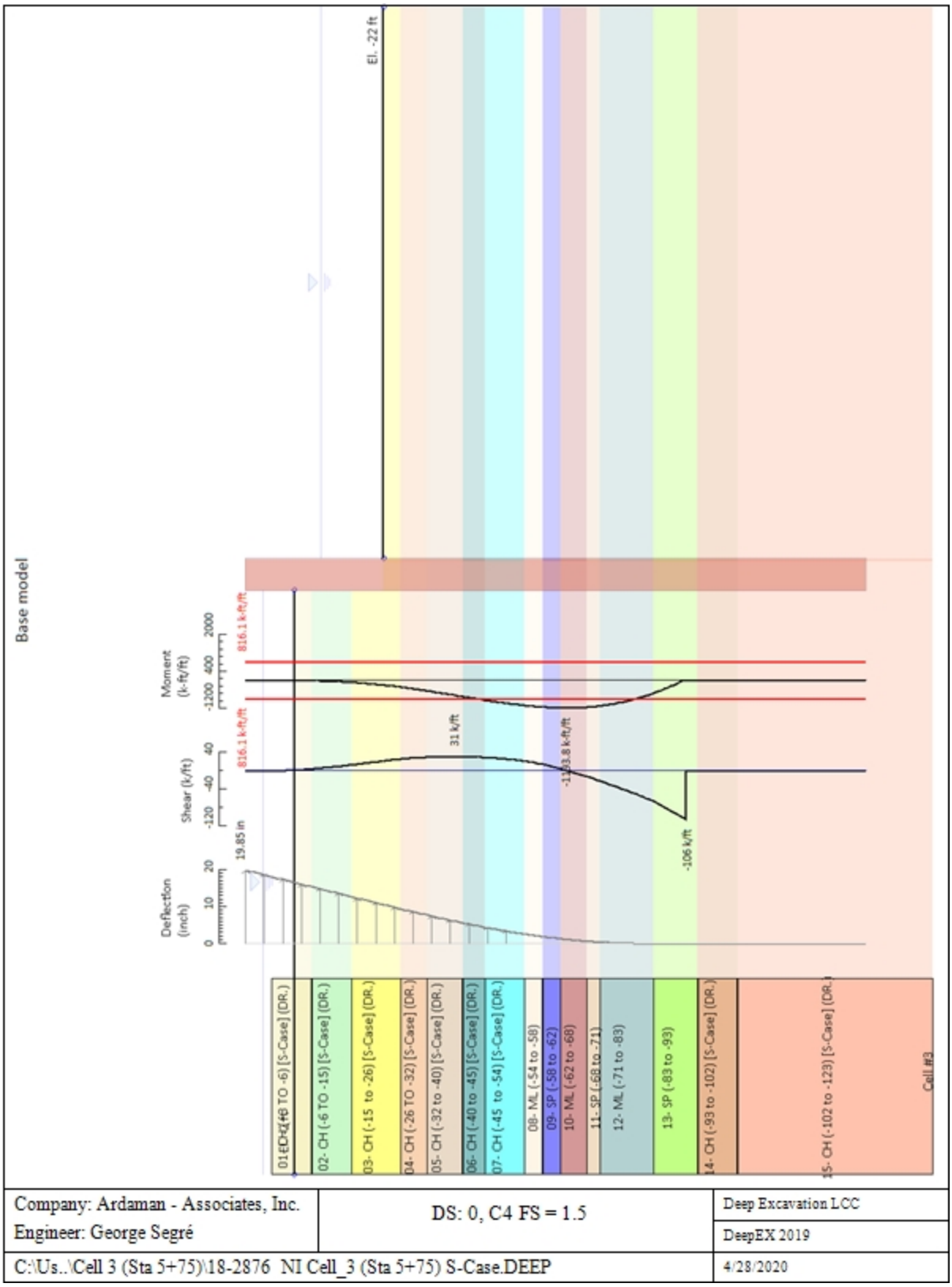
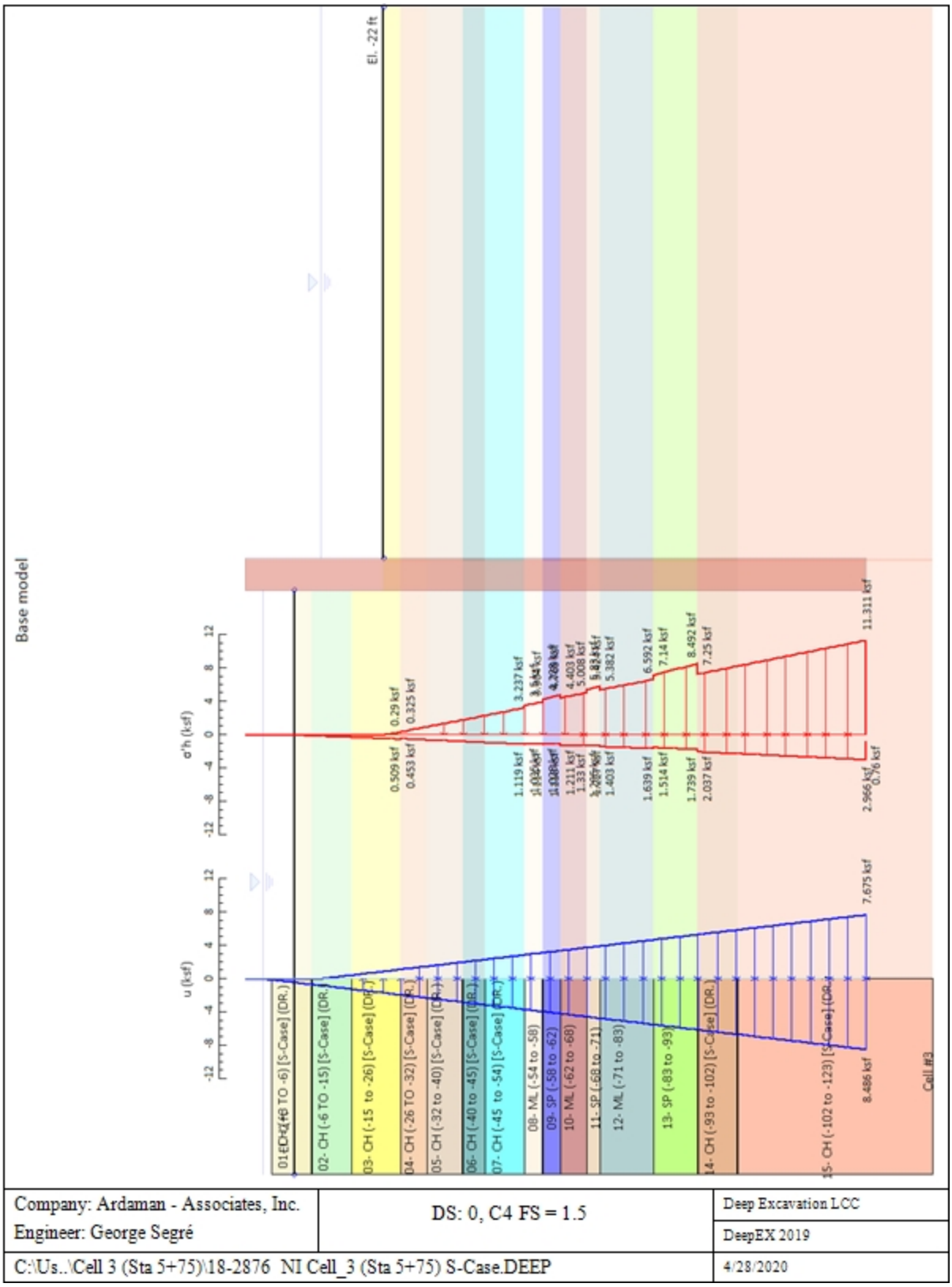


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 3 (Sta 5+75)\18-2876 NI Cell_3 (Sta 5+75) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 6+75 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -89.04 ft., NAVD88

Length of Sheetting = 98.04 ft.

Use = 100.0 ft.

Design Tip Elev. = -91.0 ft., NAVD88

Design Length of Sheeting = 100.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-15	1.00	1.00	-57.36	626.23	77.02	4.69
		Open excavation - degraded	9	-15	1.00	1.25	-66.44	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-52.22	454.03	77.22	2.98
		Open excavation - degraded	9	-8	1.00	1.25	-57.76	--	--	--
Q-Case	3	Open excavation - degraded	5	-15	1.00	1.00	-51.44	355.14	68.54	2.17
		Open excavation - degraded	5	-15	1.00	1.50	-64.47	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-45.90	245.19	44.88	1.19
		Open excavation - degraded	5	-8	1.00	1.50	-54.60	--	--	--
S-Case	1	Open excavation - degraded	9	-15	1.00	1.00	-76.14	1,170.99	121.26	14.46
		Open excavation - degraded	9	-15	1.00	1.25	-87.75	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-68.40	830.36	95.54	8.58
		Open excavation - degraded	9	-8	1.00	1.25	-78.08	--	--	--
S-Case	3	Open excavation - degraded	5	-15	1.00	1.00	-68.40	745.56	89.50	7.51
		Open excavation - degraded	5	-15	1.00	1.50	-89.04	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-60.66	487.92	67.89	3.94
		Open excavation - degraded	5	-8	1.00	1.50	-76.78	--	--	--
						Governing Value:	-89.04	1,170.99	121.26	14.46

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:18:45 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	0	0	500	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	0	0	350	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-26 T	124	124	0	0	1250	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-32 to	120	120	0	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	0	0	1730	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-45 t	125	125	0	0	3300	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- ML (-54 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	0	0	3500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
15- CH (-102 t	125	125	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	1	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.741	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

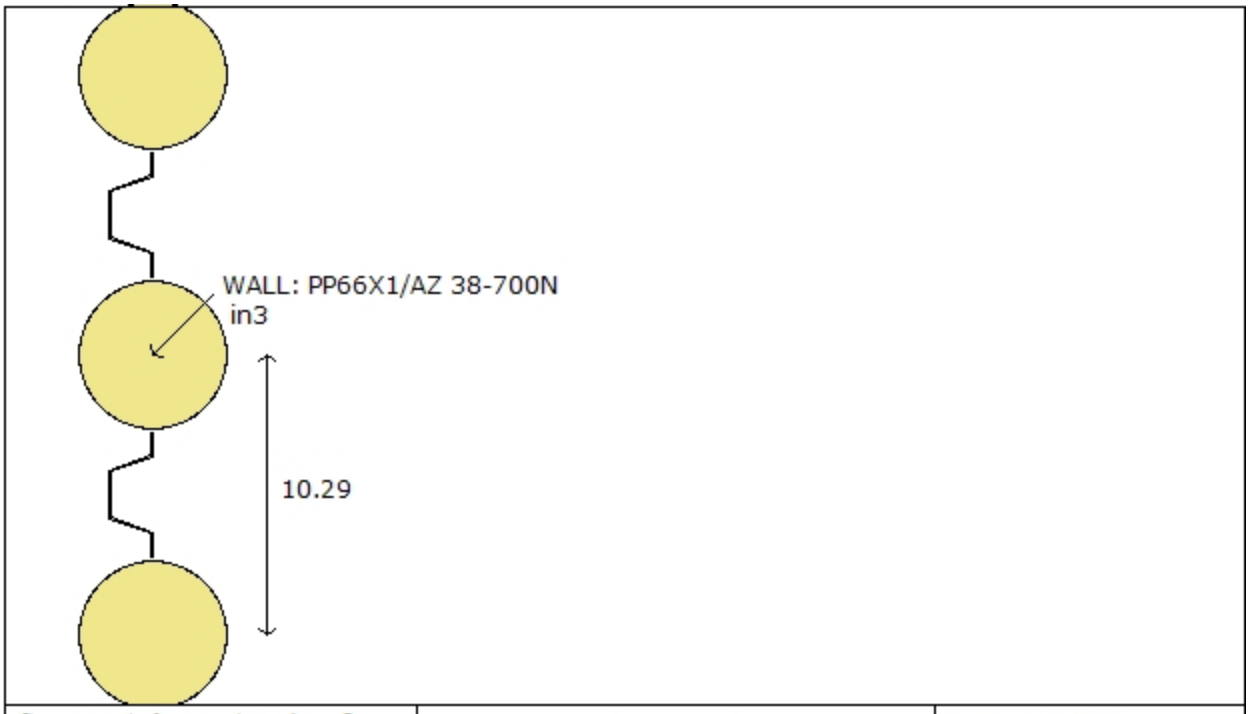
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	1
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	1
-26	04- CH (-26 TO	1	1
-32	05- CH (-32 to	1	1
-40	06- CH (-40 to	1	1
-45	07- CH (-45 to	1	1
-54	08- ML (-54 to	1	0.74
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.74
-68	11- SP (-68 to -	1	1
-71	12- ML (-71 to	1	0.74
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	1
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.298	1.33	1.933
Stage 1	Simple span	N/A	1.6	1.064	1.064	1.547
Stage 2	Simple span	N/A	1.6	1.478	1.648	2.399
Stage 3	Simple span	N/A	1.6	1.286	1.318	1.919
Stage 4	Simple span	N/A	1.6	1.509	1.644	2.264
Stage 5	Simple span	N/A	1.6	1.096	1.096	1.509
Stage 6	Simple span	N/A	1.6	1.78	2.159	2.929
Stage 7	Simple span	N/A	1.6	1.389	1.439	1.952

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

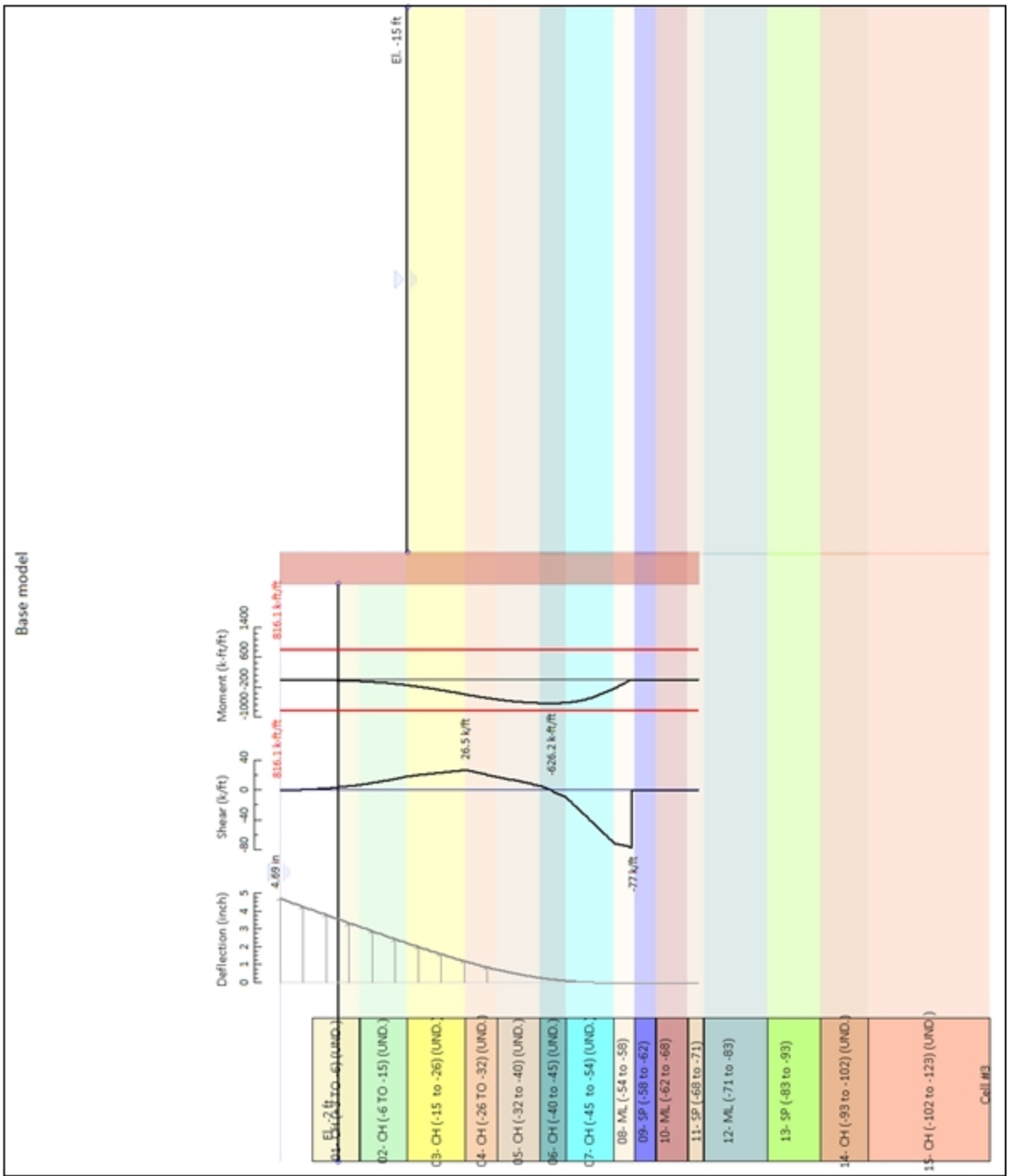
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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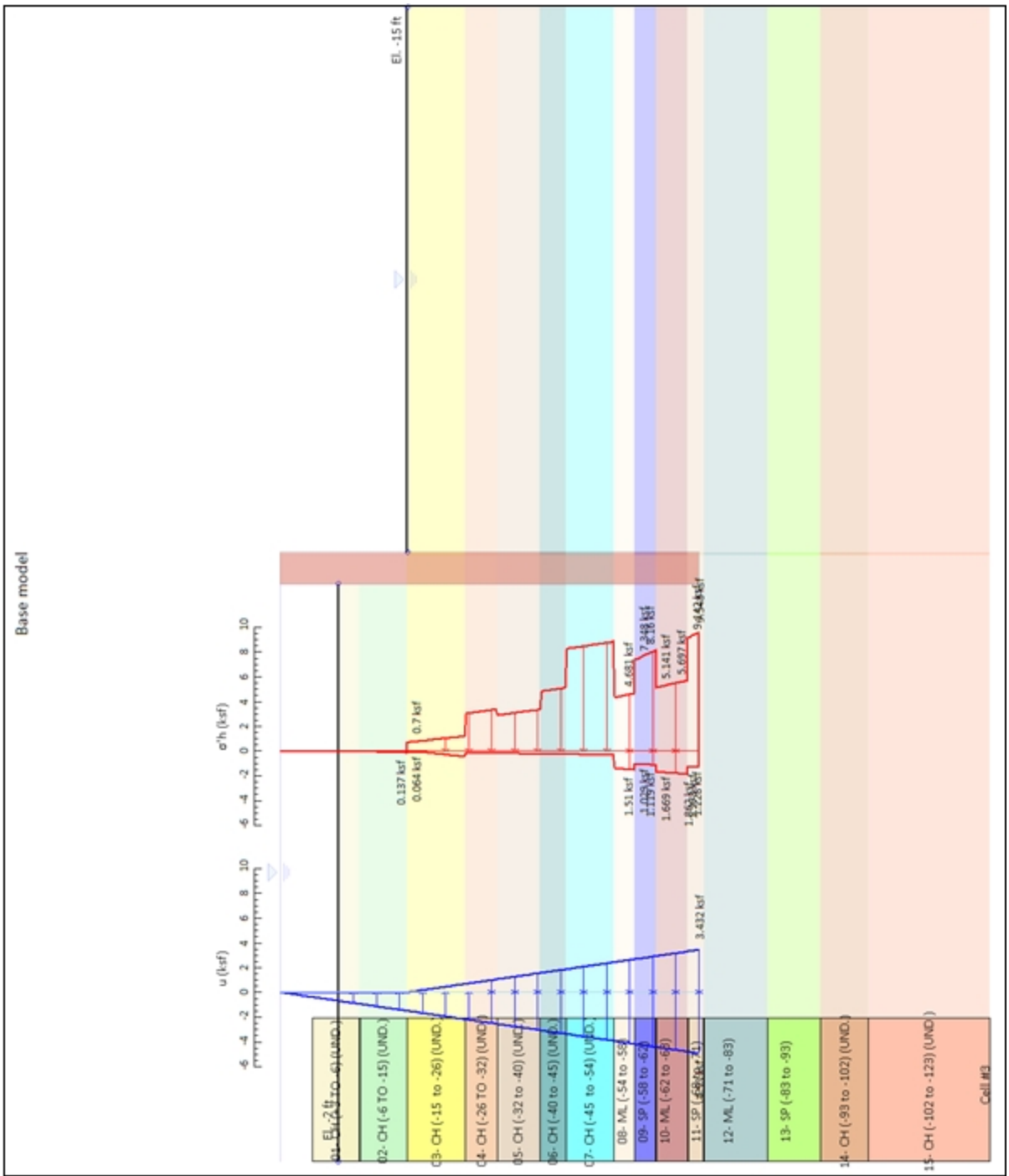

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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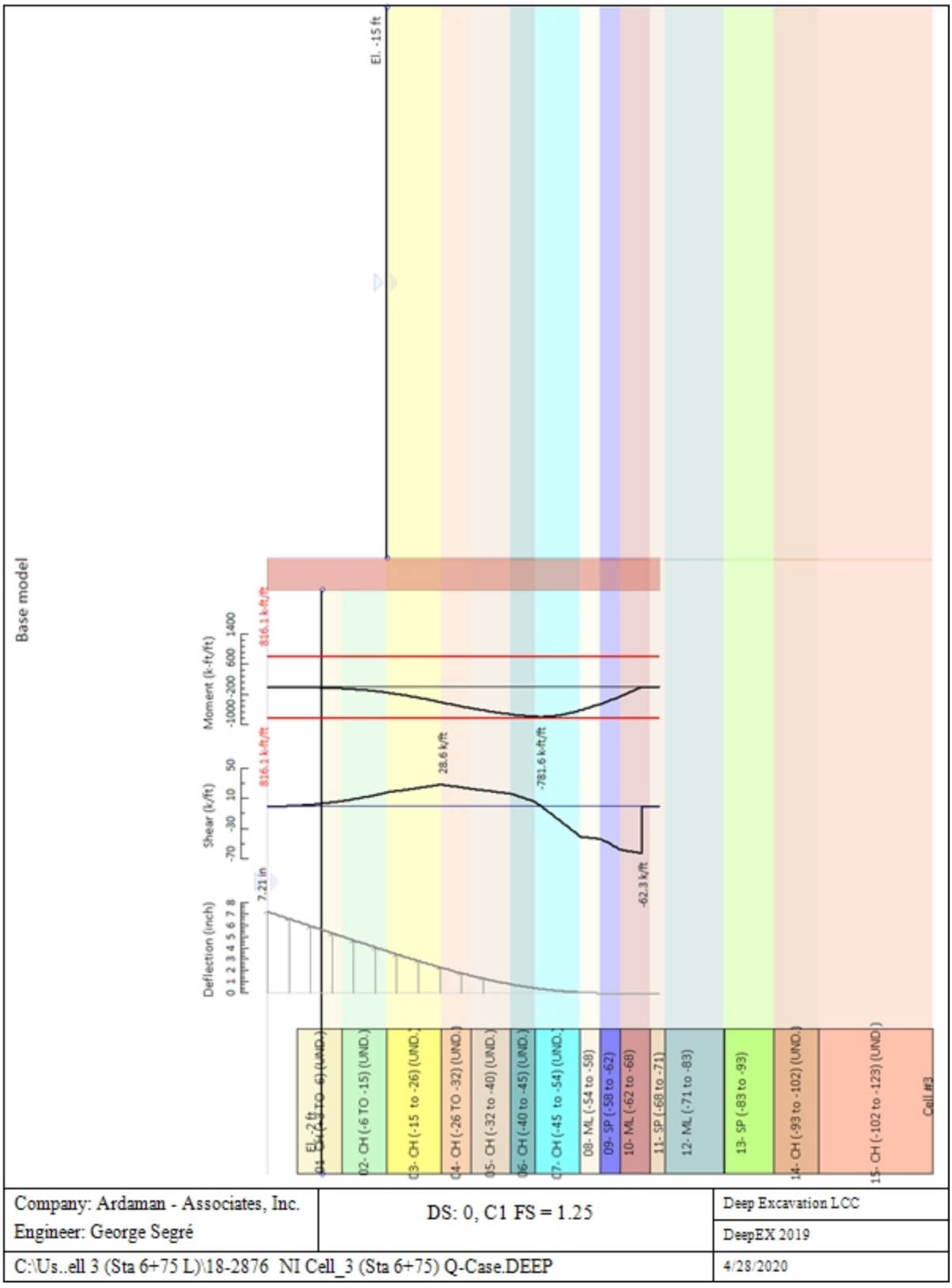
Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-70 -30 10 50
28.6 k/ft
-781.6 k-ft/ft
-62.3 k/ft
Deflection (inch)
0 1 2 3 4 5 6 7 8
7.21 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
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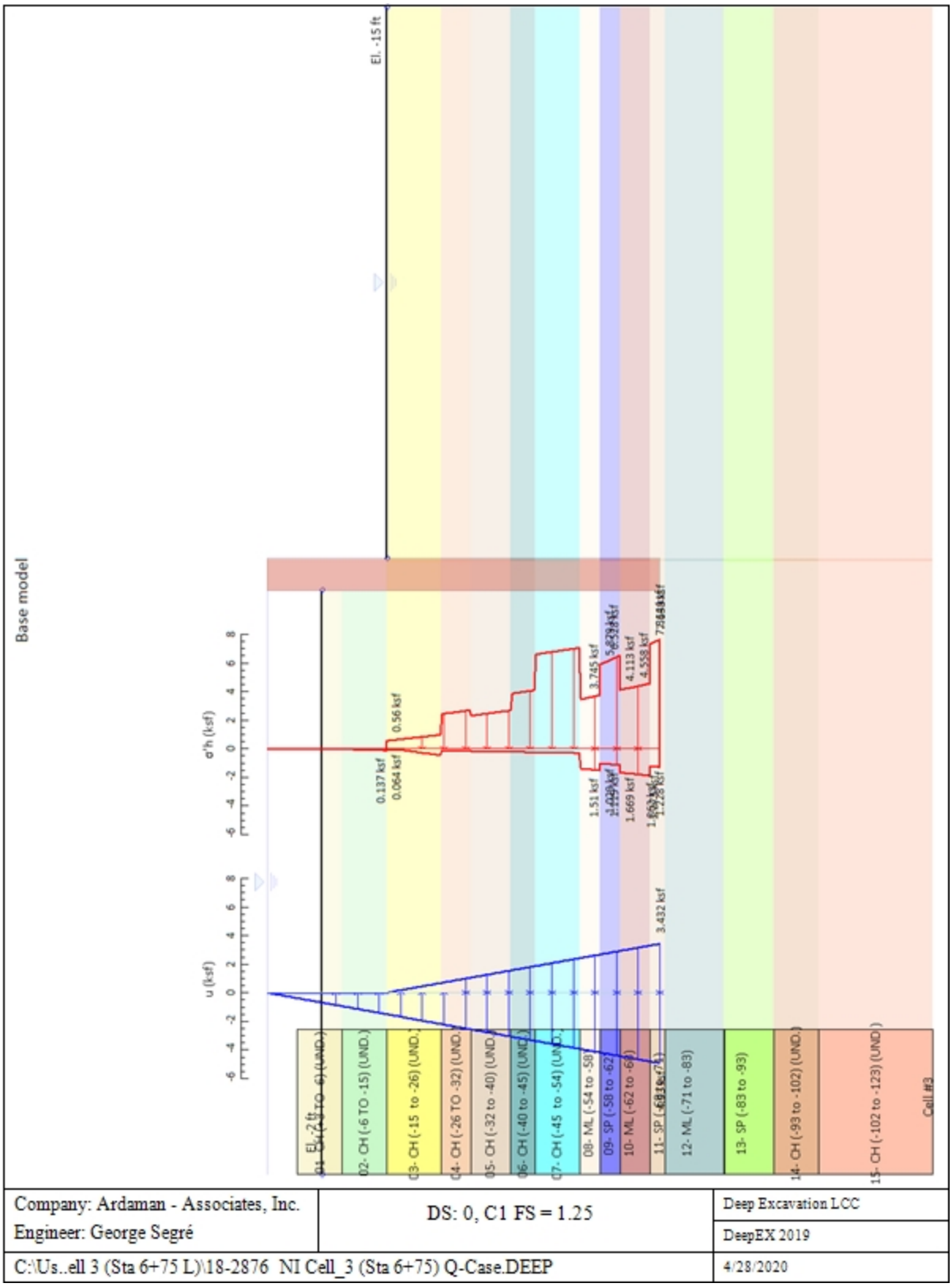
4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.56 ksf
1.51 ksf
1.669 ksf
3.745 ksf
4.113 ksf
4.558 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
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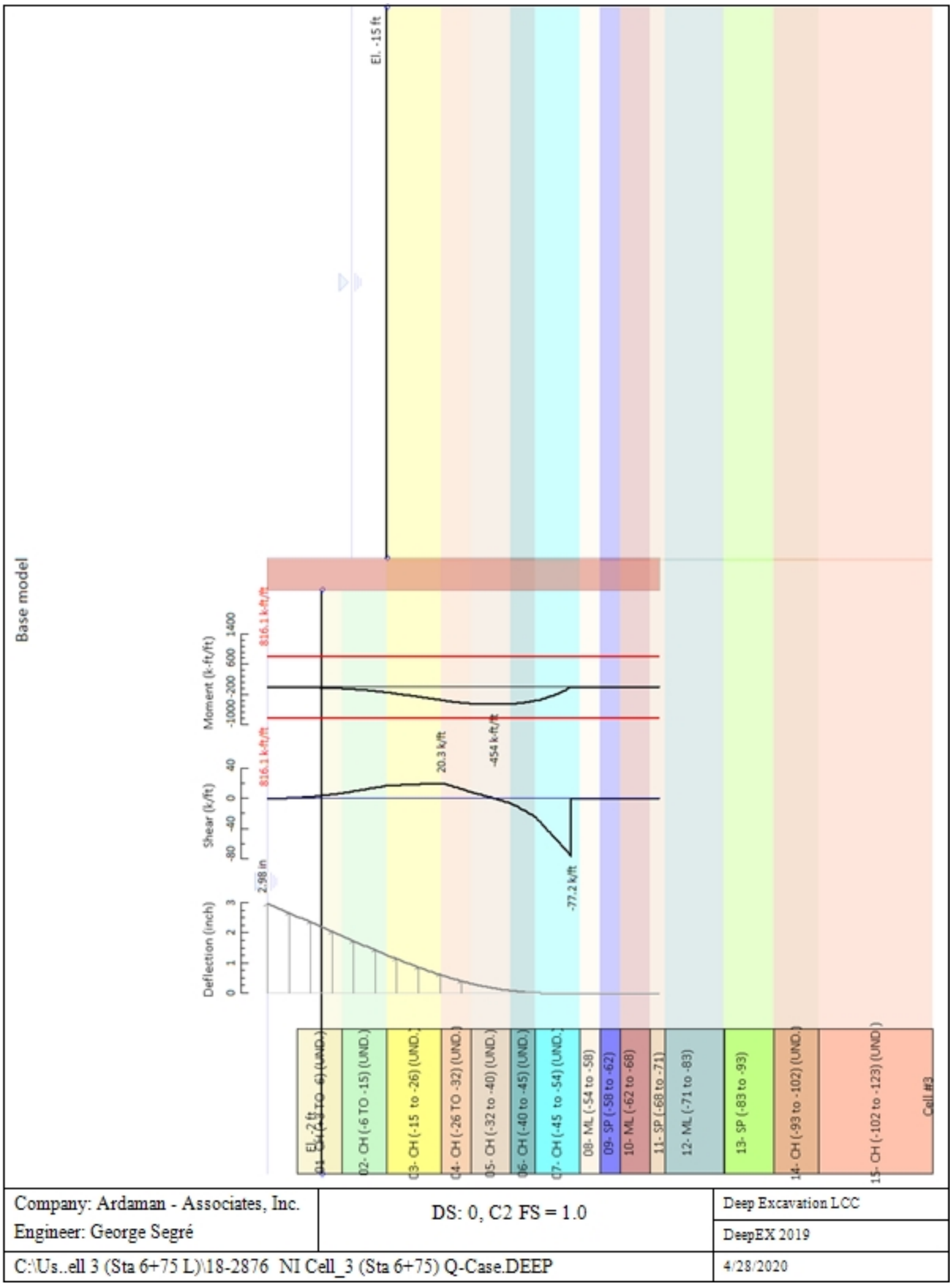
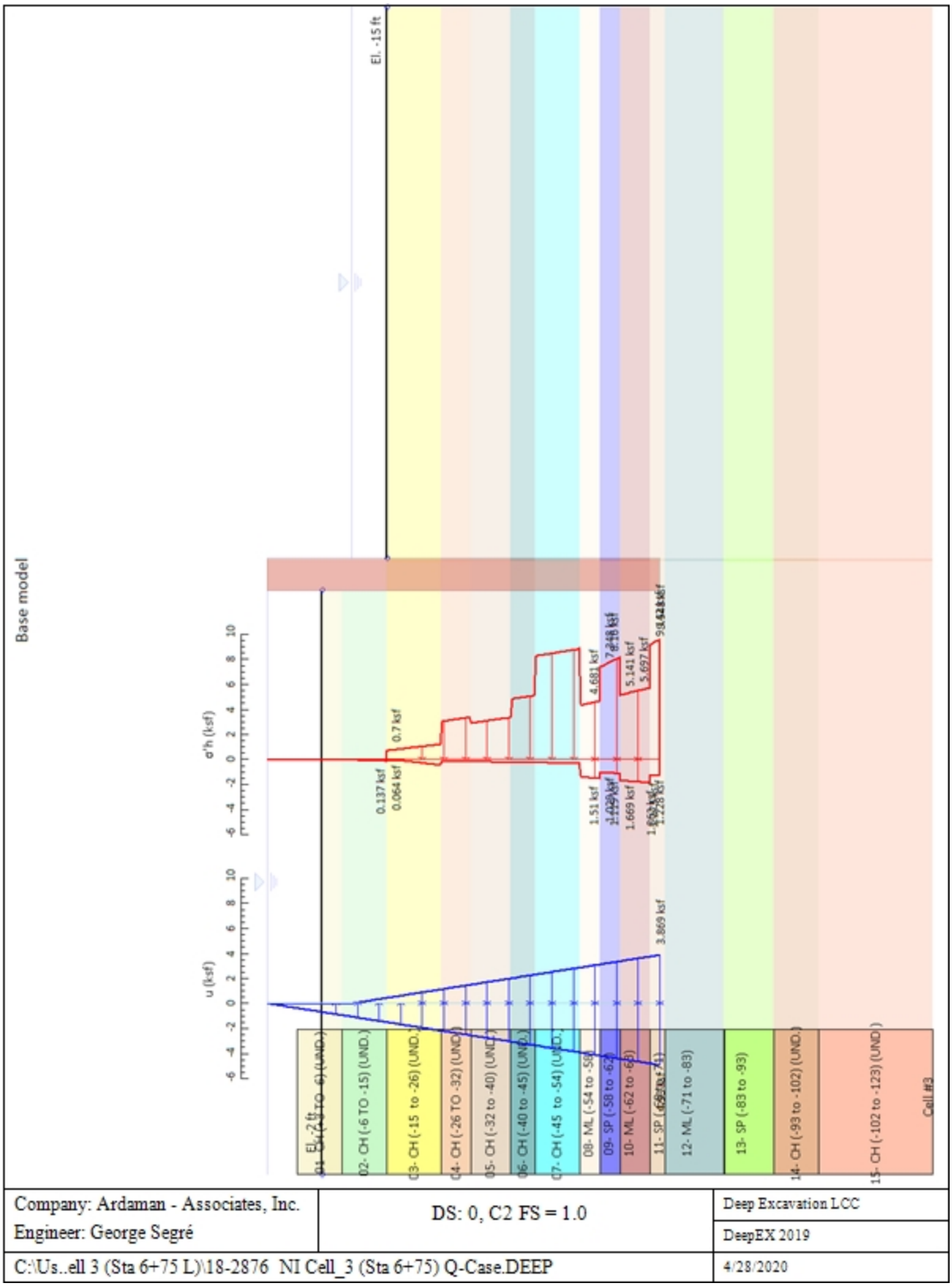
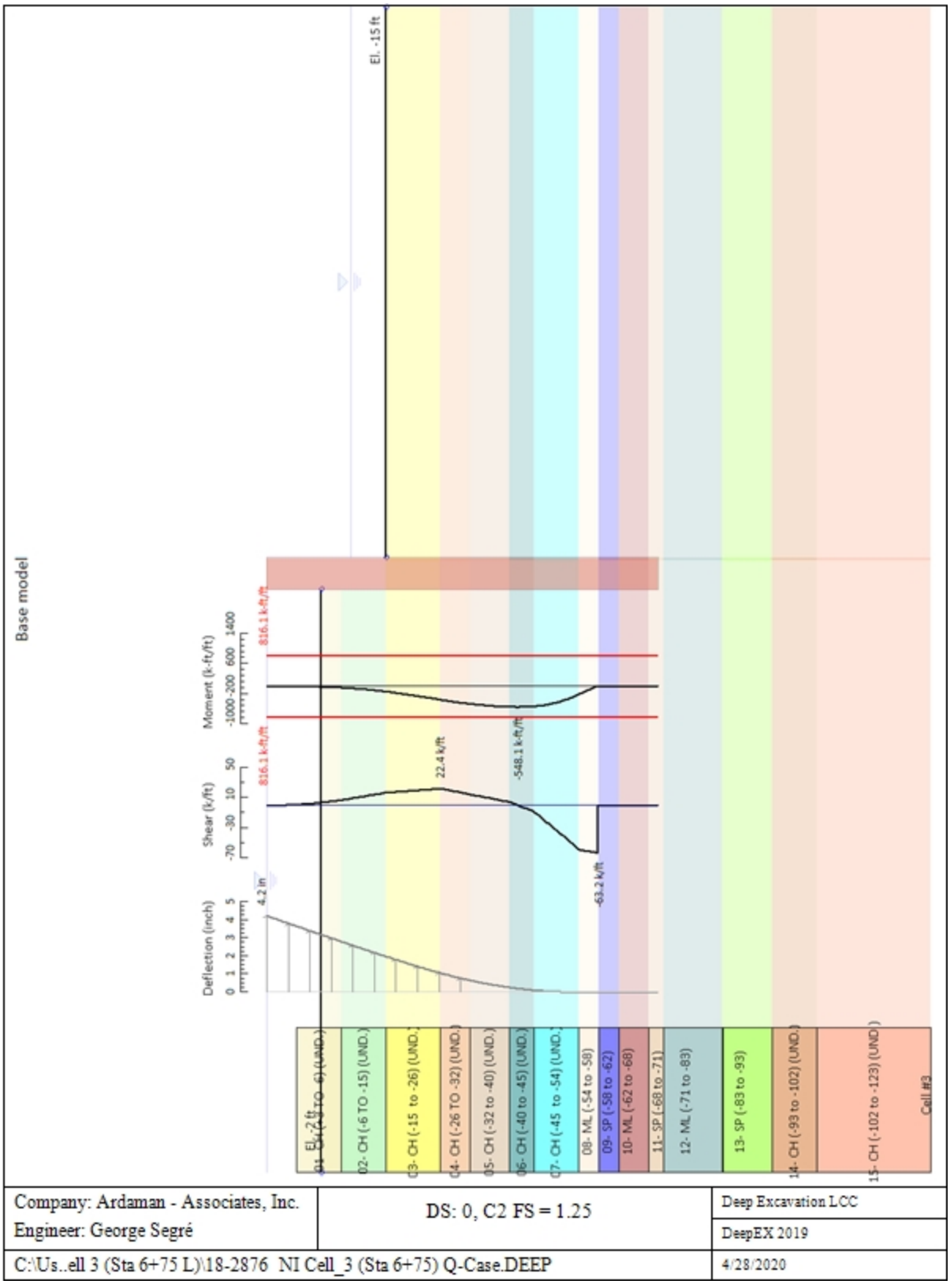
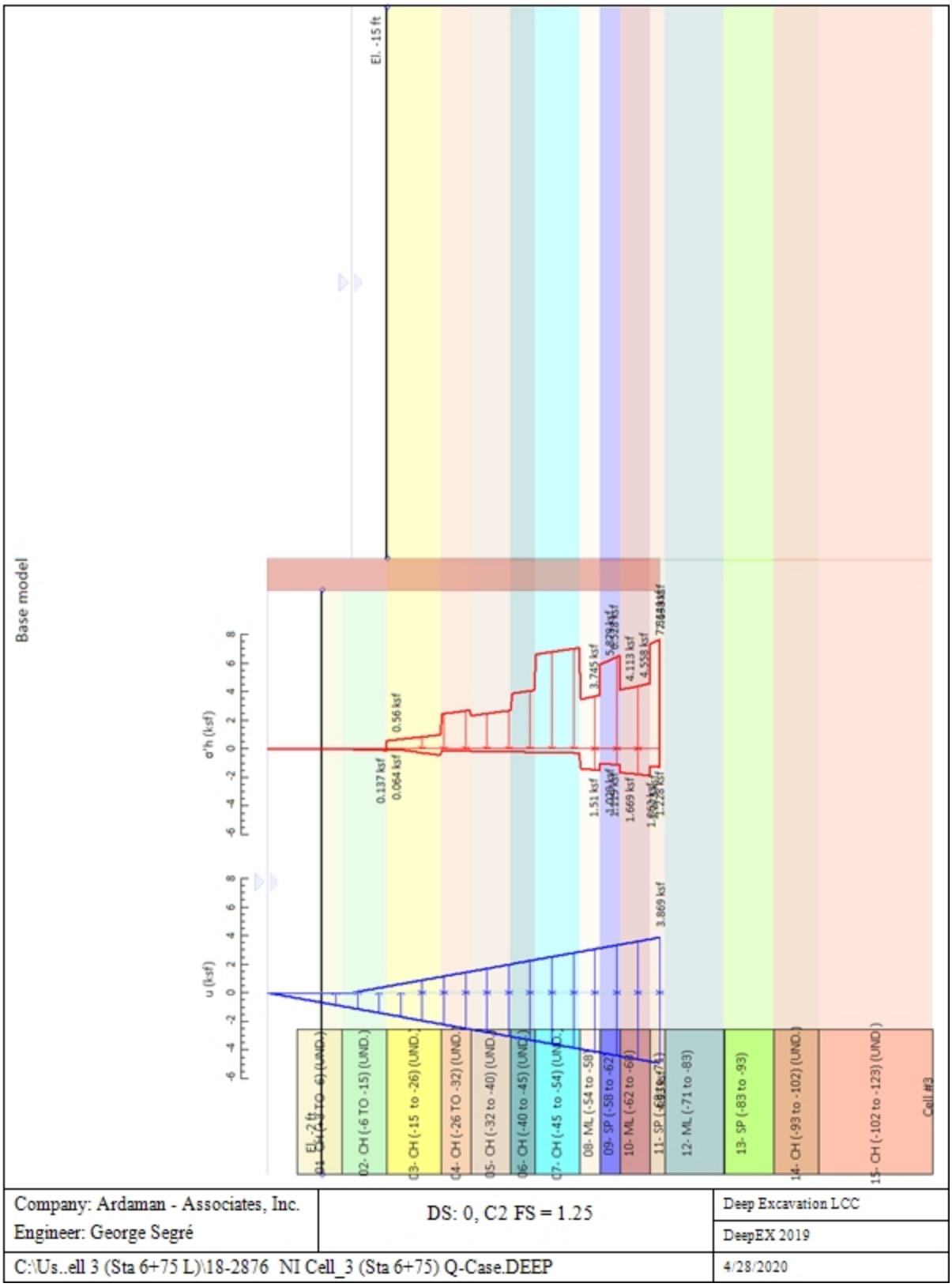
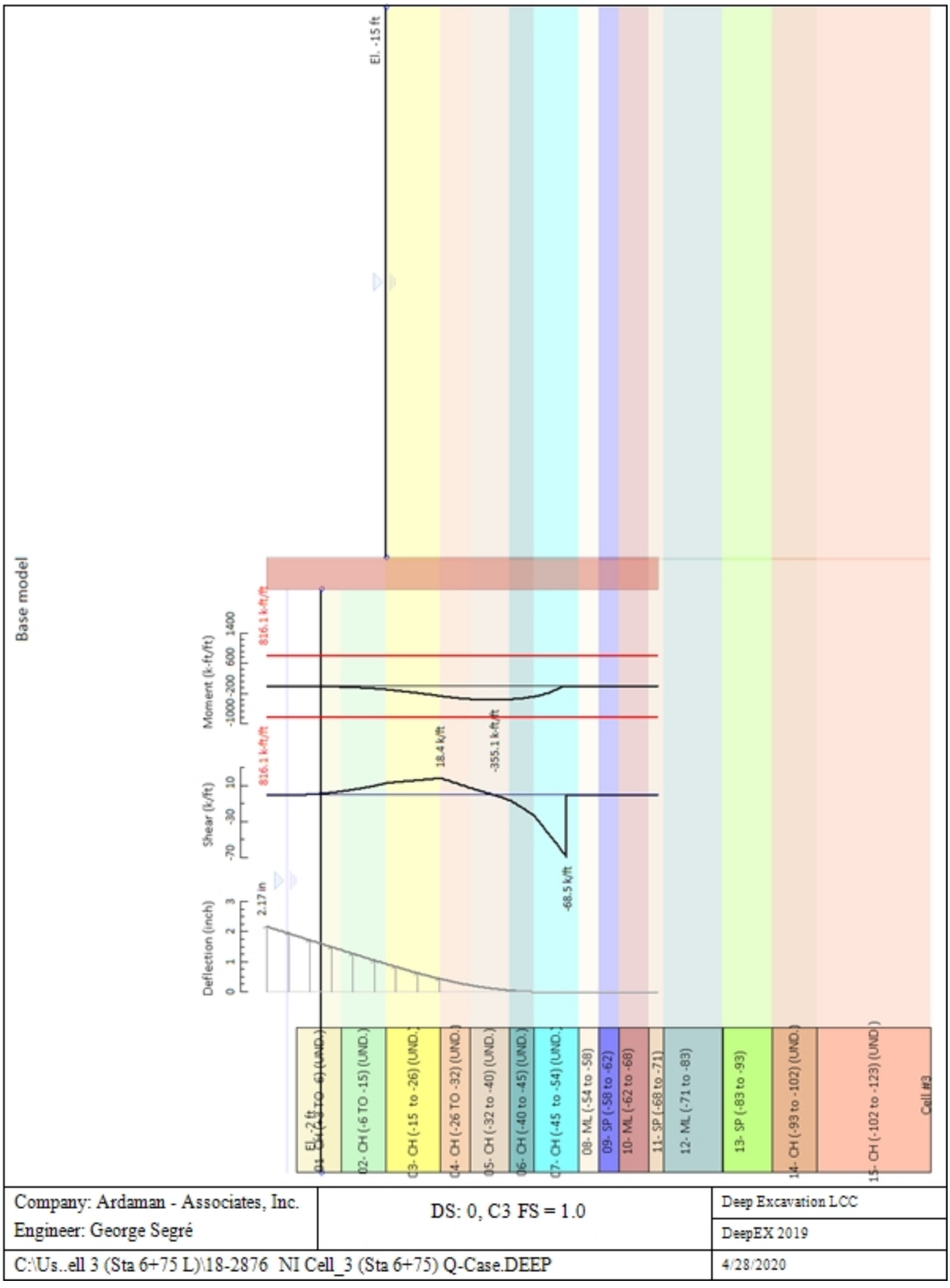

Base model
El. -15 ft
El. -2 ft
Deflection (inch)
0 1 2 3
2.98 in
Shear (k/ft)
-80 -40 0 40
816.1 k-ft/ft
20.3 k/ft
-77.2 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-454 k-ft/ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

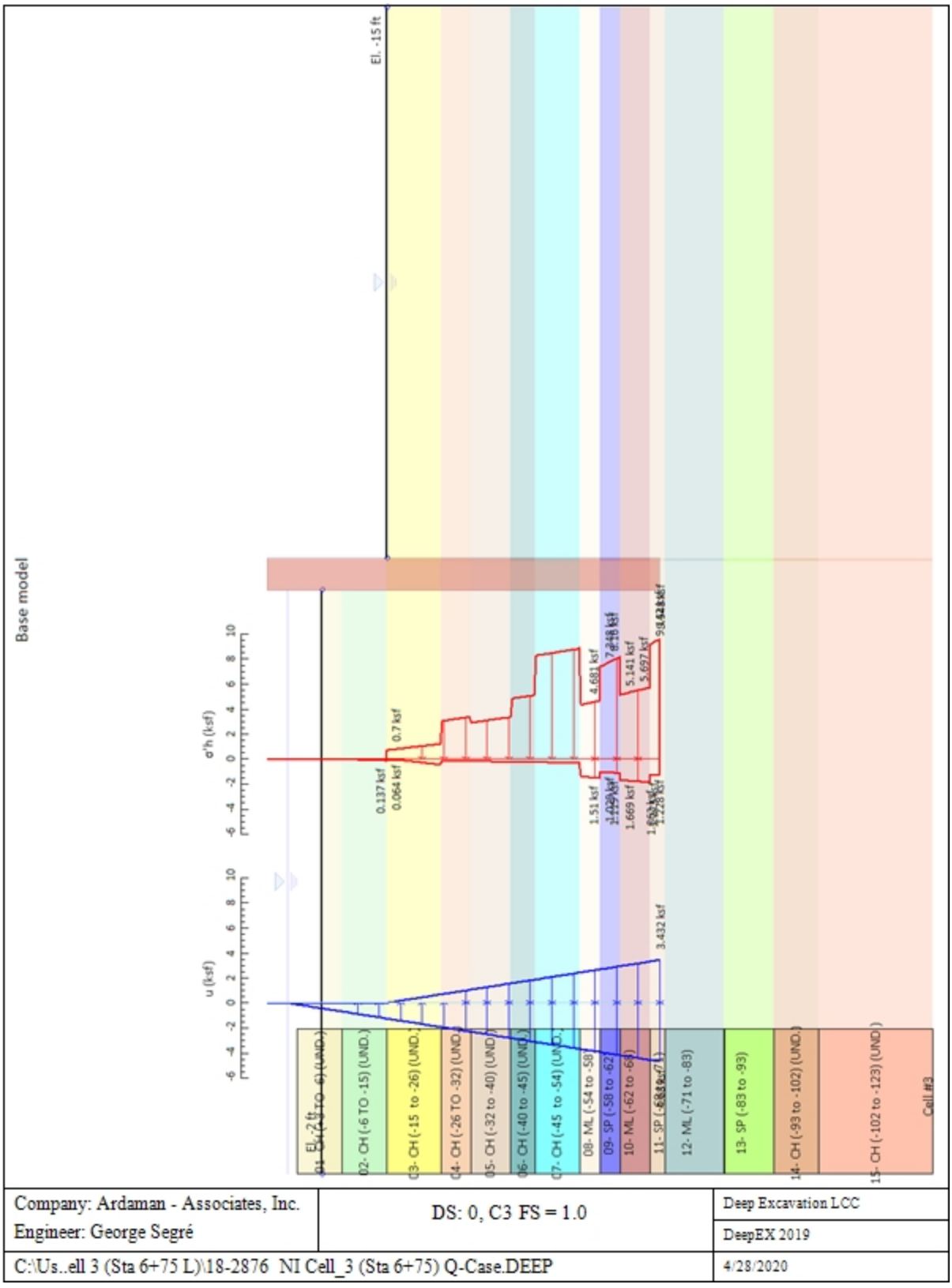

Base model
El. -15 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.869 ksf
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020


Base model
El. -15 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-548.1 k-ft/ft
Shear (k/ft)
-70 -30 10 50
22.4 k/ft
-63.2 k/ft
Deflection (inch)
0 1 2 3 4 5
4.2 in
El. -2 ft
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.56 ksf
1.51 ksf
1.669 ksf
3.745 ksf
4.113 ksf
4.558 ksf
3.869 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP		4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
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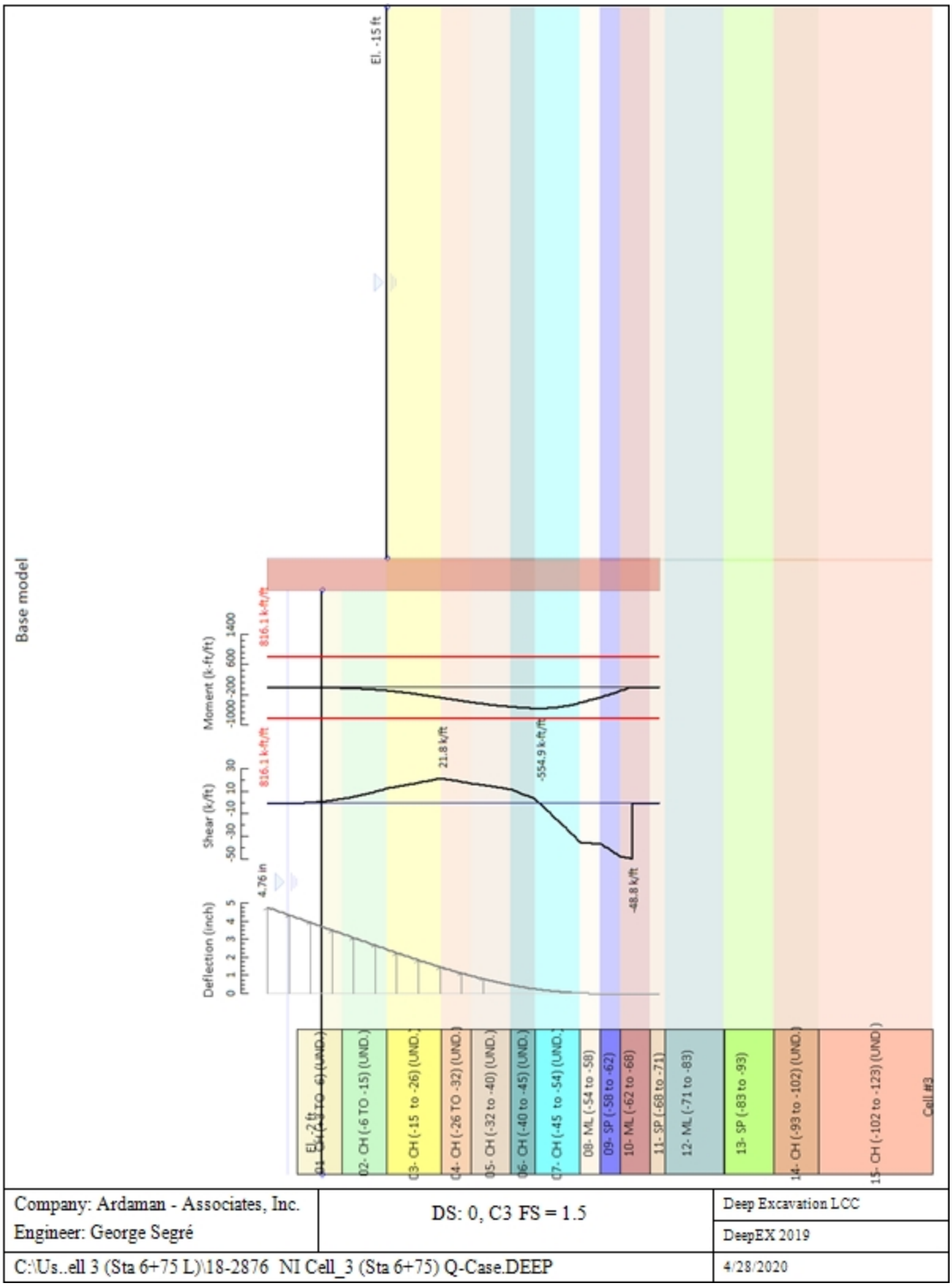
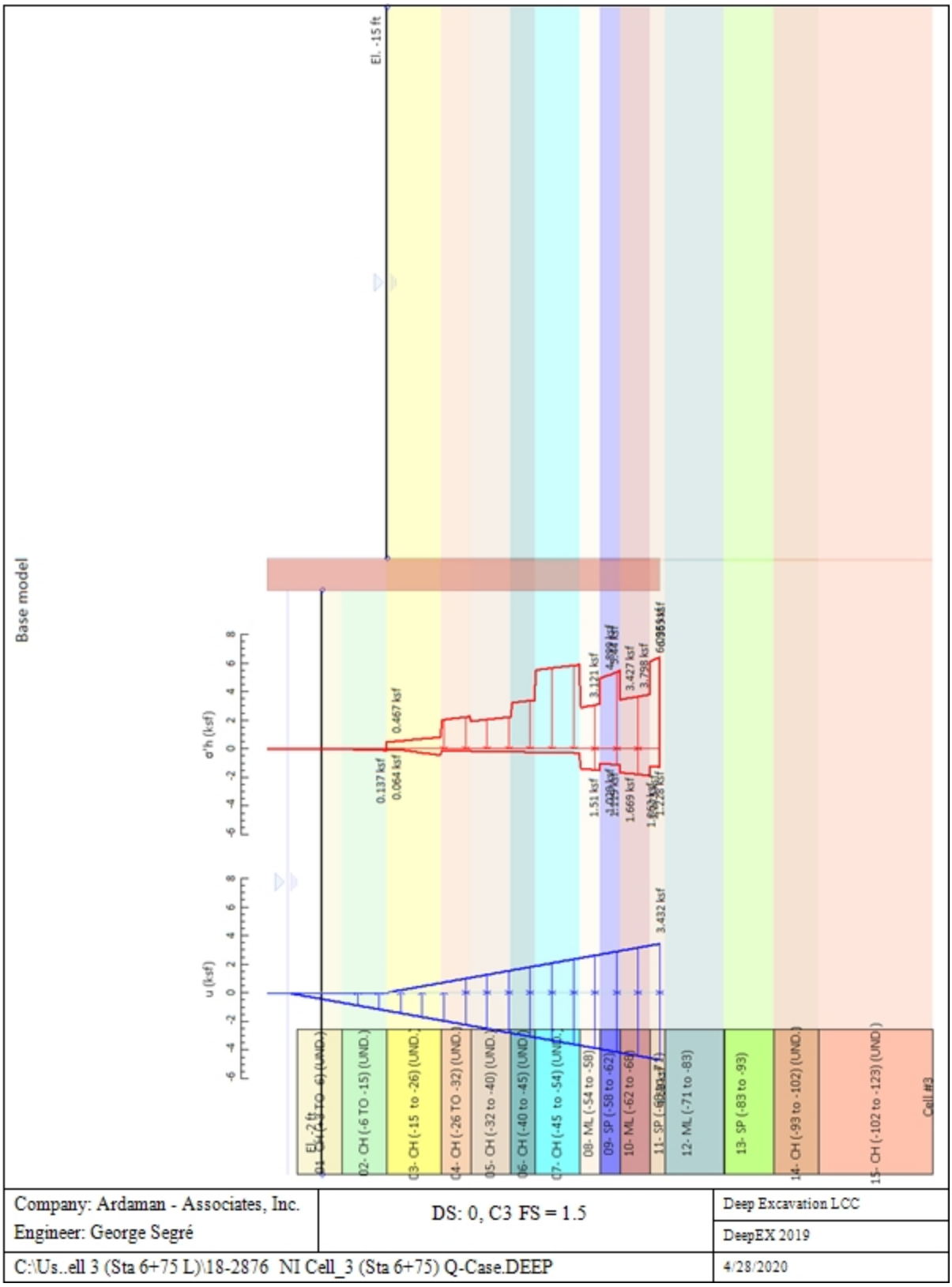
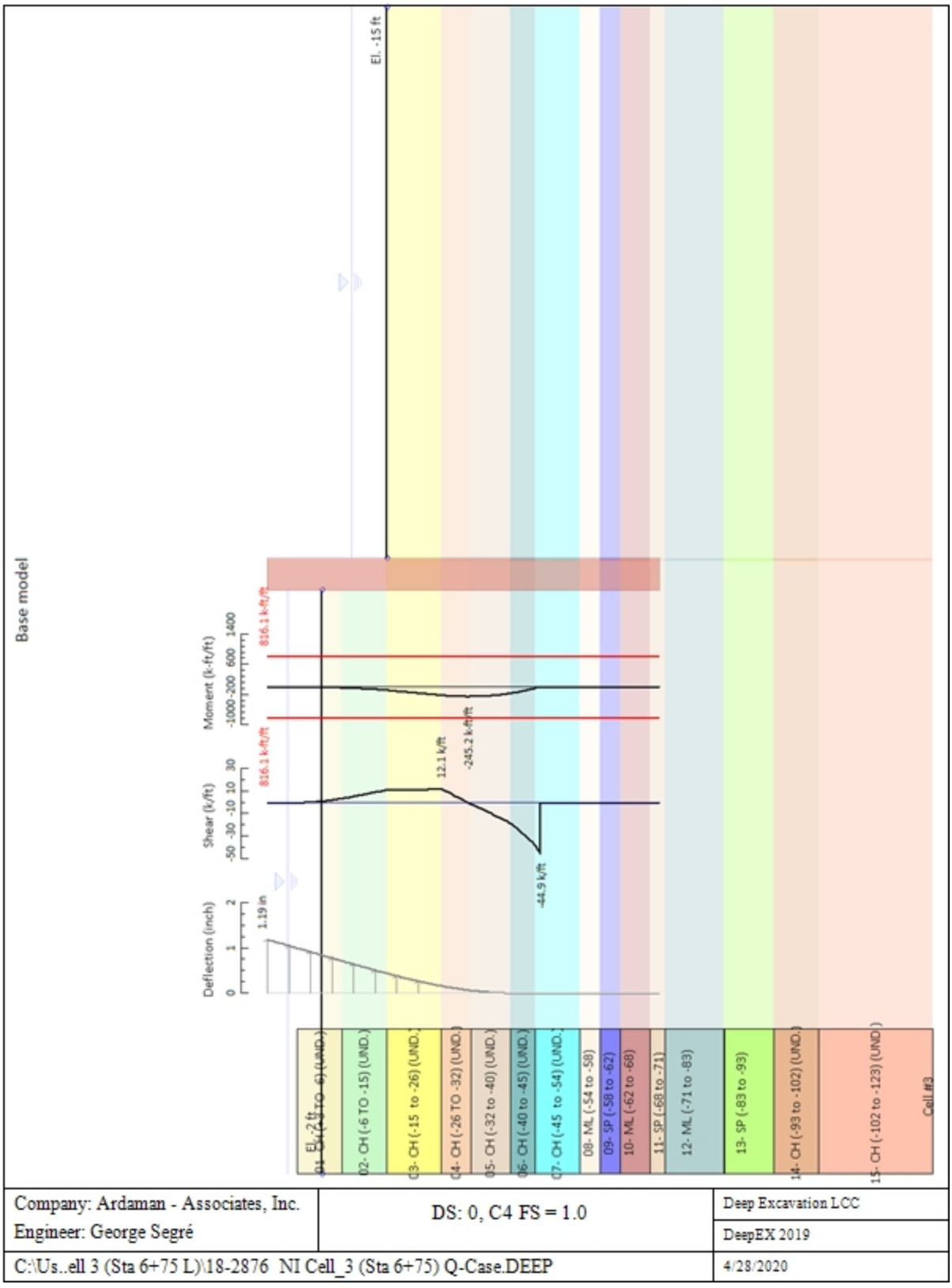
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

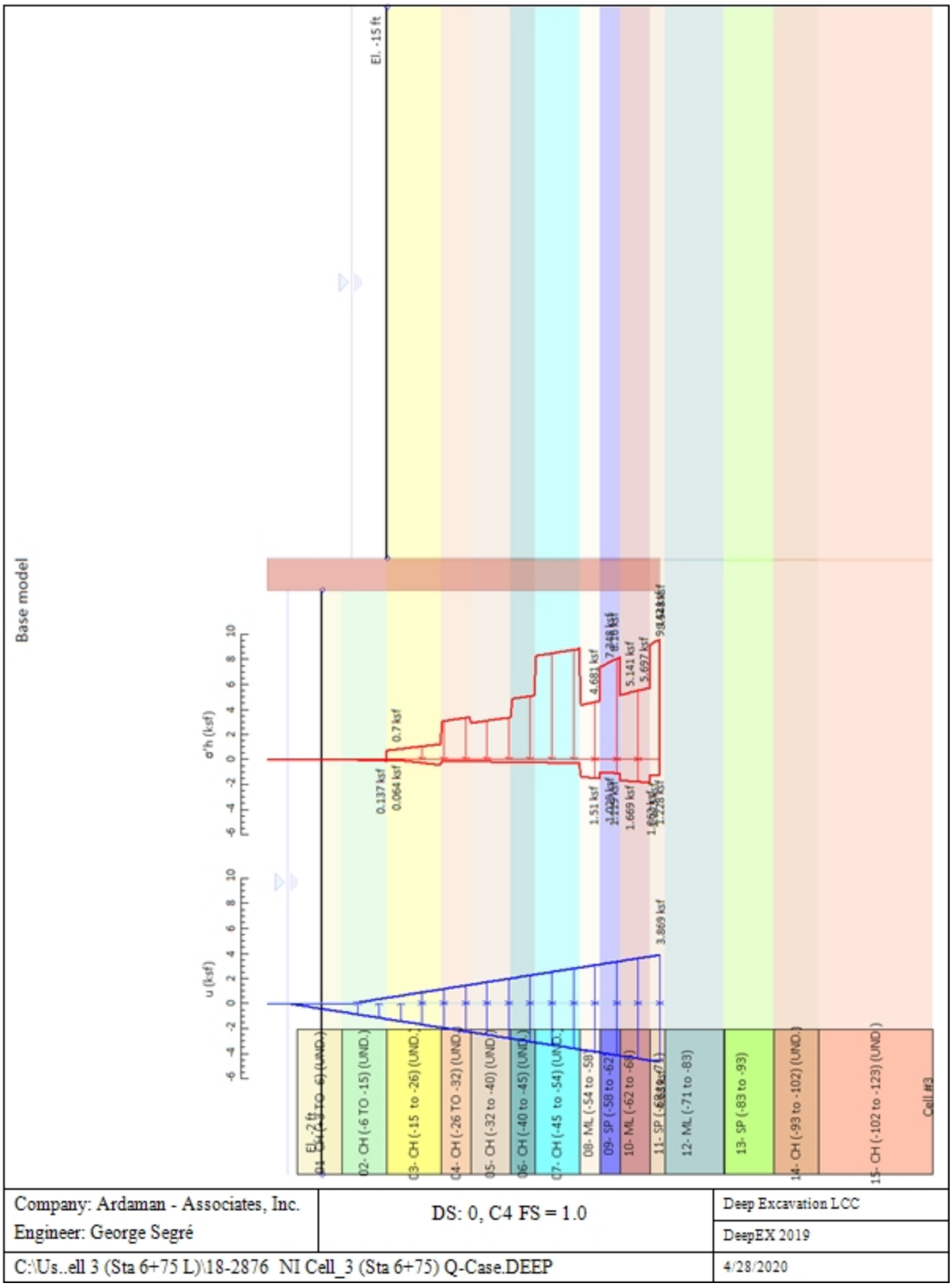


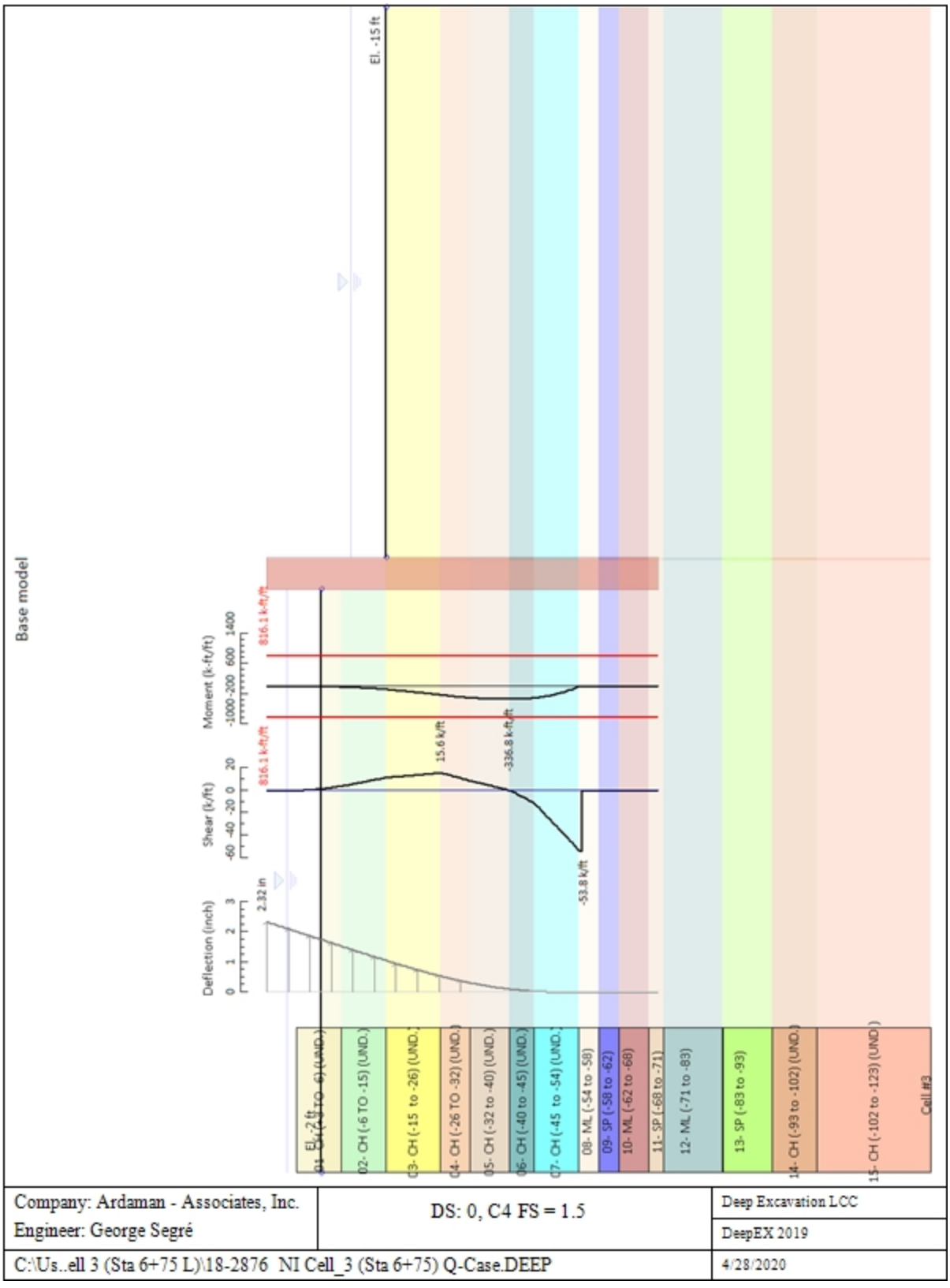
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP		4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.467 ksf
1.51 ksf
1.669 ksf
3.121 ksf
3.427 ksf
3.798 ksf
3.432 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

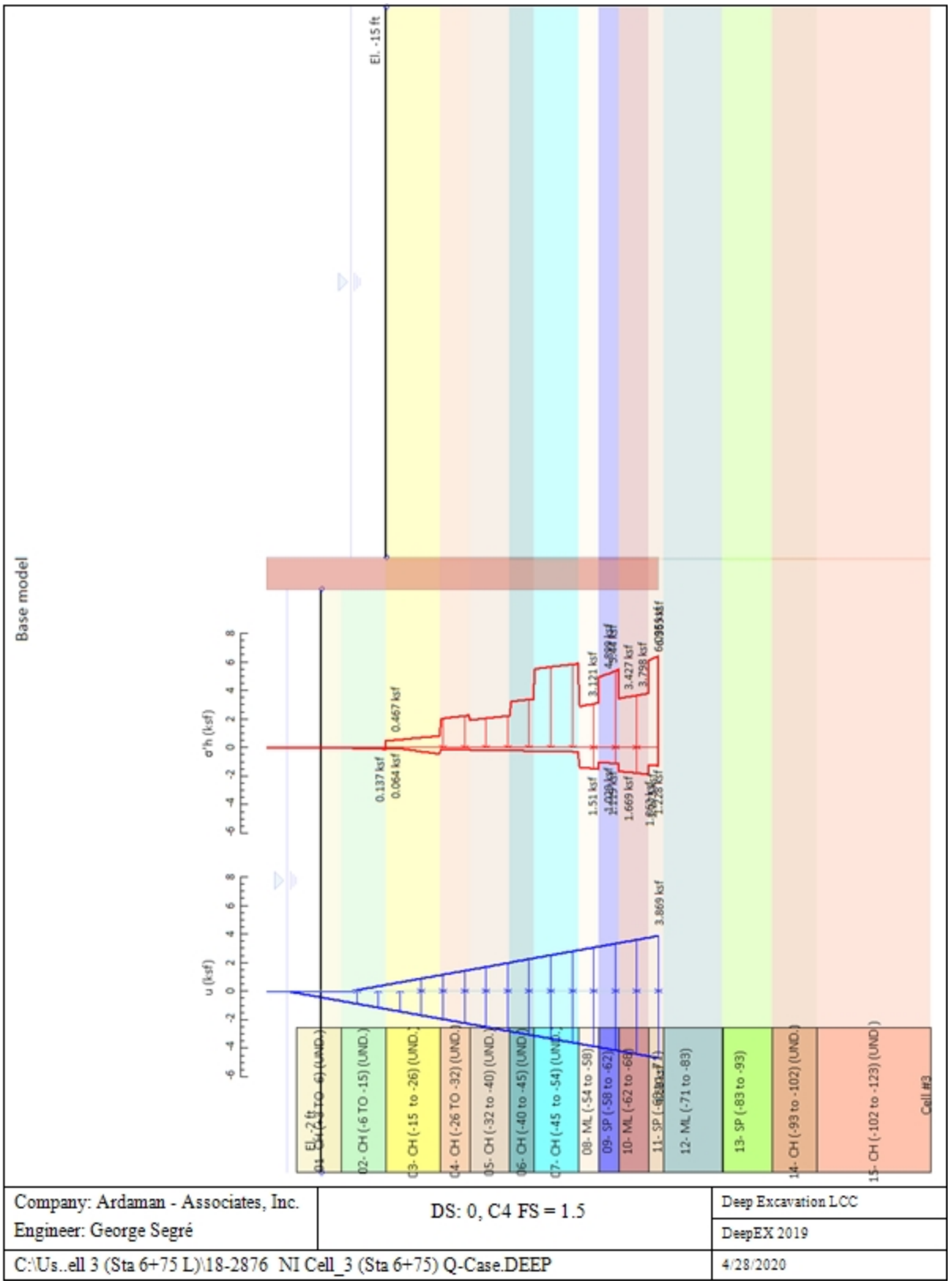


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP		4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.7 ksf
1.51 ksf
1.669 ksf
4.681 ksf
5.141 ksf
5.697 ksf
3.869 ksf
01- CL (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP		4/28/2020


Base model
El. -15 ft
El. -2 ft
σ'h (ksf)
u (ksf)
0.137 ksf
0.064 ksf
0.467 ksf
1.51 ksf
1.669 ksf
3.121 ksf
3.427 ksf
3.798 ksf
3.869 ksf
01- CH (-2 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) Q-Case.DEEP
4/28/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:25:40 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	23	0	500	23	23	300	3	0.44	2.28	0.44	2.28	True	EXP	
02- CH (-6 TO	110	110	23	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	23	0	350	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-26 T	124	124	26	0	1250	26	26	521.92	3	0.39	2.56	0.39	2.56	True	Linear	
05- CH (-32 to	120	120	26	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	26	0	1730	26	26	626.3	3	0.39	2.56	0.39	2.56	True	Linear	
07- CH (-45 t	125	125	26	0	3300	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- ML (-54 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
15- CH (-102 t	125	125	26	0	4000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	0.609	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	0.562	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.531	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

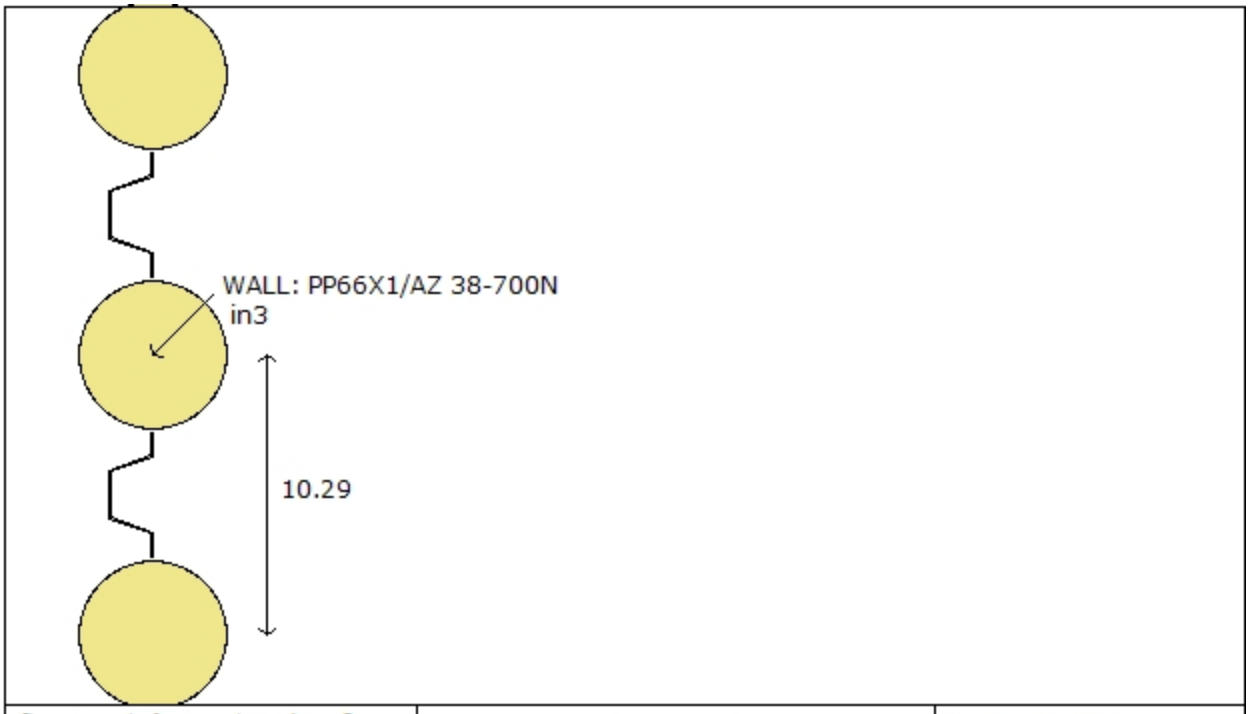
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	0.61
-6	02- CH (-6 TO -	1	0
-15	03- CH (-15 to	1	0.61
-26	04- CH (-26 TO	1	0.56
-32	05- CH (-32 to	1	0
-40	06- CH (-40 to	1	0.56
-45	07- CH (-45 to	1	0.56
-54	08- ML (-54 to	1	0.53
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.53
-68	11- SP (-68 to -	1	0.5
-71	12- ML (-71 to	1	0.53
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	0.56
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.717	1.872	2.659
Stage 1	Simple span	N/A	1.6	1.443	1.497	2.127
Stage 2	Simple span	N/A	1.6	1.966	2.233	3.119
Stage 3	Simple span	N/A	1.6	1.665	1.786	2.495
Stage 4	Simple span	N/A	1.6	1.966	2.143	2.95
Stage 5	Simple span	N/A	1.6	1.418	1.429	1.966
Stage 6	Simple span	N/A	1.6	2.3	2.63	3.527
Stage 7	Simple span	N/A	1.6	1.699	1.753	2.351

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

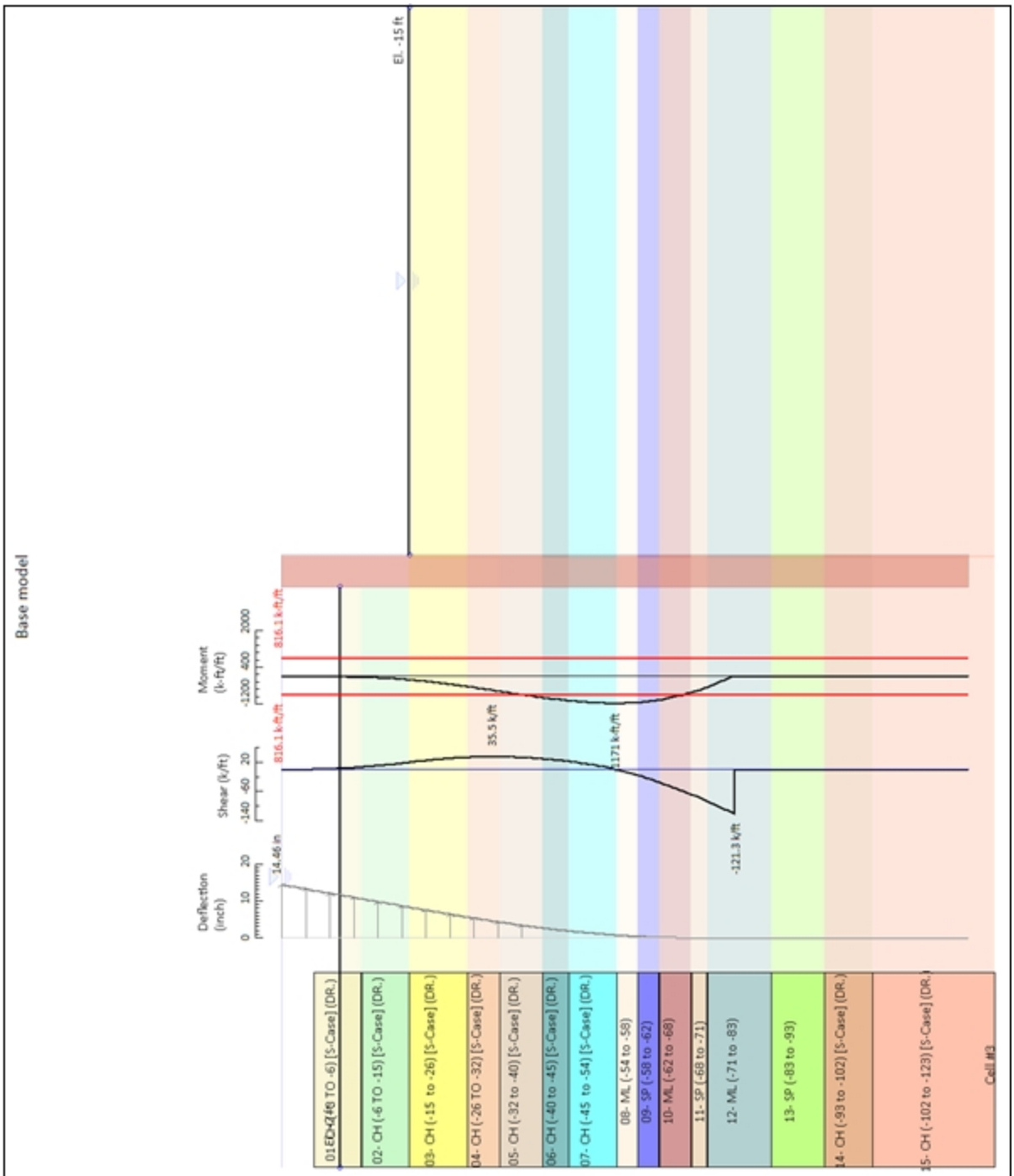
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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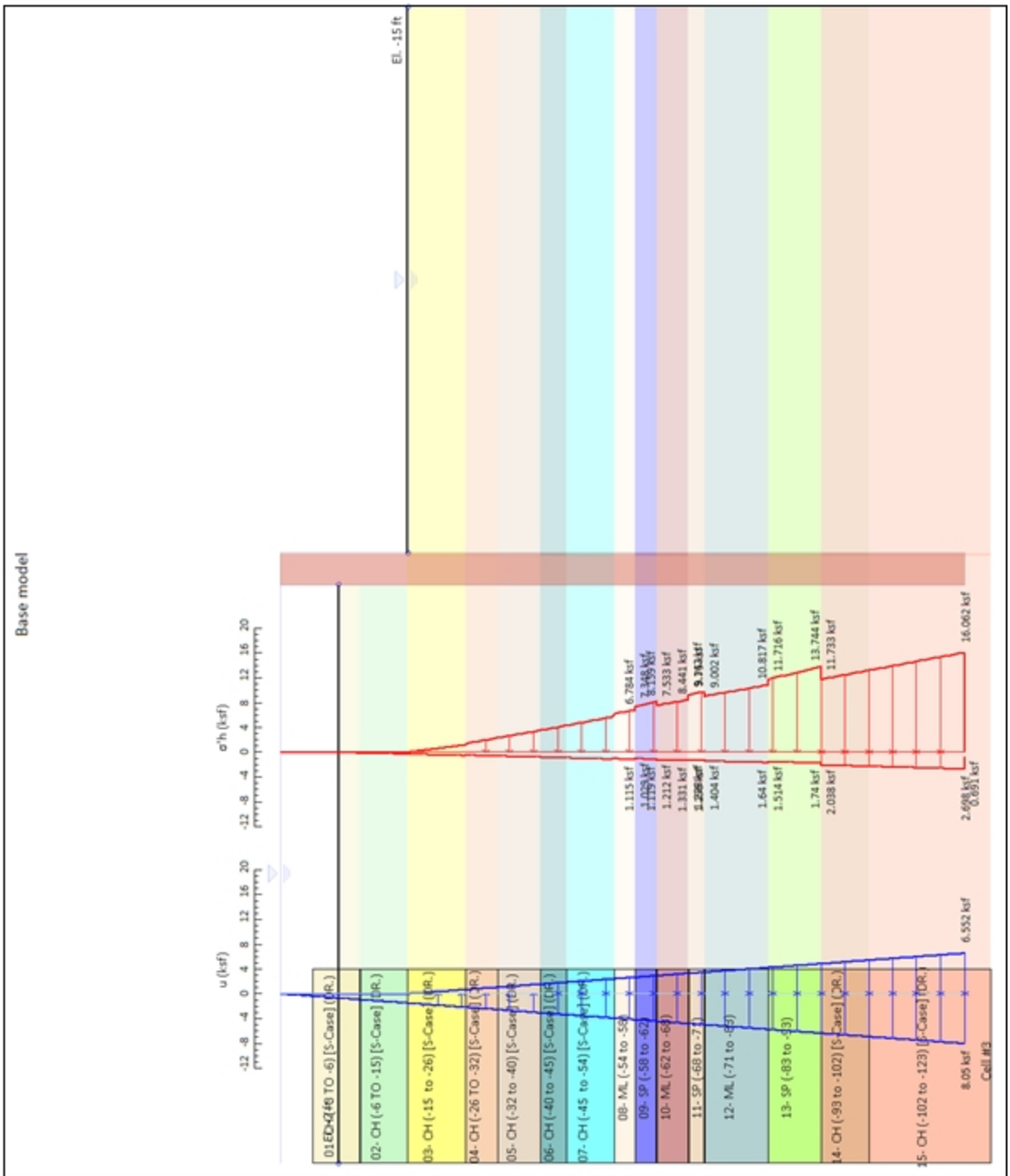

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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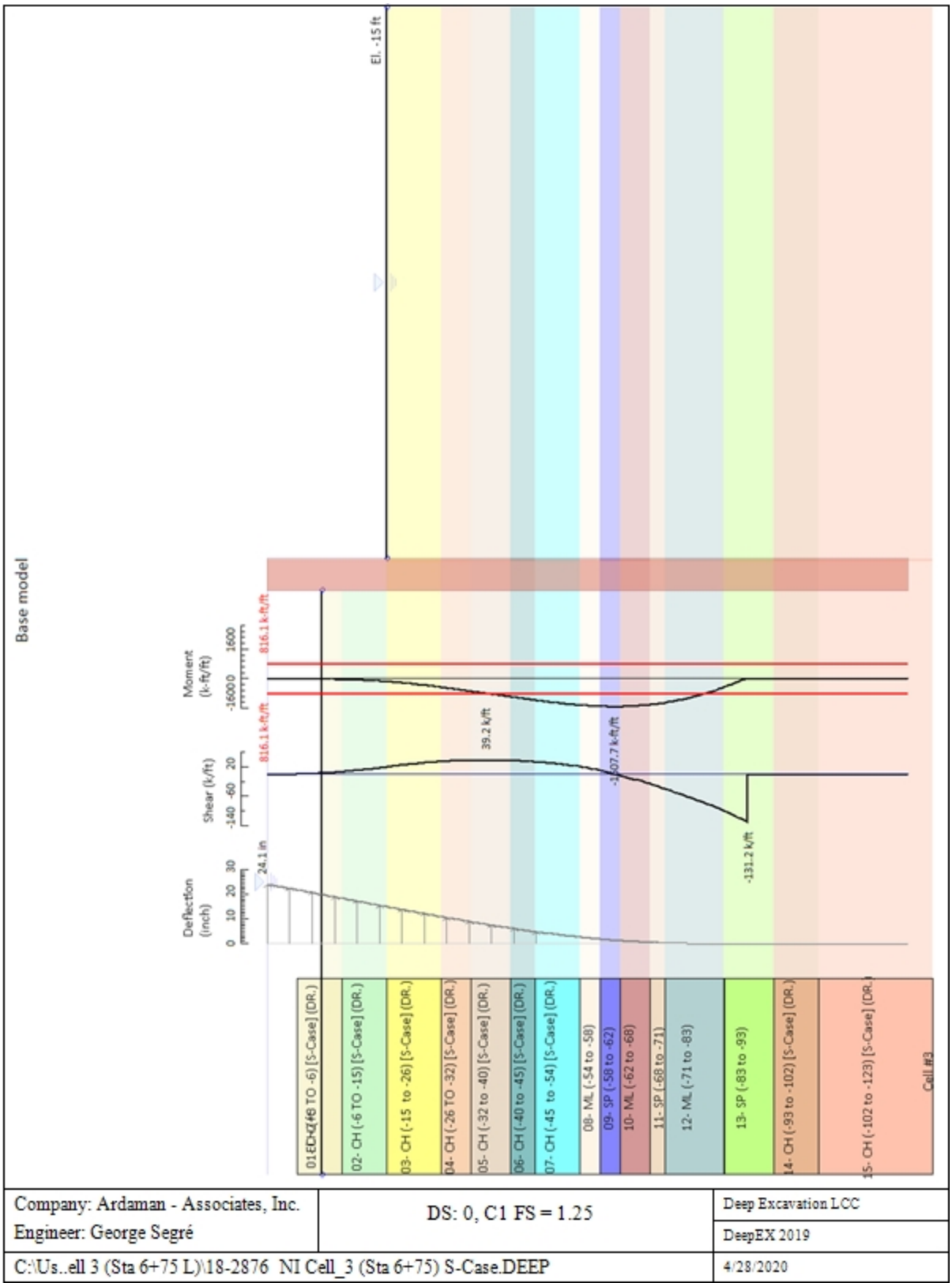

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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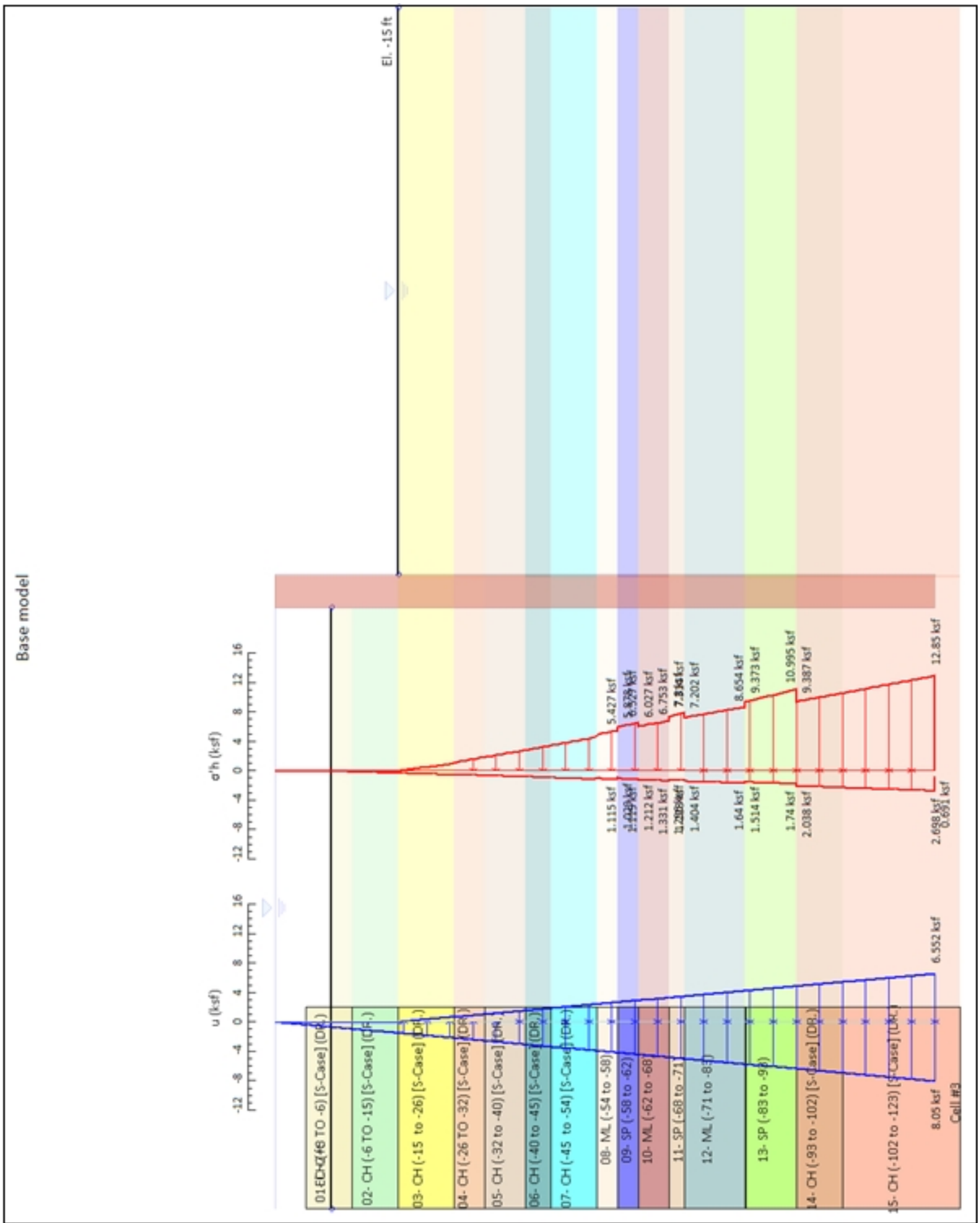
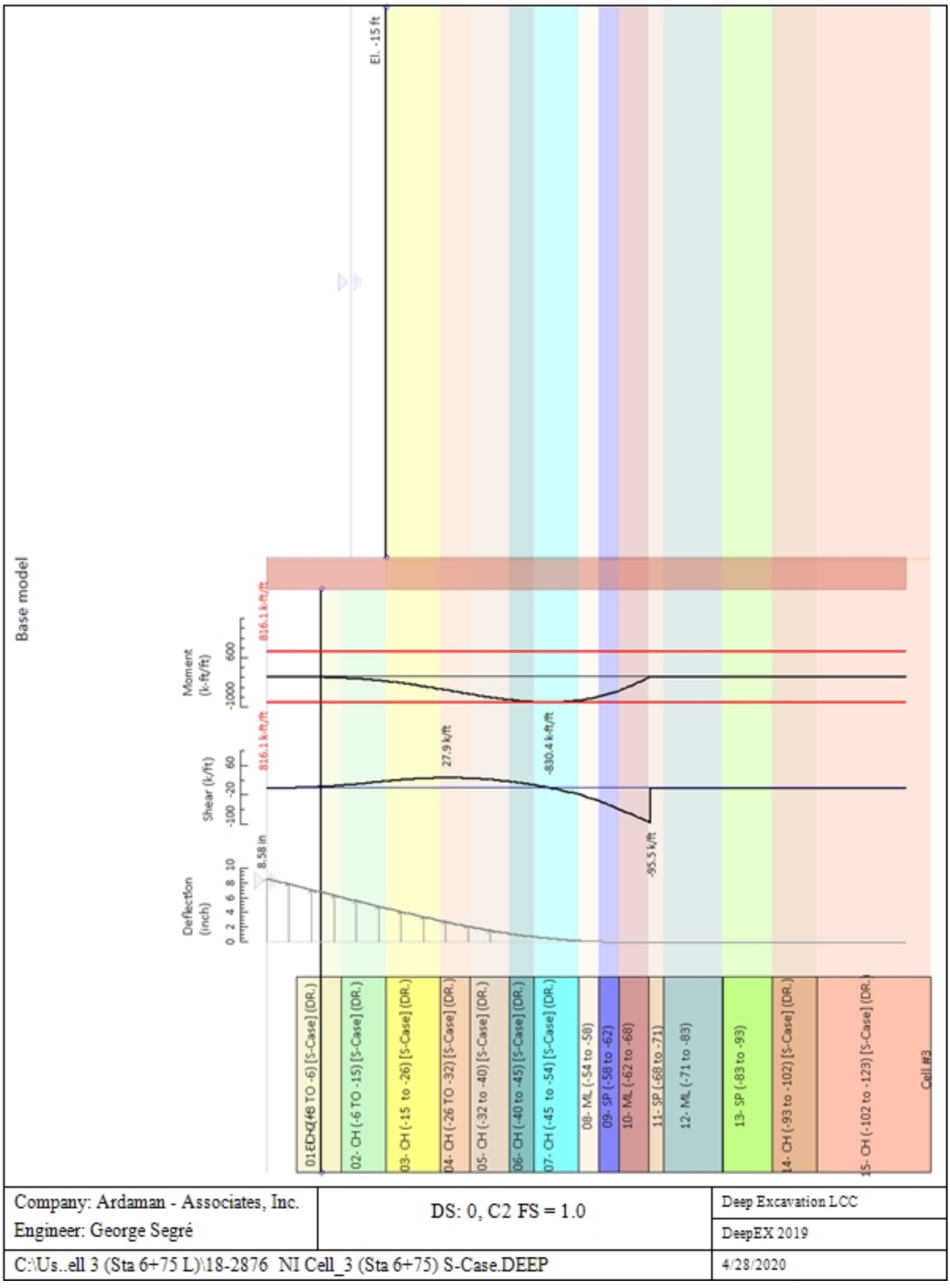


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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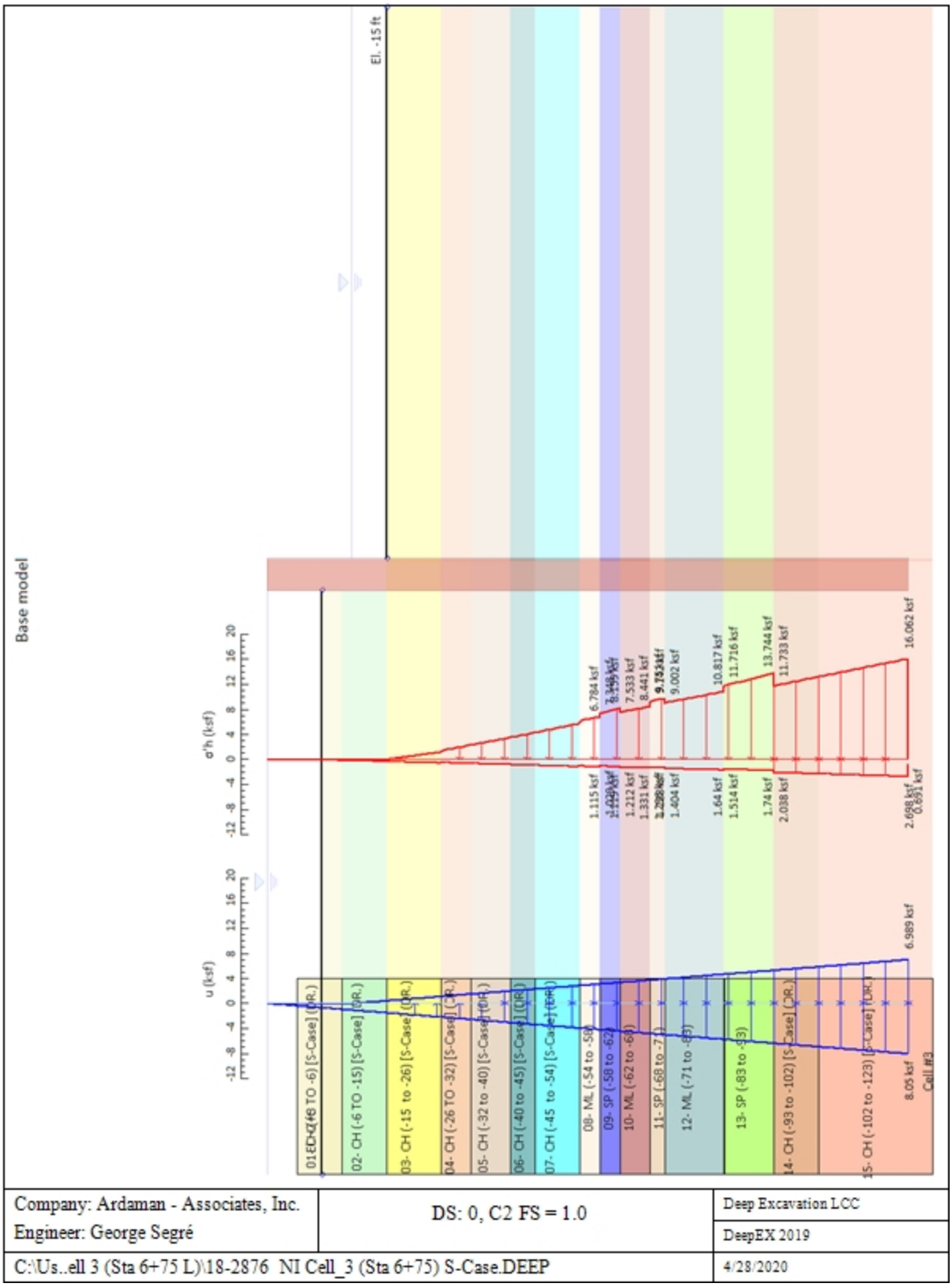

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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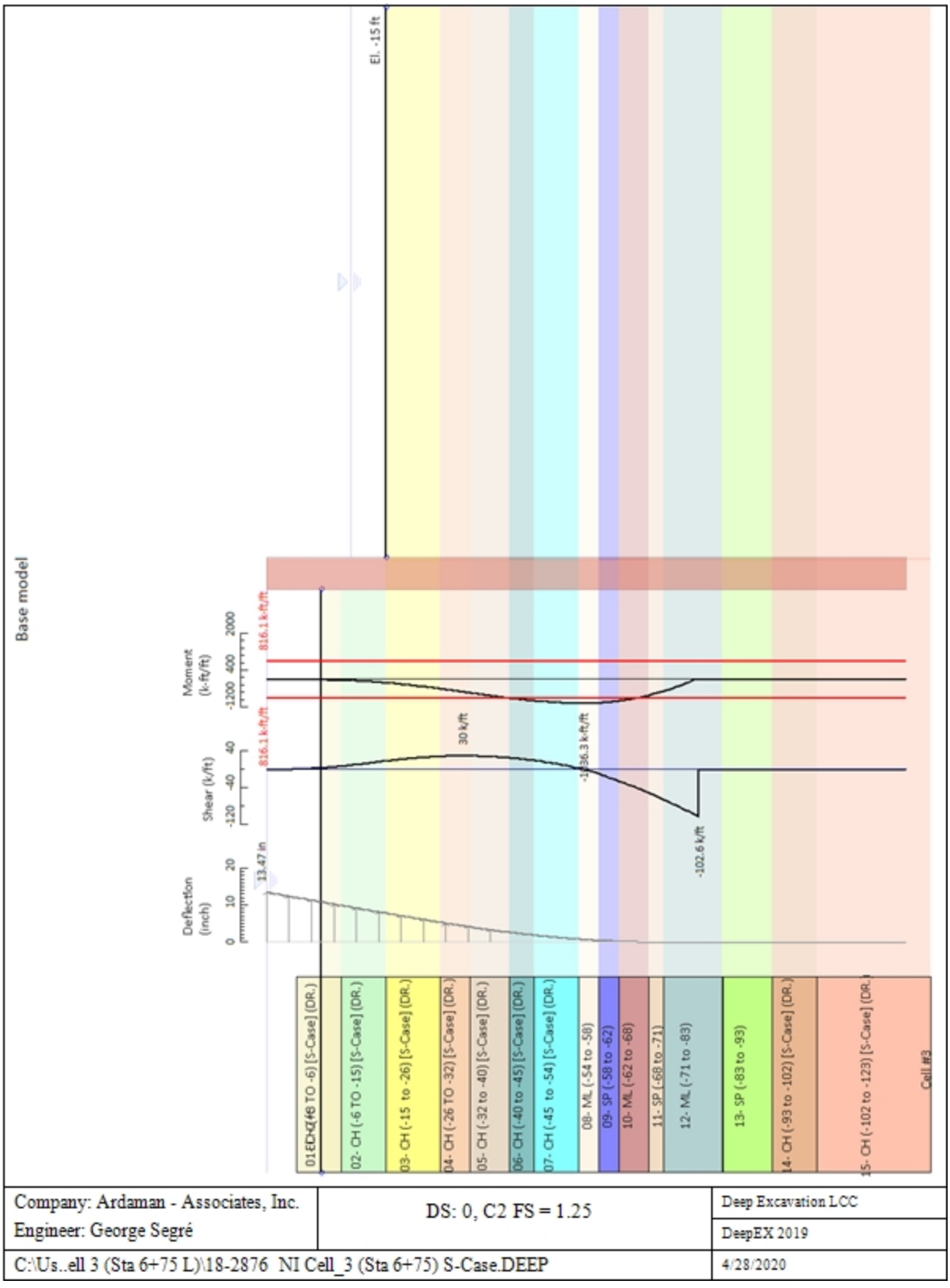
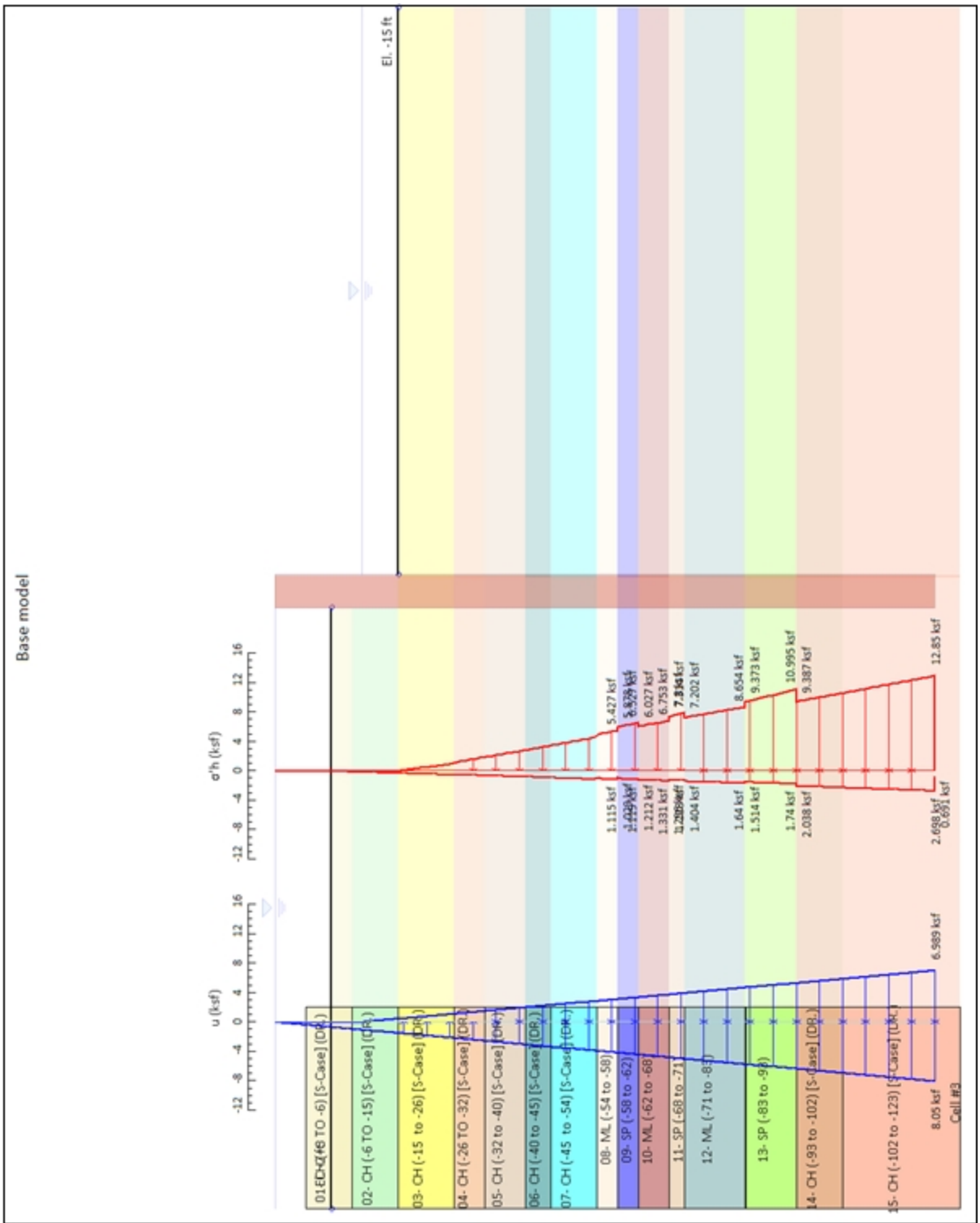

Base model
El. -15 ft
Moment (k-ft/ft)
-1200 400 2000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-120 -40 40
30 k/ft
-136.3 k-ft/ft
-102.6 k/ft
Deflection (inch)
0 10 20
13.47 in
01-EDGE (-6 TO -6) [S-Case] (DR.)
02- CH (-6 TO -15) [S-Case] (DR.)
03- CH (-15 to -26) [S-Case] (DR.)
04- CH (-26 TO -32) [S-Case] (DR.)
05- CH (-32 to -40) [S-Case] (DR.)
06- CH (-40 to -45) [S-Case] (DR.)
07- CH (-45 to -54) [S-Case] (DR.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) [S-Case] (DR.)
15- CH (-102 to -123) [S-Case] (DR.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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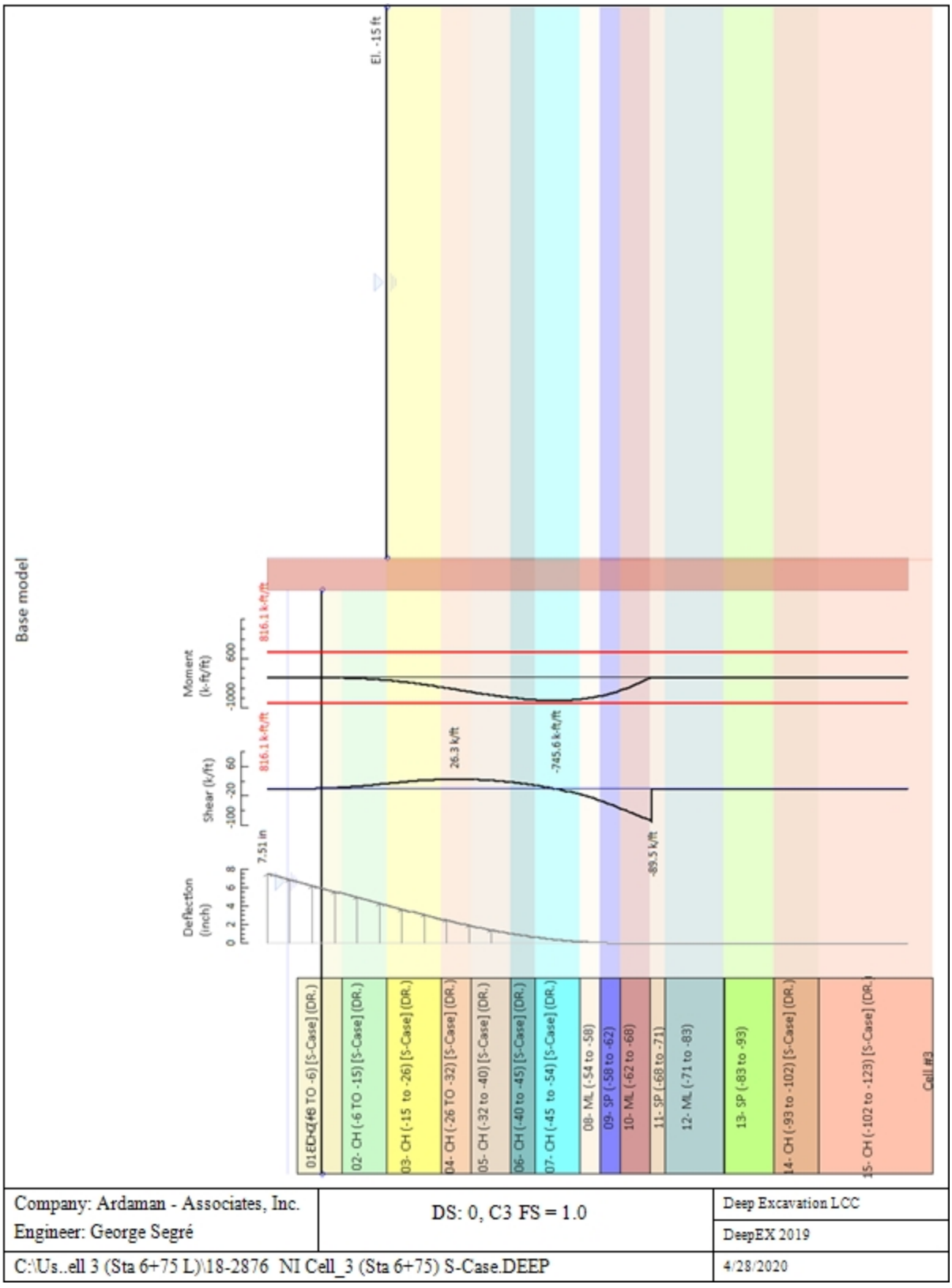

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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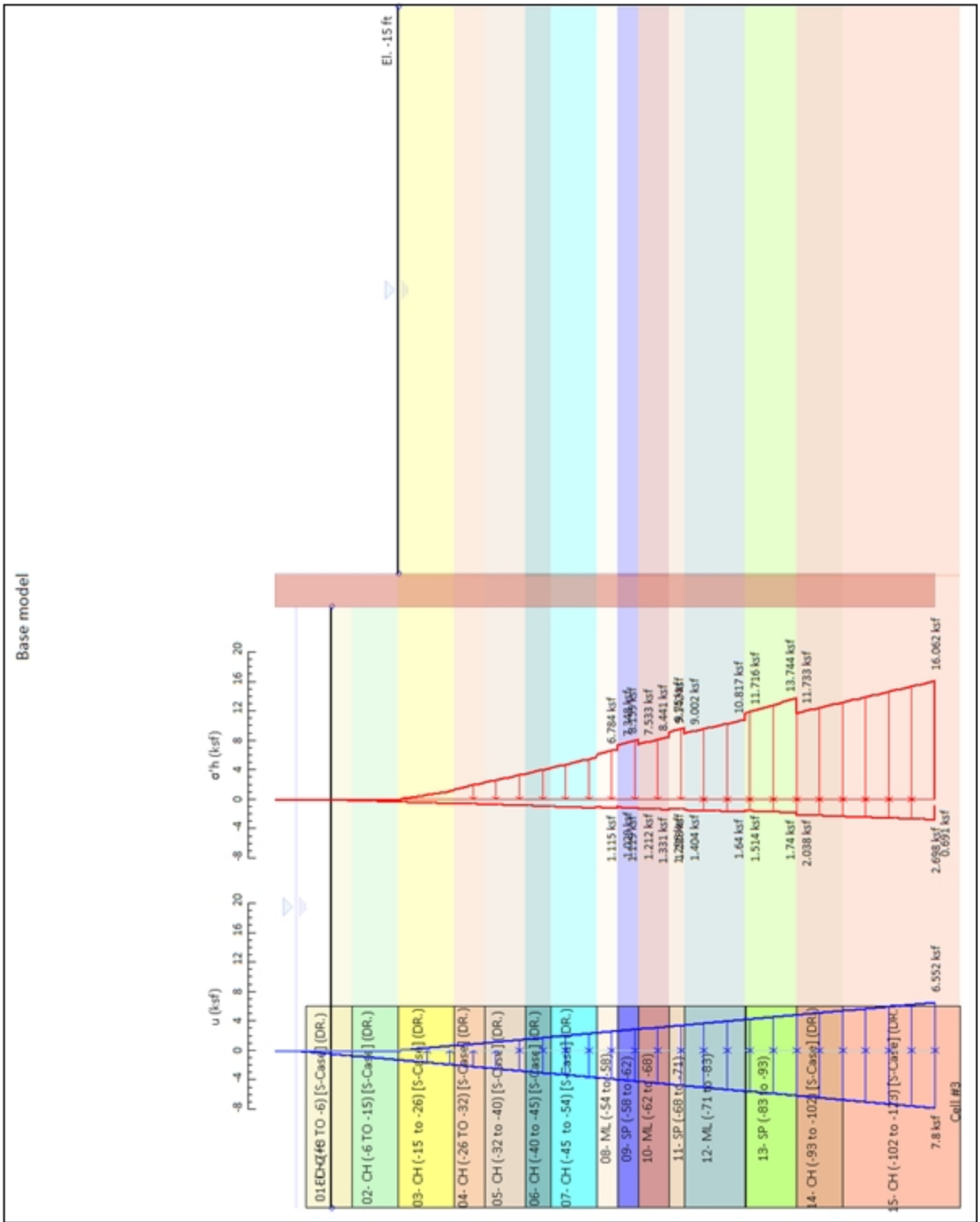
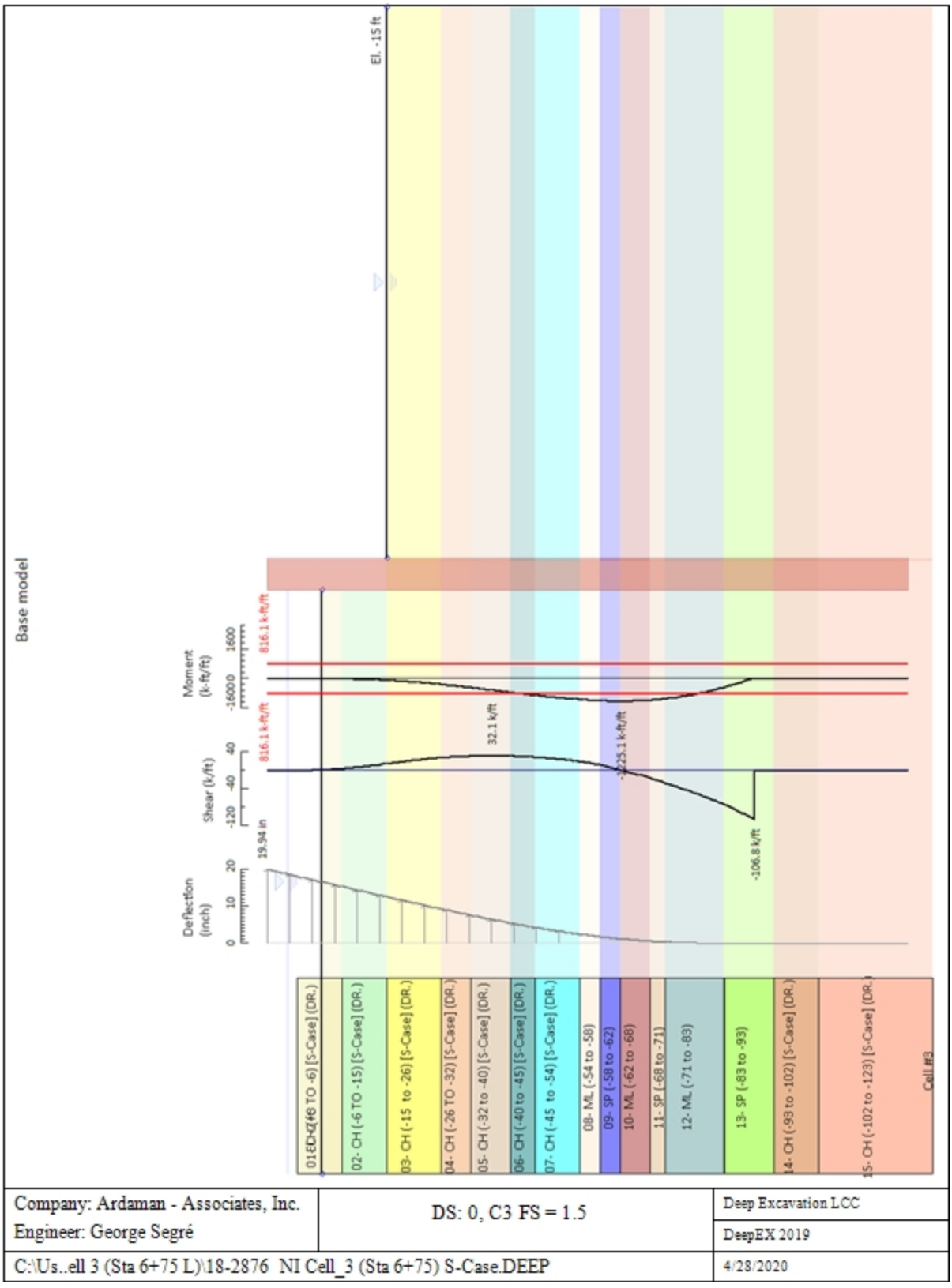


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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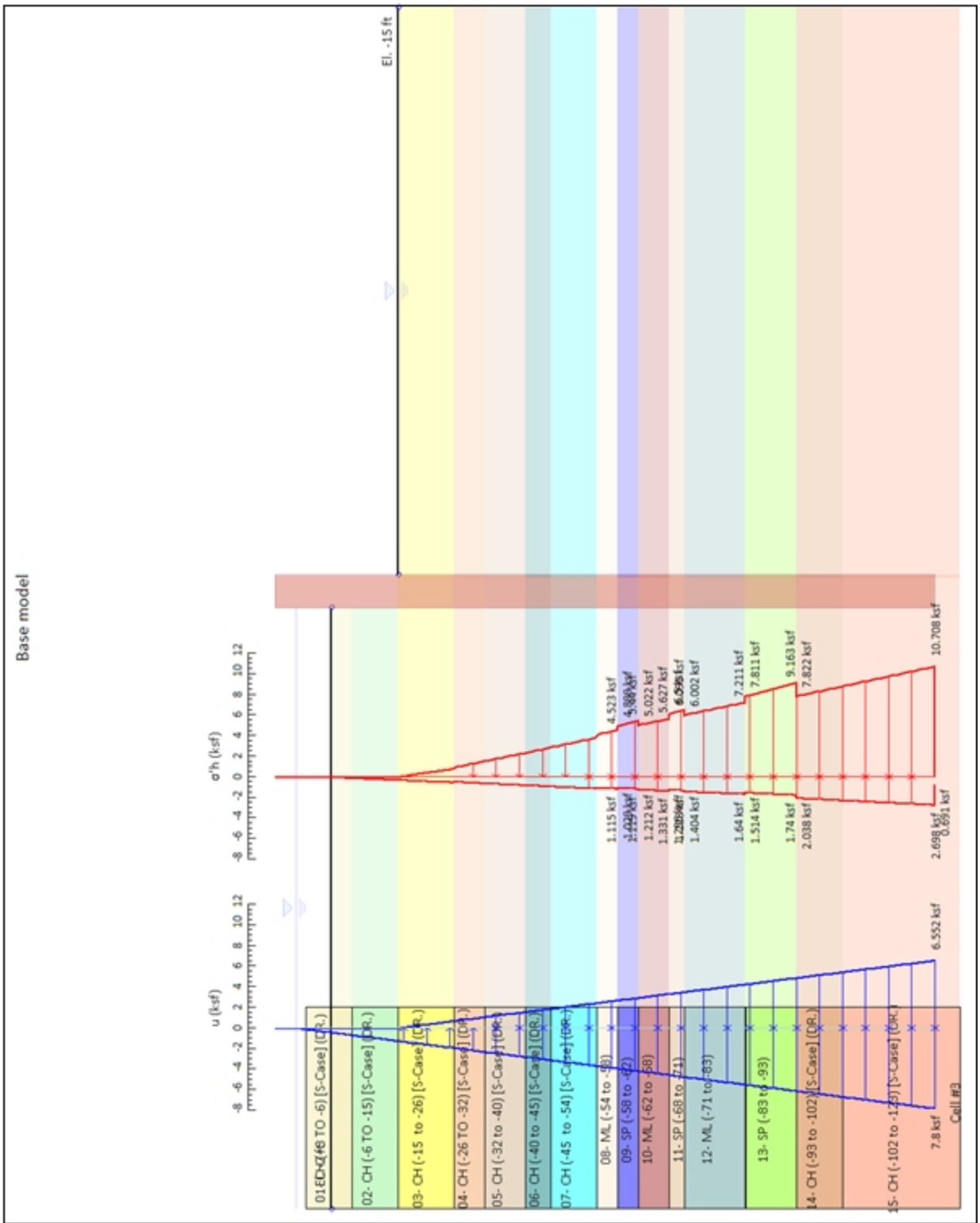
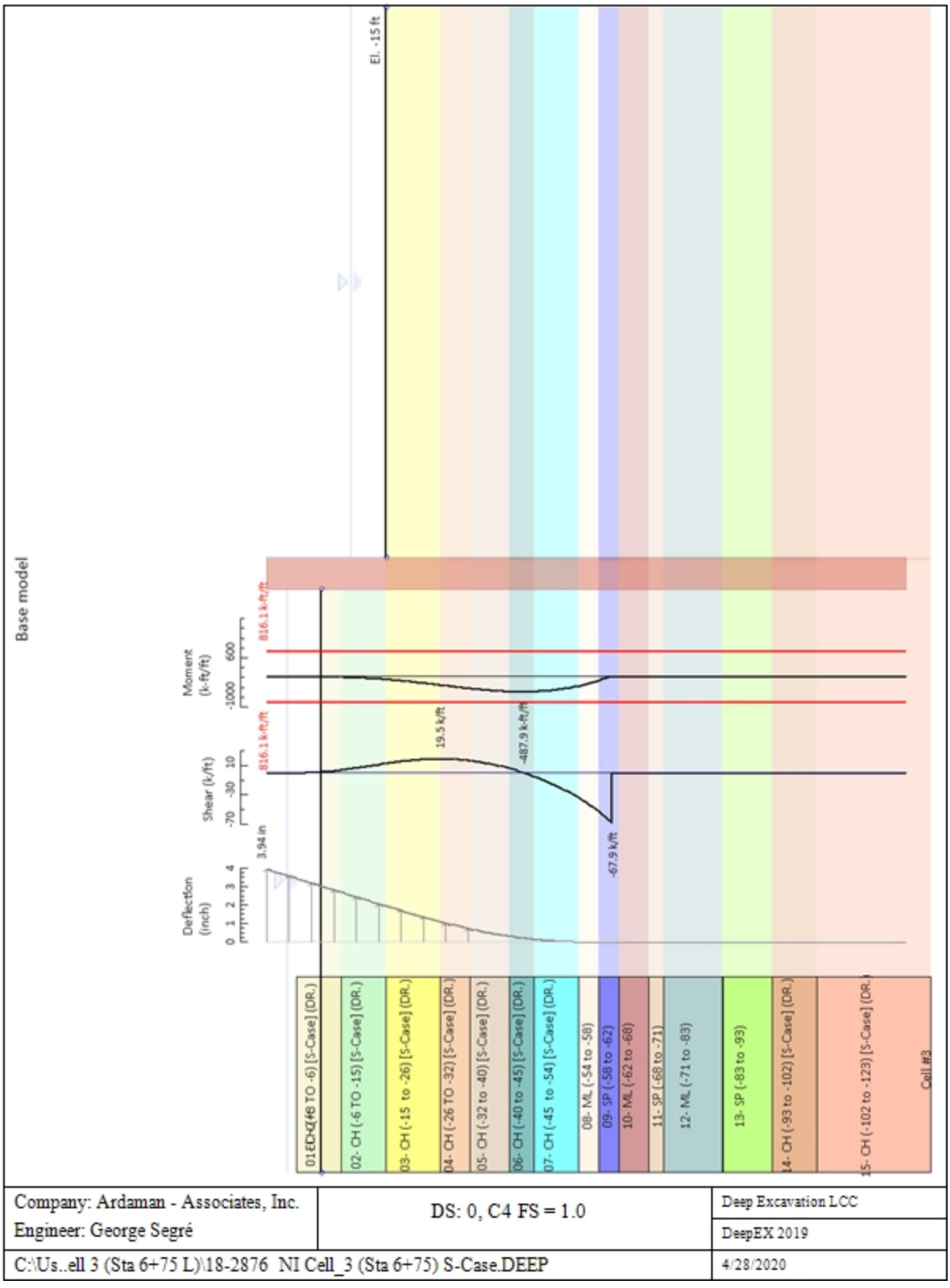


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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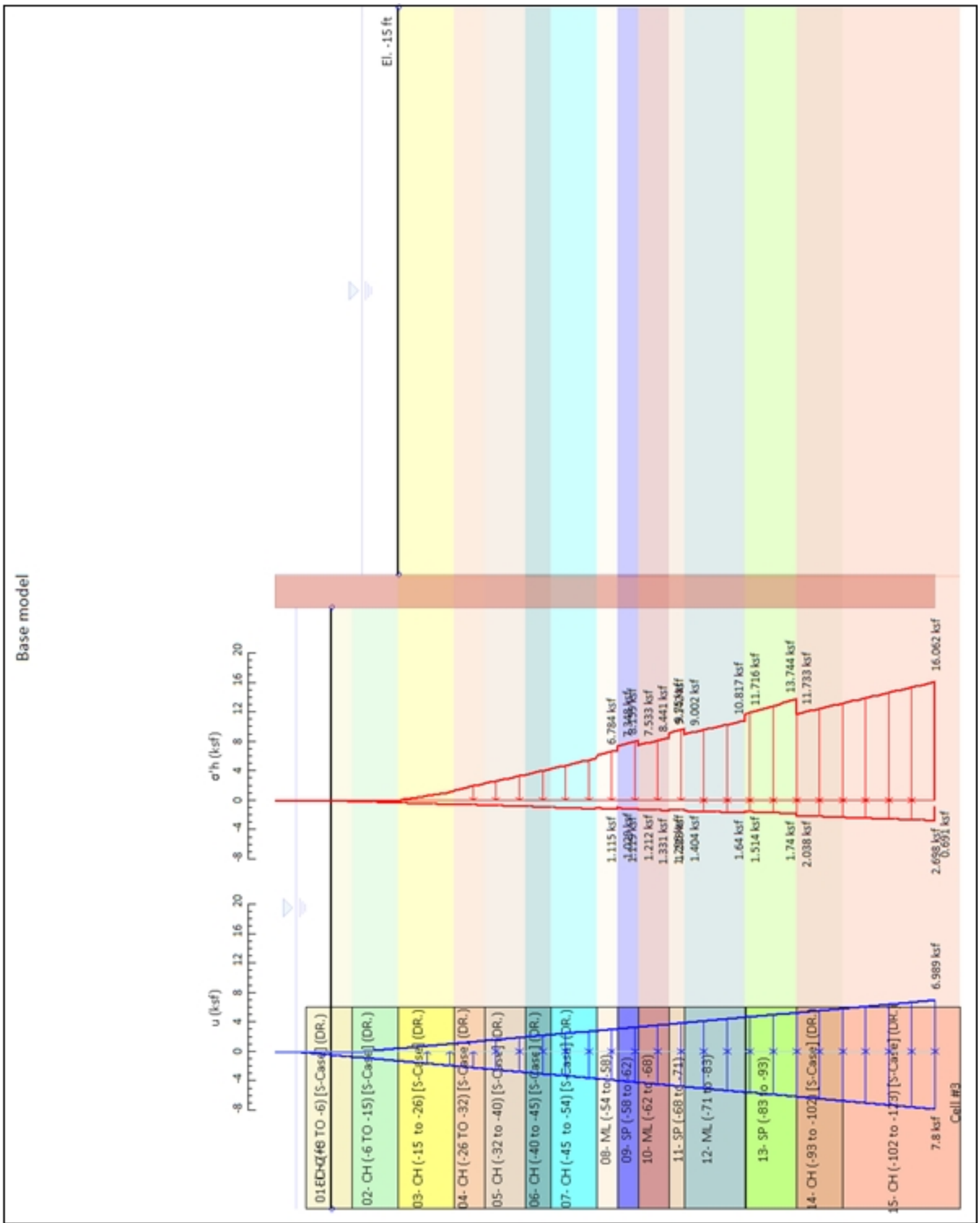

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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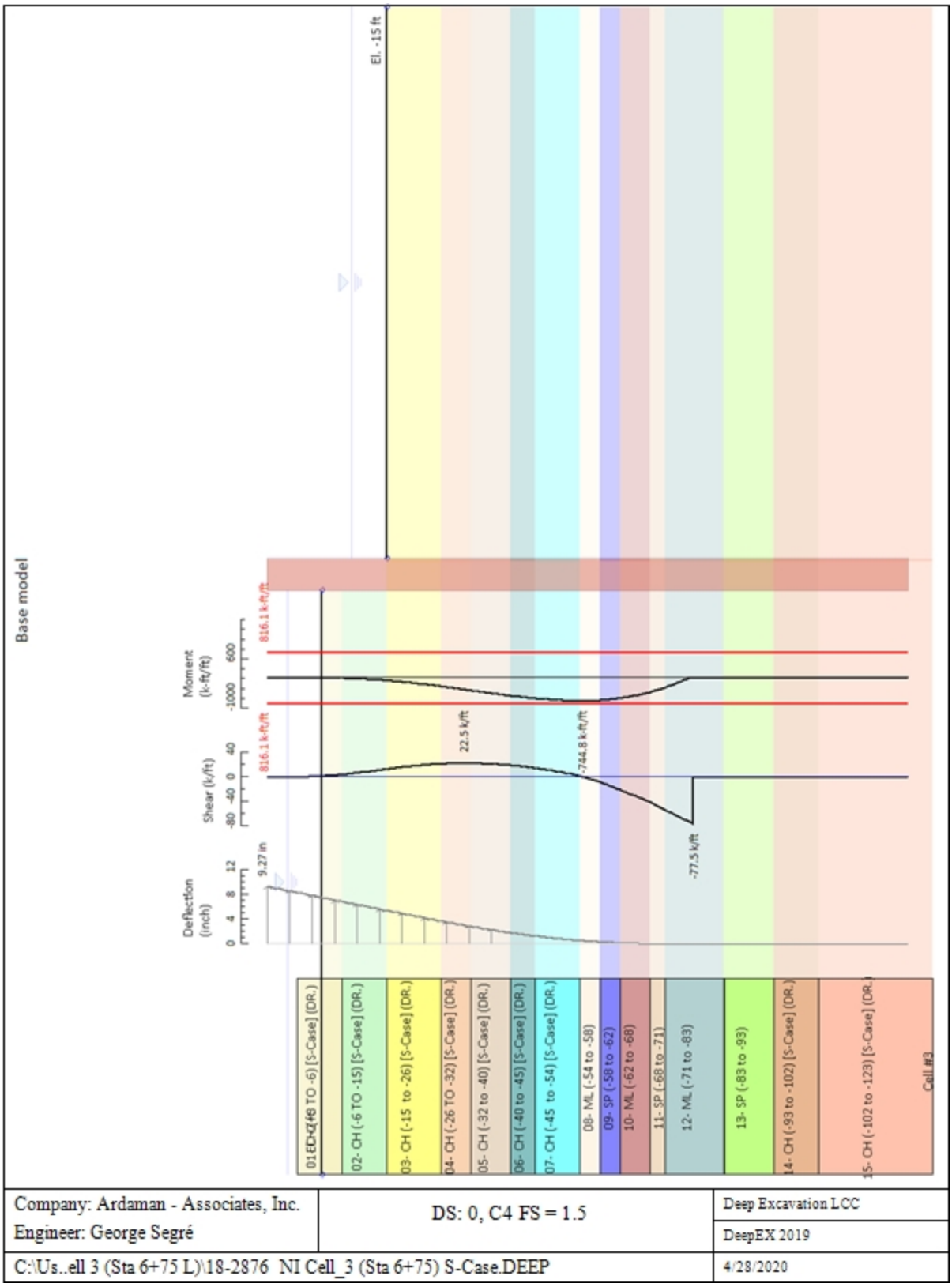

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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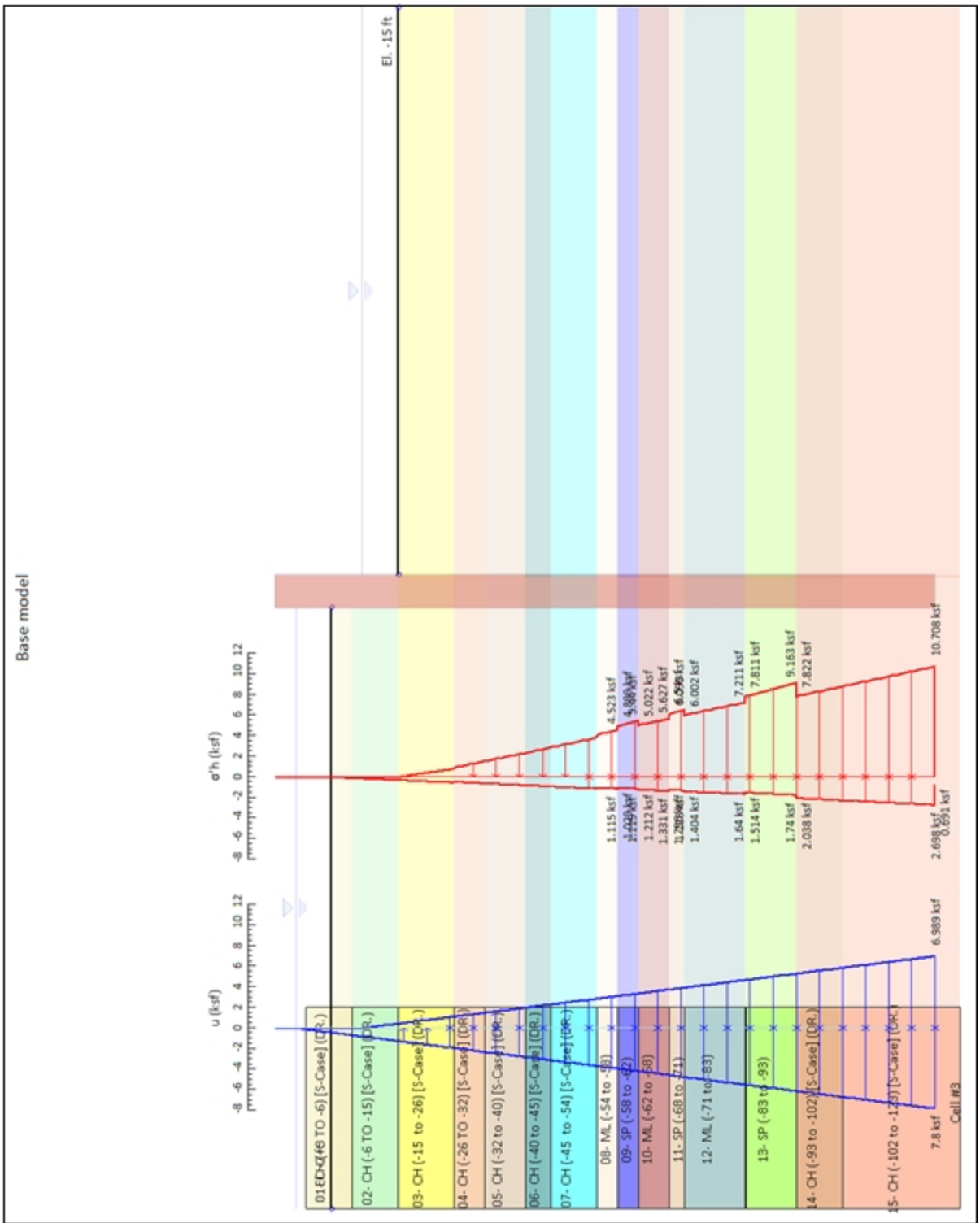

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 3 (Sta 6+75 L)\18-2876 NI Cell_3 (Sta 6+75) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Date: 4/29/2020

Project No.: 18-2876

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #3 @ Sta. 6+75 Right Wall)

Top of Wall =	9.0	ft., NAVD88	Design Tip Elev. =	-123.0 ft., NAVD88
Governing Tip Elev. =	-122.12	ft., NAVD88	Design Length of Sheeting =	132.0 ft.
Length of Sheetting =	131.12	ft.		
Use =	132.0	ft.		

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-22	1.00	1.00	-77.11	1,247.27	77.21	14.48
		Open excavation - degraded	9	-22	1.00	1.25	-98.36	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-61.31	806.13	84.60	6.51
		Open excavation - degraded	9	-8	1.00	1.25	-70.57	--	--	--
Q-Case	3	Open excavation - degraded	5	-22	1.00	1.00	-66.76	873.53	69.56	7.72
		Open excavation - degraded	5	-22	1.00	1.50	-102.86	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-54.66	507.29	81.38	3.39
		Open excavation - degraded	5	-8	1.00	1.50	-67.16	--	--	--
S-Case	1	Open excavation - degraded	9	-22	1.00	1.00	-99.03	2,638.82	198.78	52.65
		Open excavation - degraded	9	-22	1.00	1.25	-115.42	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-84.12	1,576.36	143.32	23.24
		Open excavation - degraded	9	-8	1.00	1.25	-95.30	--	--	--
S-Case	3	Open excavation - degraded	5	-22	1.00	1.00	-92.32	1,953.10	174.18	33.44
		Open excavation - degraded	5	-22	1.00	1.50	-122.12	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-76.68	1,062.20	112.88	13.04
		Open excavation - degraded	5	-8	1.00	1.50	-96.04	--	--	--
						Governing Value:	-122.12	2,638.82	198.78	52.65

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:38:25 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	0	0	500	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-6 TO	110	110	0	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	0	0	350	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-26 T	124	124	0	0	1250	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-32 to	120	120	0	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	0	0	1730	0	0	626.3	3	1	1	1	1	True	Linear	
07- CH (-45 t	125	125	0	0	3300	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- ML (-54 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	15	200	N/A	N/A	N/A	300	3	0.59	1.7	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	0	0	3500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
15- CH (-102 t	125	125	0	0	4000	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	1	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.741	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.741	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

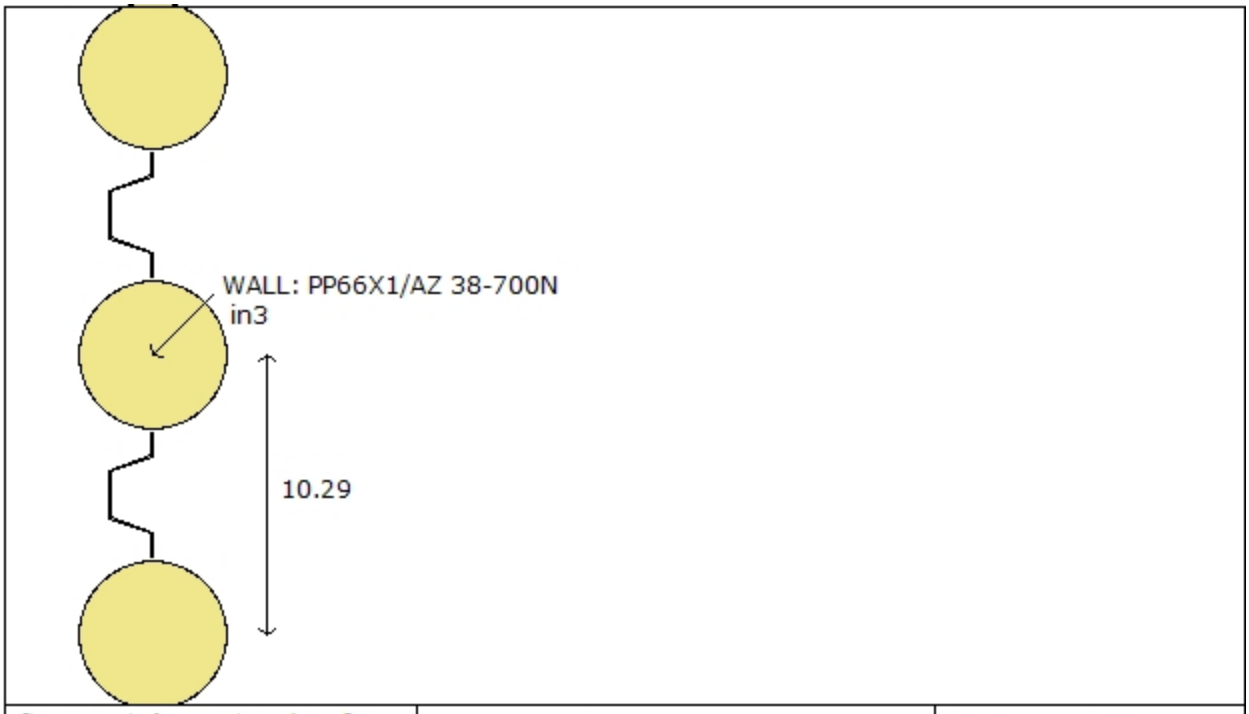
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	1
-6	02- CH (-6 TO -	1	1
-15	03- CH (-15 to	1	1
-26	04- CH (-26 TO	1	1
-32	05- CH (-32 to	1	1
-40	06- CH (-40 to	1	1
-45	07- CH (-45 to	1	1
-54	08- ML (-54 to	1	0.74
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.74
-68	11- SP (-68 to -	1	1
-71	12- ML (-71 to	1	0.74
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	1
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -110 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.418	1.418	2.089
Stage 1	Simple span	N/A	1.6	1.135	1.135	1.671
Stage 2	Simple span	N/A	1.6	1.951	1.951	2.885
Stage 3	Simple span	N/A	1.6	1.56	1.56	2.308
Stage 4	Simple span	N/A	1.6	1.608	1.608	2.313
Stage 5	Simple span	N/A	1.6	1.072	1.072	1.542
Stage 6	Simple span	N/A	1.6	2.329	2.329	3.332
Stage 7	Simple span	N/A	1.6	1.552	1.552	2.221

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

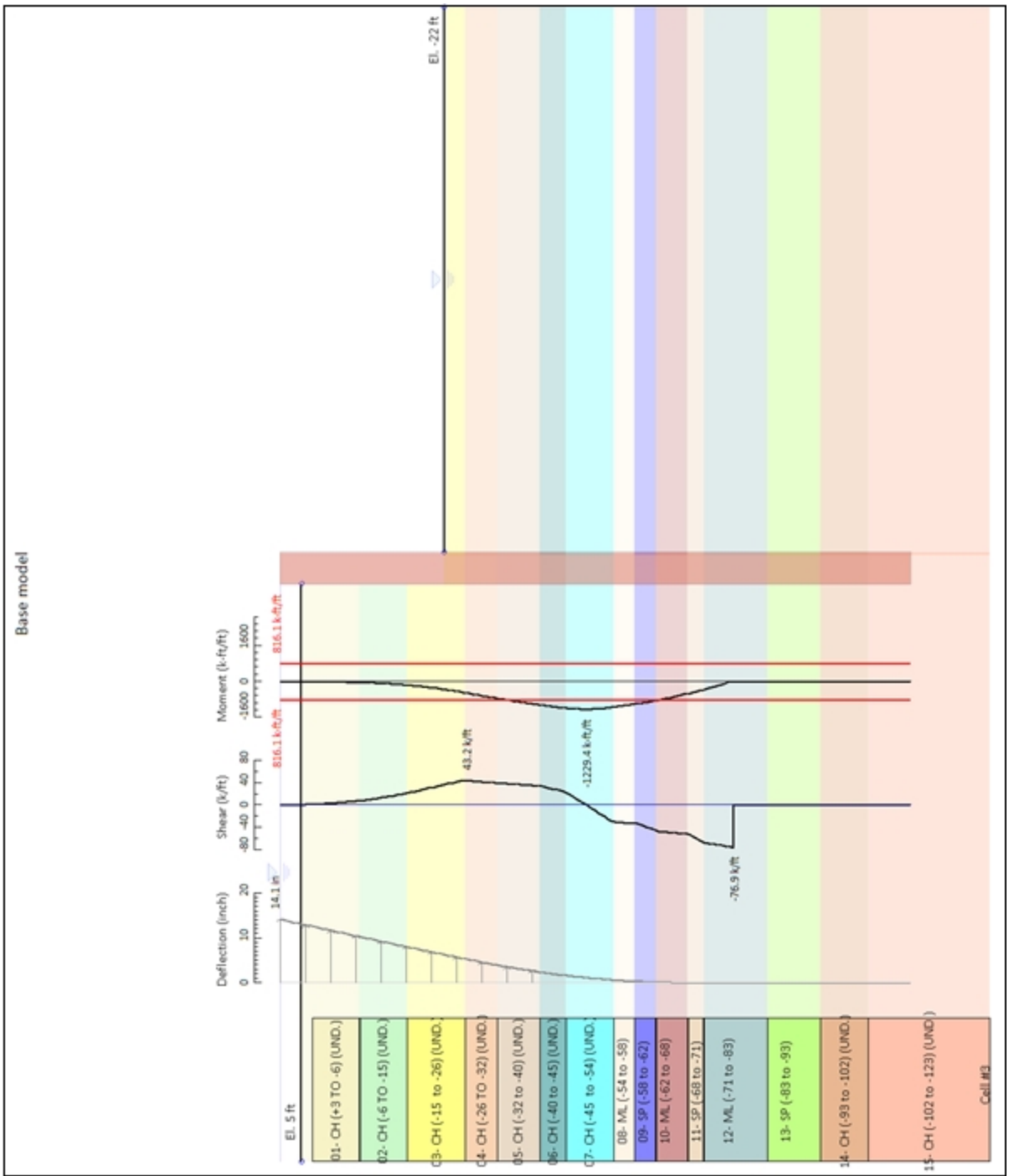
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

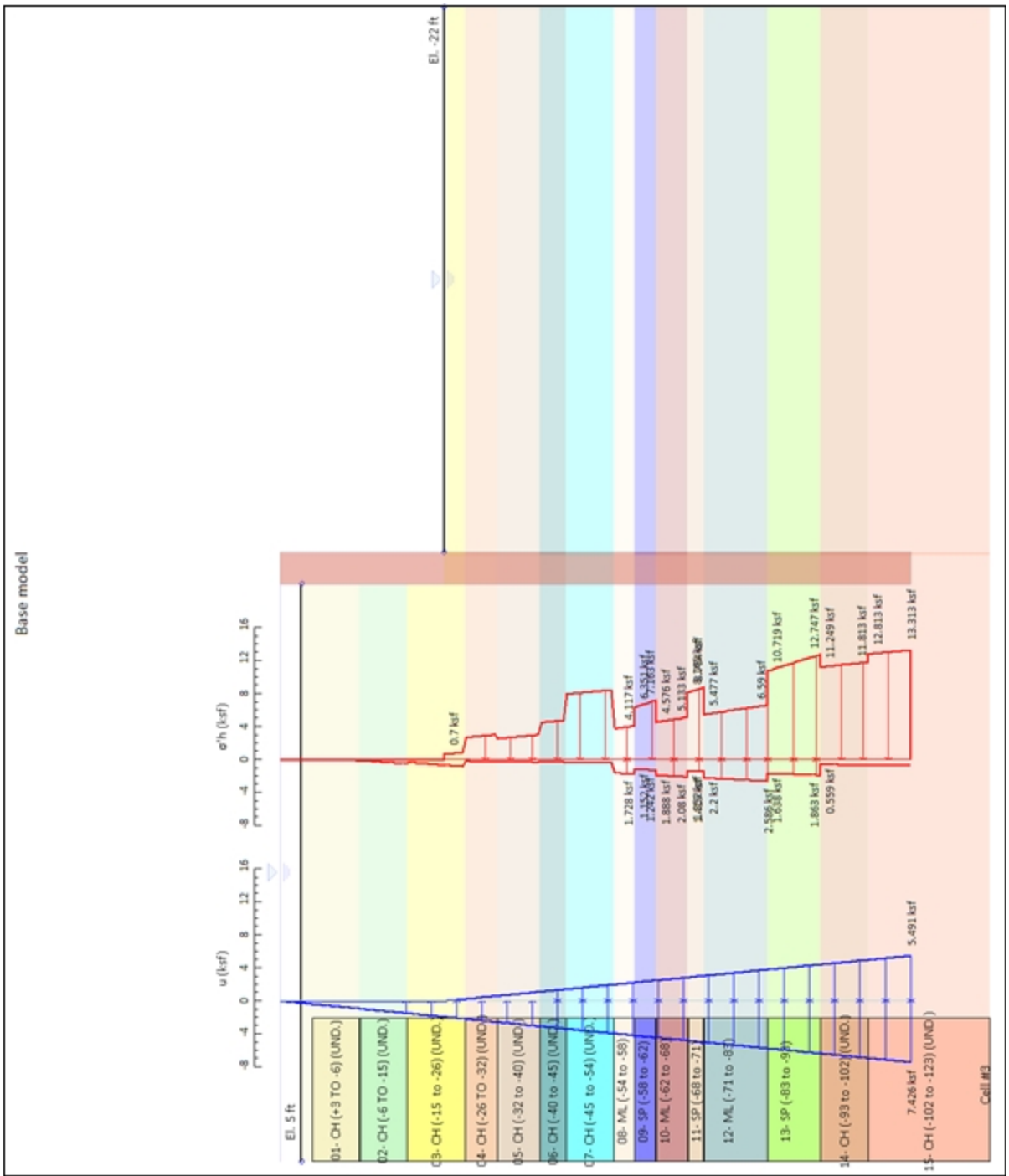
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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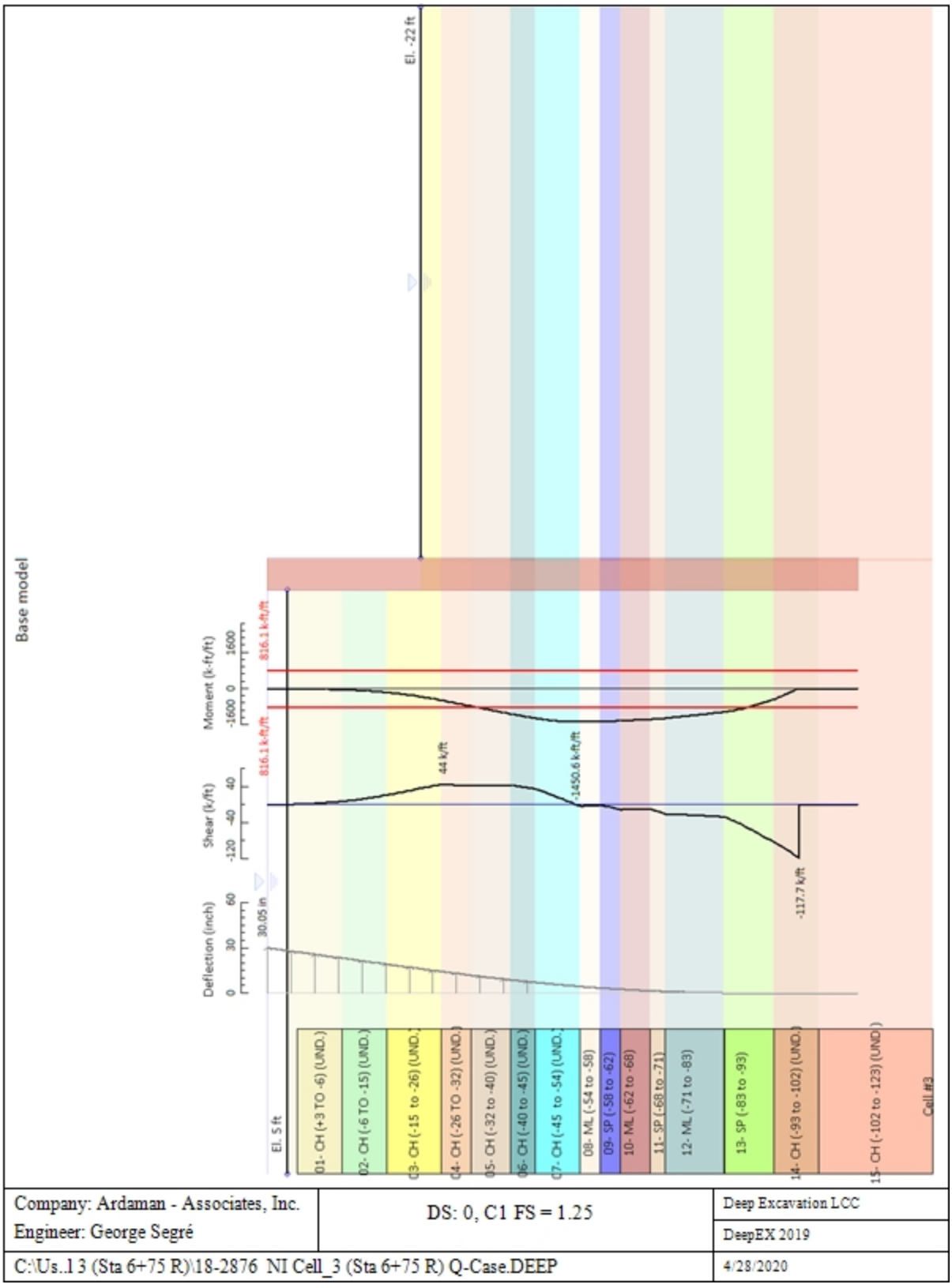
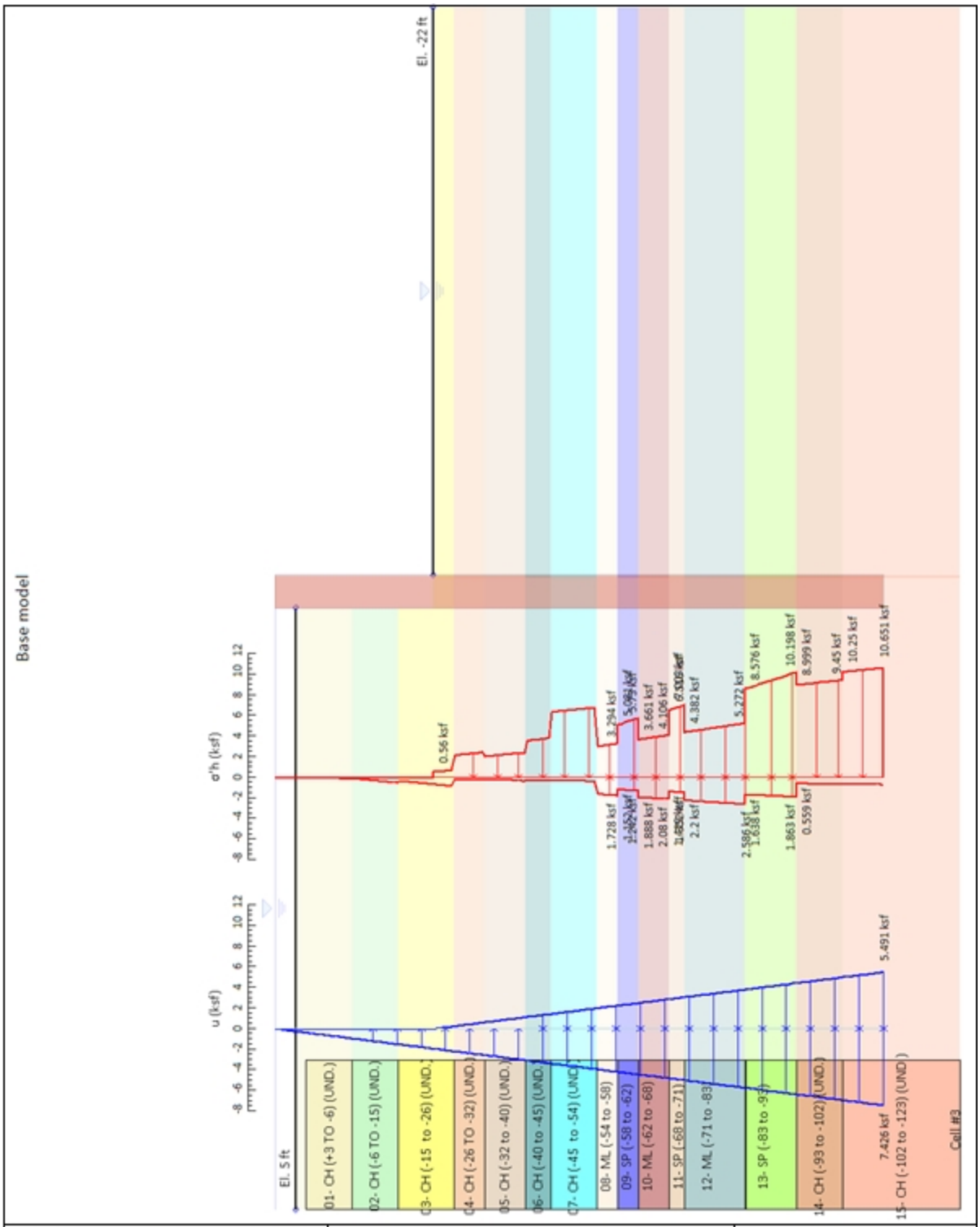

Base model
El. -22 ft
Moment (k-ft/ft)
-1600 0 1600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-120 -40 40
44 k/ft
-1450.6 k-ft/ft
-117.7 k/ft
Deflection (inch)
0 30 60
30.05 in
El. 5 ft
01- CH (+3 TO -6) (UND.)
02- CH (-6 TO -15) (UND.)
03- CH (-15 to -26) (UND.)
04- CH (-26 TO -32) (UND.)
05- CH (-32 to -40) (UND.)
06- CH (-40 to -45) (UND.)
07- CH (-45 to -54) (UND.)
08- ML (-54 to -58)
09- SP (-58 to -62)
10- ML (-62 to -68)
11- SP (-68 to -71)
12- ML (-71 to -83)
13- SP (-83 to -93)
14- CH (-93 to -102) (UND.)
15- CH (-102 to -123) (UND.)
Cell #3
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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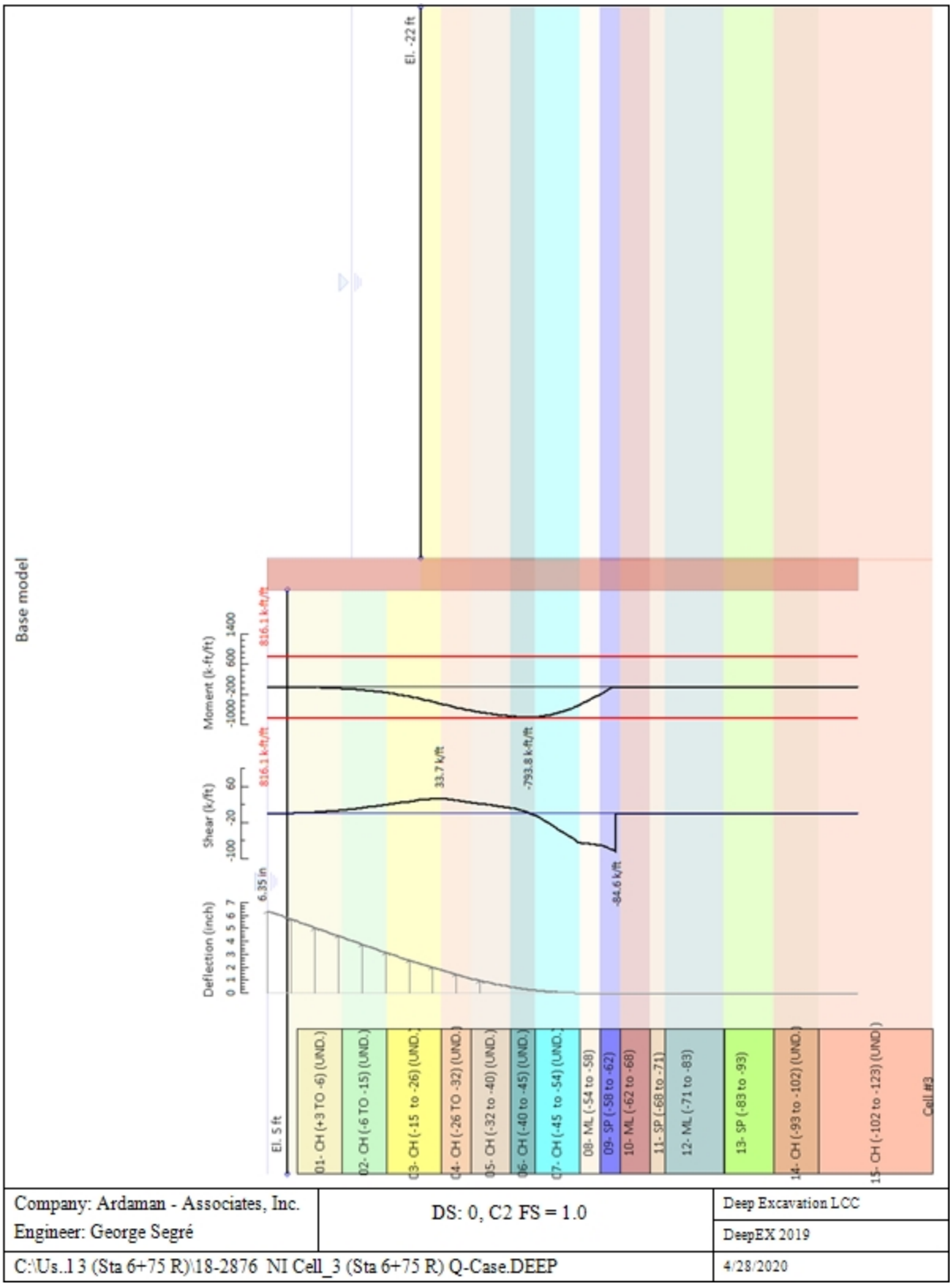

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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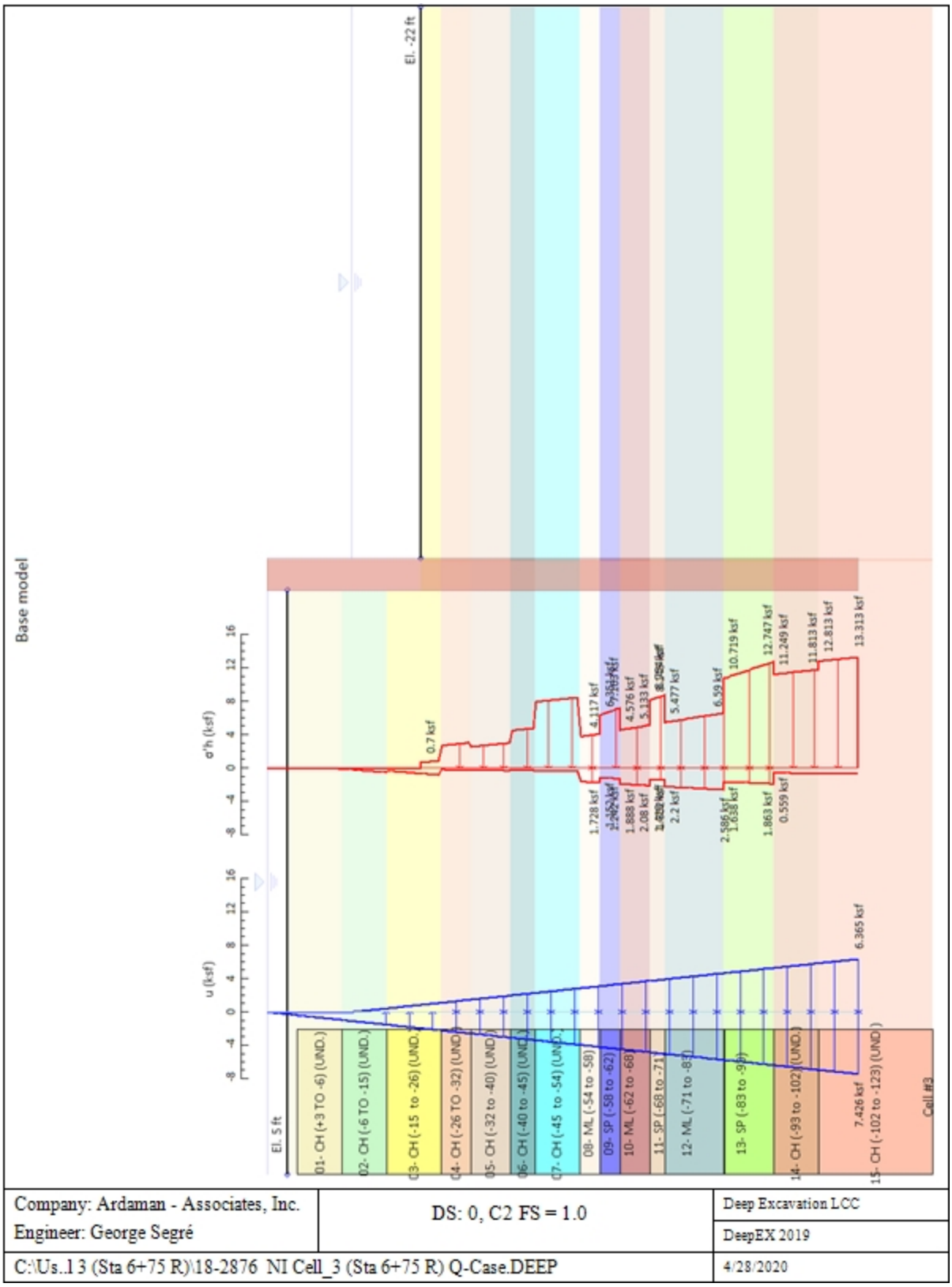

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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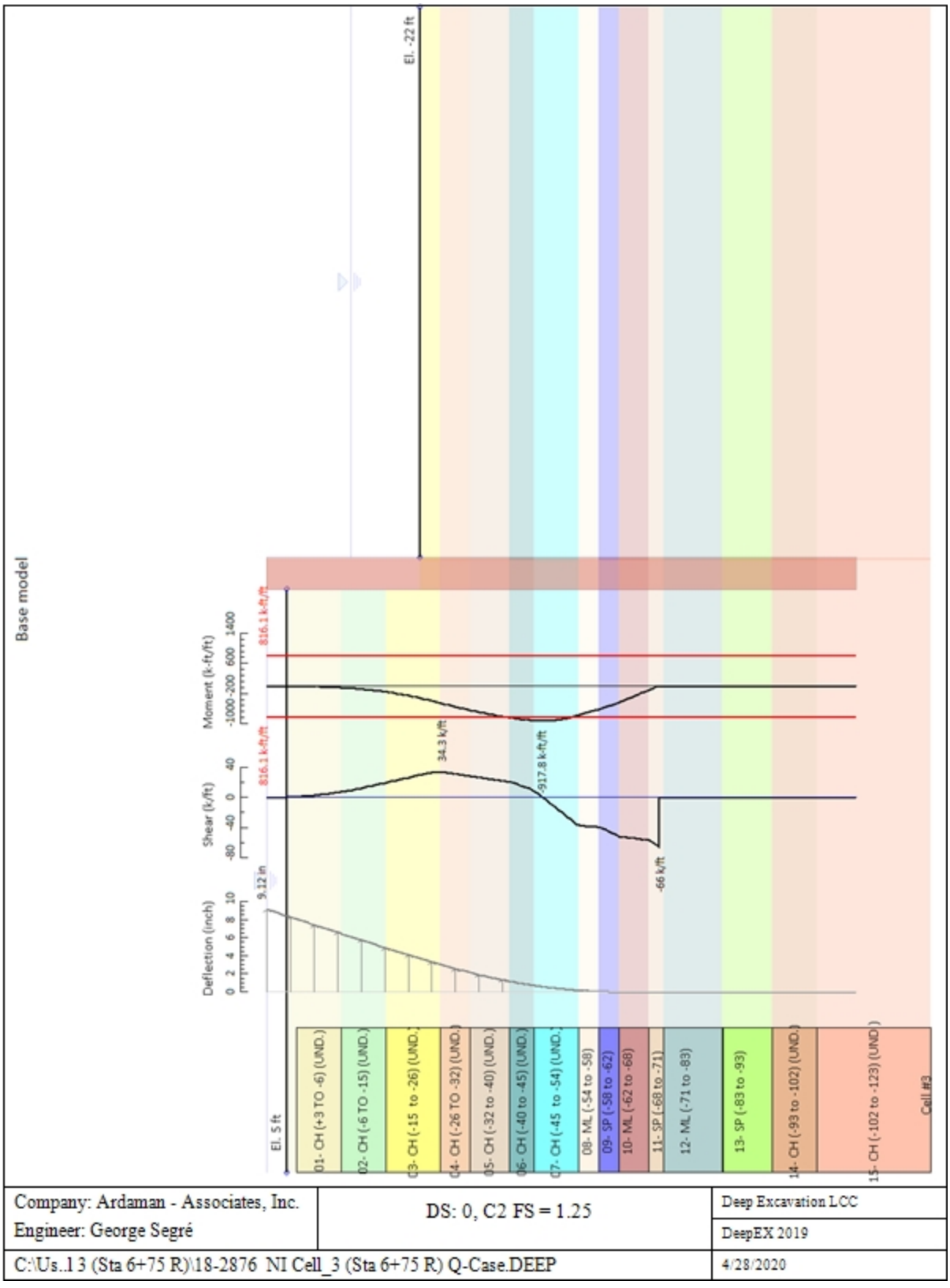

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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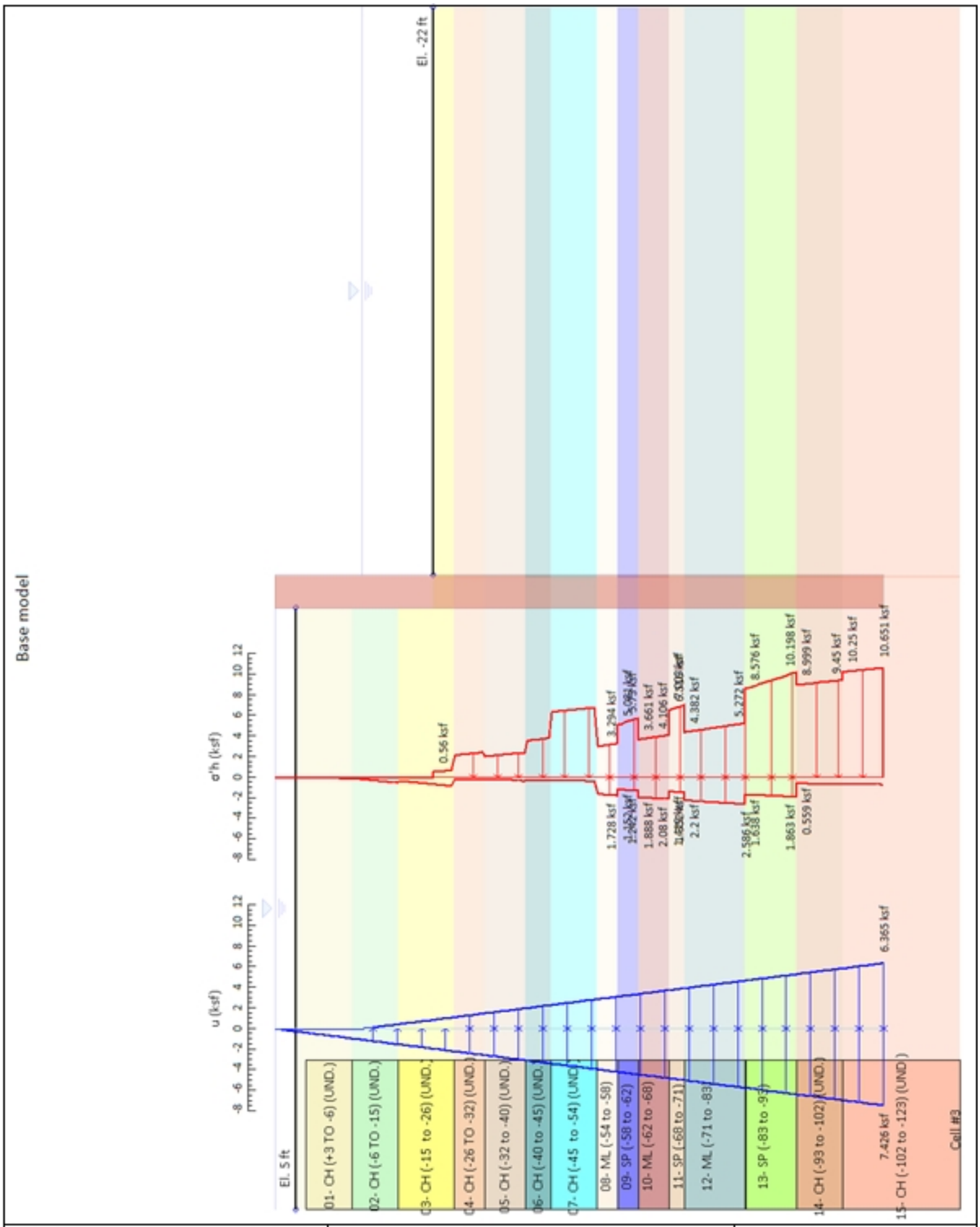

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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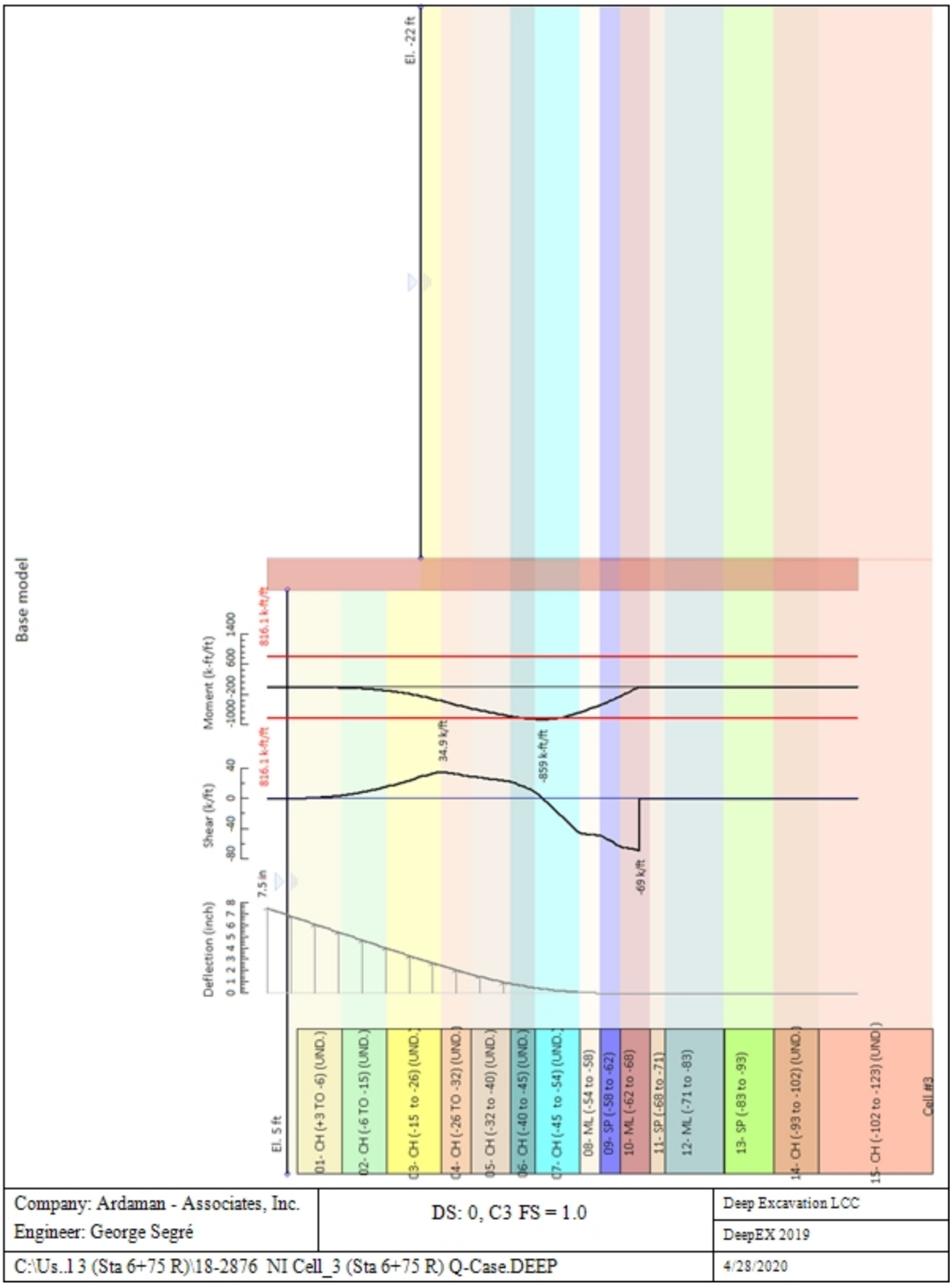

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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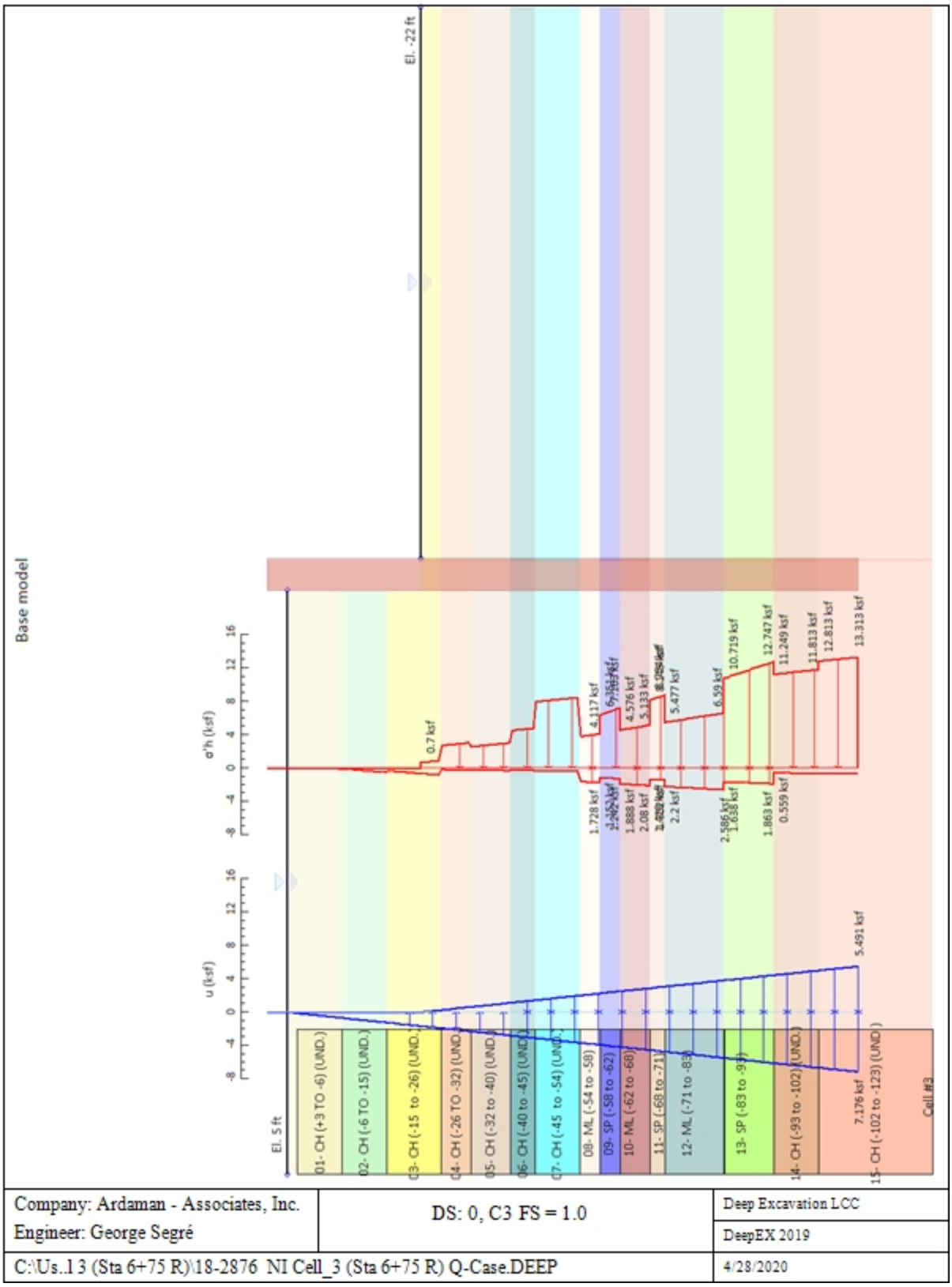

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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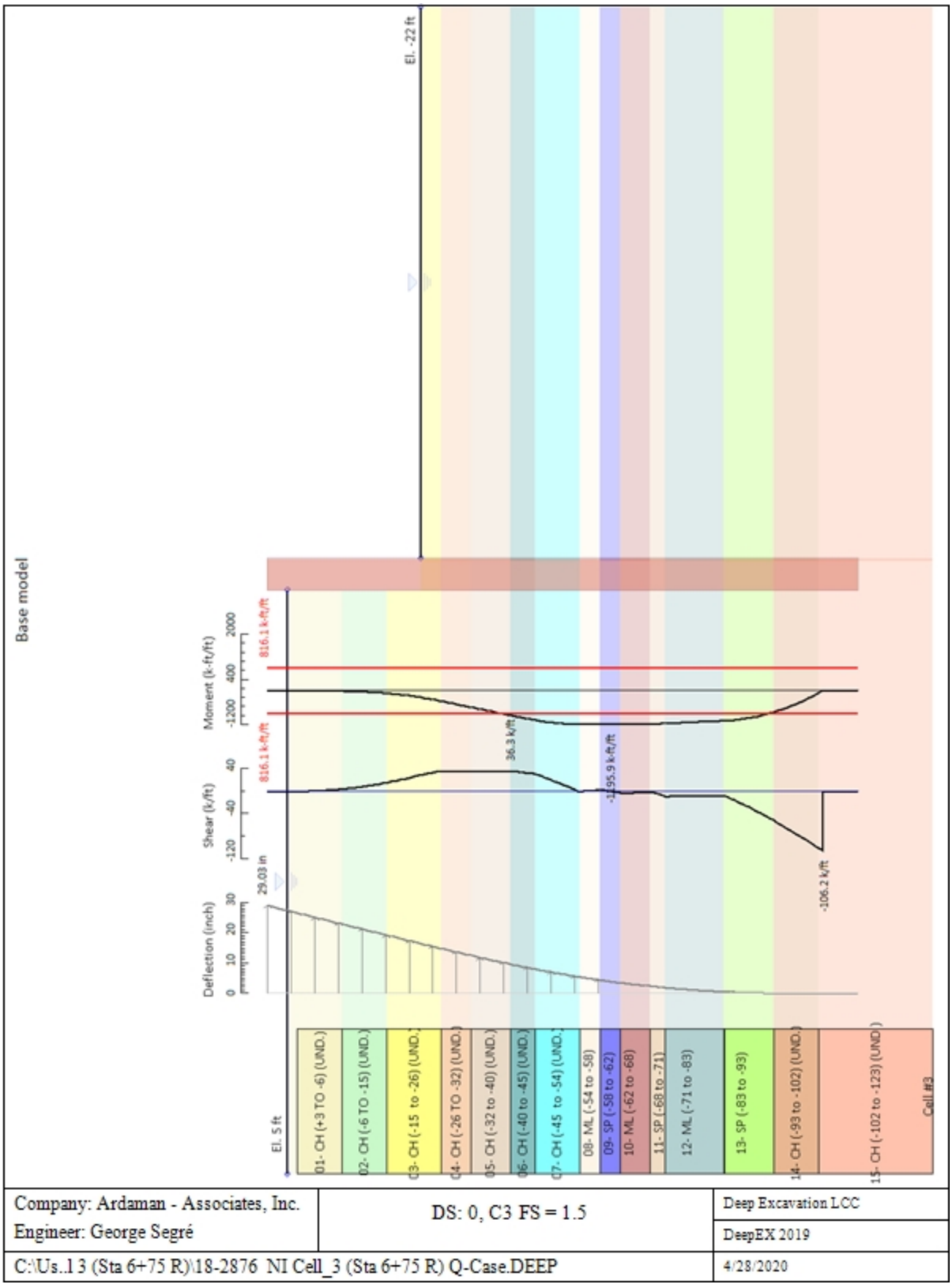

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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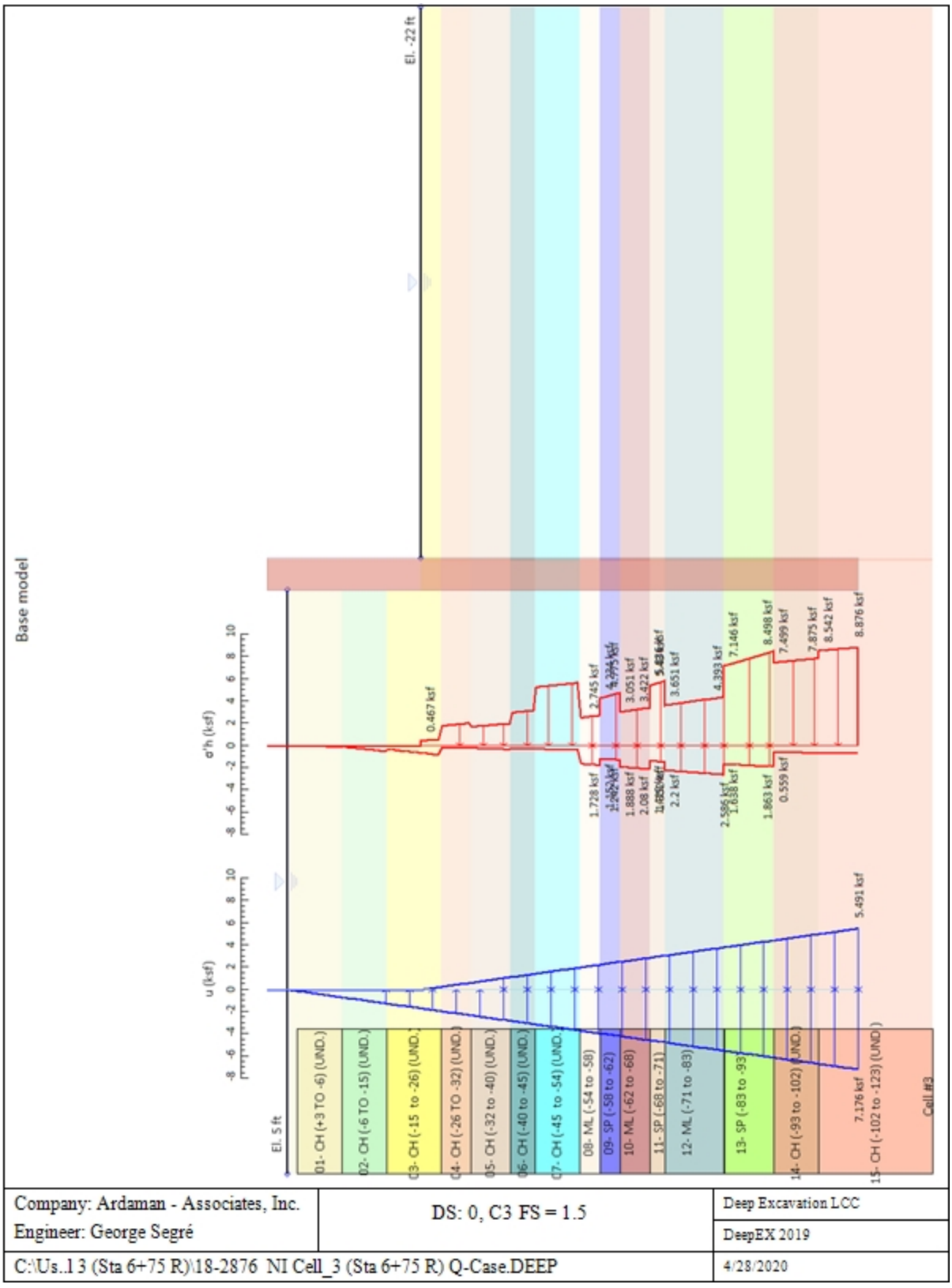

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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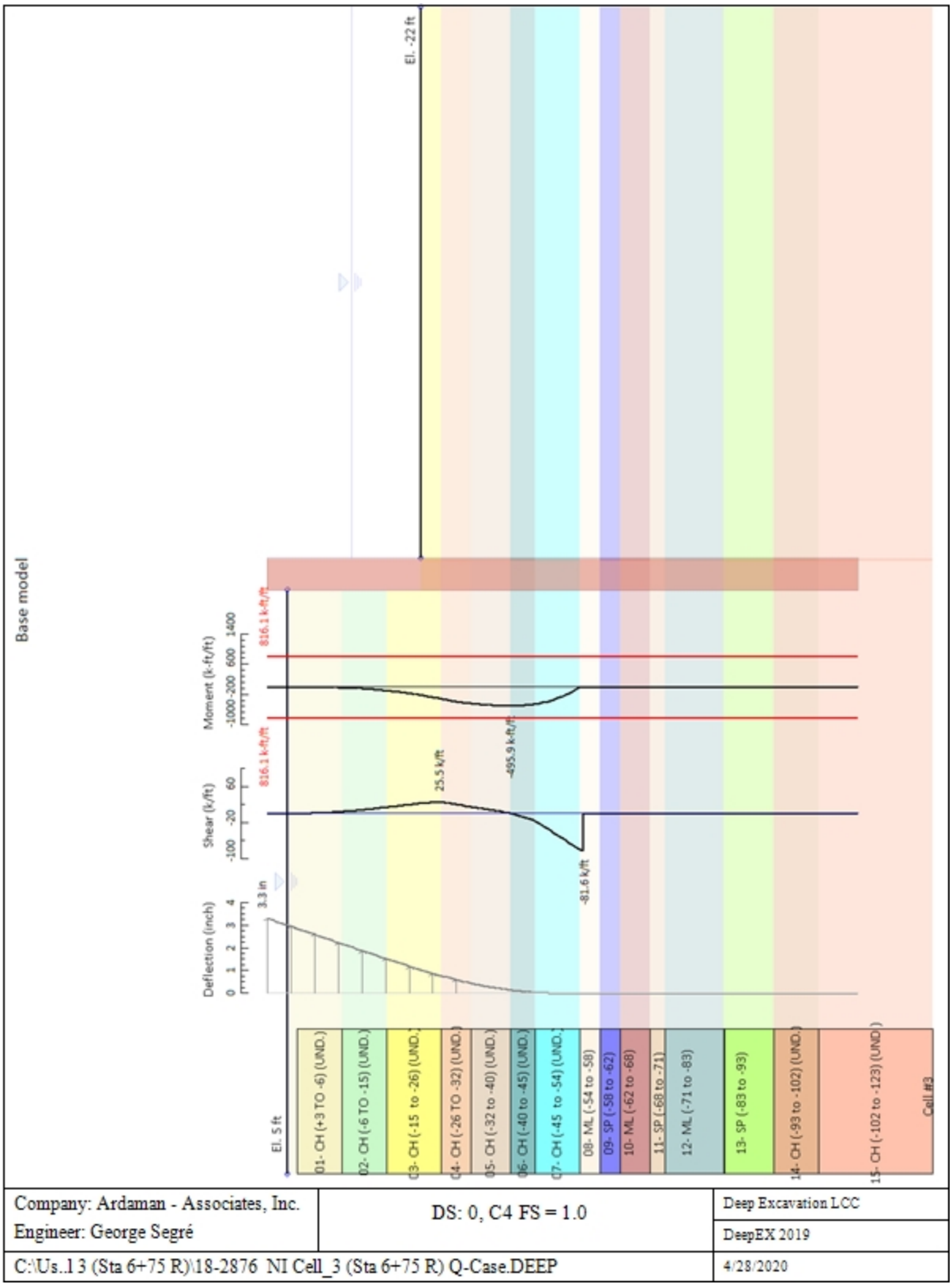

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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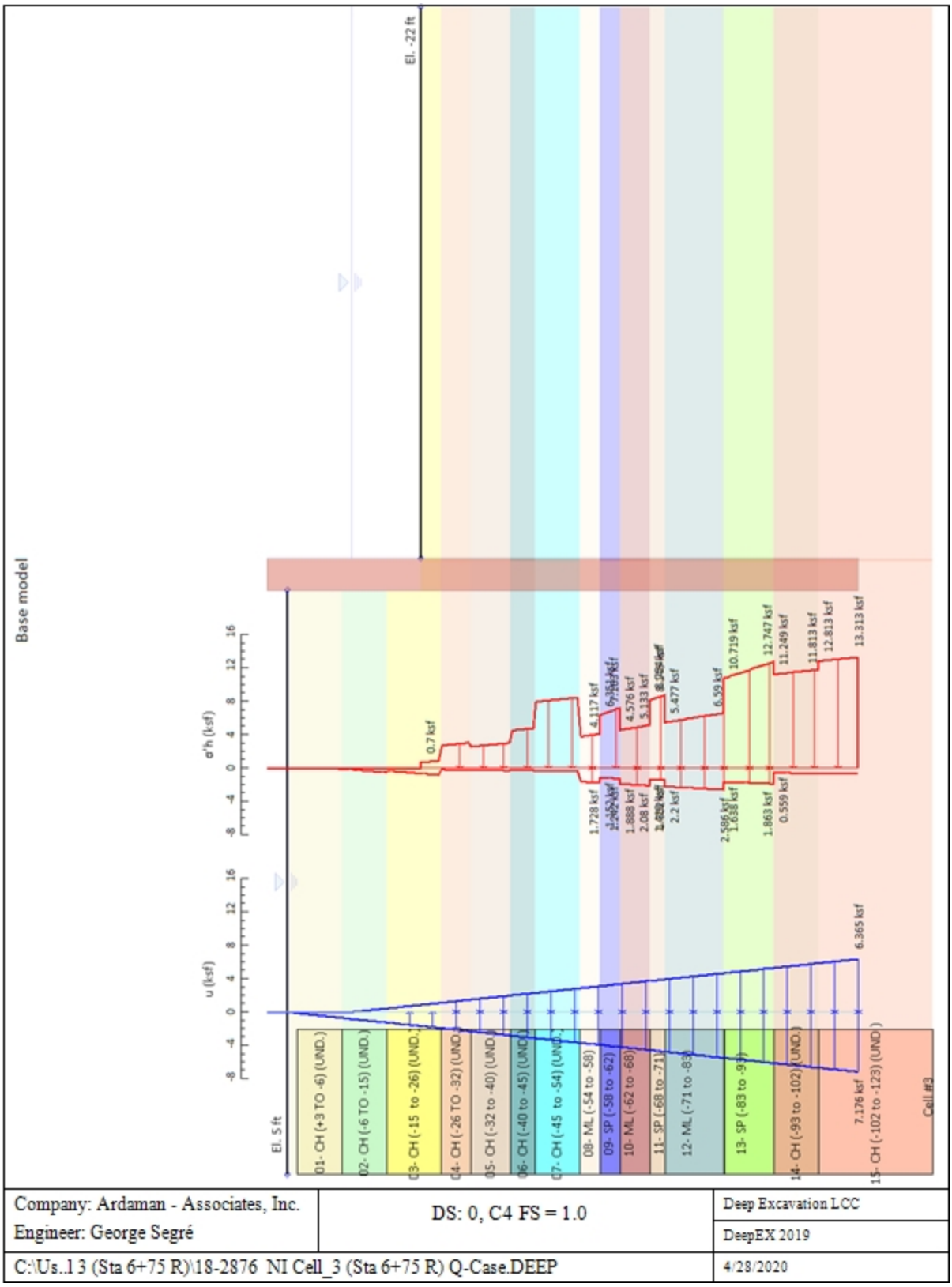

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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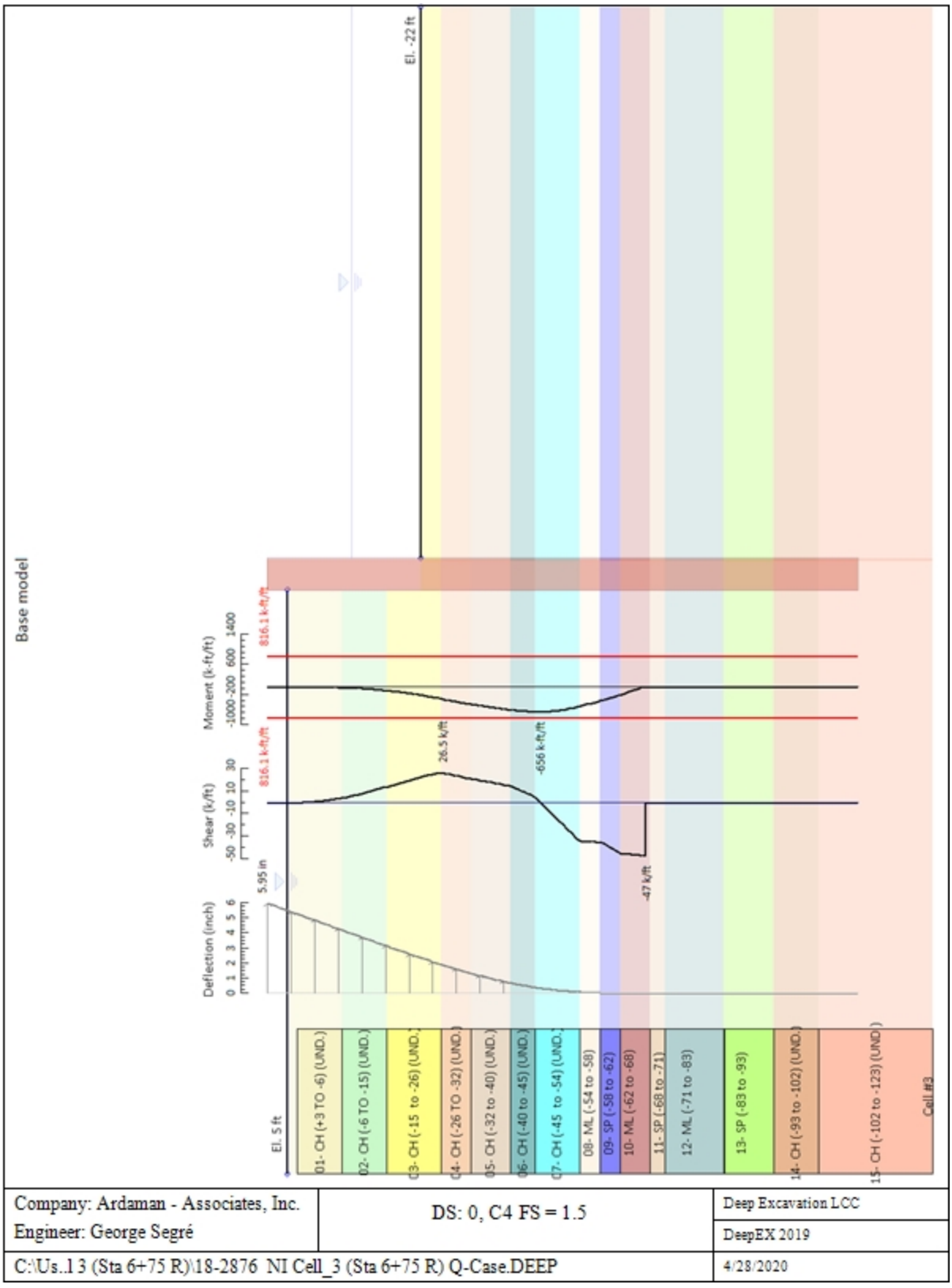

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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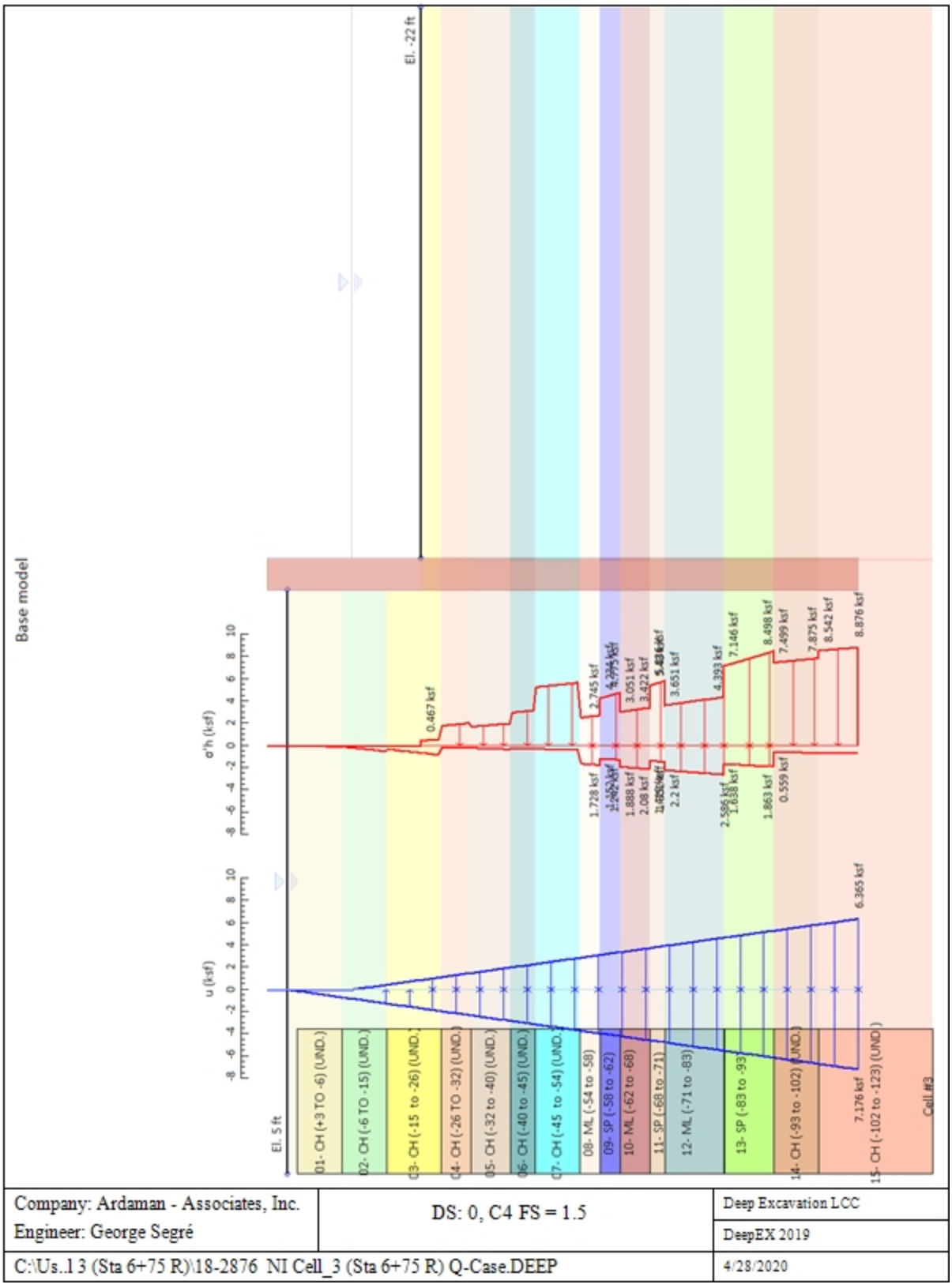

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:47:27 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 3 Sections\Cell 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+3 TO	115	115	23	0	500	23	23	300	3	0.44	2.28	0.44	2.28	True	EXP	
02- CH (-6 TO	110	110	23	0	250	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-15 t	110	110	23	0	350	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-26 T	124	124	26	0	1250	26	26	521.92	3	0.39	2.56	0.39	2.56	True	Linear	
05- CH (-32 to	120	120	26	0	1000	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- CH (-40 to	125	125	26	0	1730	26	26	626.3	3	0.39	2.56	0.39	2.56	True	Linear	
07- CH (-45 t	125	125	26	0	3300	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- ML (-54 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
09- SP (-58 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
10- ML (-62 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
11- SP (-68 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
12- ML (-71 t	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	Linear	
13- SP (-83 to	130	130	30	0	N/A	N/A	N/A	300	3	0.33	3	N/A	N/A	True	Linear	
14- CH (-93 to	125	125	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
15- CH (-102 t	125	125	26	0	4000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+3 TO	0.4	0.1	0	0.609	0.5	1	0	7.2	4.8	20	-
02- CH (-6 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-15 t	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-26 T	0.35	0.1	0	0.562	0.5	-	-	21.8	14.5	30	-
05- CH (-32 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- CH (-40 to	0.35	0.1	0	0.562	0.5	-	-	29	19.3	70	-
07- CH (-45 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- ML (-54 t	0.3	-	-	0.531	0.8	-	-	0	0	0	-
09- SP (-58 to	0.25	-	-	0.5	0.8	-	-	0	0	0	-
10- ML (-62 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
11- SP (-68 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
12- ML (-71 t	0.35	-	-	0.531	0.8	-	-	0	0	0	-
13- SP (-83 to	0.35	-	-	0.5	0.8	-	-	0	0	0	-
14- CH (-93 to	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
15- CH (-102 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction

SIMC= Simplified Clay mode

SOIL BORINGS

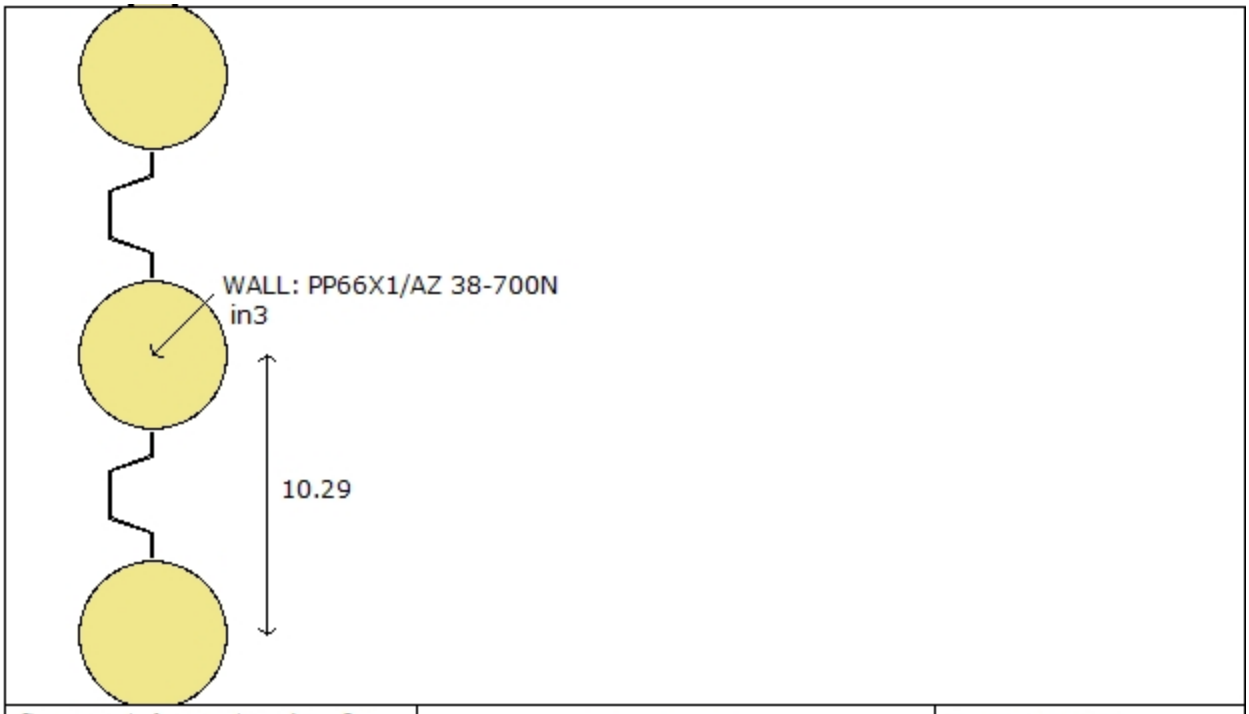
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #3, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
3	01- CH (+3 TO	1	0.61
-6	02- CH (-6 TO -	1	0
-15	03- CH (-15 to	1	0.61
-26	04- CH (-26 TO	1	0.56
-32	05- CH (-32 to	1	0
-40	06- CH (-40 to	1	0.56
-45	07- CH (-45 to	1	0.56
-54	08- ML (-54 to	1	0.53
-58	09- SP (-58 to -	1	0.5
-62	10- ML (-62 to	1	0.53
-68	11- SP (-68 to -	1	0.5
-71	12- ML (-71 to	1	0.53
-83	13- SP (-83 to -	1	0.5
-93	14- CH (-93 to	1	0.56
-102	15- CH (-102 t	1	1

WALL DATA

Wall section 0: Wall 1



Company: Ardaman - Associates, Inc. Engineer: George Segré	Wall sketch	Deep Excavation LCC DeepEX 2019
C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP		4/28/2020

Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -140 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk

F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.532	1.578	2.28
Stage 1	Simple span	N/A	1.6	1.263	1.263	1.824
Stage 2	Simple span	N/A	1.6	1.899	2.09	2.945
Stage 3	Simple span	N/A	1.6	1.61	1.672	2.356
Stage 4	Simple span	N/A	1.6	1.678	1.747	2.467
Stage 5	Simple span	N/A	1.6	1.165	1.165	1.645
Stage 6	Simple span	N/A	1.6	2.158	2.396	3.266
Stage 7	Simple span	N/A	1.6	1.594	1.598	2.177

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

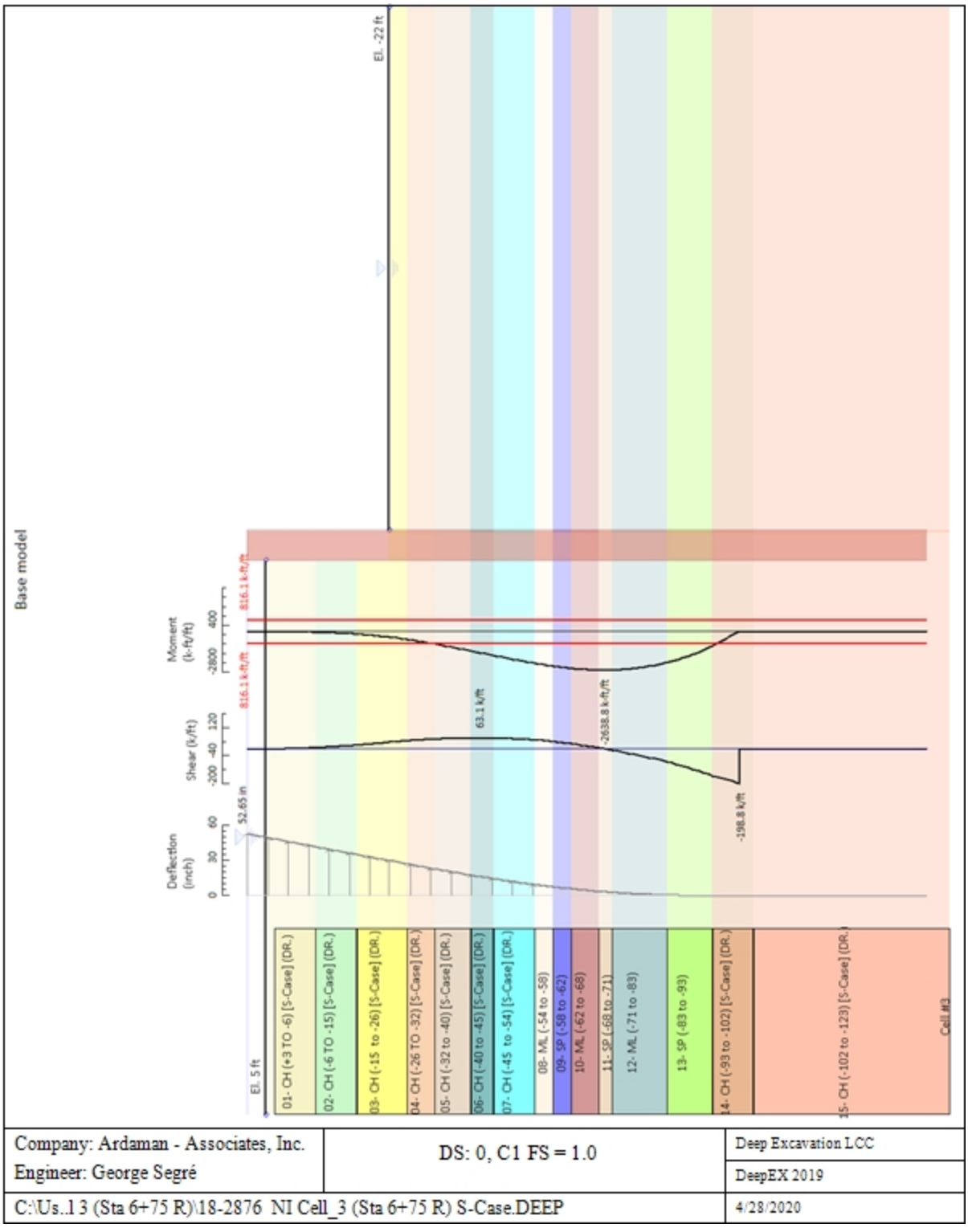
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

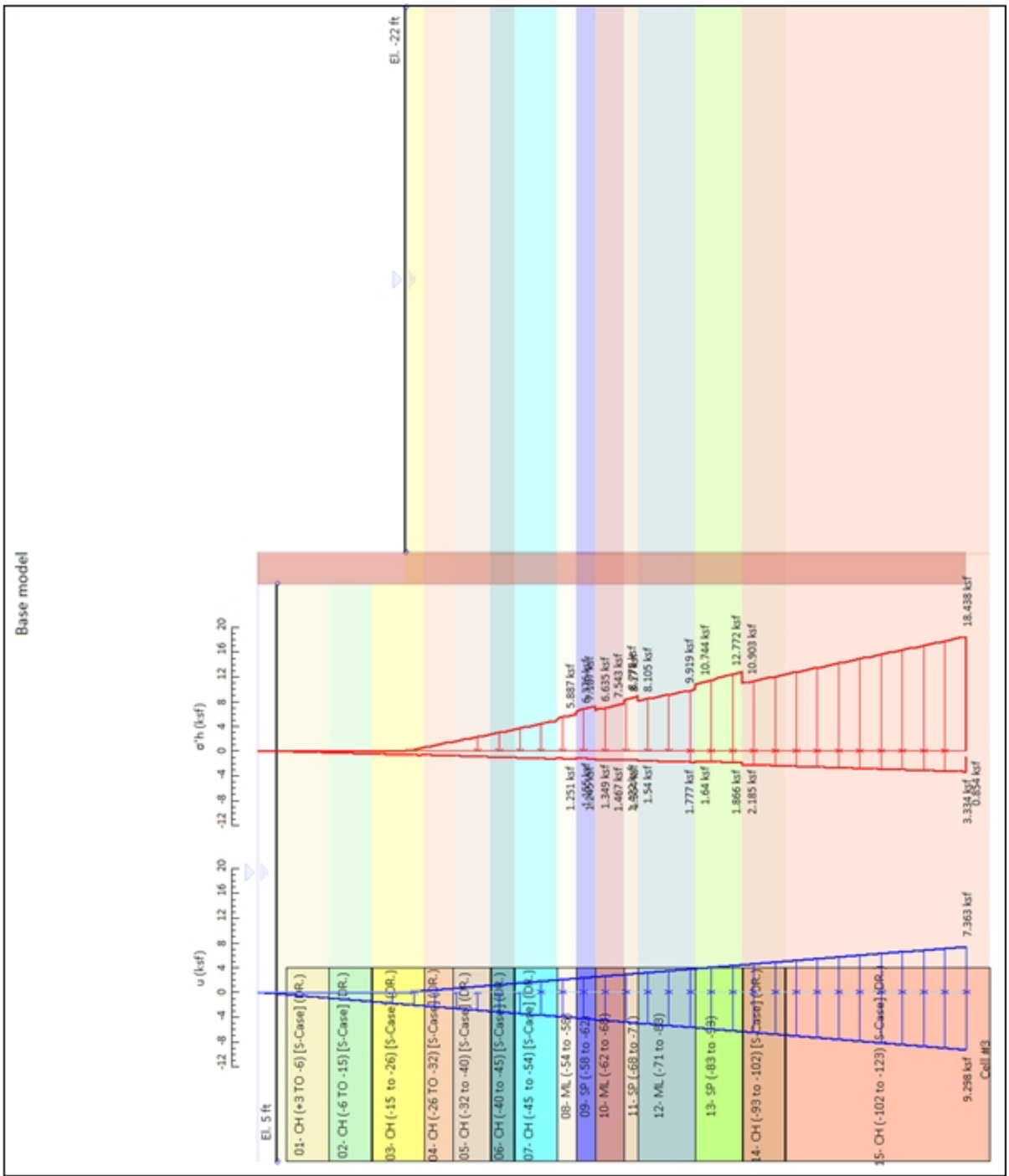
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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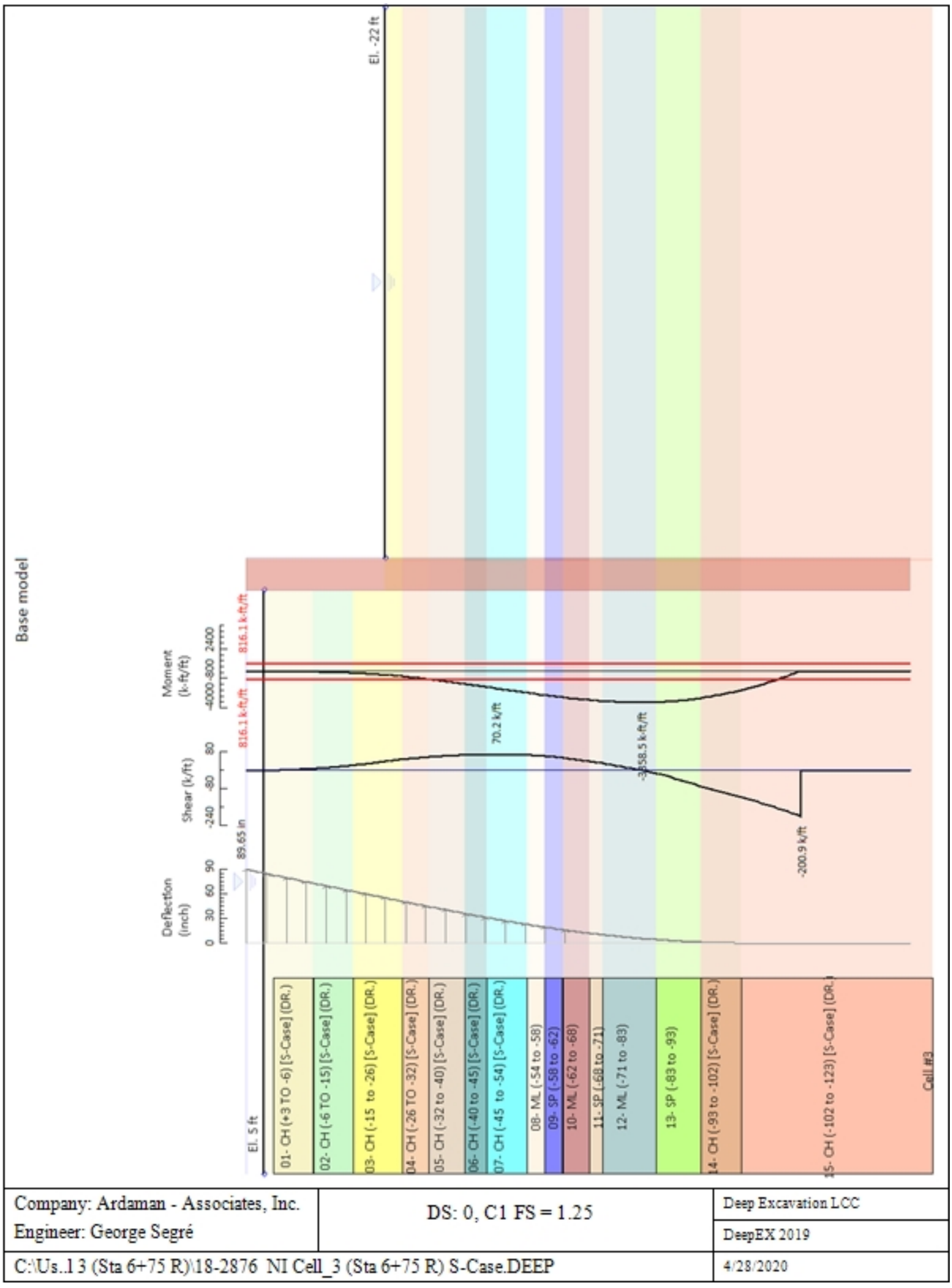

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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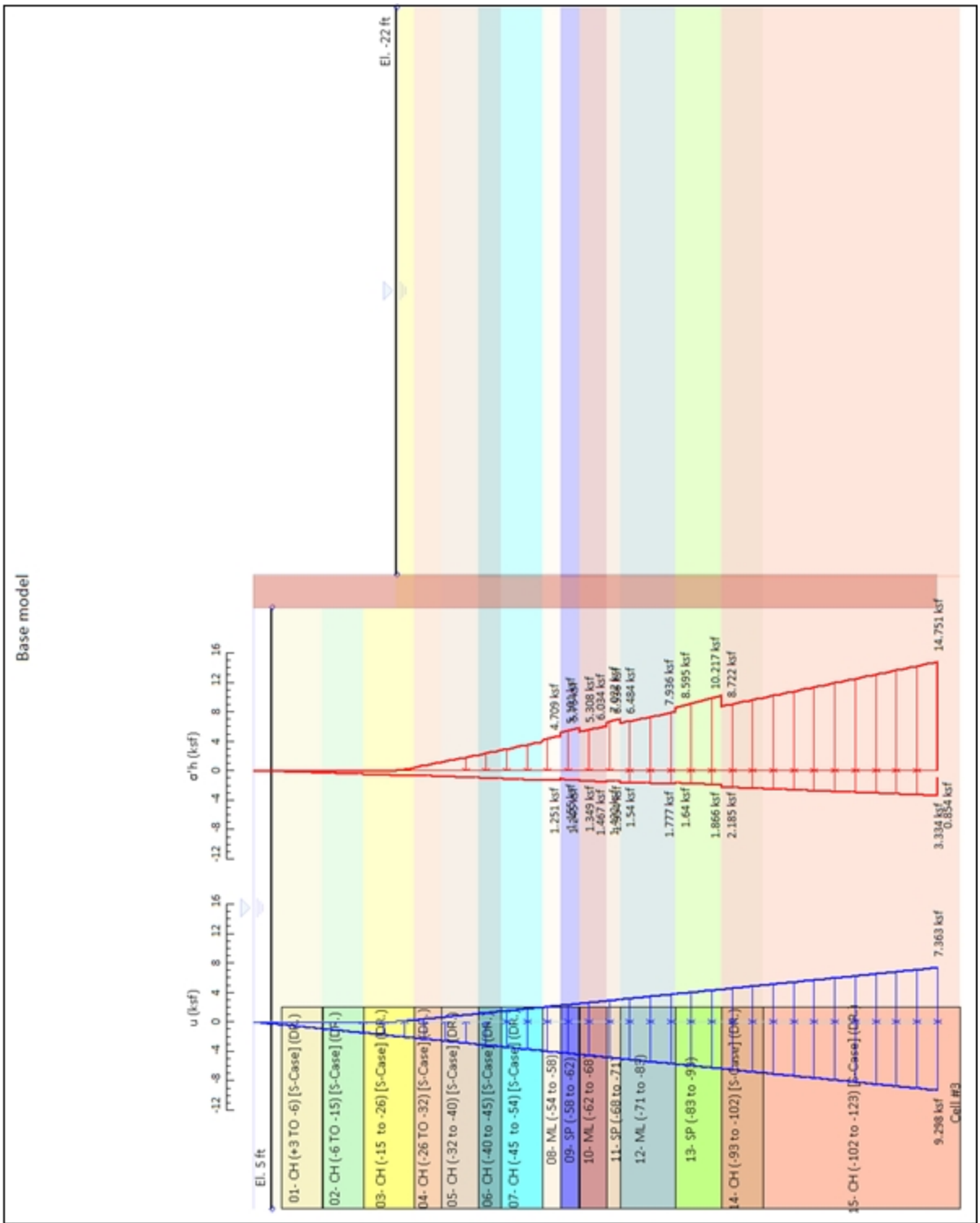
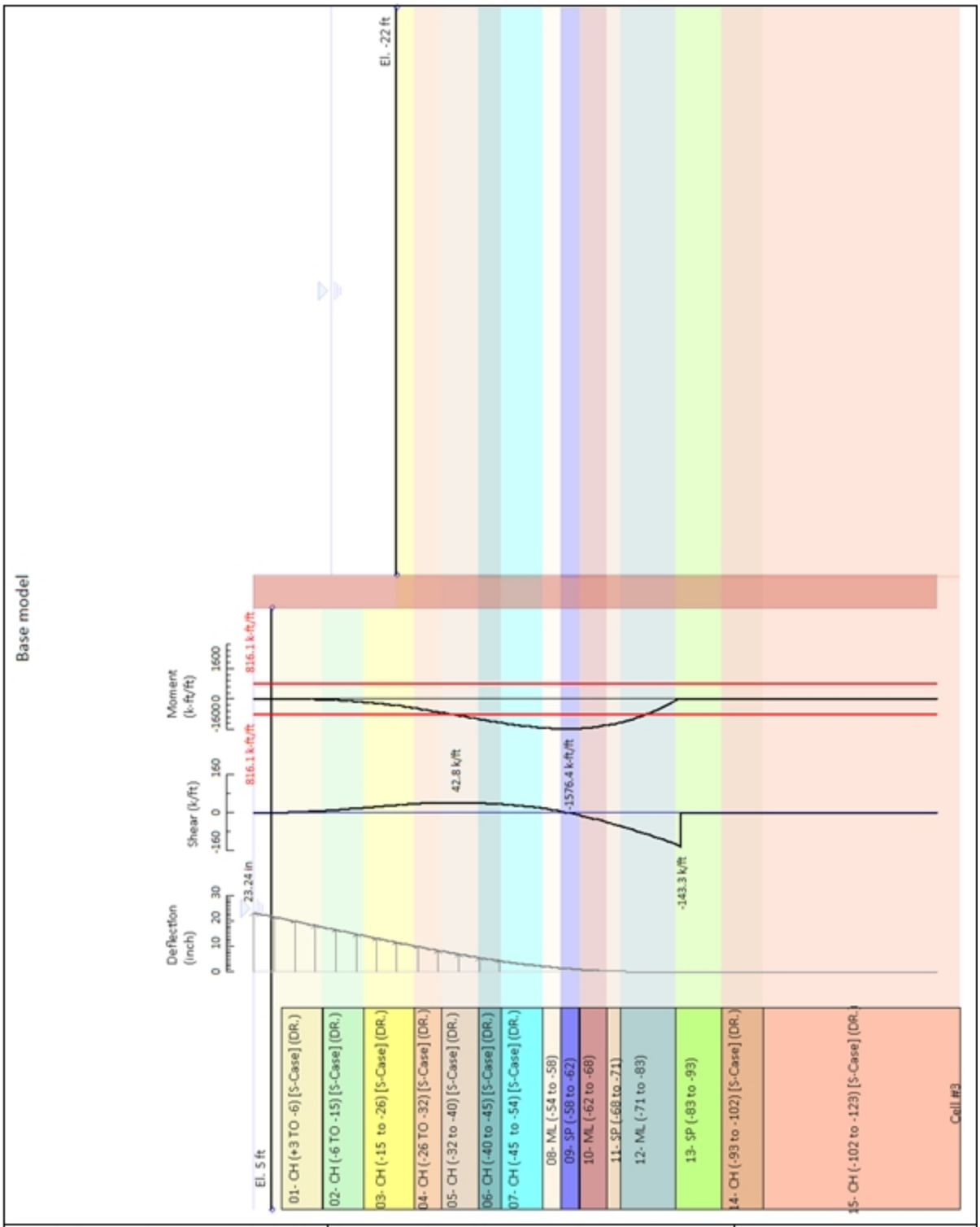


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..1 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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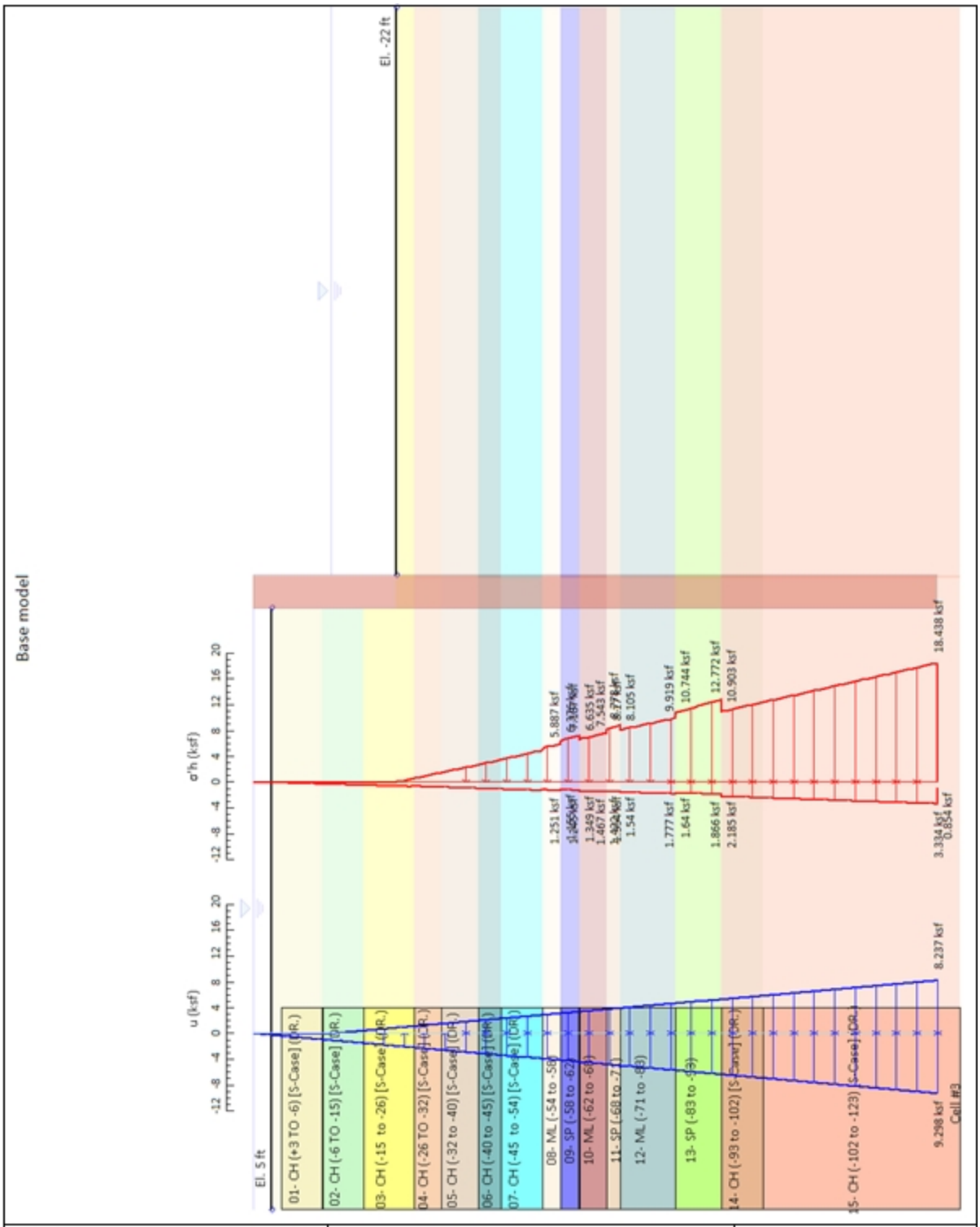

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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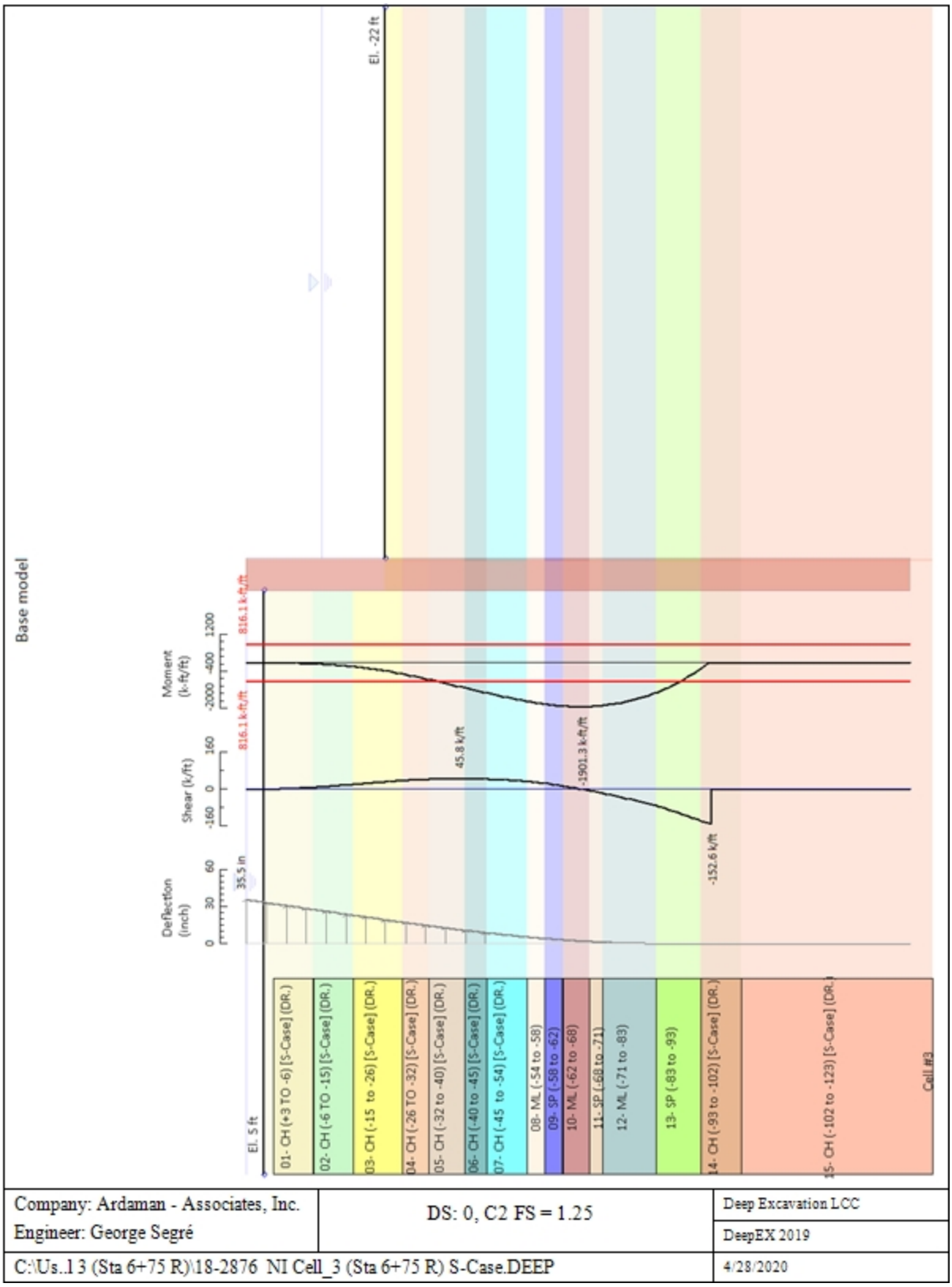

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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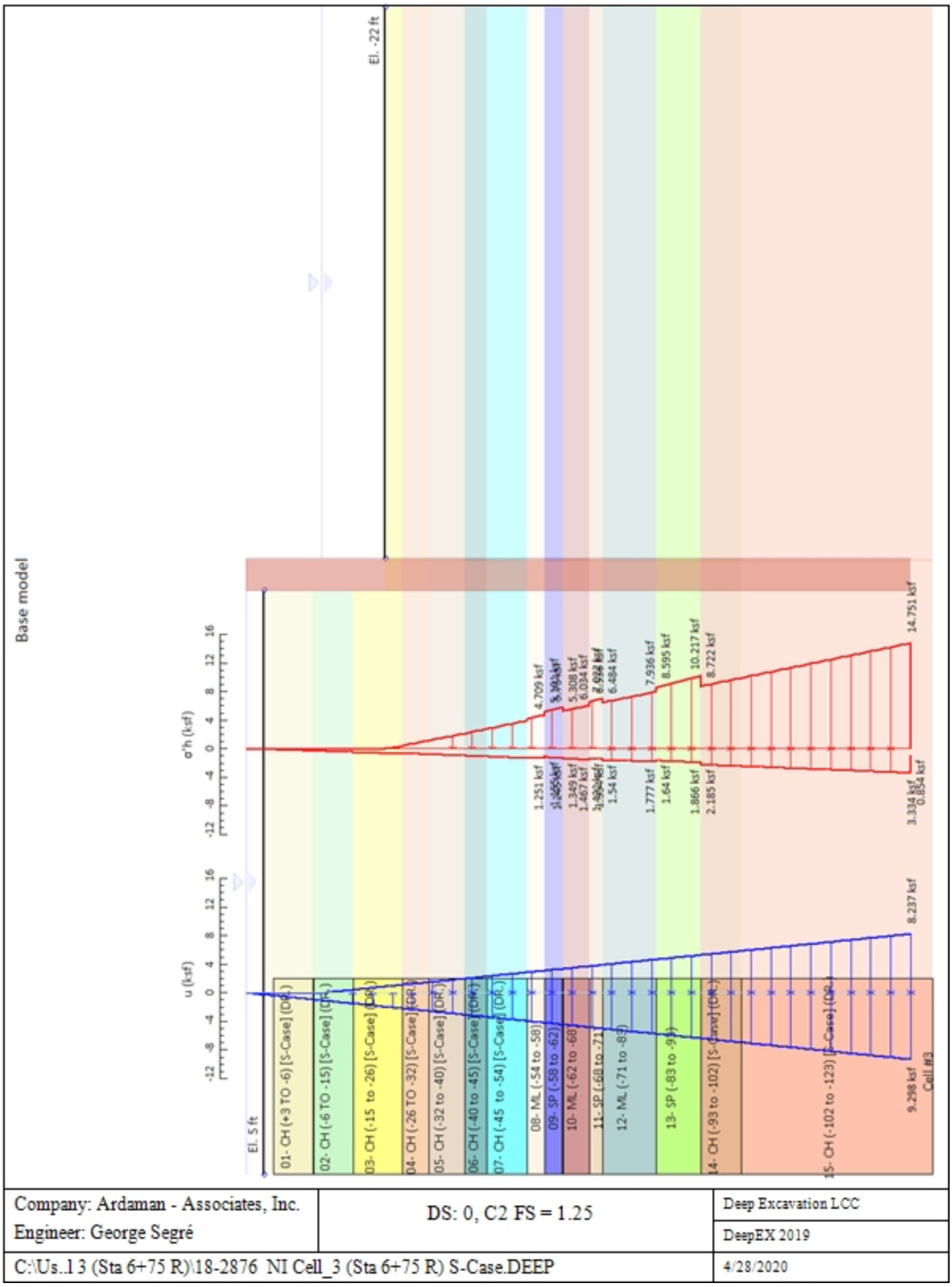

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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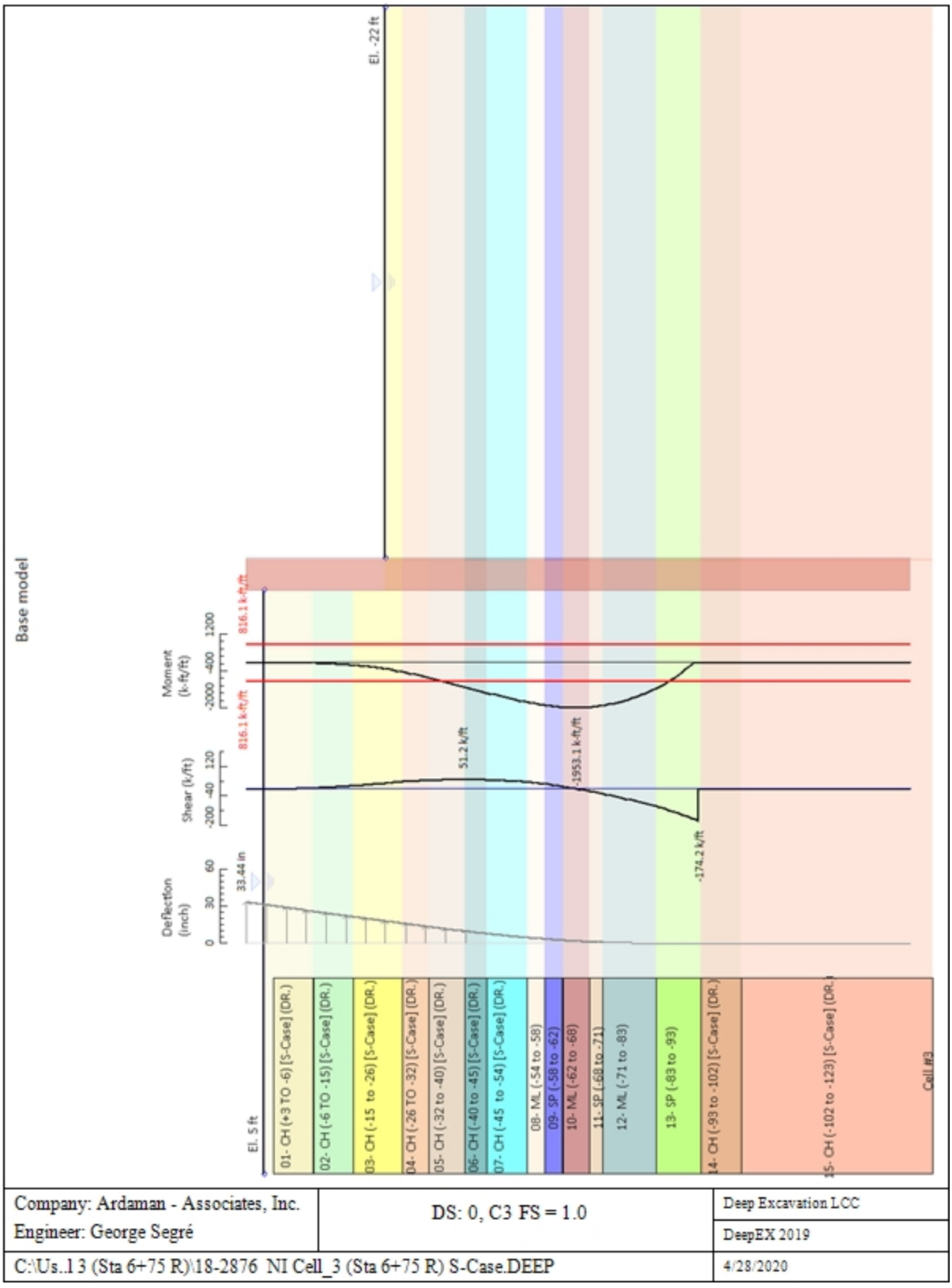

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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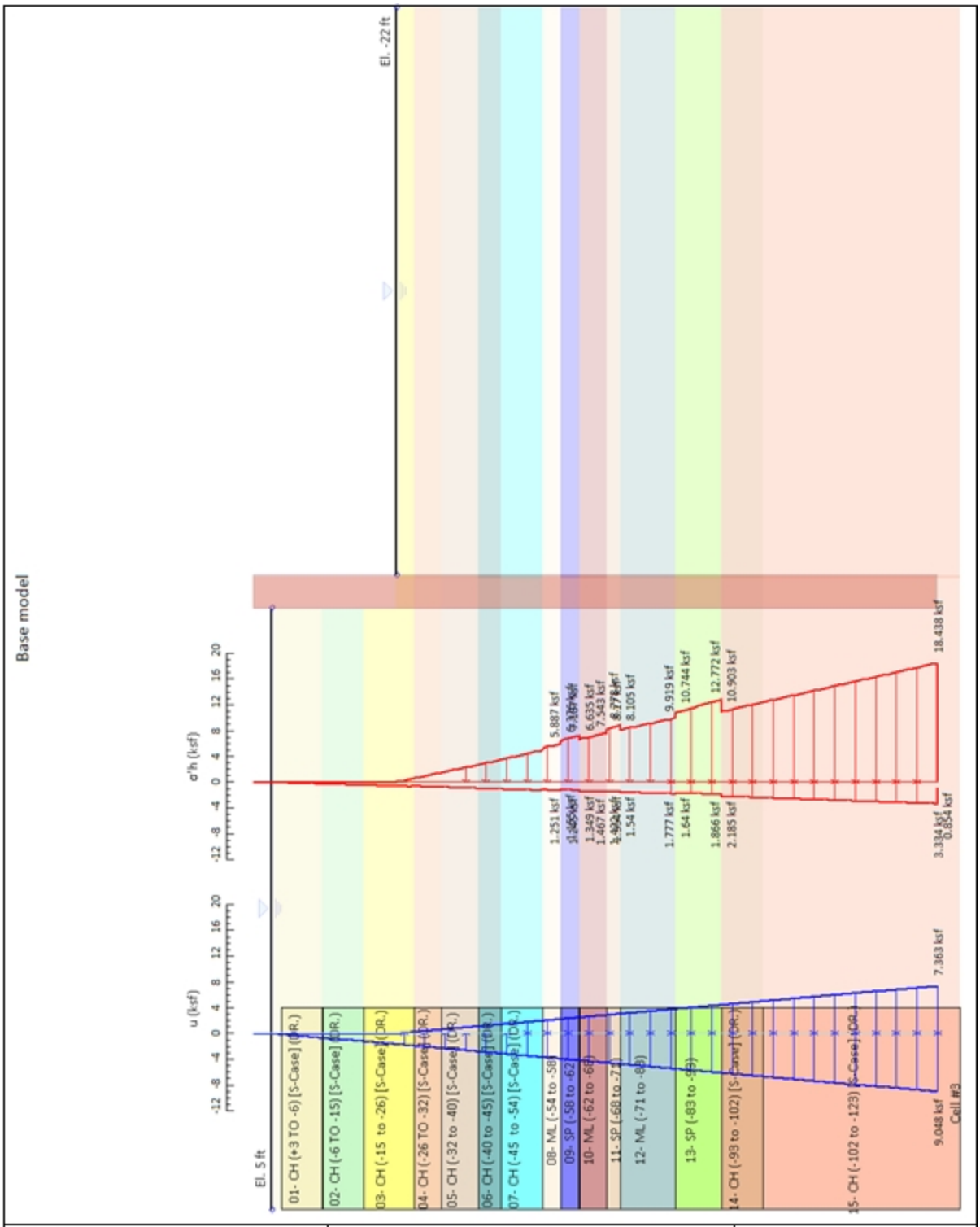

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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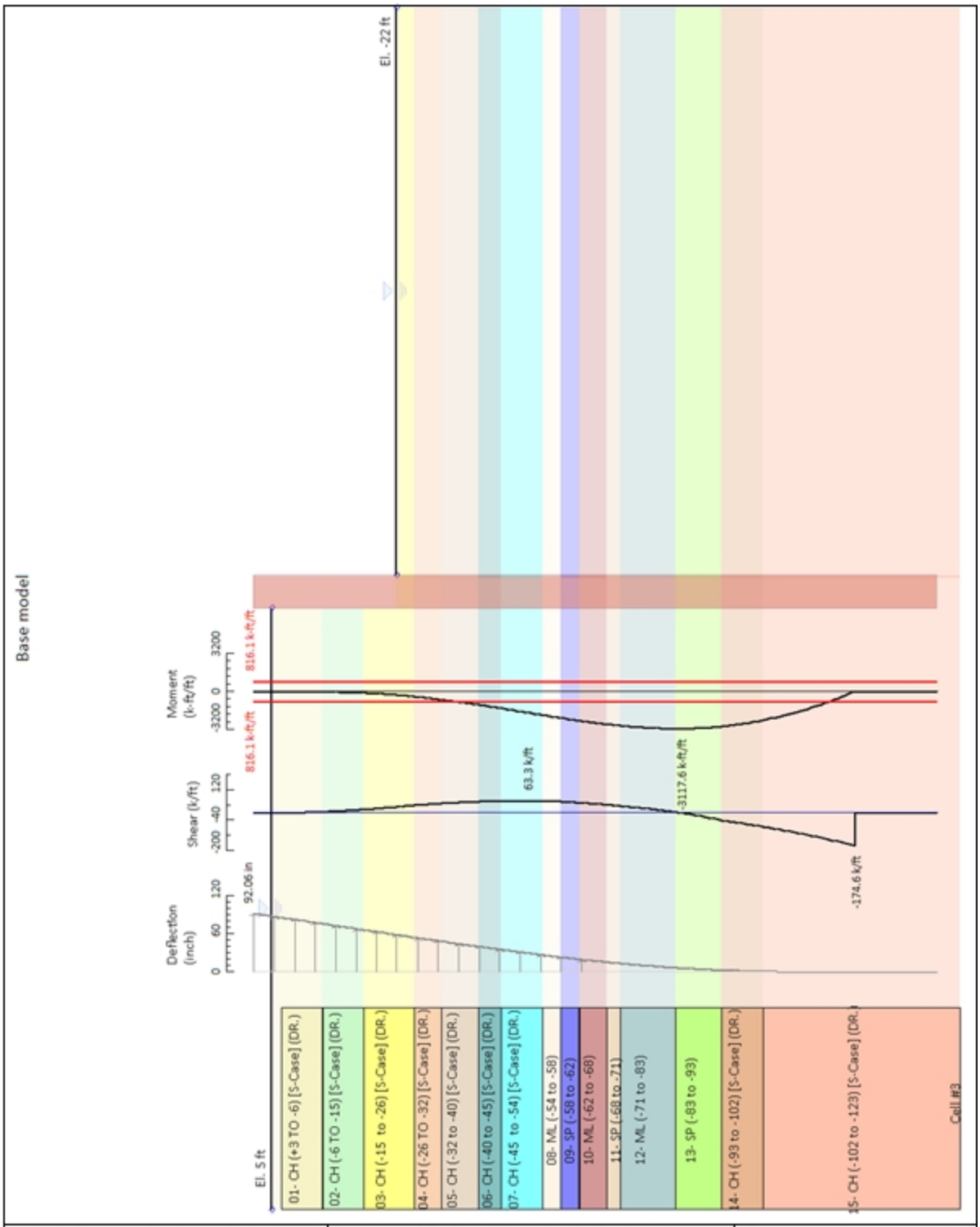

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS= 1.5	Deep Excavation LCC DeepEX 2019
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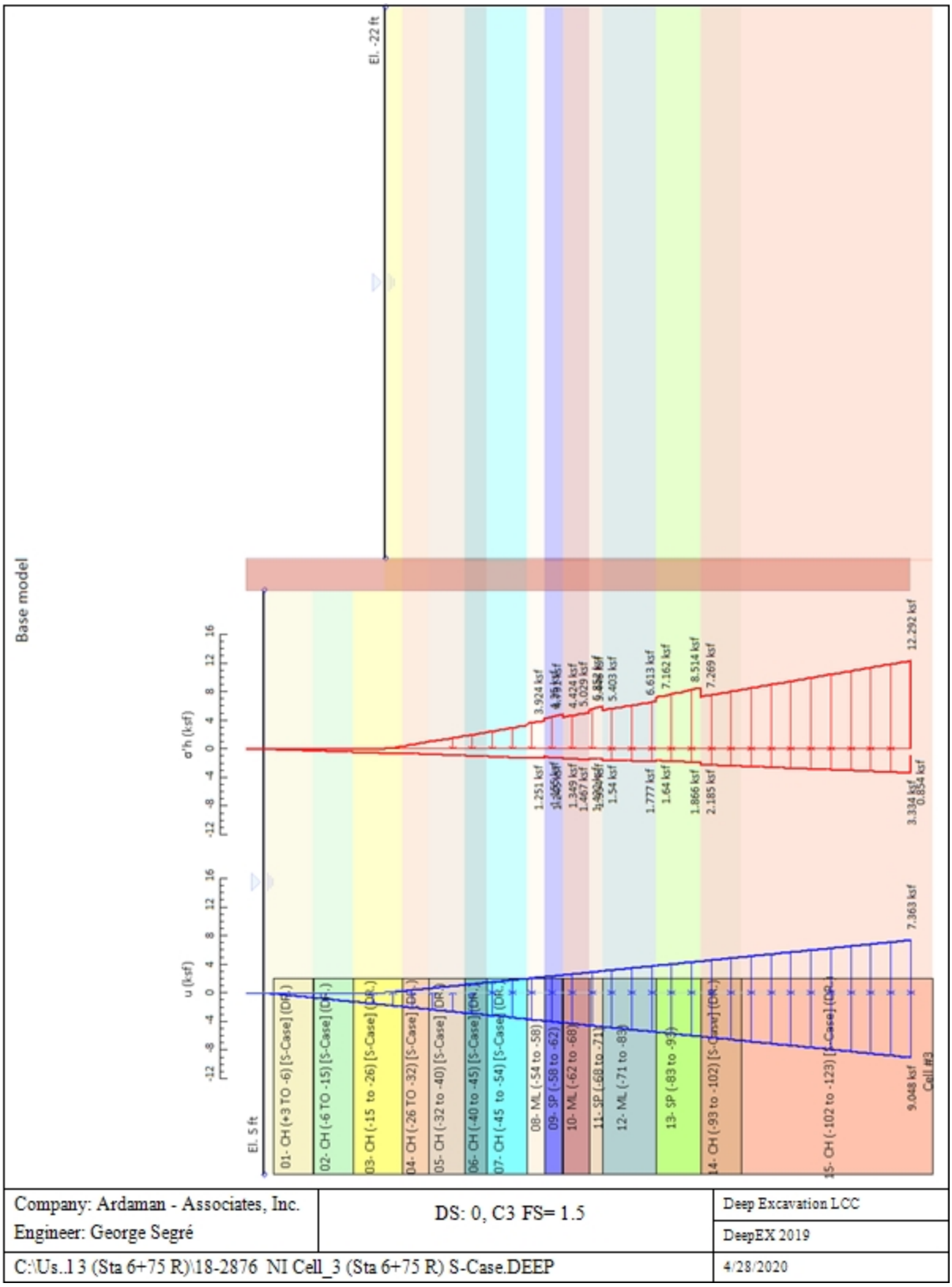

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS= 1.5	Deep Excavation LCC DeepEX 2019
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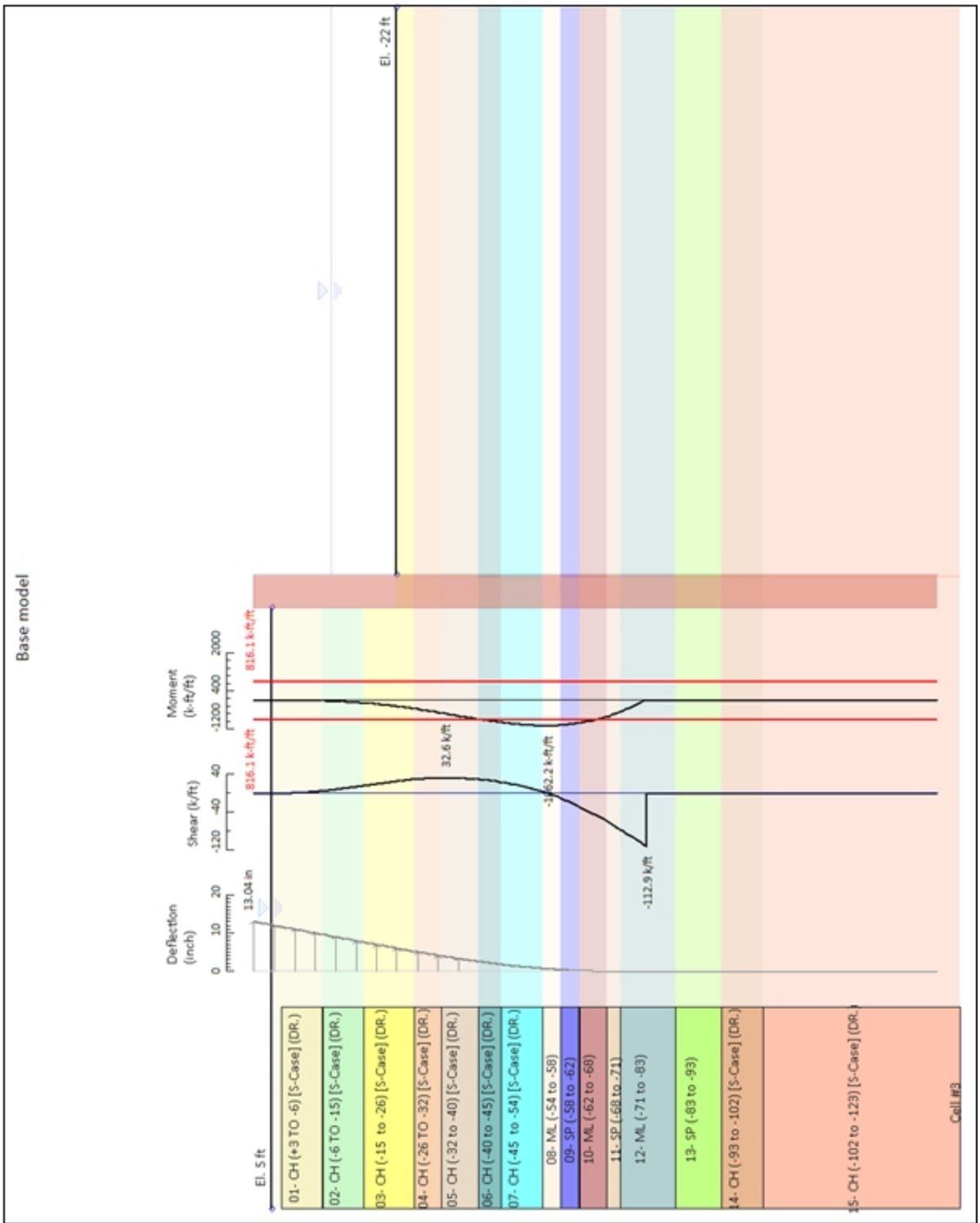

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.0	Deep Excavation LCC DeepEX 2019
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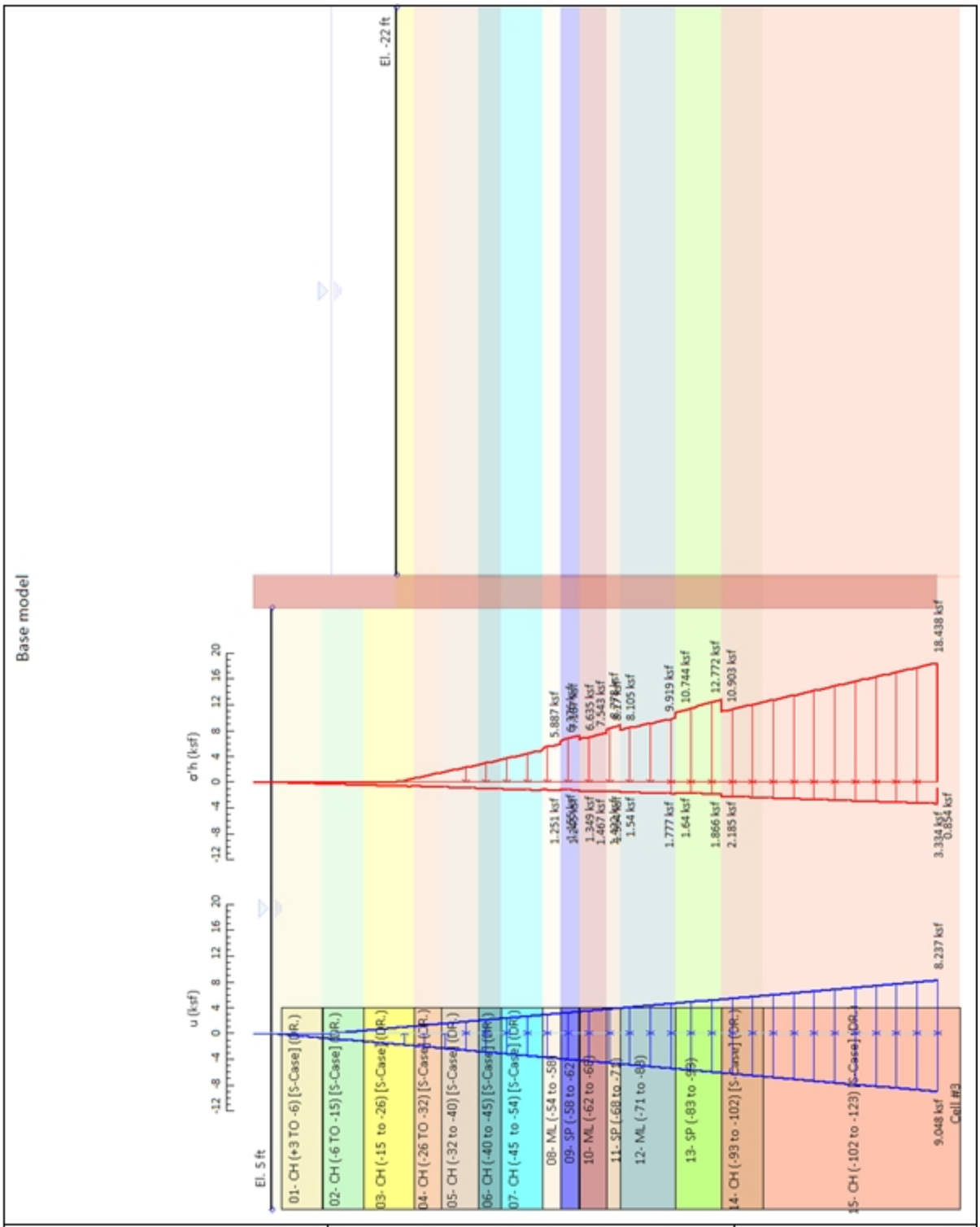

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.0	Deep Excavation LCC DeepEX 2019
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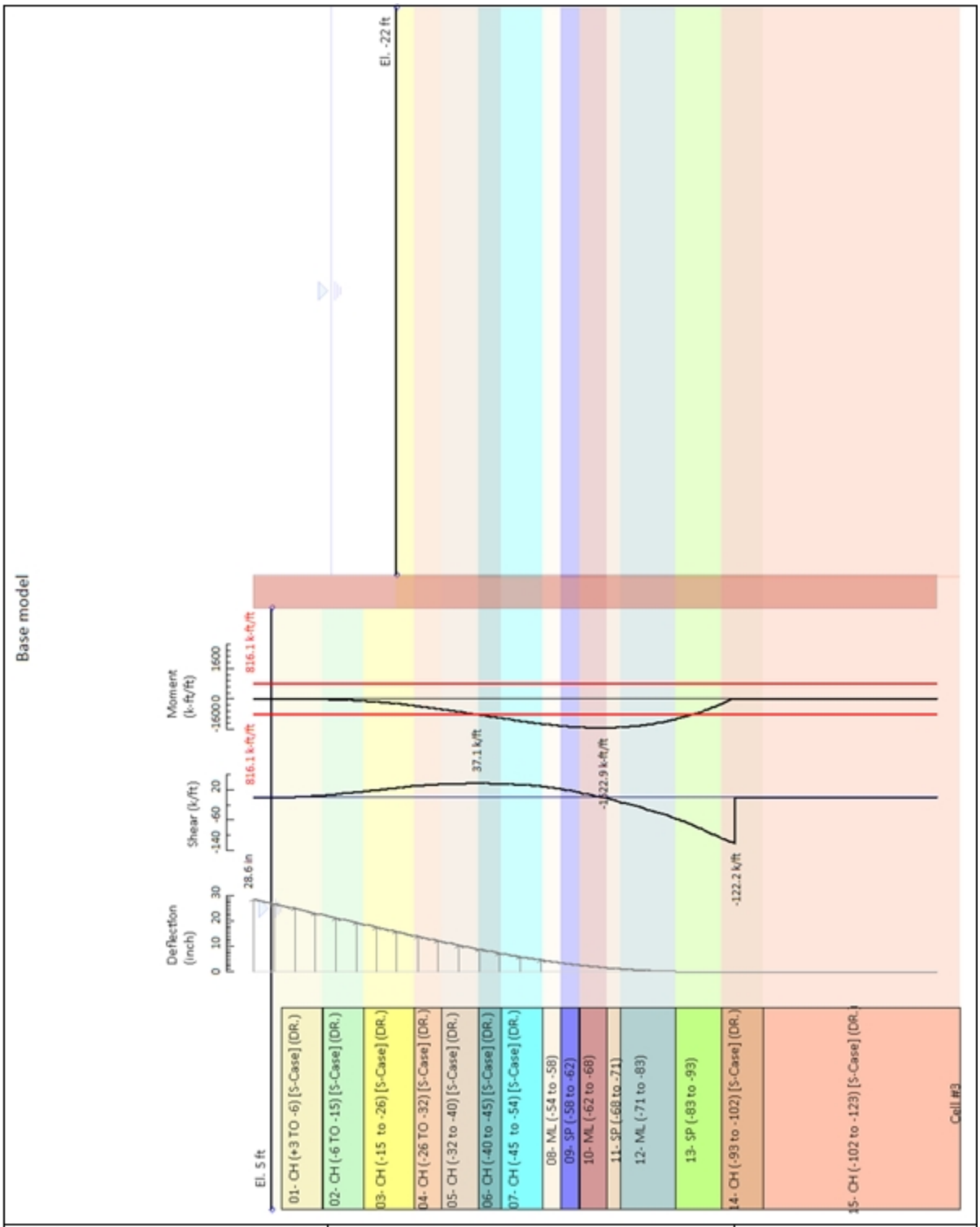

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.5	Deep Excavation LCC DeepEX 2019
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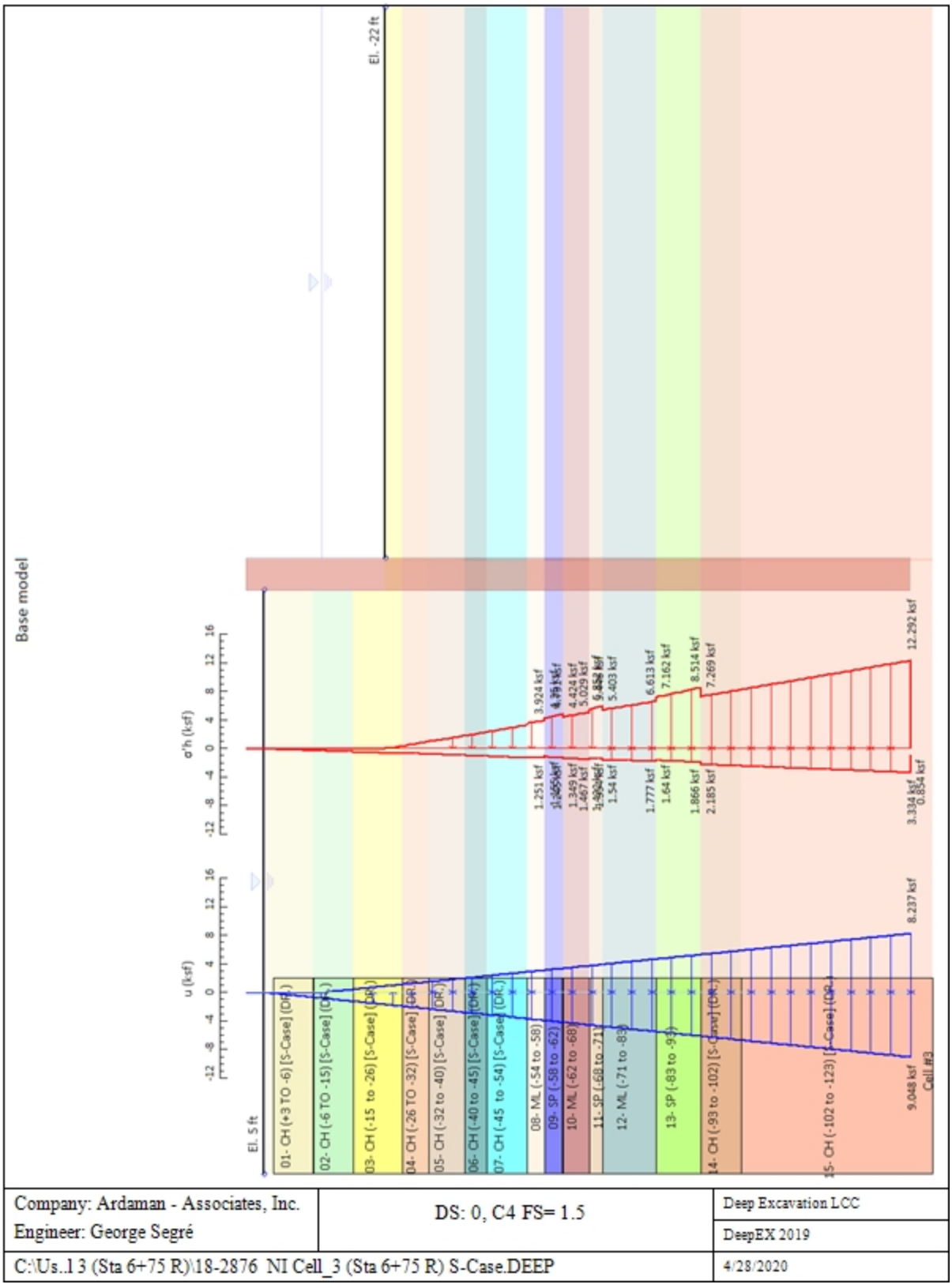

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..l 3 (Sta 6+75 R)\18-2876 NI Cell_3 (Sta 6+75 R) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 5+00 Right Wall)

Top of Wall =	9.0 ft., NAVD88	Design Tip Elev. =	-112.0 ft., NAVD88
Governing Tip Elev. =	-111.62 ft., NAVD88	Design Length of Sheeting =	121.0 ft.
Length of Sheetting =	120.62 ft.		
Use =	121.0 ft.		

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-20	1.00	1.00	-68.39	1,157.34	106.26	10.83
		Open excavation - degraded	9	-20	1.00	1.25	-79.29	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-59.12	793.11	99.42	5.85
		Open excavation - degraded	9	-8	1.00	1.25	-65.67	--	--	--
Q-Case	3	Open excavation - degraded	5	-20	1.00	1.00	-61.31	808.06	89.20	6.15
		Open excavation - degraded	5	-20	1.00	1.50	-81.47	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-53.67	496.49	85.26	3.02
		Open excavation - degraded	5	-8	1.00	1.50	-62.94	--	--	--
S-Case	1	Open excavation - degraded	9	-20	1.00	1.00	-93.56	2,238.97	198.79	39.90
		Open excavation - degraded	9	-20	1.00	1.25	-106.46	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-81.30	1,350.54	141.51	18.96
		Open excavation - degraded	9	-8	1.00	1.25	-90.97	--	--	--
S-Case	3	Open excavation - degraded	5	-20	1.00	1.00	-87.10	1,618.84	158.36	25.11
		Open excavation - degraded	5	-20	1.00	1.50	-111.62	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-74.20	863.52	104.78	10.30
		Open excavation - degraded	5	-8	1.00	1.50	-92.26	--	--	--
						Governing Value:	-111.62	2,238.97	198.79	39.90

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 9:54:41 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	0	0	1000	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-1 TO	116	116	0	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	0	0	500	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-14 T	123	123	0	0	940	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-20 to	115	115	0	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	0	0	2500	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-43 to	100	10	0	0	3000	0	0	300	3	1	1	1	1	True	Linear	
09- CH (-49 to	100	100	0	0	3500	0	0	300	3	1	1	1	1	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	1	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	1	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

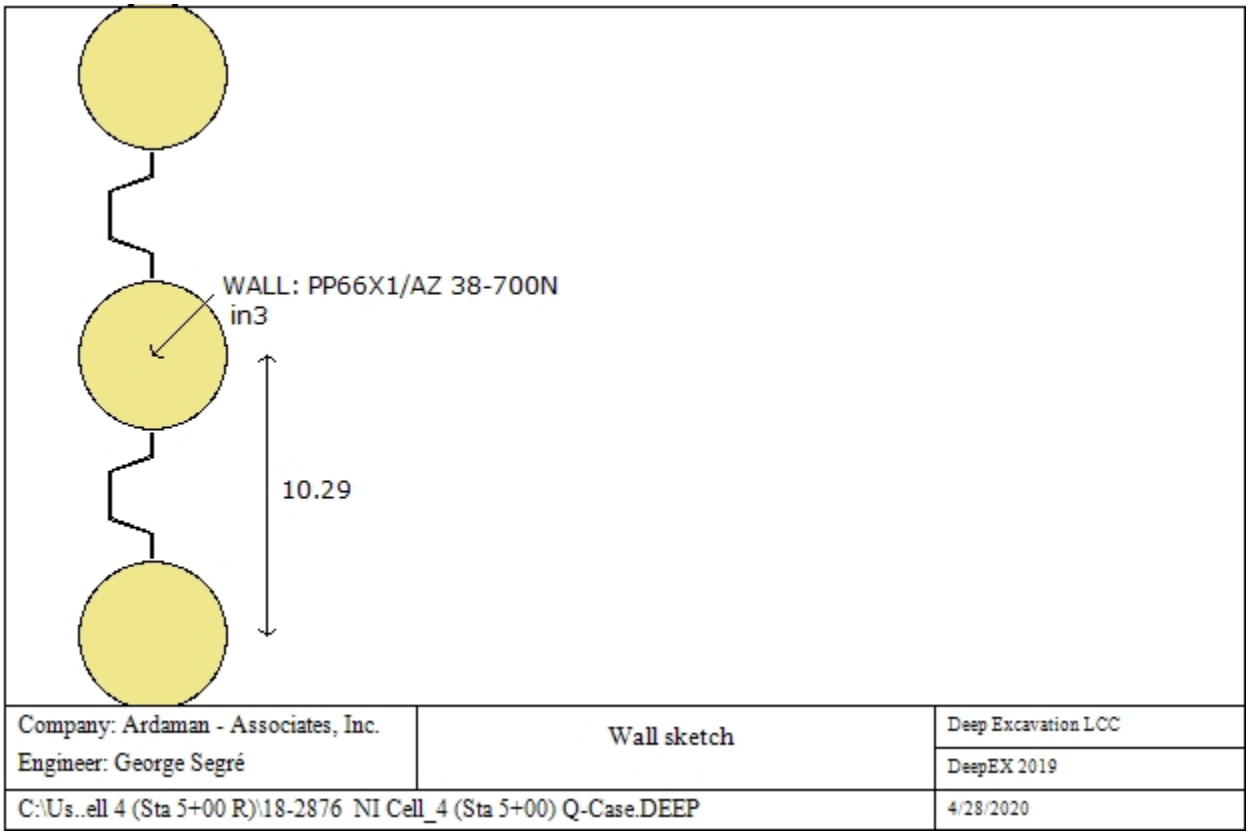
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
10	01- CH (+5 TO	1	1
-1	02- CH (-1 TO -	1	1
-7	03- CH (-7 to -	1	1
-14	04- CH (-14 TO	1	1
-20	05- CH (-20 to	1	1
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	1
-43	08- CH (-43 to	1	1
-49	09- CH (-49 to	1	1
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.653	1.666	2.445
Stage 1	Simple span	N/A	1.6	1.333	1.333	1.956
Stage 2	Simple span	N/A	1.6	2.045	2.258	3.283
Stage 3	Simple span	N/A	1.6	1.752	1.806	2.627
Stage 4	Simple span	N/A	1.6	1.884	1.884	2.634
Stage 5	Simple span	N/A	1.6	1.256	1.256	1.756
Stage 6	Simple span	N/A	1.6	2.376	2.677	3.633
Stage 7	Simple span	N/A	1.6	1.785	1.785	2.422

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

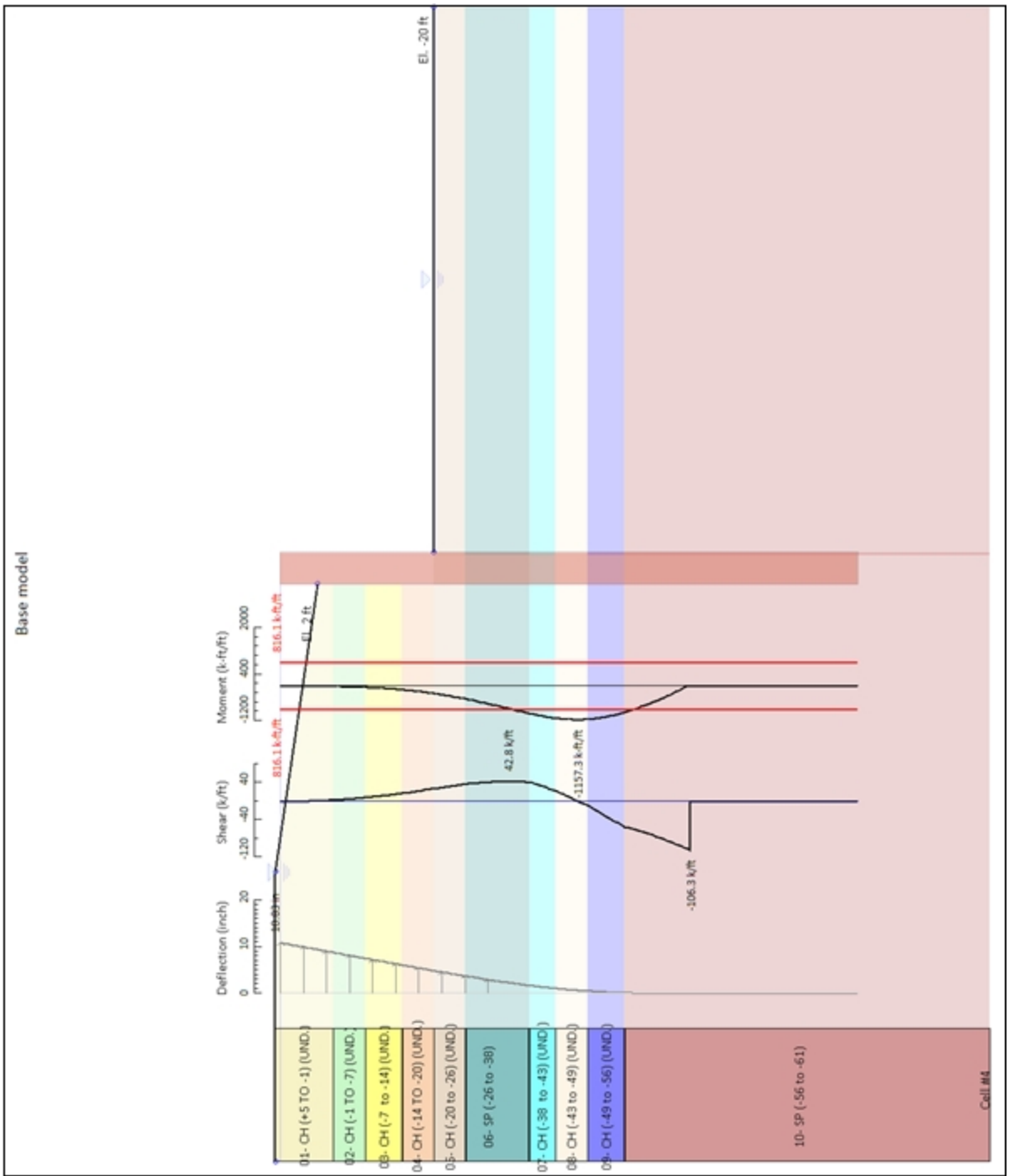
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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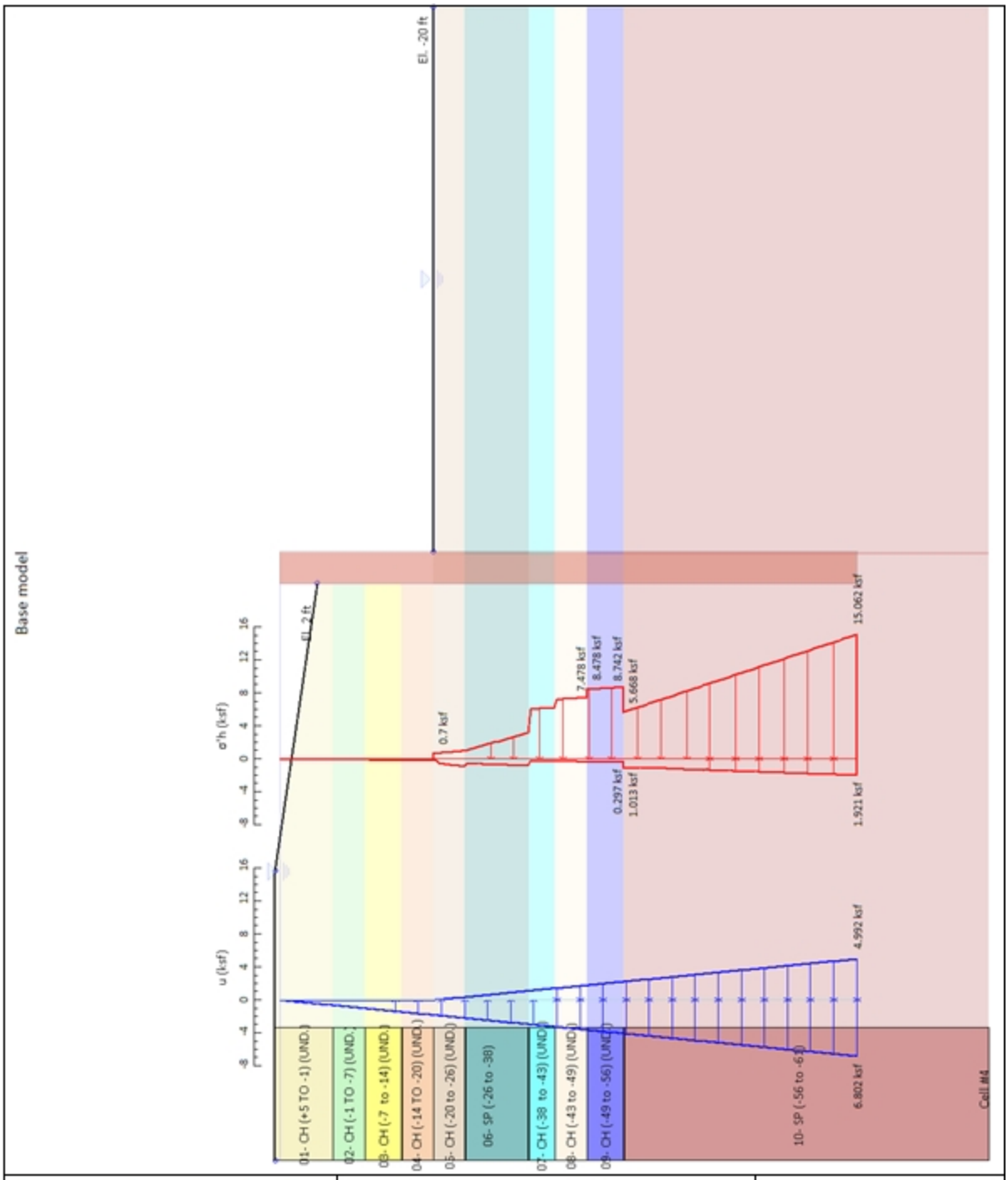

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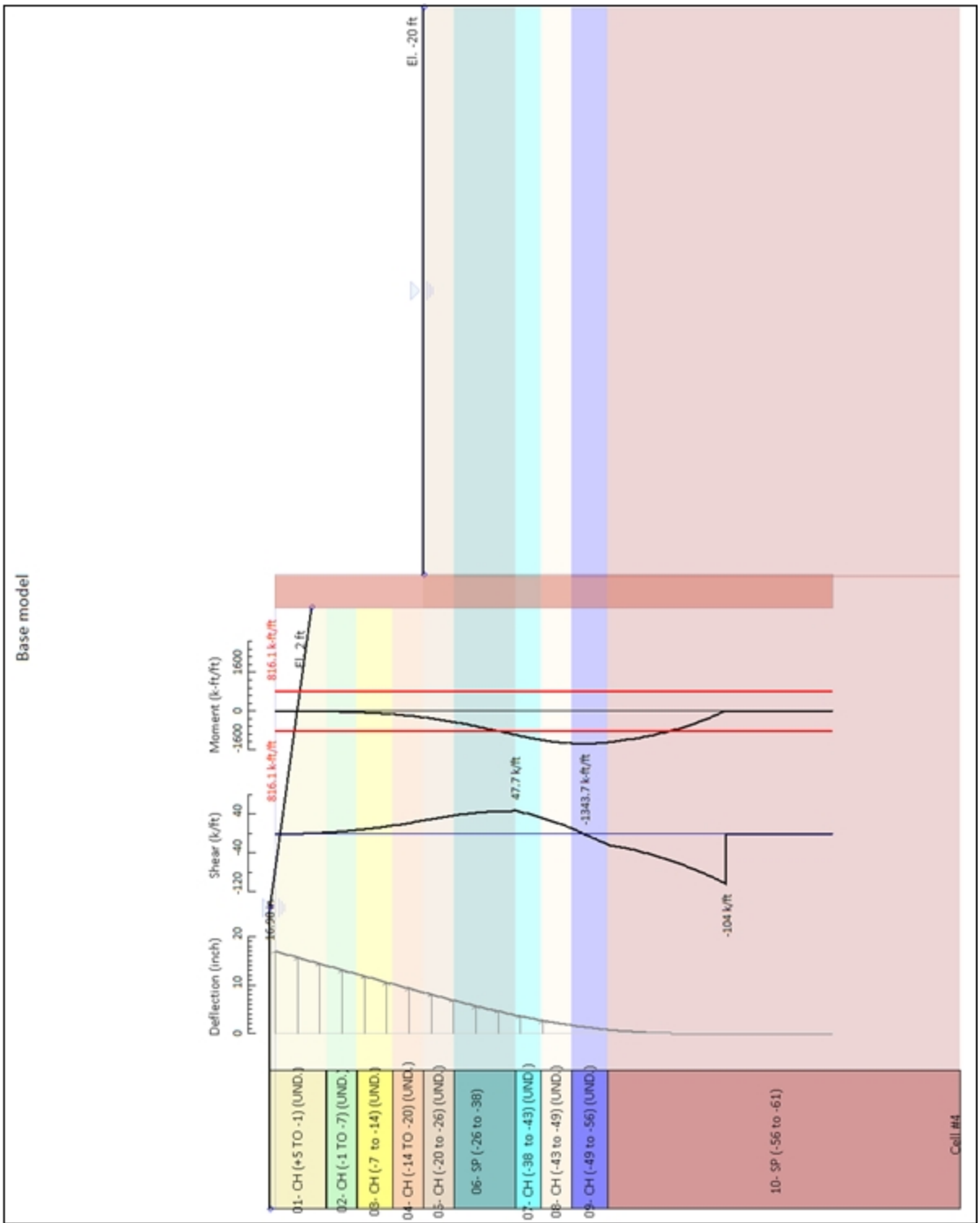

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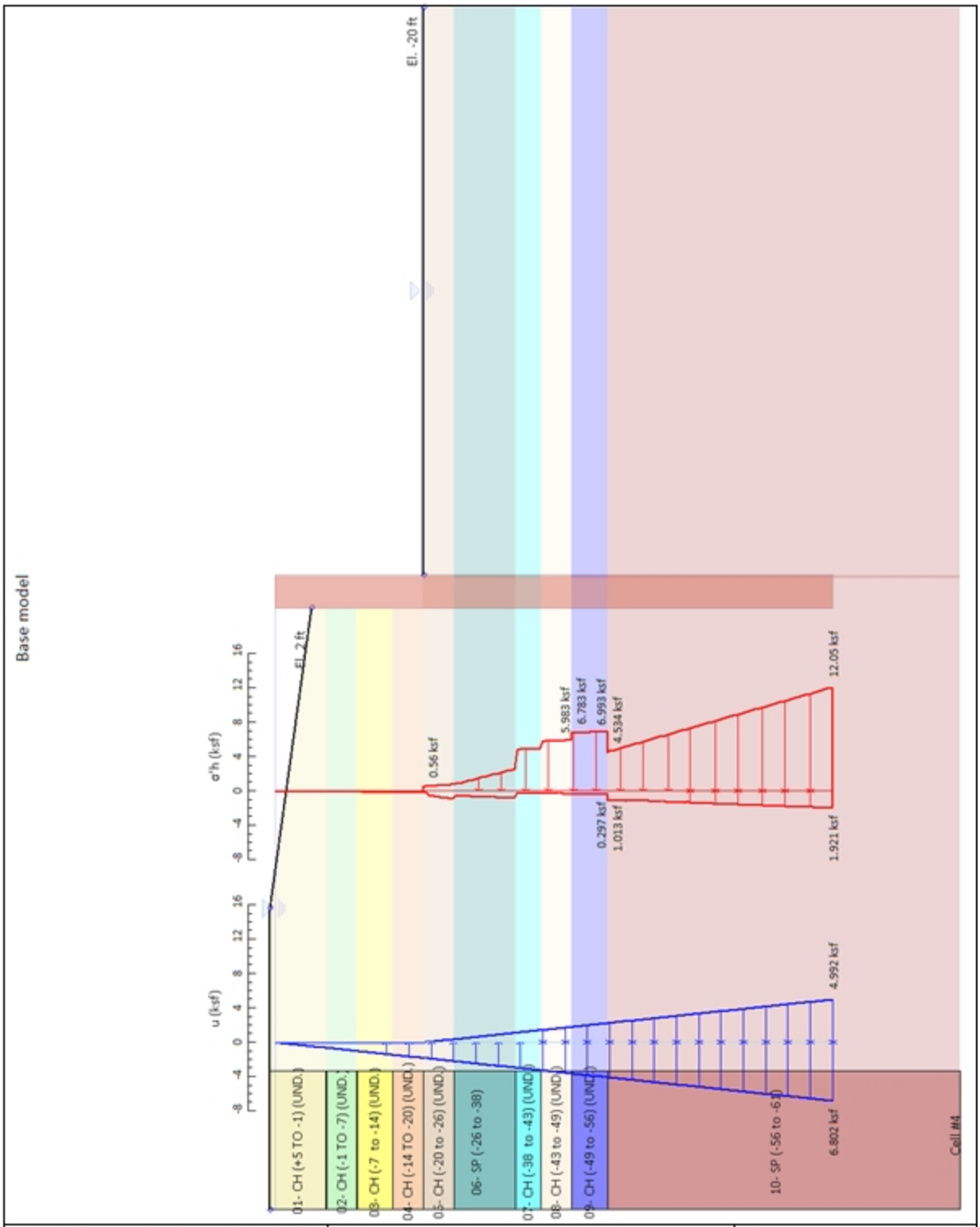

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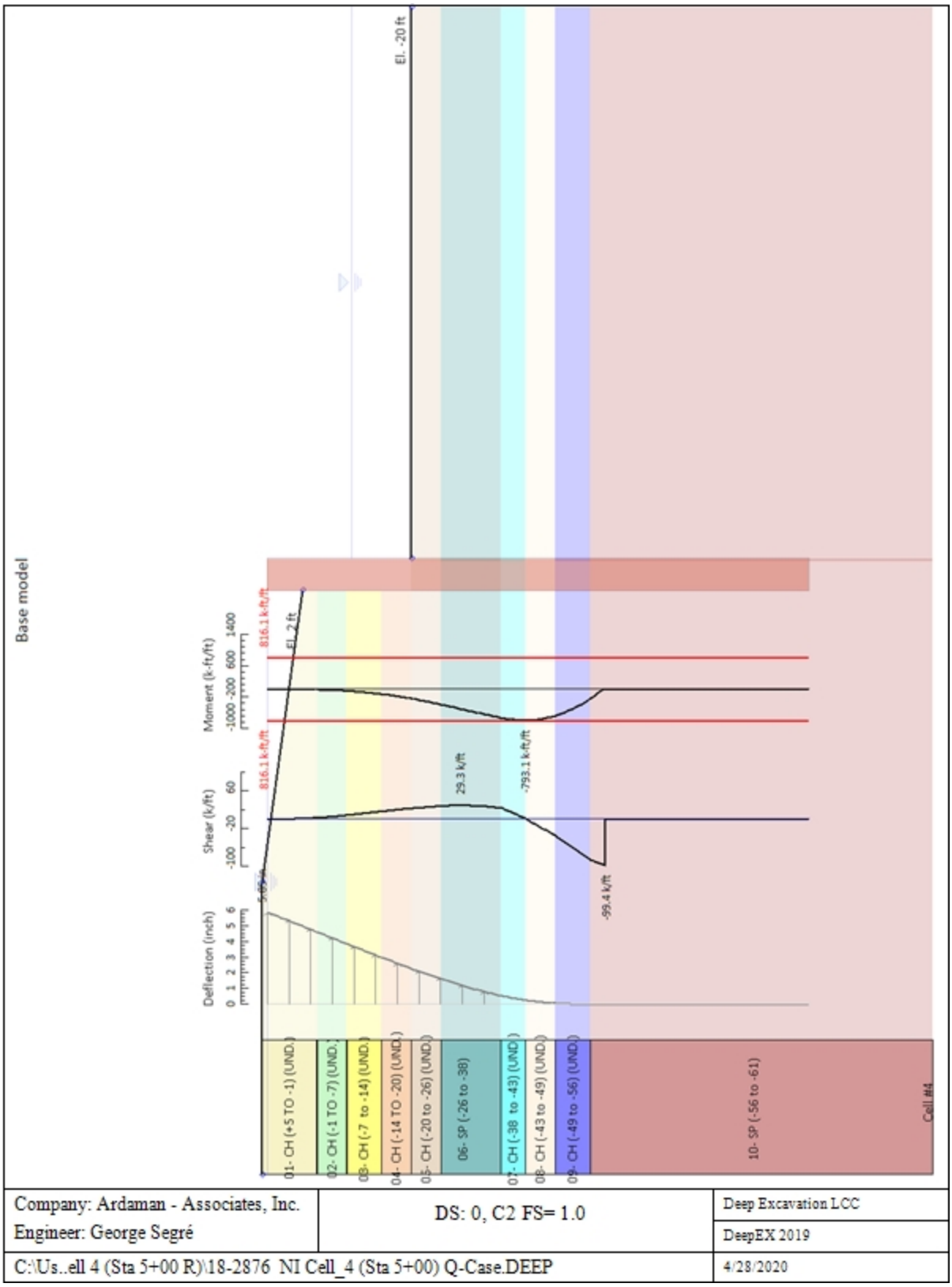

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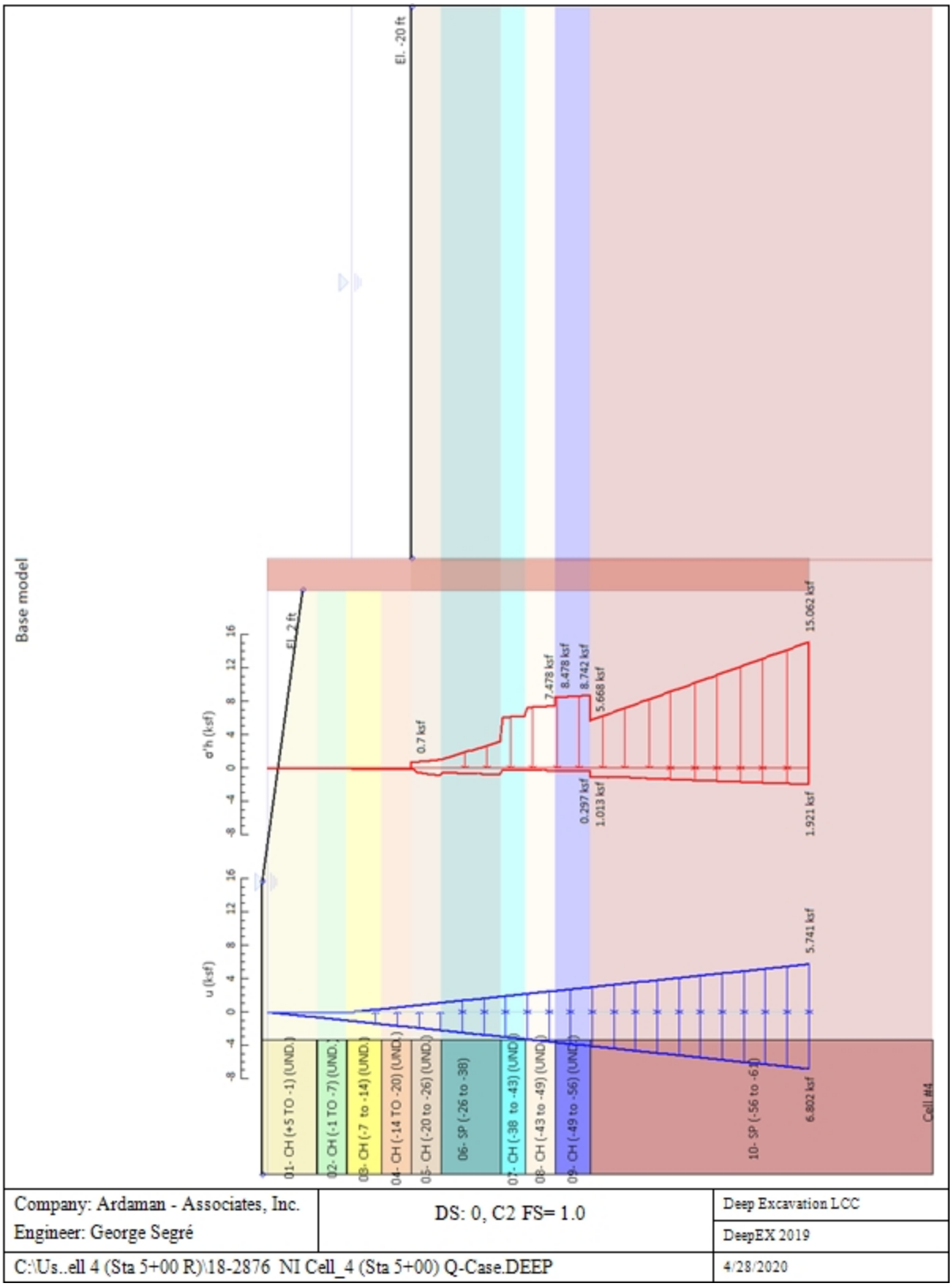

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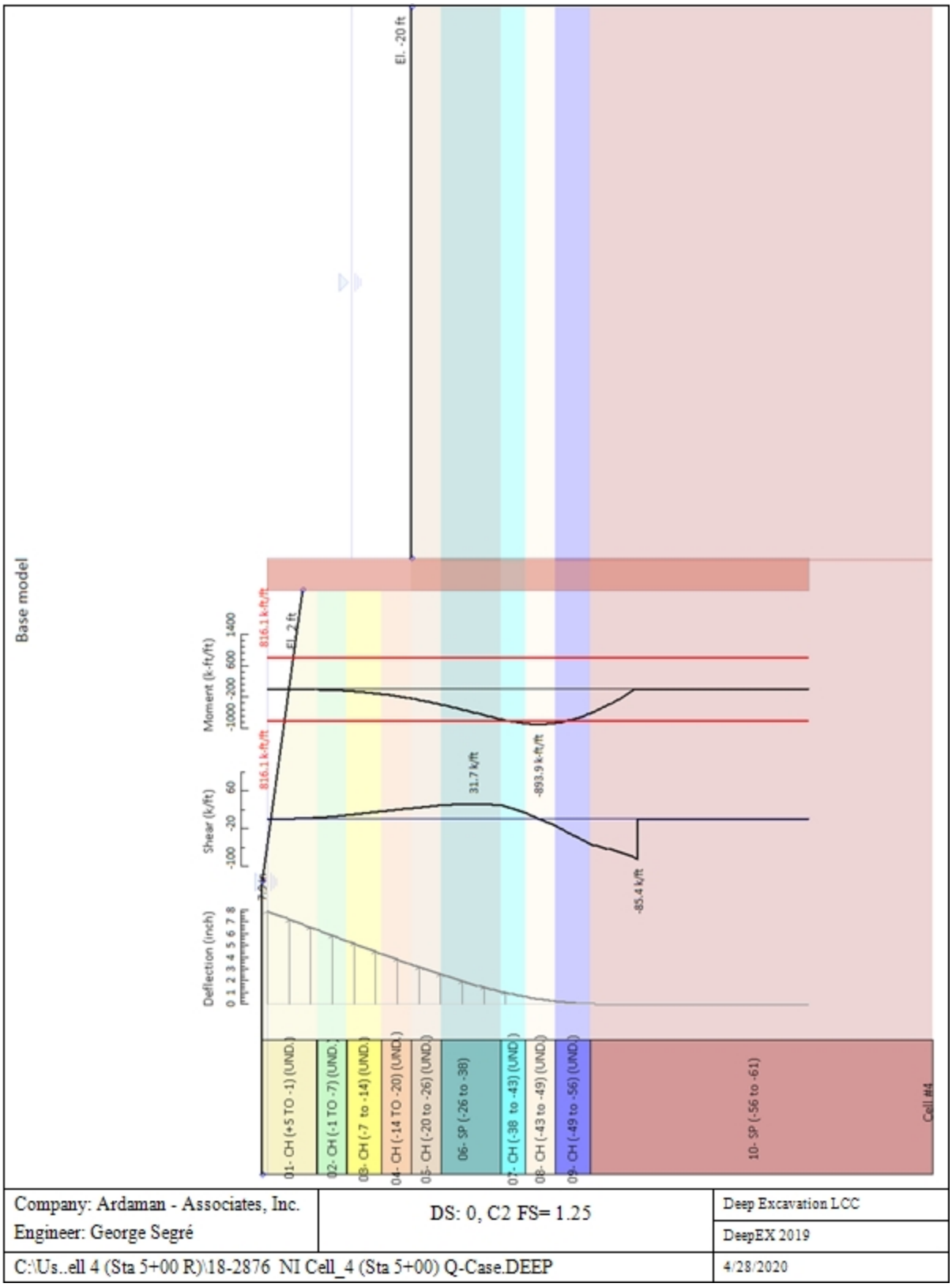

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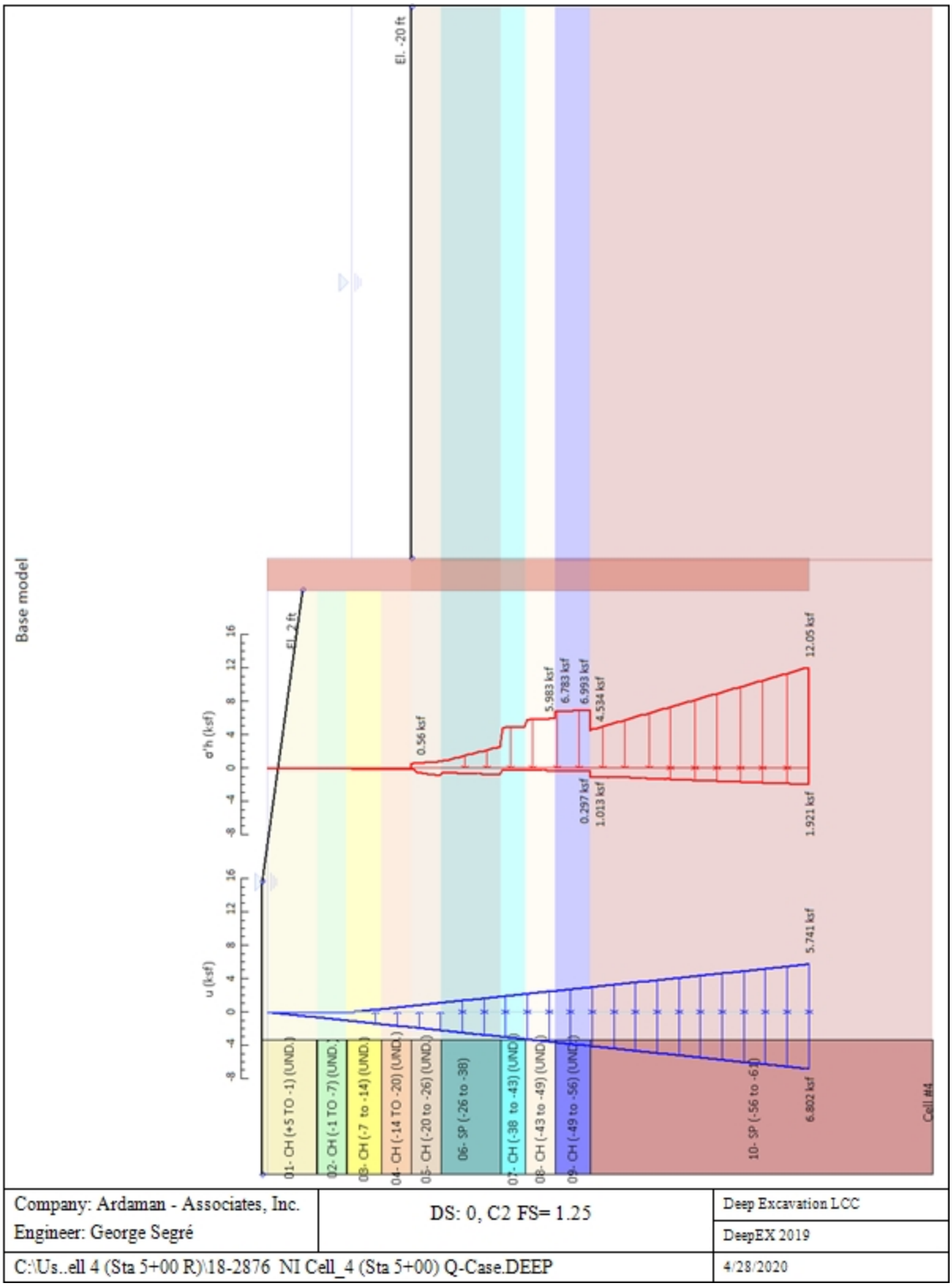
Base model
El. -20 ft
El. 2 ft
σ'h (ksf)
u (ksf)
0.56 ksf
5.983 ksf
6.783 ksf
6.993 ksf
4.534 ksf
12.05 ksf
0.297 ksf
1.013 ksf
1.921 ksf
5.741 ksf
6.802 ksf
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -62)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS= 1.25
Deep Excavation LCC
DeepEX 2019
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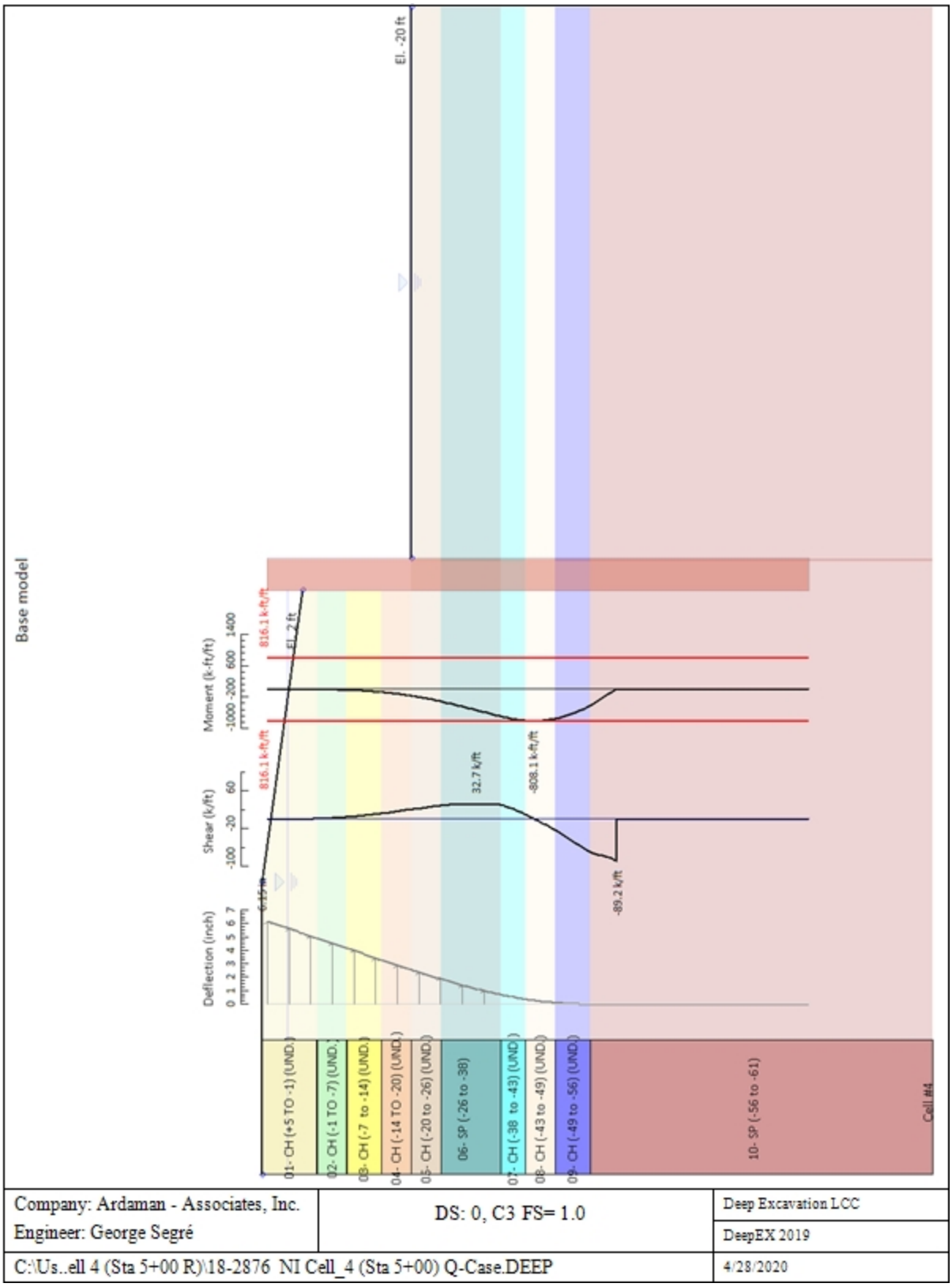
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS= 1.0	Deep Excavation LCC DeepEX 2019
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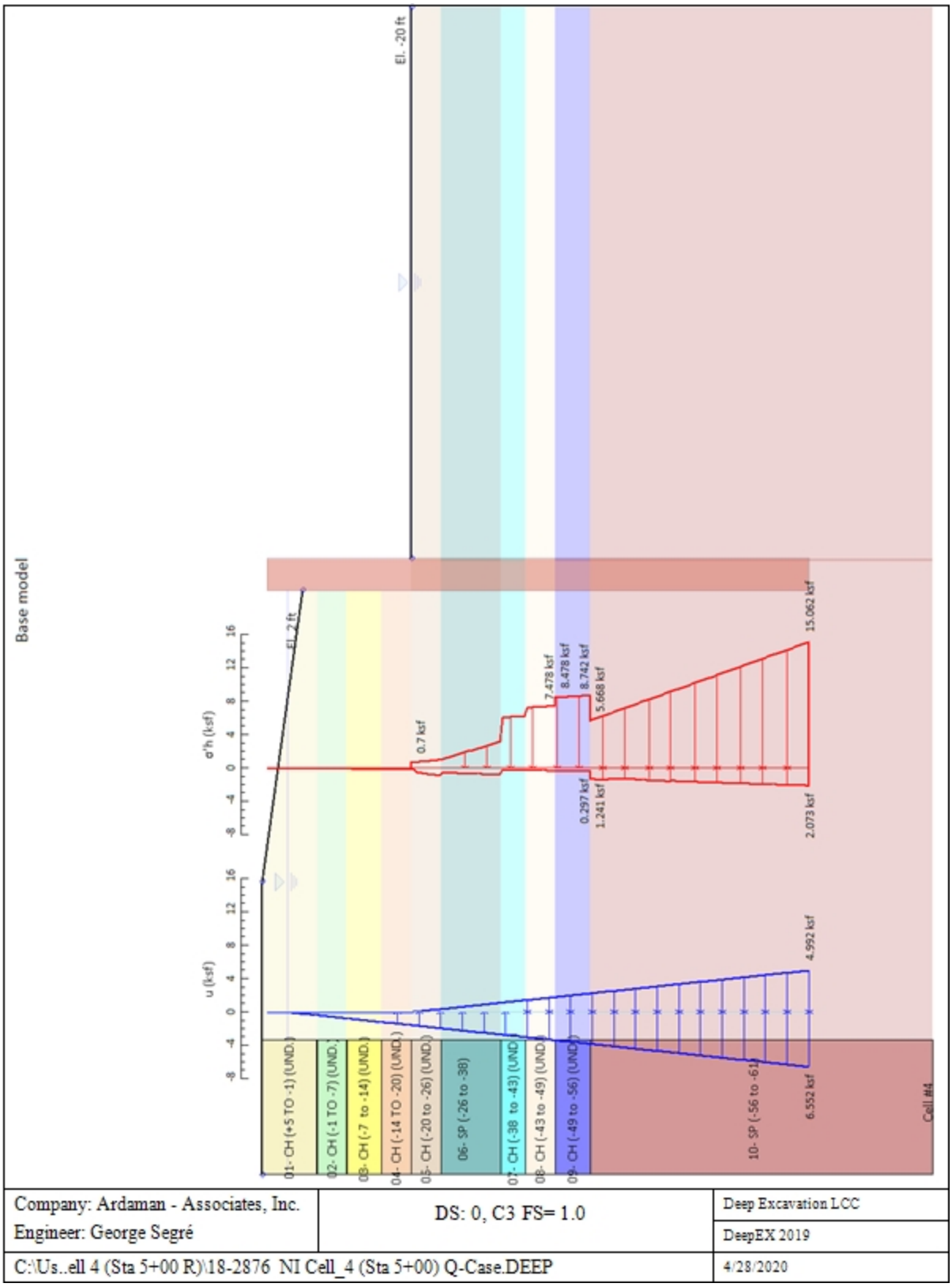
Base model
El. -20 ft
El. 2 ft
σ'h (ksf)
u (ksf)
0.7 ksf
7.478 ksf
8.478 ksf
8.742 ksf
5.668 ksf
15.062 ksf
0.297 ksf
1.241 ksf
2.073 ksf
4.992 ksf
6.552 ksf
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS= 1.0
Deep Excavation LCC
DeepEX 2019
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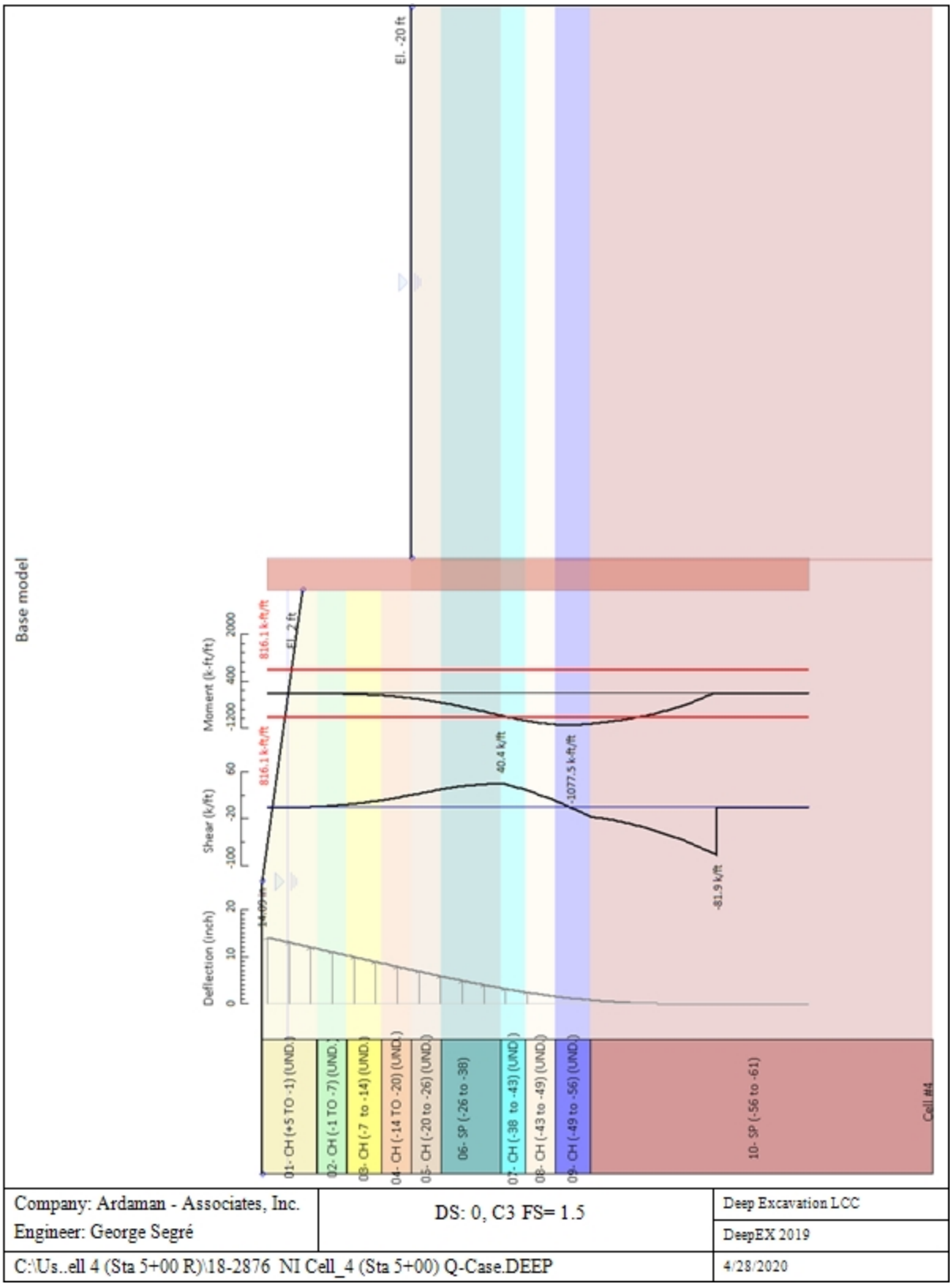
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS= 1.5	Deep Excavation LCC DeepEX 2019
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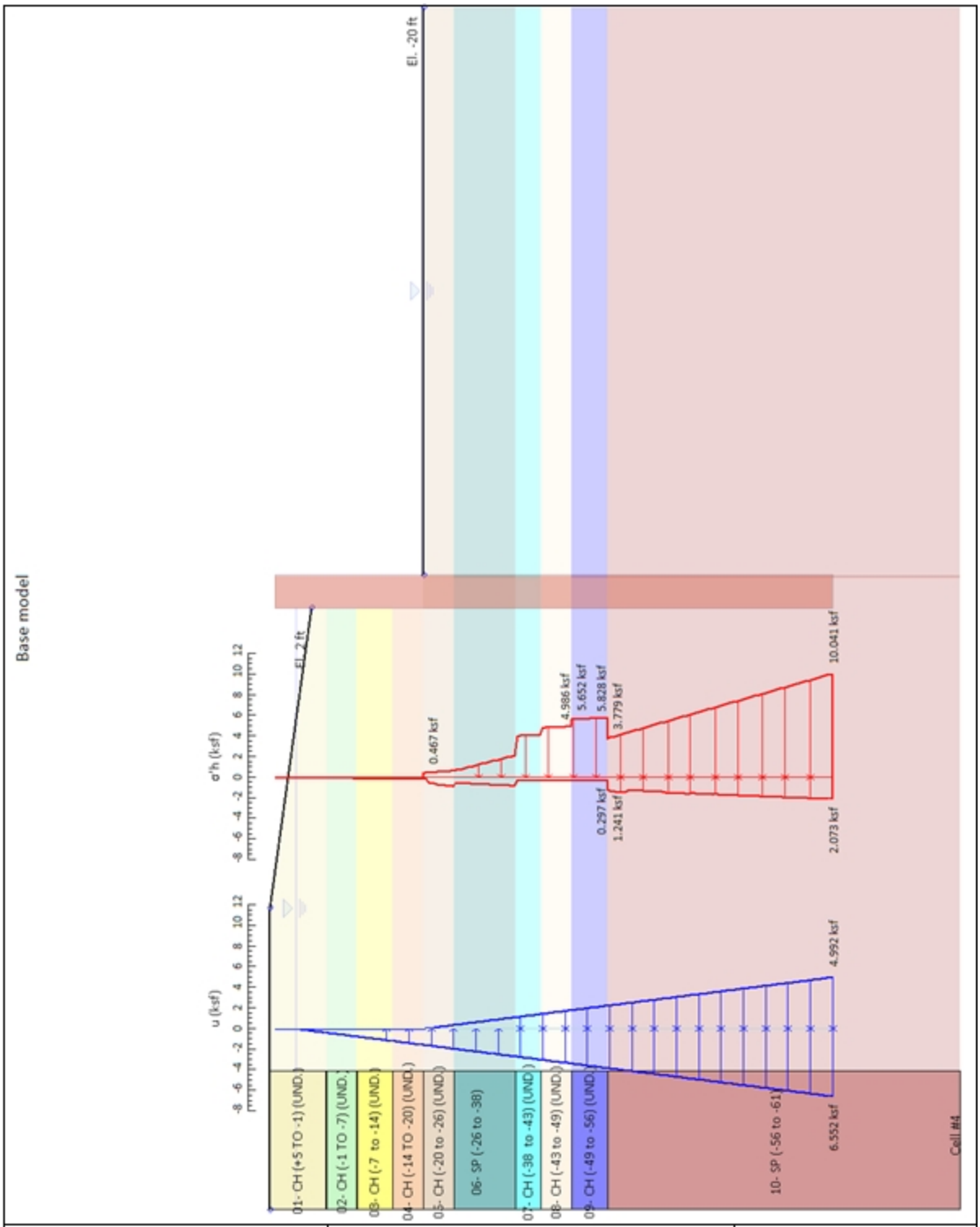

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS= 1.5	Deep Excavation LCC DeepEX 2019
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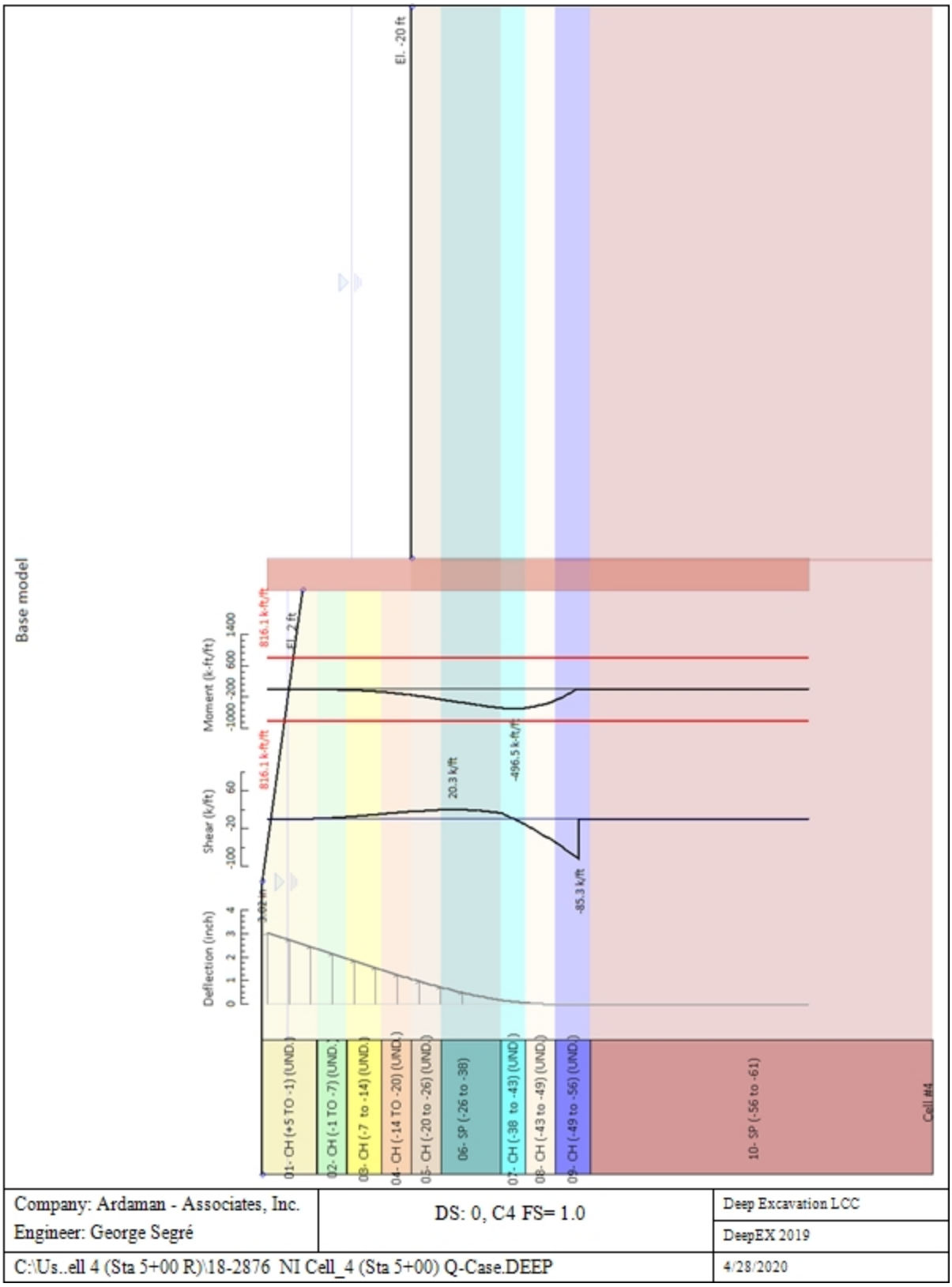

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.0	Deep Excavation LCC DeepEX 2019
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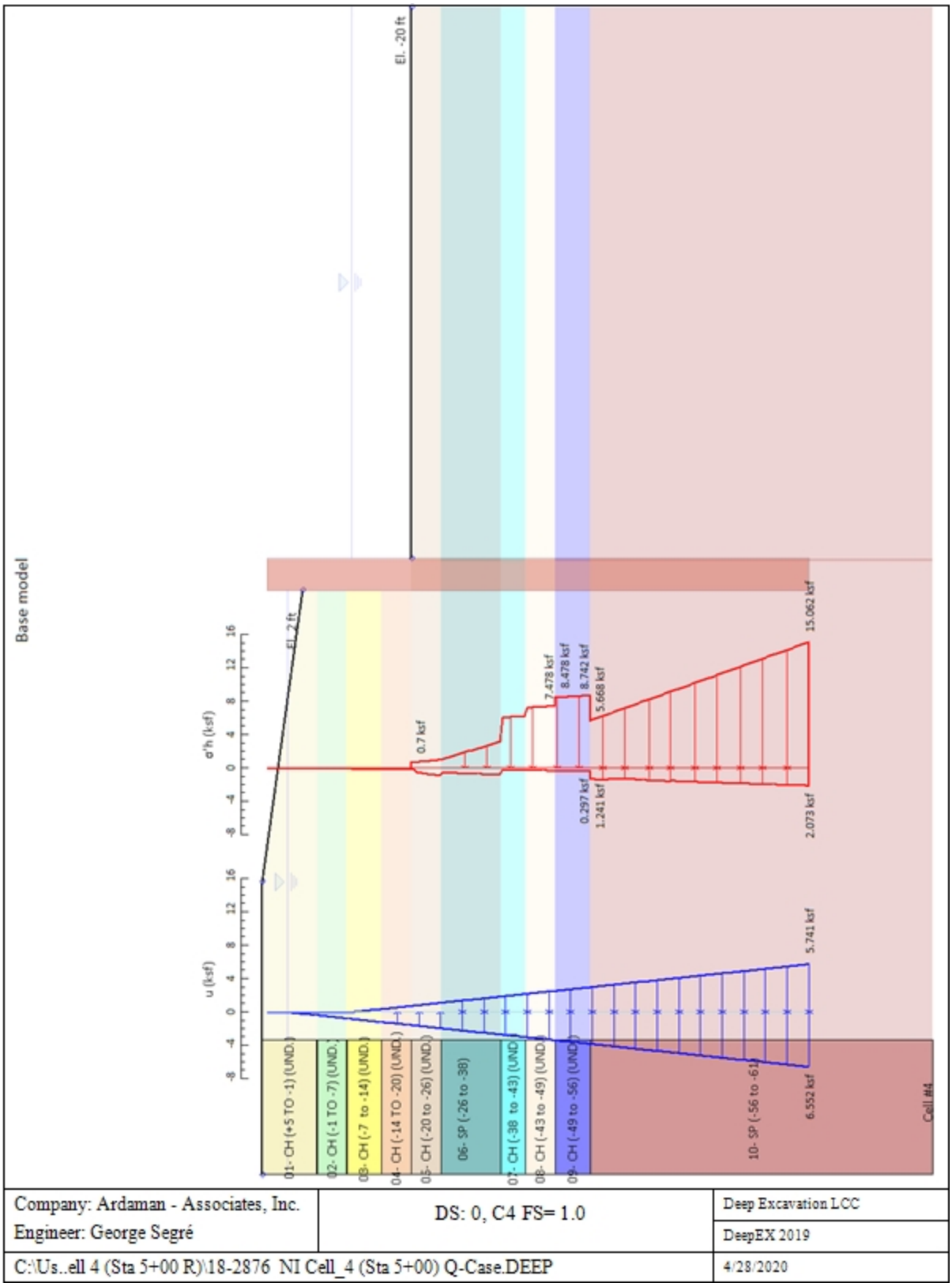
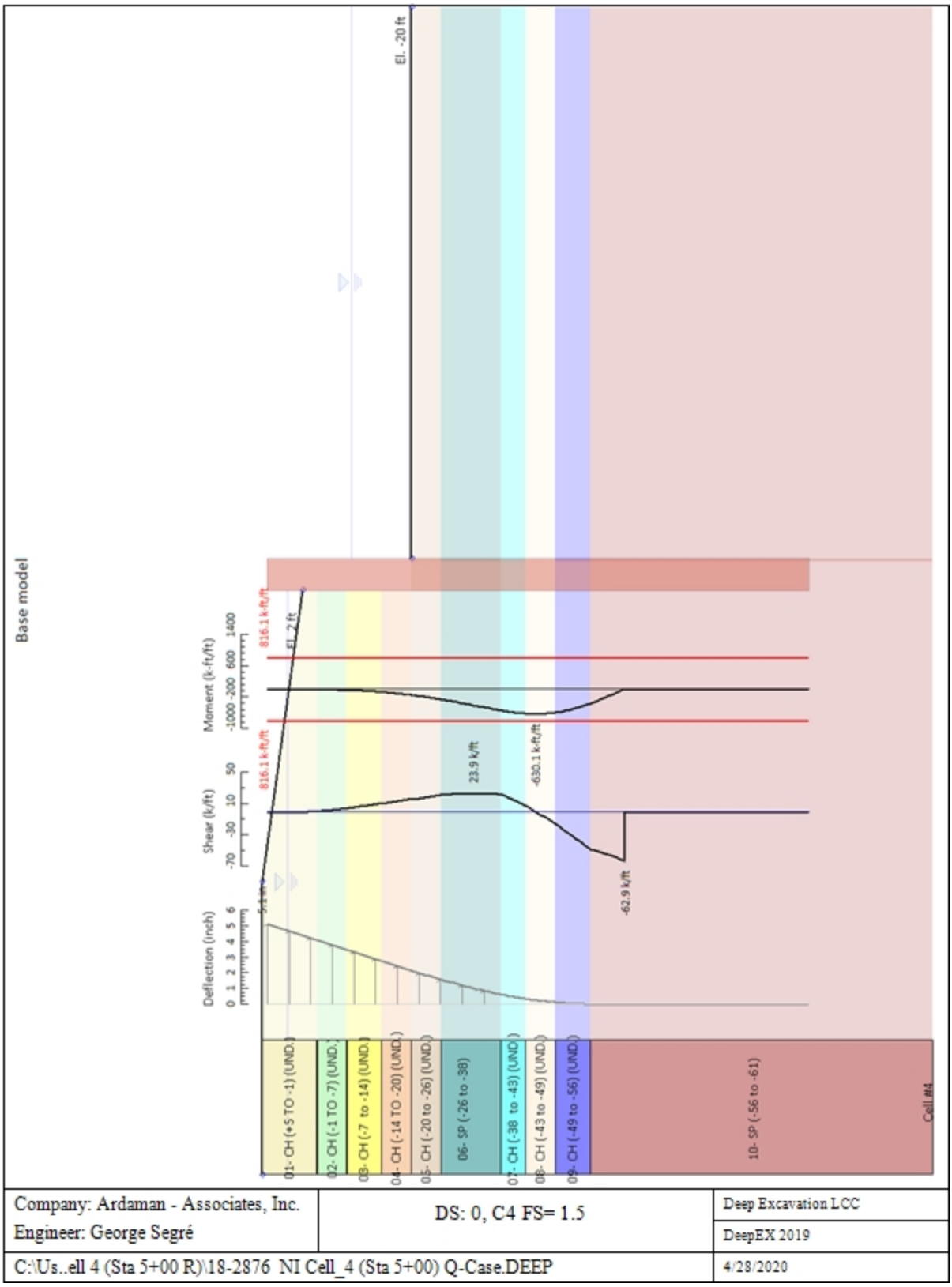


Attachment Figure C.4-24



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.5	Deep Excavation LCC DeepEX 2019
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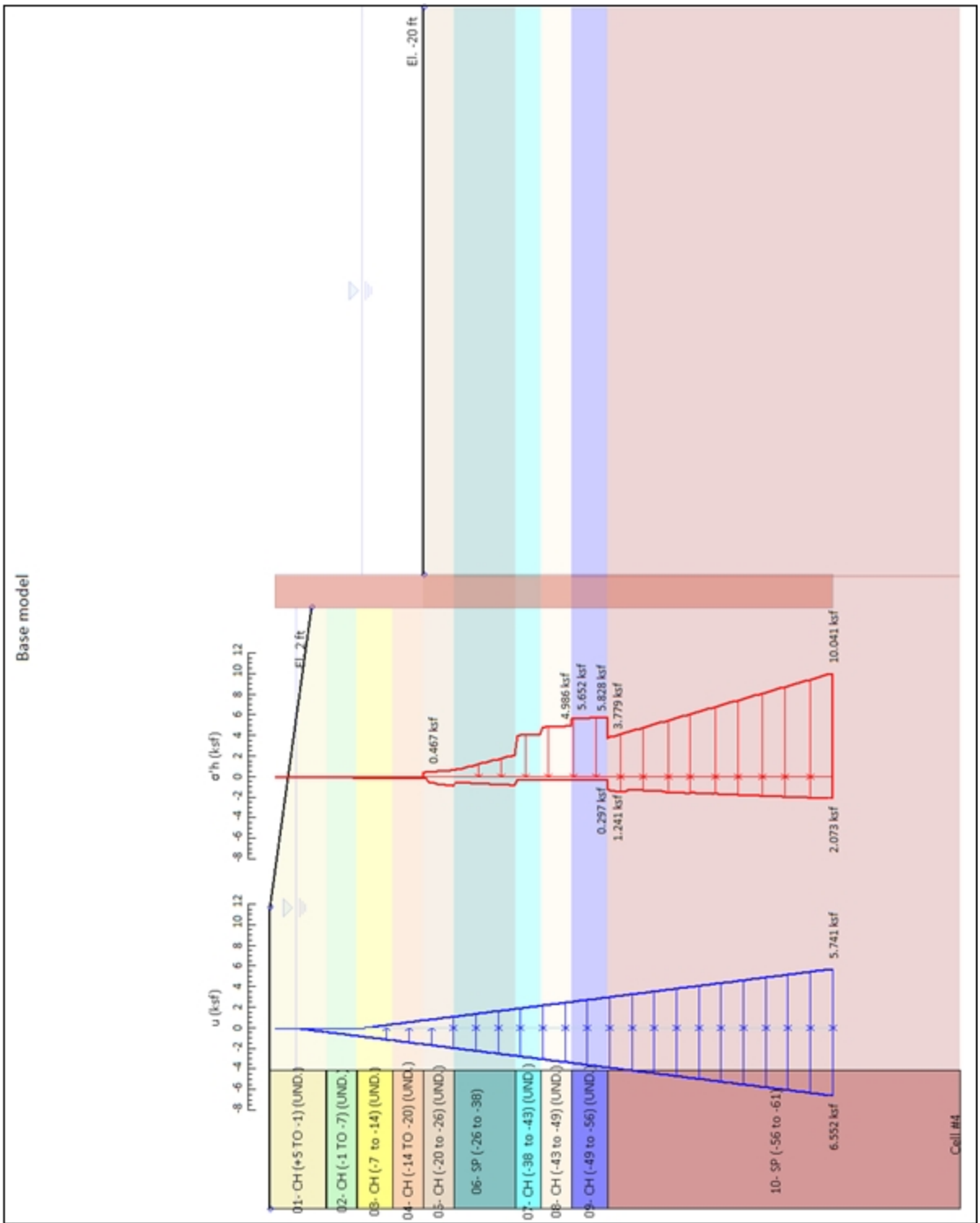

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS= 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:02:26 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	26	0	1000	26	26	300	3	0.39	2.56	0.39	2.56	True	EXP	
02- CH (-1 TO	116	116	23	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	23	0	500	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-14 T	123	123	23	0	940	23	23	521.92	3	0.44	2.28	0.44	2.28	True	Linear	
05- CH (-20 to	115	115	23	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	26	0	2500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- CH (-43 to	100	10	26	0	3000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
09- CH (-49 to	100	100	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	0.562	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	0.609	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	0.562	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	0.562	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

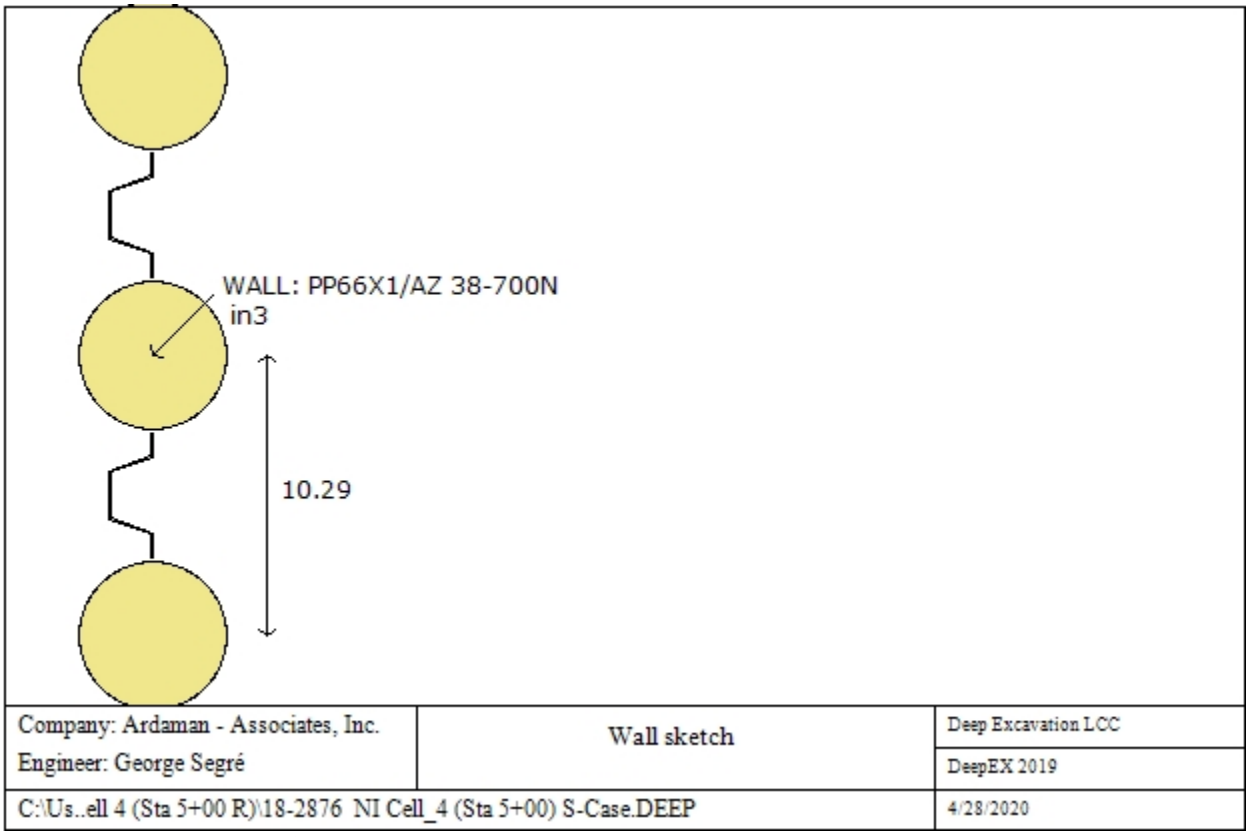
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- CH (+5 TO	1	0.56
-1	02- CH (-1 TO -	1	0
-7	03- CH (-7 to -	1	0.61
-14	04- CH (-14 TO	1	0.61
-20	05- CH (-20 to	1	0
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	0.56
-43	08- CH (-43 to	1	0.56
-49	09- CH (-49 to	1	0.56
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -120 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.359	1.514	2.459
Stage 1	Simple span	N/A	1.6	1.157	1.211	1.967
Stage 2	Simple span	N/A	1.6	1.631	1.962	3.157
Stage 3	Simple span	N/A	1.6	1.409	1.57	2.526
Stage 4	Simple span	N/A	1.6	1.49	1.673	2.639
Stage 5	Simple span	N/A	1.6	1.091	1.115	1.759
Stage 6	Simple span	N/A	1.6	1.845	2.239	3.46
Stage 7	Simple span	N/A	1.6	1.384	1.492	2.307

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

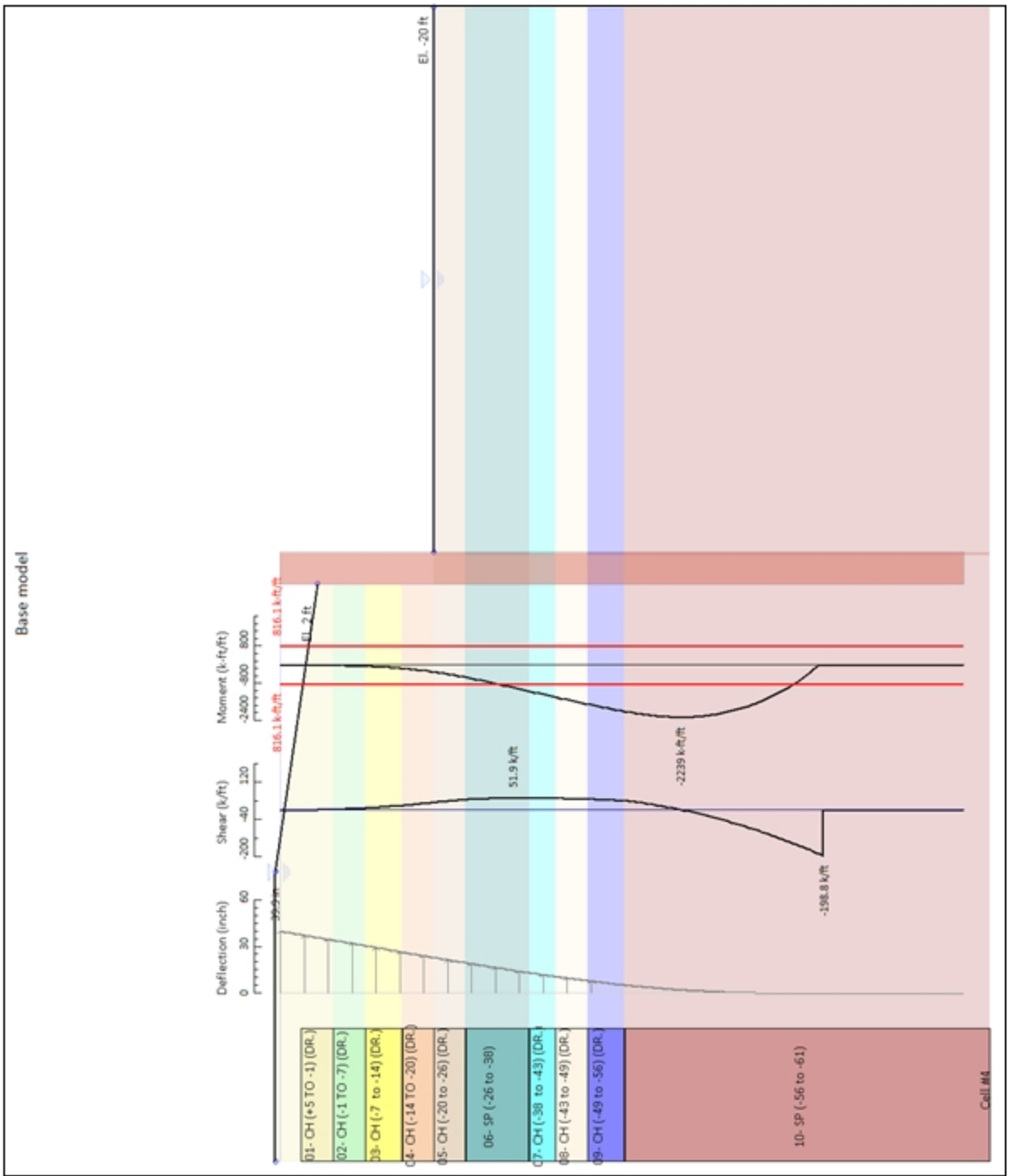
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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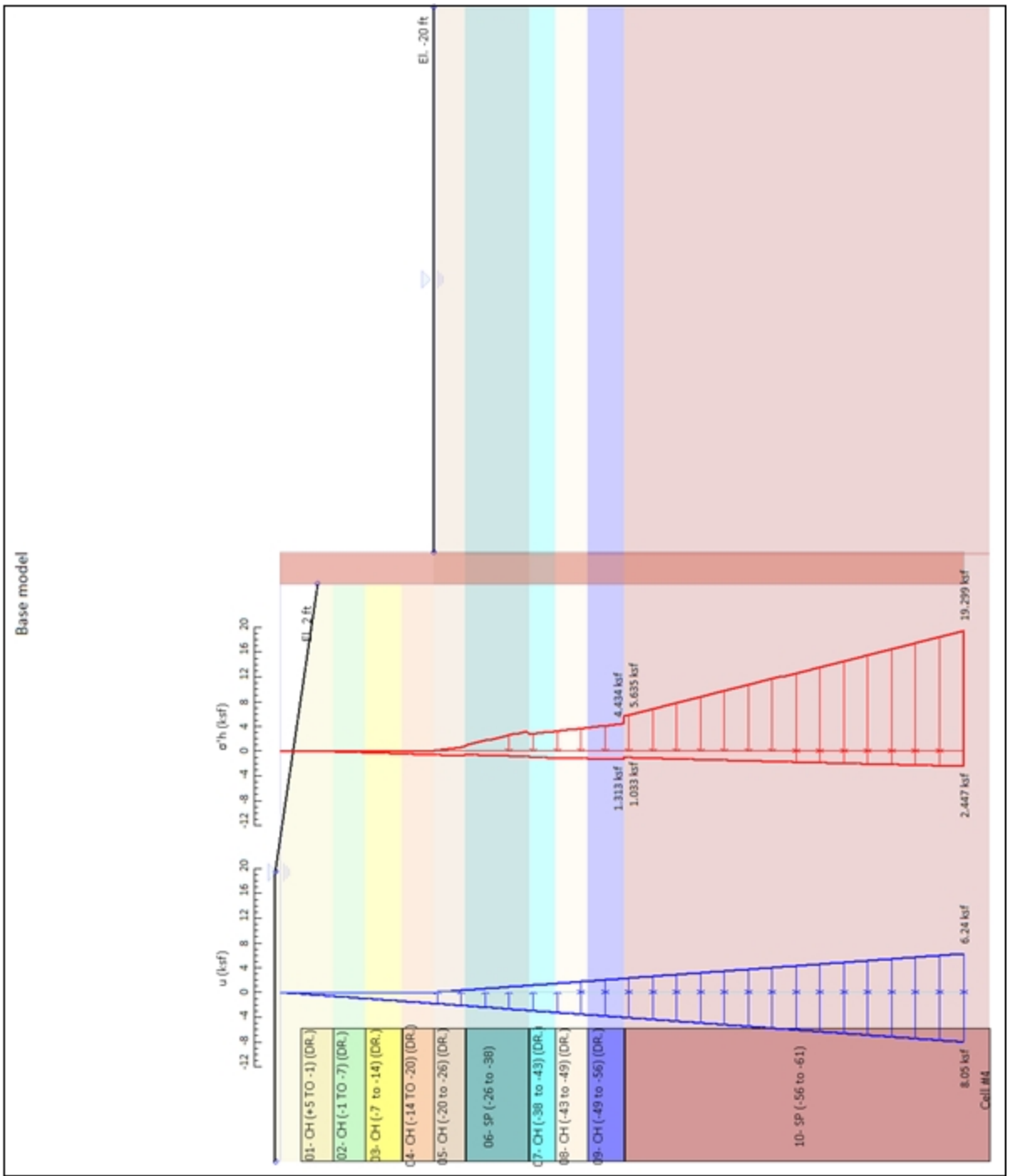

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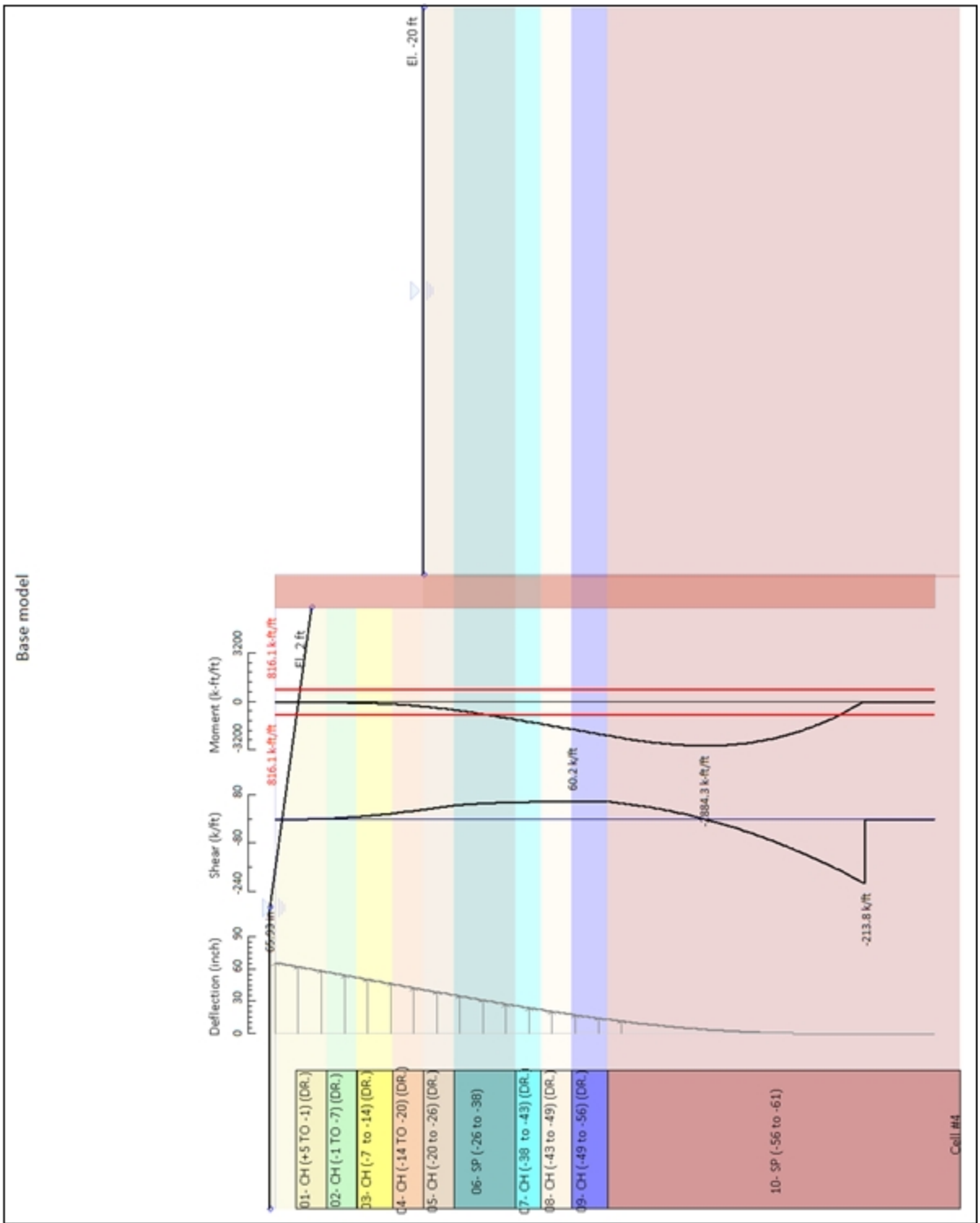

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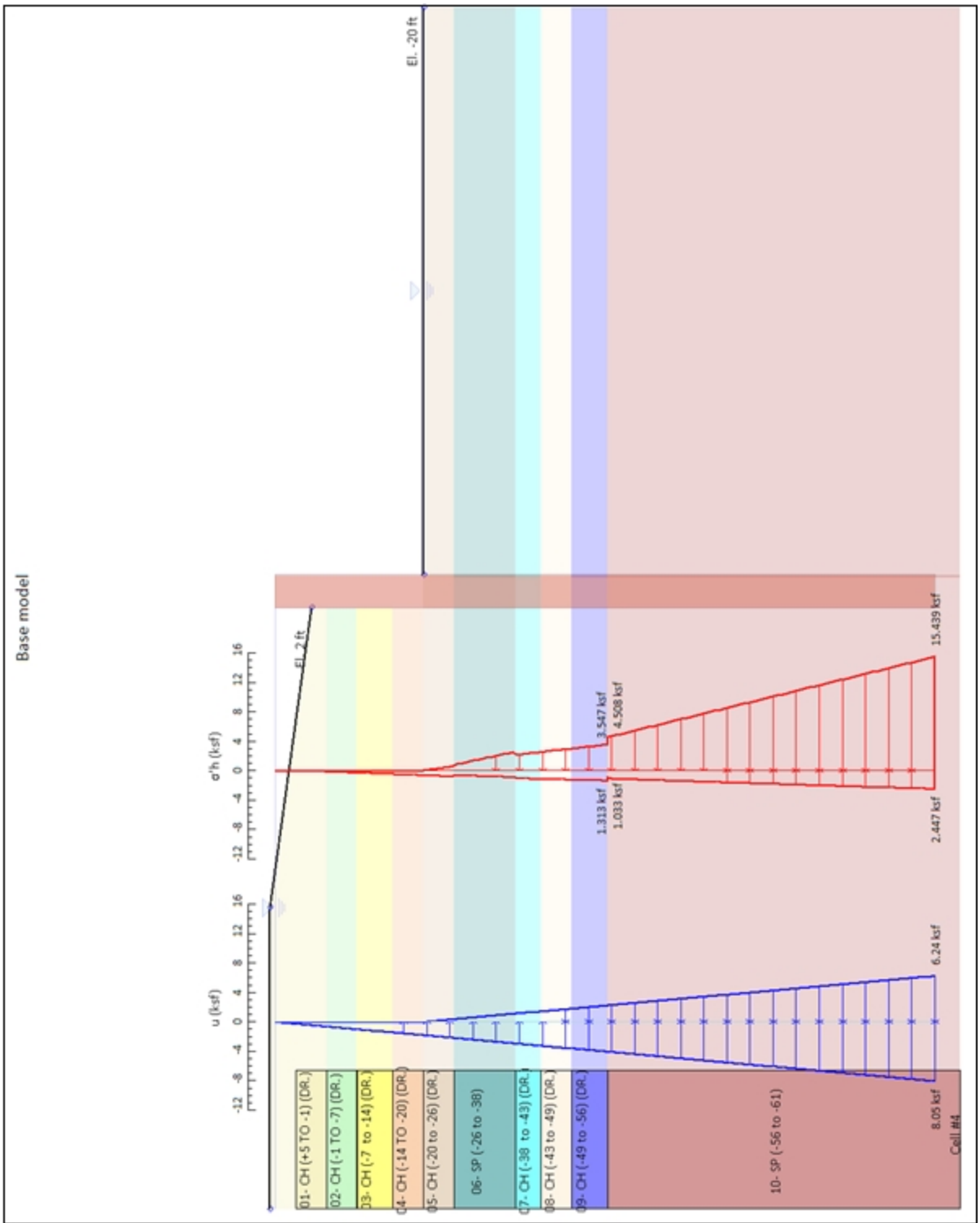

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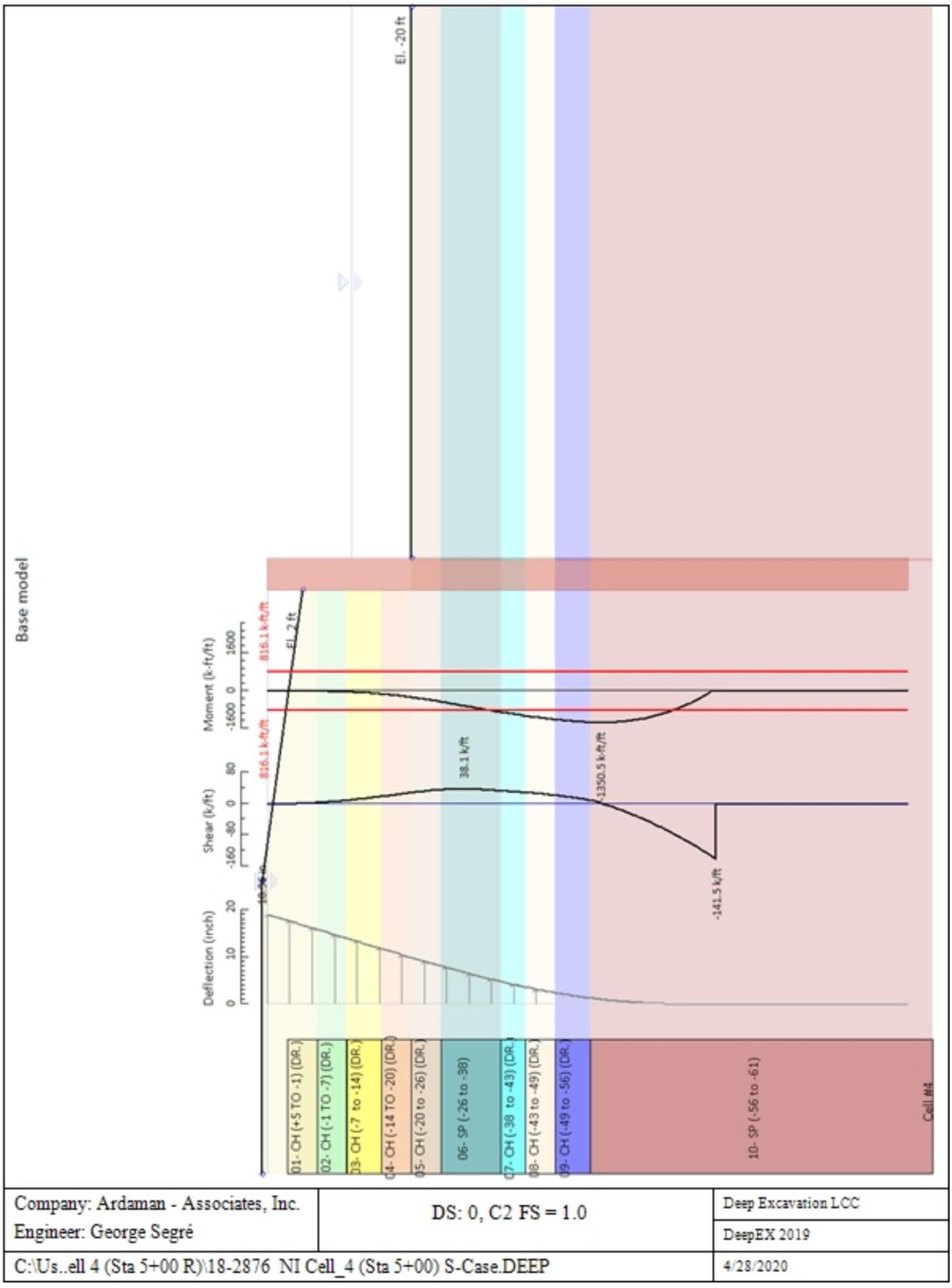

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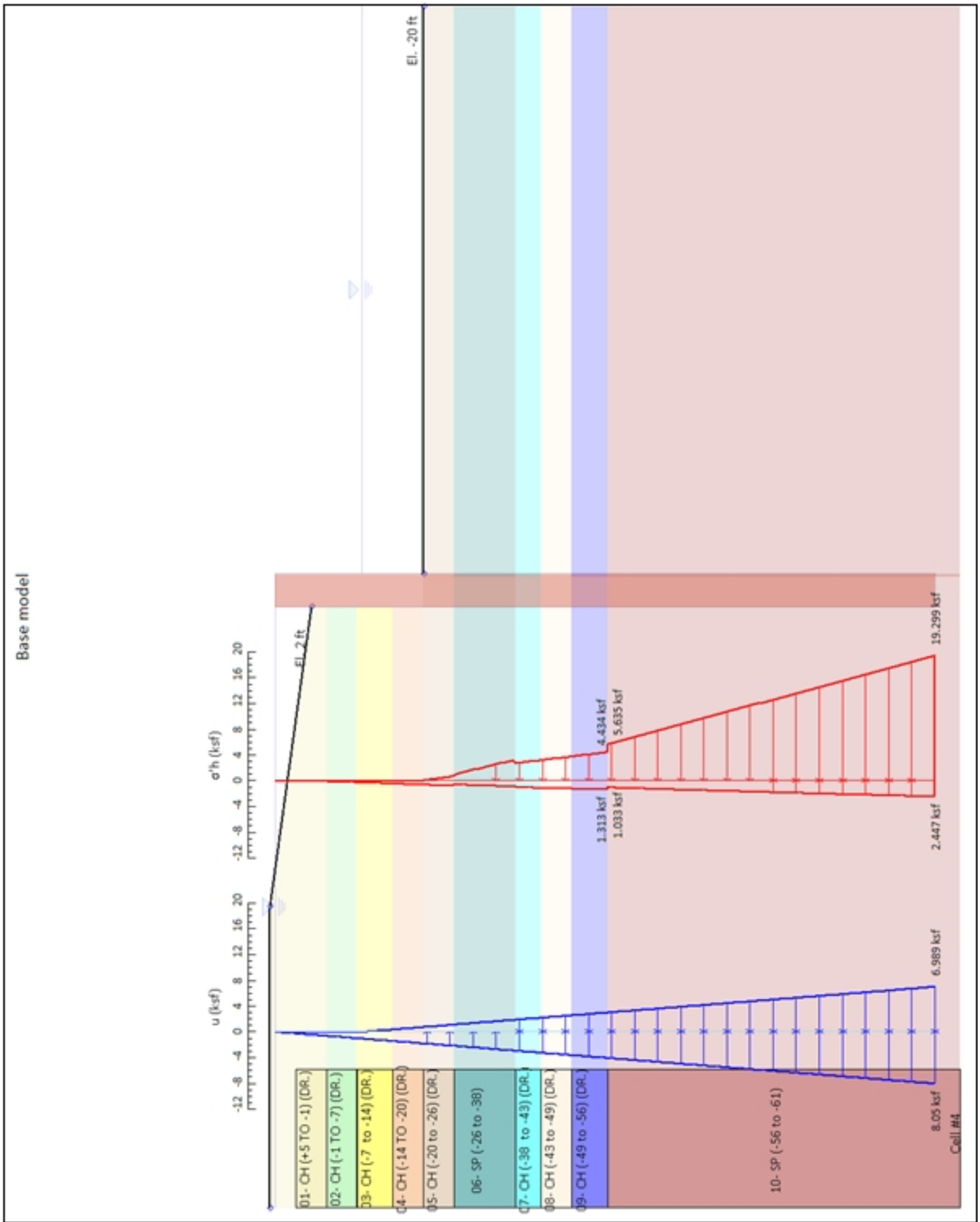

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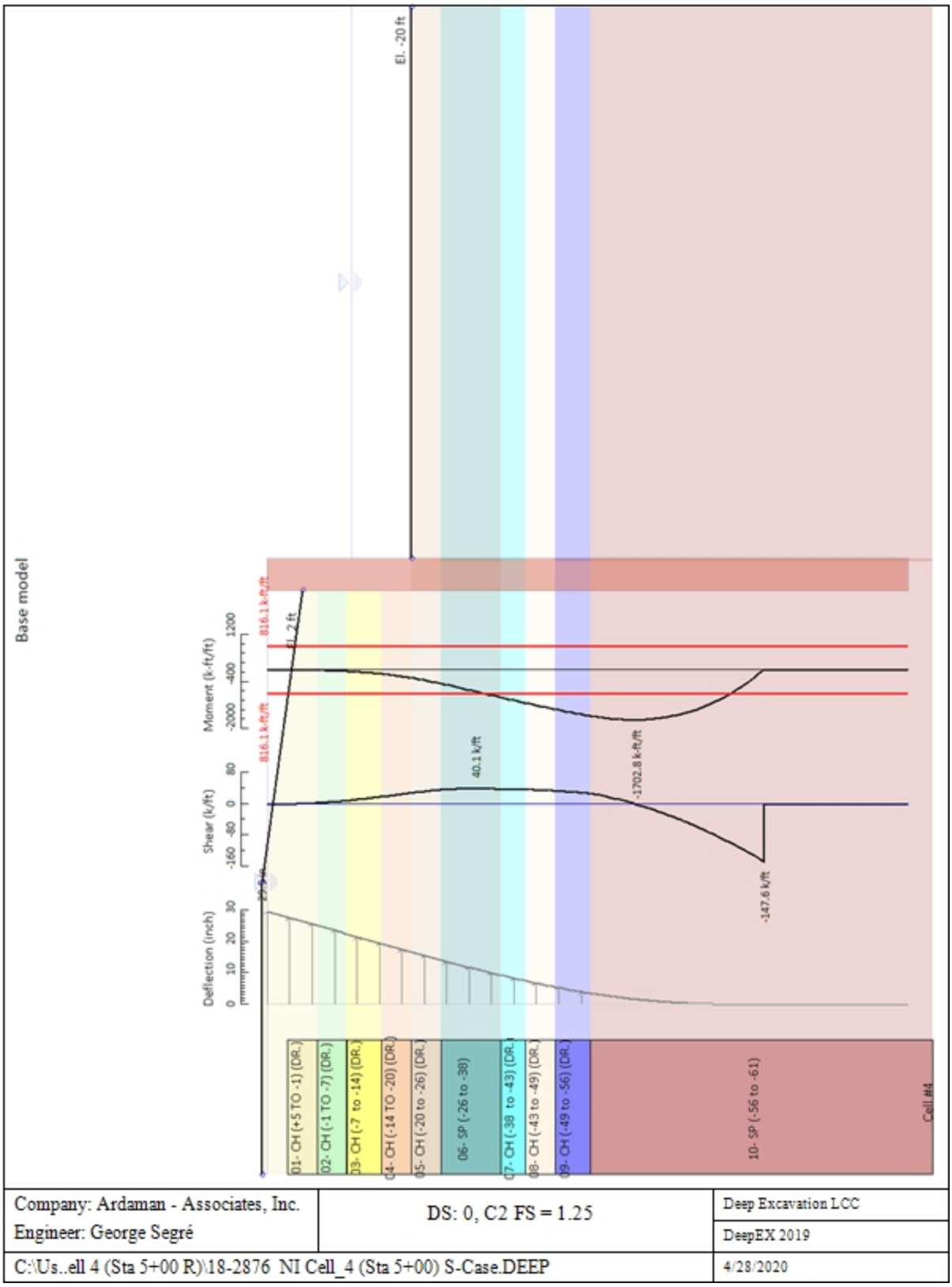

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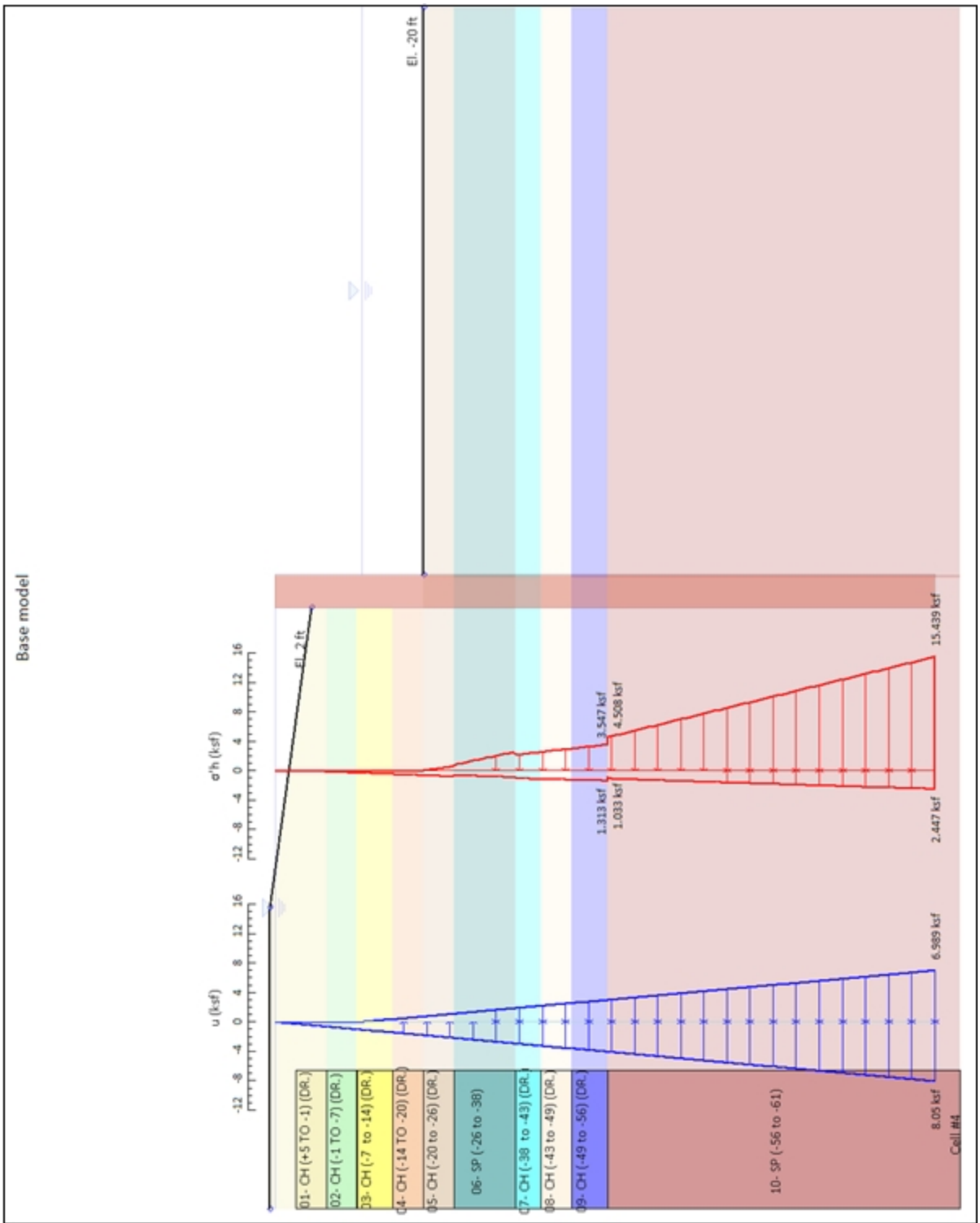

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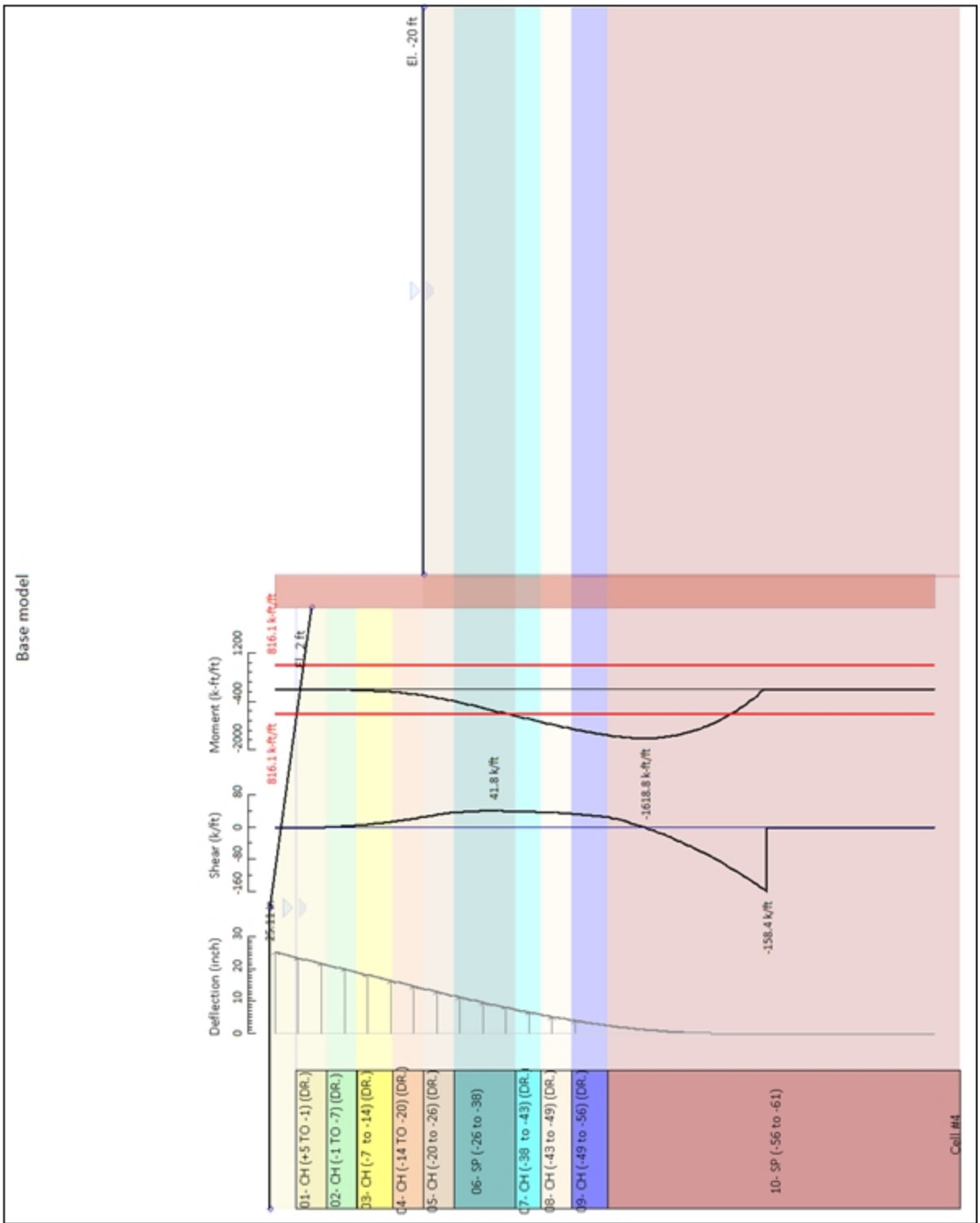

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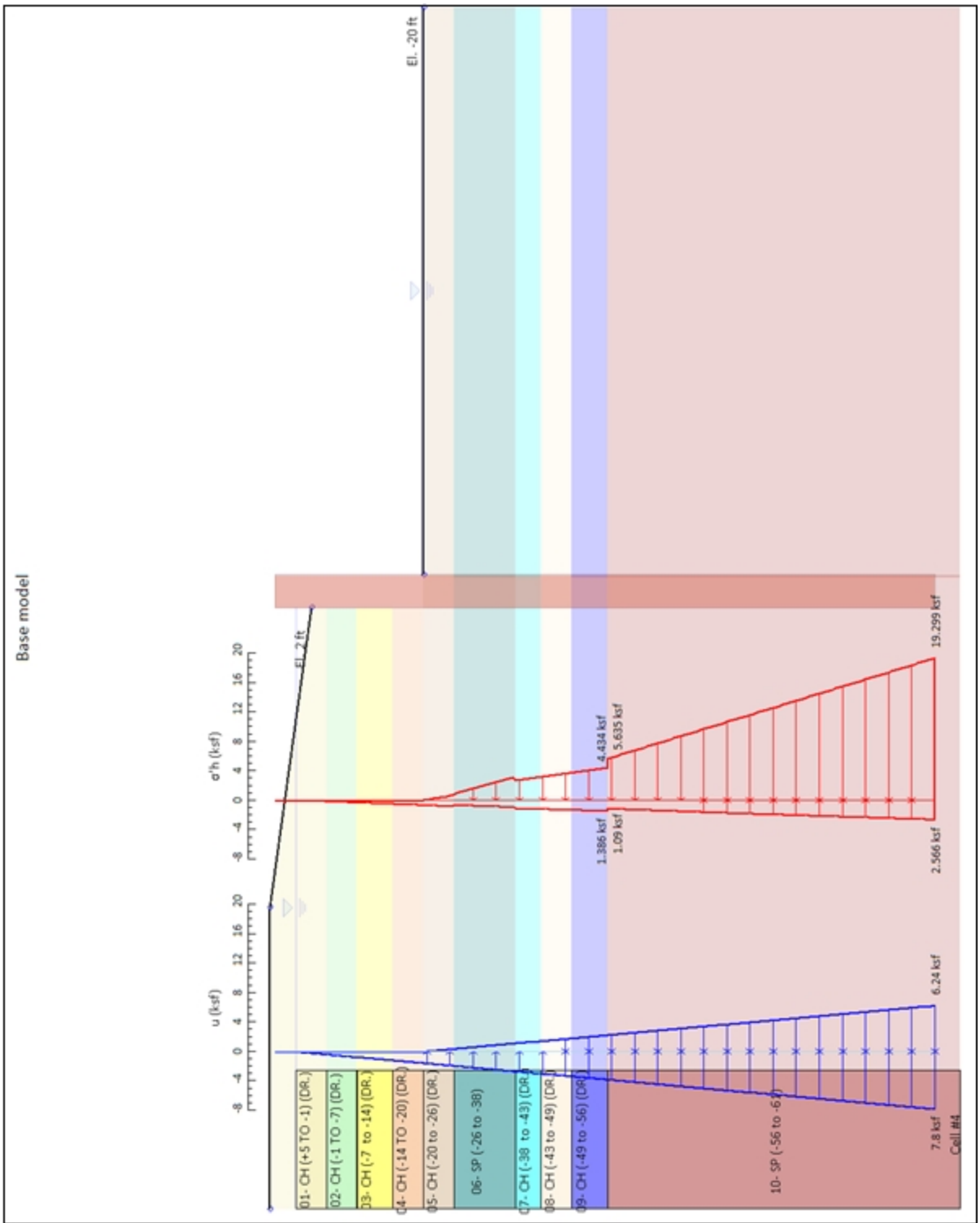

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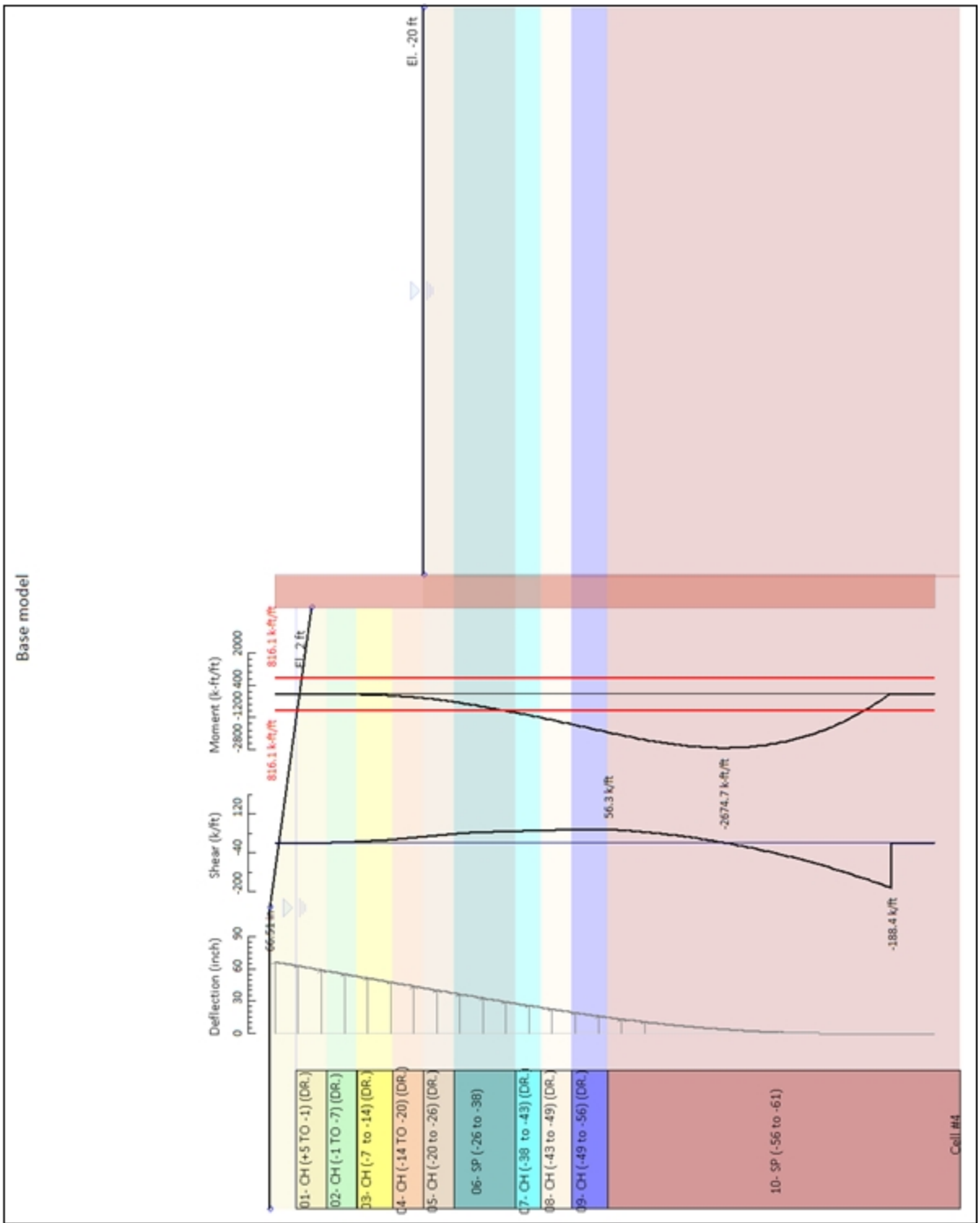

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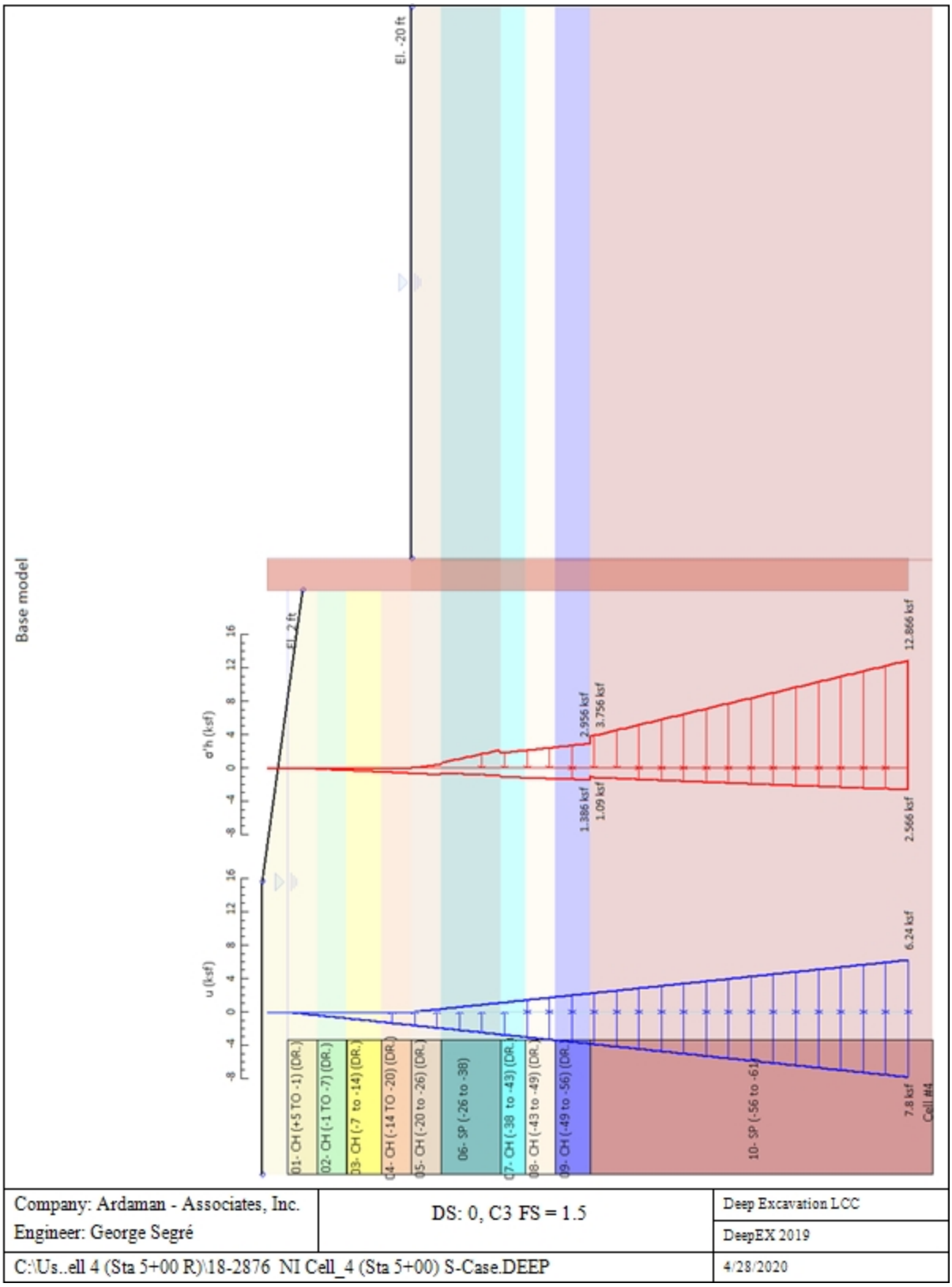

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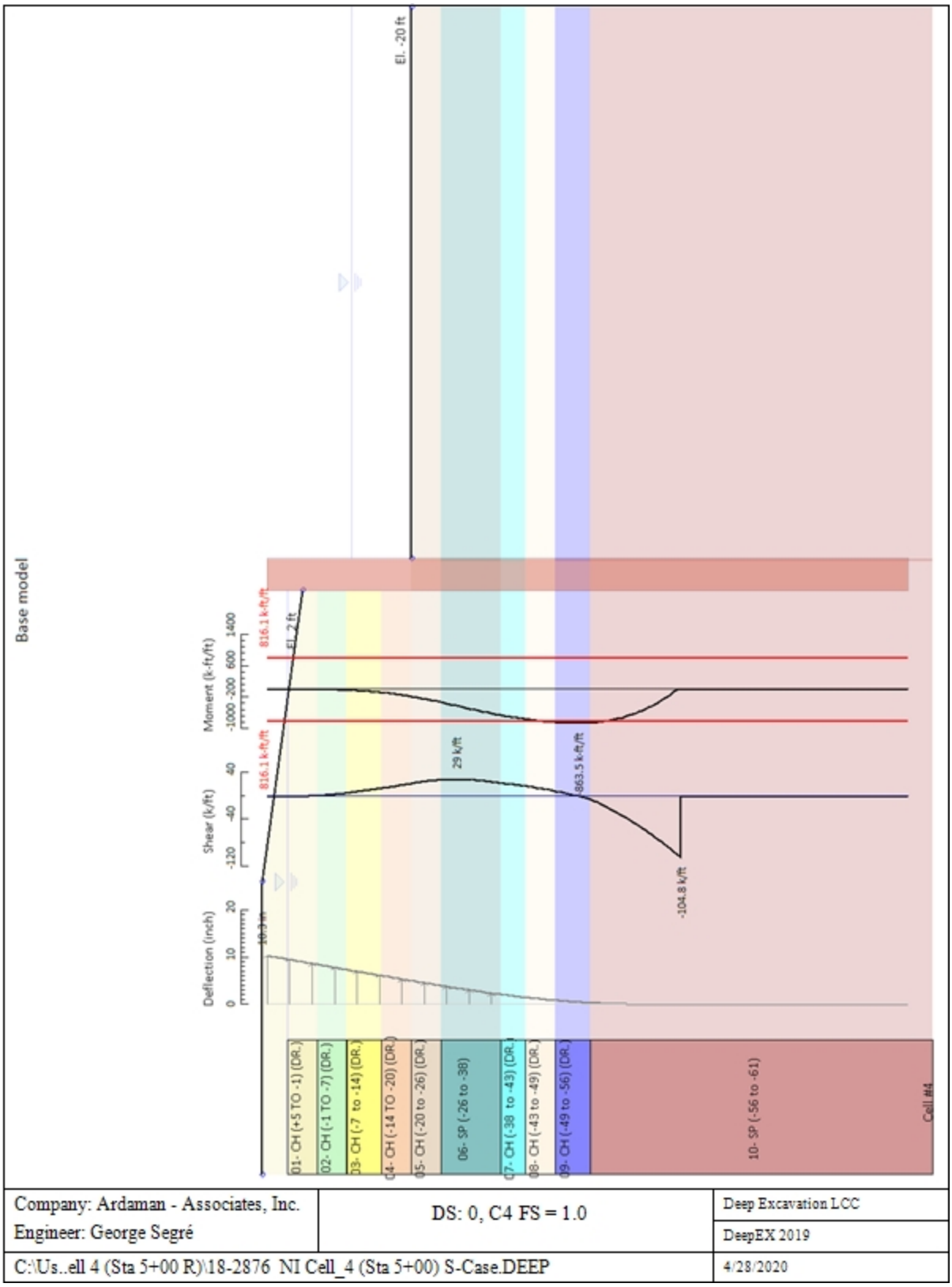

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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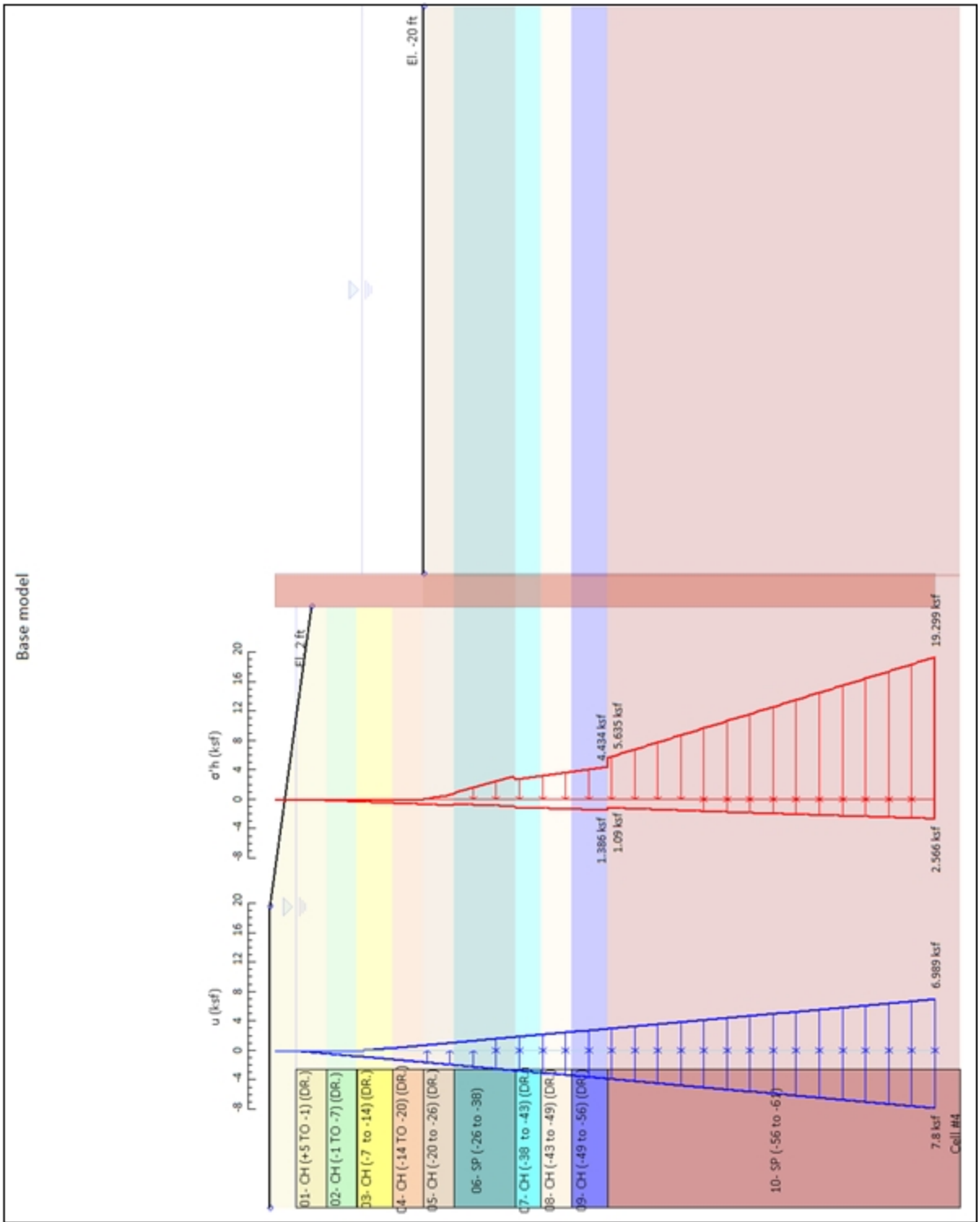

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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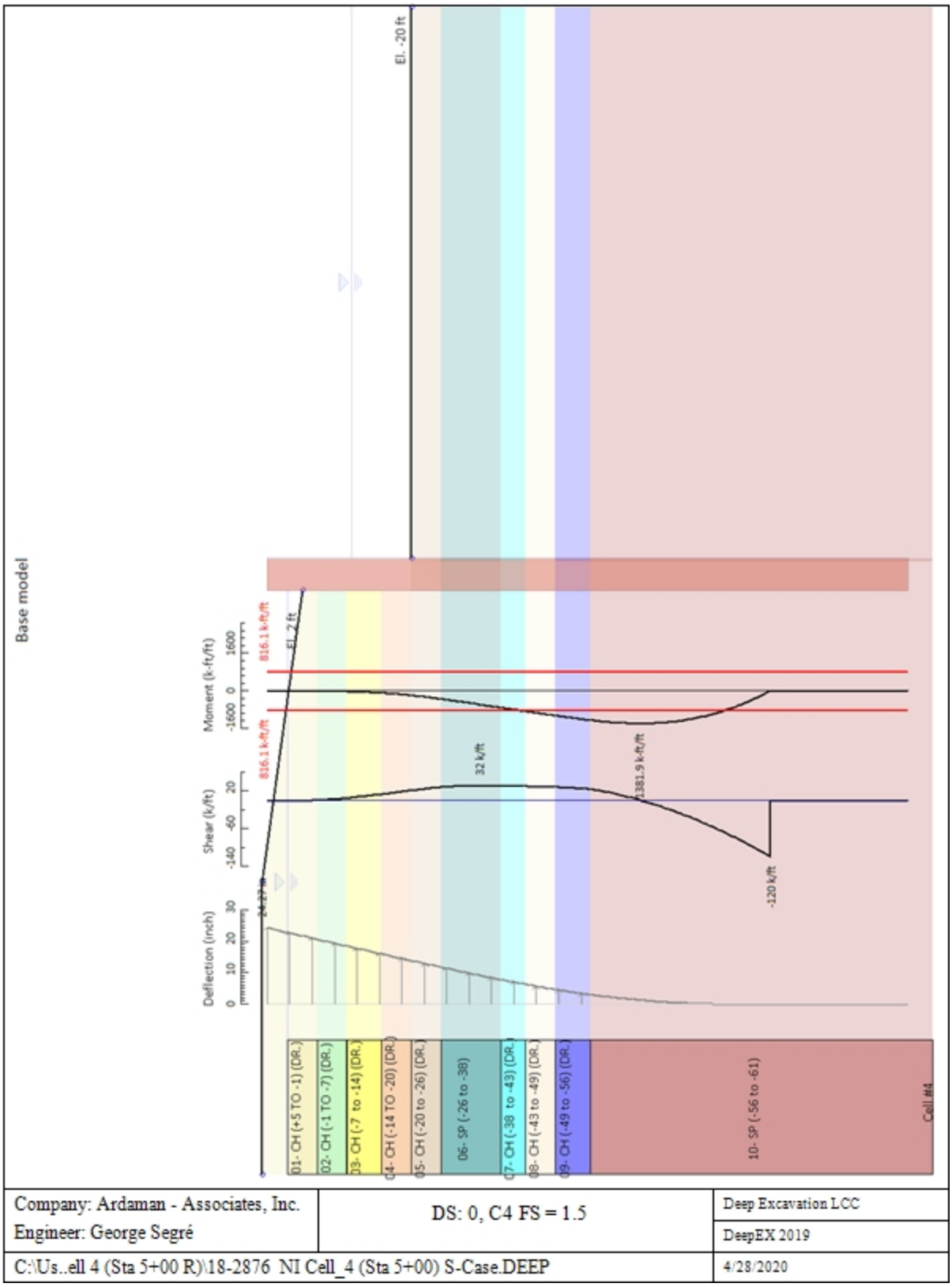

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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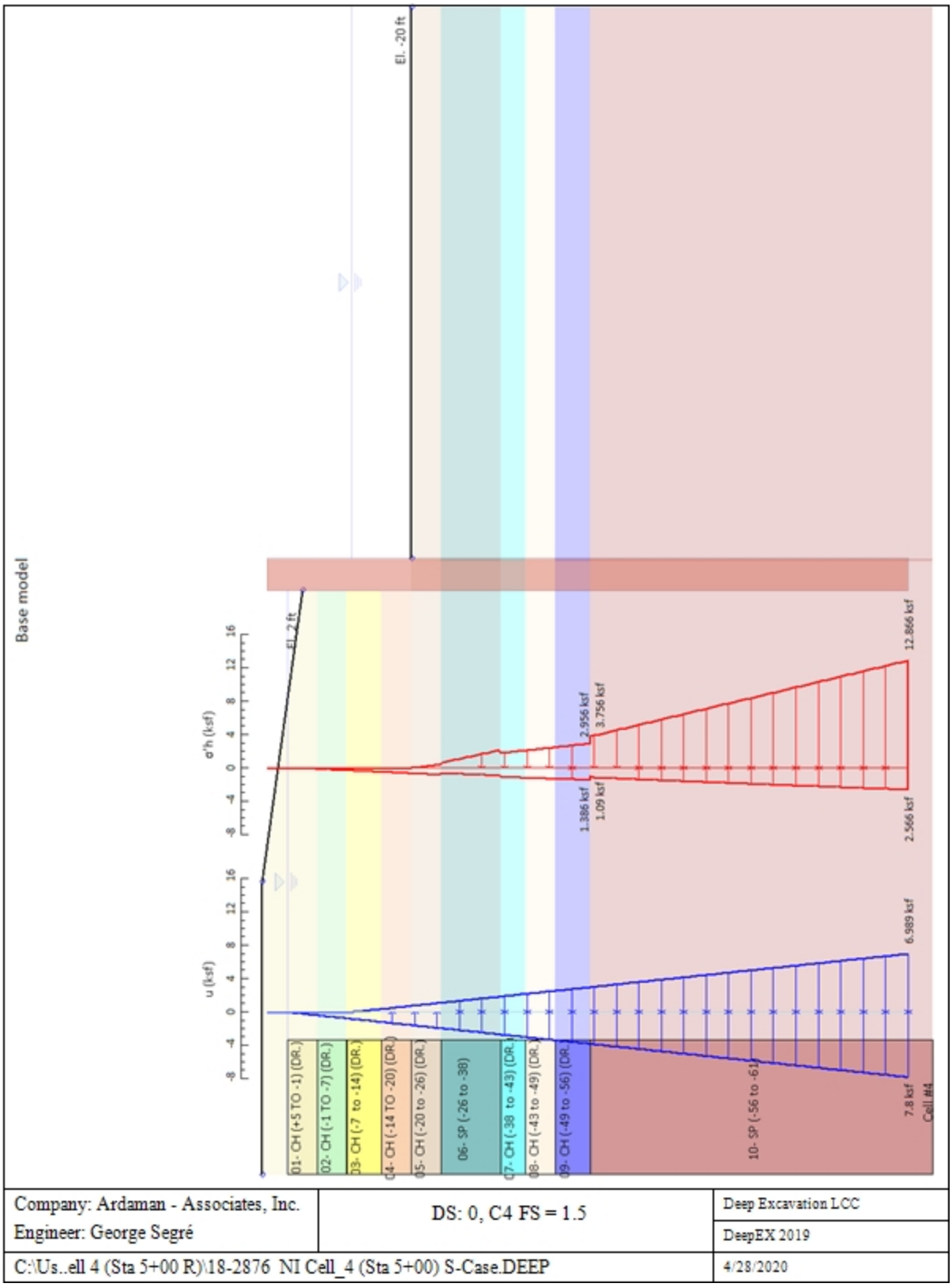

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..ell 4 (Sta 5+00 R)\18-2876 NI Cell_4 (Sta 5+00) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 8+00 Left Wall)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -59.81 ft., NAVD88

Length of Sheetting = 68.81 ft.

Use = 70.0 ft.

Design Tip Elev. = -61.0 ft., NAVD88

Design Length of Sheeting = 70.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-38.50	1,541.09	317.96	0.56
		Open excavation - degraded	9	-8	1.00	1.25	-45.50	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-34.50	1,192.00	247.53	0.49
		Open excavation - degraded	9	-4	1.00	1.25	-41.00	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-28.00	582.76	105.81	0.41
		Open excavation - degraded	5	-8	1.00	1.50	-41.50	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-23.00	456.76	104.83	0.36
		Open excavation - degraded	5	-4	1.00	1.50	-34.00	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-49.90	394.98	50.09	2.27
		Open excavation - degraded	9	-8	1.00	1.25	-59.81	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-45.45	309.29	45.07	1.52
		Open excavation - degraded	9	-4	1.00	1.25	-53.37	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-41.98	209.56	37.00	0.87
		Open excavation - degraded	5	-8	1.00	1.50	-57.33	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-37.53	147.06	31.54	0.52
		Open excavation - degraded	5	-4	1.00	1.50	-49.00	--	--	--
						Governing Value:	-59.81	1,541.09	317.96	2.27

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:09:01 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	0	0	1000	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-1 TO	116	116	0	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	0	0	500	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-14 T	123	123	0	0	940	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-20 to	115	115	0	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	0	0	2500	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-43 to	100	10	0	0	3000	0	0	300	3	1	1	1	1	True	Linear	
09- CH (-49 to	100	100	0	0	3500	0	0	300	3	1	1	1	1	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	1	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	1	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

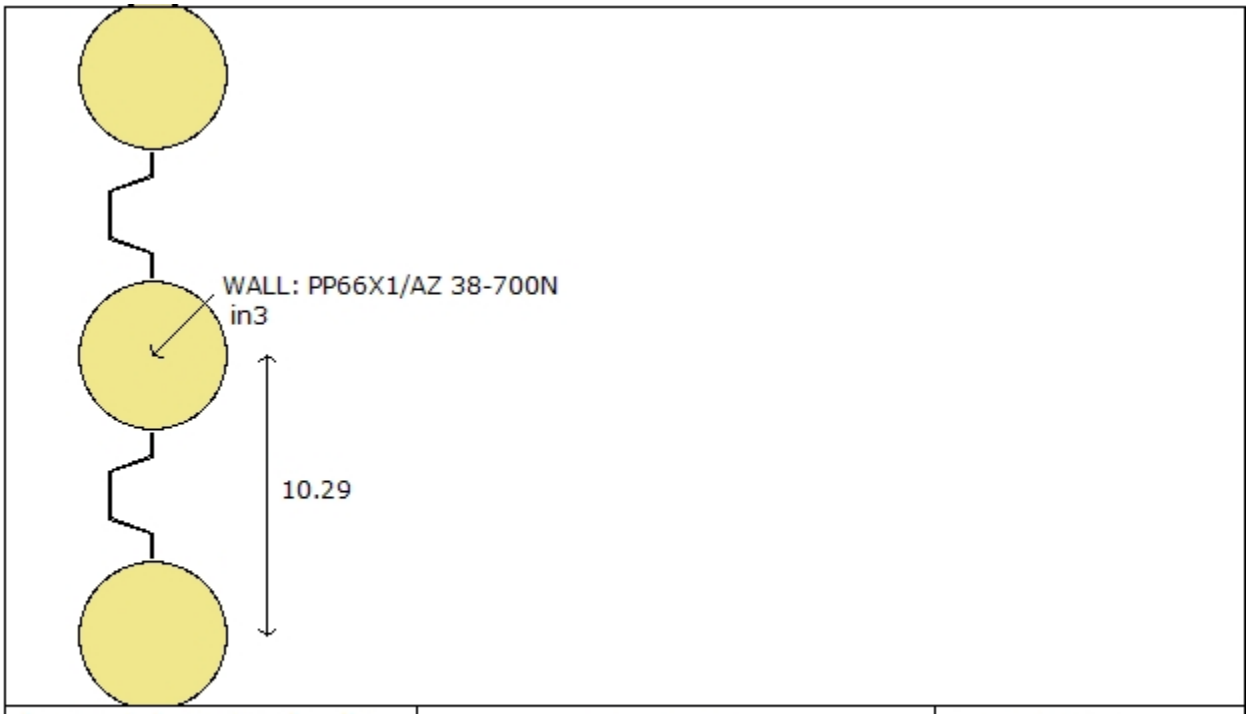
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
10	01- CH (+5 TO	1	1
-1	02- CH (-1 TO -	1	1
-7	03- CH (-7 to -	1	1
-14	04- CH (-14 TO	1	1
-20	05- CH (-20 to	1	1
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	1
-43	08- CH (-43 to	1	1
-49	09- CH (-49 to	1	1
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -91 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.721	2.99	4.118
Stage 1	Simple span	N/A	1.6	2.213	2.392	3.294
Stage 2	Simple span	N/A	1.6	3.132	3.52	4.779
Stage 3	Simple span	N/A	1.6	2.515	2.816	3.823
Stage 4	Simple span	N/A	1.6	3.739	3.739	4.899
Stage 5	Simple span	N/A	1.6	2.478	2.492	3.266
Stage 6	Simple span	N/A	1.6	4.605	4.605	5.865
Stage 7	Simple span	N/A	1.6	3.07	3.07	3.91

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

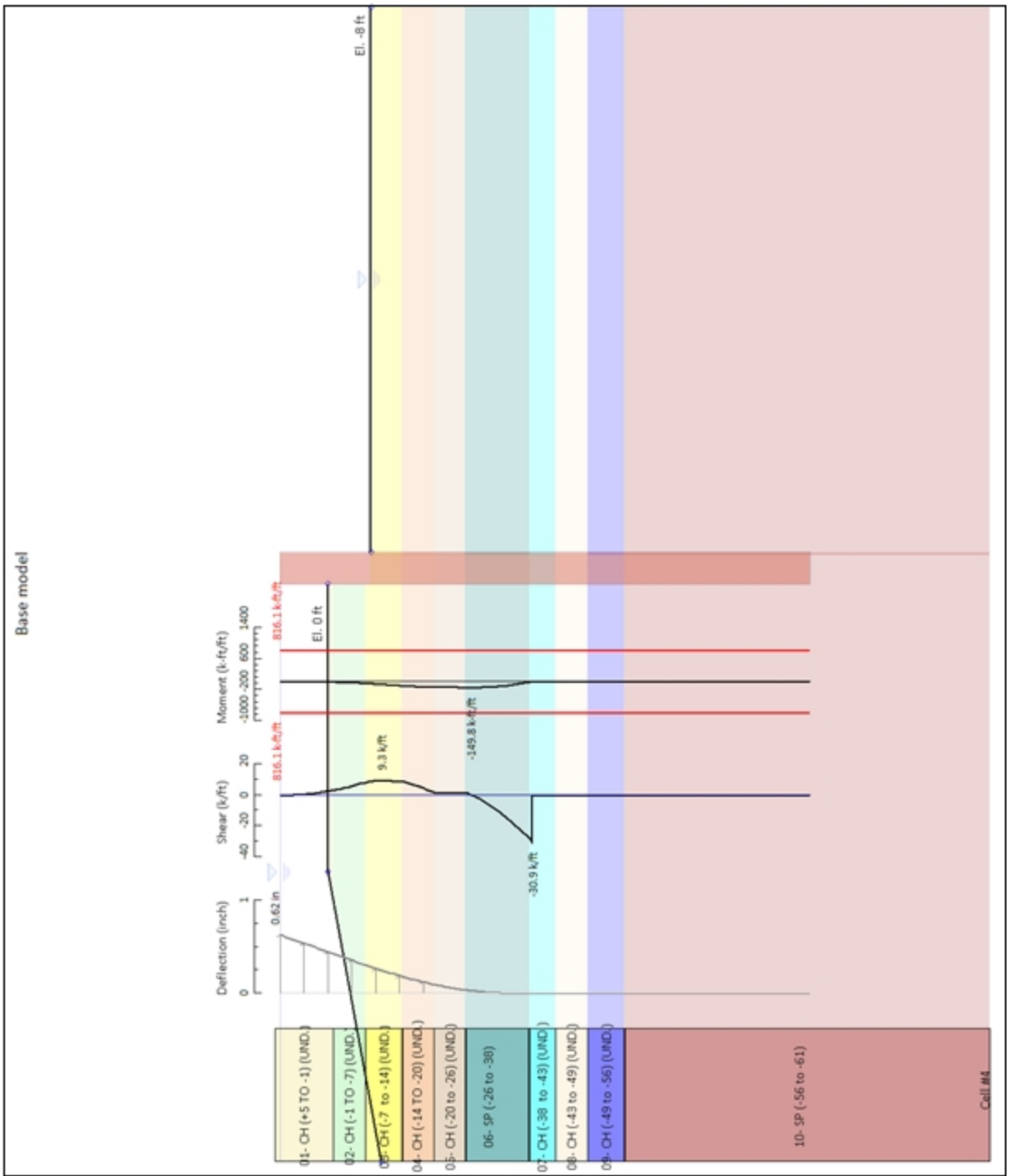
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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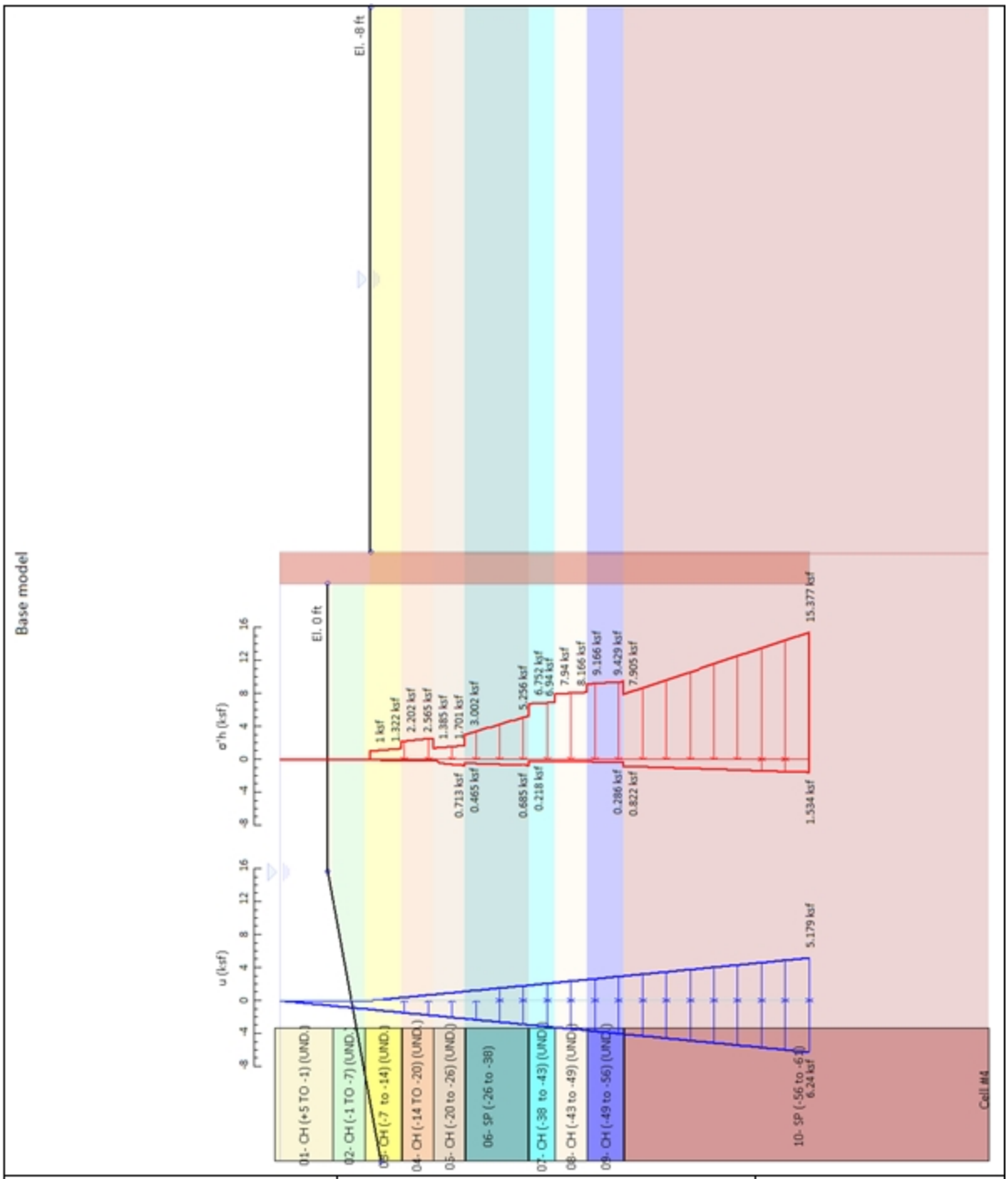

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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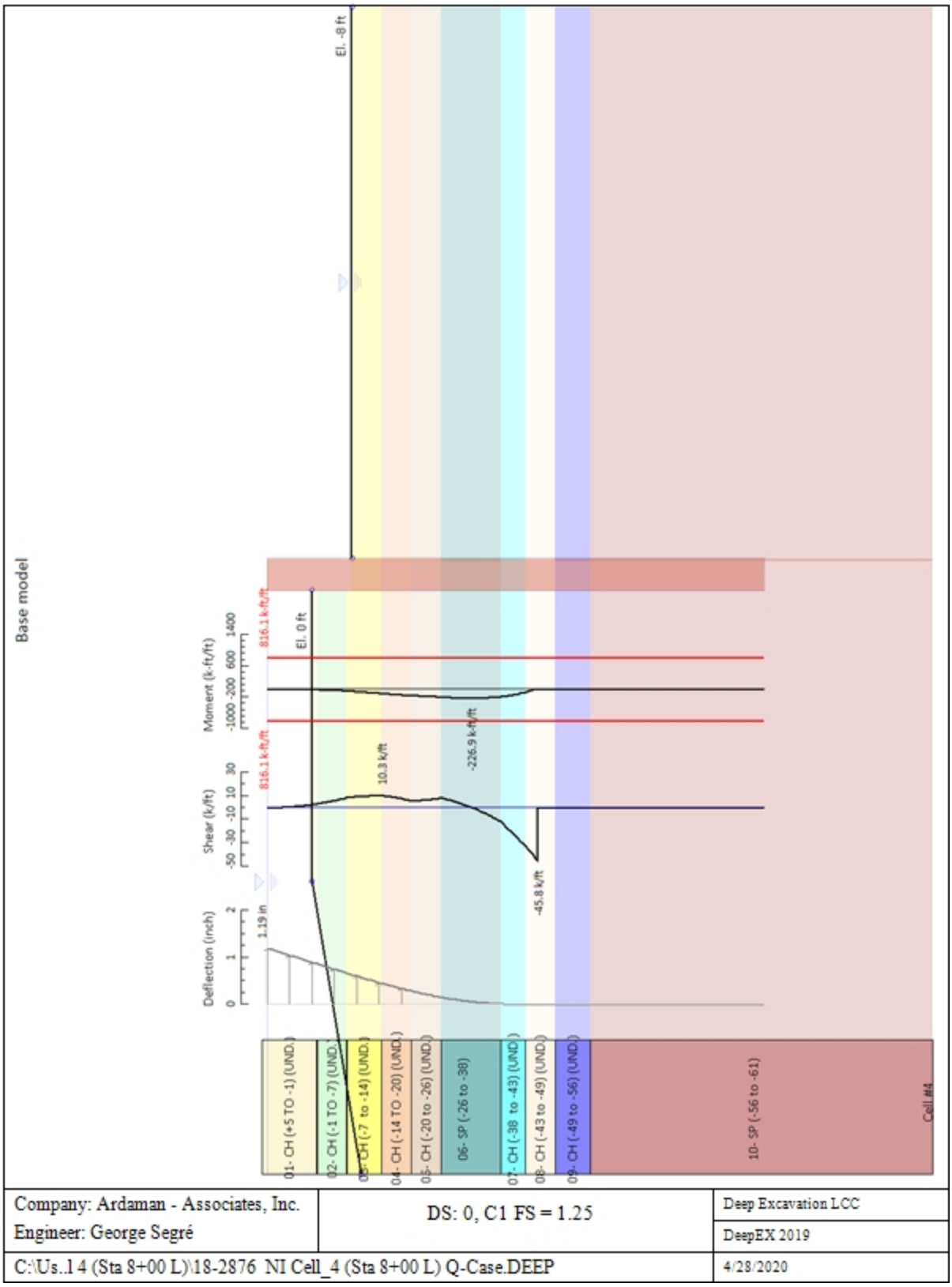

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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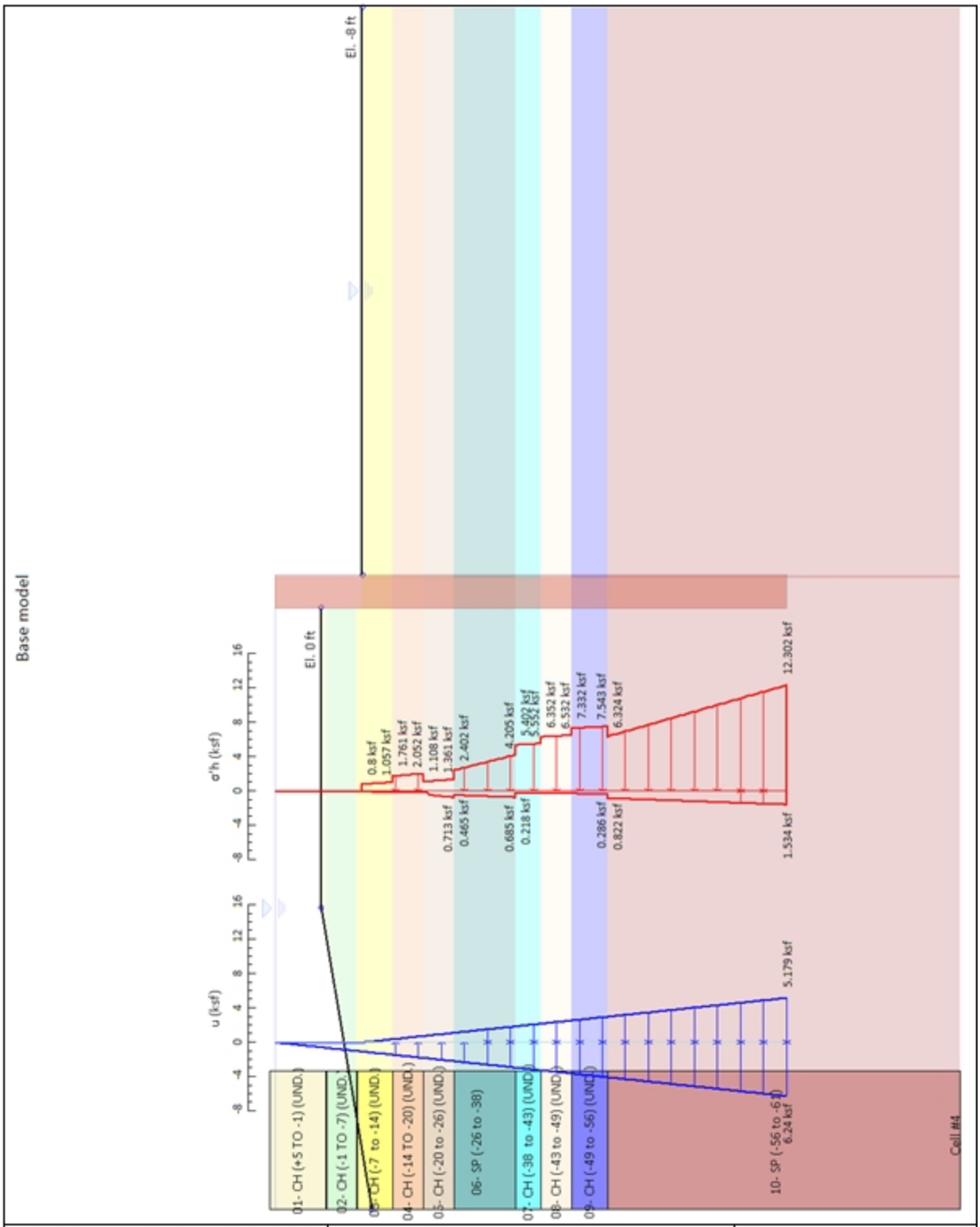

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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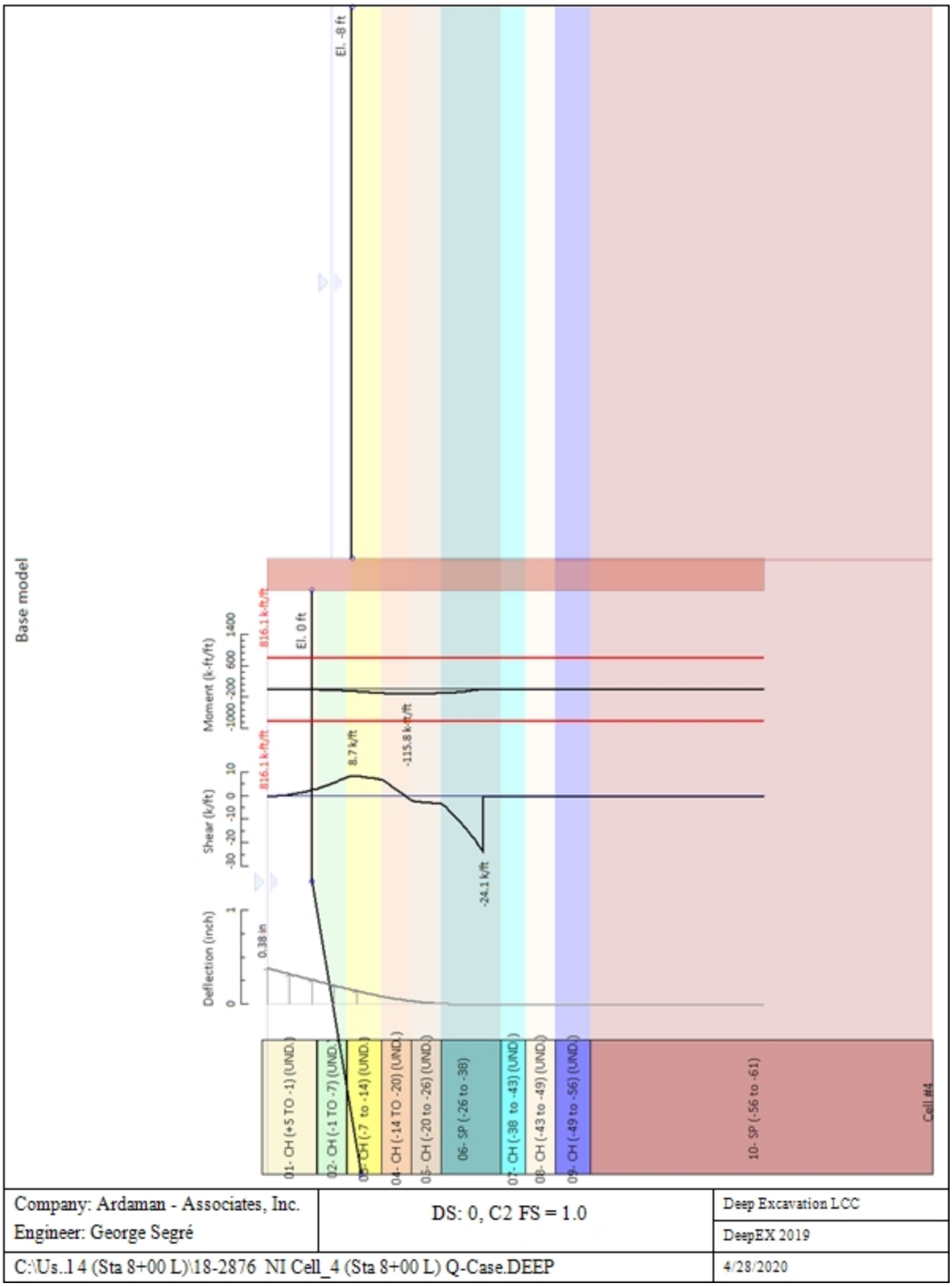

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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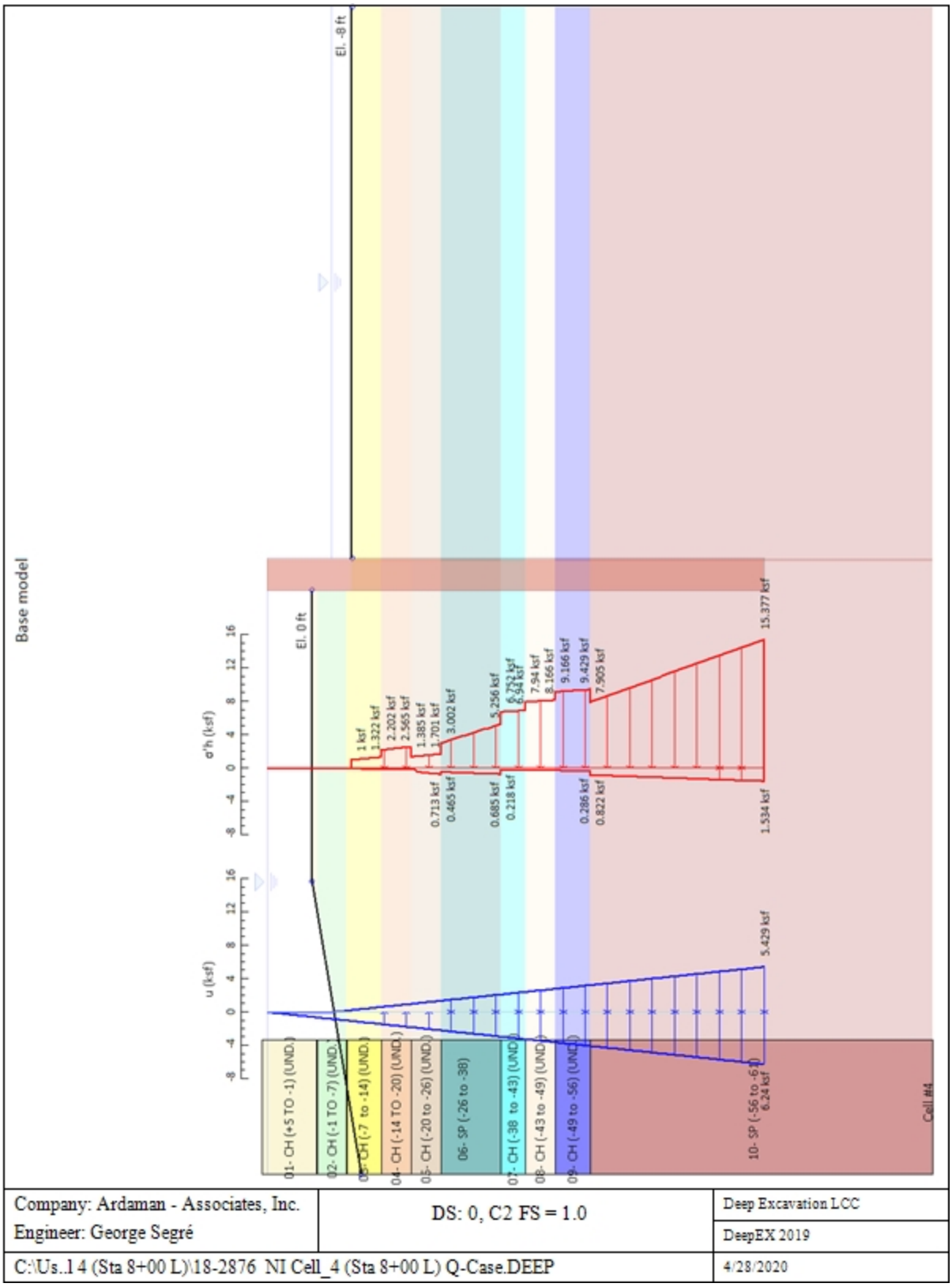

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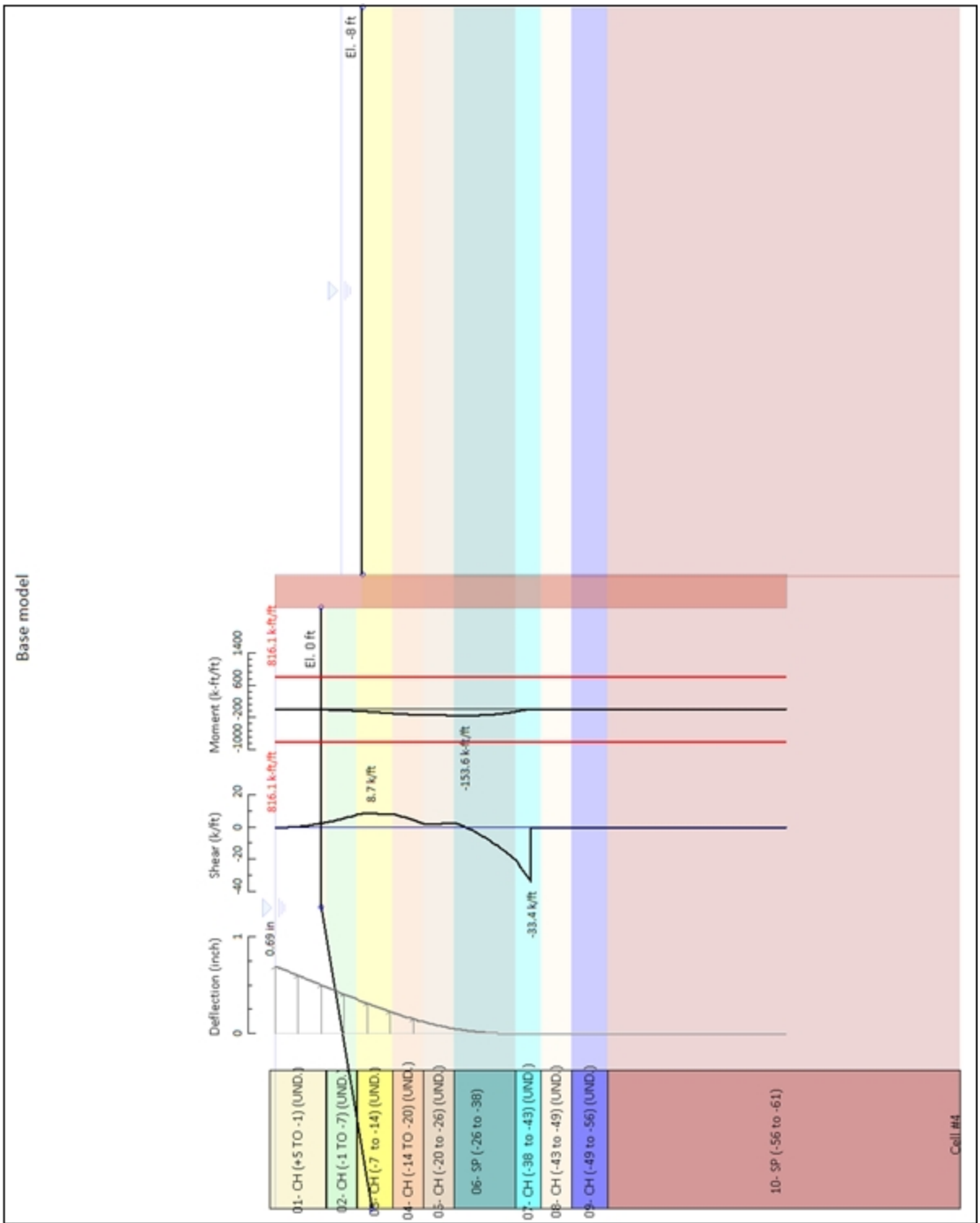

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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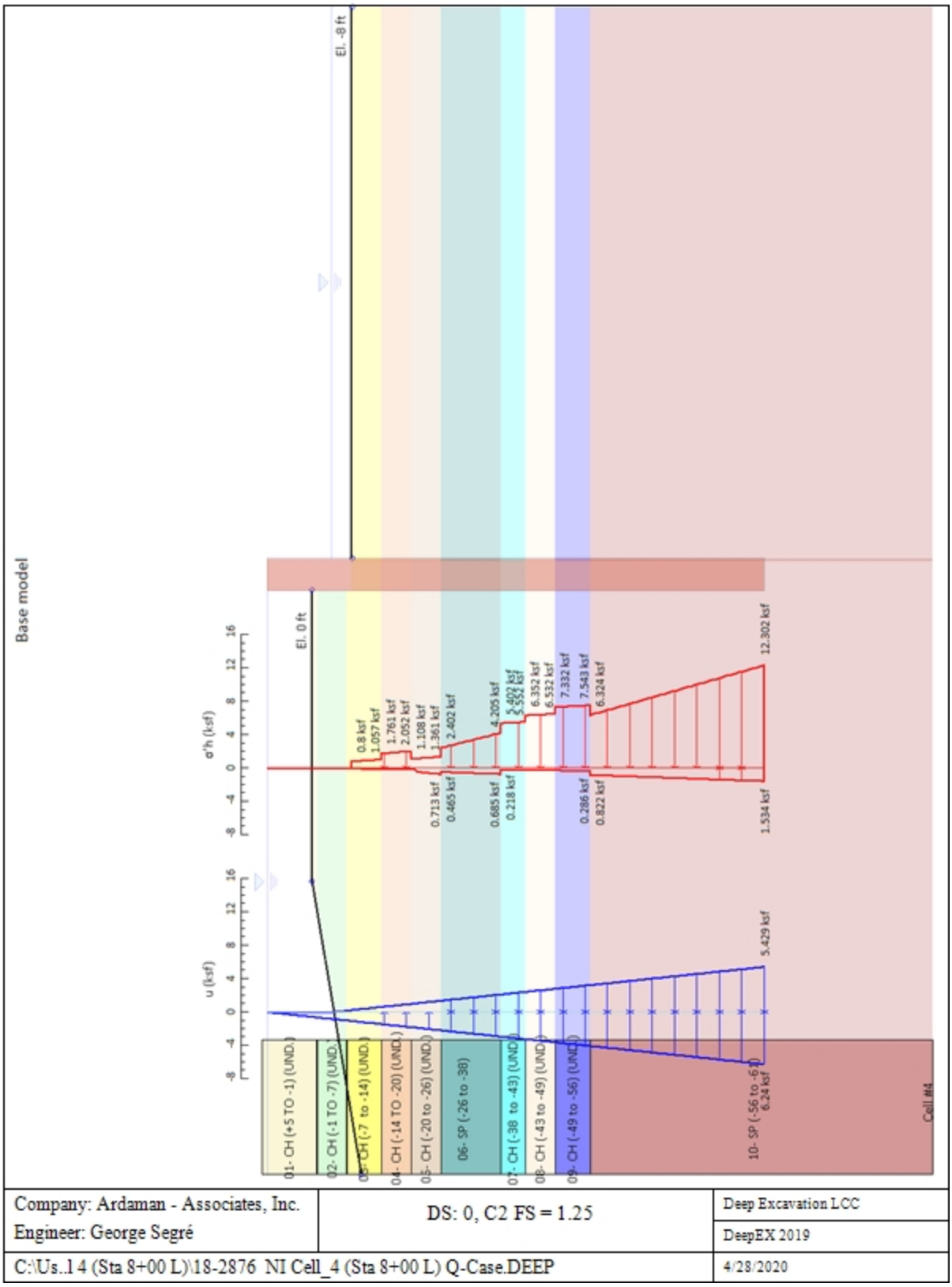

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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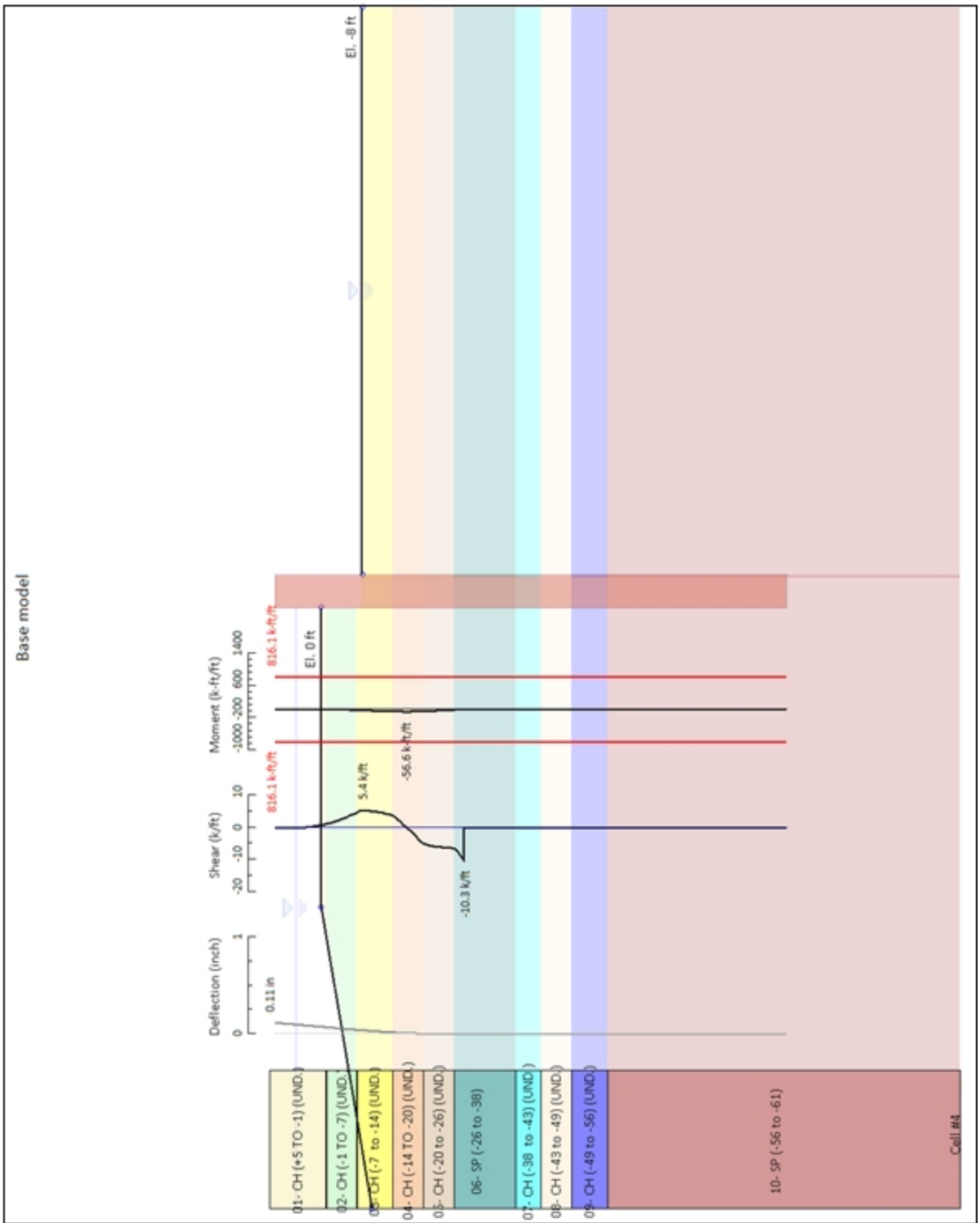

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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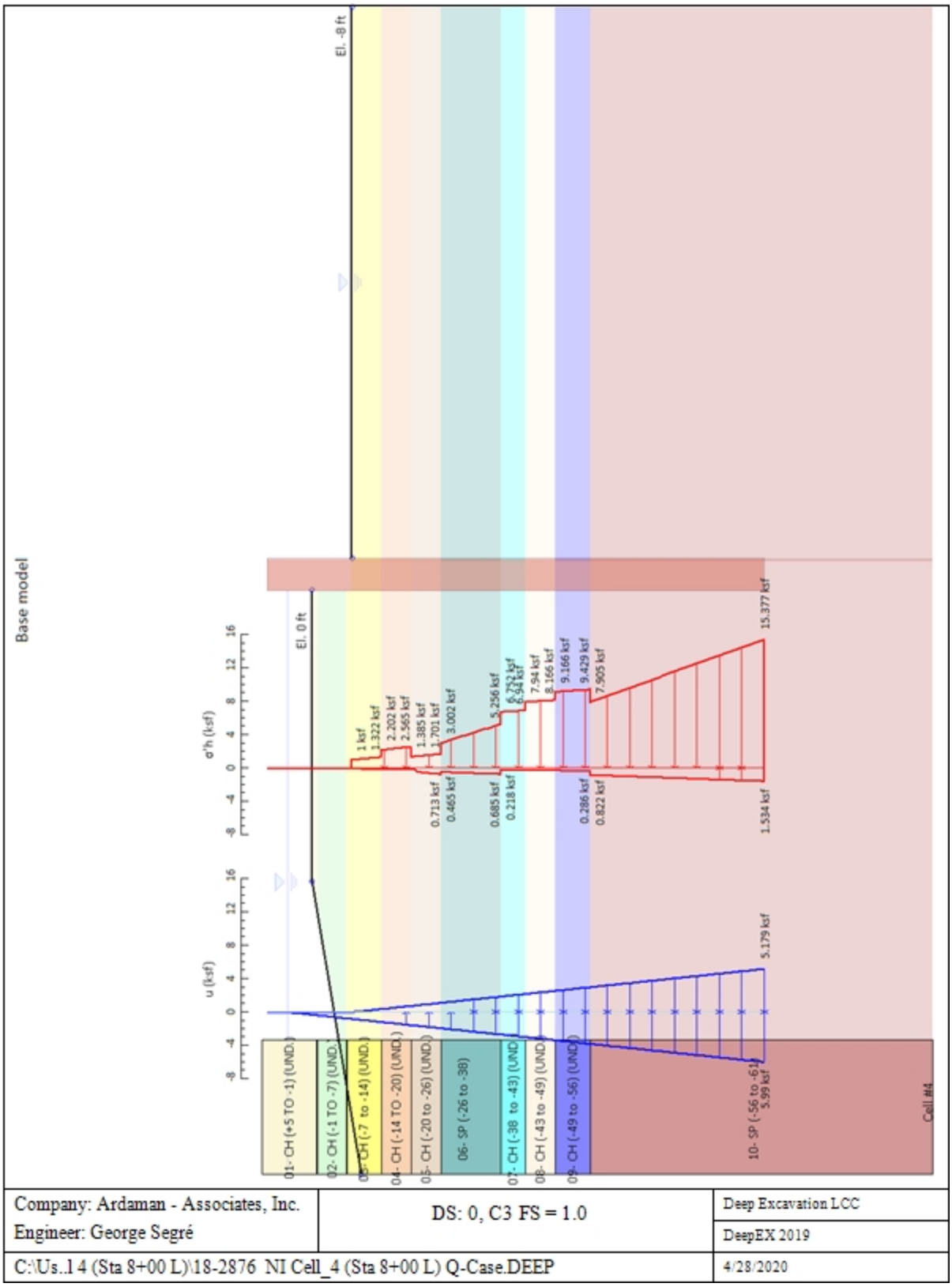

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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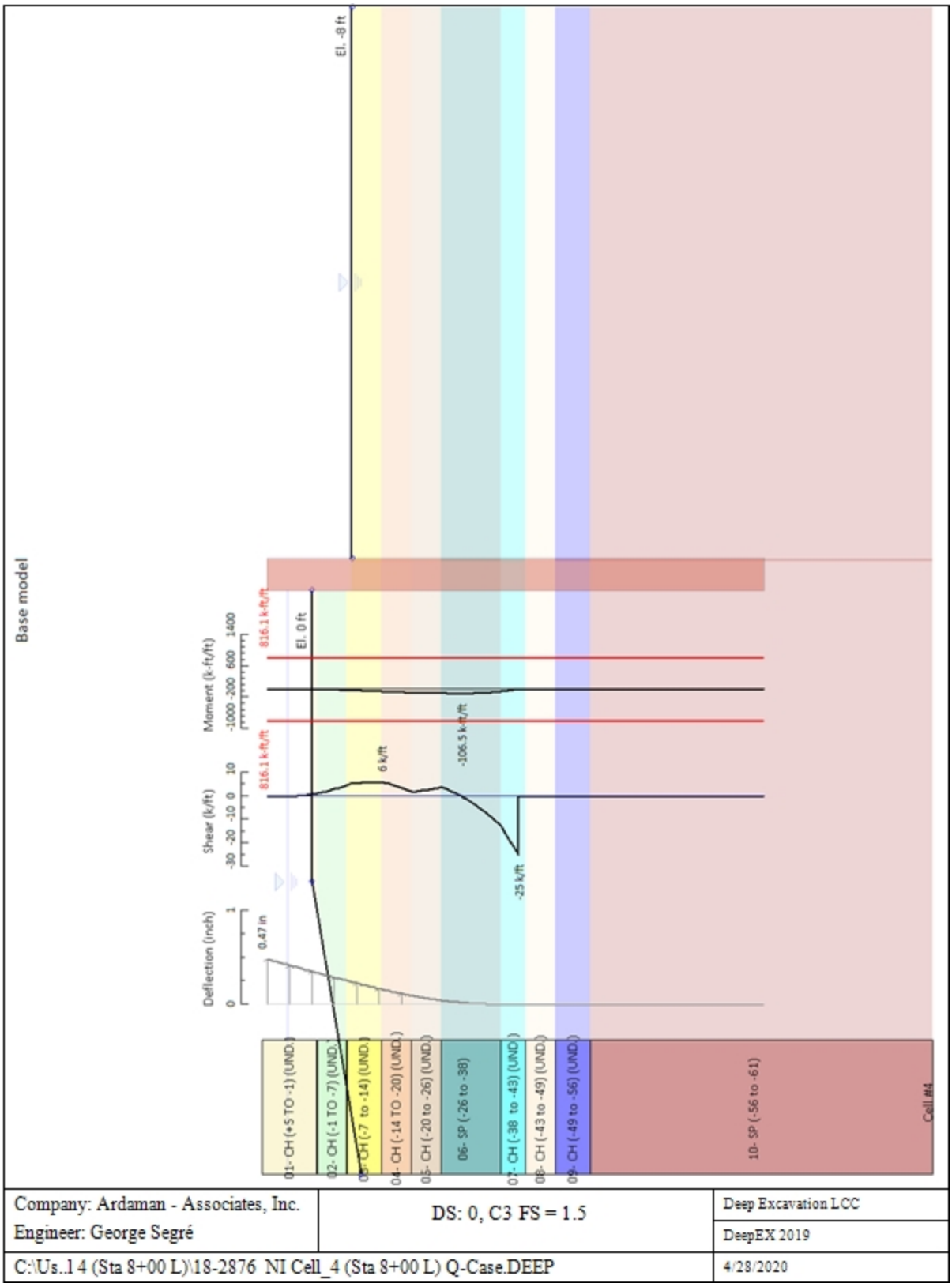
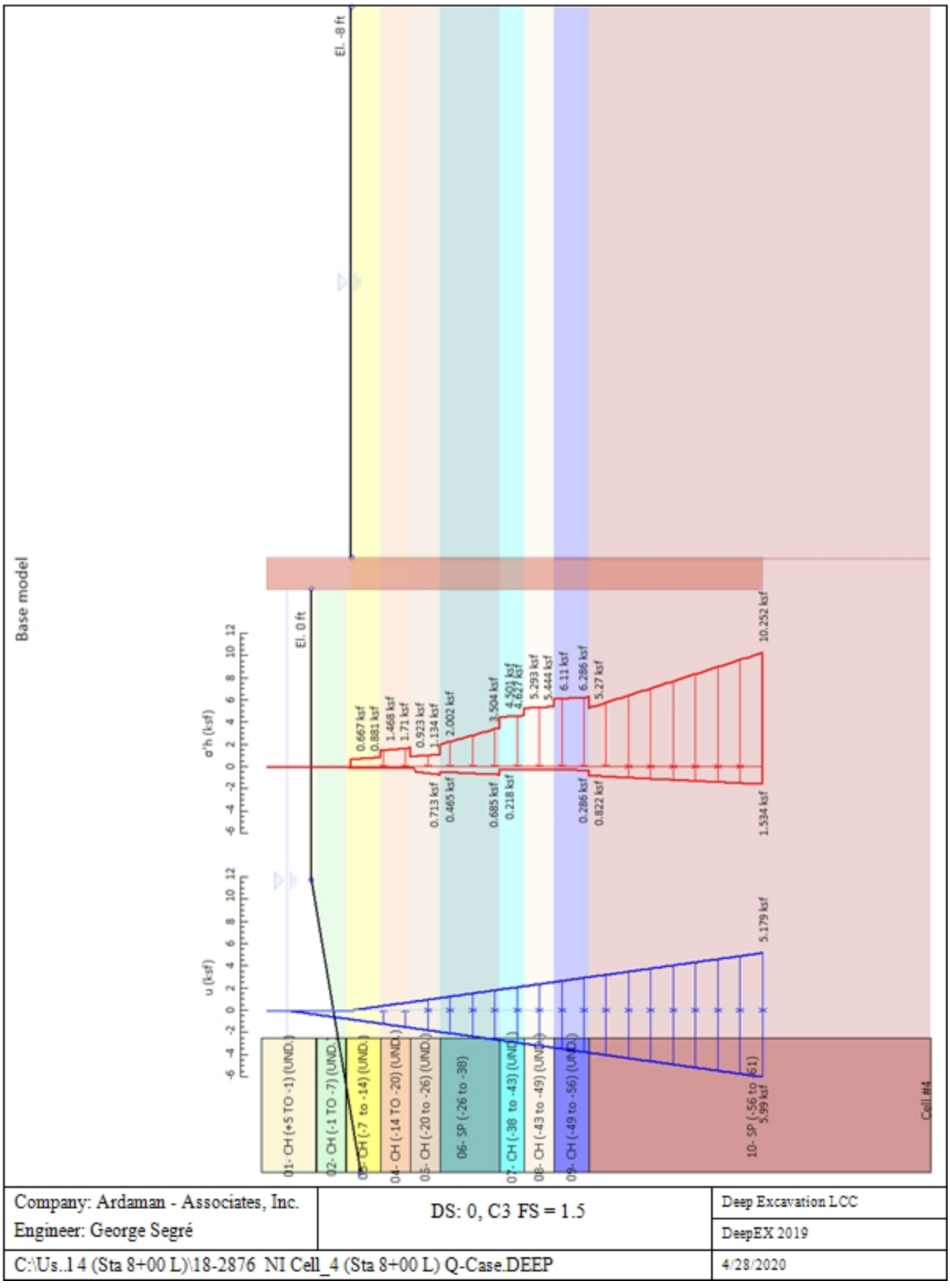
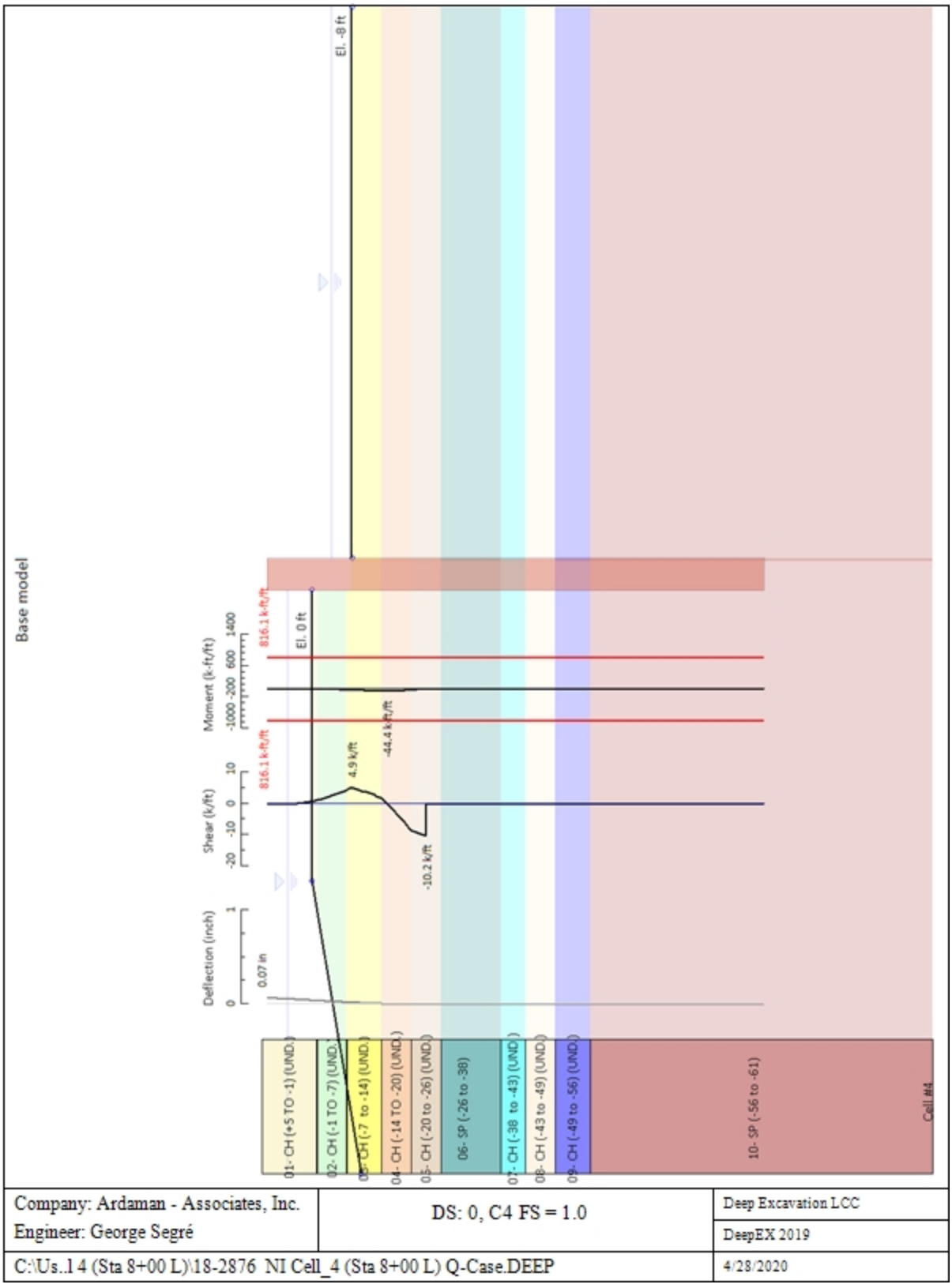

Base model
El. -8 ft
El. 0 ft
816.1 k-ft/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
6 k/ft
-106.5 k-ft/ft
-25 k/ft
Deflection (inch)
0 1
0.47 in
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP		4/28/2020


Base model
El. -8 ft
El. 0 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-44.4 k-ft/ft
Shear (k/ft)
-20 -10 0 10
4.9 k/ft
-10.2 k/ft
Deflection (inch)
0 1
0.07 in
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
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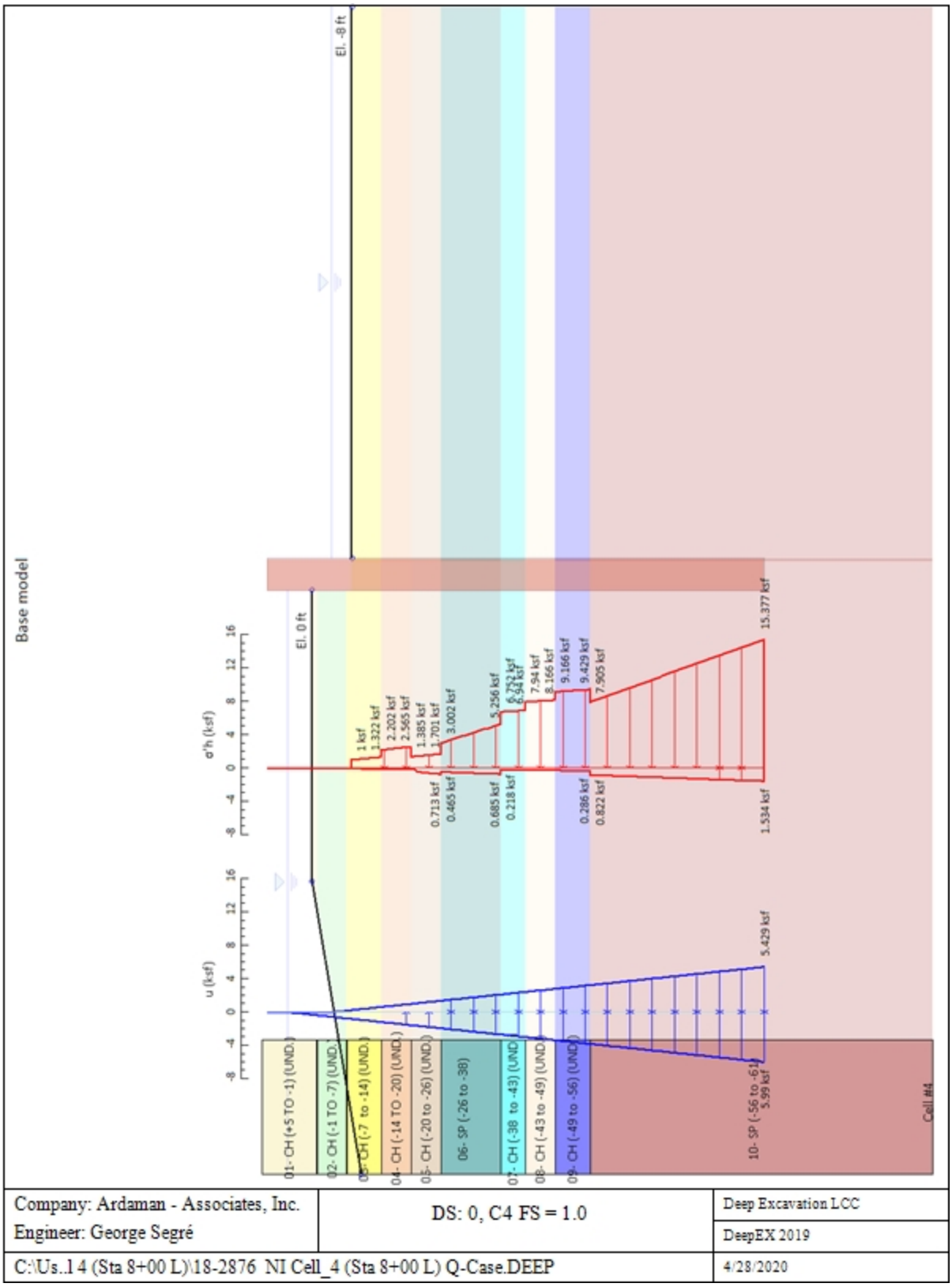
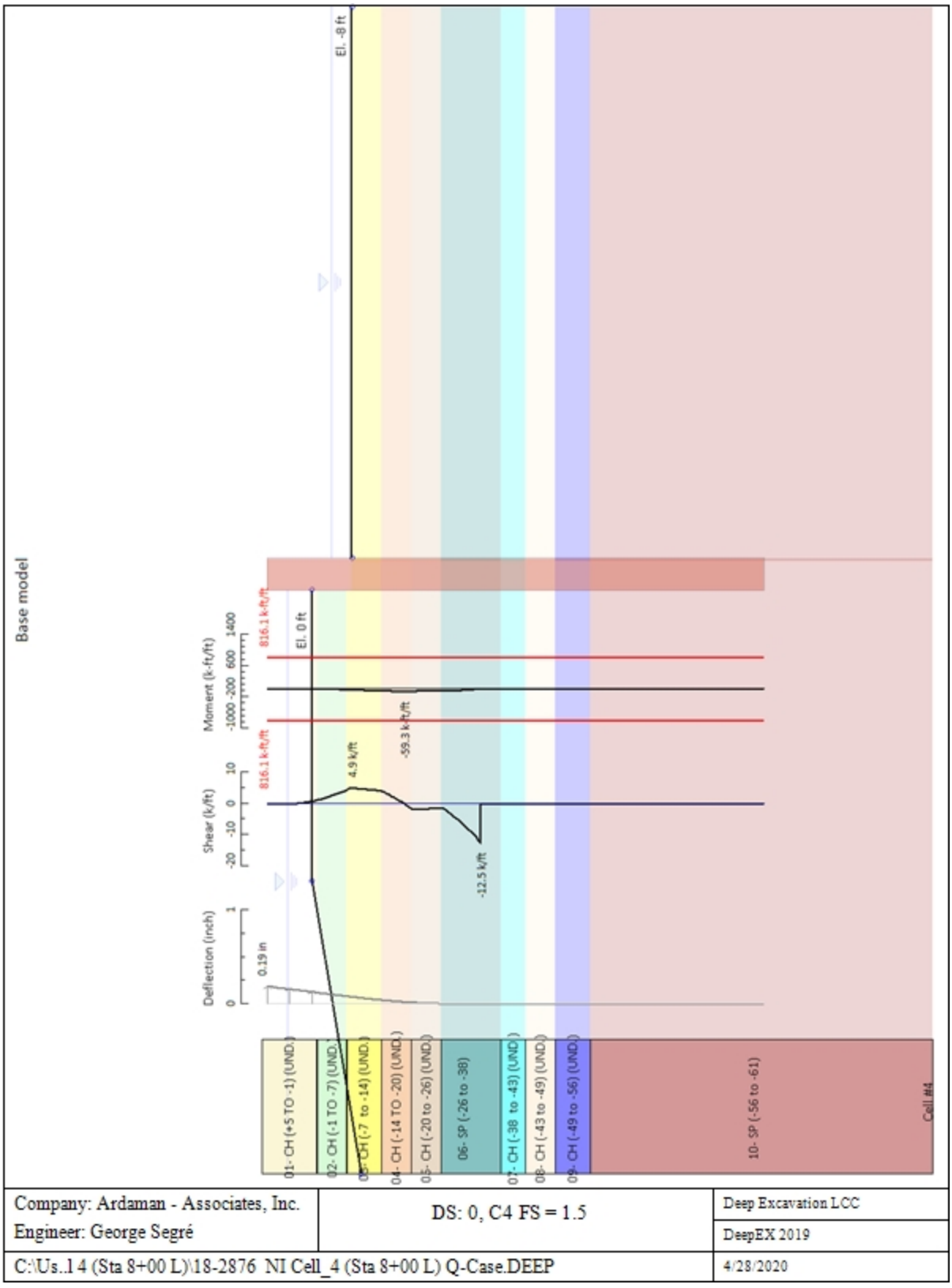


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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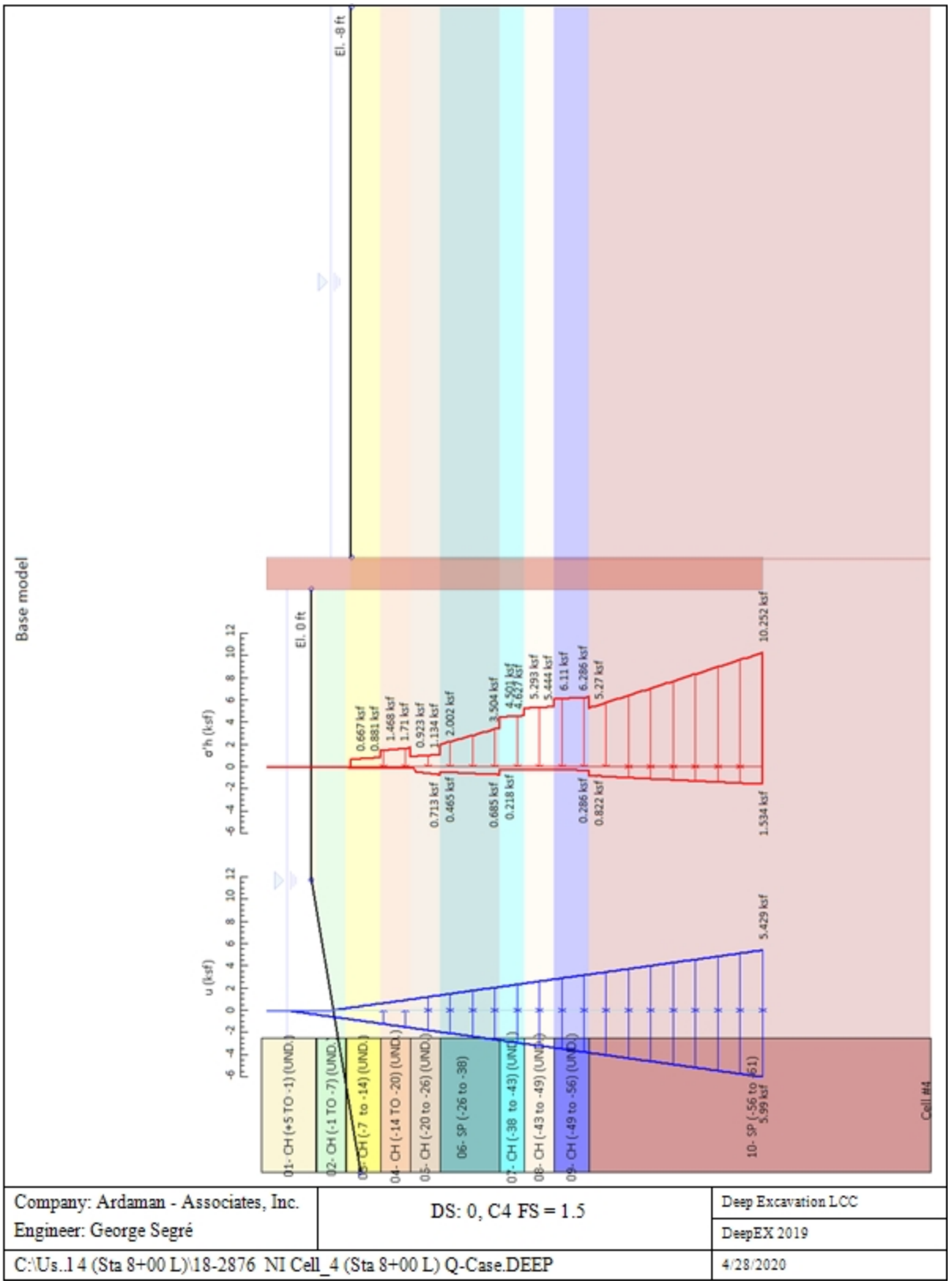

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:15:21 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	26	0	1000	26	26	300	3	0.39	2.56	0.39	2.56	True	EXP	
02- CH (-1 TO	116	116	23	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	23	0	500	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-14 T	123	123	23	0	940	23	23	521.92	3	0.44	2.28	0.44	2.28	True	Linear	
05- CH (-20 to	115	115	23	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	26	0	2500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- CH (-43 to	100	10	26	0	3000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
09- CH (-49 to	100	100	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	0.562	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	0.609	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	0.562	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	0.562	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

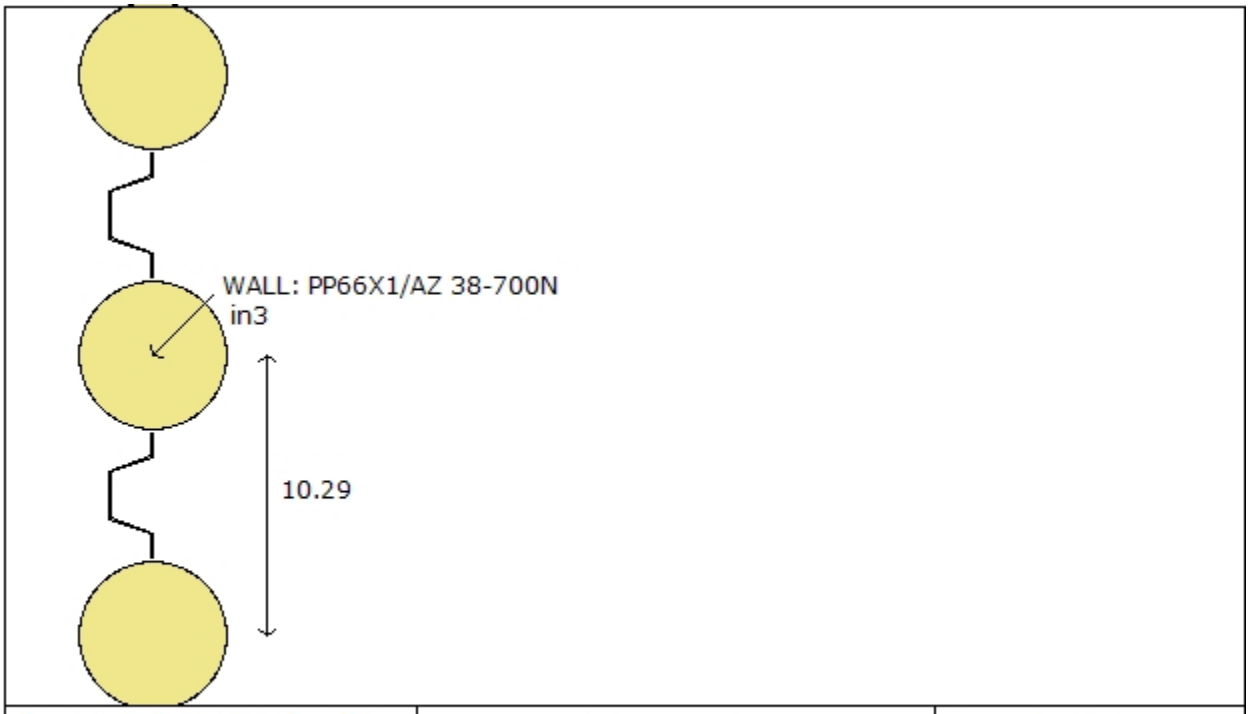
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- CH (+5 TO	1	0.56
-1	02- CH (-1 TO -	1	0
-7	03- CH (-7 to -	1	0.61
-14	04- CH (-14 TO	1	0.61
-20	05- CH (-20 to	1	0
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	0.56
-43	08- CH (-43 to	1	0.56
-49	09- CH (-49 to	1	0.56
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.957	2.118	3.252
Stage 1	Simple span	N/A	1.6	1.583	1.694	2.602
Stage 2	Simple span	N/A	1.6	2.19	2.435	3.709
Stage 3	Simple span	N/A	1.6	1.807	1.948	2.967
Stage 4	Simple span	N/A	1.6	2.413	2.563	3.791
Stage 5	Simple span	N/A	1.6	1.662	1.709	2.527
Stage 6	Simple span	N/A	1.6	2.777	3.043	4.427
Stage 7	Simple span	N/A	1.6	2	2.029	2.951

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

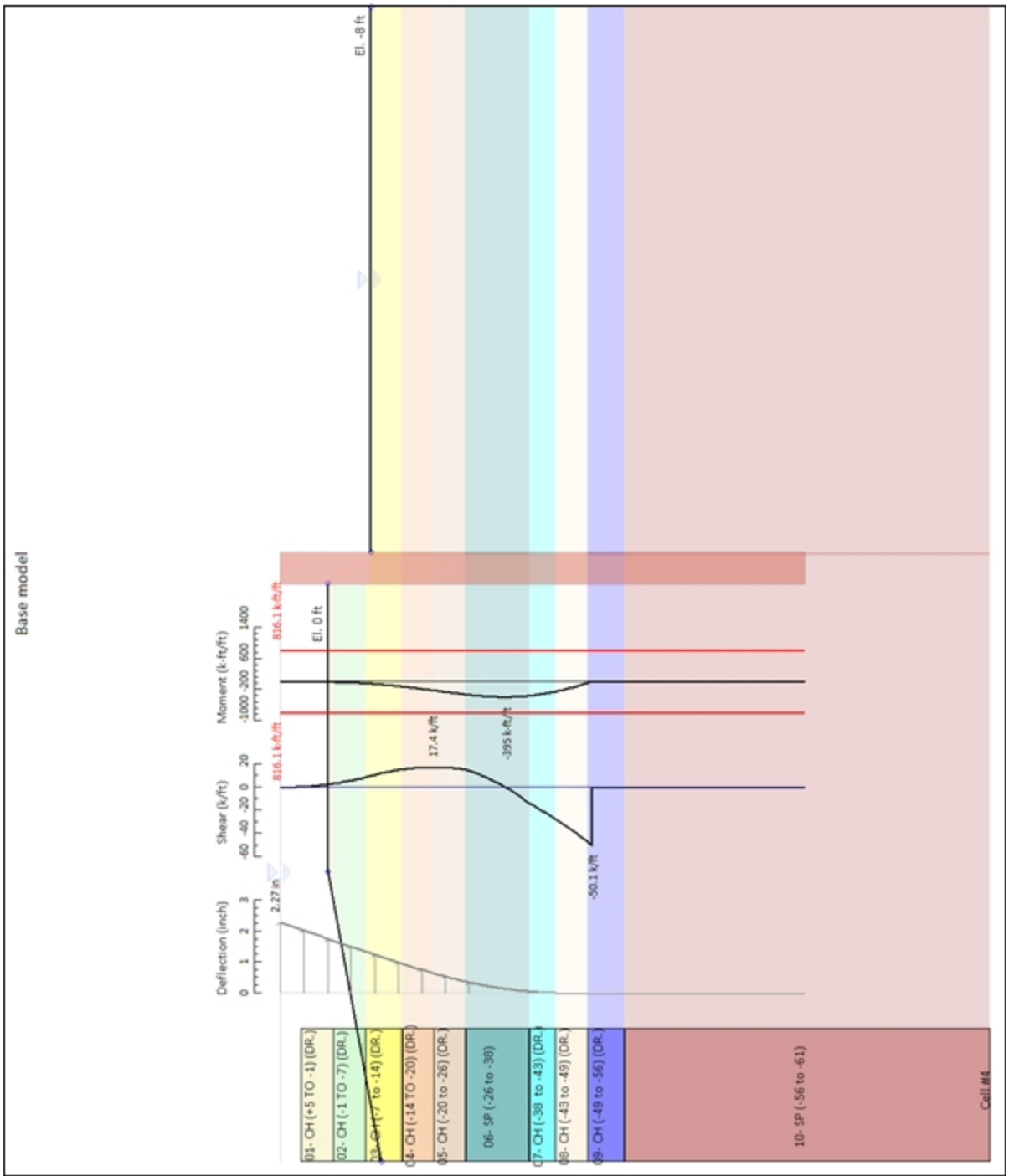
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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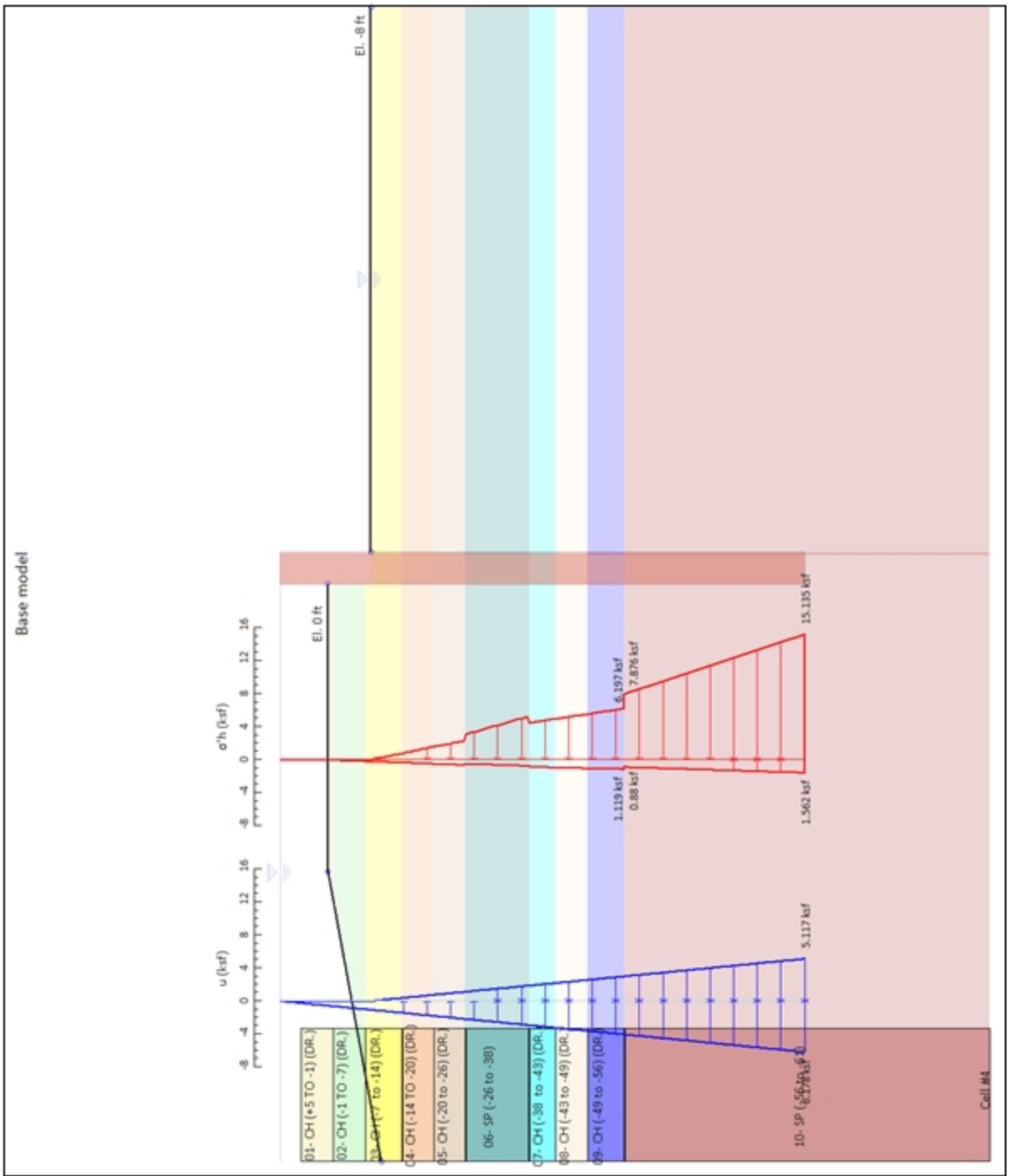

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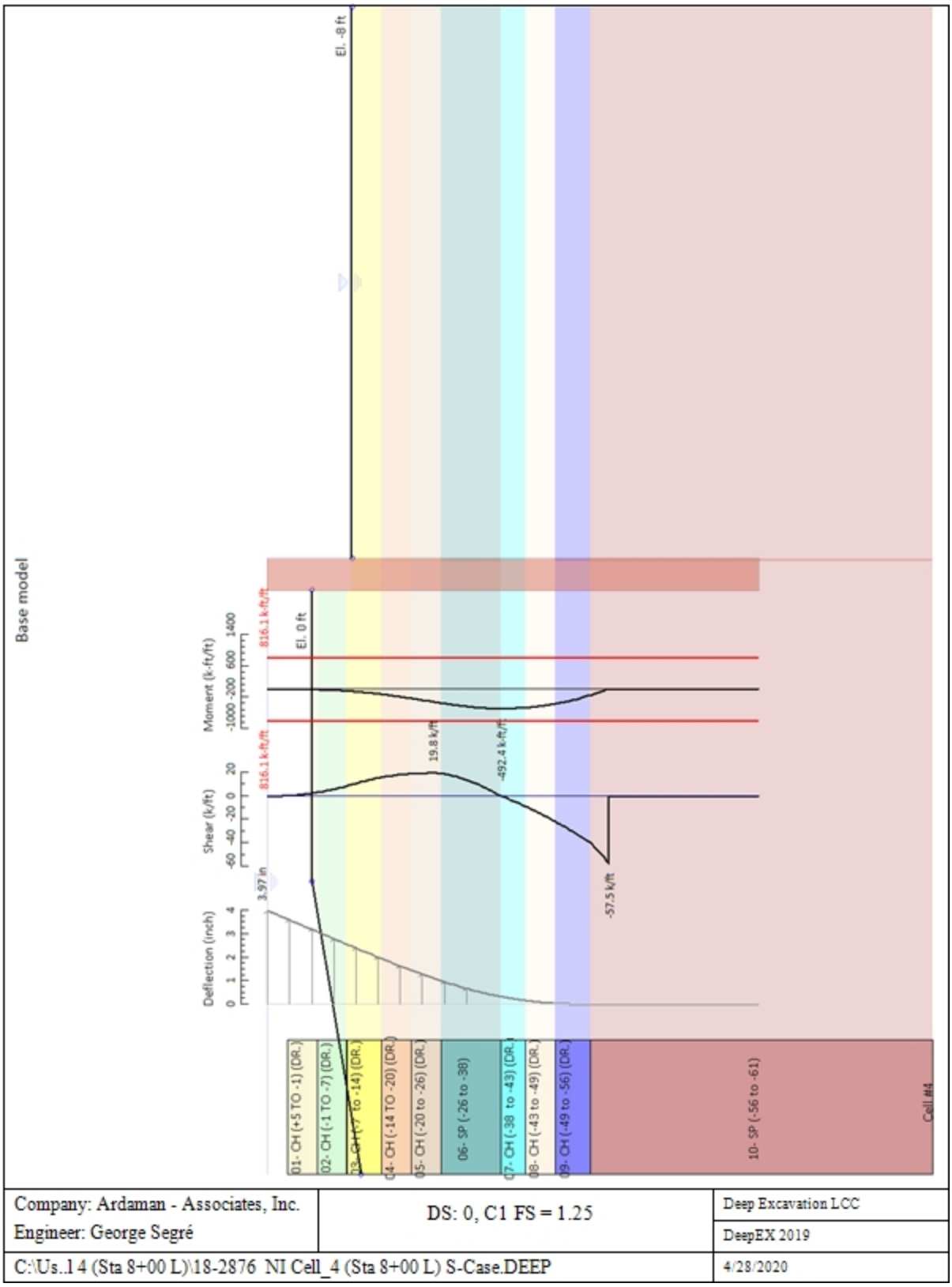

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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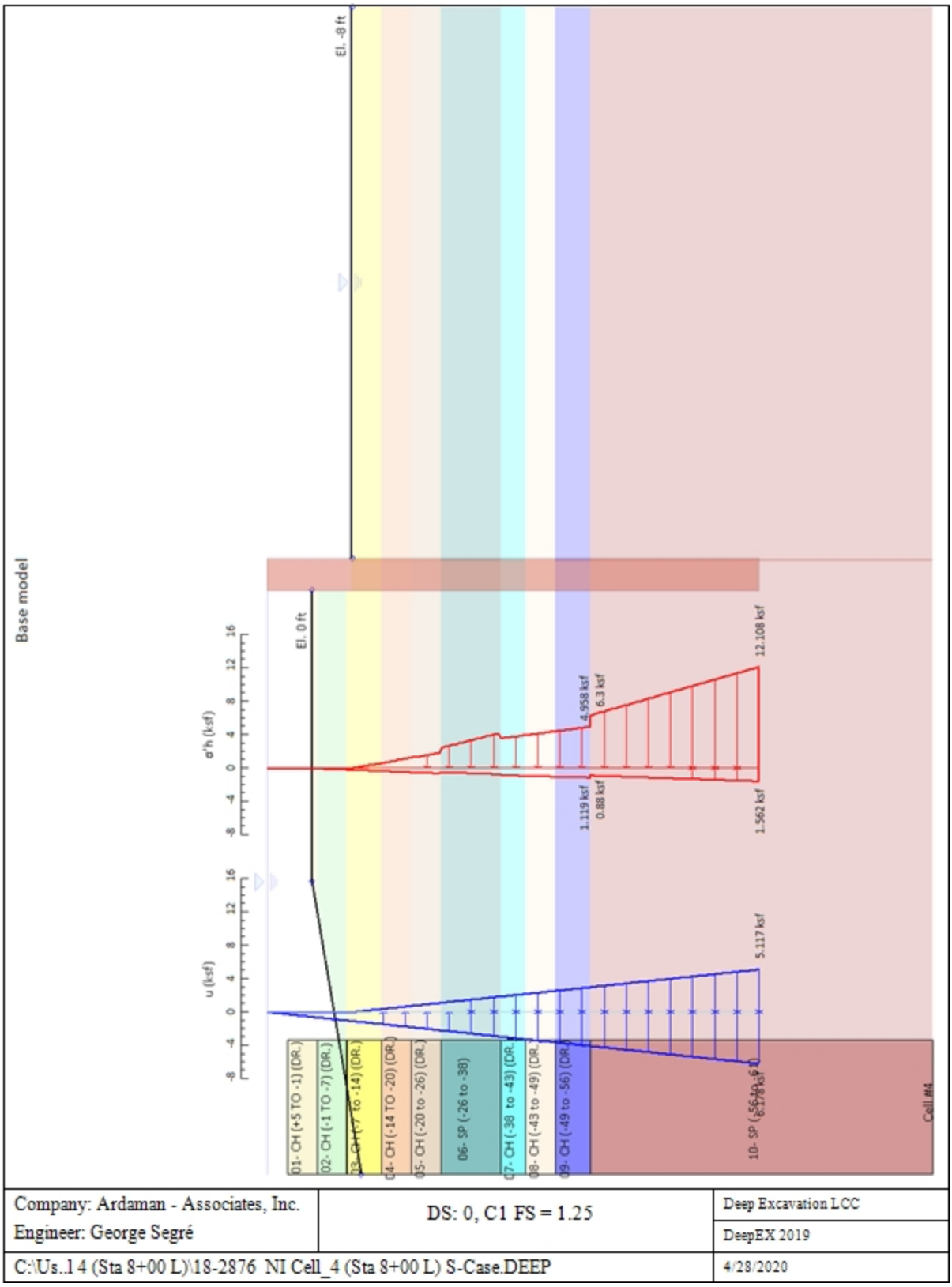
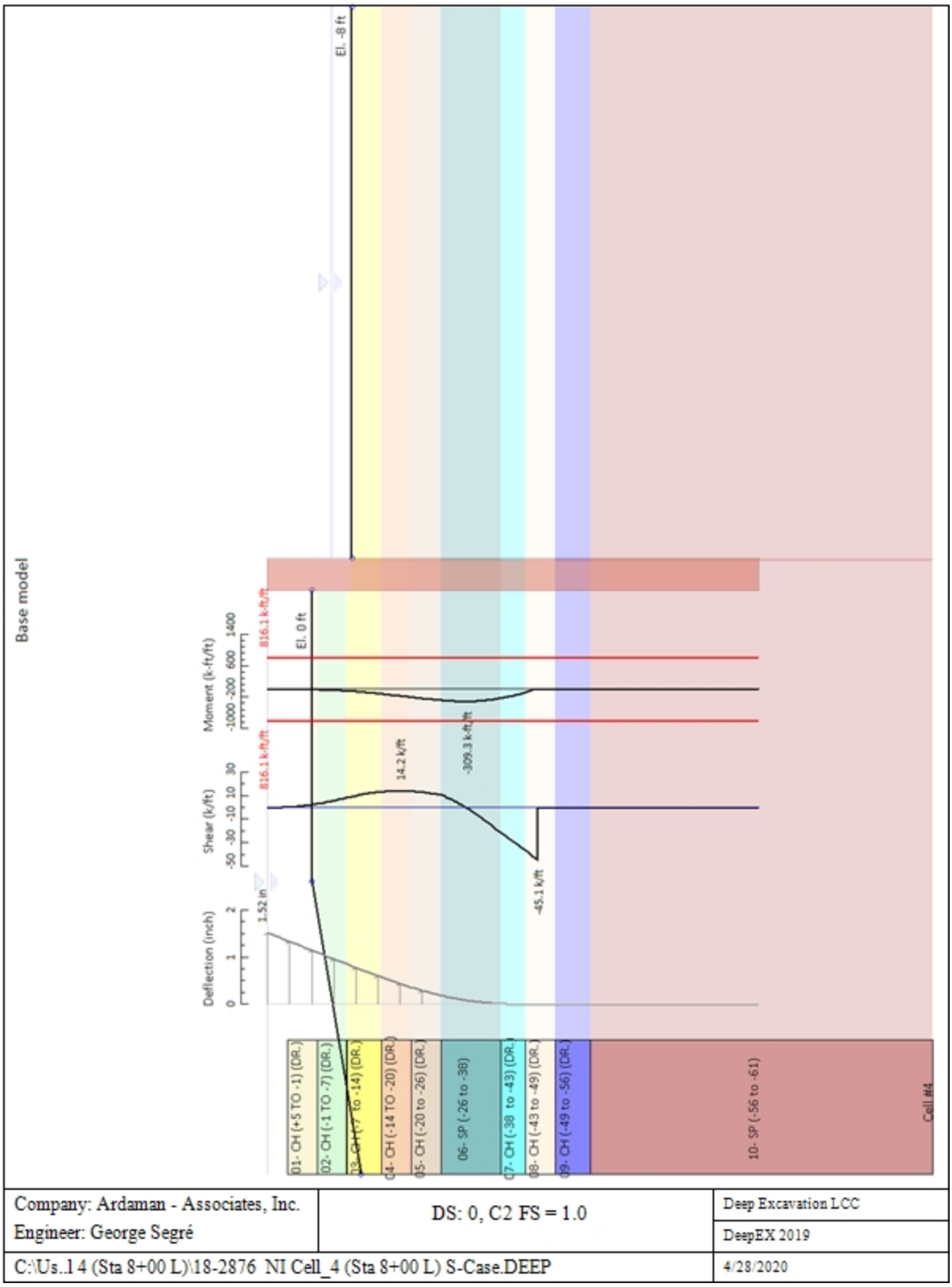


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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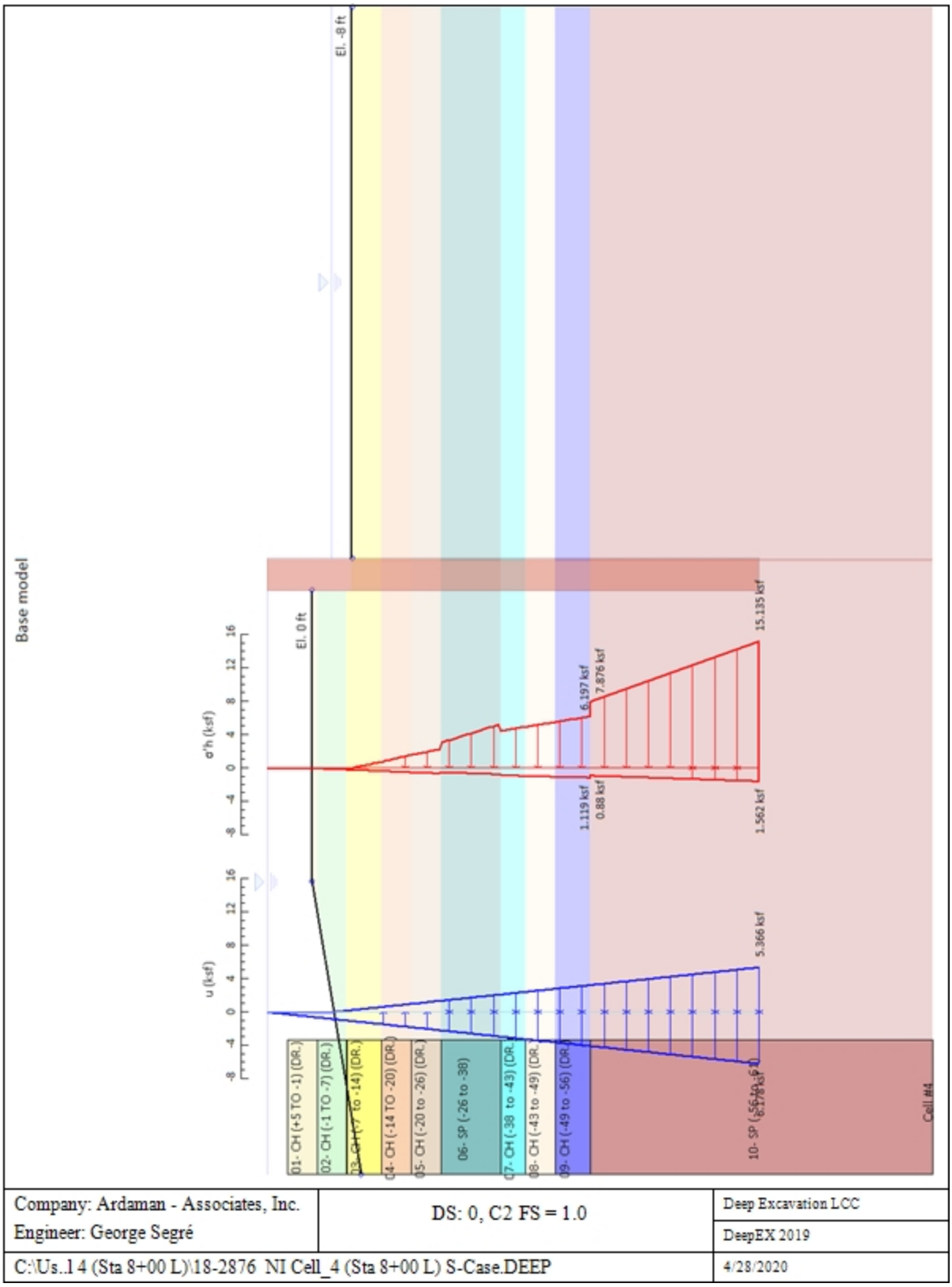

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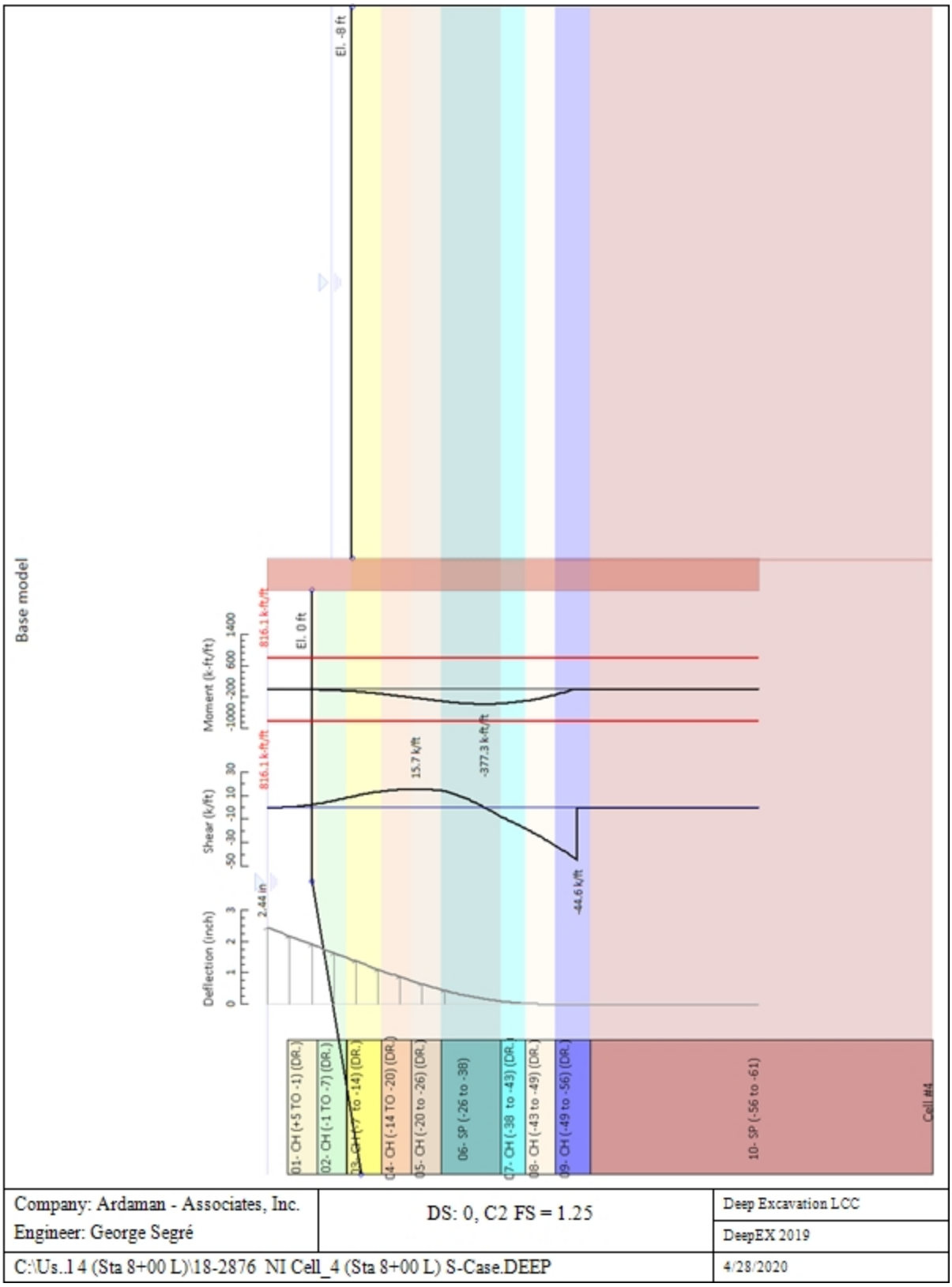

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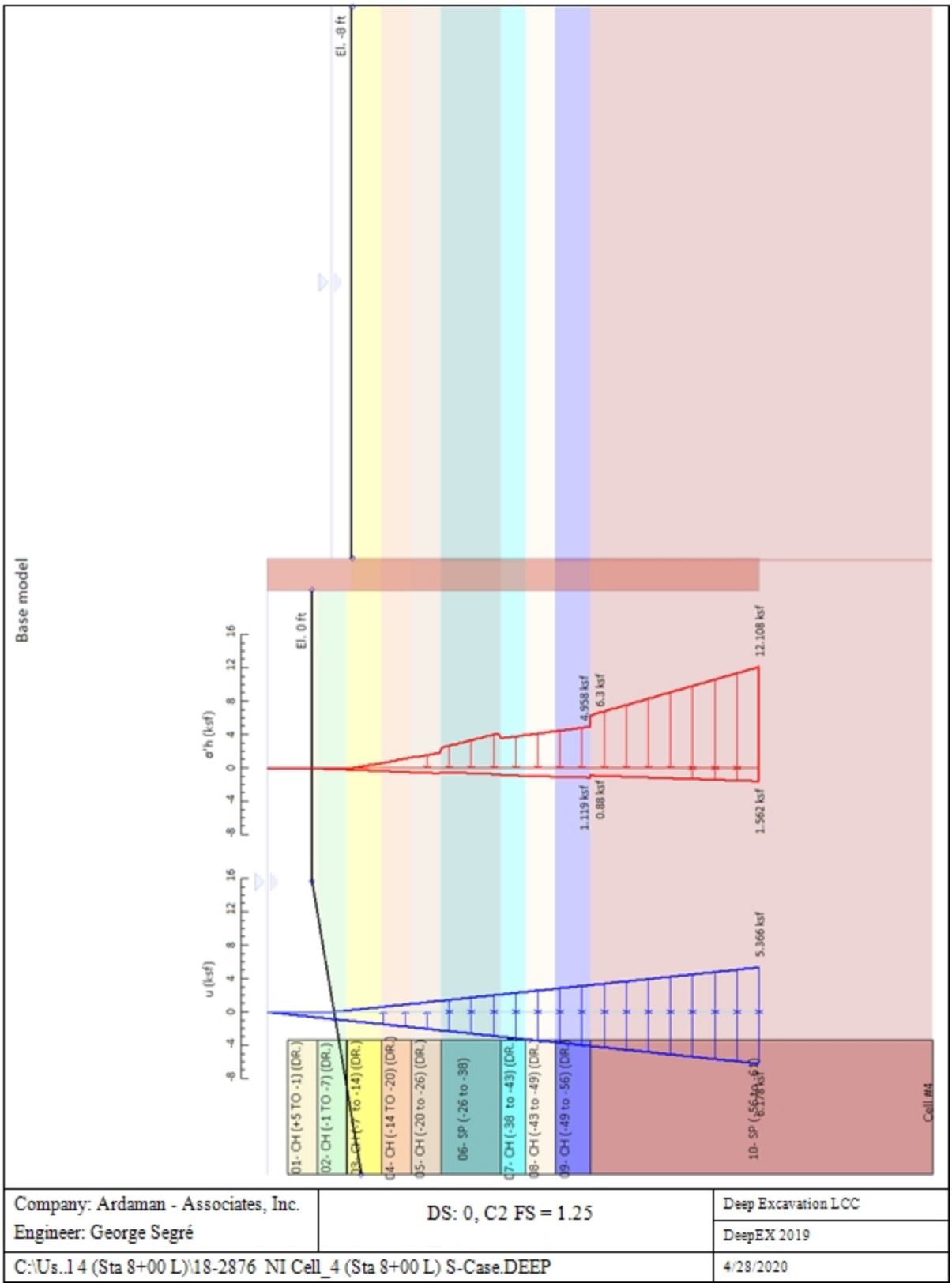

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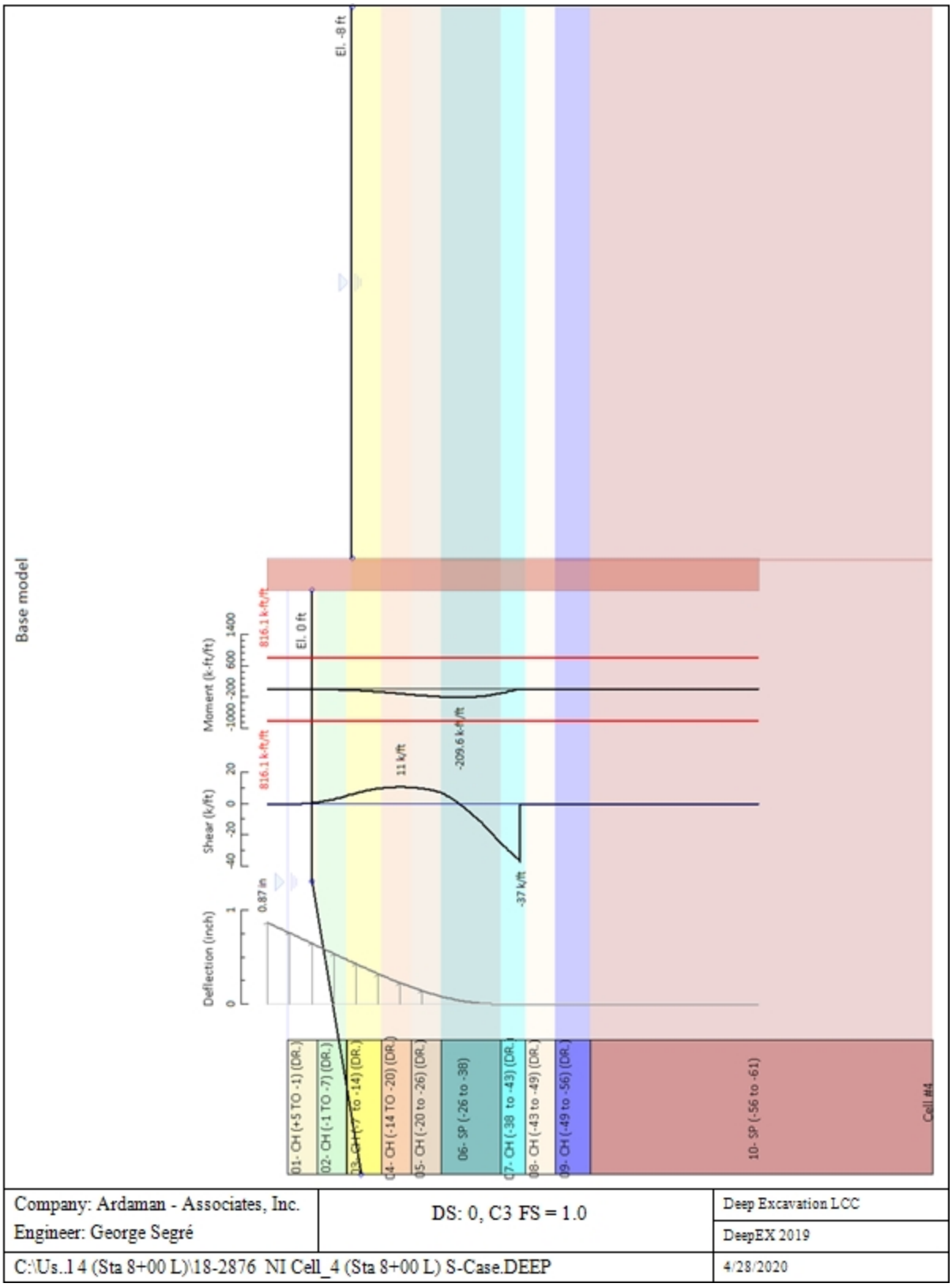

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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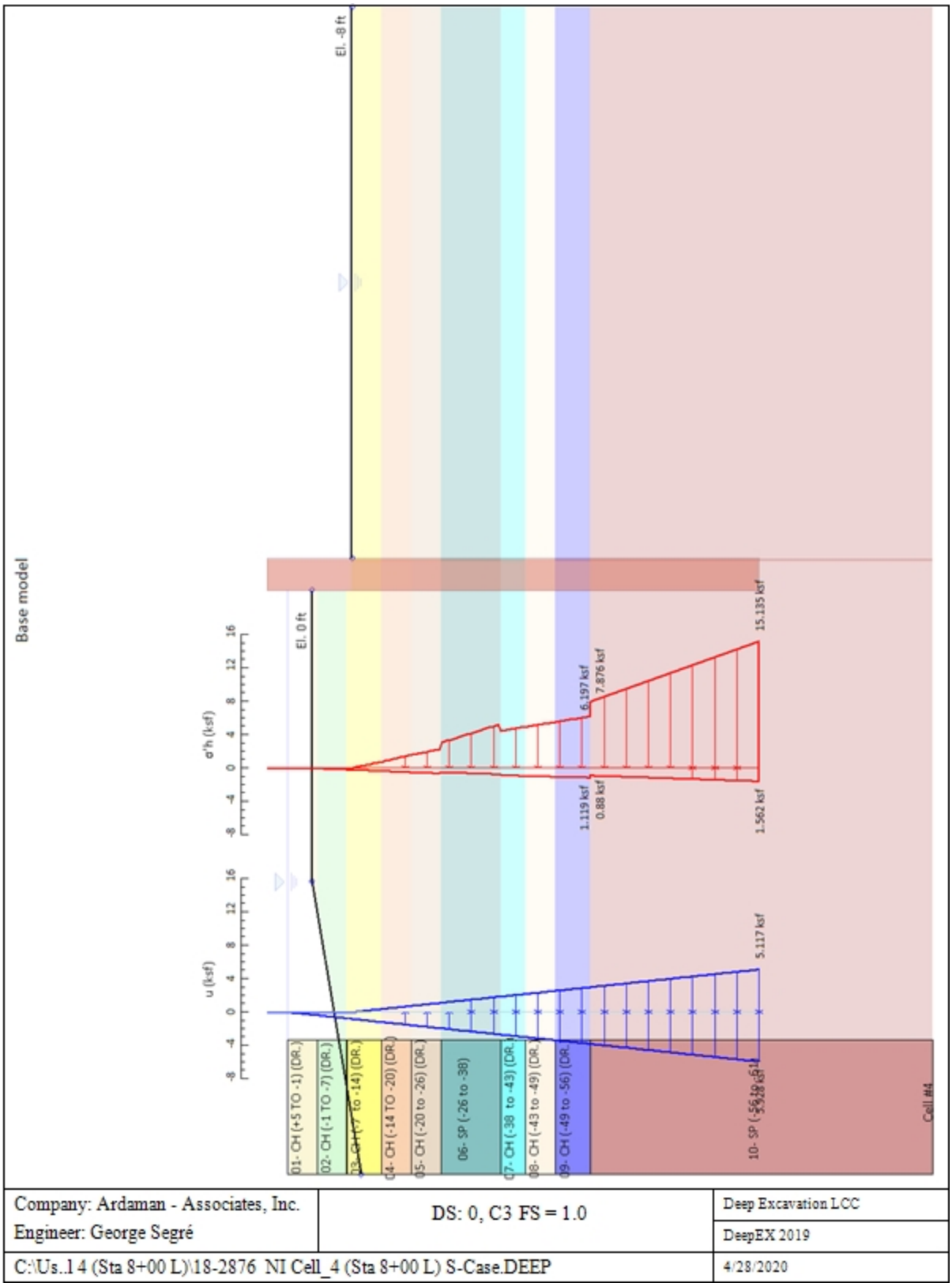
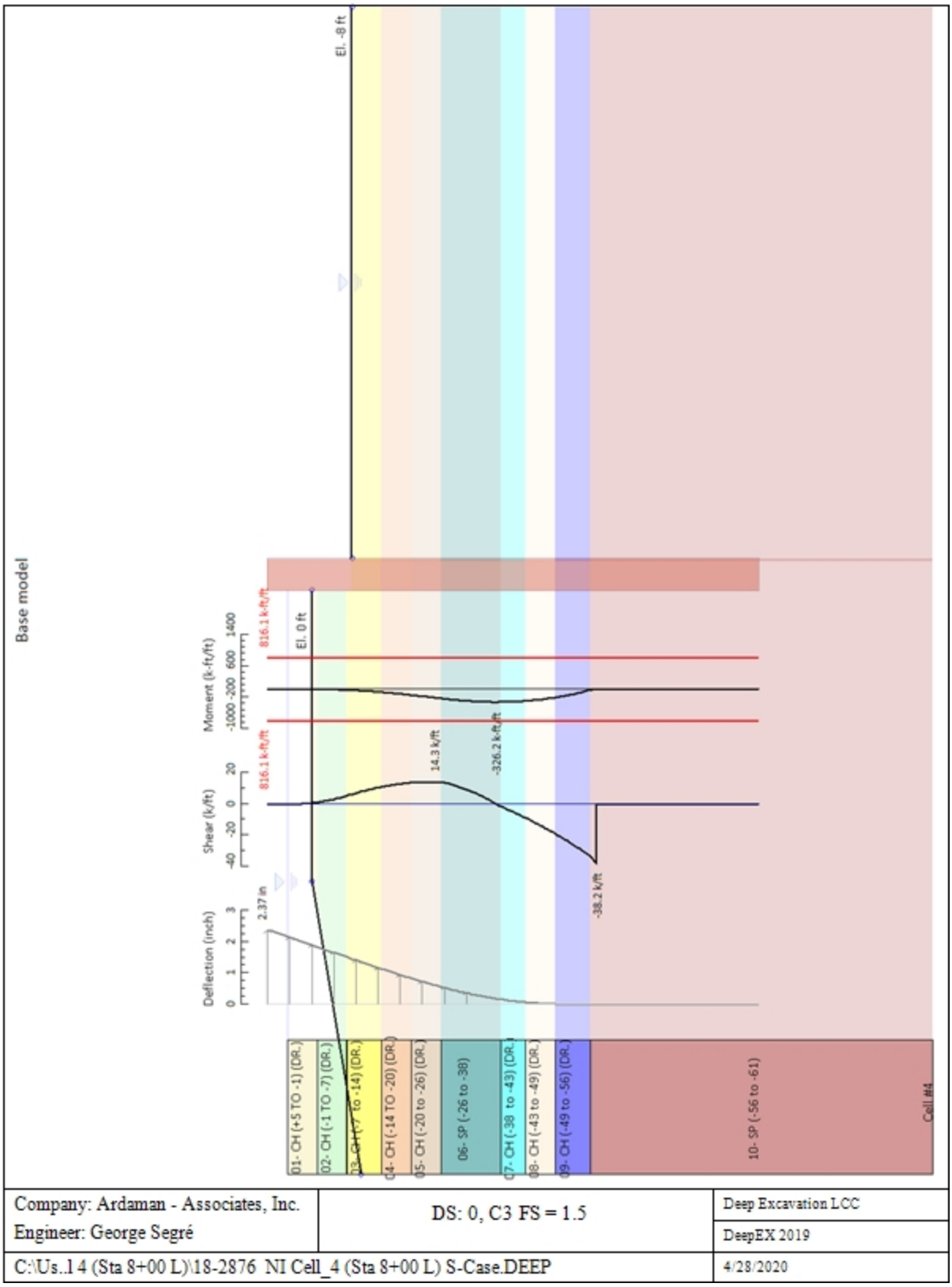

Base model
El. -8 ft
El. 0 ft
σ'h (ksf)
u (ksf)
15.135 ksf
7.876 ksf
6.197 ksf
1.119 ksf
0.88 ksf
1.562 ksf
5.117 ksf
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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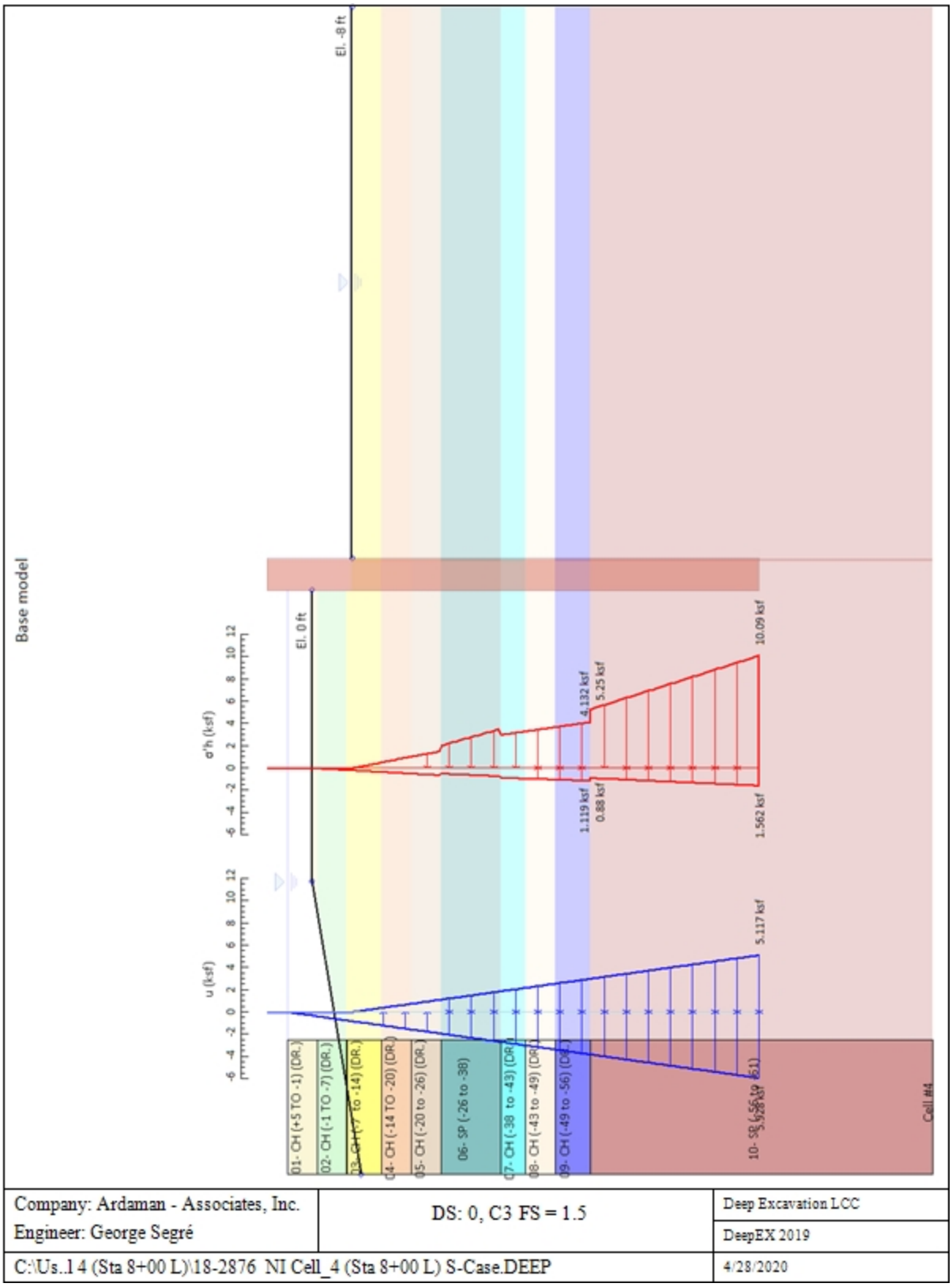
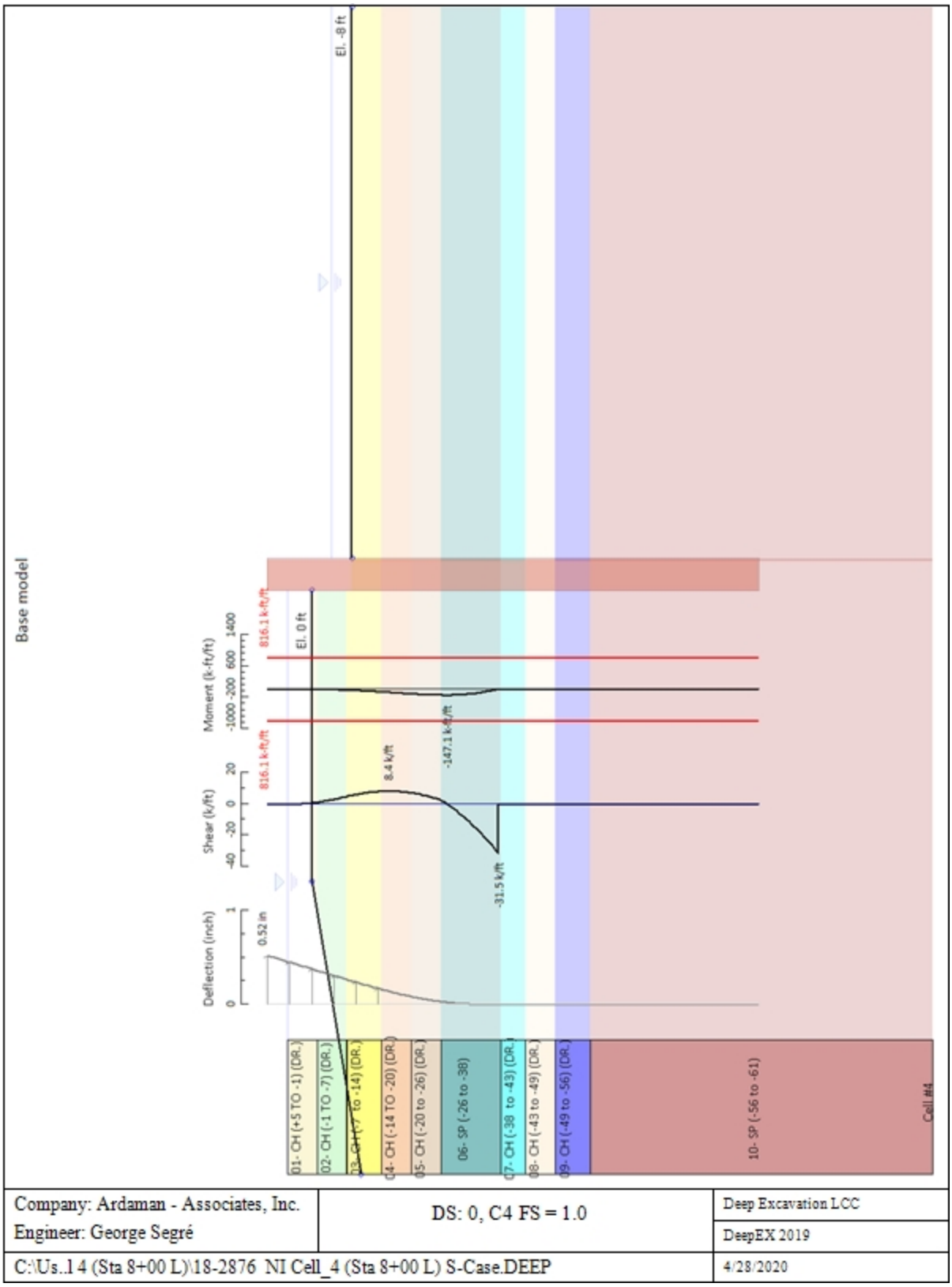
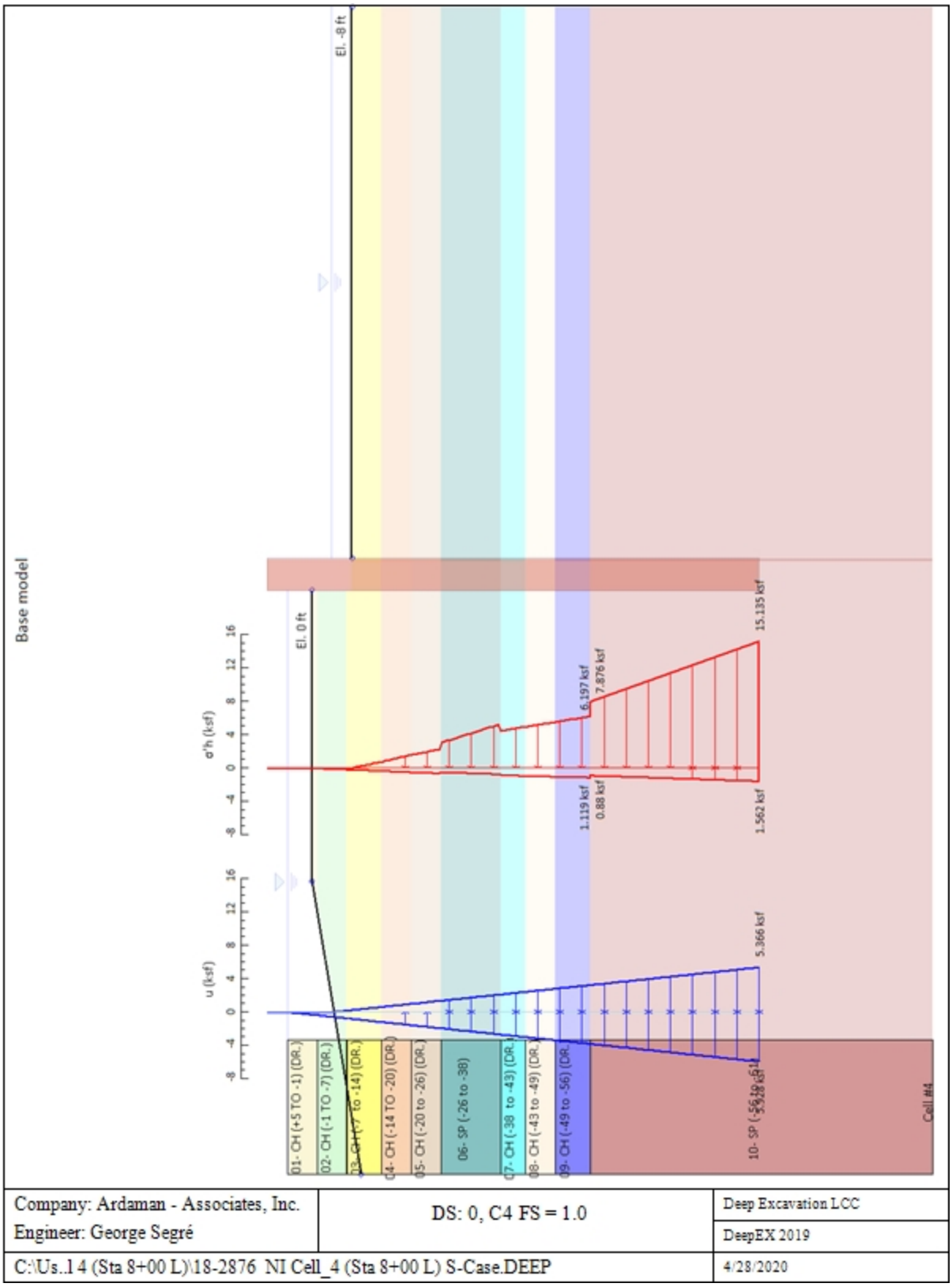


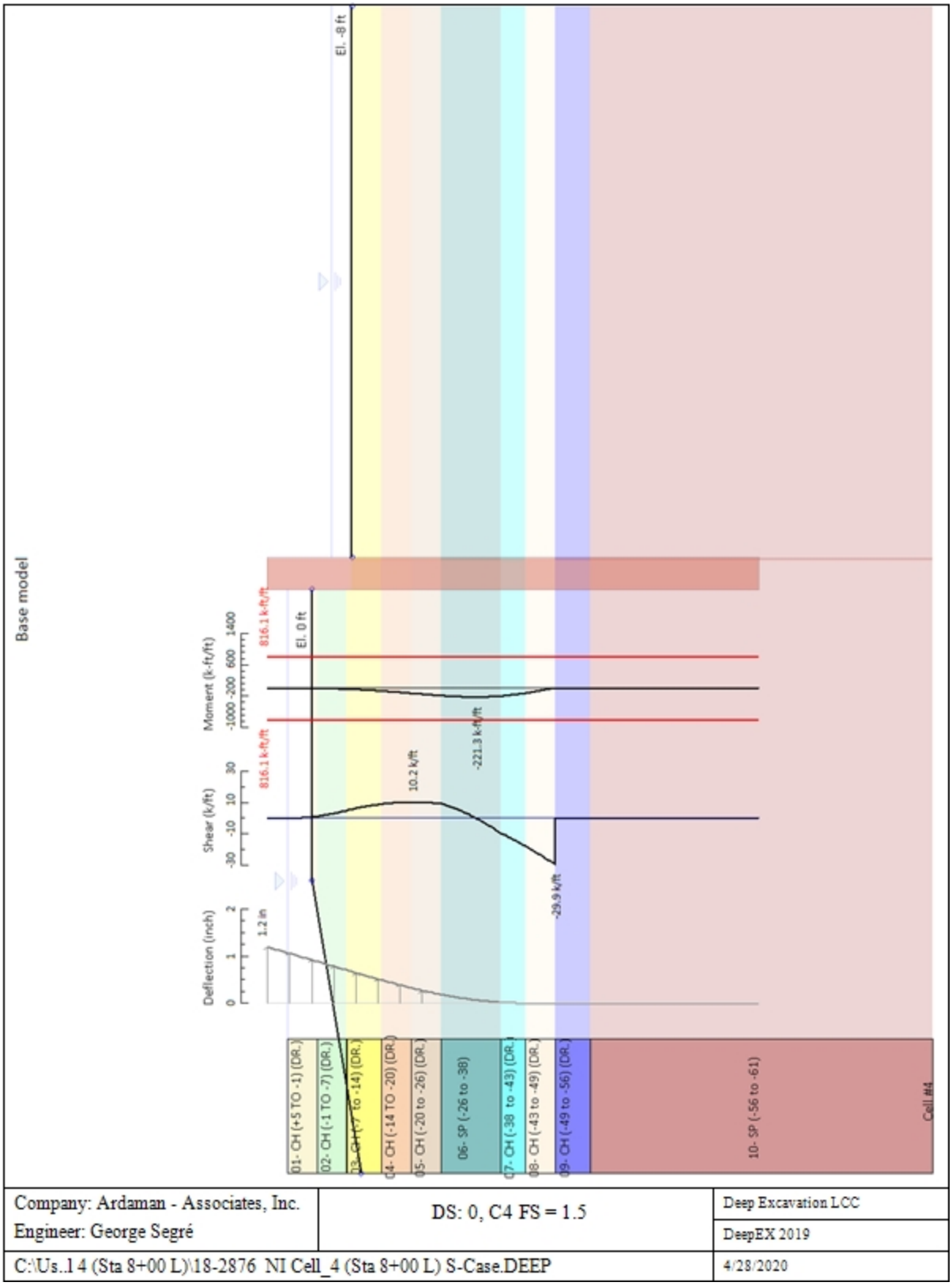
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020



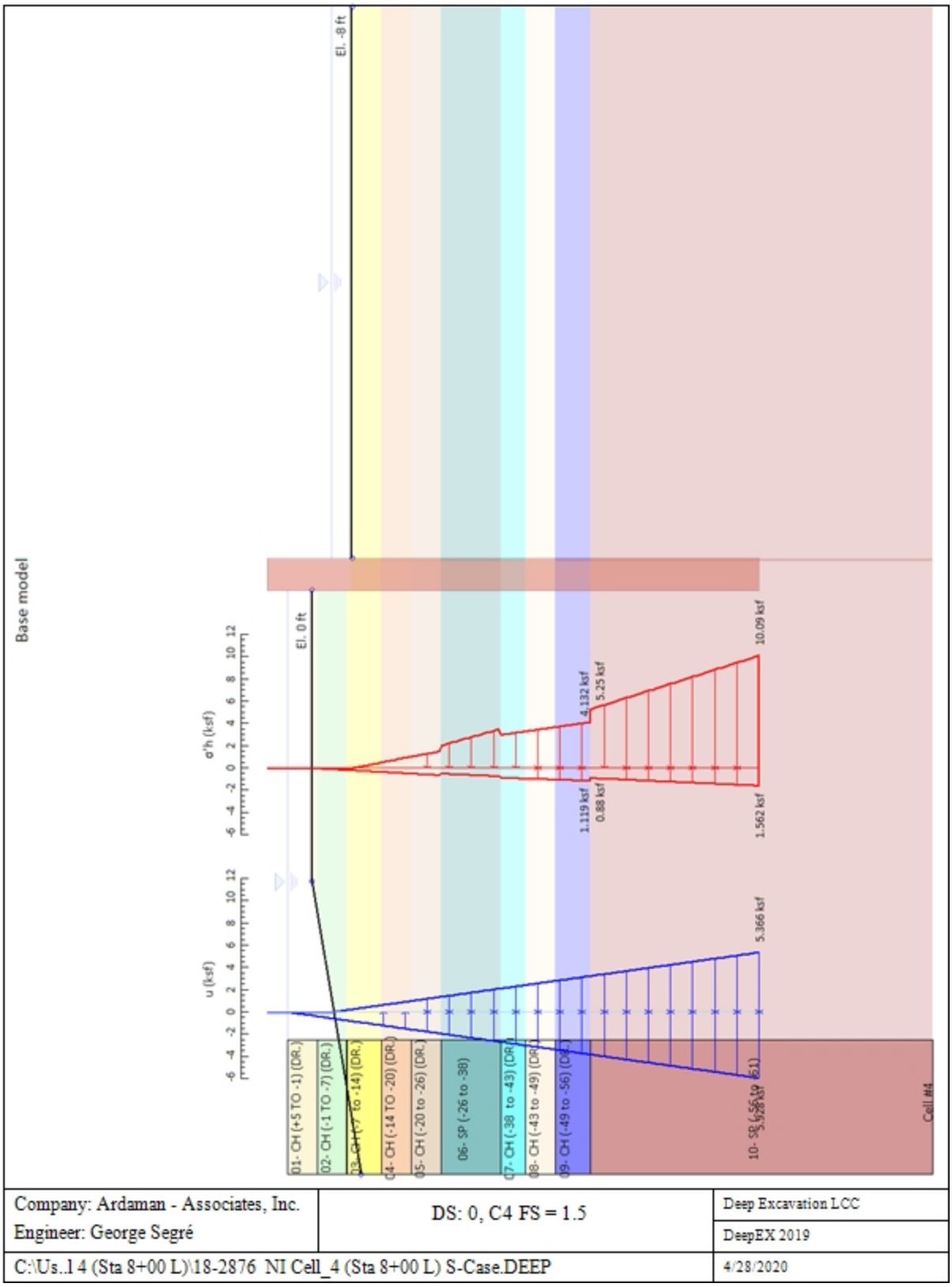
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 L)\18-2876 NI Cell_4 (Sta 8+00 L) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Date: 4/29/2020

Project No.: 18-2876

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #4 @ Sta. 8+00 Right Wall)

Top of Wall =	9.0	ft., NAVD88	Design Tip Elev. =	-21.0 ft., NAVD88
Governing Tip Elev. =	-17.73	ft., NAVD88	Design Length of Sheeting =	30.0 ft.
Length of Sheetting =	26.73	ft.		
Use =	30.0	ft.		

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-2.00	4.82	3.23	0.10
		Open excavation - degraded	9	-8	1.00	1.25	-3.50	--	--	--
Q-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-2.00	4.82	3.23	0.10
		Open excavation - degraded	9	-4	1.00	1.25	-3.50	--	--	--
Q-Case	3	Open excavation - degraded	5	-8	1.00	1.00	0.00	0.40	1.94	0.10
		Open excavation - degraded	5	-8	1.00	1.50	0.00	--	--	--
Q-Case	4	Open excavation - degraded	5	-4	1.00	1.00	0.00	0.40	1.94	0.10
		Open excavation - degraded	5	-4	1.00	1.50	0.00	--	--	--
S-Case	1	Open excavation - degraded	9	-8	1.00	1.00	-11.79	17.12	7.28	0.10
		Open excavation - degraded	9	-8	1.00	1.25	-16.24	--	--	--
S-Case	2	Open excavation - degraded	9	-4	1.00	1.00	-12.78	17.25	6.76	0.10
		Open excavation - degraded	9	-4	1.00	1.25	-17.73	--	--	--
S-Case	3	Open excavation - degraded	5	-8	1.00	1.00	-4.36	1.76	1.64	0.10
		Open excavation - degraded	5	-8	1.00	1.50	-9.32	--	--	--
S-Case	4	Open excavation - degraded	5	-4	1.00	1.00	-4.36	1.76	1.64	0.10
		Open excavation - degraded	5	-4	1.00	1.50	-9.81	--	--	--
						Governing Value:	-17.73	17.25	7.28	0.10

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:32:36 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	0	0	1000	0	0	300	3	1	1	1	1	True	EXP	
02- CH (-1 TO	116	116	0	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	0	0	500	0	0	150	3	1	1	1	1	True	Linear	
04- CH (-14 T	123	123	0	0	940	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-20 to	115	115	0	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	0	0	2500	0	0	300	3	0.31	3.26	0.33	0.33	True	Linear	
08- CH (-43 to	100	10	0	0	3000	0	0	300	3	1	1	1	1	True	Linear	
09- CH (-49 to	100	100	0	0	3500	0	0	300	3	1	1	1	1	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	1	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	1	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	1	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	1	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	1	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	1	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	1	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

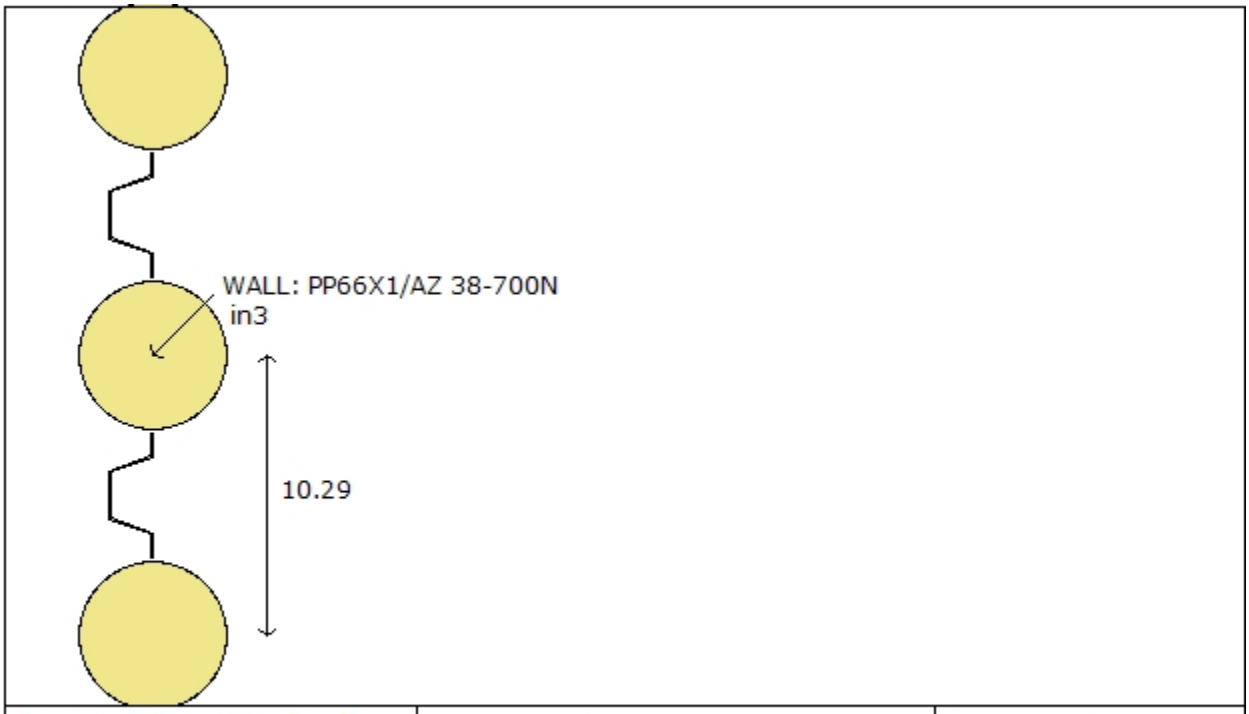
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
10	01- CH (+5 TO	1	1
-1	02- CH (-1 TO -	1	1
-7	03- CH (-7 to -	1	1
-14	04- CH (-14 TO	1	1
-20	05- CH (-20 to	1	1
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	1
-43	08- CH (-43 to	1	1
-49	09- CH (-49 to	1	1
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -91 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	3.851	3.851	4.79
Stage 1	Simple span	N/A	1.6	3.081	3.081	3.832
Stage 2	Simple span	N/A	1.6	4.253	4.253	5.29
Stage 3	Simple span	N/A	1.6	3.402	3.402	4.232
Stage 4	Simple span	N/A	1.6	4.742	4.742	5.636
Stage 5	Simple span	N/A	1.6	3.161	3.161	3.758
Stage 6	Simple span	N/A	1.6	5.444	5.444	6.394
Stage 7	Simple span	N/A	1.6	3.629	3.629	4.262

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

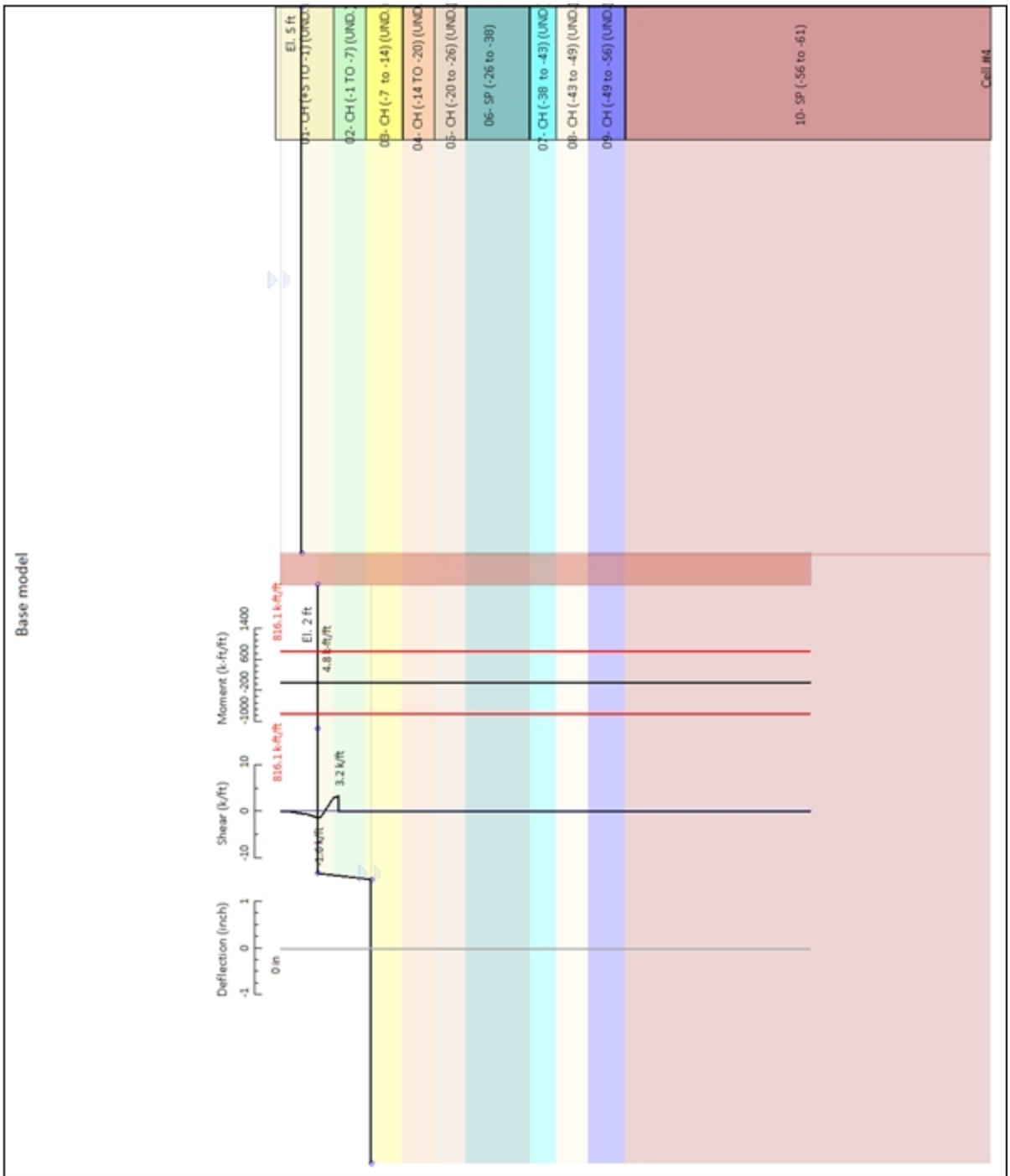
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
4.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
3.2 k/ft
-10.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
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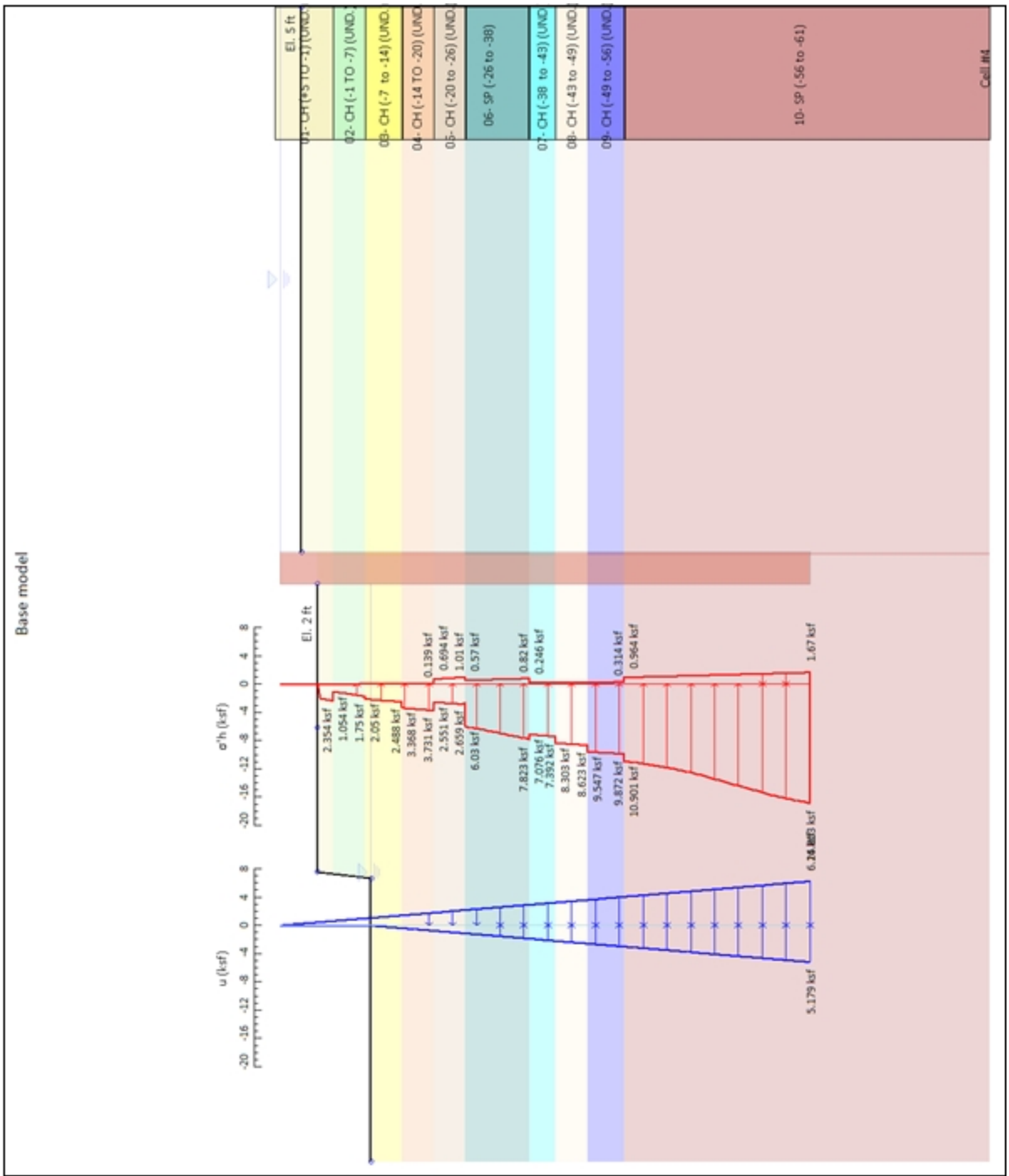
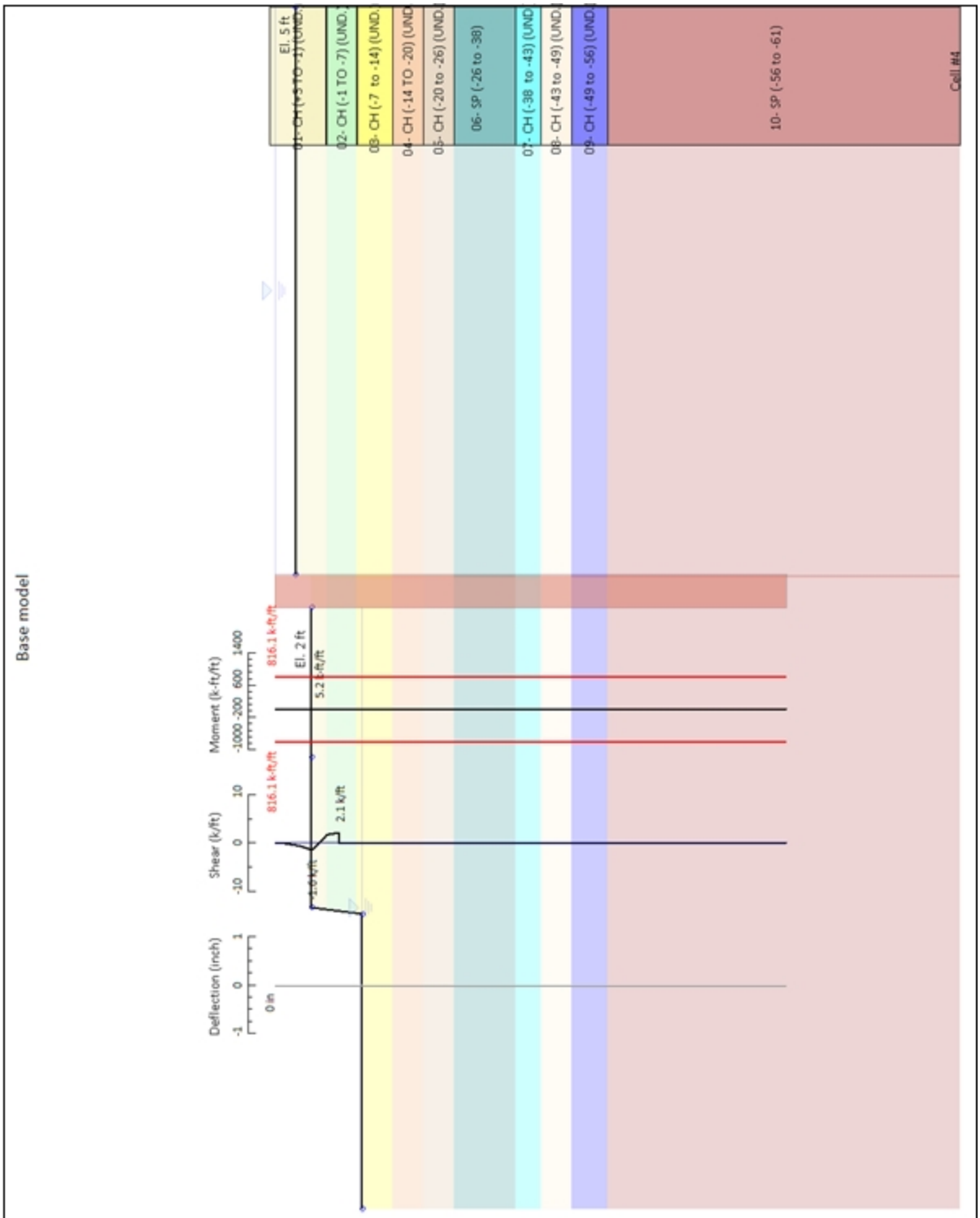


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
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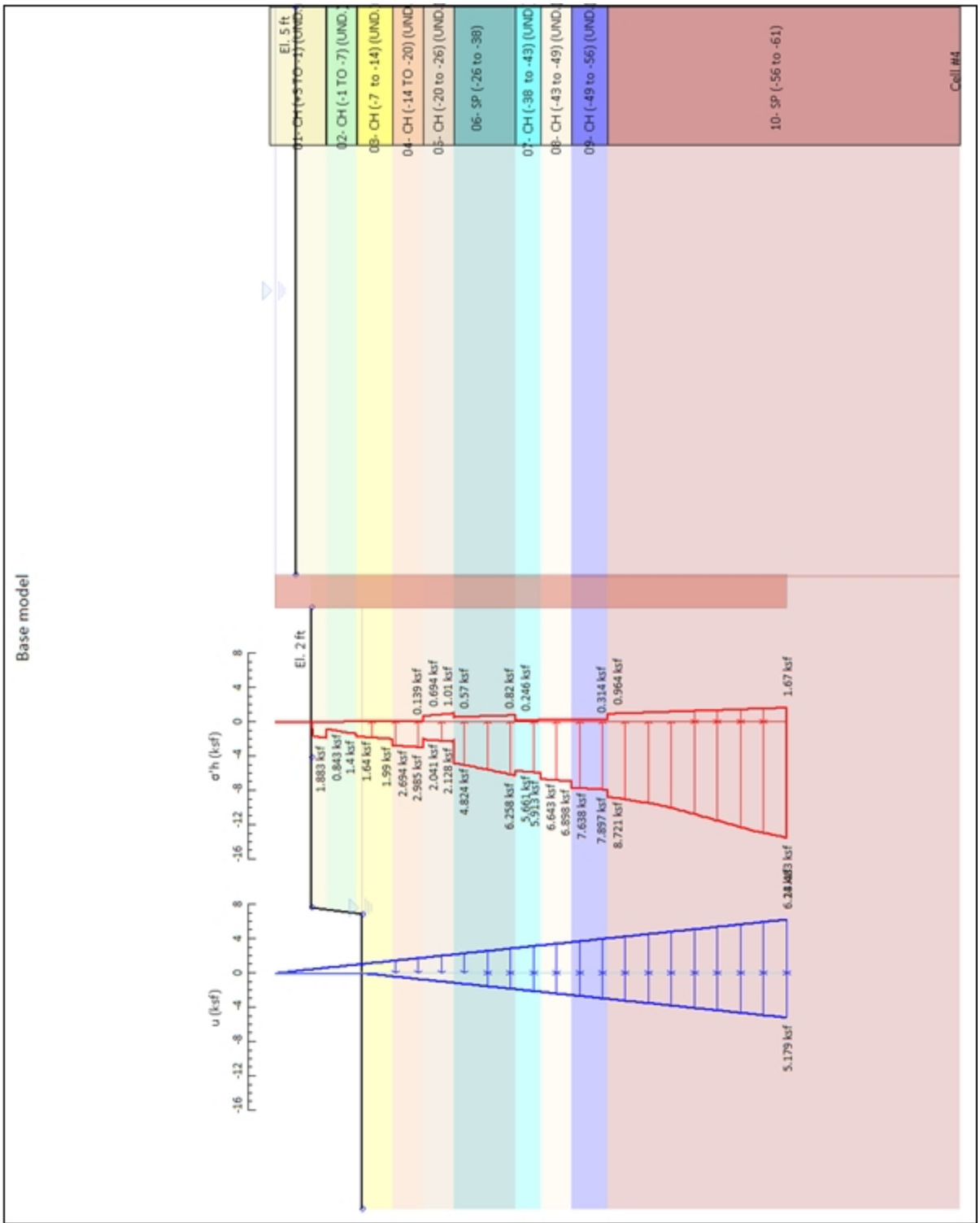
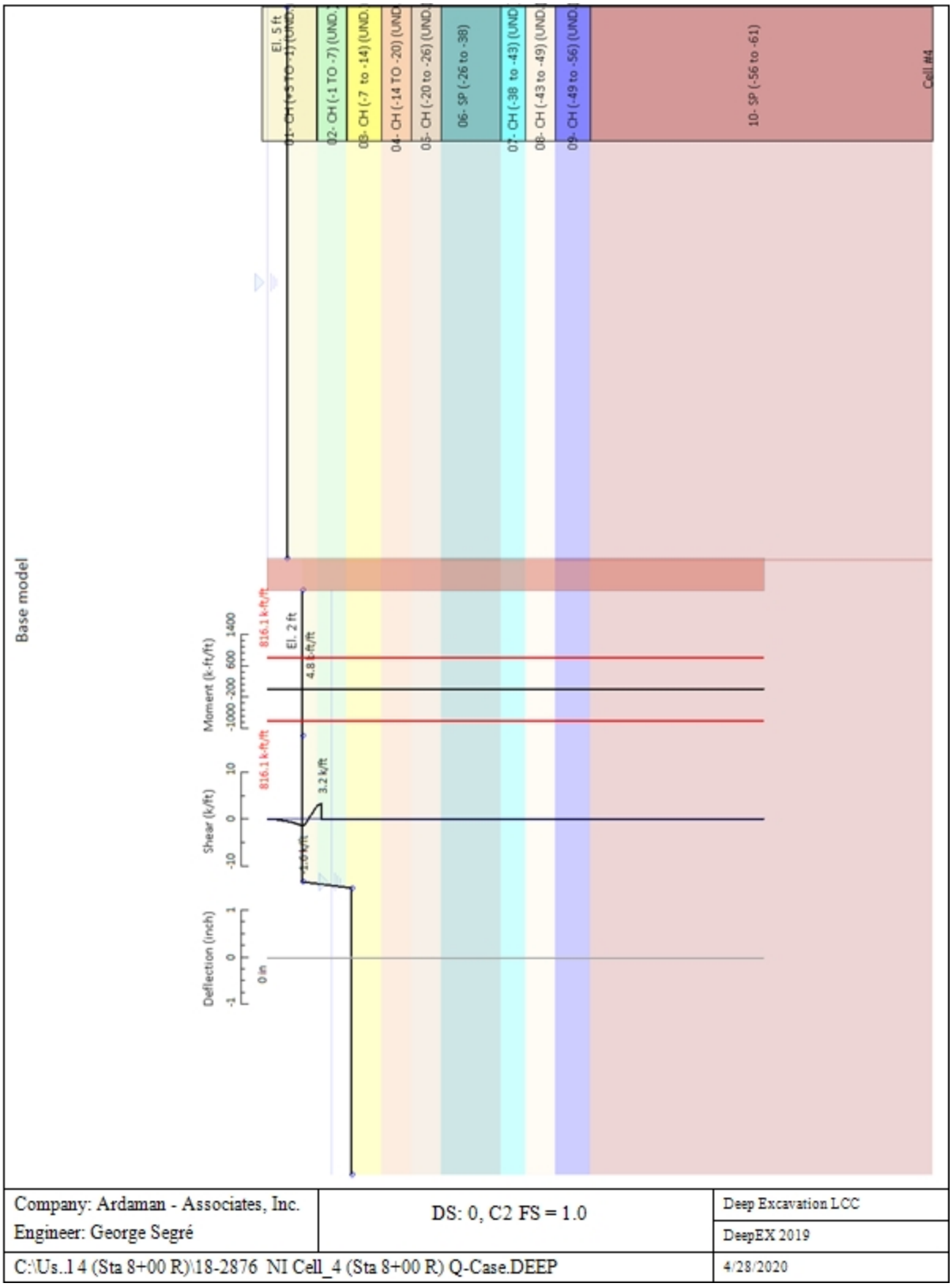
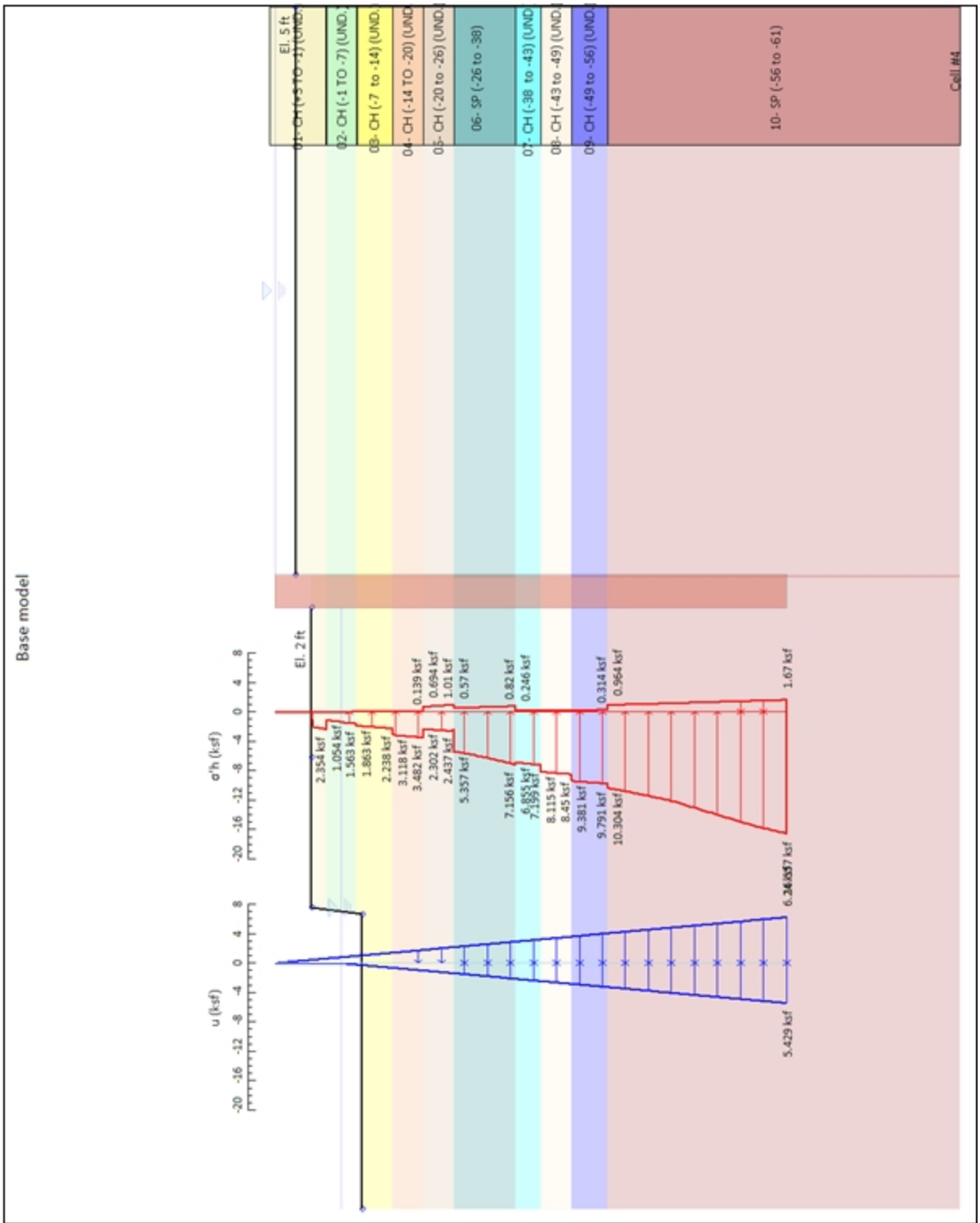
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
5.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

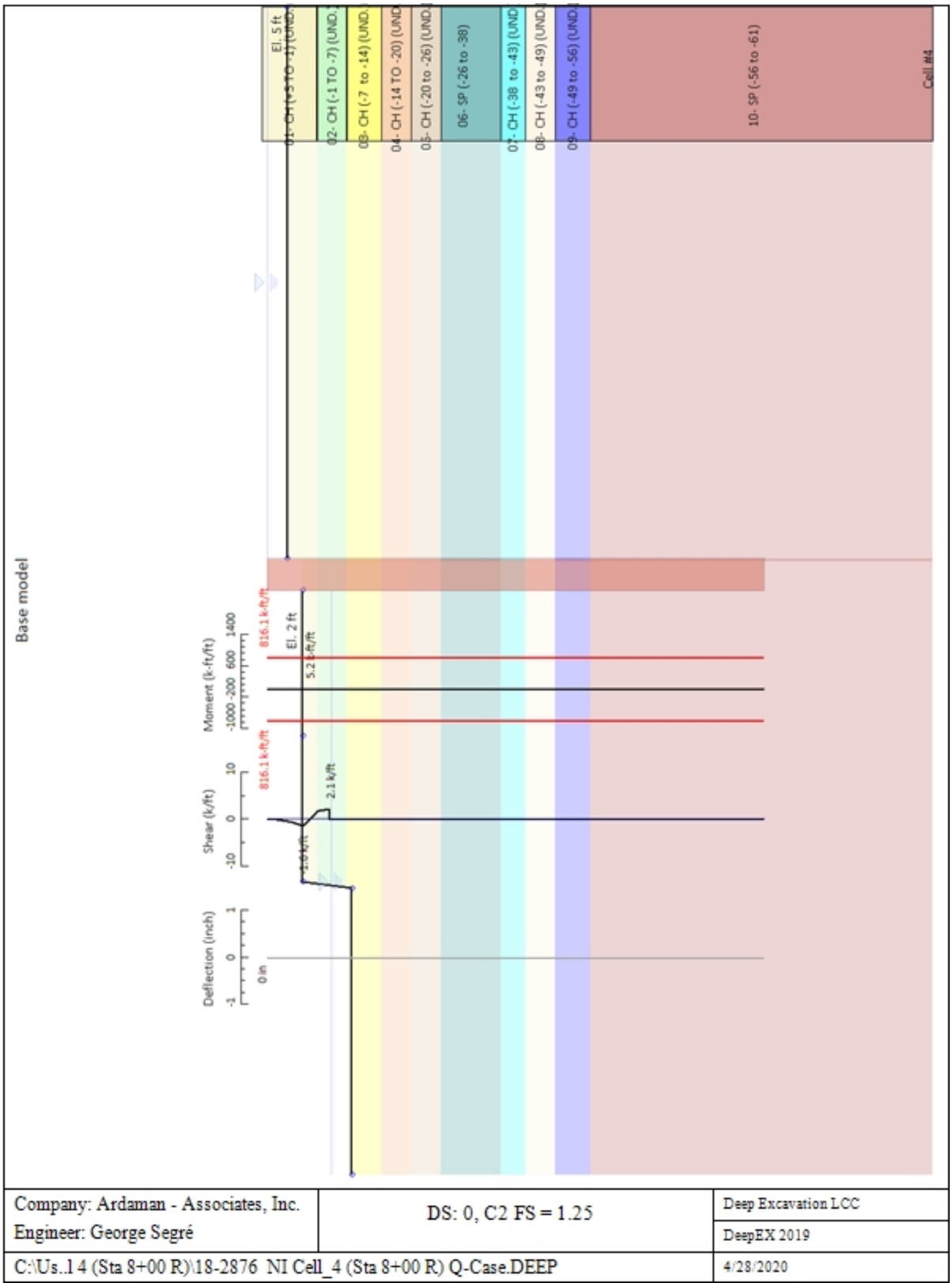


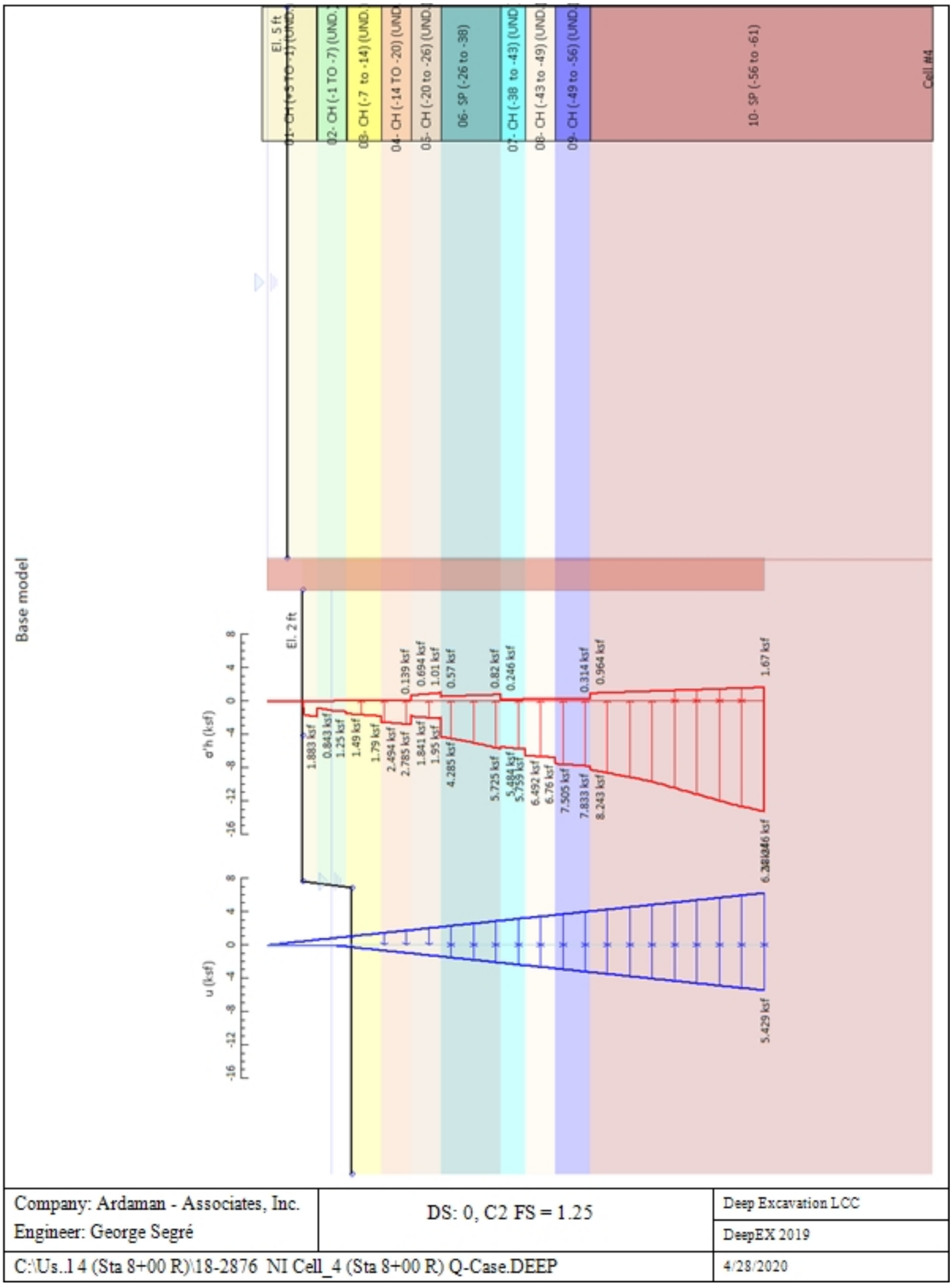
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
4.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
3.2 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

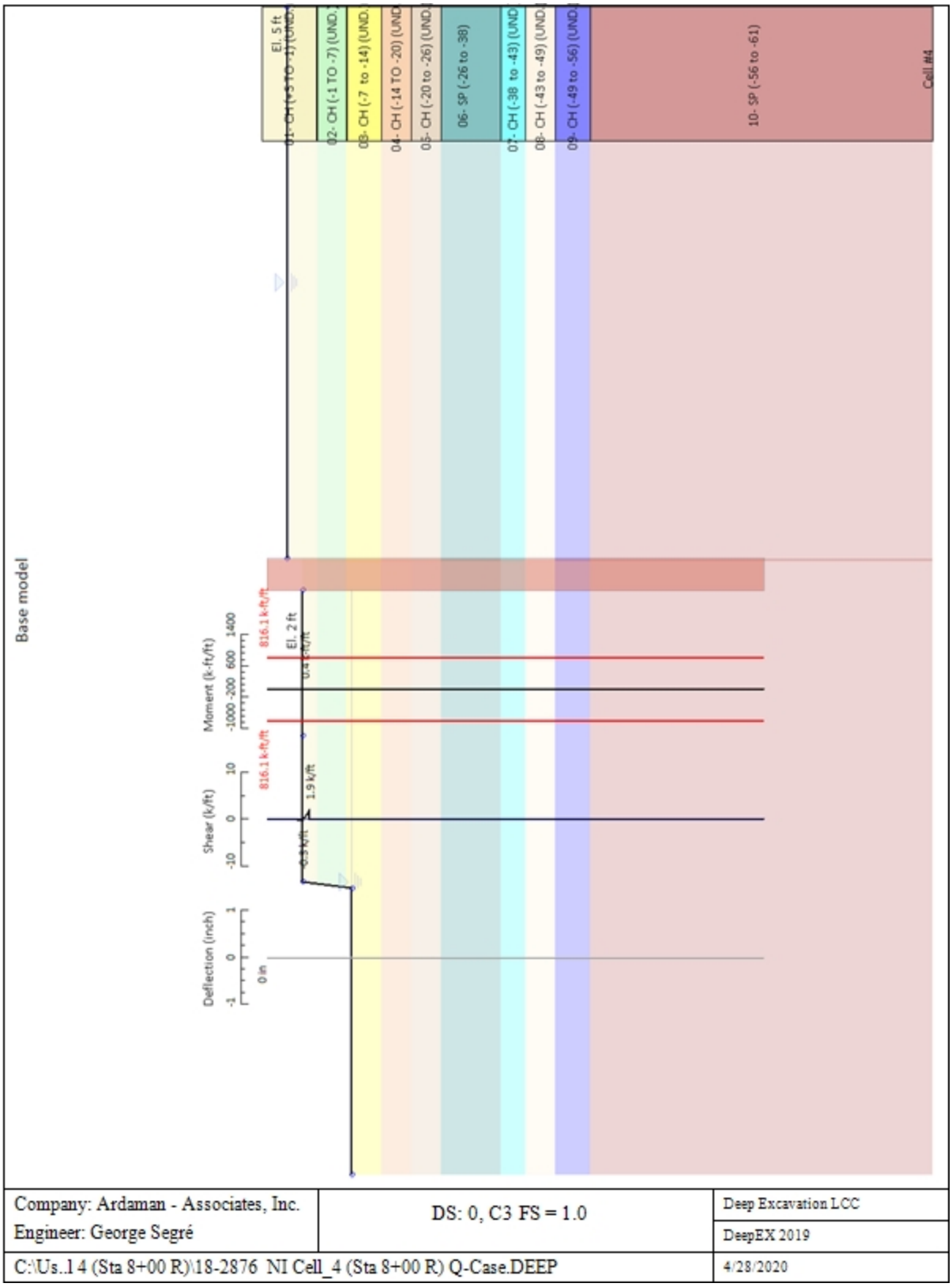


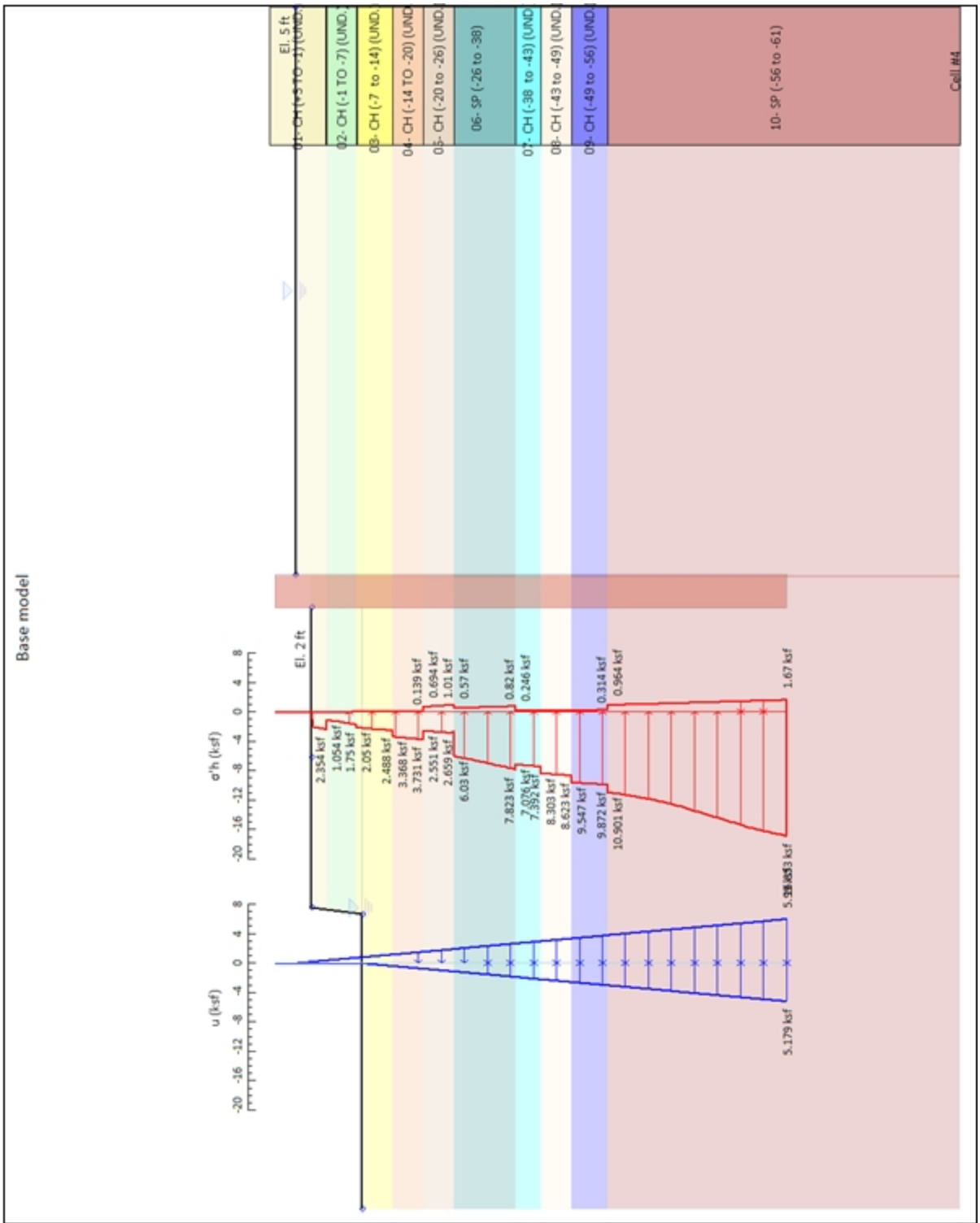
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
5.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-1.0 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

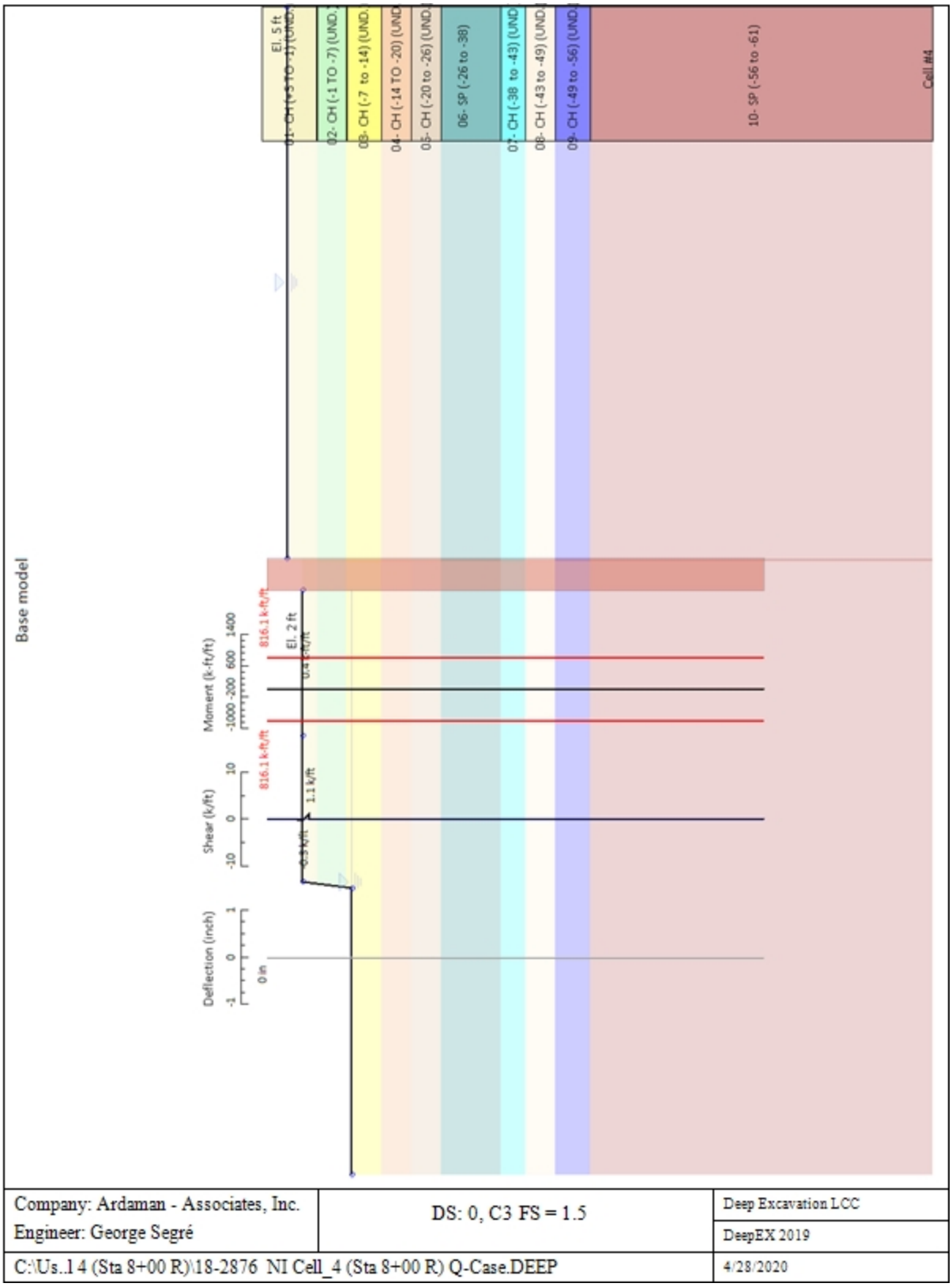


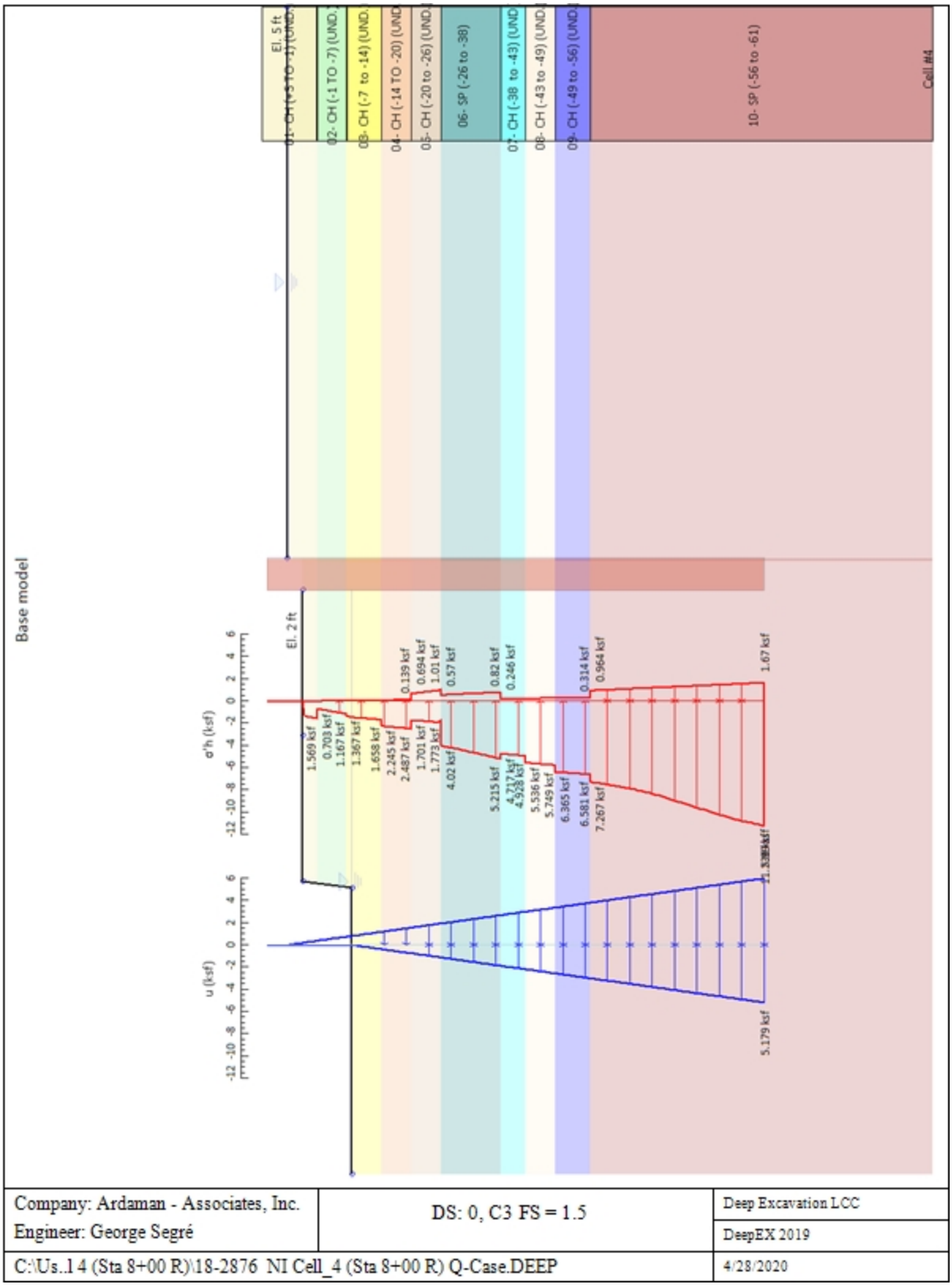
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.9 k/ft
-0.1 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

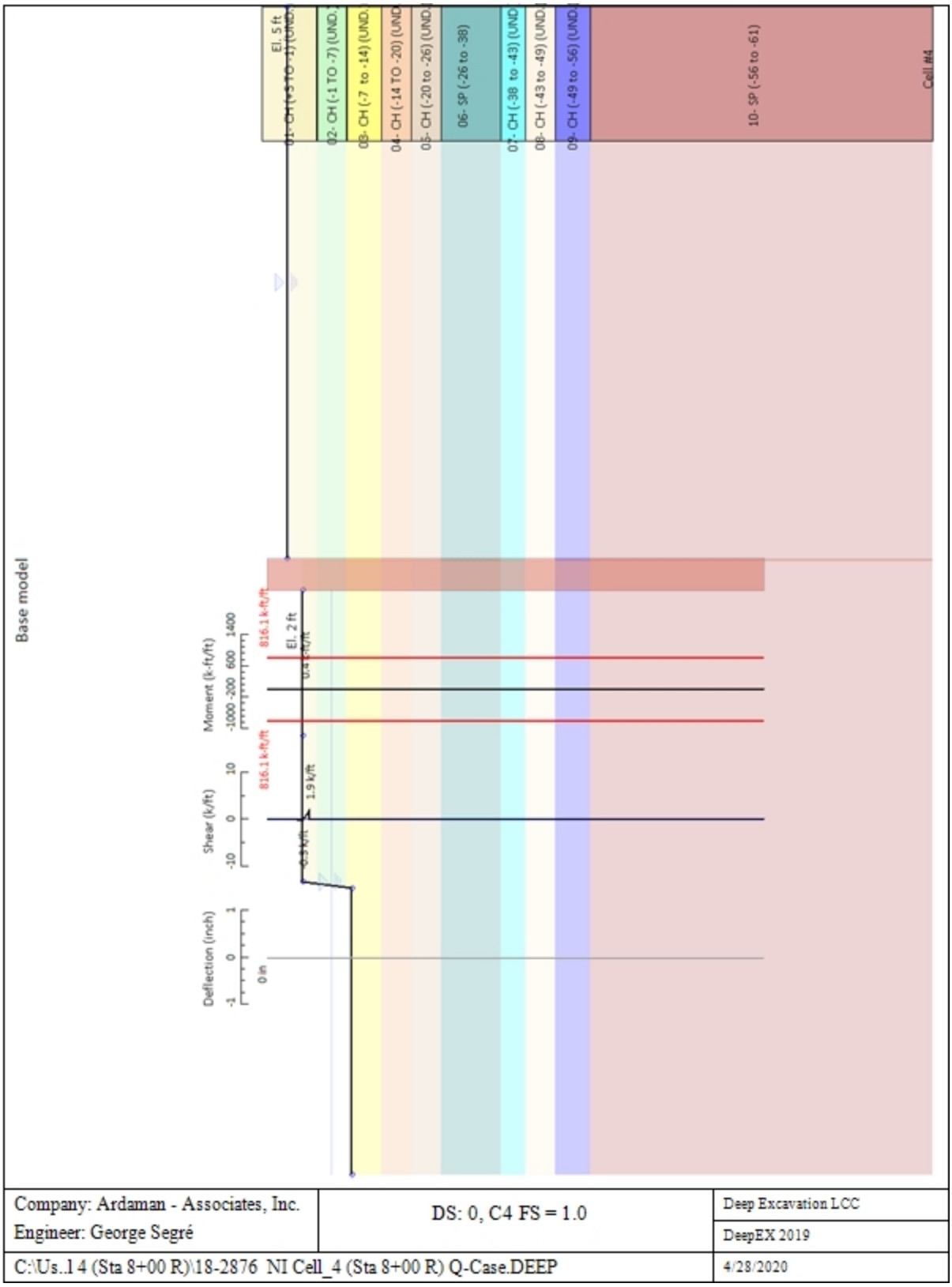


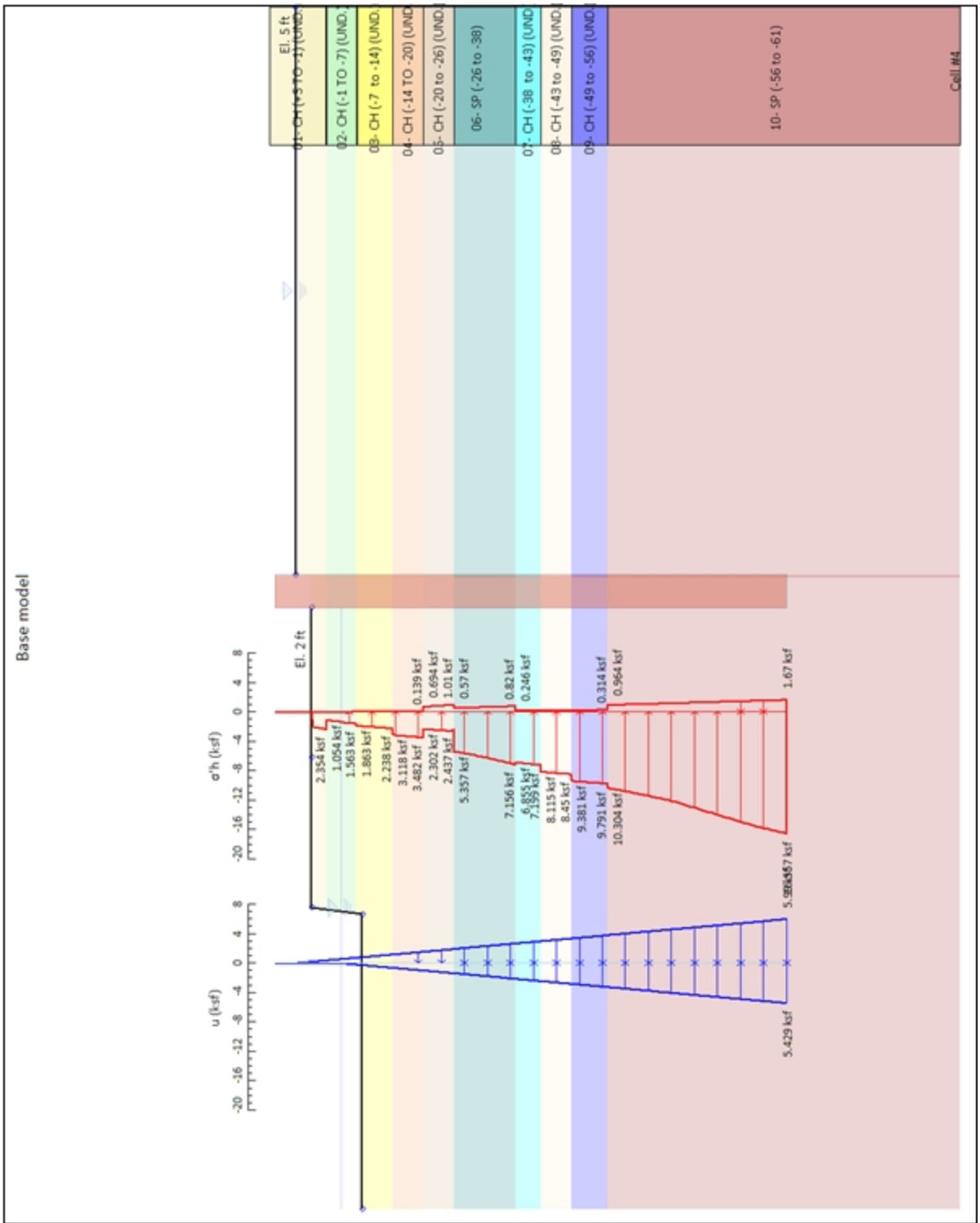
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.1 k/ft
0.3 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020

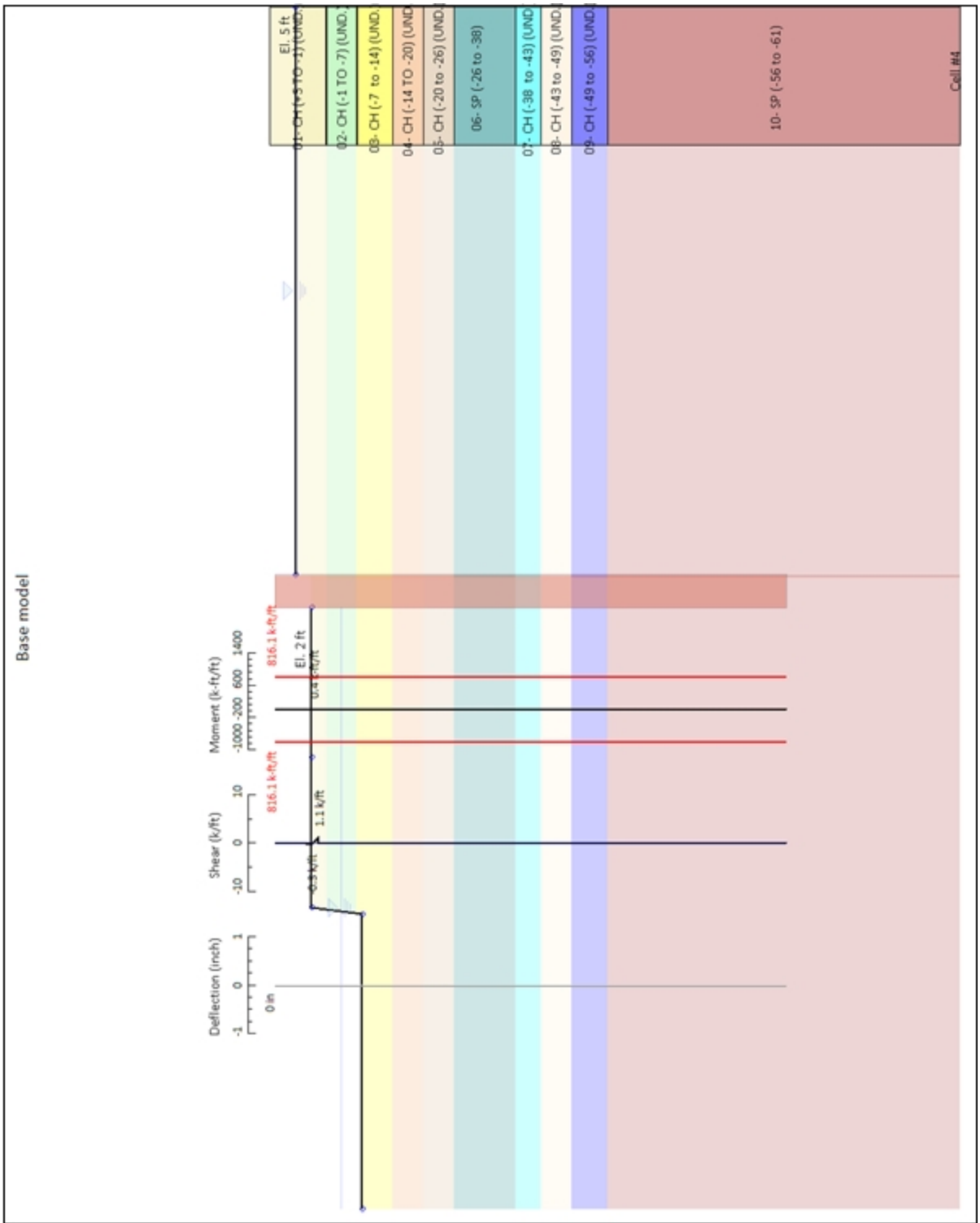


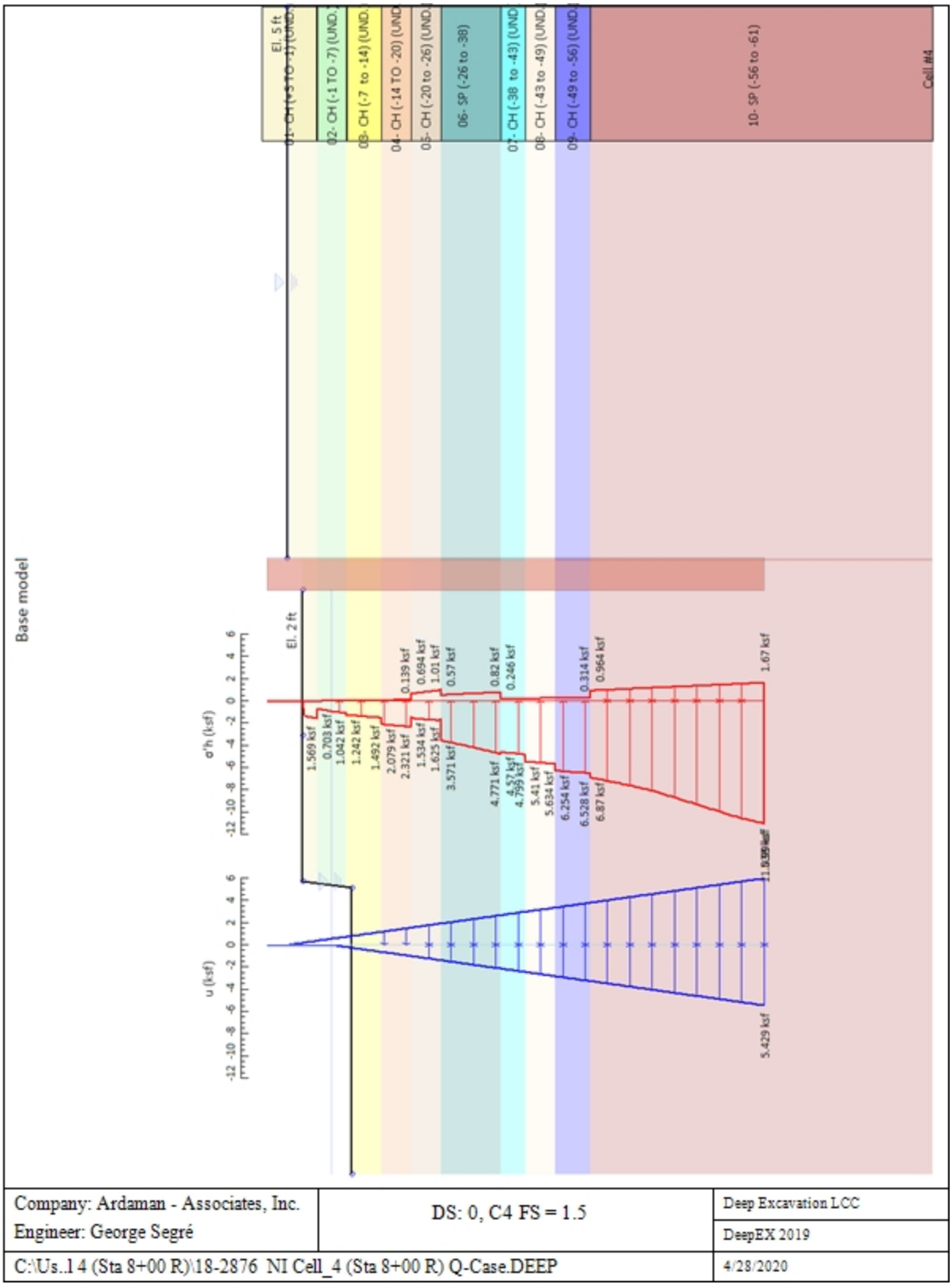
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
El. 5 ft
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.9 k/ft
-0.1 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (UND.)
02- CH (-1 TO -7) (UND.)
03- CH (-7 to -14) (UND.)
04- CH (-14 TO -20) (UND.)
05- CH (-20 to -26) (UND.)
06- SP (-26 to -38)
07- CH (-38 to -43) (UND.)
08- CH (-43 to -49) (UND.)
09- CH (-49 to -56) (UND.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
0.4 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.1 k/ft
-0.9 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:49:56 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 4 Sections\Cell 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- CH (+5 TO	118	118	26	0	1000	26	26	300	3	0.39	2.56	0.39	2.56	True	EXP	
02- CH (-1 TO	116	116	23	0	350	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- CH (-7 to	116	116	23	0	500	23	23	150	3	0.44	2.28	0.44	2.28	True	Linear	
04- CH (-14 T	123	123	23	0	940	23	23	521.92	3	0.44	2.28	0.44	2.28	True	Linear	
05- CH (-20 to	115	115	23	0	350	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-26 to	125	125	30	0	N/A	N/A	N/A	626.3	3	0.33	3	N/A	N/A	True	Linear	
07- CH (-38 t	100	100	26	0	2500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
08- CH (-43 to	100	10	26	0	3000	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
09- CH (-49 to	100	100	26	0	3500	26	26	300	3	0.39	2.56	0.39	2.56	True	Linear	
10- SP (-56 to	128	128	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- CH (+5 TO	0.4	0.1	0	0.562	0.5	1	0	7.2	4.8	20	-
02- CH (-1 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- CH (-7 to	0.4	0.1	0	0.609	0.5	-	-	13	8.7	20	-
04- CH (-14 T	0.35	0.1	0	0.609	0.5	-	-	21.8	14.5	30	-
05- CH (-20 to	0.45	0.1	0	0	0.5	-	-	18.1	12.1	30	-
06- SP (-26 to	0.35	-	-	0.5	0.5	-	-	29	19.3	70	-
07- CH (-38 t	0.35	0.1	0	0.562	0.8	-	-	0	0	0	-
08- CH (-43 to	0.3	0.1	0	0.562	0.8	-	-	0	0	0	-
09- CH (-49 to	0.25	0.1	0	0.562	0.8	-	-	0	0	0	-
10- SP (-56 to	0.35	-	-	0.47	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

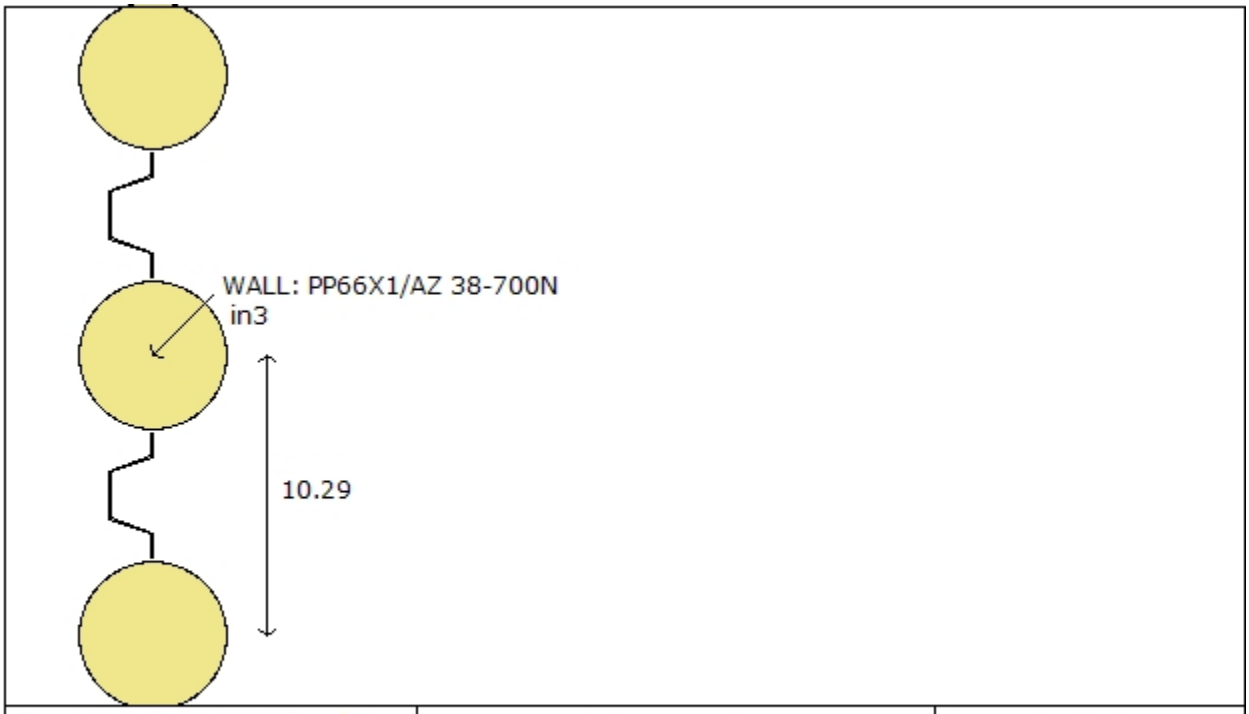
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Cell #4, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- CH (+5 TO	1	0.56
-1	02- CH (-1 TO -	1	0
-7	03- CH (-7 to -	1	0.61
-14	04- CH (-14 TO	1	0.61
-20	05- CH (-20 to	1	0
-26	06- SP (-26 to -	1	0.5
-38	07- CH (-38 to	1	0.56
-43	08- CH (-43 to	1	0.56
-49	09- CH (-49 to	1	0.56
-56	10- SP (-56 to -	1	0.47

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.
Concrete capacities are calculated with ACI 318-11

Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.936	2.936	3.682
Stage 1	Simple span	N/A	1.6	2.349	2.349	2.945
Stage 2	Simple span	N/A	1.6	3.095	3.095	3.987
Stage 3	Simple span	N/A	1.6	2.476	2.476	3.19
Stage 4	Simple span	N/A	1.6	3.506	3.506	4.256
Stage 5	Simple span	N/A	1.6	2.338	2.338	2.837
Stage 6	Simple span	N/A	1.6	3.799	3.799	4.706
Stage 7	Simple span	N/A	1.6	2.533	2.533	3.138

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

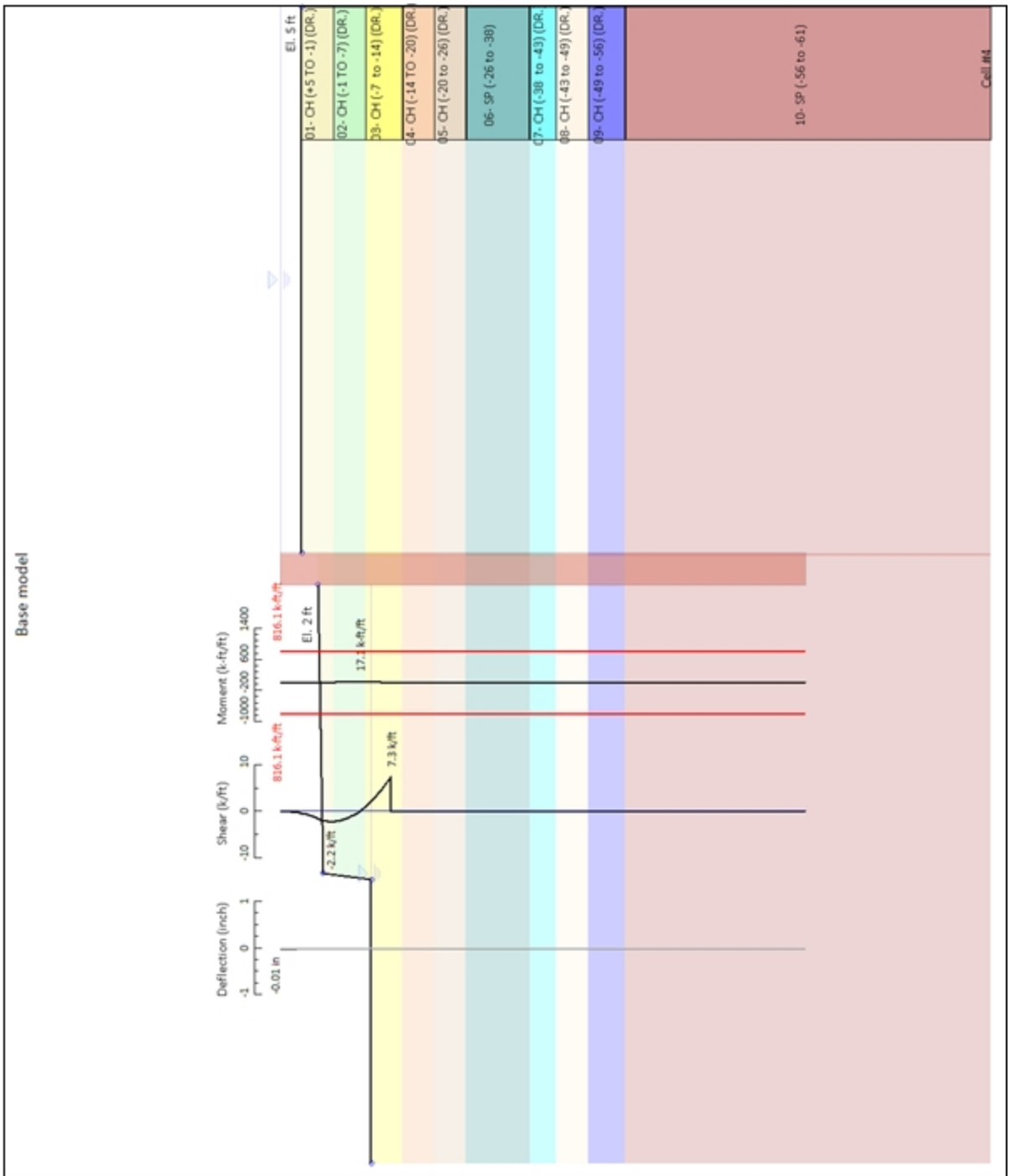
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

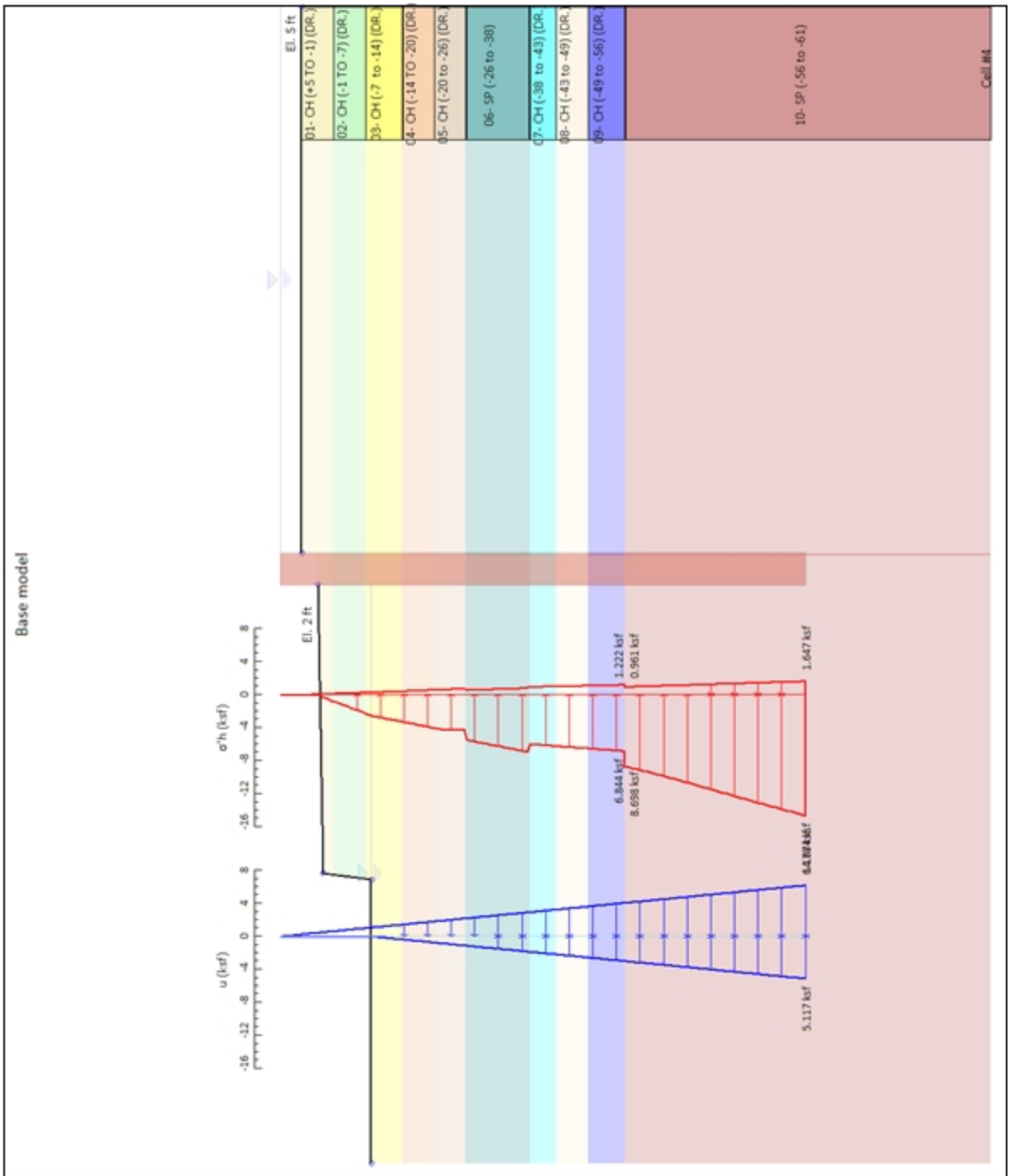
Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
17.1 k-ft/ft
Shear (k/ft)
-10 0 10
816.1 k/ft
7.3 k/ft
-2.2 k/ft
Deflection (inch)
-1 0 1
-0.01 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
01- CH (+5 TO -1) (DR.)
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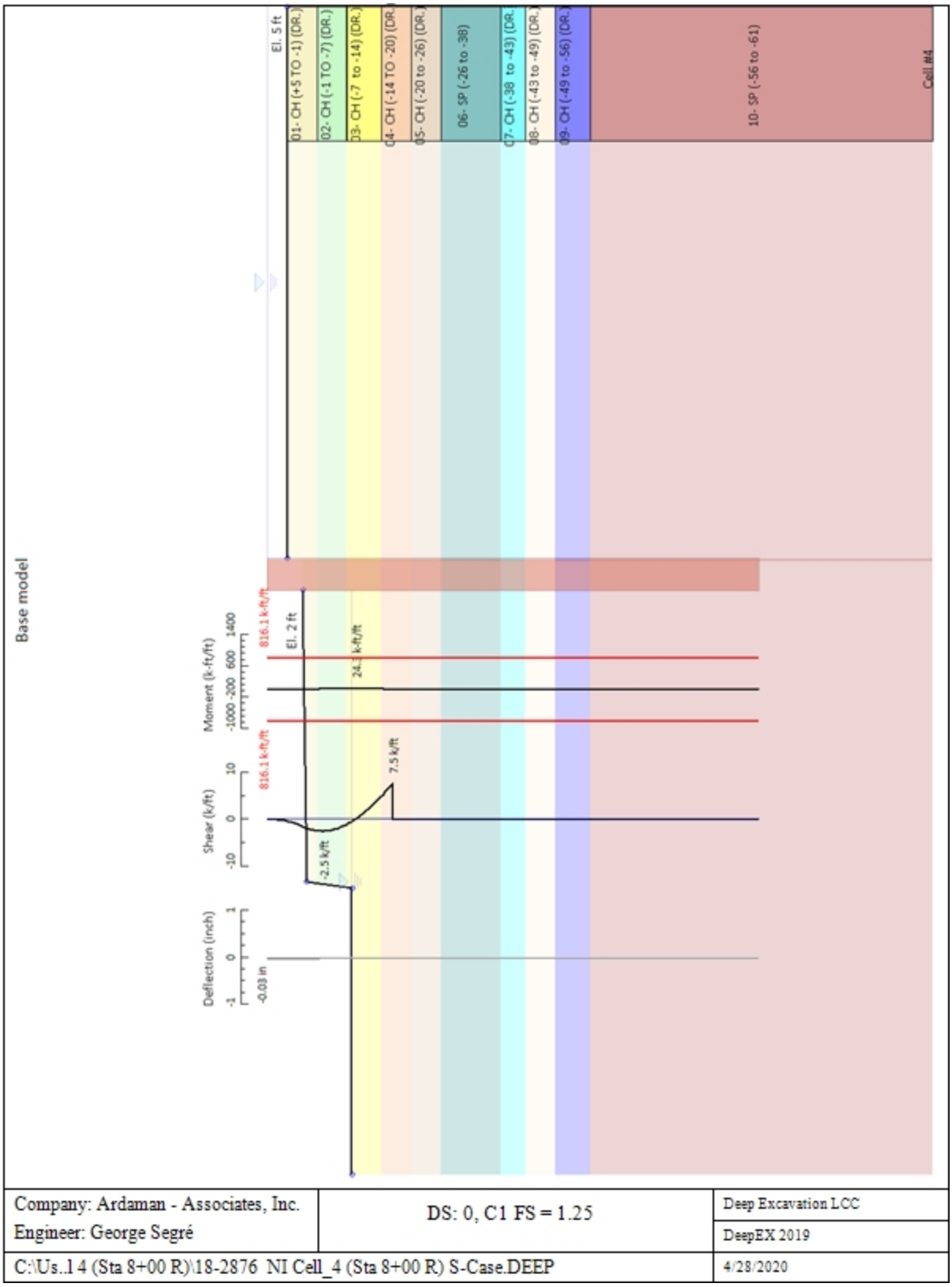
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.844 ksf
8.698 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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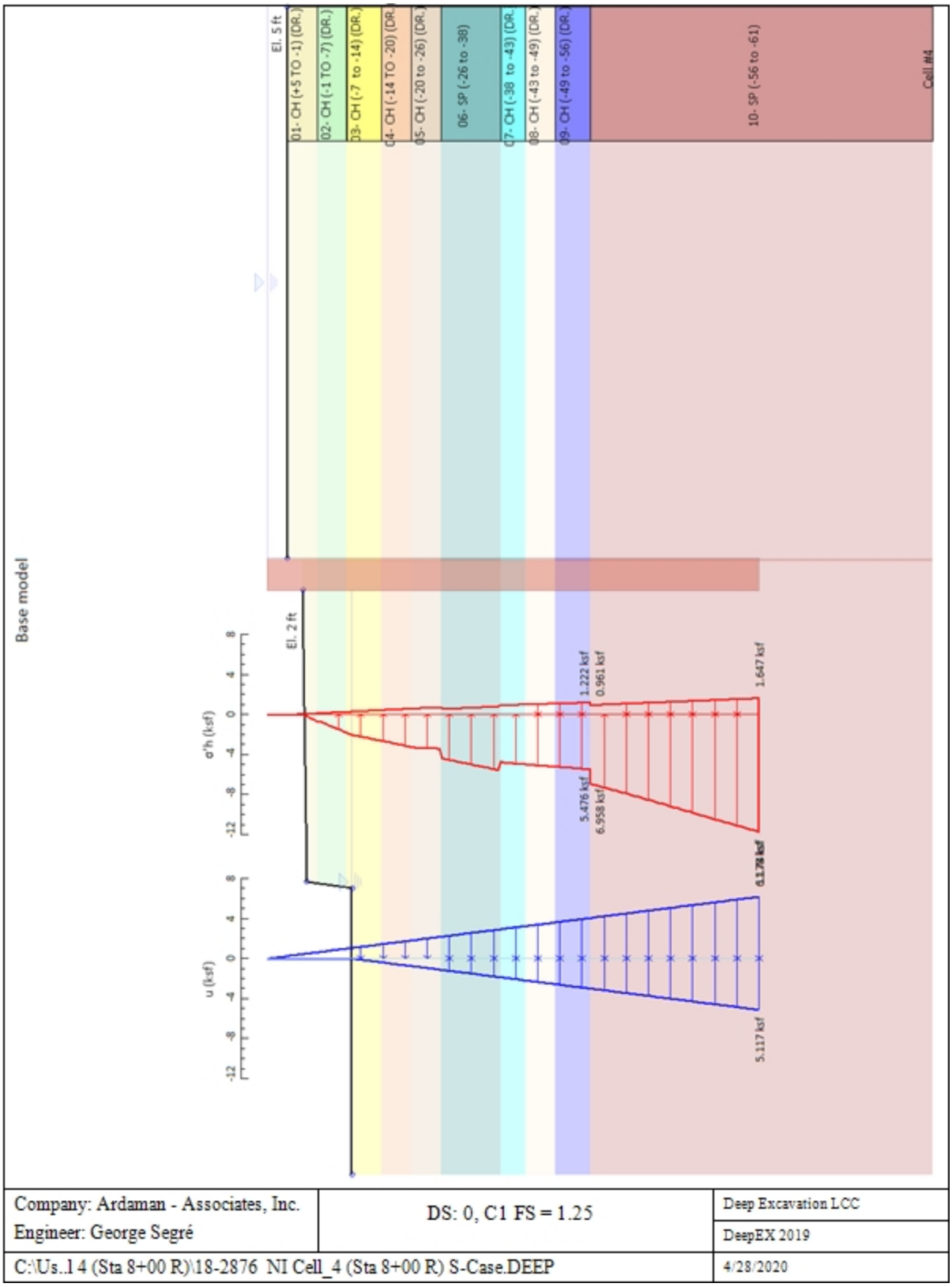
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
24.1 k-ft/ft
Shear (k/ft)
-10 0 10
7.5 k/ft
-2.5 k/ft
Deflection (inch)
-1 0 1
-0.03 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
5.476 ksf
6.958 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
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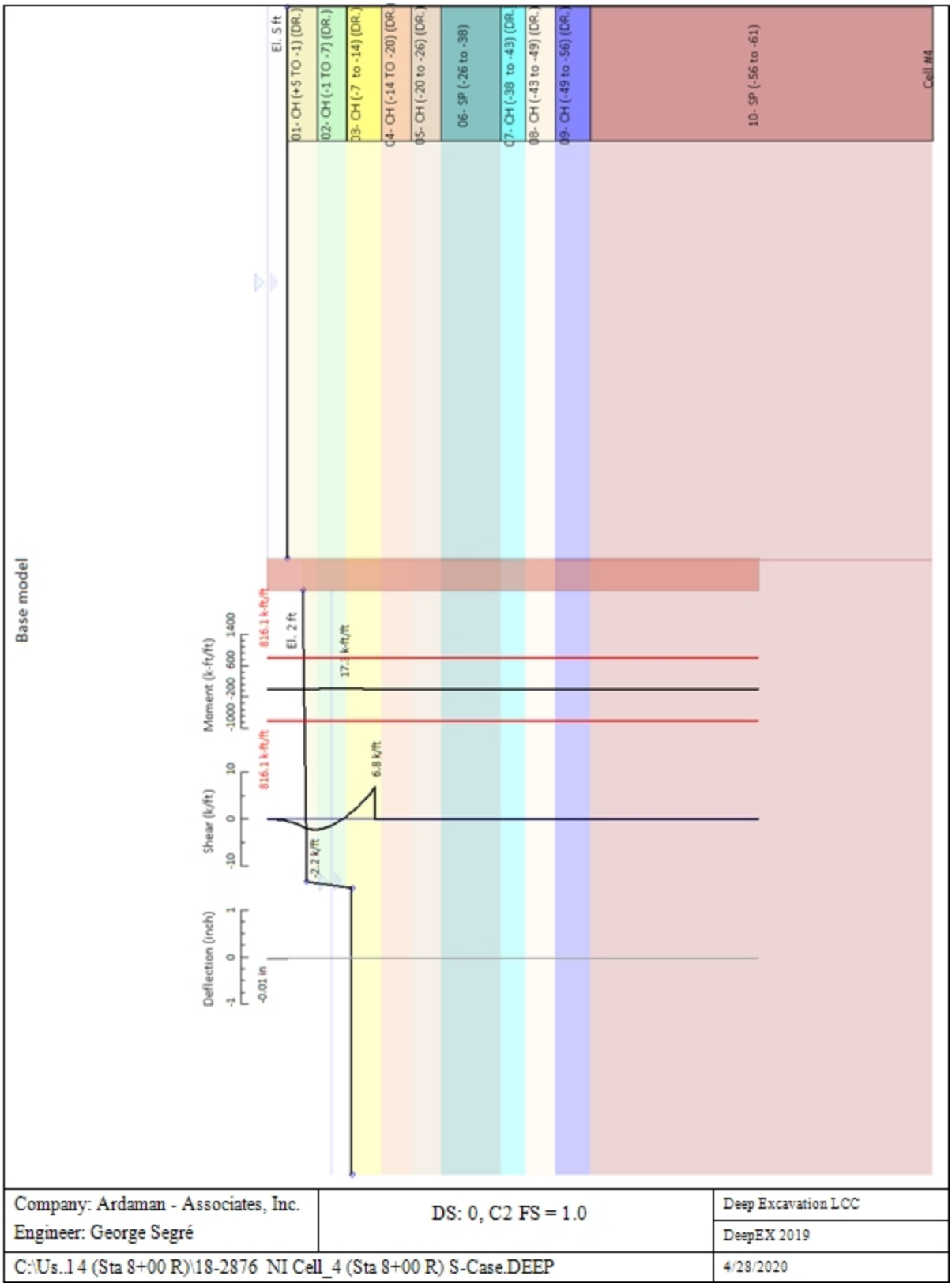
4/28/2020


Base model
El. 5 ft
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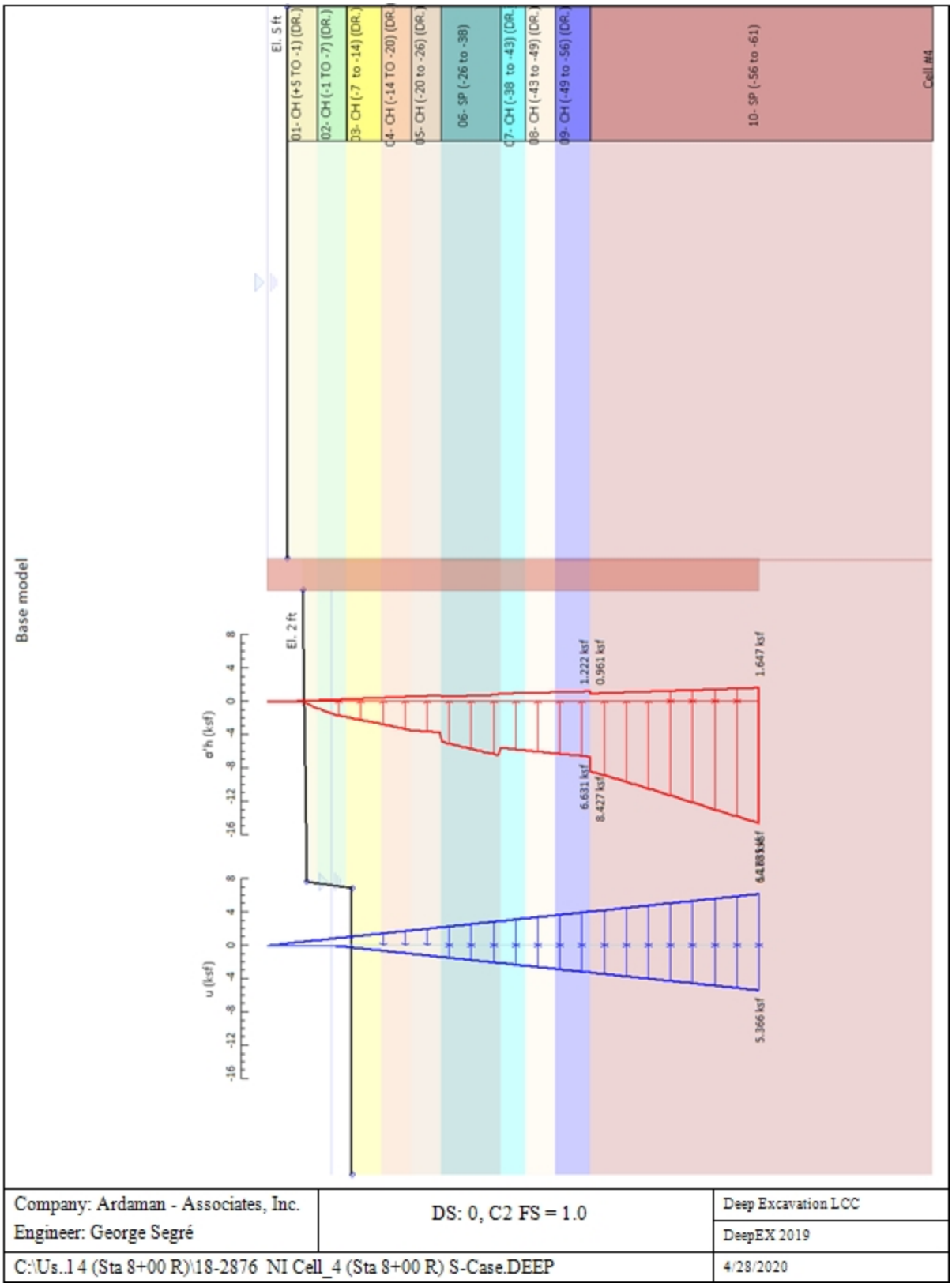
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
17.2 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
6.8 k/ft
-7.2 k/ft
Deflection (inch)
-1 0 1
-0.01 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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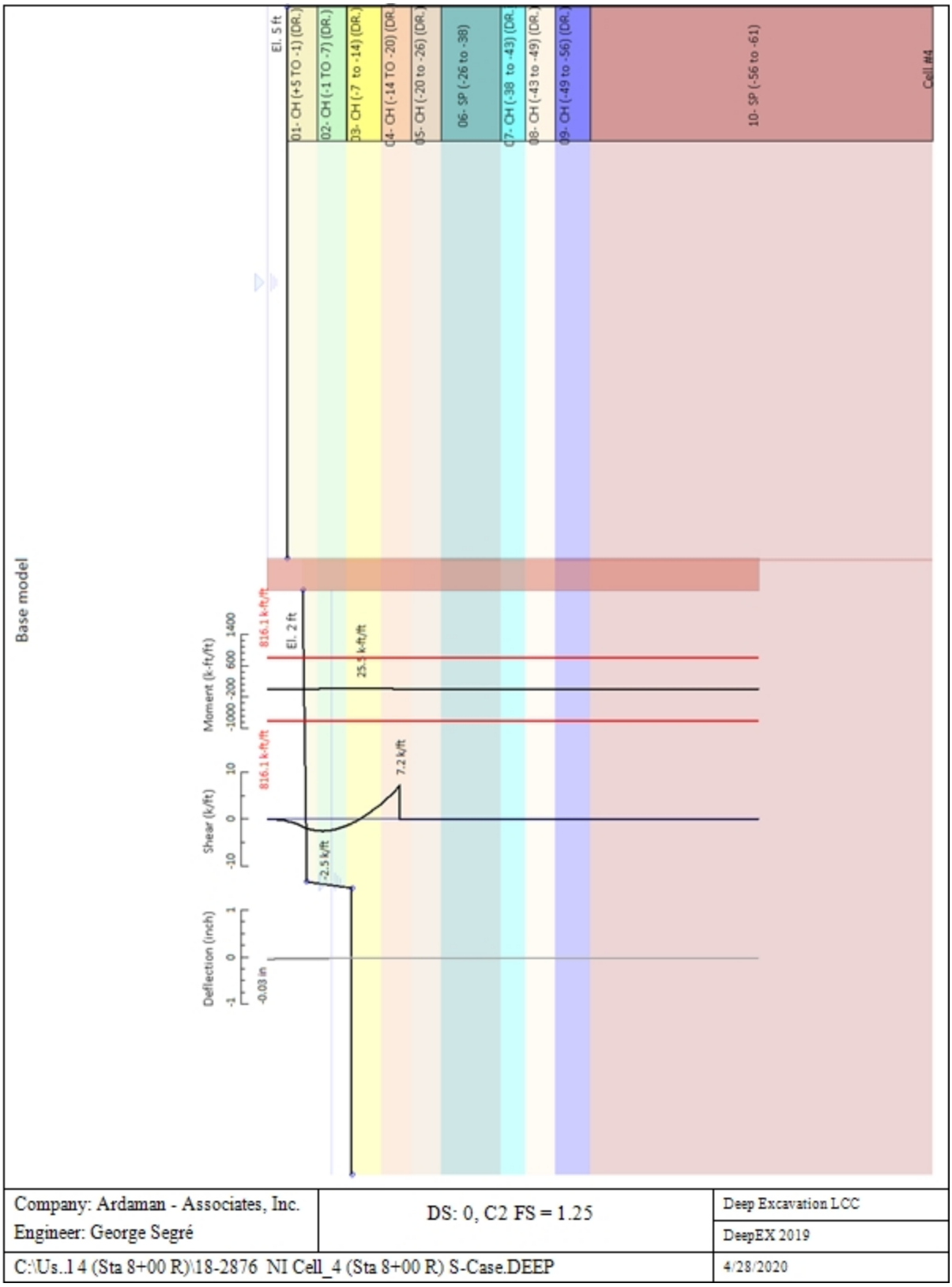
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.631 ksf
8.427 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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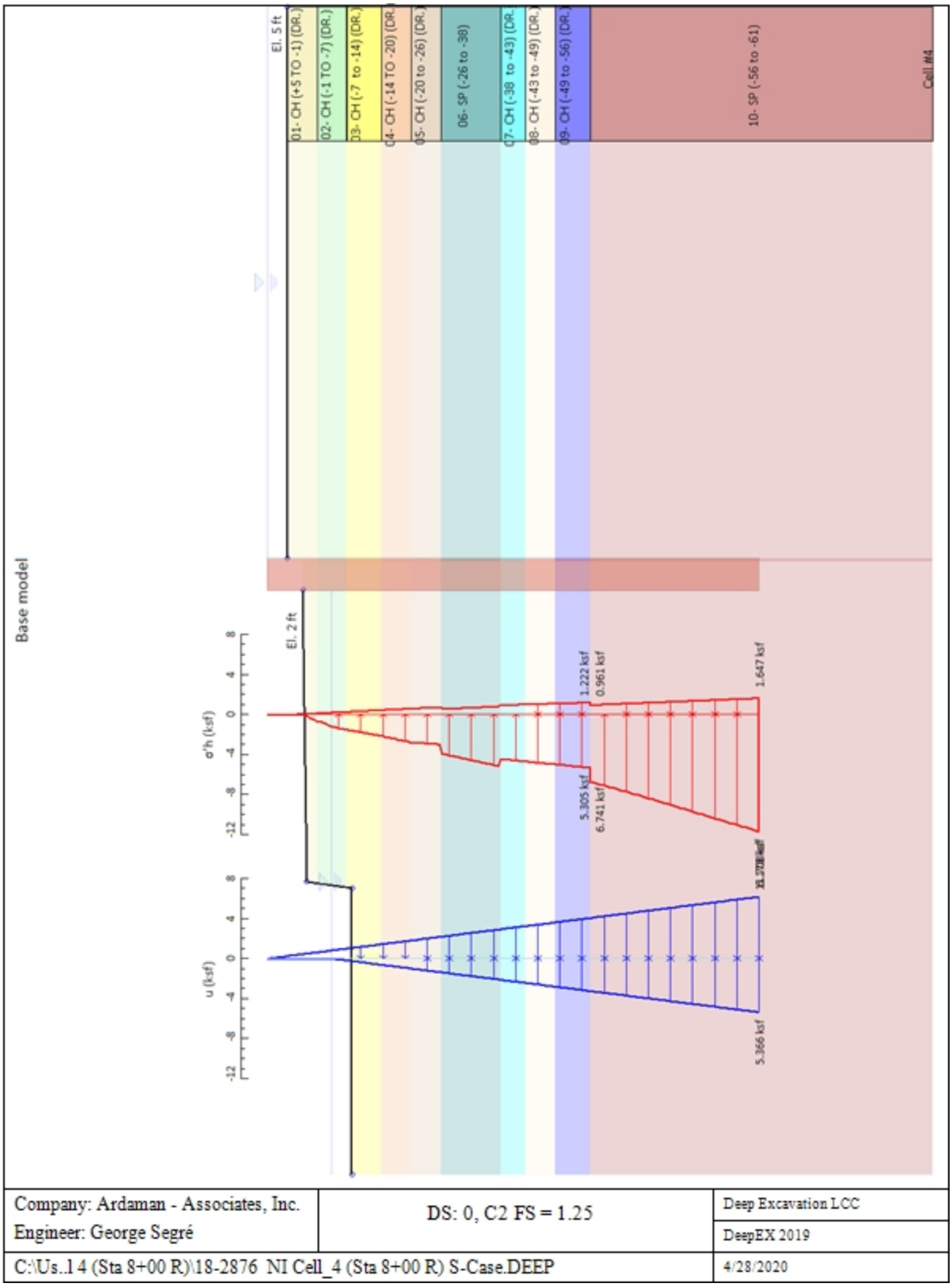
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
25.5 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
7.2 k/ft
-2.5 k/ft
Deflection (inch)
-1 0 1
-0.03 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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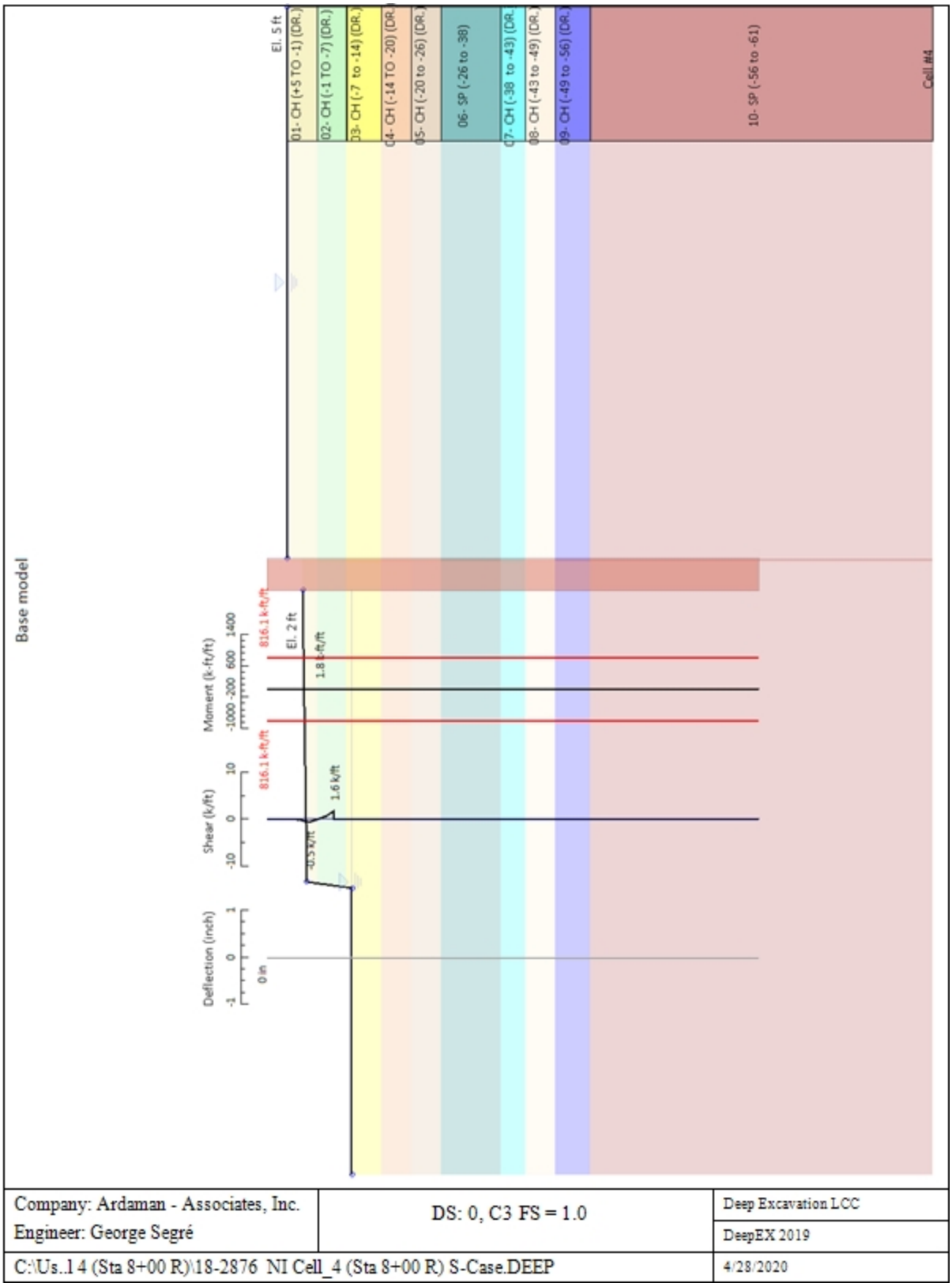
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
5.305 ksf
6.741 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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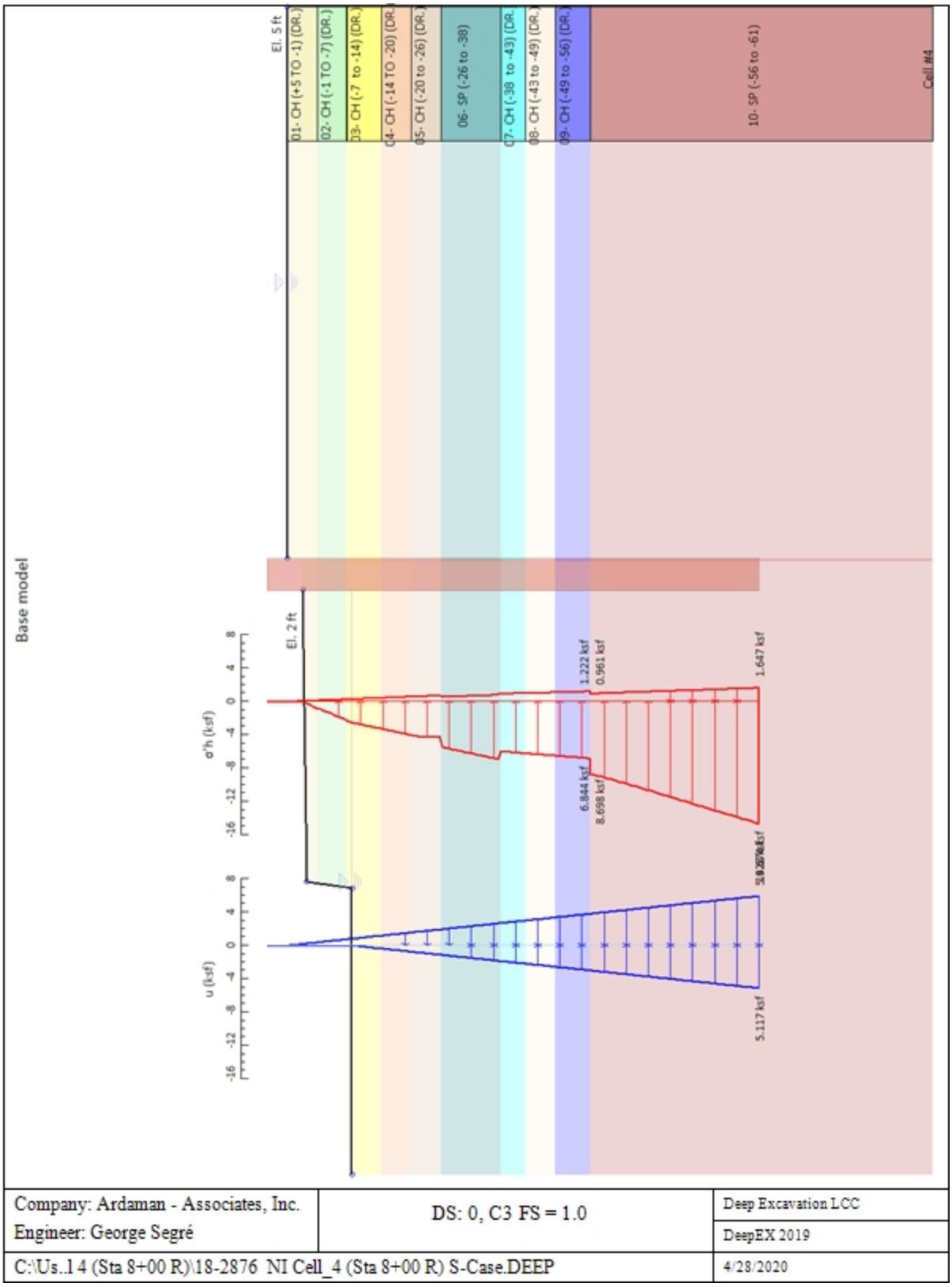
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
1.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.6 k/ft
-0.5 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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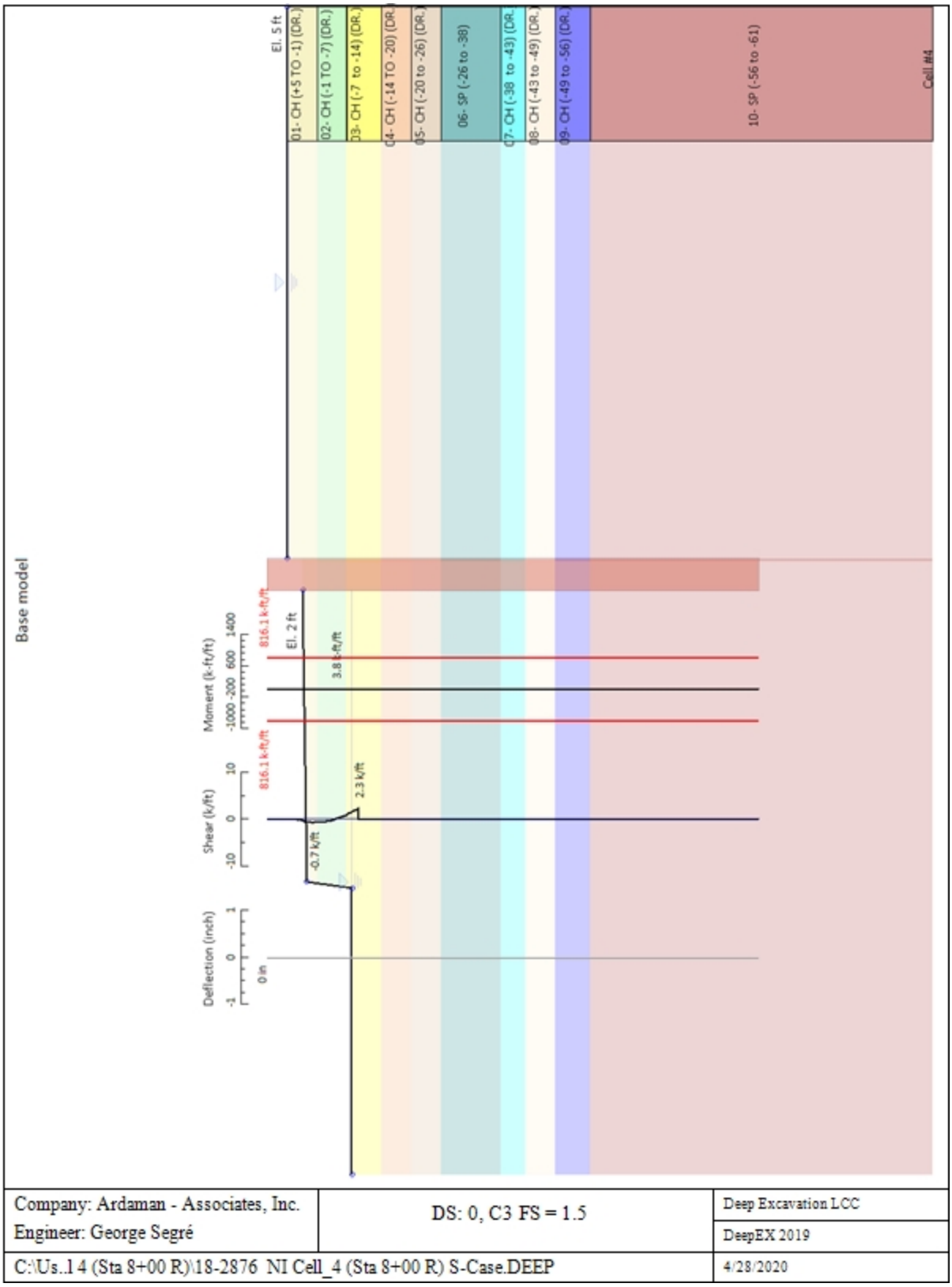
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.844 ksf
8.698 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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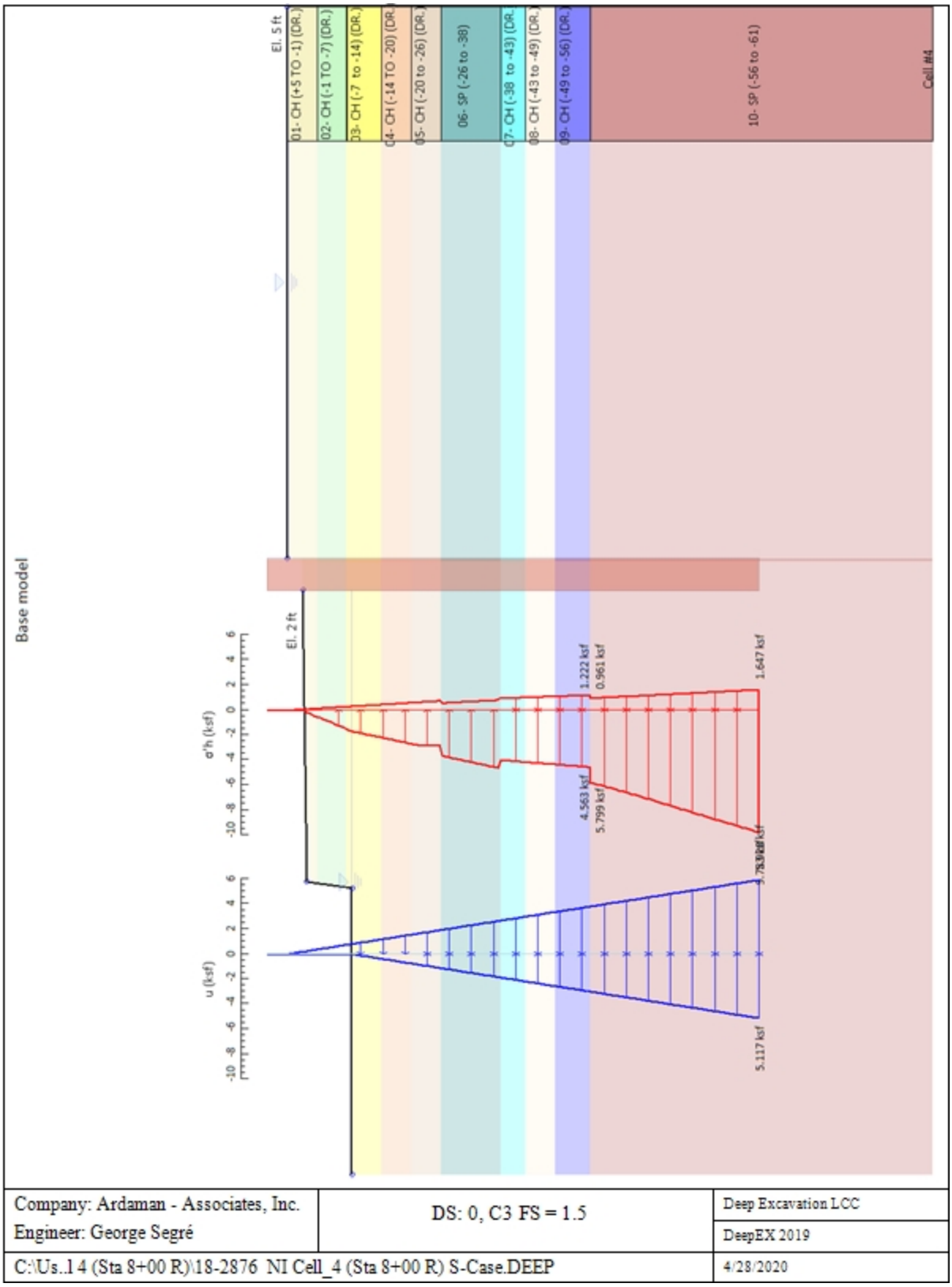
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
3.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.3 k/ft
-0.7 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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02- CH (-1 TO -7) (DR.)
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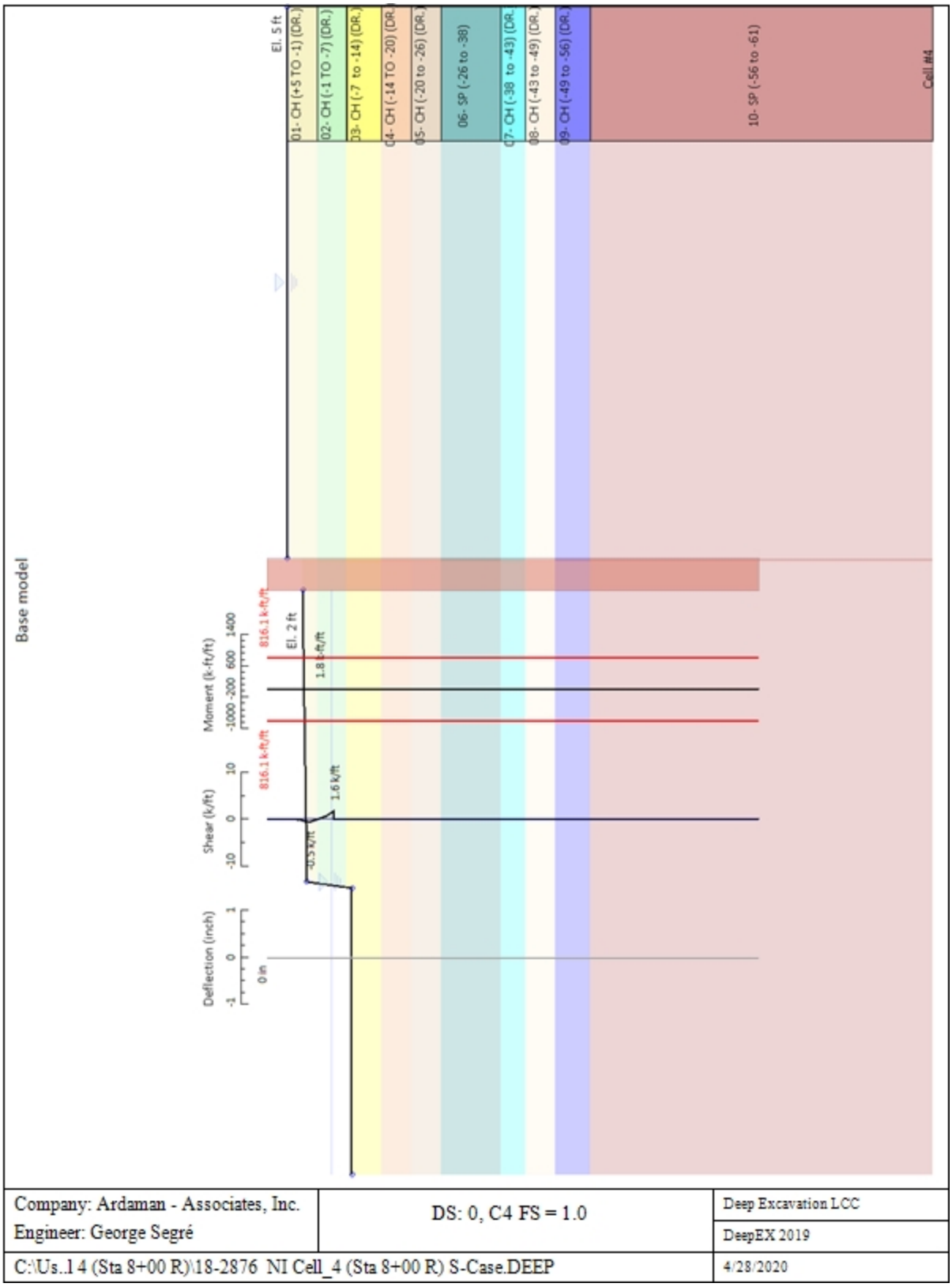
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
4.563 ksf
5.799 ksf
5.117 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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02- CH (-1 TO -7) (DR.)
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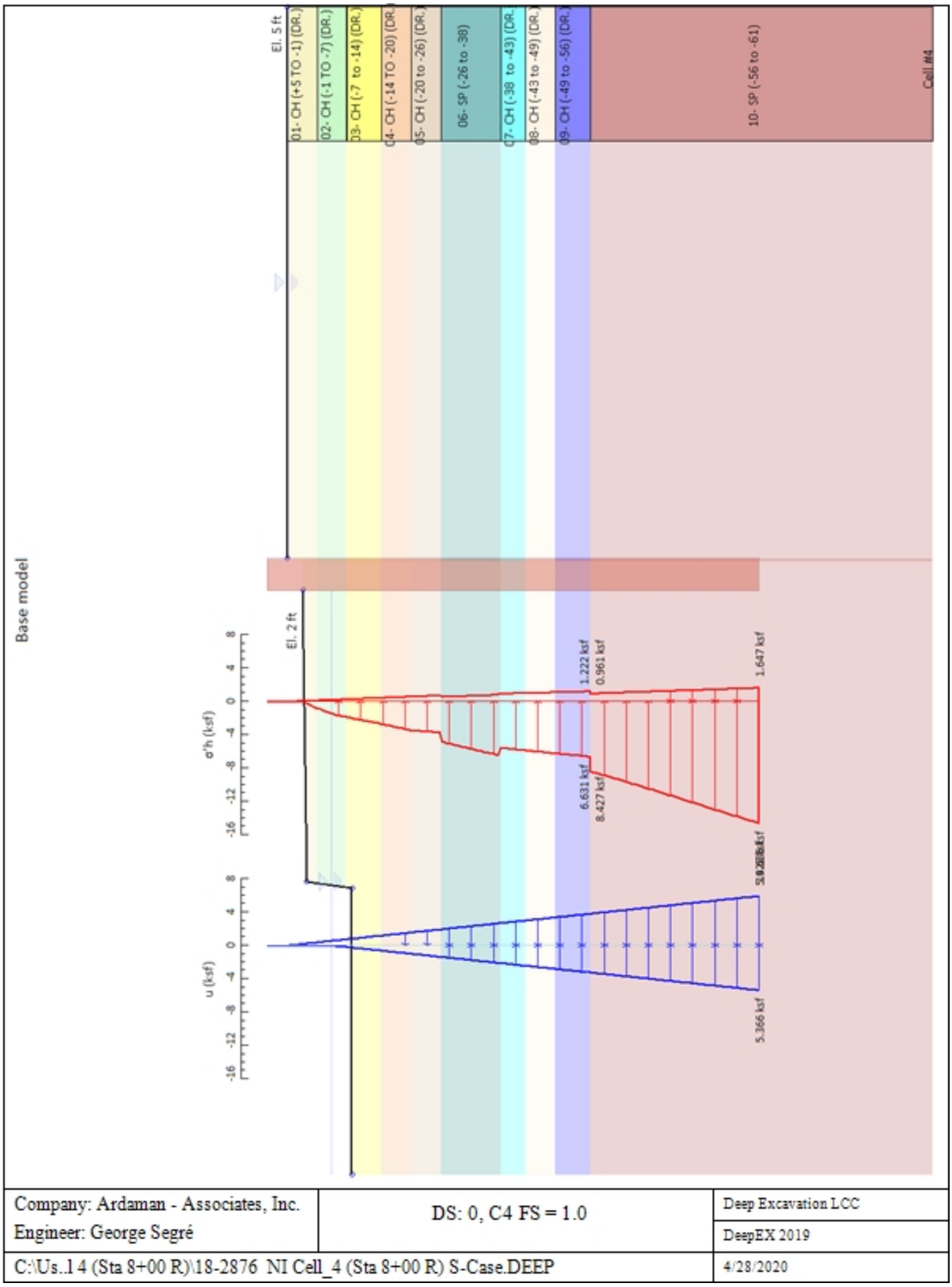
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
El. 2 ft
1.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
1.6 k/ft
-0.5 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..l 4 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020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El. 5 ft
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02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
1.222 ksf
0.961 ksf
1.647 ksf
6.631 ksf
8.427 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
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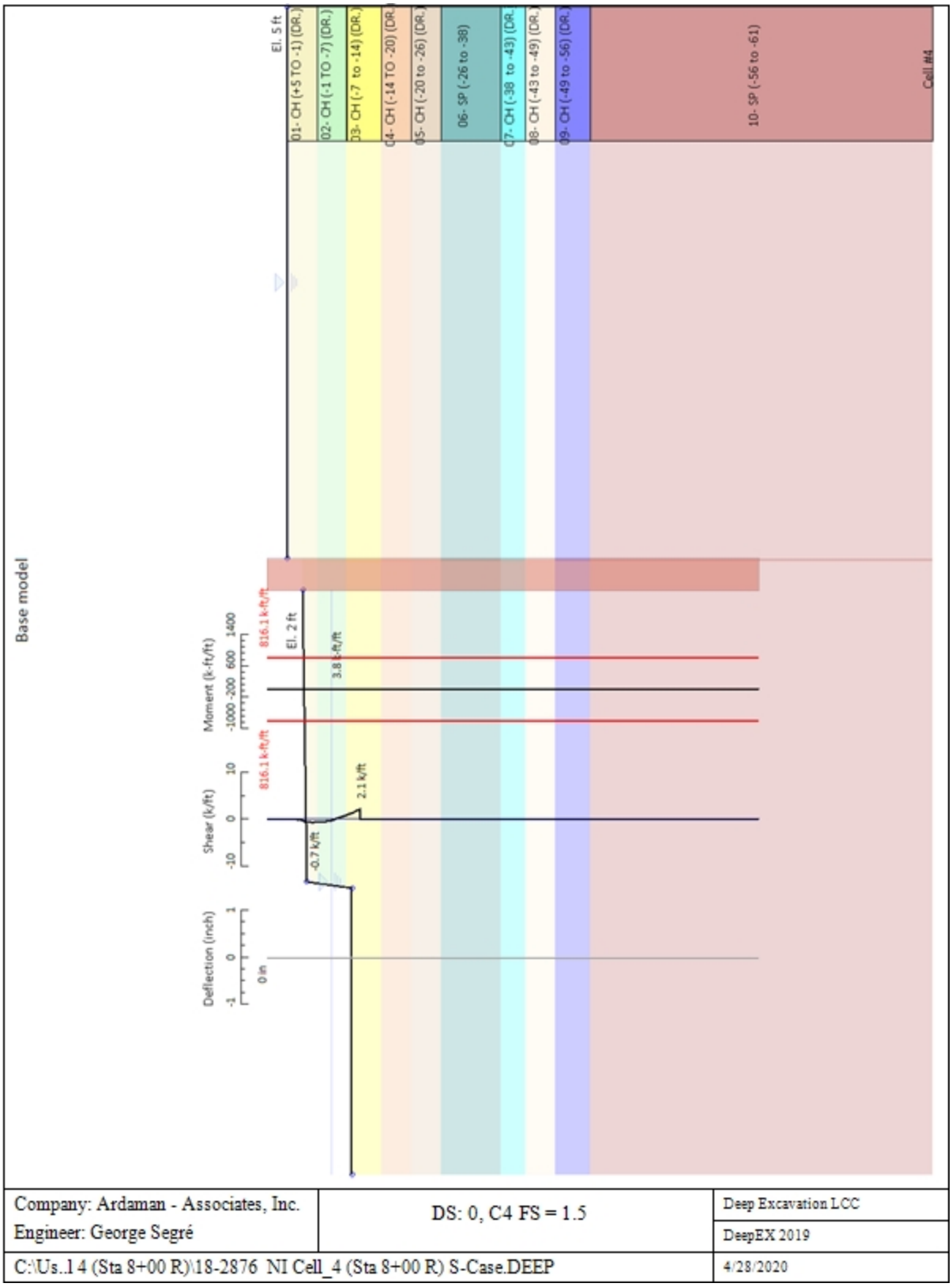
4/28/2020


Base model
El. 5 ft
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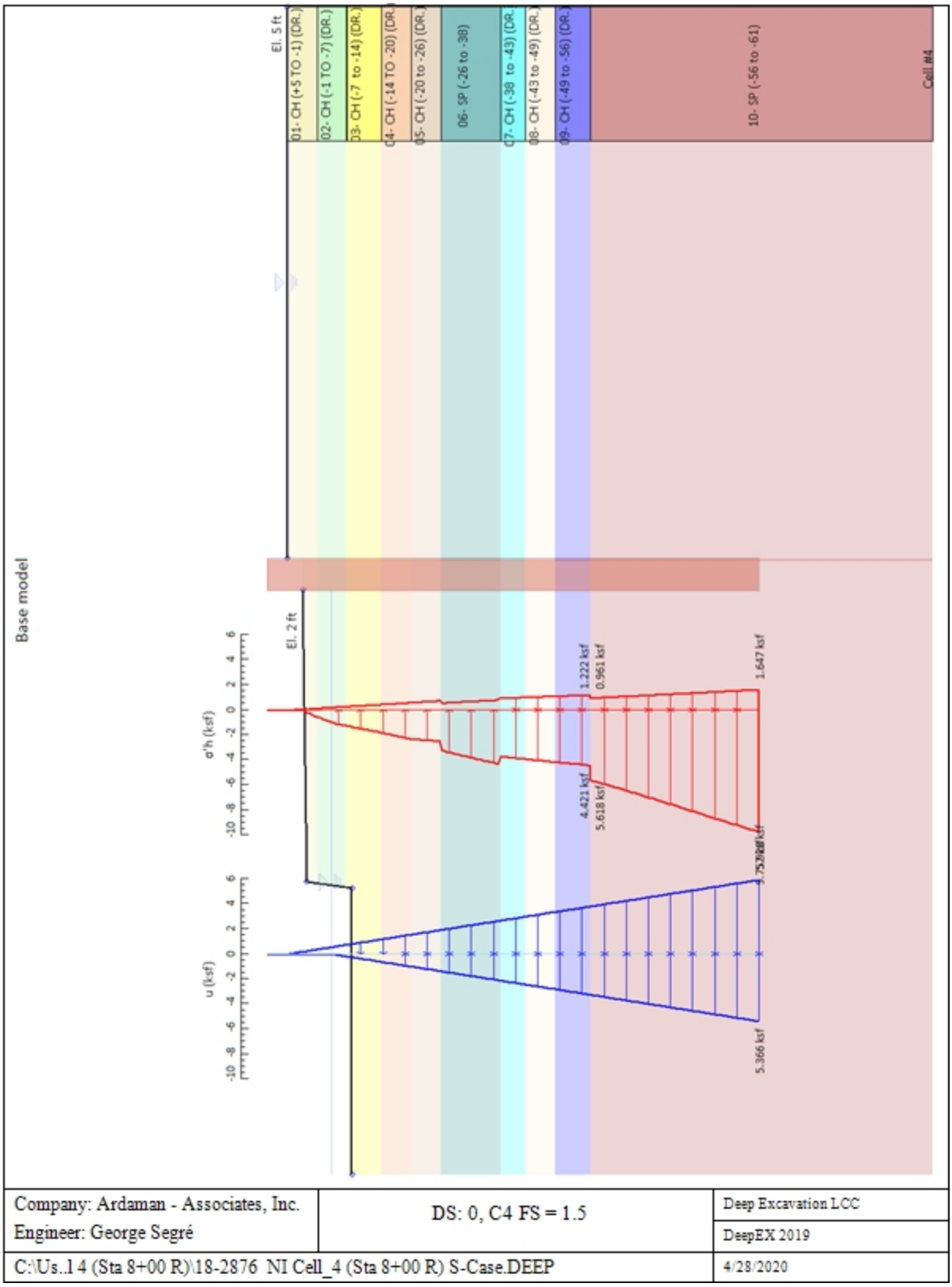
02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
3.8 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-10 0 10
2.1 k/ft
-0.7 k/ft
Deflection (inch)
-1 0 1
0 in
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020


Base model
El. 5 ft
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02- CH (-1 TO -7) (DR.)
03- CH (-7 to -14) (DR.)
04- CH (-14 TO -20) (DR.)
05- CH (-20 to -26) (DR.)
06- SP (-26 to -38)
07- CH (-38 to -43) (DR.)
08- CH (-43 to -49) (DR.)
09- CH (-49 to -56) (DR.)
10- SP (-56 to -61)
Cell #4
El. 2 ft
σ'h (ksf)
u (ksf)
-10 -8 -6 -4 -2 0 2 4 6
1.222 ksf
0.961 ksf
1.647 ksf
4.421 ksf
5.618 ksf
5.366 ksf
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..14 (Sta 8+00 R)\18-2876 NI Cell_4 (Sta 8+00 R) S-Case.DEEP
4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #5 @ Sta. 5+50)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -78.74 ft., NAVD88

Length of Sheetting = 87.74 ft.

Use = 90.0 ft.

Design Tip Elev. = -81.0 ft., NAVD88

Design Length of Sheeting = 90.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-12	1.00	1.00	-35.24	64.22	21.97	0.19
		Open excavation - degraded	9	-12	1.00	1.25	-41.00	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-30.90	33.47	11.66	0.09
		Open excavation - degraded	9	-8	1.00	1.25	-36.82	--	--	--
Q-Case	3	Open excavation - degraded	5	-12	1.00	1.00	-28.92	14.89	7.64	0.03
		Open excavation - degraded	5	-12	1.00	1.50	-40.77	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-15.49	5.52	2.64	0.01
		Open excavation - degraded	5	-8	1.00	1.50	-34.84	--	--	--
S-Case	1	Open excavation - degraded	9	-12	1.00	1.00	-61.31	585.04	64.38	5.13
		Open excavation - degraded	9	-12	1.00	1.25	-76.02	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-56.40	489.99	56.20	3.65
		Open excavation - degraded	9	-8	1.00	1.25	-69.48	--	--	--
S-Case	3	Open excavation - degraded	5	-12	1.00	1.00	-52.04	353.27	44.31	2.18
		Open excavation - degraded	5	-12	1.00	1.50	-78.74	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-47.14	294.91	38.26	1.50
		Open excavation - degraded	5	-8	1.00	1.50	-68.94	--	--	--
						Governing Value:	-78.74	585.04	64.38	5.13

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:55:38 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- ML (+5 T	117	117	15	0	200	15	15	300	3	0.59	1.7	0.59	1.7	True	EXP	
02- CH (+3 TO	128	128	0	0	1000	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- ML (+2 to	117	117	15	0	200	15	15	150	3	0.59	1.7	0.59	1.7	True	Linear	
04- CH (+0 TO	127	127	0	0	750	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-5 to -	130	130	0	0	1700	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-13 to	130	130	31	0	N/A	N/A	N/A	626.3	3	0.32	3.12	N/A	N/A	True	Linear	
07- SP (-22 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	
08- CH (-33 to	128	128	0	0	1800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-41 to	130	130	0	0	1950	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- CH (-46 to	130	130	0	0	2200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- CH (-56 to	130	130	0	0	2500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- ML (+5 T	0.4	0.1	0	0.741	0.5	1	0	7.2	4.8	20	-
02- CH (+3 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- ML (+2 to	0.4	0.1	0	0.741	0.5	-	-	13	8.7	20	-
04- CH (+0 TO	0.35	0.1	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-5 to -	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- SP (-13 to	0.35	-	-	0.485	0.5	-	-	29	19.3	70	-
07- SP (-22 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-
08- CH (-33 to	0.3	0.1	0	1	0.8	-	-	0	0	0	-
09- CH (-41 to	0.25	0.1	0	1	0.8	-	-	0	0	0	-
10- CH (-46 to	0.35	0.1	0	0	0.8	-	-	0	0	0	-
11- CH (-56 to	0.35	0.1	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

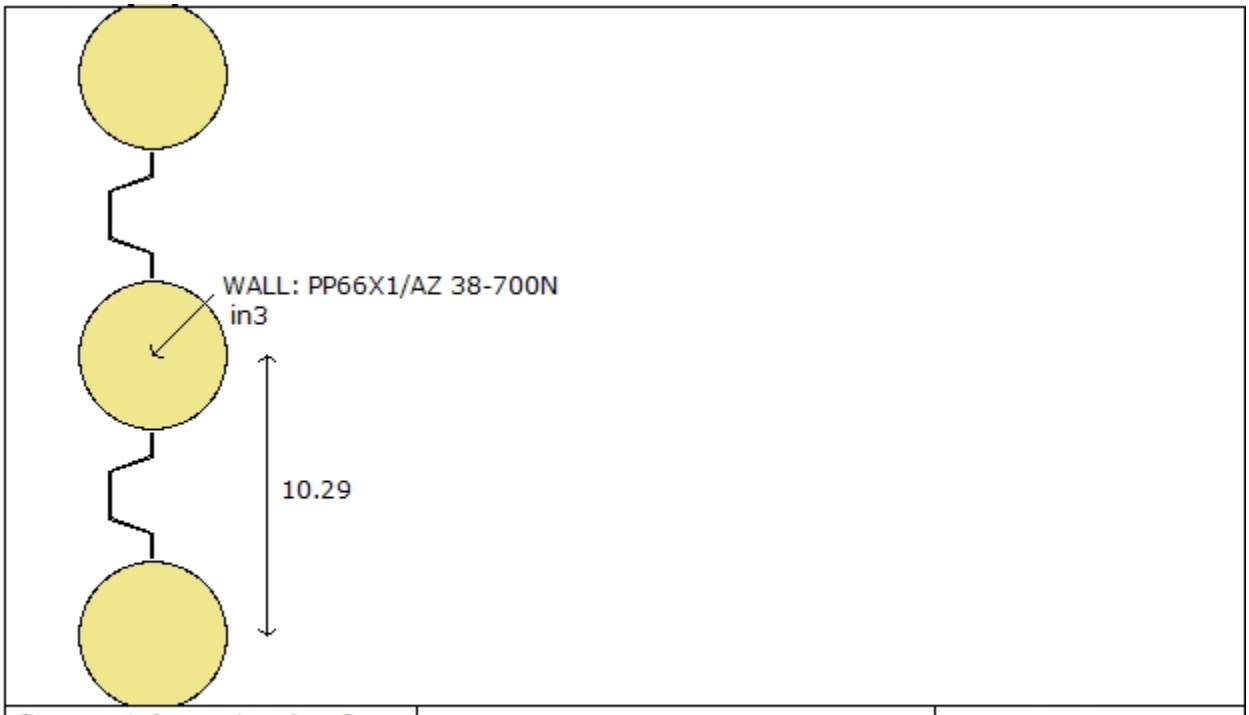
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- ML (+5 TO	1	0.74
3	02- CH (+3 TO	1	0
2	03- ML (+2 to	1	0.74
0	04- CH (+0 TO	1	1
-5	05- CH (-5 to -	1	0.45
-13	06- SP (-13 to -	1	0.48
-22	07- SP (-22 to	1	0.47
-33	08- CH (-33 to	1	1
-41	09- CH (-41 to	1	1
-46	10- CH (-46 to	1	0
-56	11- CH (-56 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.003	2.003	2.458
Stage 1	Simple span	N/A	1.6	1.631	1.631	1.983
Stage 2	Simple span	N/A	1.6	2.107	2.107	2.546
Stage 3	Simple span	N/A	1.6	1.726	1.726	2.06
Stage 4	Simple span	N/A	1.6	2.254	2.254	2.701
Stage 5	Simple span	N/A	1.6	1.556	1.556	1.831
Stage 6	Simple span	N/A	1.6	2.372	2.372	2.798
Stage 7	Simple span	N/A	1.6	1.657	1.657	1.908

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

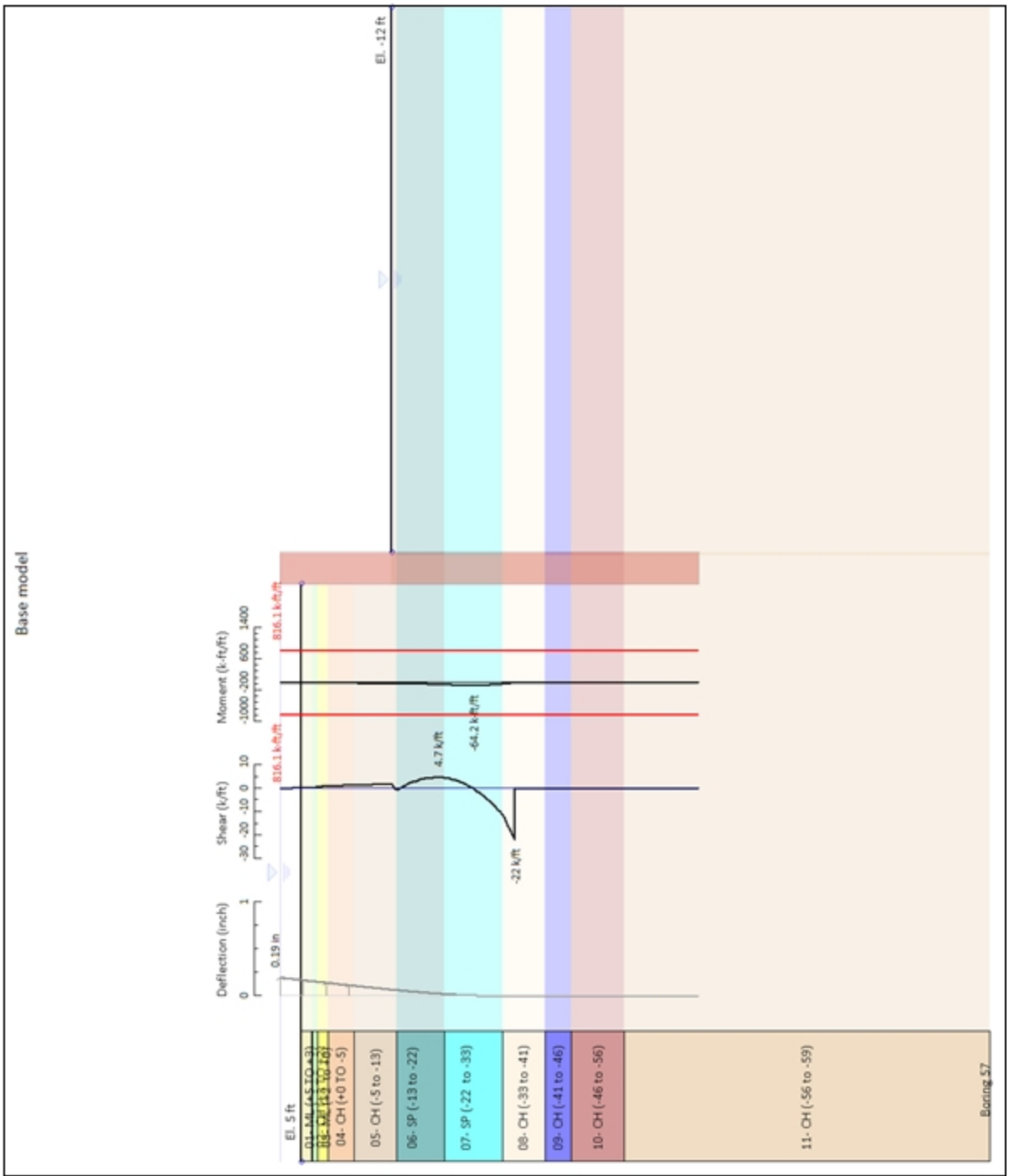
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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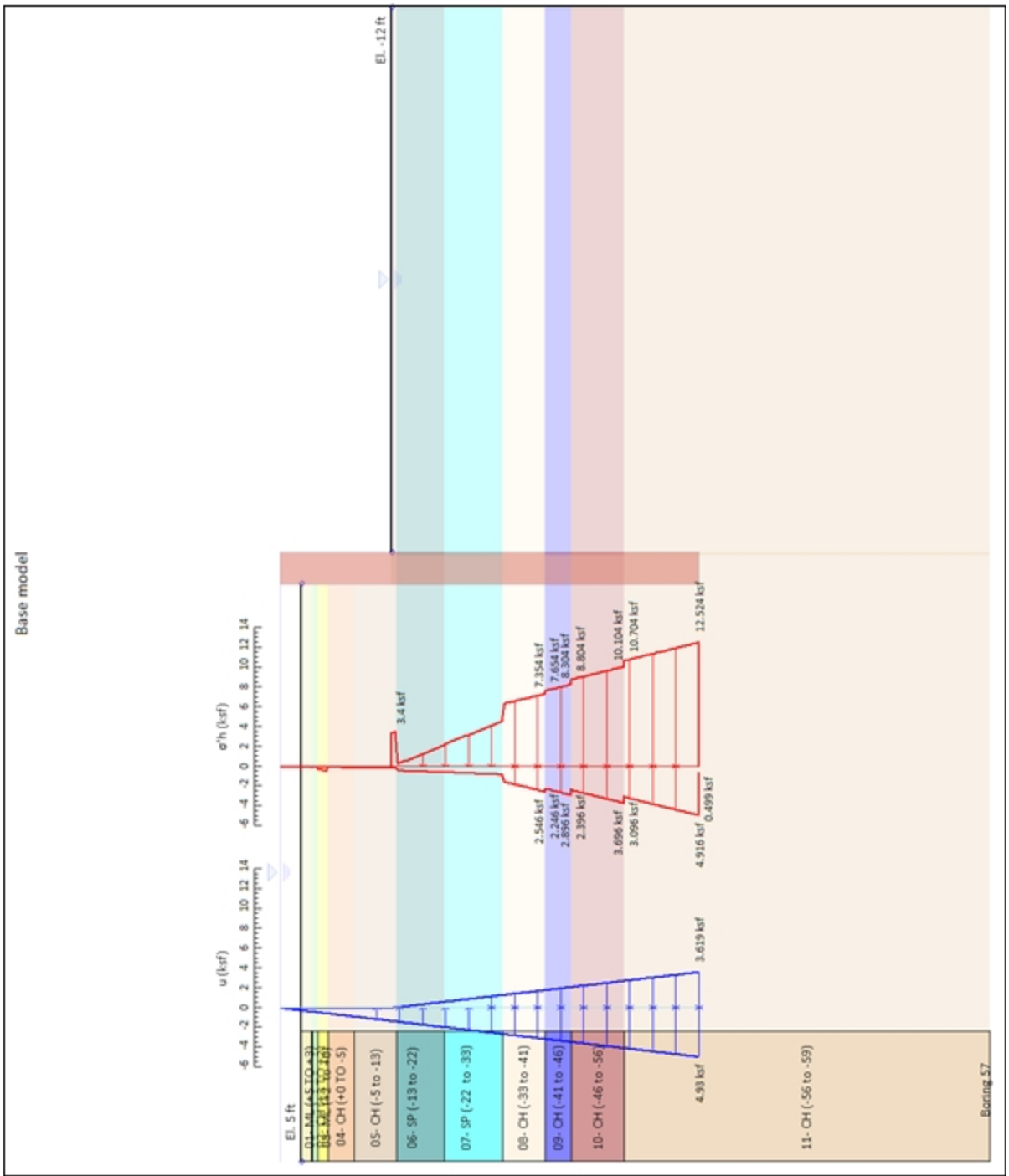

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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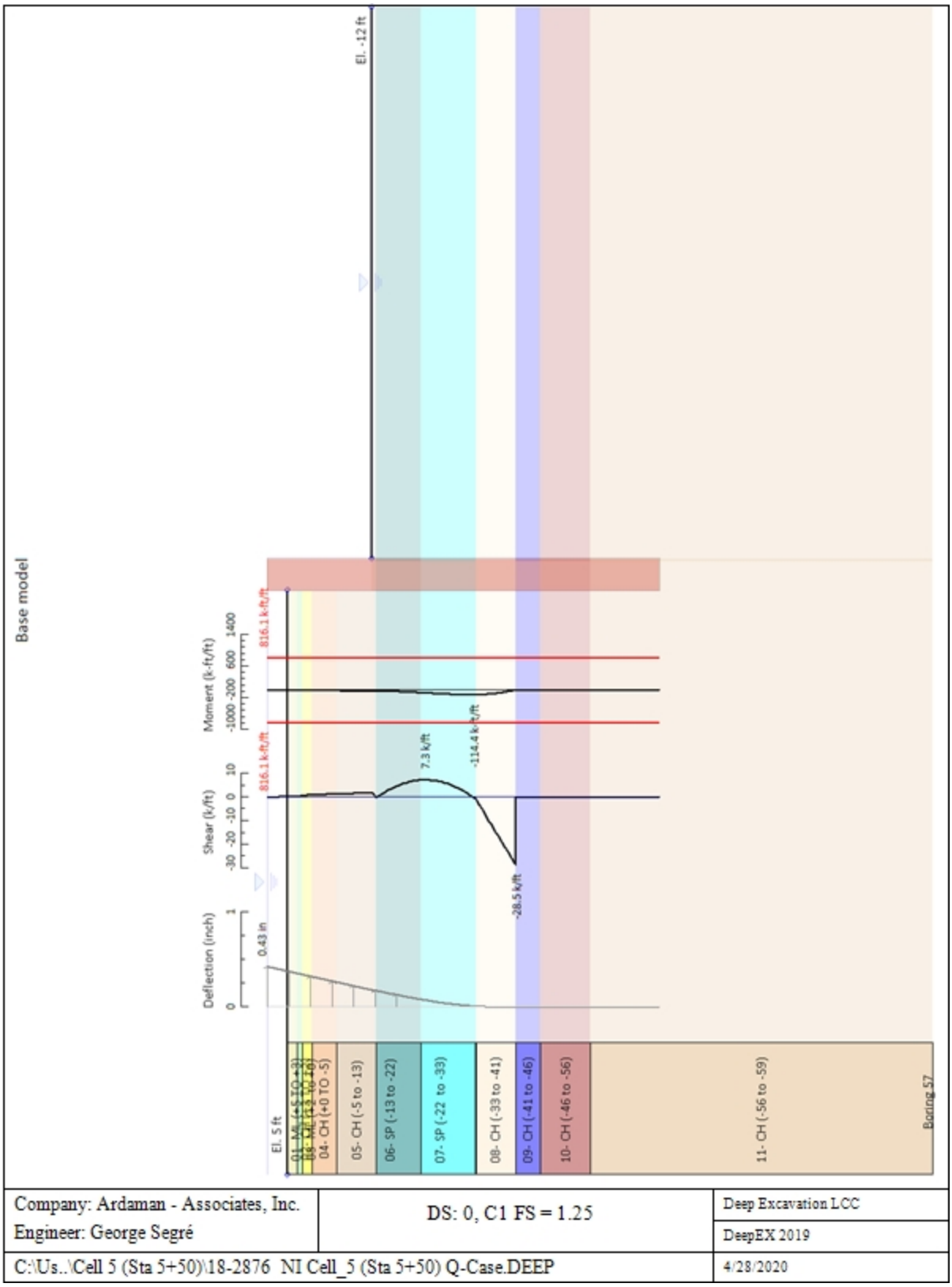

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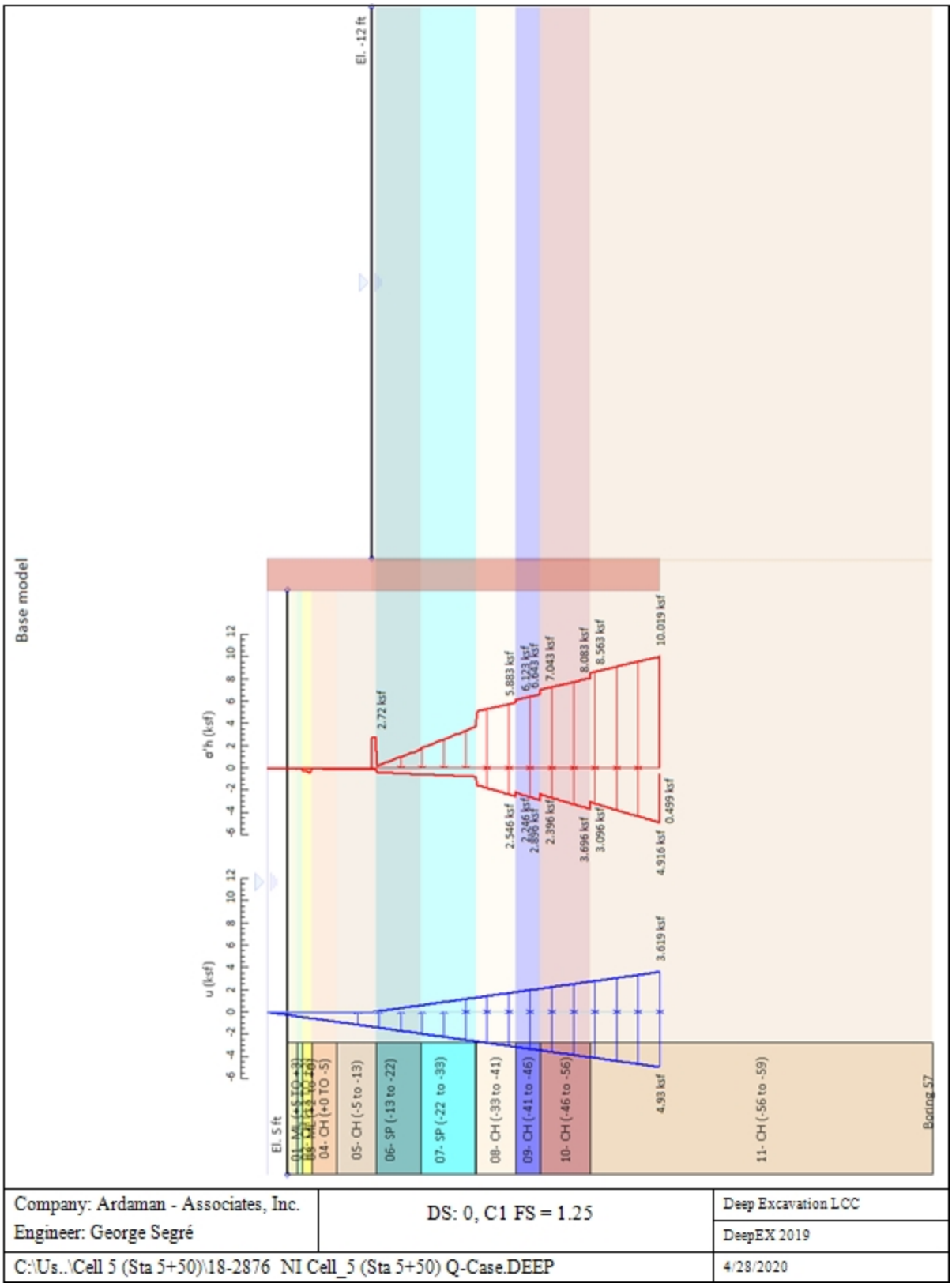

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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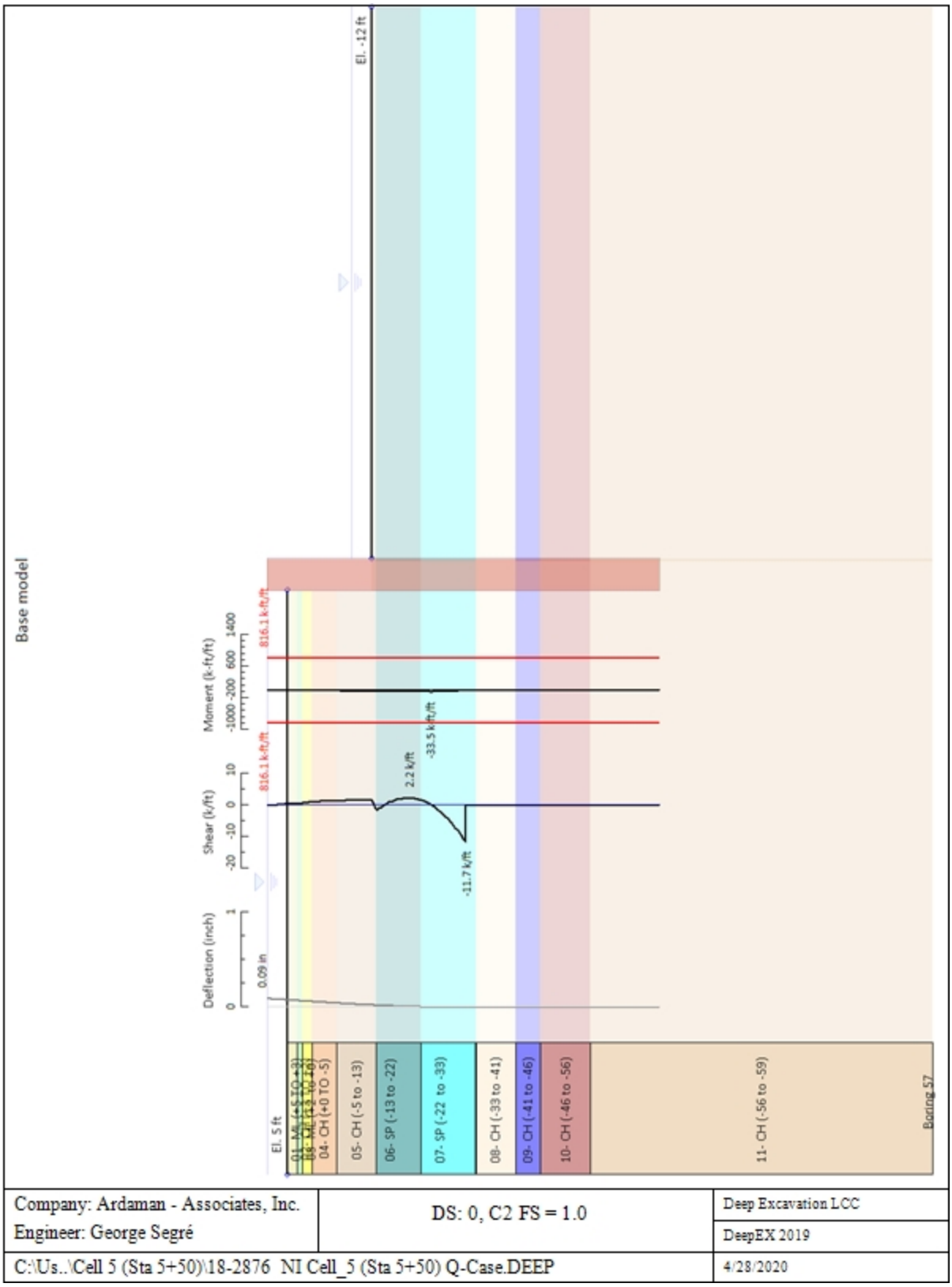

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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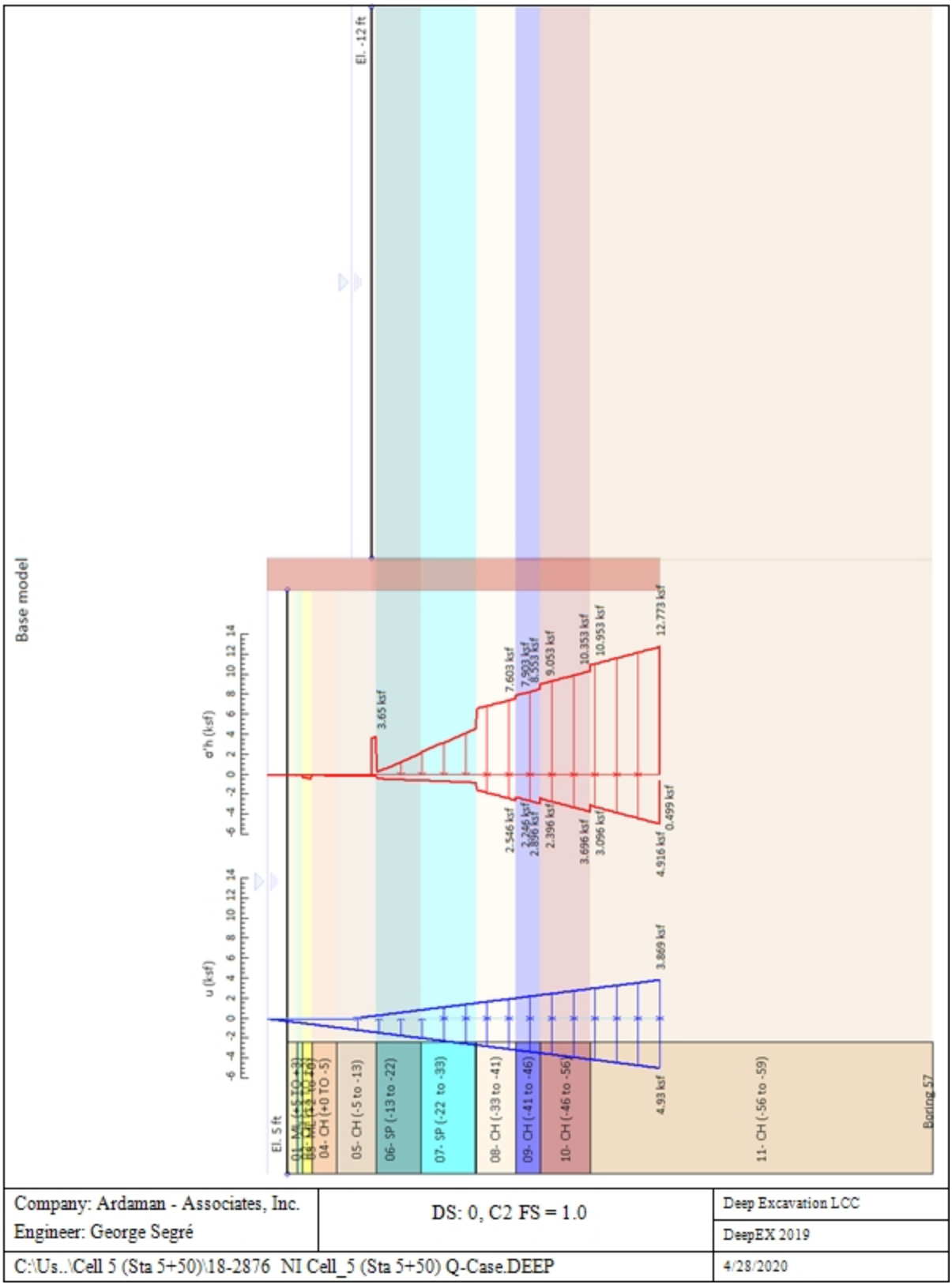

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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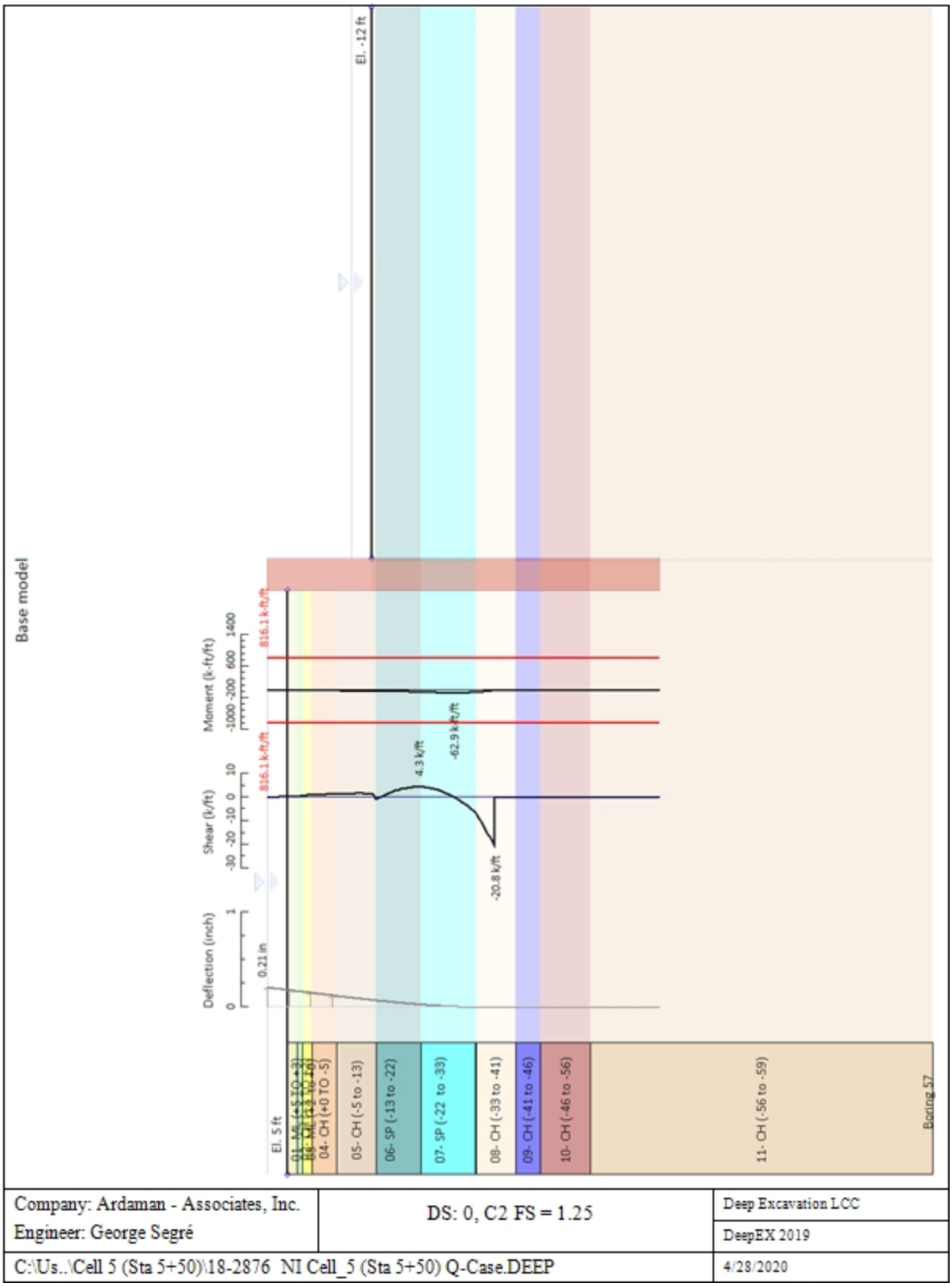

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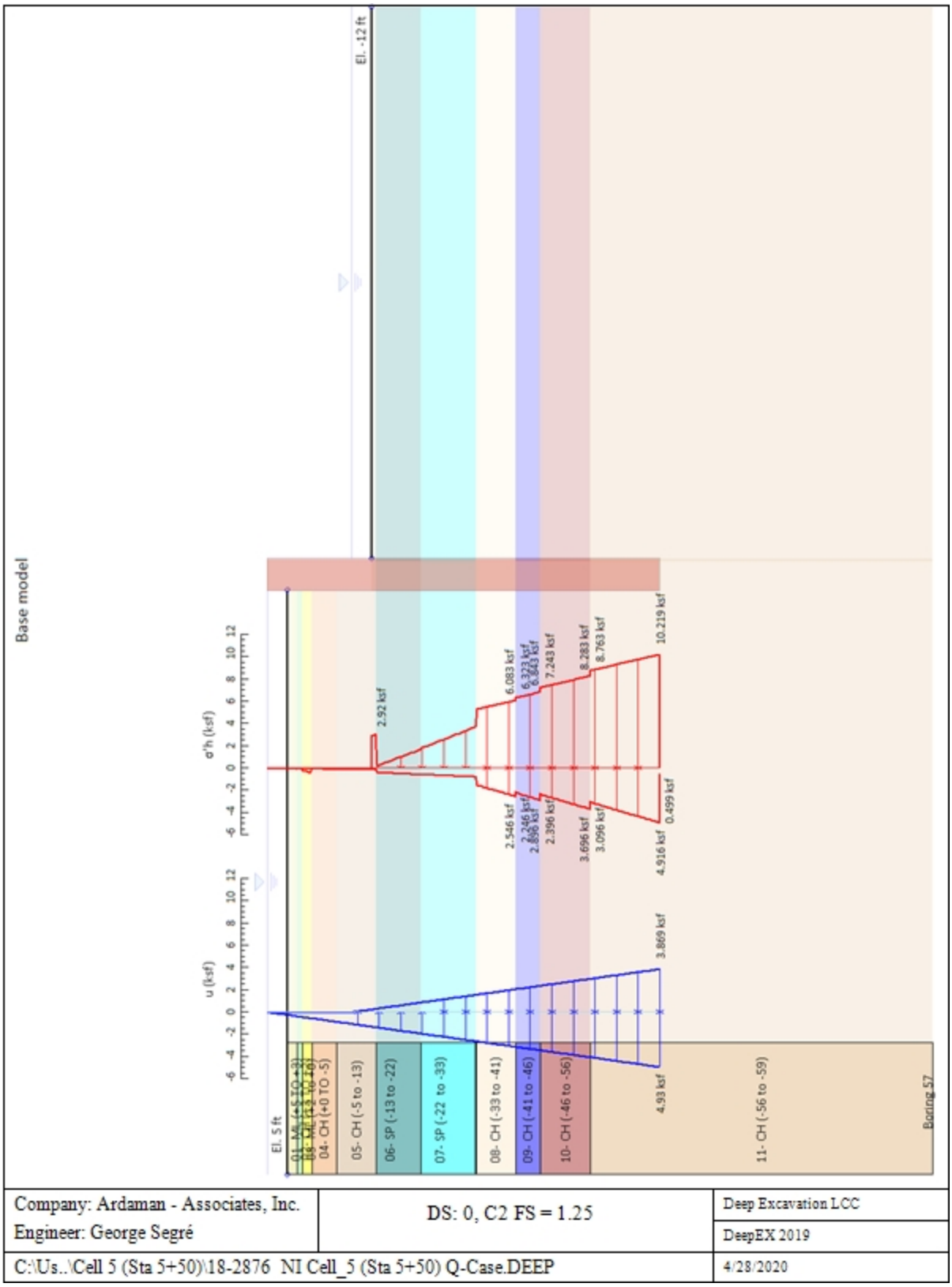

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
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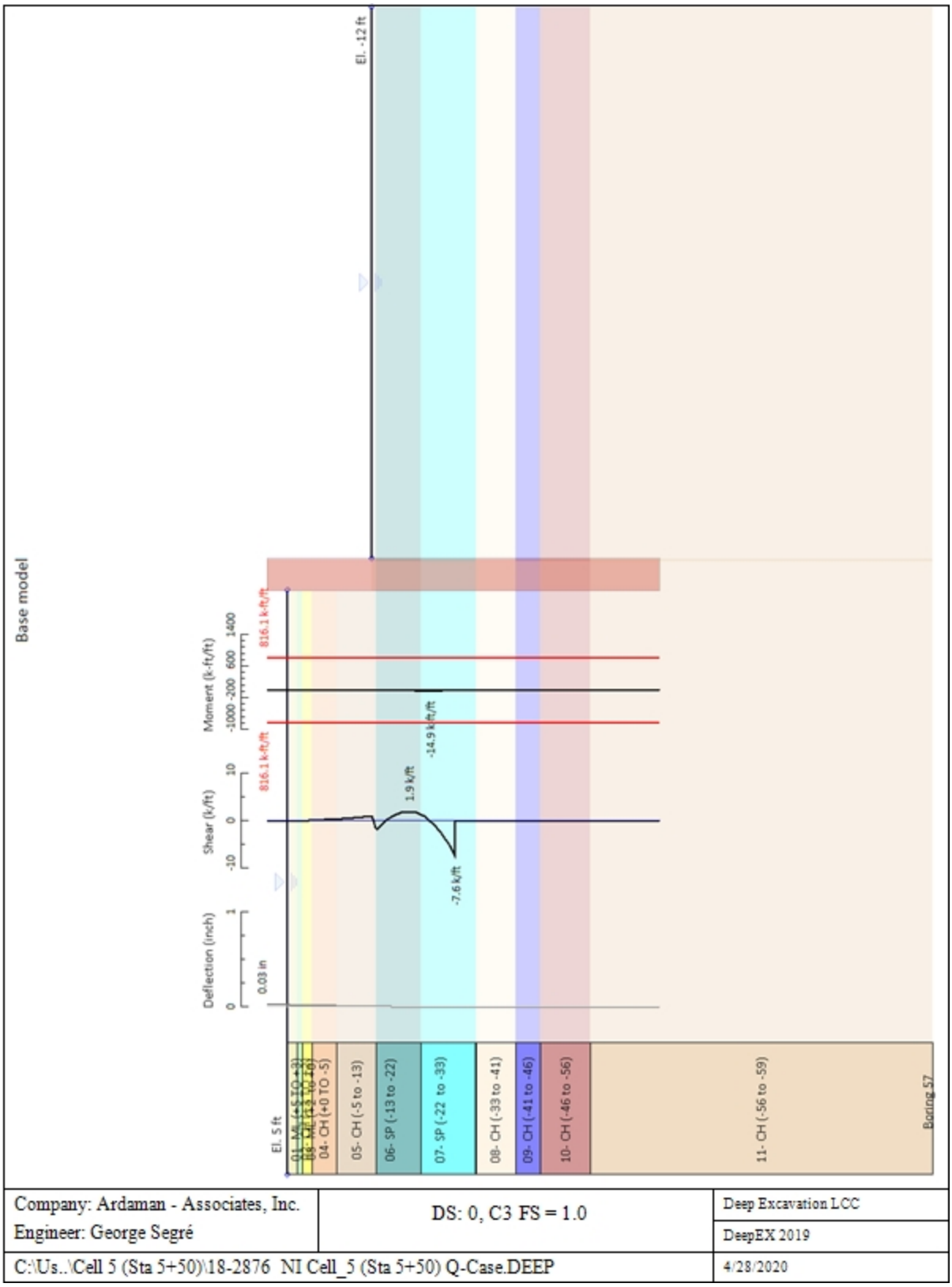

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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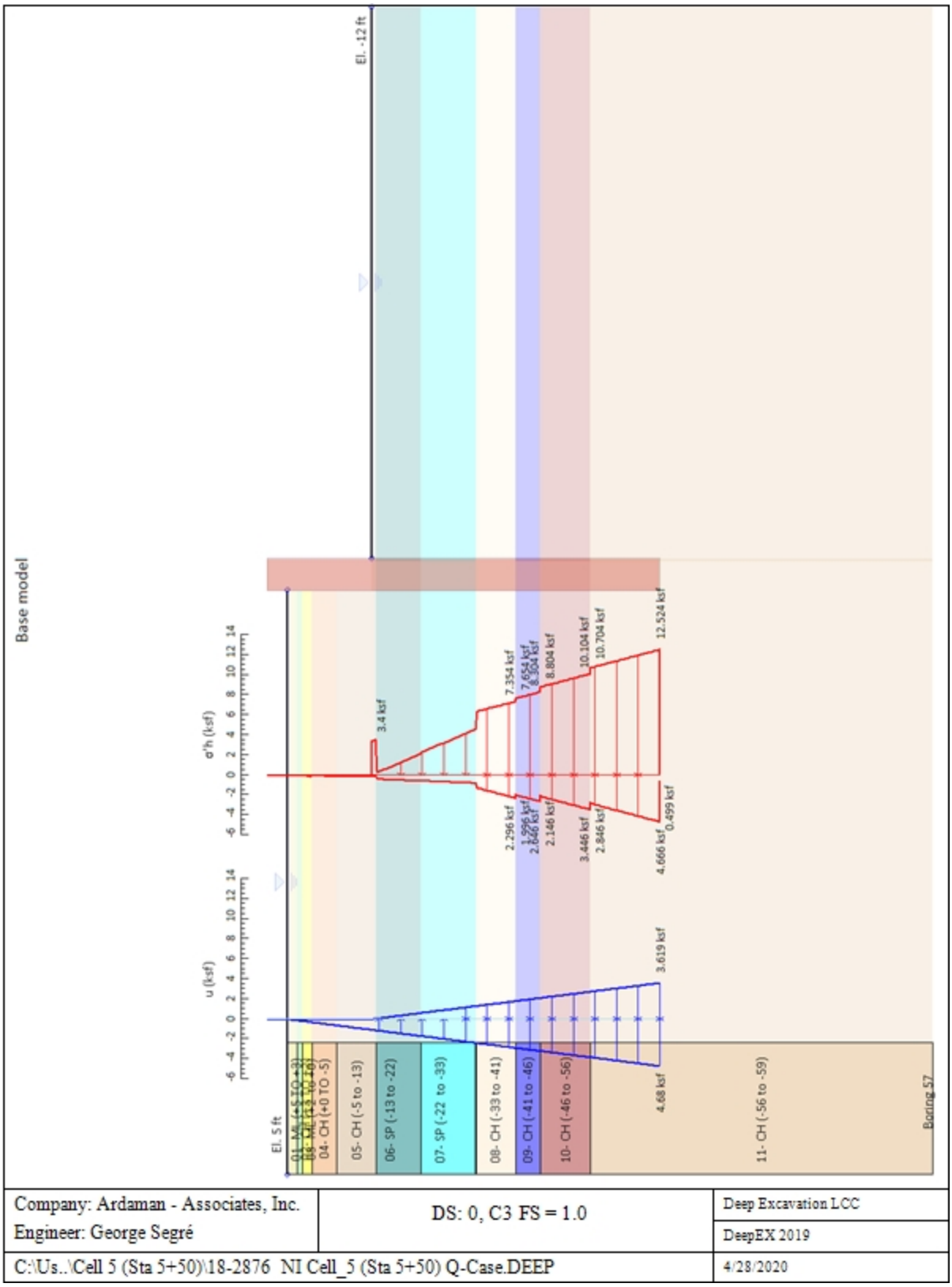

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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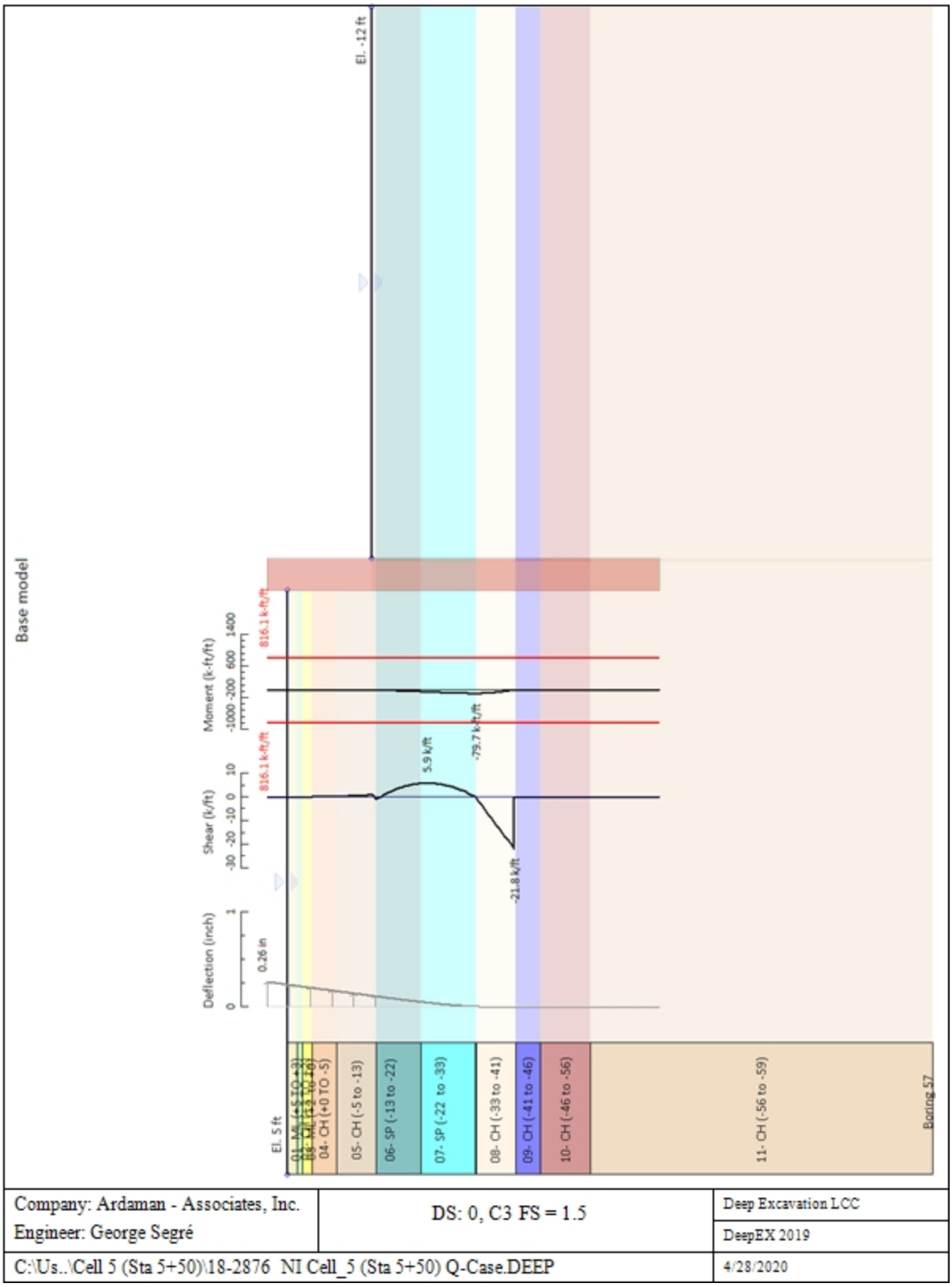

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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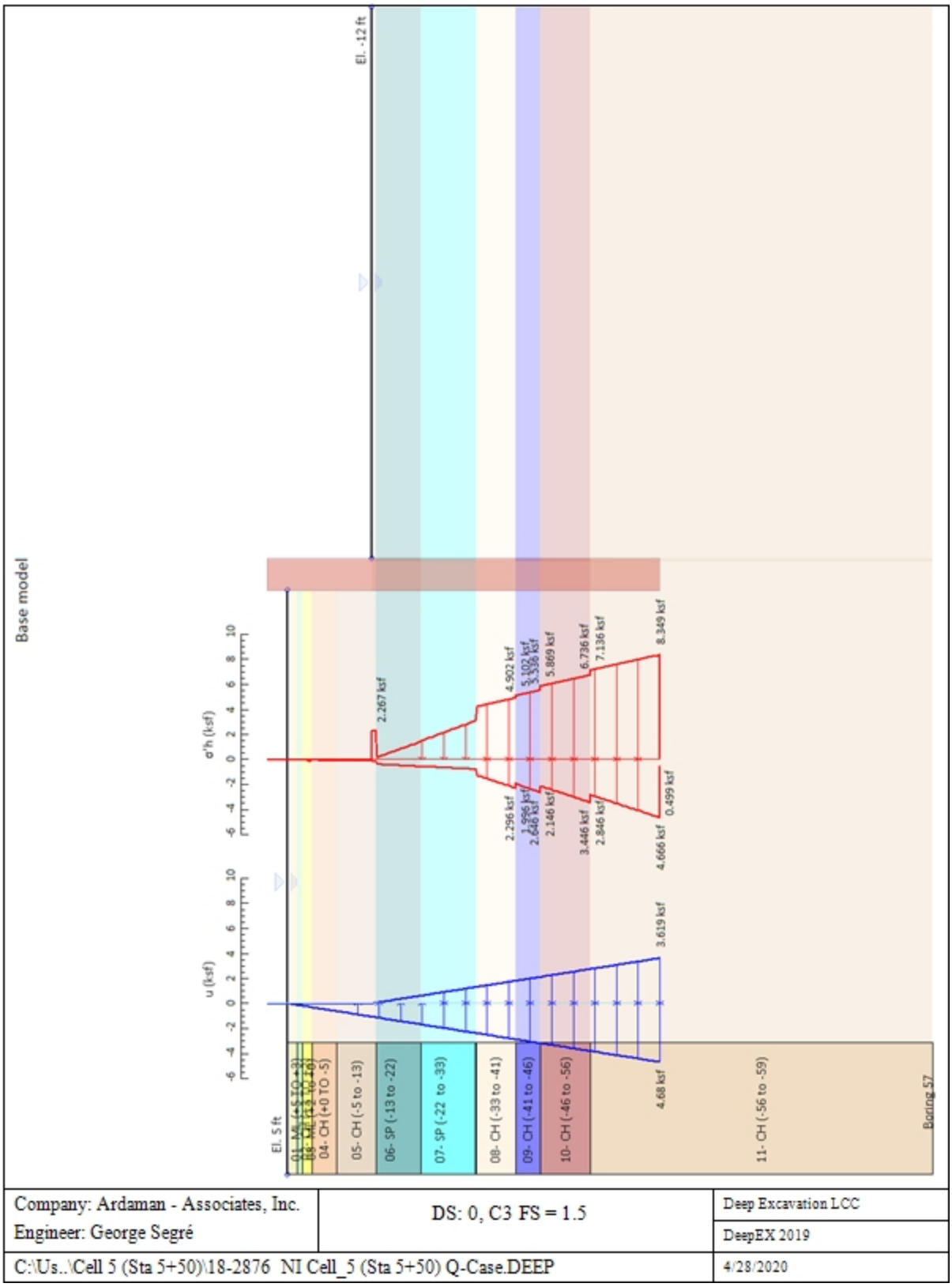
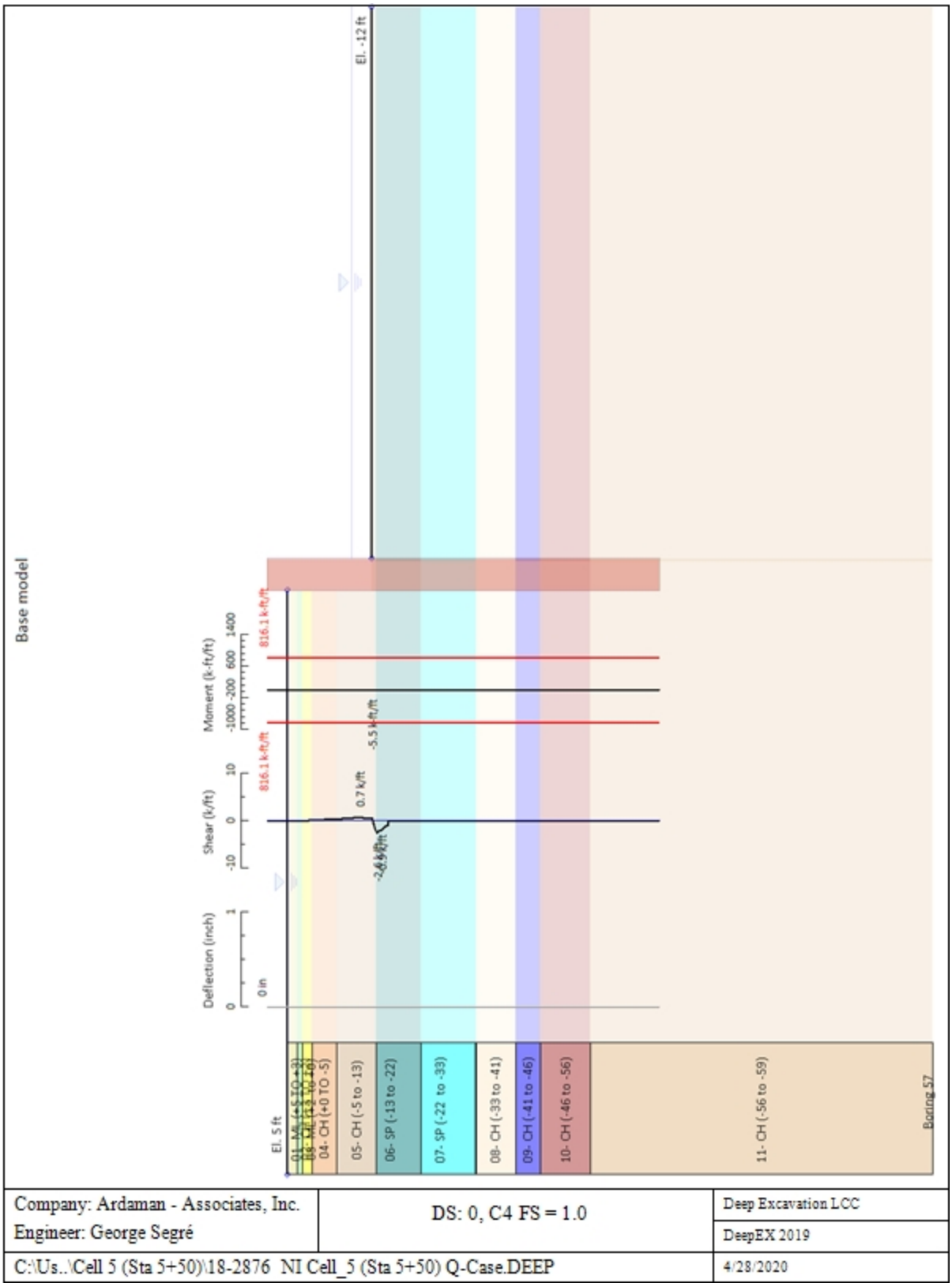
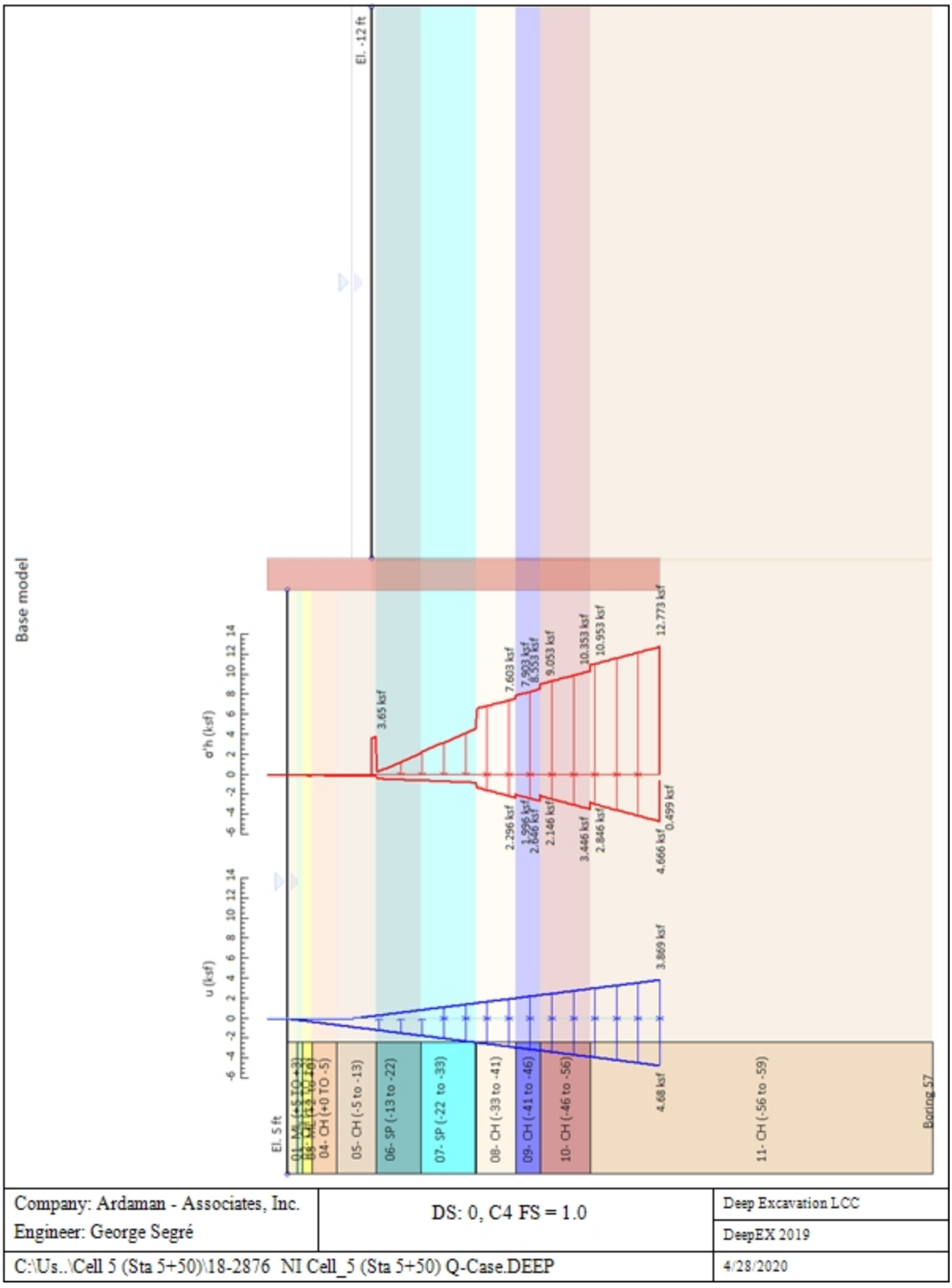

Base model
El. -12 ft
El. 5 ft
σ'h (ksf)
u (ksf)
2.267 ksf
4.902 ksf
5.102 ksf
5.336 ksf
5.869 ksf
6.736 ksf
7.136 ksf
8.349 ksf
2.296 ksf
1.996 ksf
2.646 ksf
2.146 ksf
3.446 ksf
2.846 ksf
4.666 ksf
0.499 ksf
3.619 ksf
4.68 ksf
01- MG (+5 TO -3)
03- CH (-3 TO -5)
04- CH (+0 TO -5)
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP
4/28/2020



Attachment Figure C.5-23



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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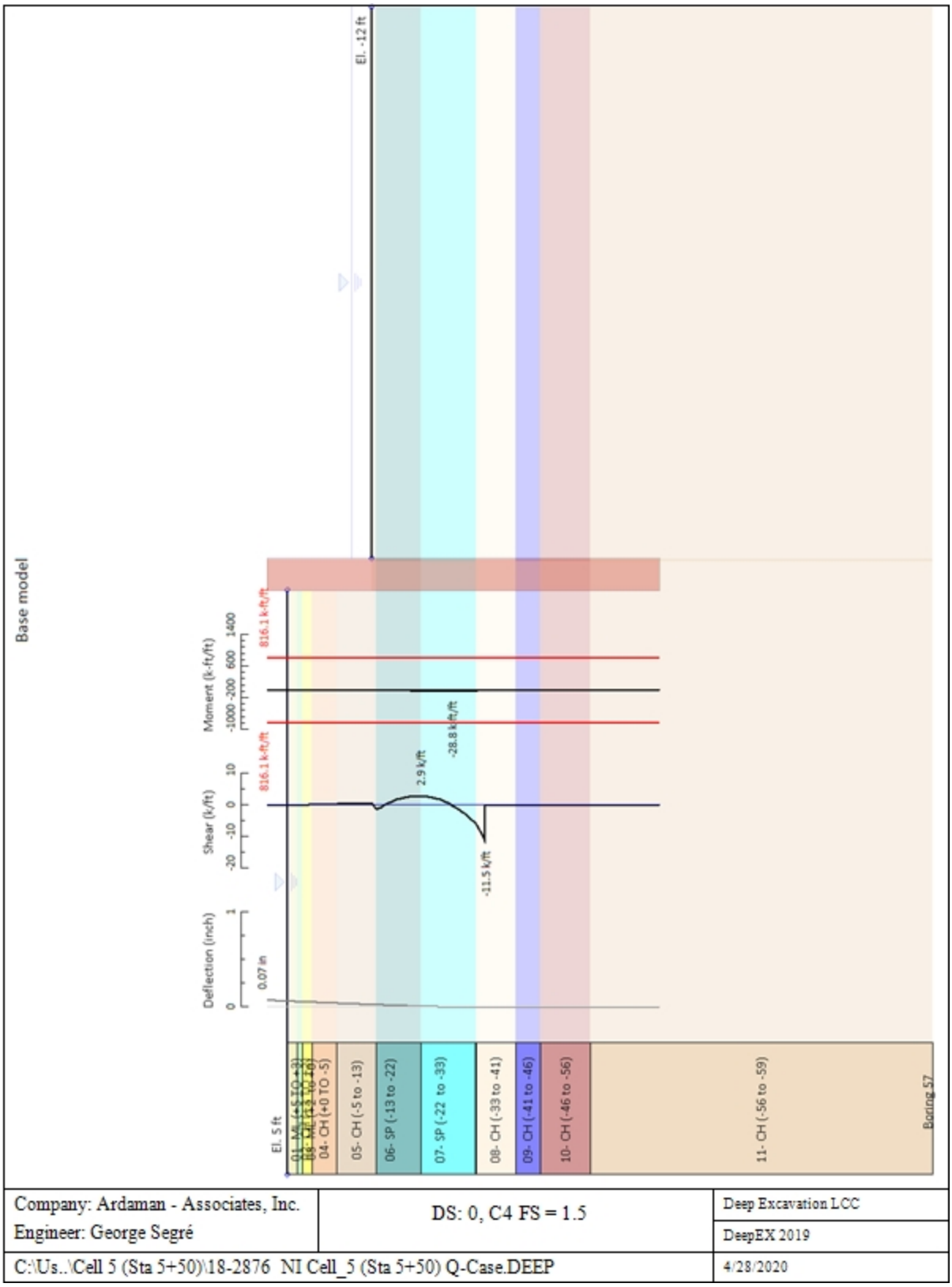
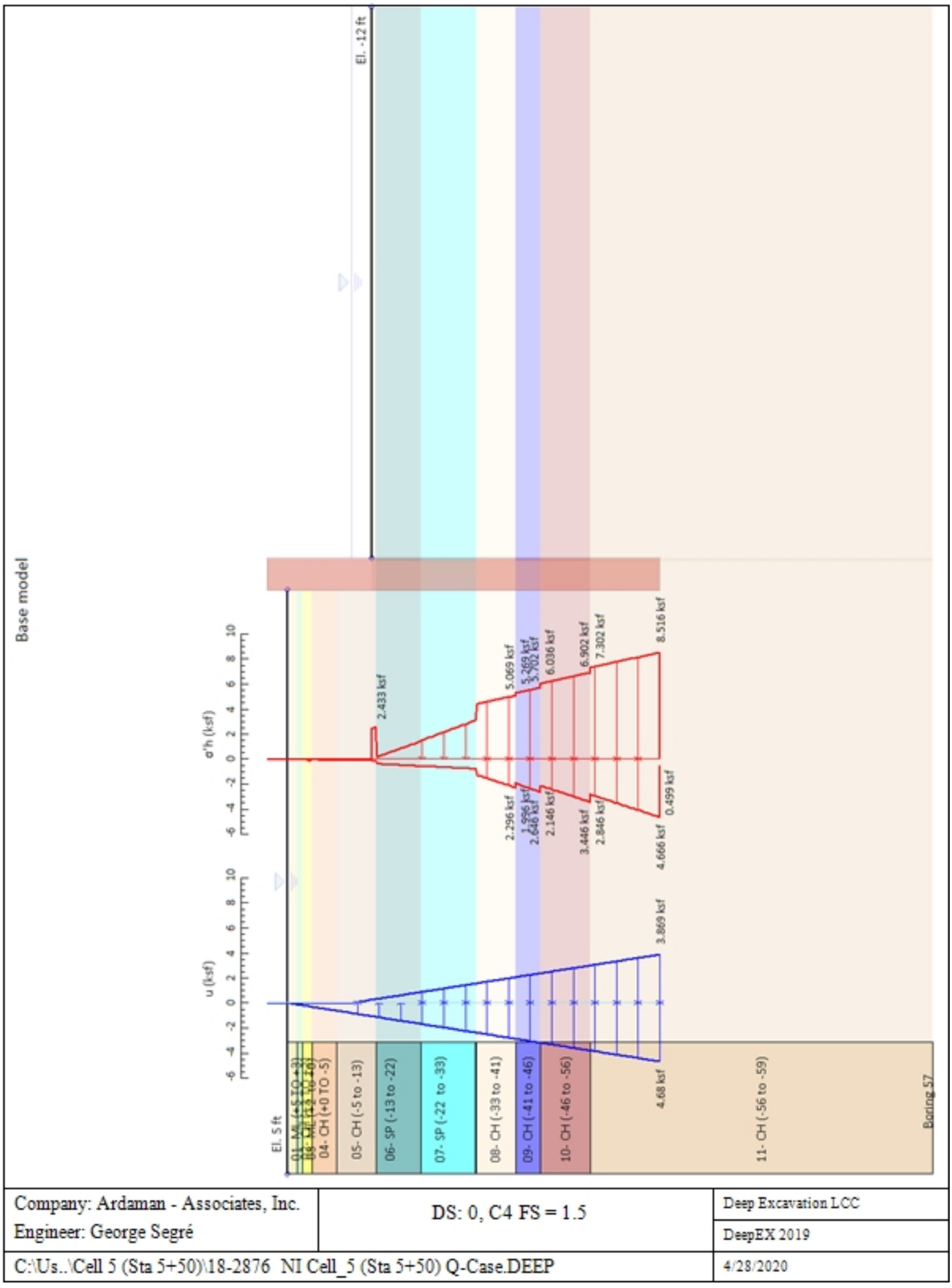


Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) Q-Case.DEEP		4/28/2020

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 10:59:37 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- ML (+5 T	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	EXP	
02- CH (+3 TO	128	128	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- ML (+2 to	117	117	28	0	N/A	N/A	N/A	150	3	0.36	2.77	N/A	N/A	True	Linear	
04- CH (+0 TO	127	127	23	0	N/A	N/A	N/A	521.92	3	0.44	2.28	N/A	N/A	True	Linear	
05- CH (-5 to -	130	130	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- SP (-13 to	130	130	31	0	N/A	N/A	N/A	626.3	3	0.32	3.12	N/A	N/A	True	Linear	
07- SP (-22 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	
08- CH (-33 to	128	128	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
09- CH (-41 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
10- CH (-46 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
11- CH (-56 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- ML (+5 T	0.4	-	-	0.531	0.5	1	0	7.2	4.8	20	-
02- CH (+3 TO	0.3	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- ML (+2 to	0.4	-	-	0.531	0.5	-	-	13	8.7	20	-
04- CH (+0 TO	0.35	-	-	0.609	0.5	-	-	21.8	14.5	30	-
05- CH (-5 to -	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- SP (-13 to	0.35	-	-	0.485	0.5	-	-	29	19.3	70	-
07- SP (-22 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-
08- CH (-33 to	0.3	-	-	0.609	0.8	-	-	0	0	0	-
09- CH (-41 to	0.25	-	-	0.609	0.8	-	-	0	0	0	-
10- CH (-46 to	0.35	-	-	0.609	0.8	-	-	0	0	0	-
11- CH (-56 to	0.35	-	-	0.609	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

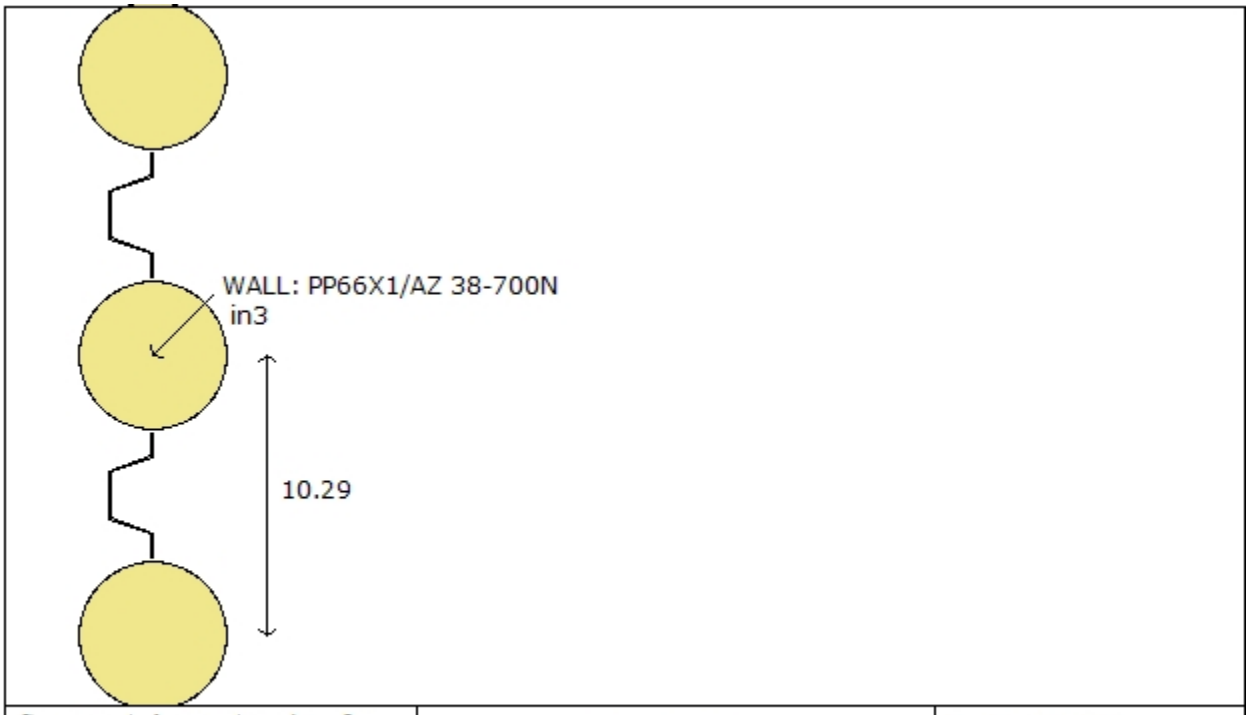
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- ML (+5 TO	1	0.53
3	02- CH (+3 TO	1	0.61
2	03- ML (+2 to	1	0.53
0	04- CH (+0 TO	1	0.61
-5	05- CH (-5 to -	1	0.61
-13	06- SP (-13 to -	1	0.48
-22	07- SP (-22 to	1	0.47
-33	08- CH (-33 to	1	0.61
-41	09- CH (-41 to	1	0.61
-46	10- CH (-46 to	1	0.61
-56	11- CH (-56 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -100 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.372	1.372	1.615
Stage 1	Simple span	N/A	1.6	1.174	1.174	1.384
Stage 2	Simple span	N/A	1.6	1.427	1.427	1.658
Stage 3	Simple span	N/A	1.6	1.228	1.228	1.427
Stage 4	Simple span	N/A	1.6	1.486	1.486	1.701
Stage 5	Simple span	N/A	1.6	1.128	1.128	1.296
Stage 6	Simple span	N/A	1.6	1.545	1.545	1.746
Stage 7	Simple span	N/A	1.6	1.187	1.187	1.341

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

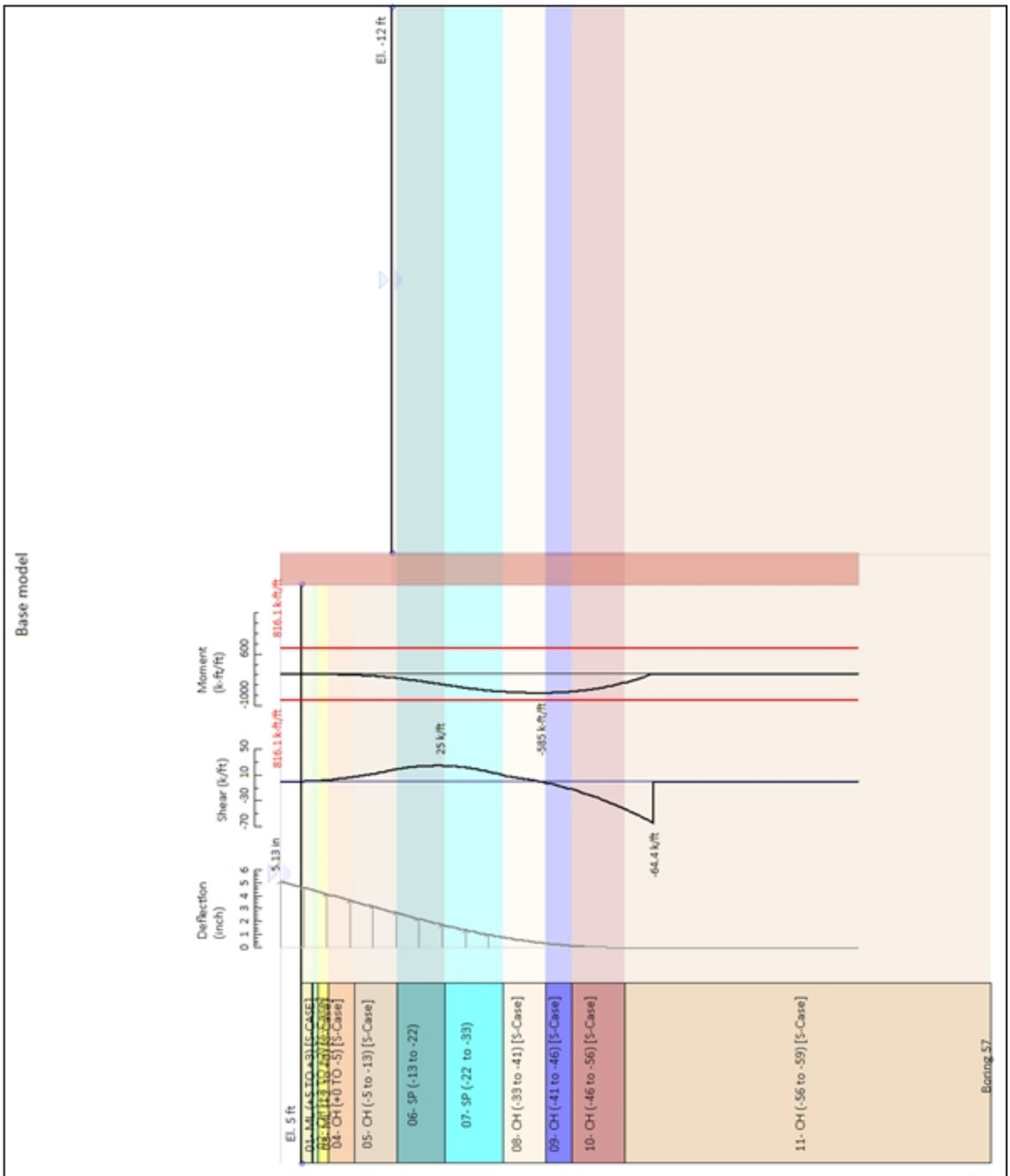
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



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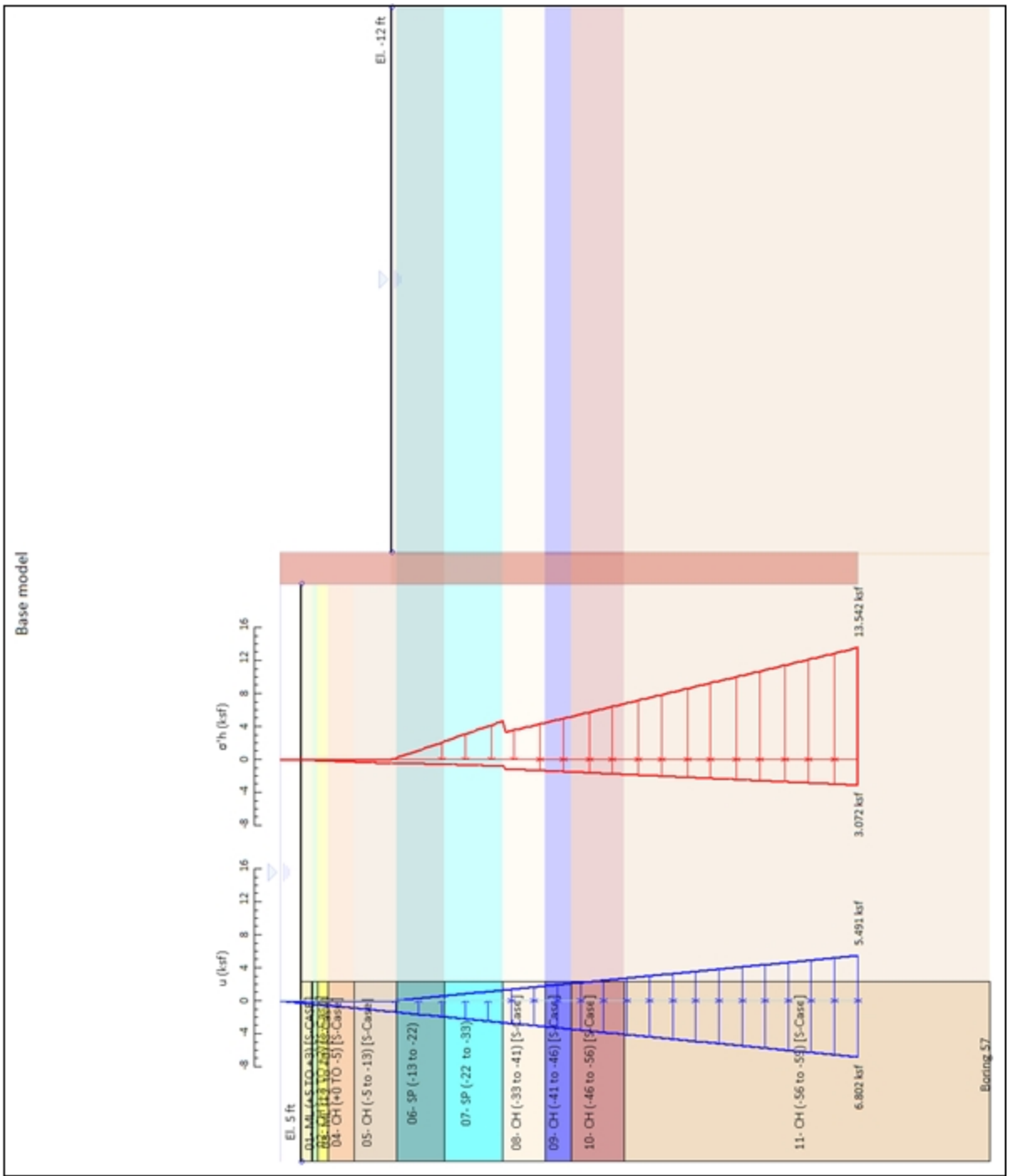

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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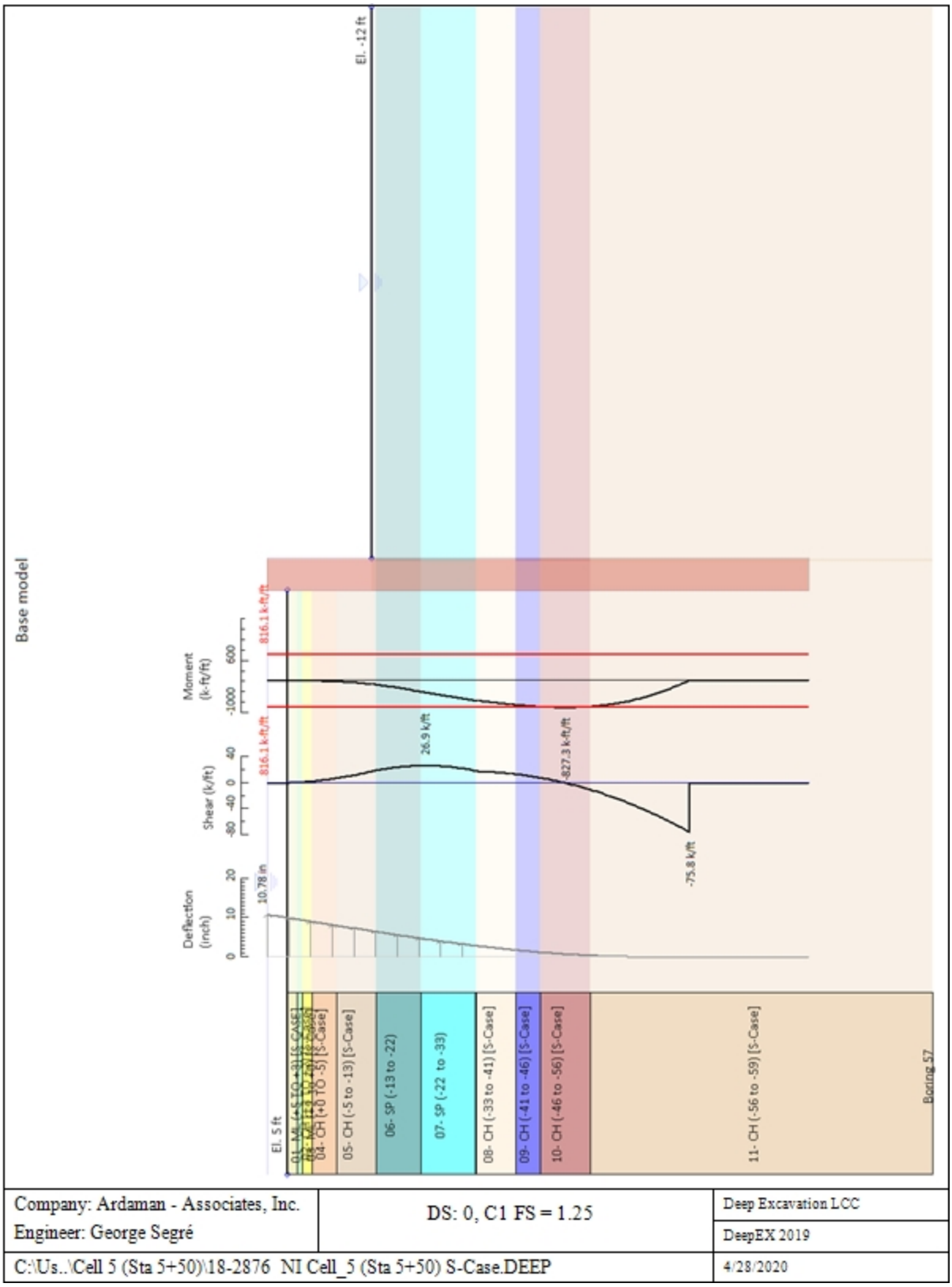
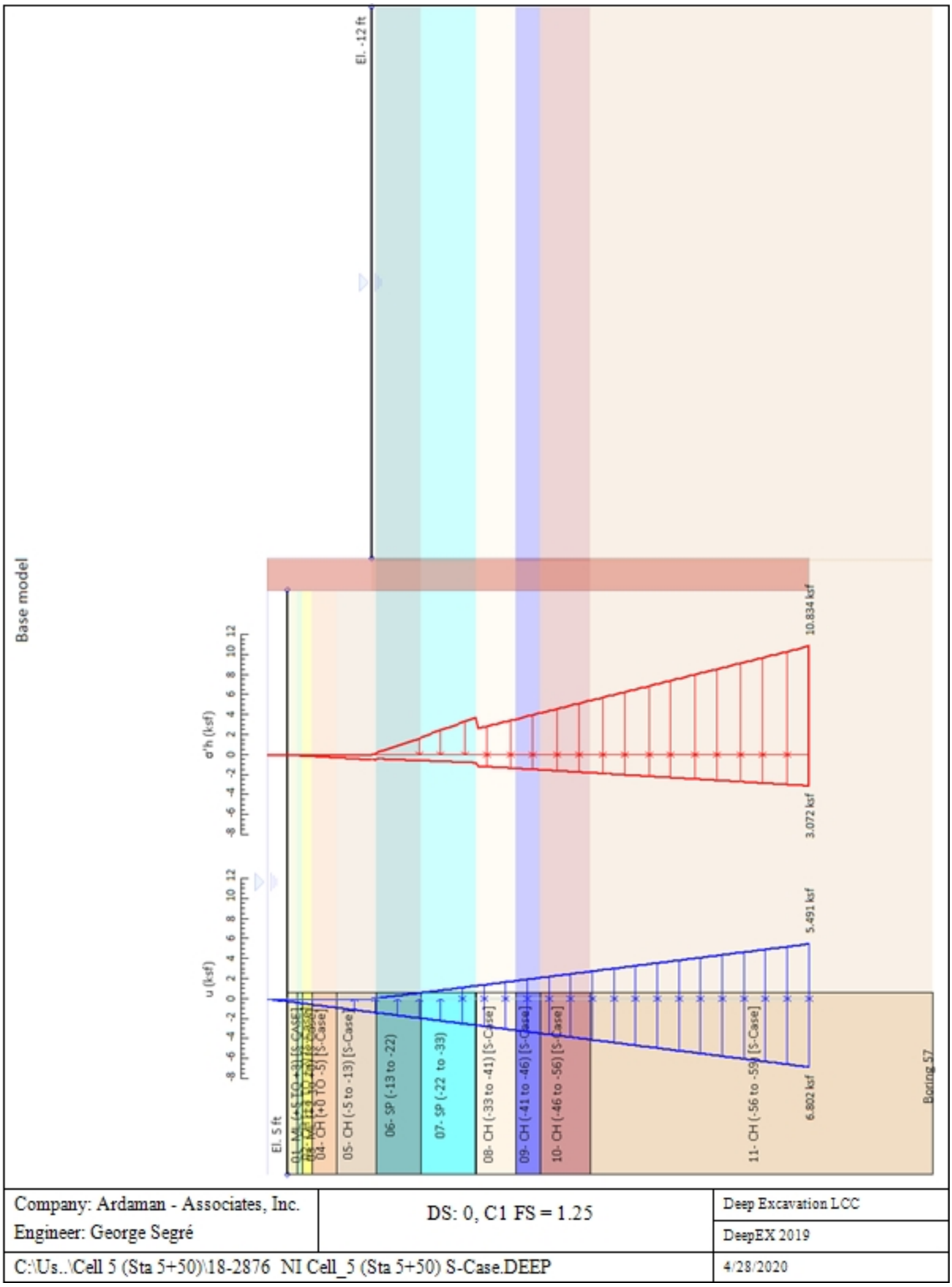

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
40
0
-40
-80
26.9 k/ft
-827.3 k-ft/ft
-75.8 k/ft
Deflection (inch)
0
10
20
10.78 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
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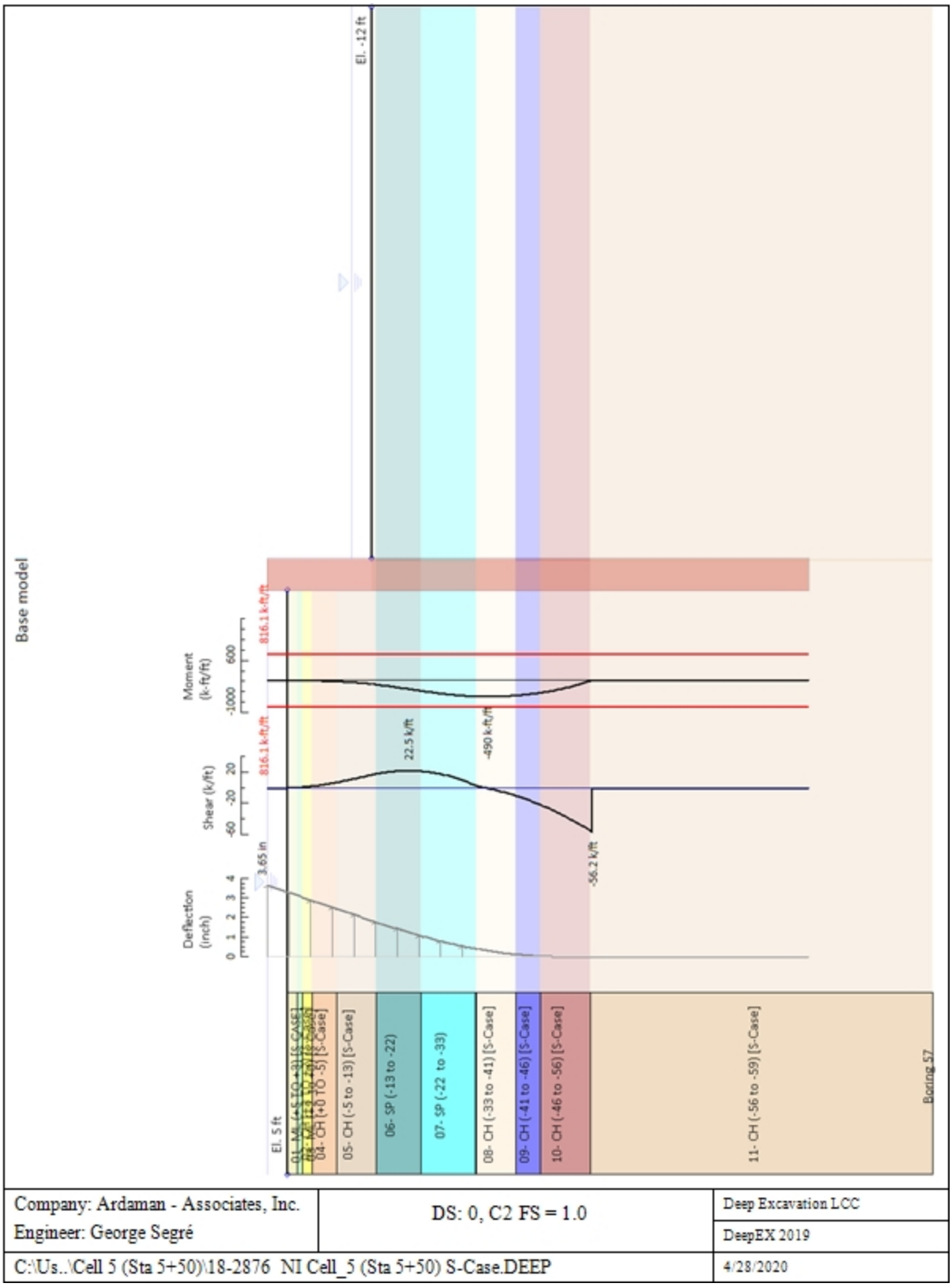
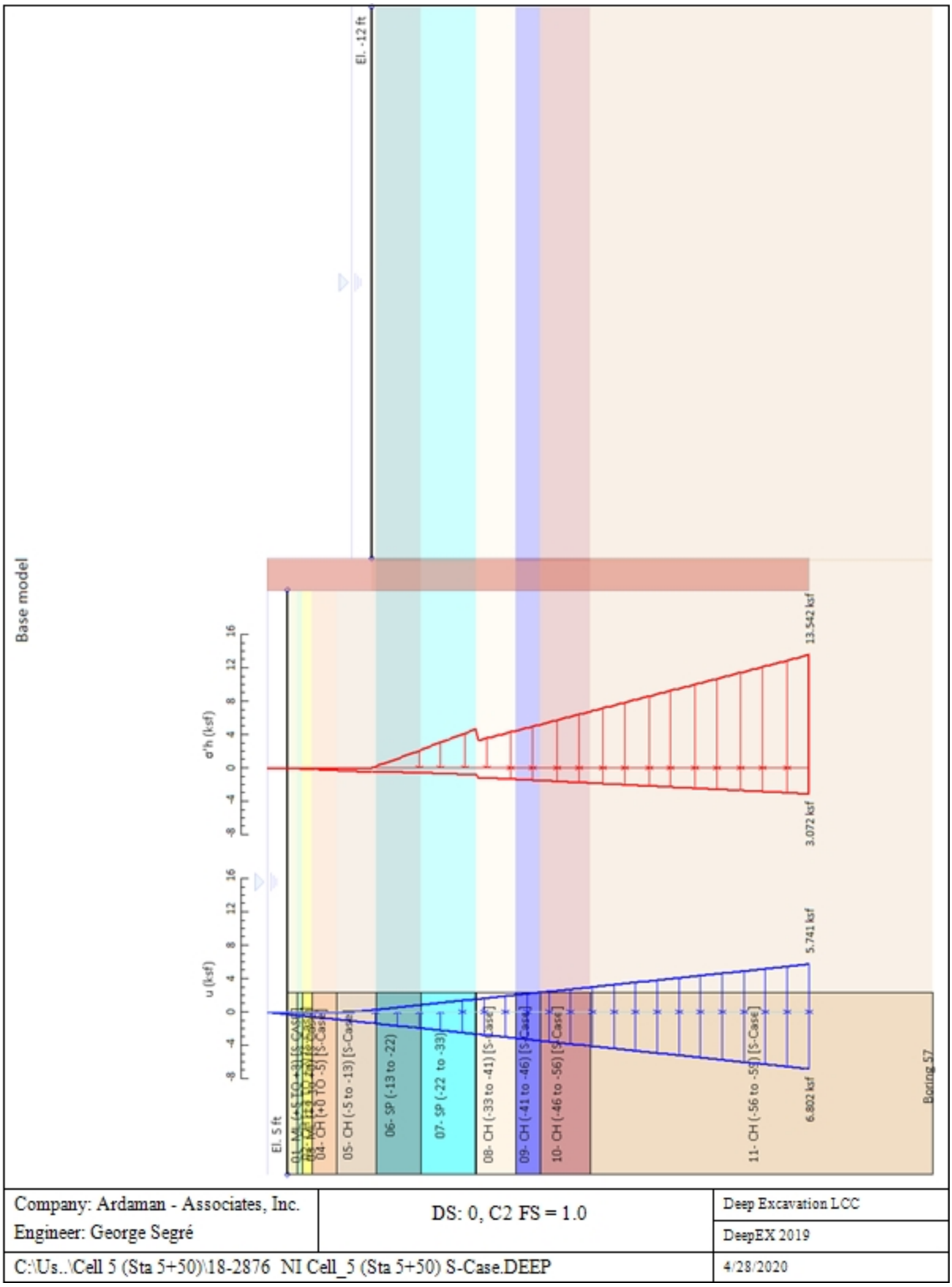

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
-20
-60
22.5 k/ft
-490 k-ft/ft
-56.2 k/ft
Deflection (inch)
0 1 2 3 4
3.65 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
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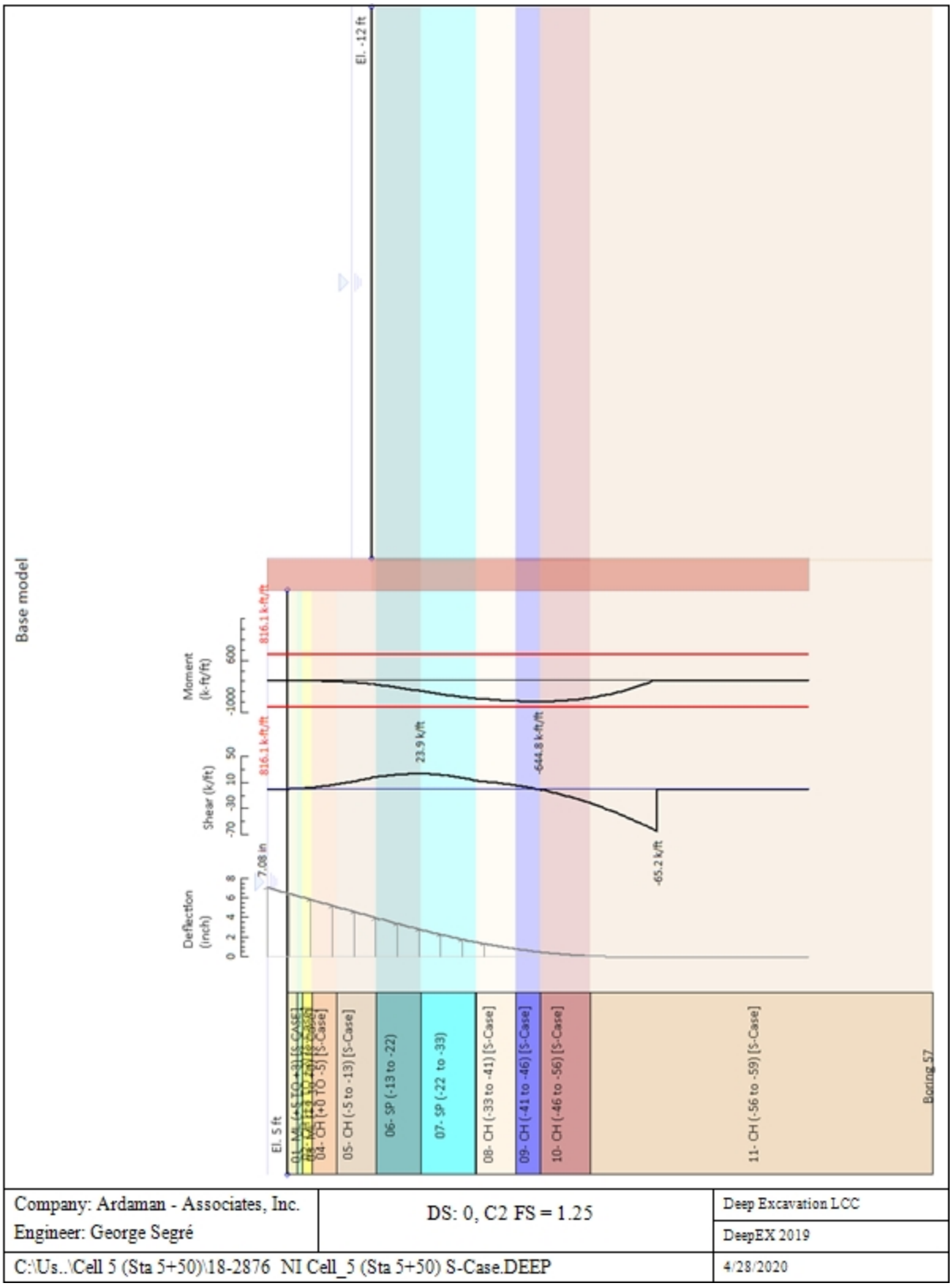
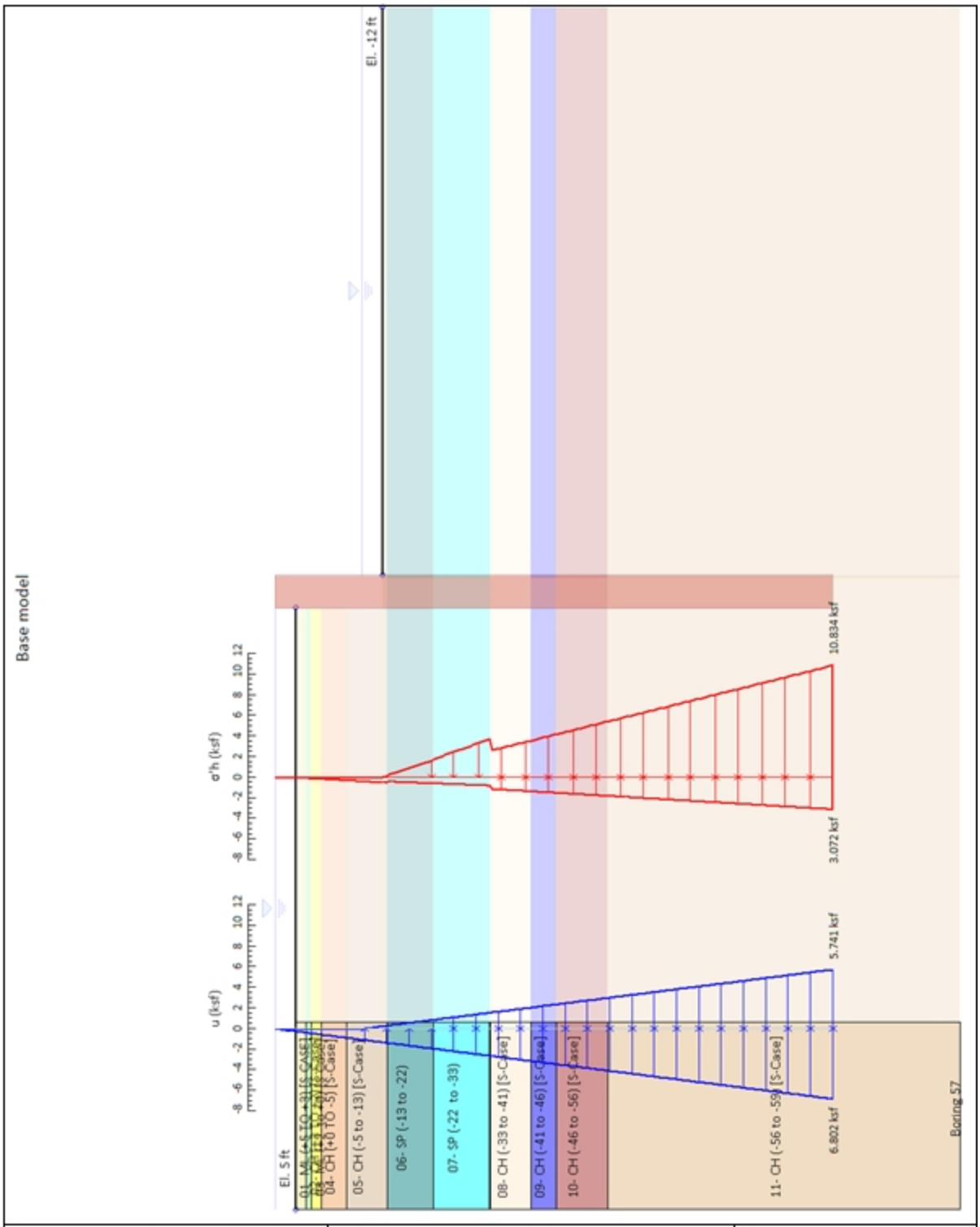
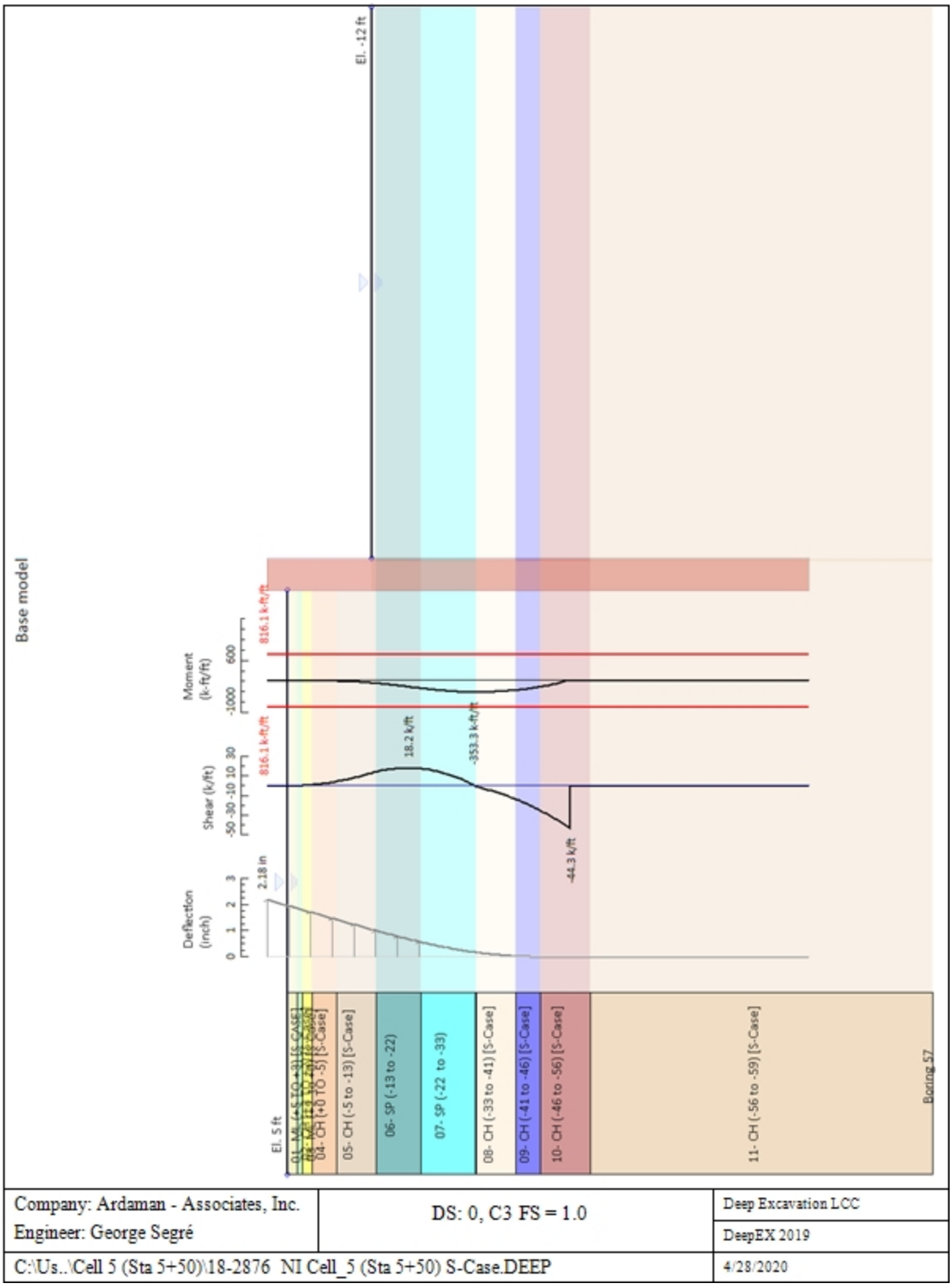
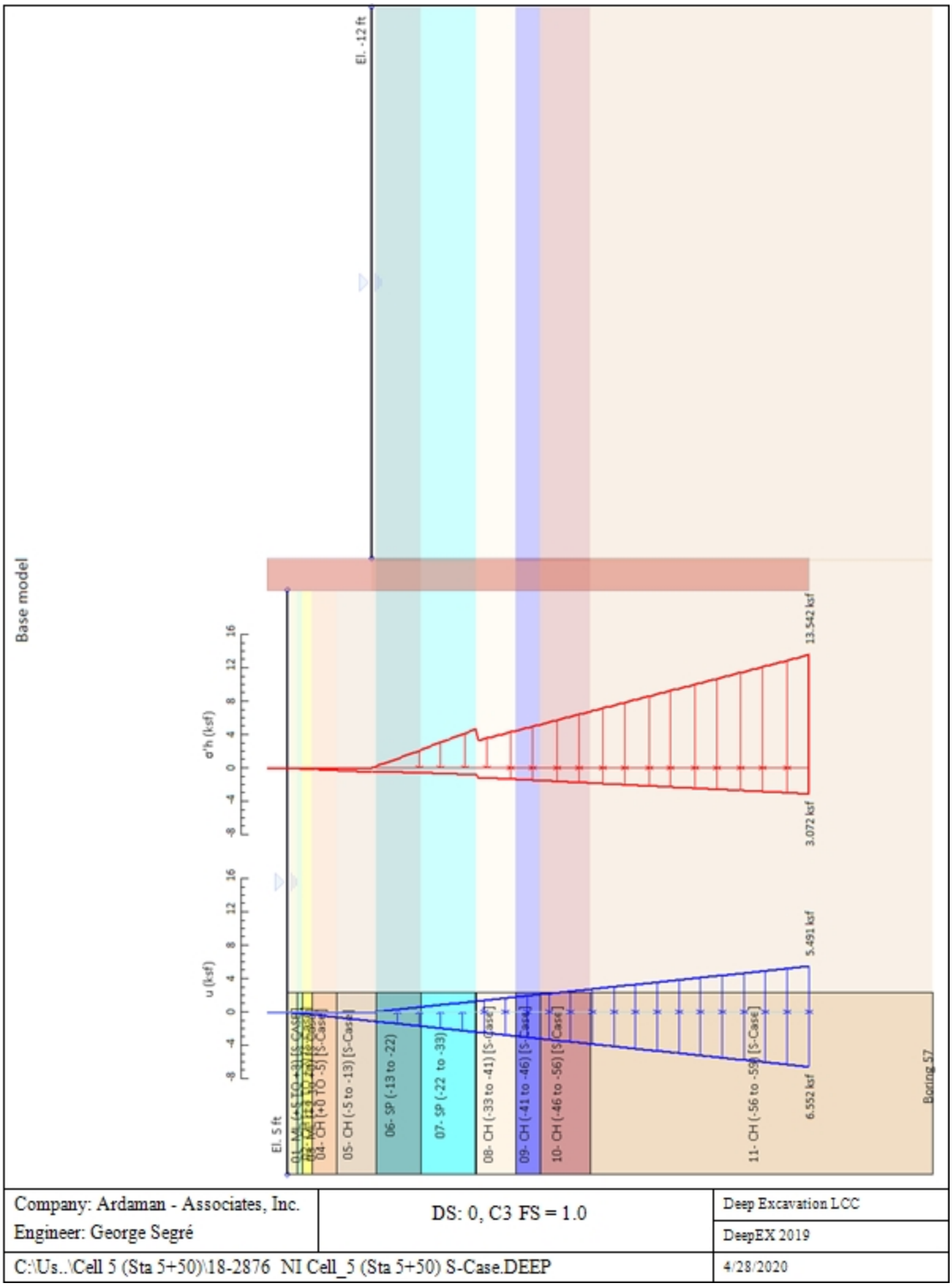

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
50
10
-30
-70
23.9 k/ft
-644.8 k-ft/ft
-65.2 k/ft
Deflection (inch)
0
2
4
6
8
7.08 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP		4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
18.2 k/ft
-353.3 k-ft/ft
-44.3 k/ft
Deflection (inch)
0 1 2 3
2.18 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
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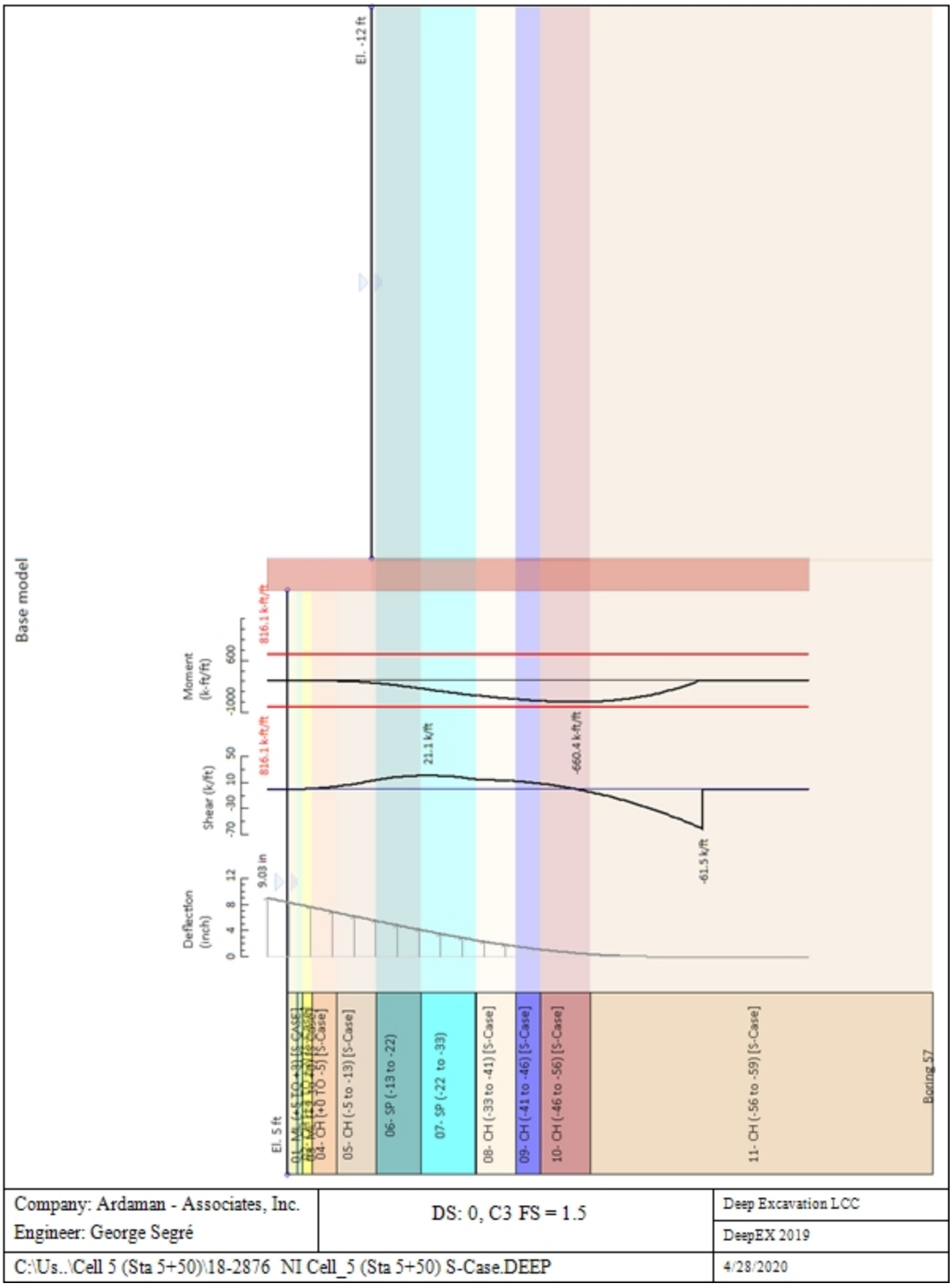
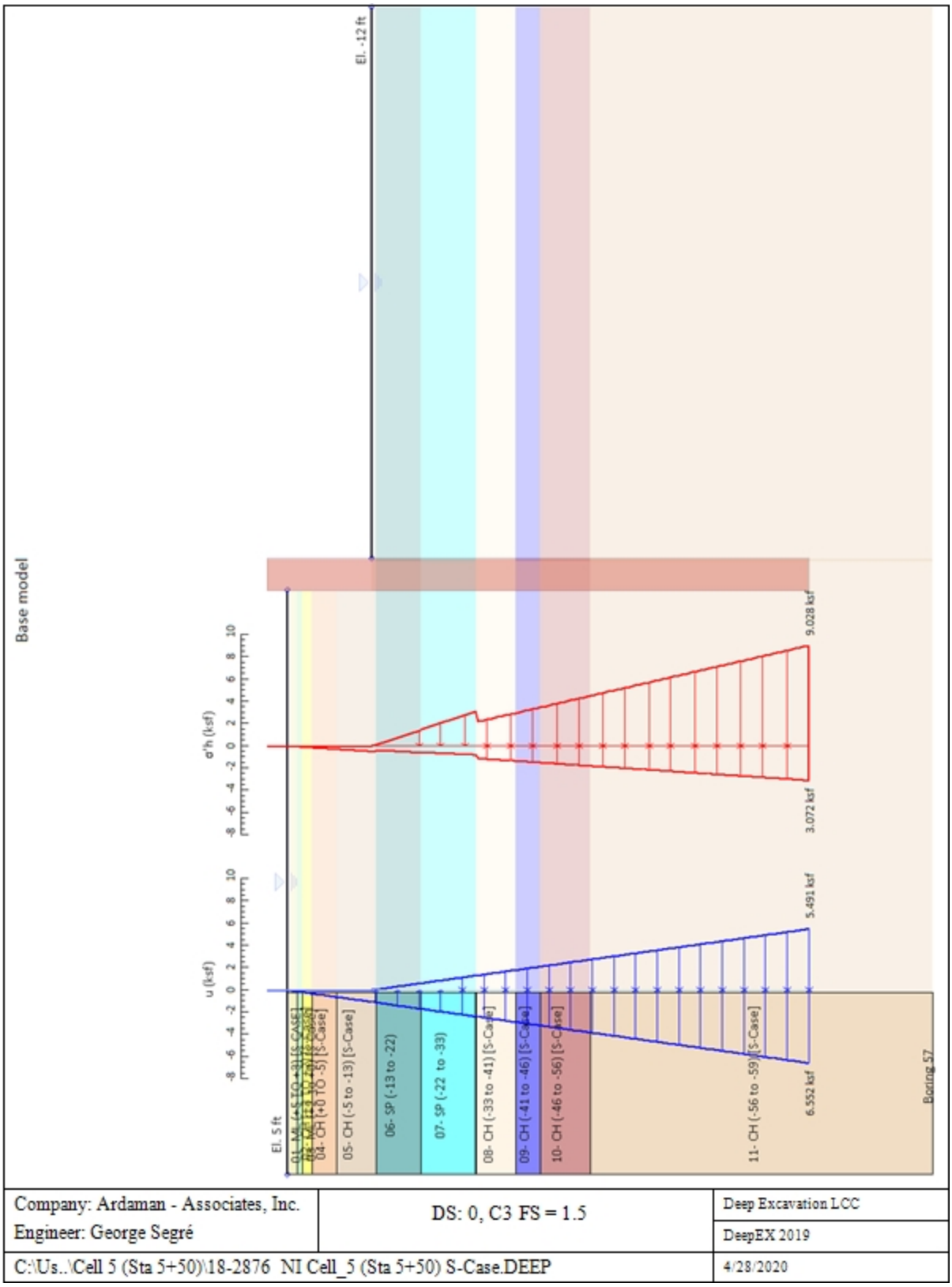

Base model
El. -12 ft
Moment (k-ft/ft)
816.1 k-ft/ft
-1000
600
Shear (k/ft)
816.1 k-ft/ft
-70 -30 10 50
21.1 k/ft
-660.4 k-ft/ft
-61.5 k/ft
Deflection (inch)
9.03 in
0 4 8 12
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.5	Deep Excavation LCC DeepEX 2019
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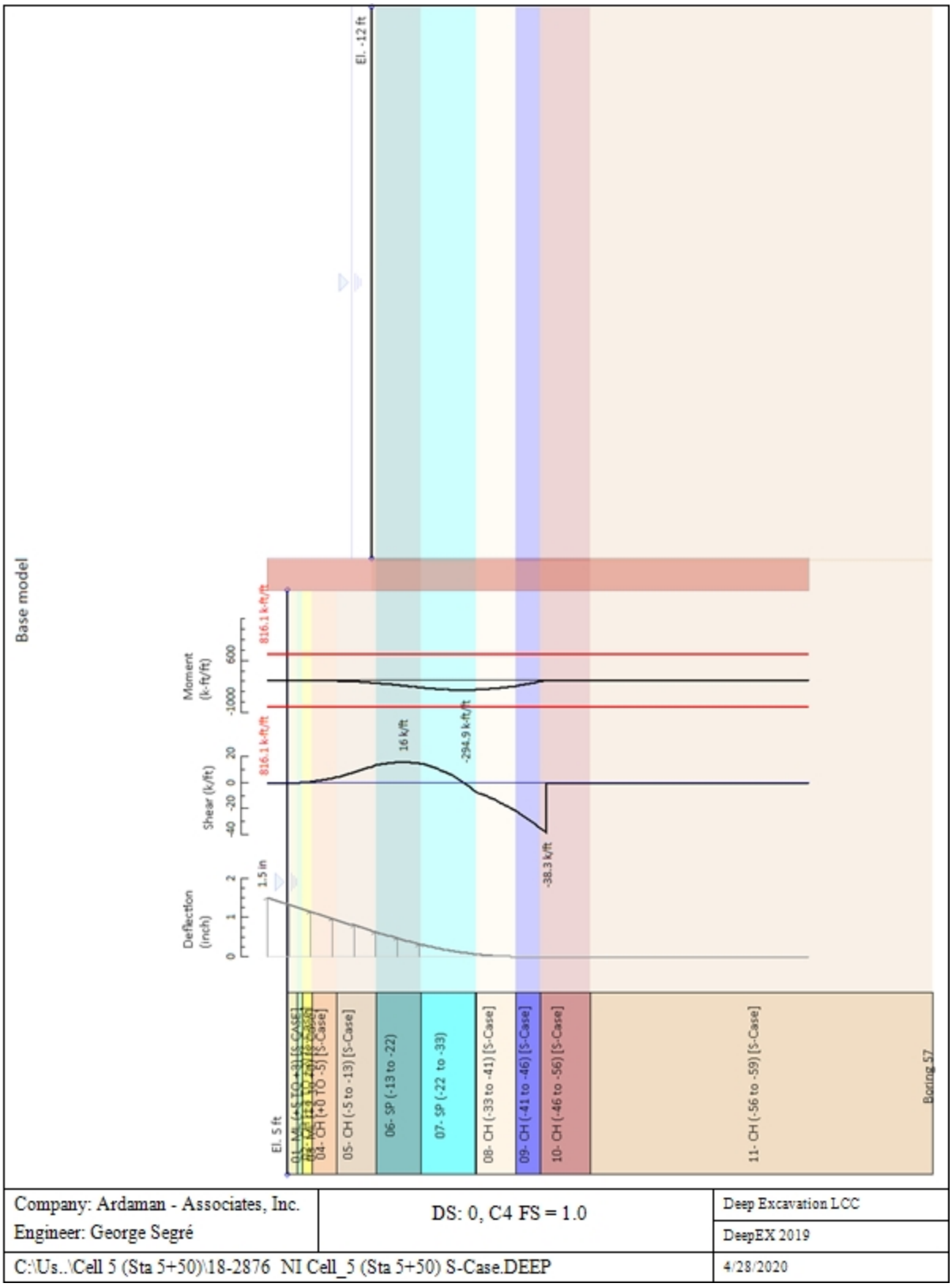
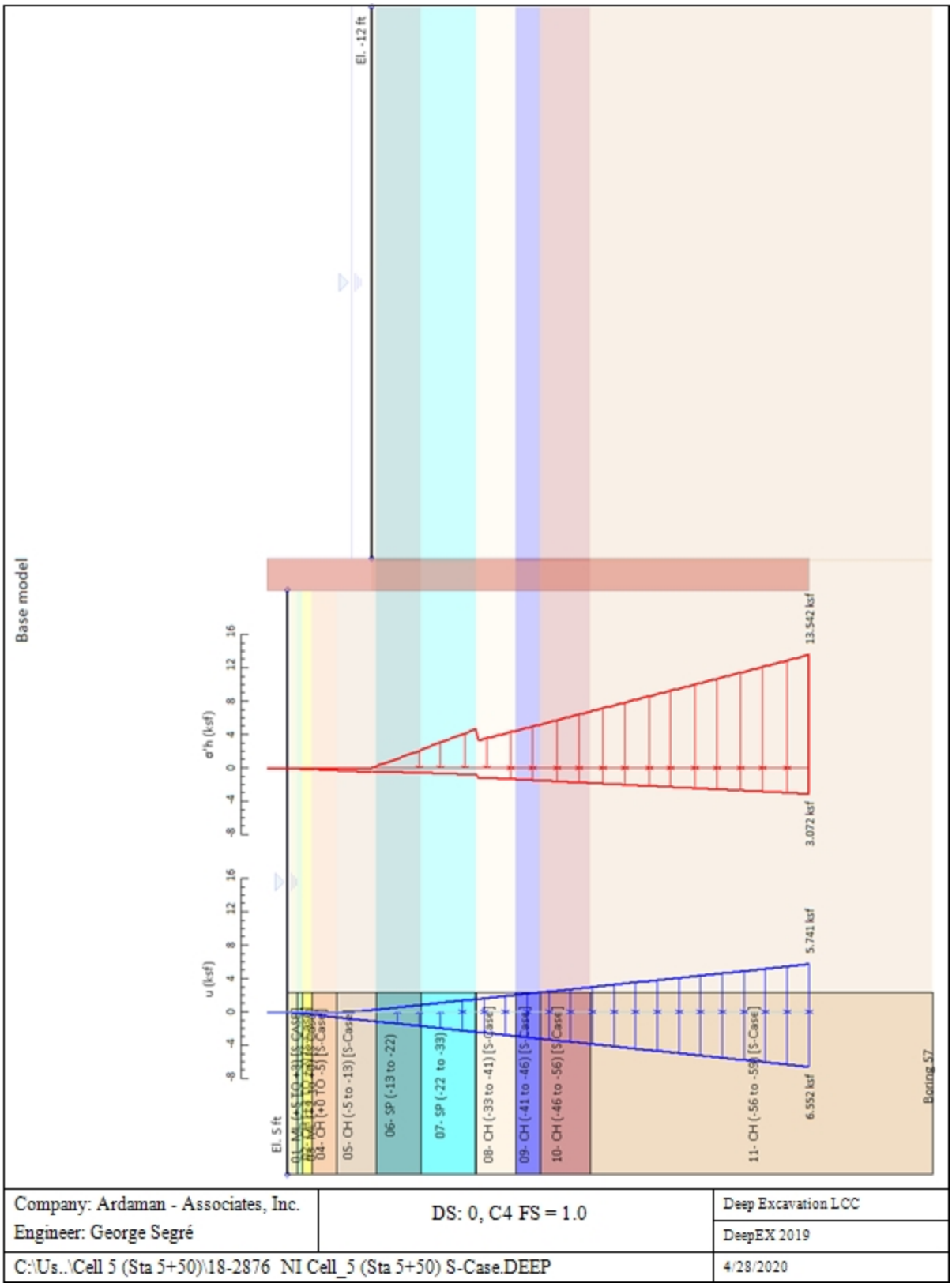

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
16 k/ft
-294.9 k-ft/ft
-38.3 k/ft
Deflection (inch)
0
1
2
1.5 in
El. 5 ft
04- CH (+0 TO -5) [S-Case]
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
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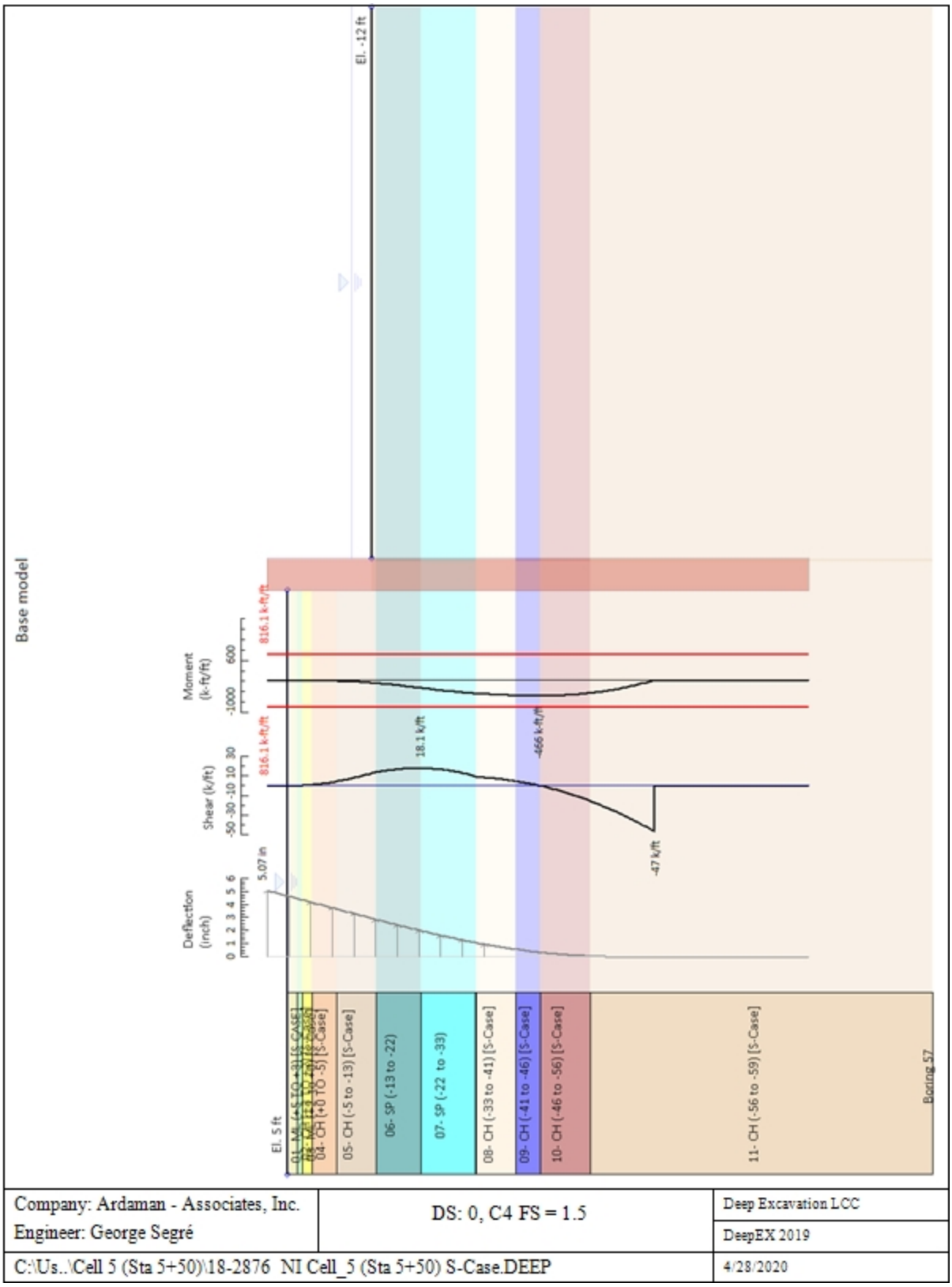

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
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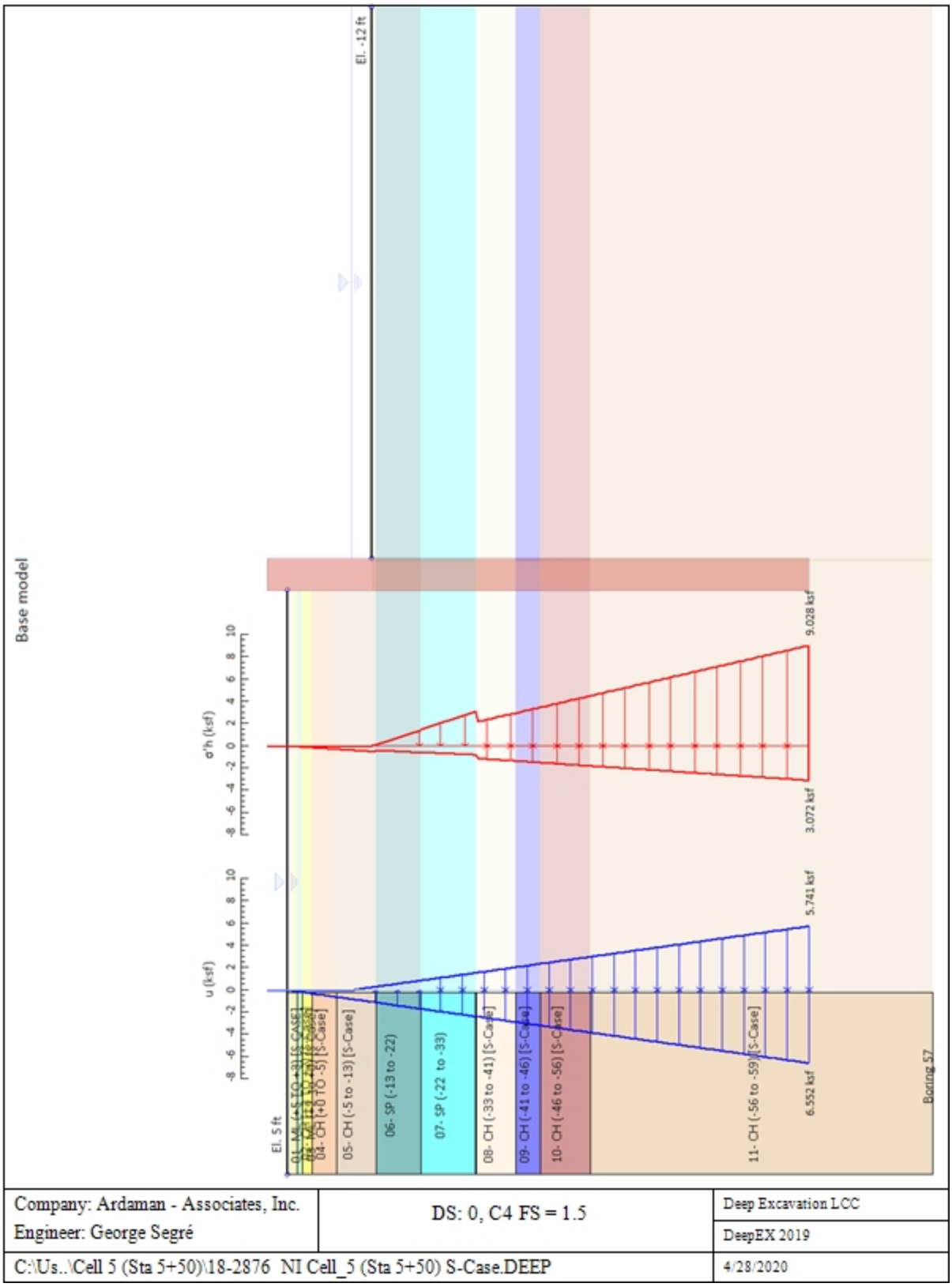

Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 5+50)\18-2876 NI Cell_5 (Sta 5+50) S-Case.DEEP		4/28/2020

Project: San Jacinto Waste Pits

Project No.: 18-2876

Date: 4/29/2020

Pile Type Selected in DeepEx: PAZ66/AZ38-700N

DeepEx Summary Page - Northern Impoundment (Cell #5 @ Sta. 6+25)

Top of Wall = 9.0 ft., NAVD88

Governing Tip Elev. = -67.72 ft., NAVD88

Length of Sheetting = 76.72 ft.

Use = 80.0 ft.

Design Tip Elev. = -71.0 ft., NAVD88

Design Length of Sheeting = 80.0 ft.

Condition	Case	Description	Water (Driving) (ft., NAVD88)	Water (Passive) (ft., NAVD88)	FS Active	FS Passive	Tip Elev. (ft., NAVD88)	Max Moment (kip-ft/ft.)	Max Shear (kip/ft.)	Deflection (in)
Q-Case	1	Open excavation - degraded	9	-12	1.00	1.00	-38.40	159.19	40.01	0.62
		Open excavation - degraded	9	-12	1.00	1.25	-43.14	--	--	--
Q-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-36.03	123.61	33.67	0.44
		Open excavation - degraded	9	-8	1.00	1.25	-40.38	--	--	--
Q-Case	3	Open excavation - degraded	5	-12	1.00	1.00	-32.08	56.31	16.30	0.16
		Open excavation - degraded	5	-12	1.00	1.50	-40.77	--	--	--
Q-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-28.52	37.42	12.25	0.09
		Open excavation - degraded	5	-8	1.00	1.50	-36.82	--	--	--
S-Case	1	Open excavation - degraded	9	-12	1.00	1.00	-54.86	427.14	51.24	3.01
		Open excavation - degraded	9	-12	1.00	1.25	-67.72	--	--	--
S-Case	2	Open excavation - degraded	9	-8	1.00	1.00	-50.40	361.87	45.66	2.12
		Open excavation - degraded	9	-8	1.00	1.25	-60.80	--	--	--
S-Case	3	Open excavation - degraded	5	-12	1.00	1.00	-44.96	237.67	32.75	1.10
		Open excavation - degraded	5	-12	1.00	1.50	-66.74	--	--	--
S-Case	4	Open excavation - degraded	5	-8	1.00	1.00	-41.00	192.93	30.35	0.75
		Open excavation - degraded	5	-8	1.00	1.50	-57.33	--	--	--
						Governing Value:	-67.72	427.14	51.24	3.01

DeepEX 2019: Report Output

Copyright@2009 - 2019 Deep Excavation LLC: www.deepexcavation.com A program for the evaluation of deep excavations Deep Excavation LLC, New York, New York, www.deepexcavation.com

Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 11:04:19 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- ML (+5 T	117	117	15	0	200	15	15	300	3	0.59	1.7	0.59	1.7	True	EXP	
02- CH (+3 TO	128	128	0	0	1000	18	26	60	3	0.33	3	0.39	2.56	True	Linear	
03- ML (+2 to	117	117	15	0	200	15	15	150	3	0.59	1.7	0.59	1.7	True	Linear	
04- CH (+0 TO	127	127	0	0	750	0	0	521.92	3	1	1	1	1	True	Linear	
05- CH (-5 to -	130	130	0	0	1700	21.1	30	417.54	3	0.47	2.12	0.33	3	True	Linear	
06- SP (-13 to	130	130	31	0	N/A	N/A	N/A	626.3	3	0.32	3.12	N/A	N/A	True	Linear	
07- SP (-22 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	
08- CH (-33 to	128	128	0	0	1800	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
09- CH (-41 to	130	130	0	0	1950	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
10- CH (-46 to	130	130	0	0	2200	0	0	300	3	0.33	3	0.33	0.33	True	Linear	
11- CH (-56 to	130	130	0	0	2500	0	0	300	3	0.33	3	0.33	0.33	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- ML (+5 T	0.4	0	0	0.741	0.5	1	0	7.2	4.8	20	-
02- CH (+3 TO	0.3	0.1	0	0	0.5	-	-	5.1	3.4	20	-
03- ML (+2 to	0.4	0	0	0.741	0.5	-	-	13	8.7	20	-
04- CH (+0 TO	0.35	0	0	1	0.5	-	-	21.8	14.5	30	-
05- CH (-5 to -	0.45	0.1	0	0.45	0.5	-	-	18.1	12.1	30	-
06- SP (-13 to	0.35	-	-	0.485	0.5	-	-	29	19.3	70	-
07- SP (-22 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-
08- CH (-33 to	0.3	0	0	1	0.8	-	-	0	0	0	-
09- CH (-41 to	0.25	0	0	1	0.8	-	-	0	0	0	-
10- CH (-46 to	0.35	0	0	0	0.8	-	-	0	0	0	-
11- CH (-56 to	0.35	0	0	1	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

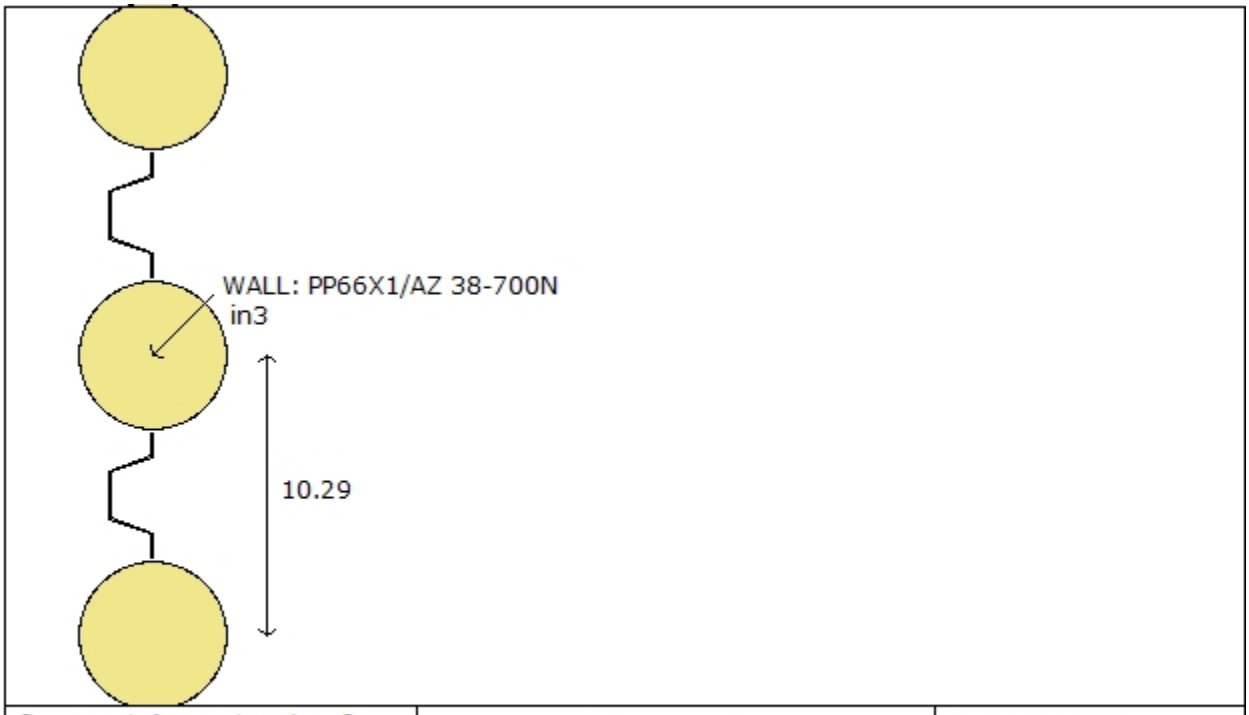
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- ML (+5 TO	1	0.74
3	02- CH (+3 TO	1	0
2	03- ML (+2 to	1	0.74
0	04- CH (+0 TO	1	1
-5	05- CH (-5 to -	1	0.45
-13	06- SP (-13 to -	1	0.48
-22	07- SP (-22 to	1	0.47
-33	08- CH (-33 to	1	1
-41	09- CH (-41 to	1	1
-46	10- CH (-46 to	1	0
-56	11- CH (-56 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -70 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	2.153	2.153	2.83
Stage 1	Simple span	N/A	1.6	1.753	1.753	2.283
Stage 2	Simple span	N/A	1.6	2.265	2.265	2.932
Stage 3	Simple span	N/A	1.6	1.856	1.856	2.372
Stage 4	Simple span	N/A	1.6	2.546	2.546	3.206
Stage 5	Simple span	N/A	1.6	1.757	1.757	2.173
Stage 6	Simple span	N/A	1.6	2.678	2.678	3.321
Stage 7	Simple span	N/A	1.6	1.871	1.871	2.264

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

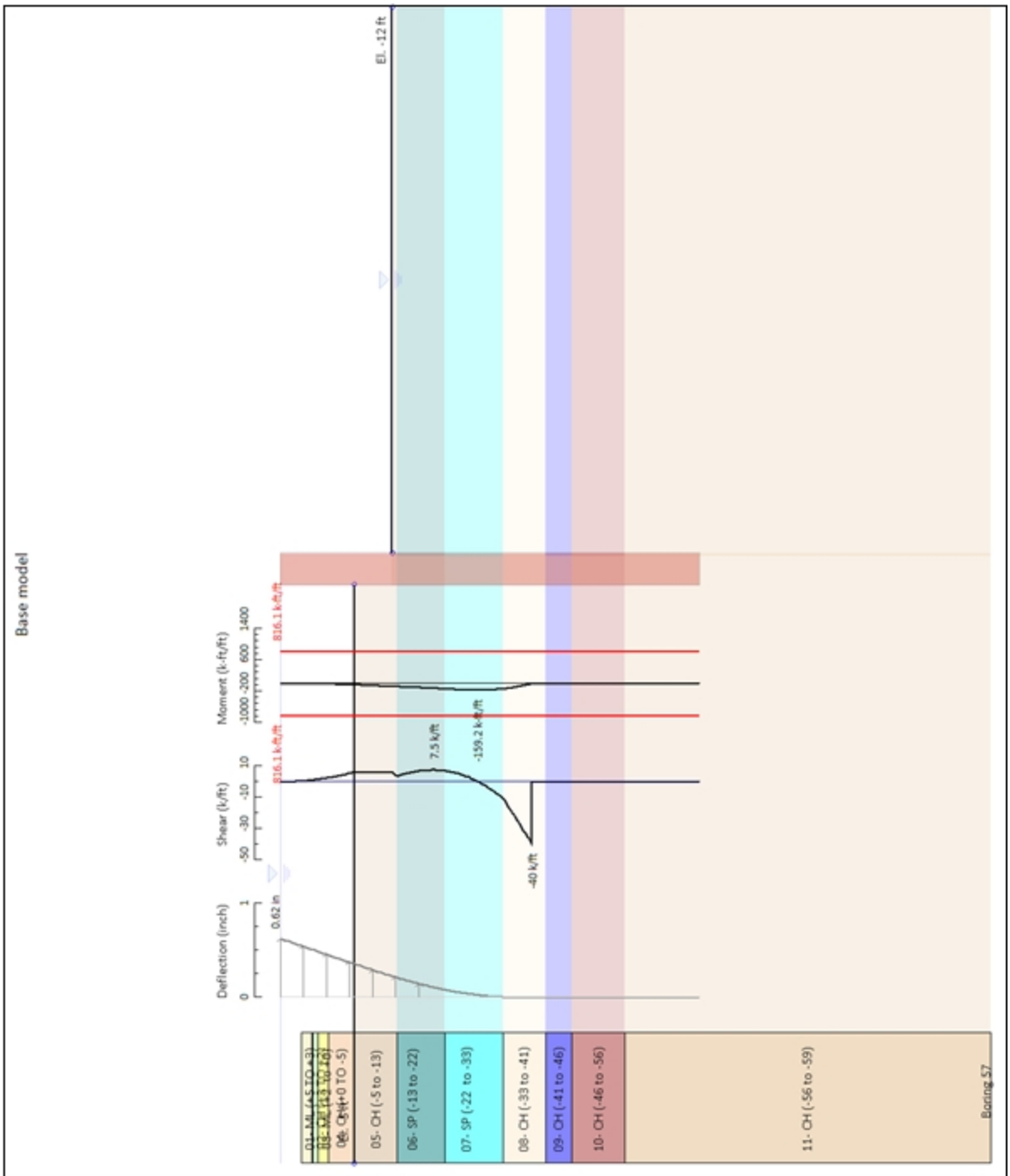
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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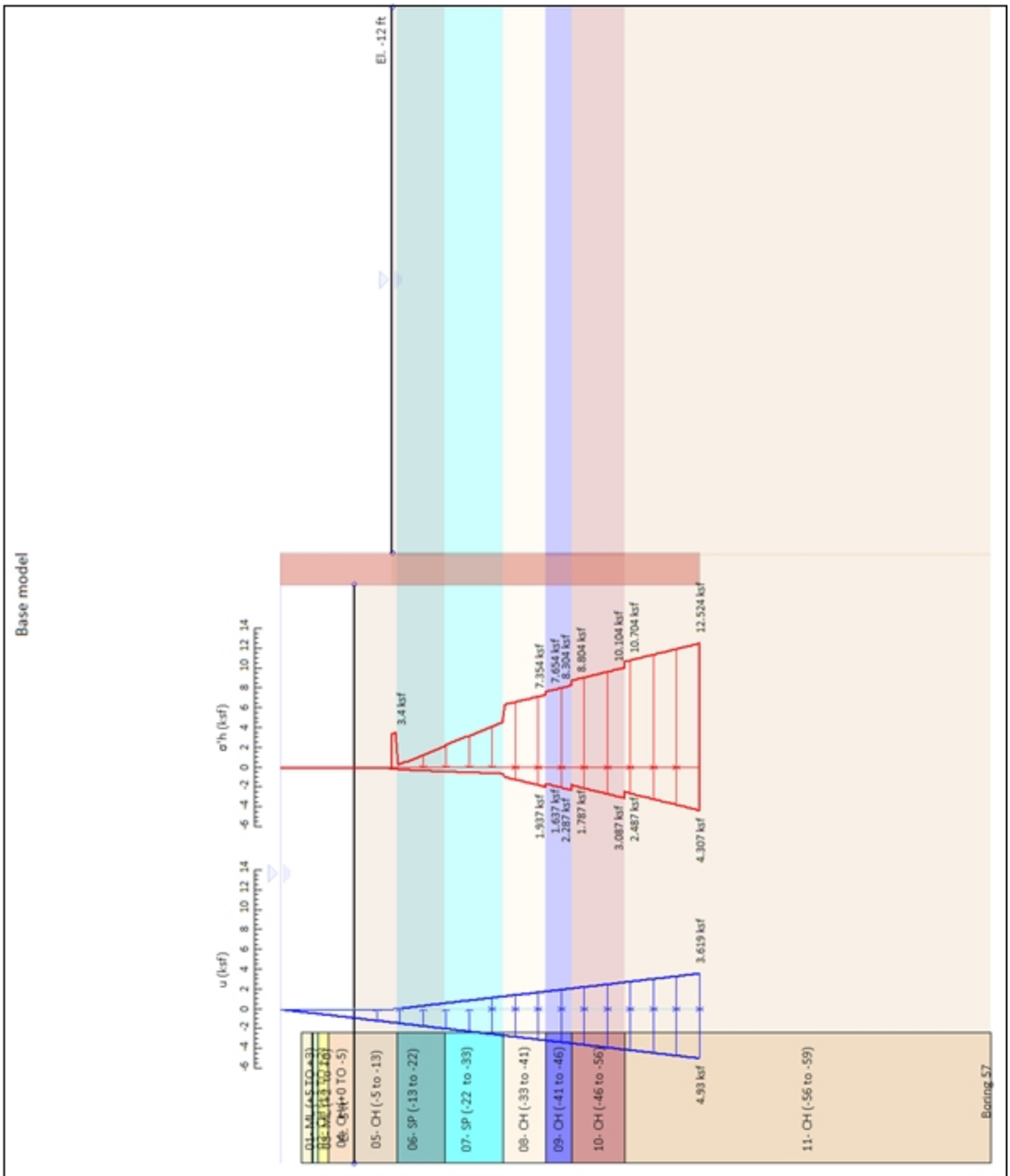
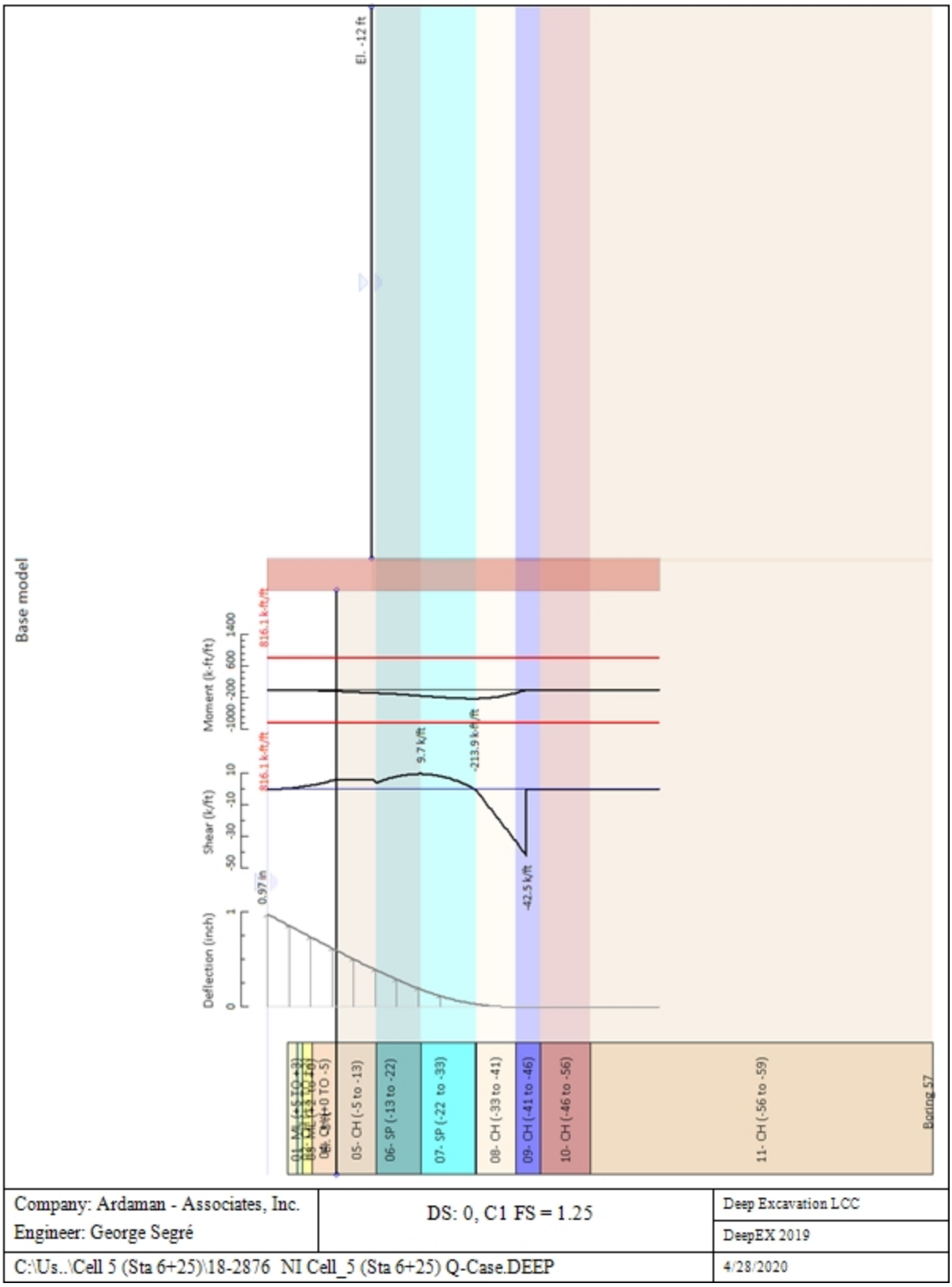
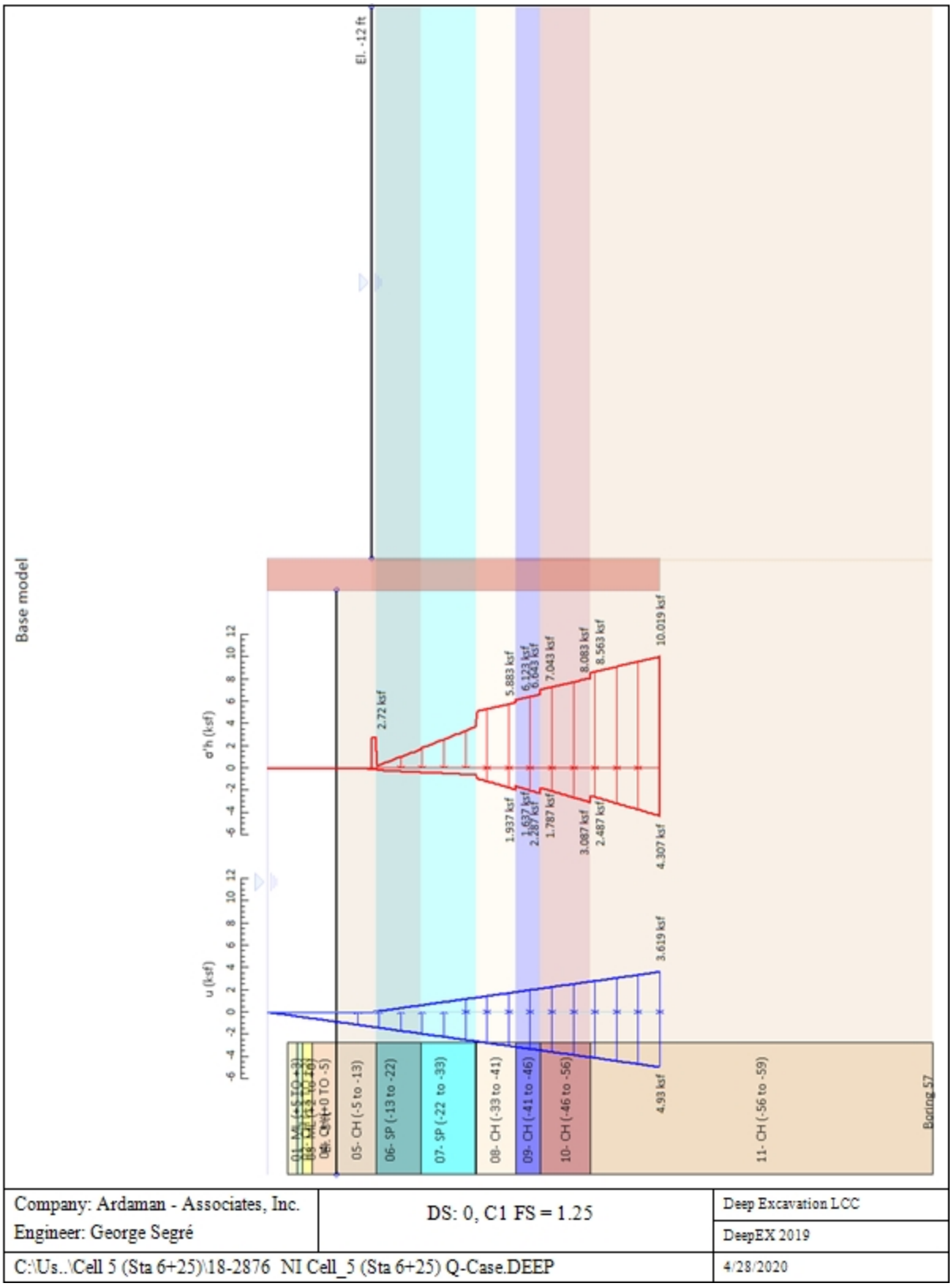
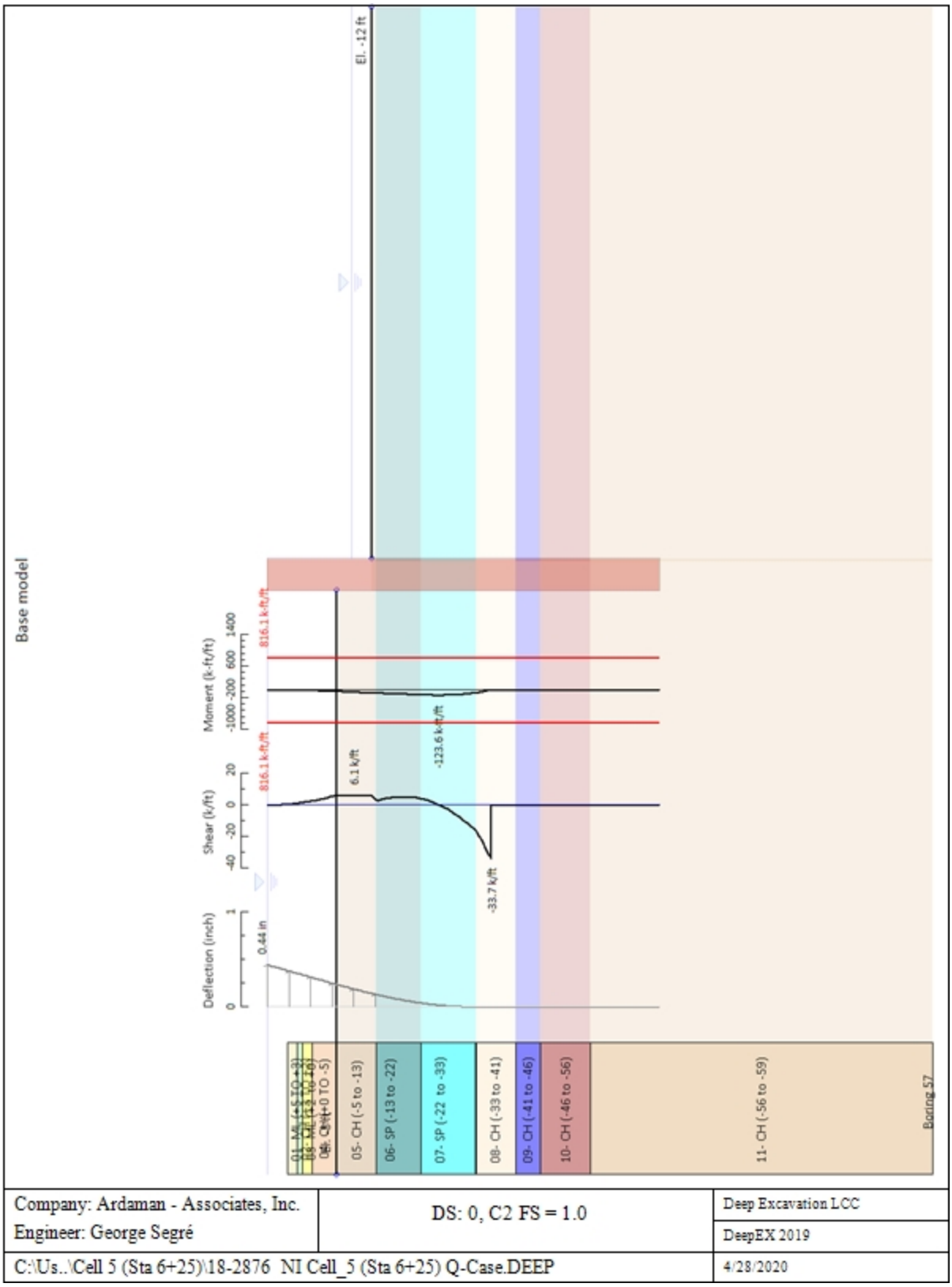


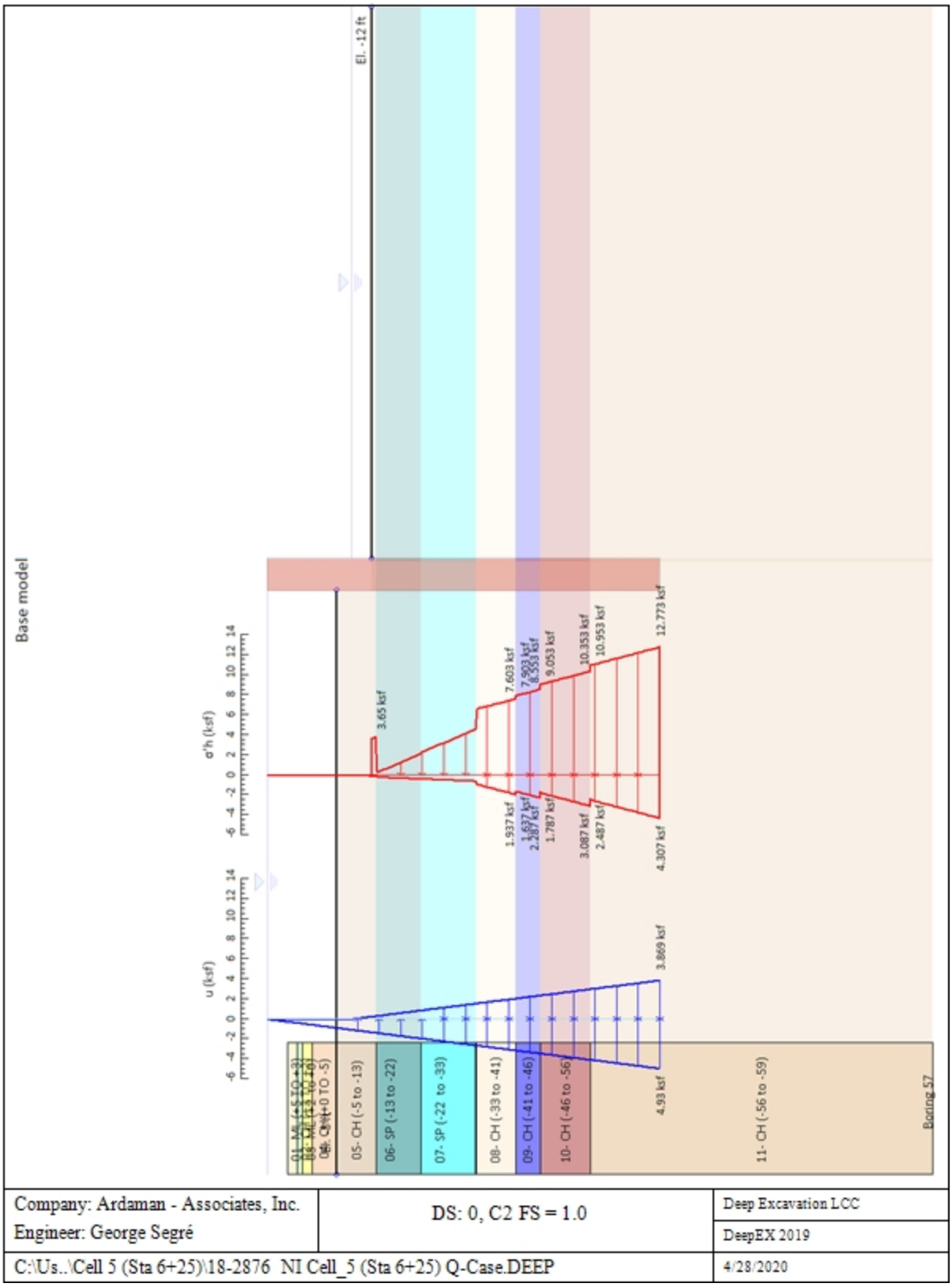
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP		4/28/2020

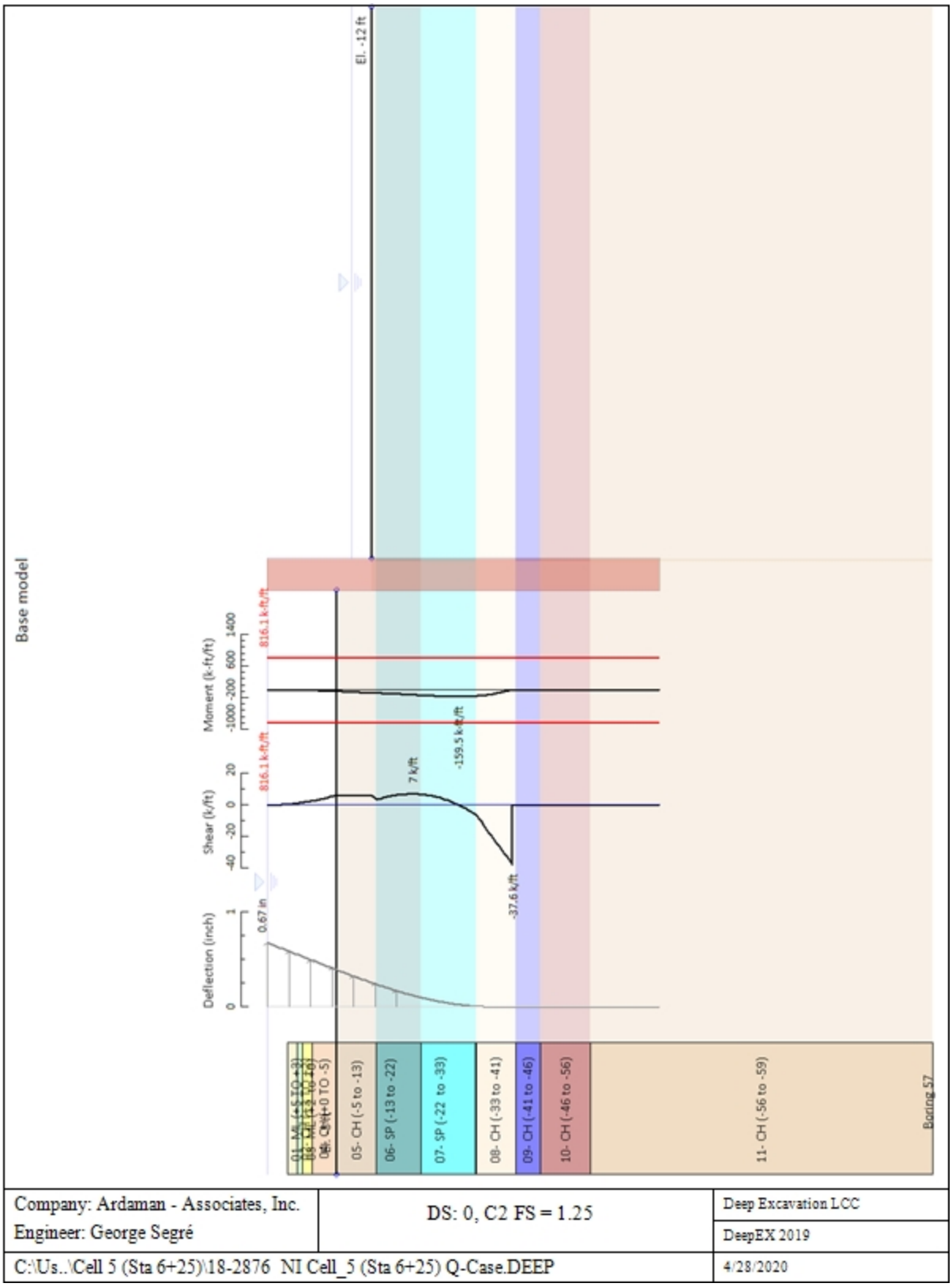

Base model
El. -12 ft
Deflection (inch)
0
1
0.97 in
Shear (k/ft)
-50 -30 -10 10
816.1 k-ft/ft
9.7 k/ft
-42.5 k/ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-213.9 k-ft/ft
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020



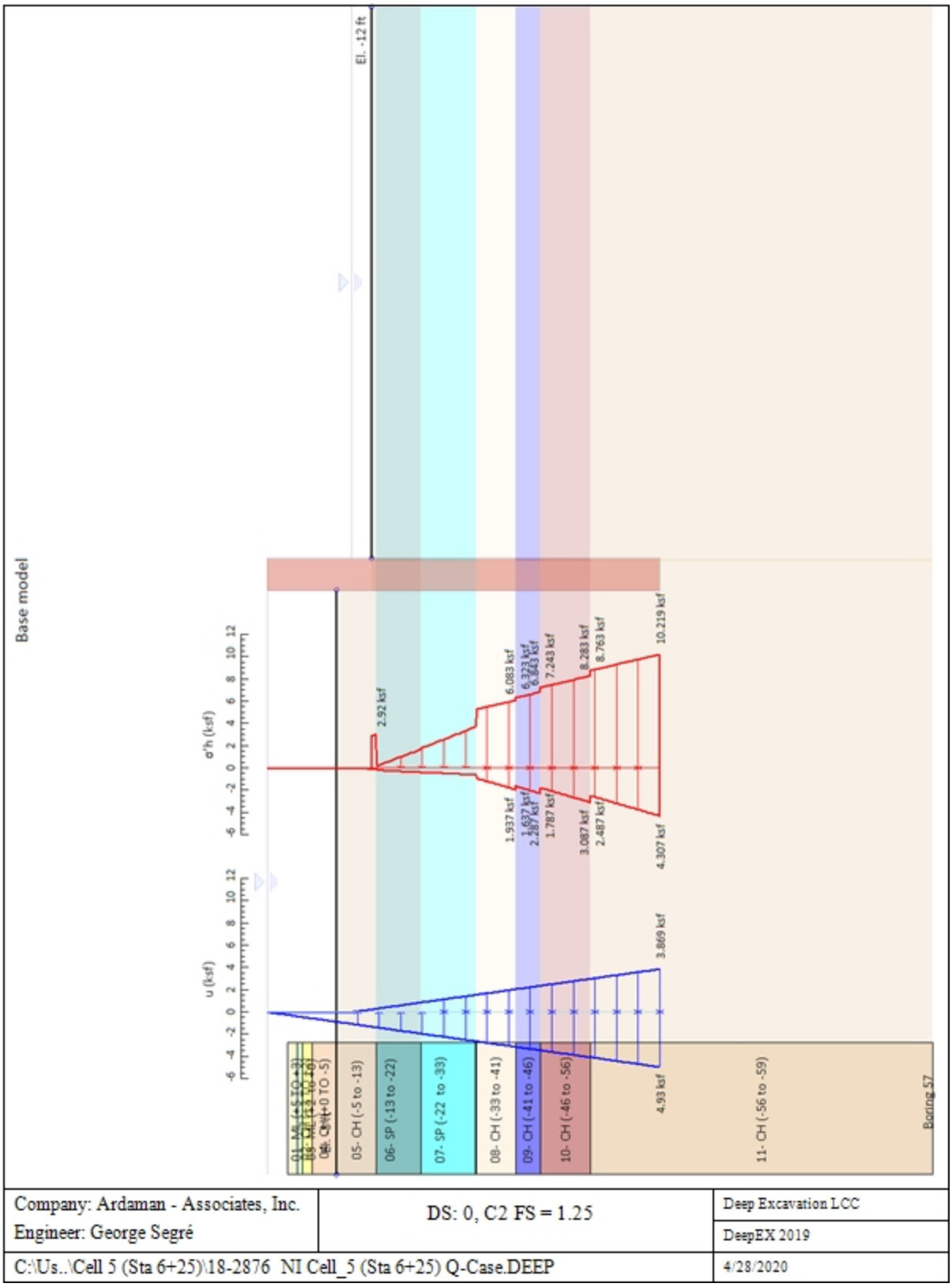
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP		4/28/2020

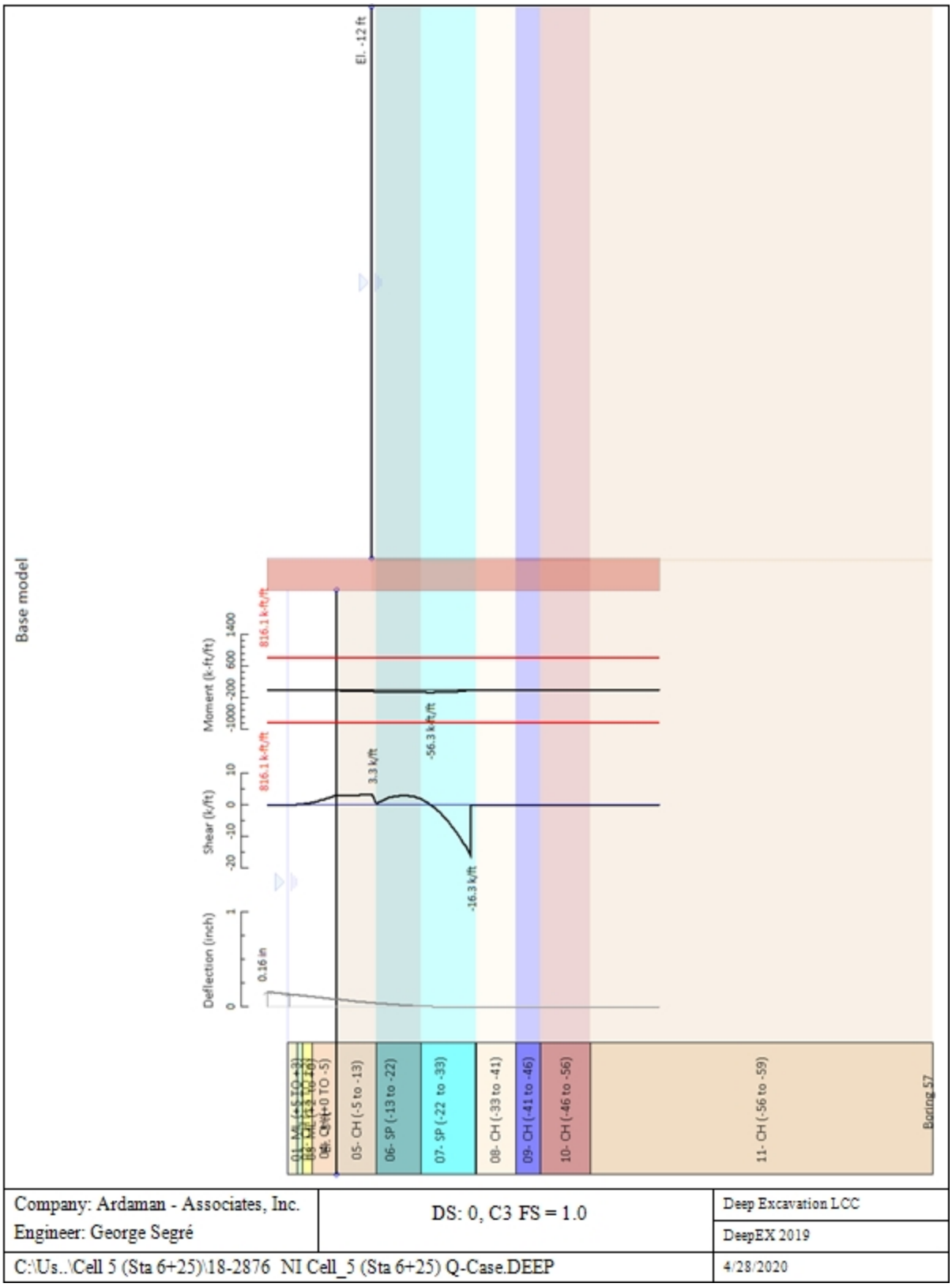

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-123.6 k-ft/ft
Shear (k/ft)
-40 -20 0 20
816.1 k-ft/ft
6.1 k/ft
-33.7 k/ft
Deflection (inch)
0 1
0.44 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

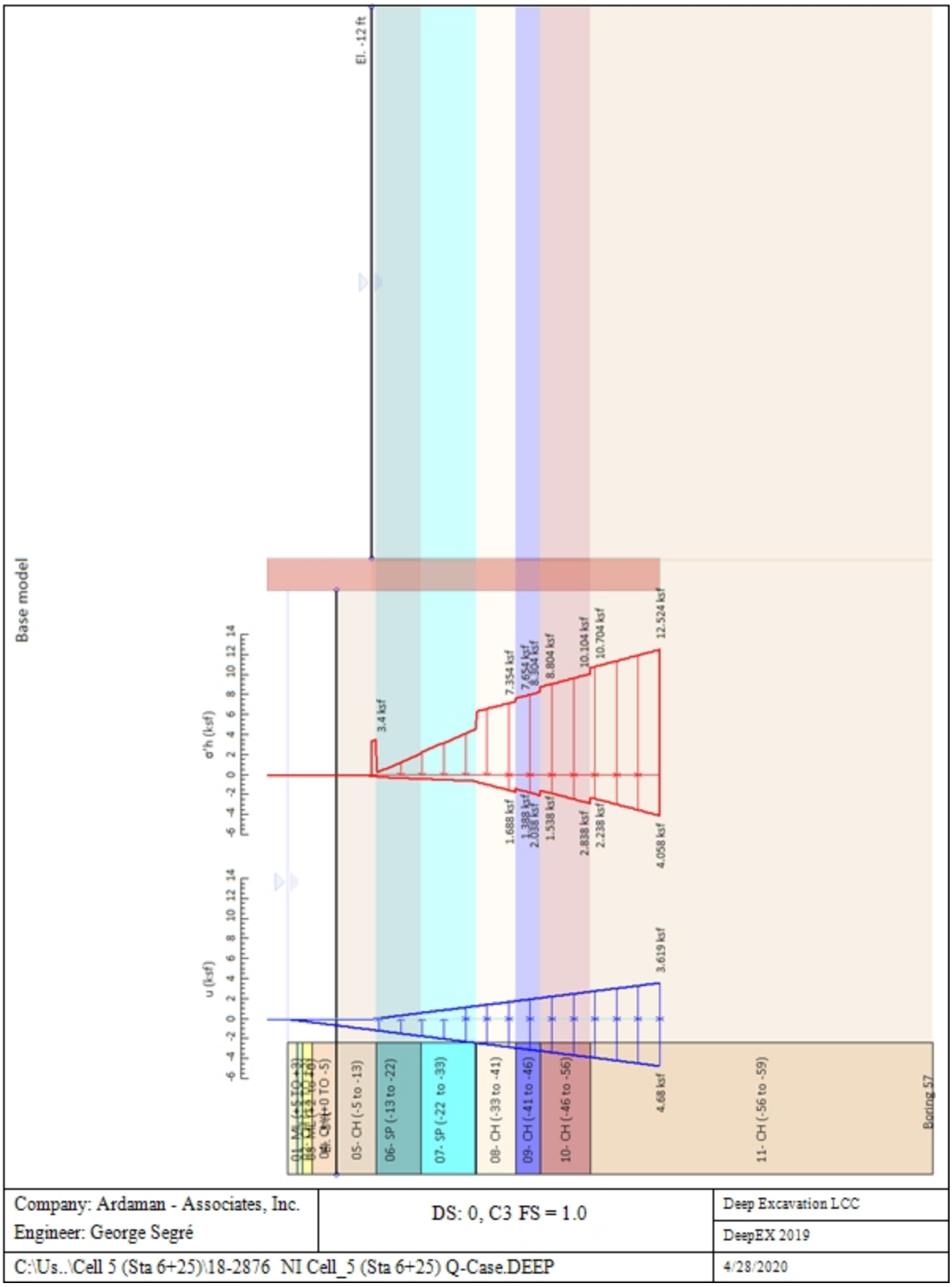

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
3.65 ksf
7.603 ksf
9.053 ksf
10.353 ksf
10.953 ksf
12.773 ksf
1.937 ksf
1.787 ksf
3.087 ksf
2.487 ksf
4.307 ksf
3.869 ksf
4.93 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

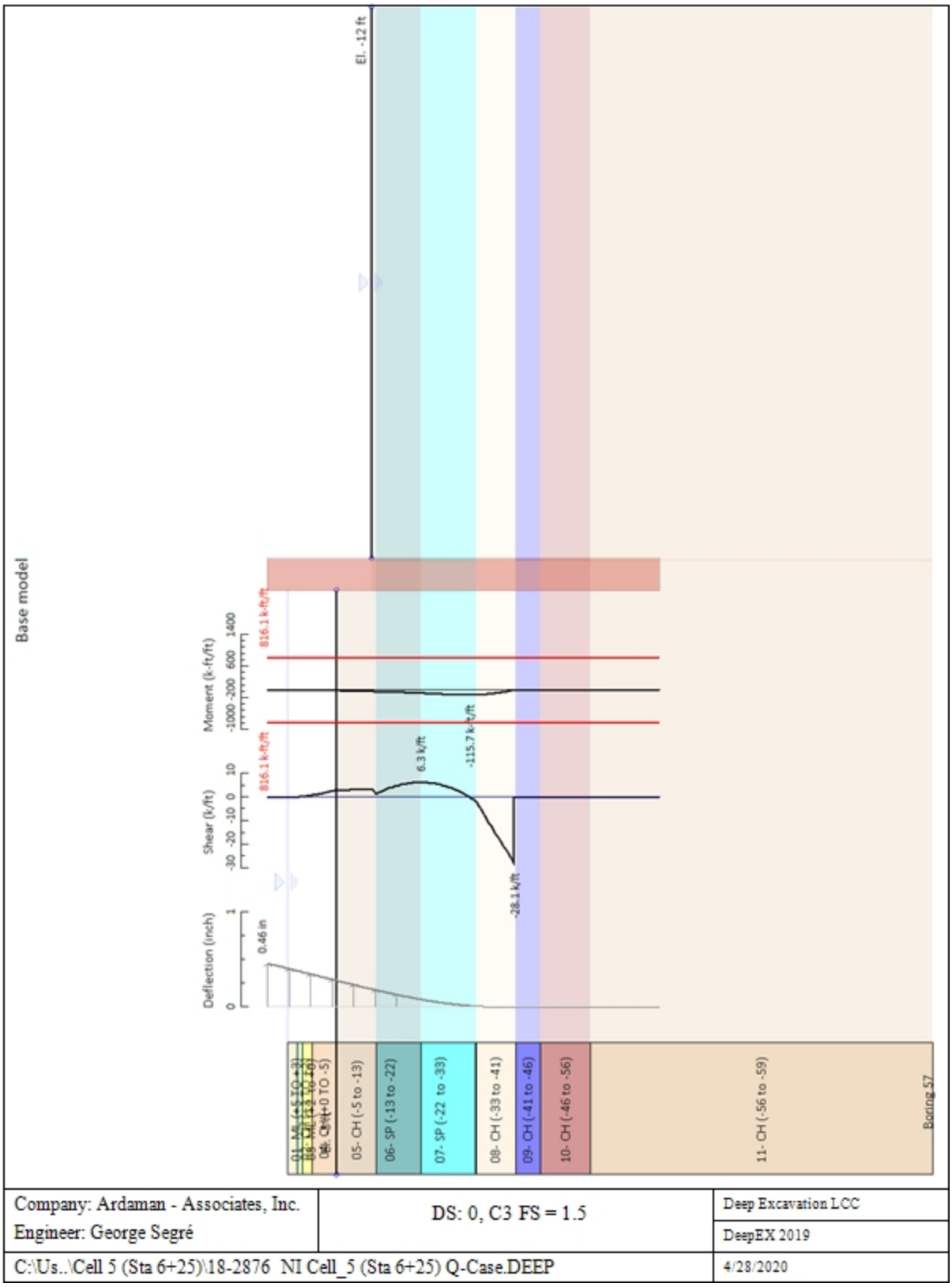


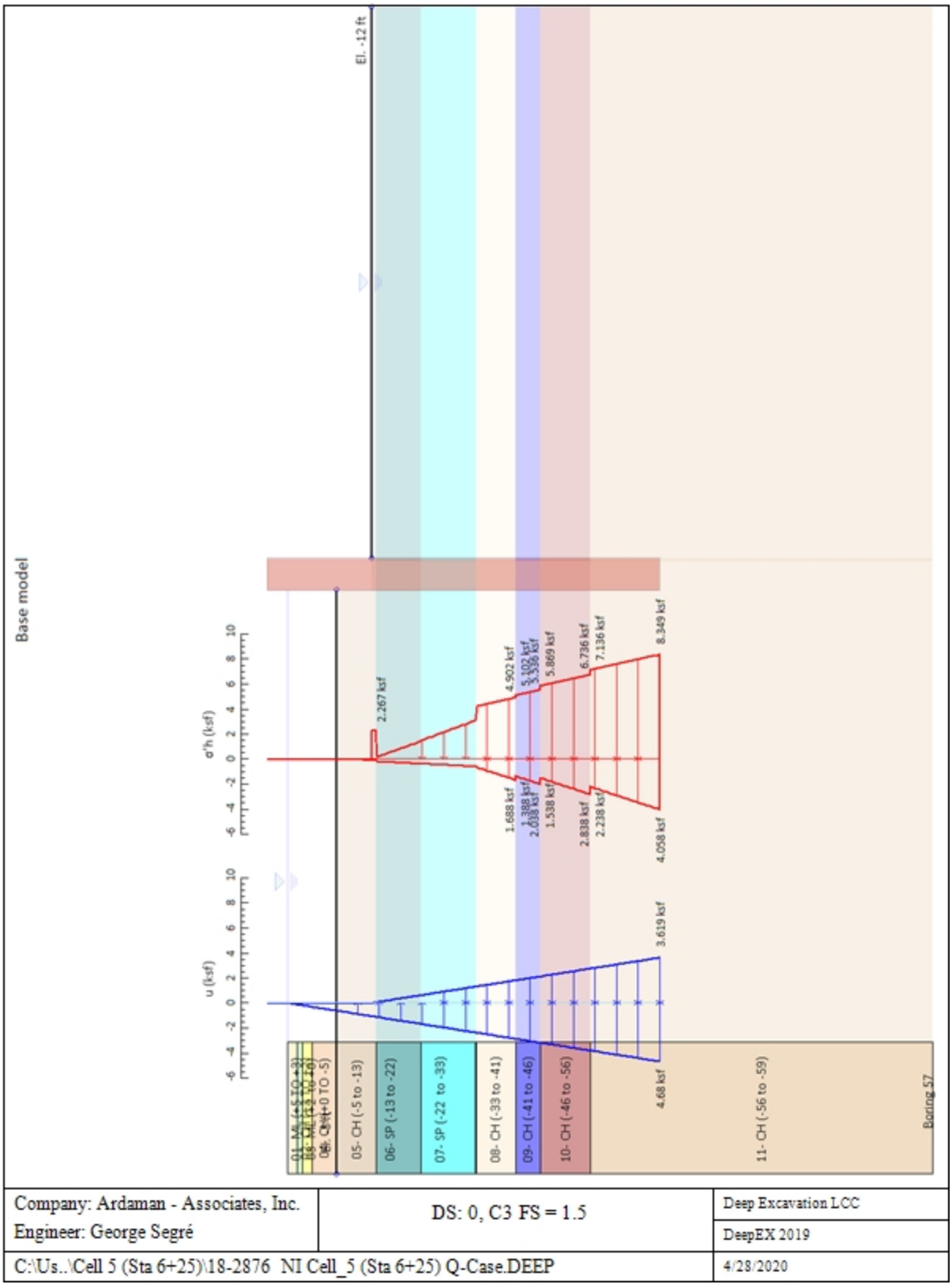
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP		4/28/2020

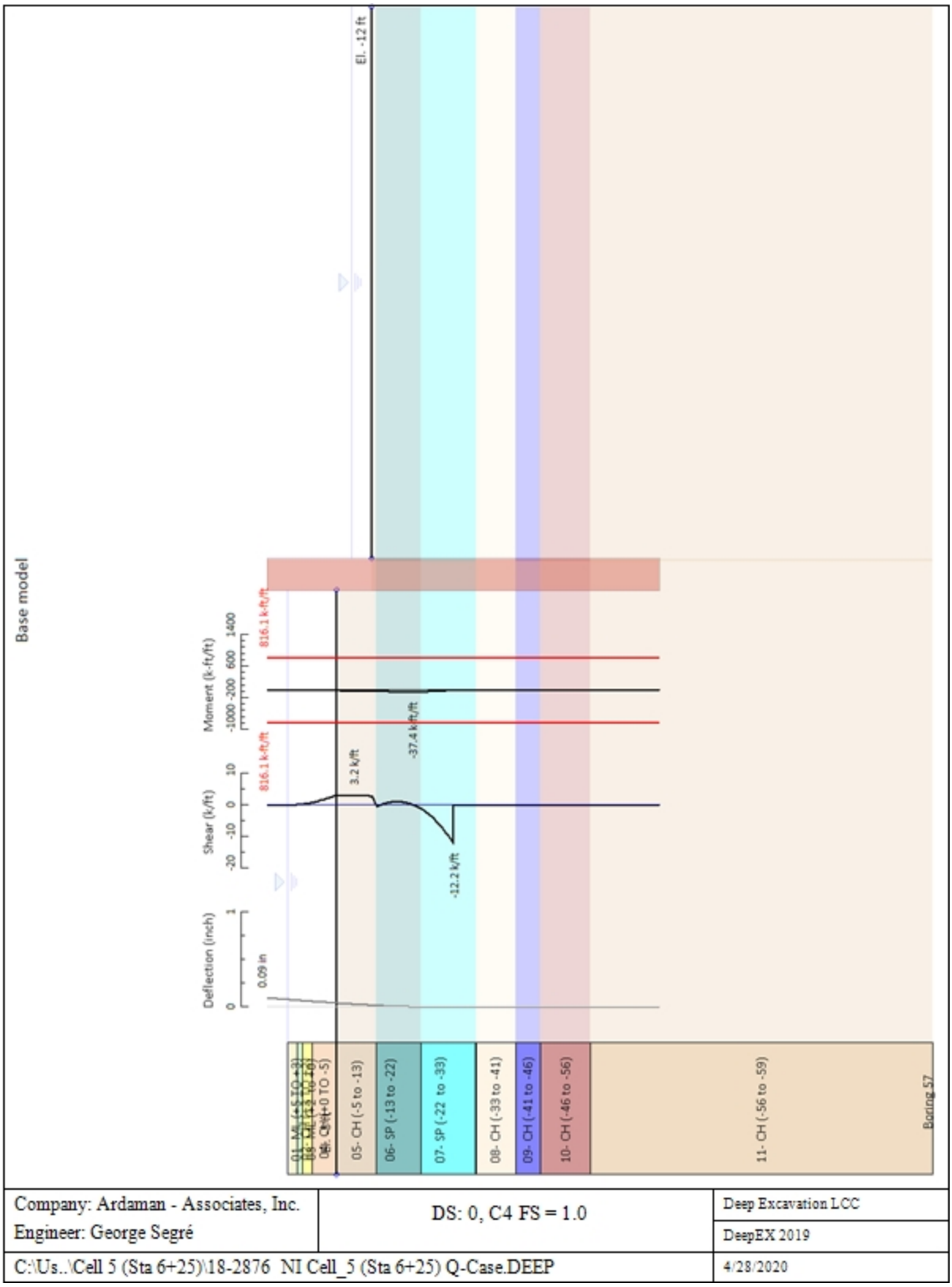

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.92 ksf
6.083 ksf
6.323 ksf
6.643 ksf
7.243 ksf
8.283 ksf
8.763 ksf
10.219 ksf
1.937 ksf
1.697 ksf
2.287 ksf
1.787 ksf
3.087 ksf
2.487 ksf
4.307 ksf
3.869 ksf
4.93 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

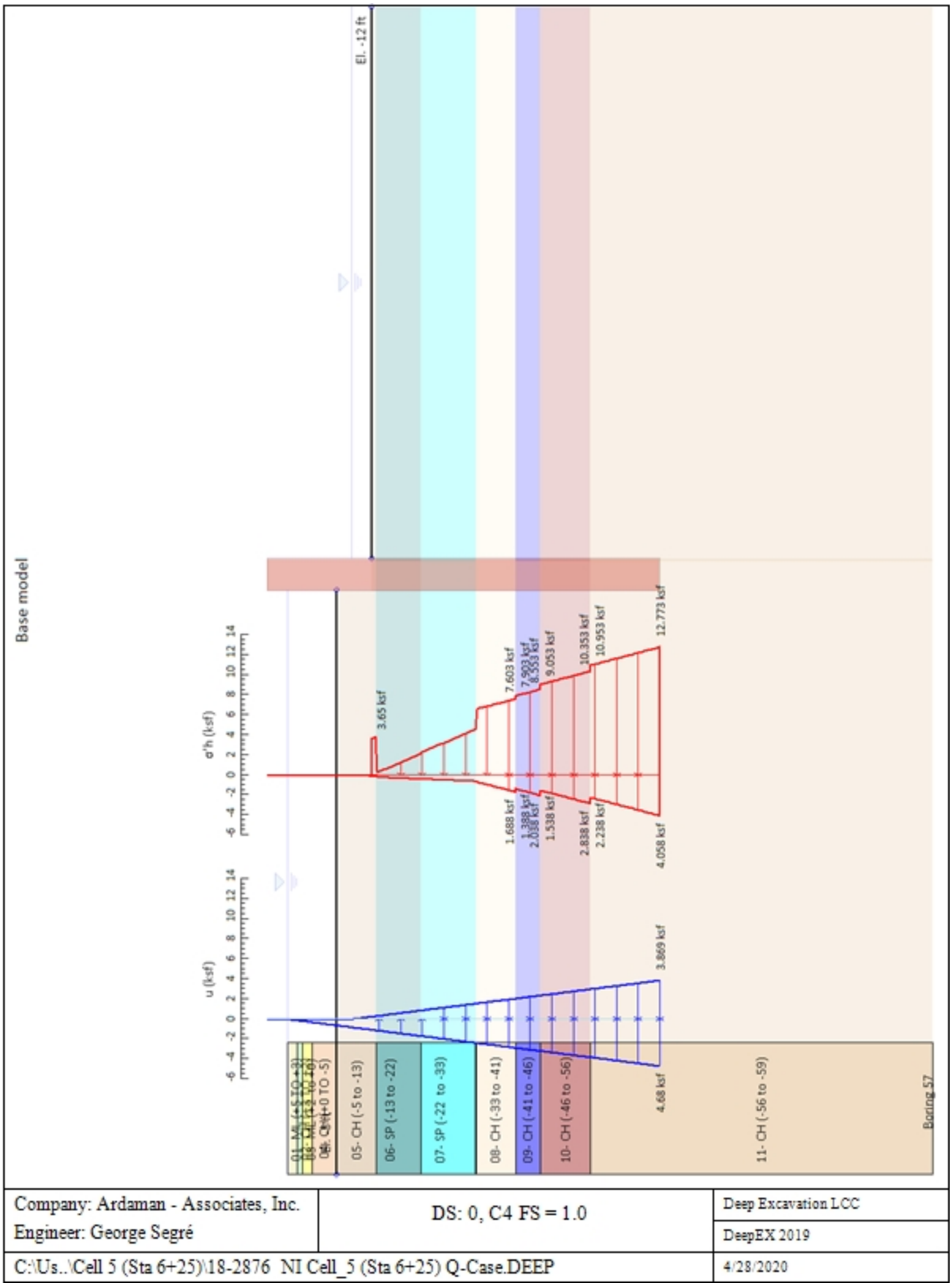

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-56.3 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.3 k/ft
-16.3 k/ft
Deflection (inch)
0 1
0.16 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
3.4 ksf
7.354 ksf
7.654 ksf
8.504 ksf
8.804 ksf
10.104 ksf
10.704 ksf
12.524 ksf
1.688 ksf
1.988 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.619 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

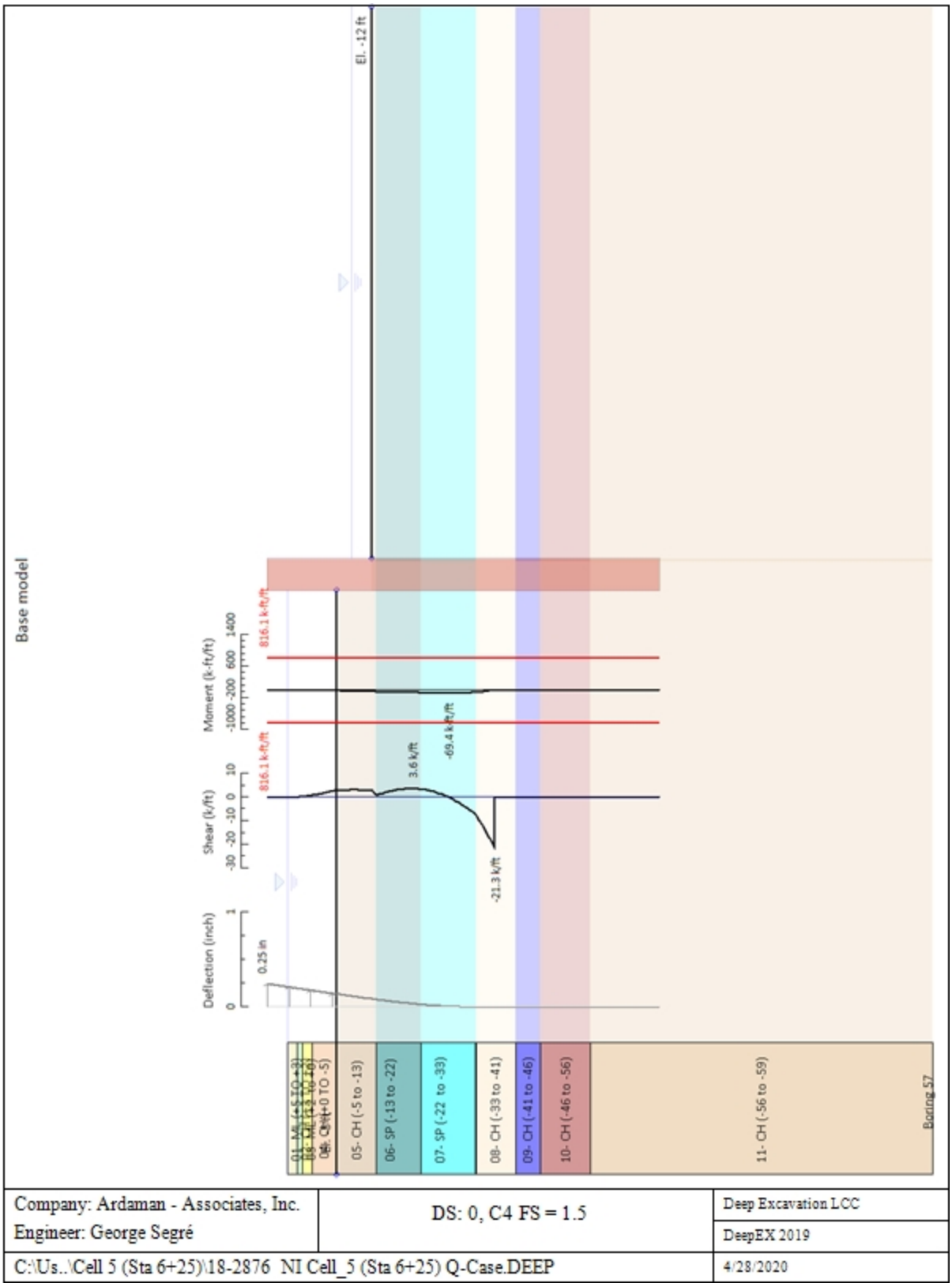

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
-115.7 k-ft/ft
Shear (k/ft)
-30 -20 -10 0 10
816.1 k-ft/ft
6.3 k/ft
-28.1 k/ft
Deflection (inch)
0 1
0.46 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.267 ksf
4.902 ksf
5.102 ksf
5.336 ksf
5.869 ksf
6.736 ksf
7.136 ksf
8.349 ksf
1.688 ksf
1.388 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.619 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

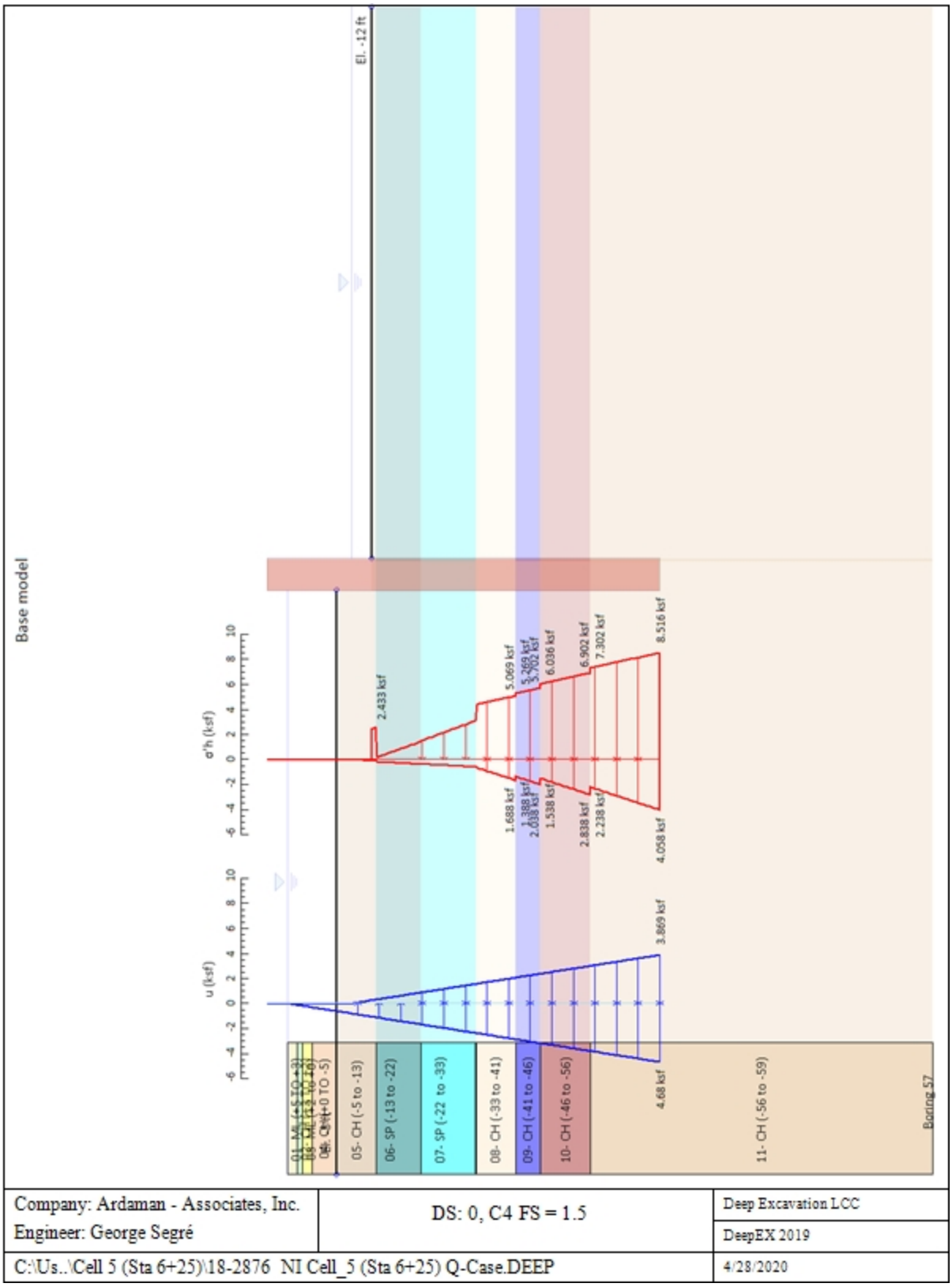

Base model
El. -12 ft
Moment (k-ft/ft)
-1000 -200 600 1400
816.1 k-ft/ft
816.1 k-ft/ft
-37.4 k-ft/ft
Shear (k/ft)
-20 -10 0 10
3.2 k/ft
-12.2 k/ft
Deflection (inch)
0 1
0.09 in
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP		4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
2.433 ksf
5.069 ksf
5.269 ksf
5.702 ksf
6.036 ksf
6.902 ksf
7.302 ksf
8.516 ksf
1.688 ksf
1.988 ksf
2.038 ksf
1.538 ksf
2.838 ksf
2.238 ksf
4.058 ksf
3.869 ksf
4.68 ksf
05- CH (-5 to -13)
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41)
09- CH (-41 to -46)
10- CH (-46 to -56)
11- CH (-56 to -59)
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) Q-Case.DEEP
4/28/2020

DeepEX 2019: Report Output

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Project: San Jacinto Waste Pits



Ardaman & Associates, Inc.

Company: Ardaman - Associates, Inc.
Prepared by engineer: George Segré
File number: 18-2876
Time: 4/28/2020 11:10:00 AM

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File: C:\Users\George.Segre\Desktop\Northern Impoundment\Cell 5 Sections\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S -Case.DEEP

STRUCTURAL MATERIALS DATA

Steel

Name	Strength Fy	Fu	Elastic E	Density g
	(ksi)	(ksi)	(ksi)	(kcf)
A36	36	58	29000	0.49
A50	50	72.5	29000	0.49

Concrete

Name	Strength Fc'	Elastic E	Density g	Tension Strength Ft
	(ksi)	(ksi)	(kcf)	(% of Fc')
Fc 3ksi	3	3122	0.15	10
Fc 4ksi	4	3605	0.15	10
Fc 5ksi	5	4031	0.15	10
Fc 6ksi	6	4415	0.15	10

Steel rebar

Name	Strength Fy	Elastic E
	(ksi)	(ksi)
Grade 60	60	29000
Grade 75	75	29000
Grade 80	80	29000
Grade 150	150	29000
Strands 270 ksi	270	29000
S410	59.4	30434.8
S500	72.5	30434.8
B450C	65.2	30434.8

Wood

Name	Ultimate Bending Srtength Fbu	Ultimate Tensile Strength Ftu	Ultimate Shear Strength Fvu	Density g	Elastic E
	(ksi)	(ksi)	(ksi)	(kcf)	(ksi)
Construction Timb	1.6	1.4	0.8	0.05	1000
Regular grade	1	1	0.6	0.05	800

STEEL
Name=material name
fy=fyk= characteristc resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
CONCRETE
Name=material name
f'c=fck= cylindrical resistance for concrete (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
Tension strength=ft=fctk= characteristic tension resistance for concrete
STEEL REBARS
Name=material name
fy=fyk= characteristic resistance for steel (for all the codes)
Fu=fuk= ultimate resistence for steel (for all the codes)
Elastic E= Elastic modulus
Density g= specific weight
WOOD
Name=material name
Fb=fbk= Ultimate bending strength
Ftu=ftuk= Ultimate tensile strength

Fvu=fvuk= Ultimate shear strength
Density g= specific weight
Elastic E= Elastic modulus

Project: San Jacinto Waste Pits
Results for Design Section 0: Base model

SOIL DATA

Name	g tot	g dry	Frict	C'	Su	FRp	FRcv	Eload	rEur	kAp	kPp	kAcv	kPcv	Vary	Spring	Color
	(pcf)	(pcf)	(deg)	(psf)	(psf)	(deg)	(deg)	(ksf)	(-)	NL	NL	NL	NL		Model	
01- ML (+5 T	117	117	28	0	N/A	N/A	N/A	300	3	0.36	2.77	N/A	N/A	True	EXP	
02- CH (+3 TO	128	128	23	0	N/A	N/A	N/A	60	3	0.44	2.28	N/A	N/A	True	Linear	
03- ML (+2 to	117	117	28	0	N/A	N/A	N/A	150	3	0.36	2.77	N/A	N/A	True	Linear	
04- CH (+0 TO	127	127	23	0	N/A	N/A	N/A	521.92	3	0.44	2.28	N/A	N/A	True	Linear	
05- CH (-5 to -	130	130	23	0	N/A	N/A	N/A	417.54	3	0.44	2.28	N/A	N/A	True	Linear	
06- SP (-13 to	130	130	31	0	N/A	N/A	N/A	626.3	3	0.32	3.12	N/A	N/A	True	Linear	
07- SP (-22 t	130	130	32	0	N/A	N/A	N/A	300	3	0.31	3.26	N/A	N/A	True	Linear	
08- CH (-33 to	128	128	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
09- CH (-41 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
10- CH (-46 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	
11- CH (-56 to	130	130	23	0	N/A	N/A	N/A	300	3	0.44	2.28	N/A	N/A	True	Linear	

Name	Poisson	Min Ka	Min sh	ko.NC	nOCR	aH.EXP	aV.EXP	qSkin	qNails	kS.nails	PL
	v	(clays)	(clays)	-	-	(0 to 1)	(0 to 1)	(psi)	(psi)	(k/ft3)	(ksi)
01- ML (+5 T	0.4	-	-	0.531	0.5	1	0	7.2	4.8	20	-
02- CH (+3 TO	0.3	-	-	0.609	0.5	-	-	5.1	3.4	20	-
03- ML (+2 to	0.4	-	-	0.531	0.5	-	-	13	8.7	20	-
04- CH (+0 TO	0.35	-	-	0.609	0.5	-	-	21.8	14.5	30	-
05- CH (-5 to -	0.45	-	-	0.609	0.5	-	-	18.1	12.1	30	-
06- SP (-13 to	0.35	-	-	0.485	0.5	-	-	29	19.3	70	-
07- SP (-22 t	0.35	-	-	0.47	0.8	-	-	0	0	0	-
08- CH (-33 to	0.3	-	-	0.609	0.8	-	-	0	0	0	-
09- CH (-41 to	0.25	-	-	0.609	0.8	-	-	0	0	0	-
10- CH (-46 to	0.35	-	-	0.609	0.8	-	-	0	0	0	-
11- CH (-56 to	0.35	-	-	0.609	0.8	-	-	0	0	0	-

gtot = total soil specific weight
gdry = dry weigth of the soil
Frict = friction angle
C' = effective cohesion
Su = Undrained shear strength (only for CLAY soils in undrained conditions, used as a cutoff strength in NL analysis)
Evc = Virgin compression elastic modulus
Eur = unloading/reloading elastic modulus
Kap = Peak active thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kpp = Peak passive thrust coefficient (initial value, may be modified on each stage according to analysis settings).
Kacv = Constant volume active thrust coeff (only for clays, initial value)
Kpcv = Constant volume passive thrust coeff (only for clays, initial value).
Spring models= spring model (LIN= constant E over the soil layer height , EXP=exponential , SIMC=simplified winkler)
LIN= Linear-Elastic-Perfectly Plastic,
EXP: Exponential, SUB: Modulus of Subgrade Reaction
SIMC= Simplified Clay mode

SOIL BORINGS

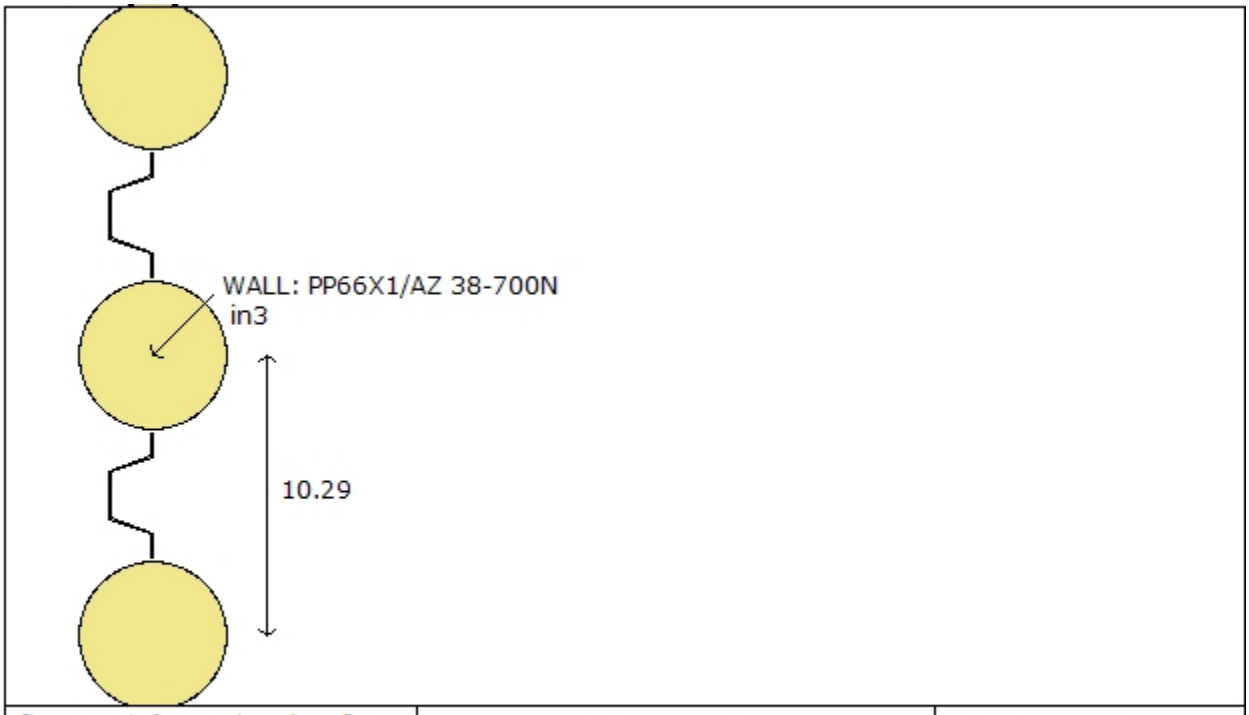
Top Elev= superior SOil level
Soil type= type of the soil (sand , clay , etc)
OCR= overconsolidation ratio
K0= at rest coefficient

Name: Boring 57, pos: (-100, 0)

Top elev.	Soil type	OCR	Ko
5	01- ML (+5 TO	1	0.53
3	02- CH (+3 TO	1	0.61
2	03- ML (+2 to	1	0.53
0	04- CH (+0 TO	1	0.61
-5	05- CH (-5 to -	1	0.61
-13	06- SP (-13 to -	1	0.48
-22	07- SP (-22 to	1	0.47
-33	08- CH (-33 to	1	0.61
-41	09- CH (-41 to	1	0.61
-46	10- CH (-46 to	1	0.61
-56	11- CH (-56 to	1	1

WALL DATA

Wall section 0: Wall 1



Wall uses wall section 0: Wall 1
Wall type: Combined sheet pile wall
Top wall El: 9 ft Bottom wall El: -90 ft
Hor. wall spacing: 10.29 ft Wall thickness = 5.5 ft
Passive width below exc: 10.29 ft Active width below exc: 10.29 ft Swater= 10.29 ft
Steel members fy = 50 ksi Esteel = 29000 ksi
Wall friction: Ignored
Steel wall capacities are calculated with AISC 360-16 ALL.

Concrete capacities are calculated with ACI 318-11
Note: With ultimate capacities you may have to use a structural safety factor.
Steel sheet pile properties

Table: Steel Sheet Pile Cross Sectional Properties

DES	Sheet	Piles	A	Ixx	Sxx	Pile A	Pile Ixx	Pile Sxx	Pile D	Pile bf	Pile tf	Pile tw
			(in2/ft)	(in4/ft)	(in3/ft)	(in^2)	(in4)	(in3)	(in)	(in)	(in)	(in)
PA 60/19-700	AZ 38-700N	PP60X0.62	25.1	10793	327.1	204.2	107870.5	3268.8	66		1	

GENERAL WALL DATA
Hor wall spacing= Wall horizontal spacing
Passive width below exc= spacing for passive thrust pressure for classic analysis
f'c=fck= cylindrical concrete resistance
fyk=fy= steel rebar characteristic resistance
Econc= Concrete Elastic modulus
fctk= characteristic Concrete tension
Esteel= steel elastic modulus
TABULAR DATA (principal parameters)
1) Diaphragm wall (rectangular cross section)
N/A= data not available
Fy=fyk
F'c=fck
D=wall thickness
B=wall width
2)Steel sheet pile
DES=shape (Z or U)
W=width per unit of length
A=area
h=height
t=horizontal part thickness
b=width of the single sheet pile part
s=inclined part thickness
Ixx=strong axis inertia (per unit of length)
Sxx=strong axis section modulus (per unit of length)
3)Secant piles wall, Tangent piles wall, soldier piles, soldier piles and timber lagging
W=weight per unit of length
A=area
D=diameter
tw=web thickness
tp= pipe thickness
bf=flange width
tf= flange thickness
k= flange thickness+stem base height
Ixx= strong axis inertia modulus (per unit of length)
Sxx= strong axis section modulus (per unit of length)
rx=radius of gyration about X axis
ry=radius of gyration about Y axis
Iyy=weak axis inertia modulus (per unit of length)
Syy=weak axis section modulus (per unit of length)
rT=radius of gyration for torsion
Cw= warping constant

GENERAL ANALYSIS CRITERIA

Summary of stage assumptions

Name	Analysis	Drive	ka-Mult	Htr T/B	Resist	Res	Contle
	Method	Press		(%)	Press	Mult	Method
Stage 0	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 1	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 2	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 3	Conventional	Ka	N/A	N/A	Kp/M	1.25	Free Earth
Stage 4	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 5	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth
Stage 6	Conventional	Ka	N/A	N/A	Kp/M	1	Free Earth
Stage 7	Conventional	Ka	N/A	N/A	Kp/M	1.5	Free Earth

Name	Support	Axial	Used	Min Toe	Toe	Toe
	Model	Incl	FSwall	FDtoe	FSrot	FSpas
Stage 0	Simple span	N/A	1.6	1.391	1.391	1.634
Stage 1	Simple span	N/A	1.6	1.189	1.189	1.4
Stage 2	Simple span	N/A	1.6	1.453	1.453	1.683
Stage 3	Simple span	N/A	1.6	1.251	1.251	1.449
Stage 4	Simple span	N/A	1.6	1.53	1.53	1.737
Stage 5	Simple span	N/A	1.6	1.16	1.16	1.323
Stage 6	Simple span	N/A	1.6	1.598	1.598	1.789
Stage 7	Simple span	N/A	1.6	1.228	1.228	1.375

Name=excavation stage name

Analysis method

springs = Elastoplastic spring analysis used

DR = Drained condition for CLAY model

U = Undrained condition for CLAY model for all the soils

Up = Undrained condition just for selected soil

Limit equilibrium analysis settings

Drive press:

Ka (Active pressure diagram), Ka-Trap = Trapezoid apparent diagram from active pressures x multiplier,

FHWA= Federal Highway Administration apparent pressure diagrams.

Ko = At-rest lateral earth pressures.

Peck = Peck 1969 Apparent earth pressure diagrams.

2 Step rect = Two step rectangular apparent earth pressure diagram.

User def. = User defined apparent earth pressure diagram.

Ka+d (and so on) indicates that wall friction is applied

ka mult = multiplication factor for Ka when Ka-Trap is selected

Htr T/B (%) = trapezoidal pressure scheme, top and bottom triangular percentage of excavation depth H

Resit press = Kp (passive earth pressures)

Res Mult = Safety factor applied directly on resisting pressures (

COntle Method = cantilever analysis method for limit equilibrium analysis.

Support Model: Method for calculating support reactions in limit-equlibrium analysis.

Beam= support reactions beam analysis (uses Blum's method).

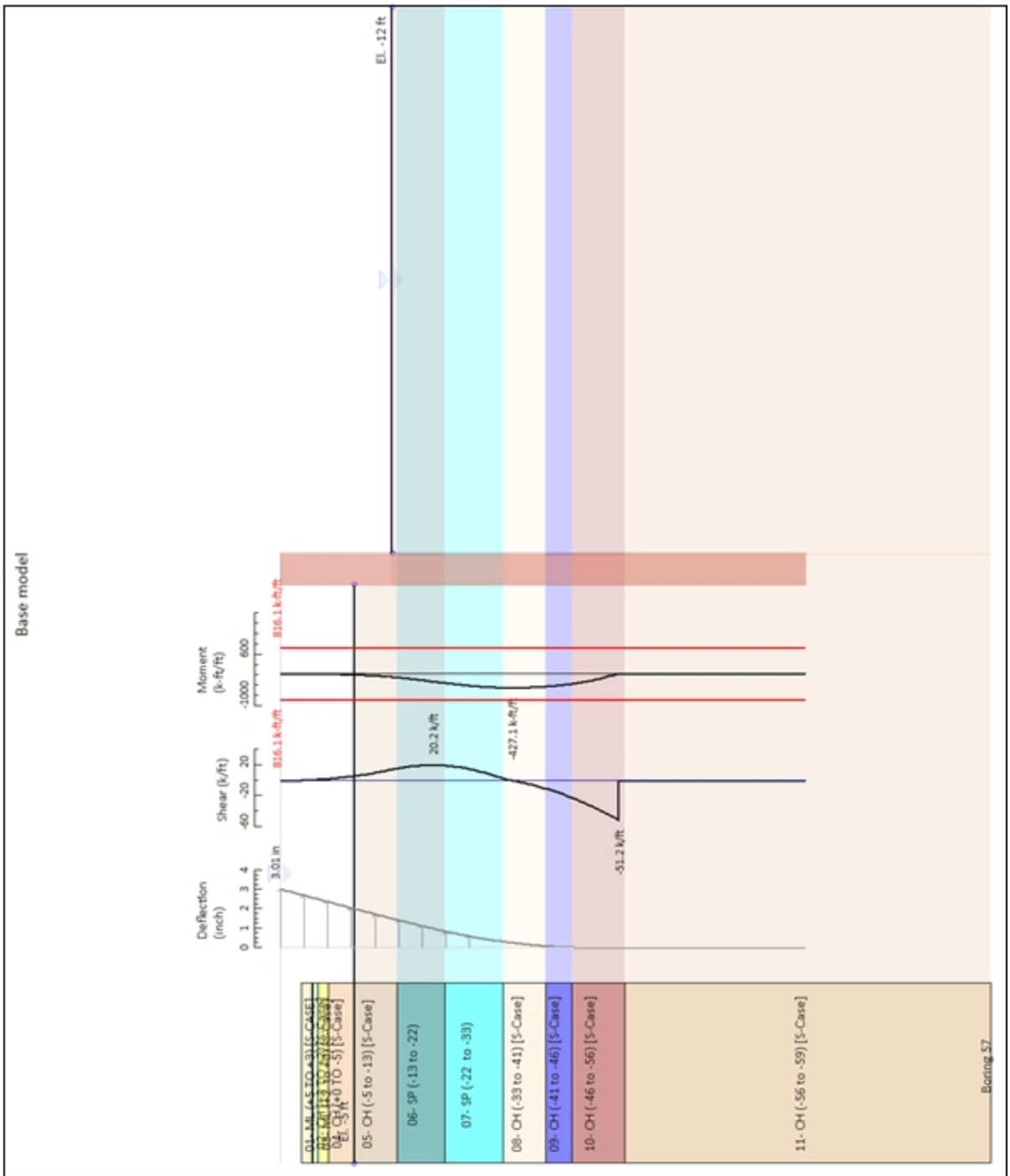
Trib= support reactions from tributary height calculations (Can be applied with apparent diagrams).

Axial Incl = Axial loads included for structural design

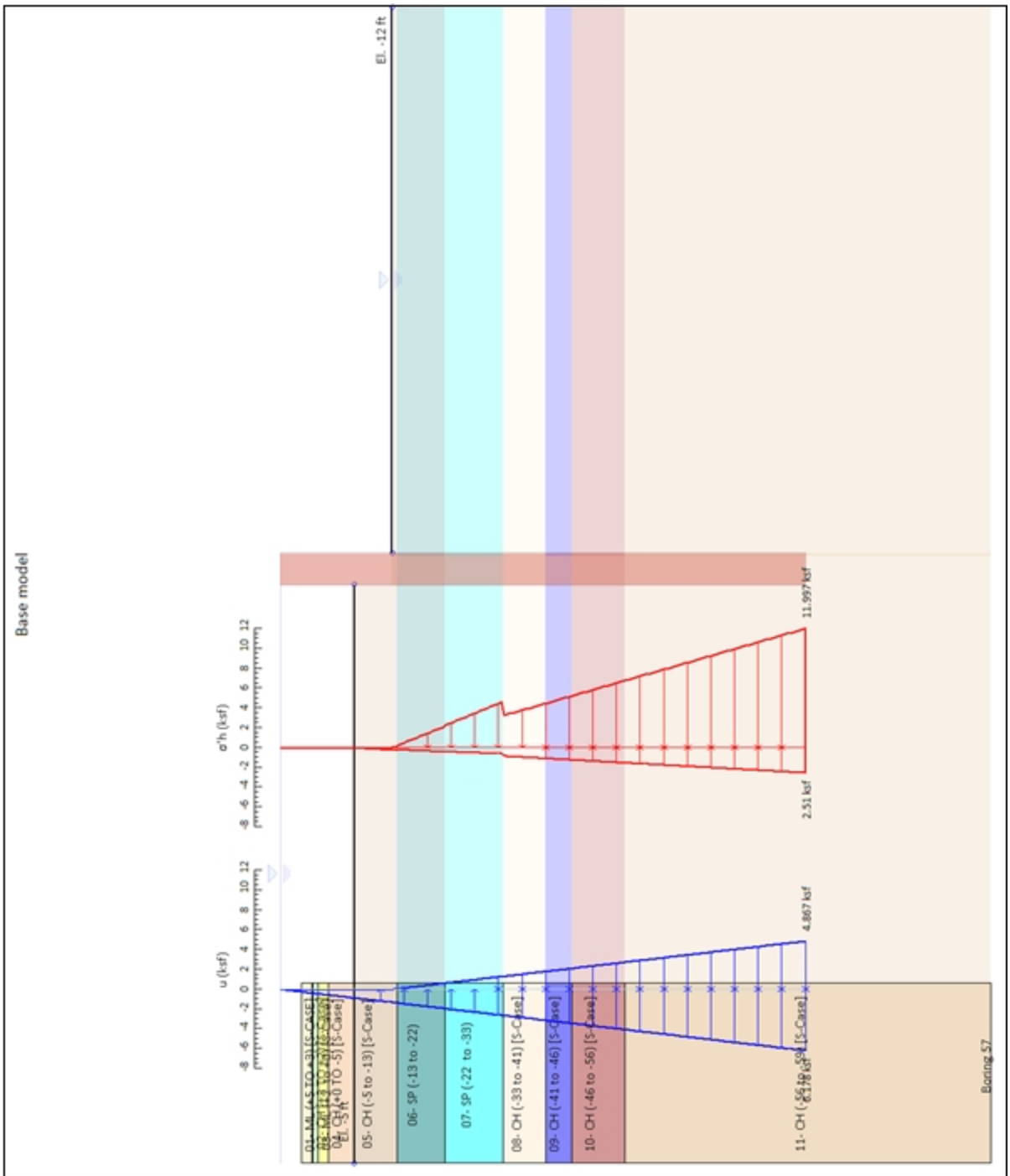
Used FS wall = Safety factor for axial+bending wall resistance to divide ultimate wall capacities.
Min FD Toe= embedded minimum safety factor (for limit equilibrium analysis)
Toe FS rot= rotation safety factor (classic for limit equilibrium analysis)
Toe FSpas= driving/resisting pressure safety factor (for limit equilibrium analysis)

EXCAVATION STAGES SKETCHES

A sequence of figures for each excavation stage is reported



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP		4/28/2020



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C1 FS = 1.0	Deep Excavation LCC DeepEX 2019
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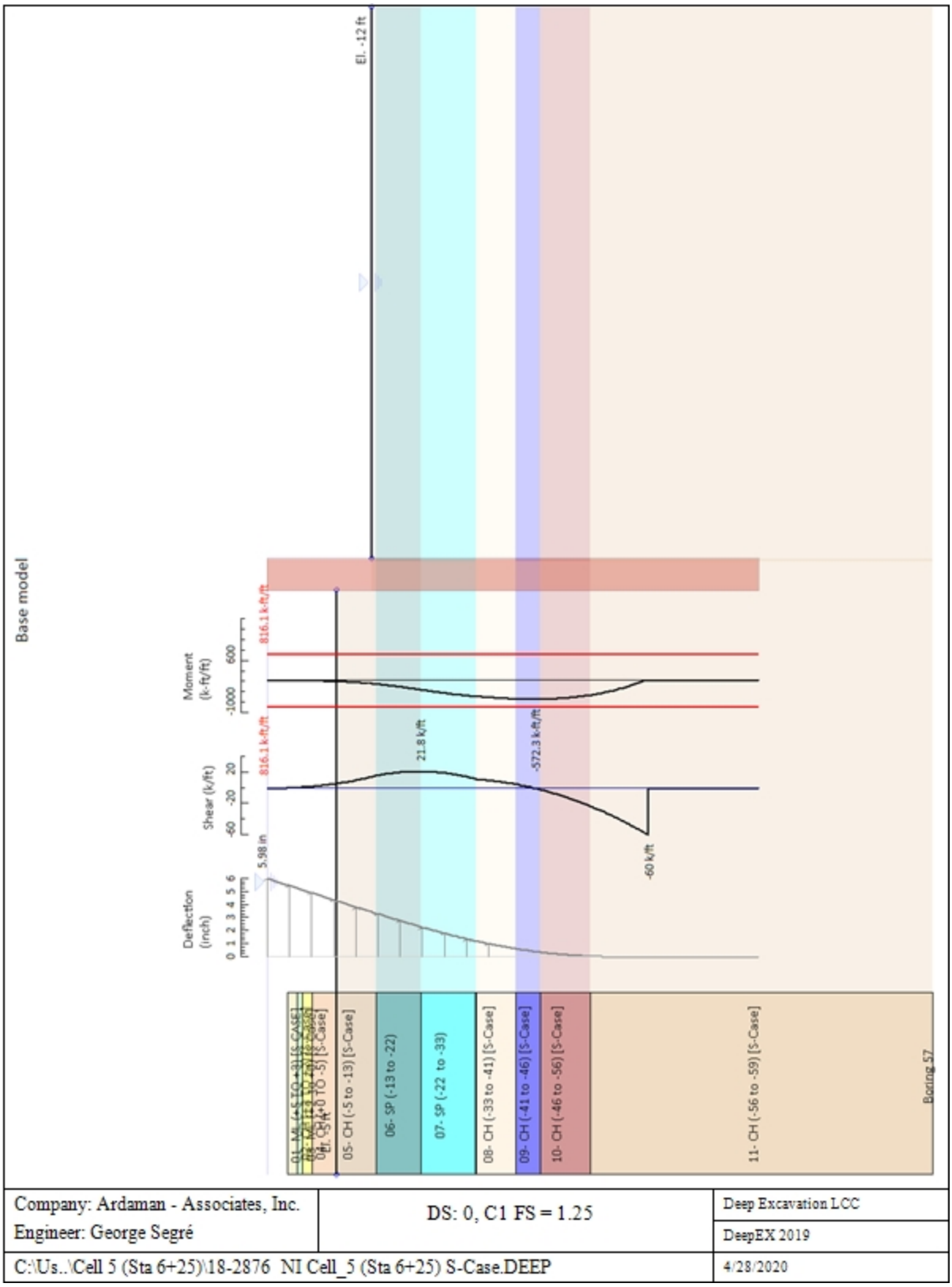
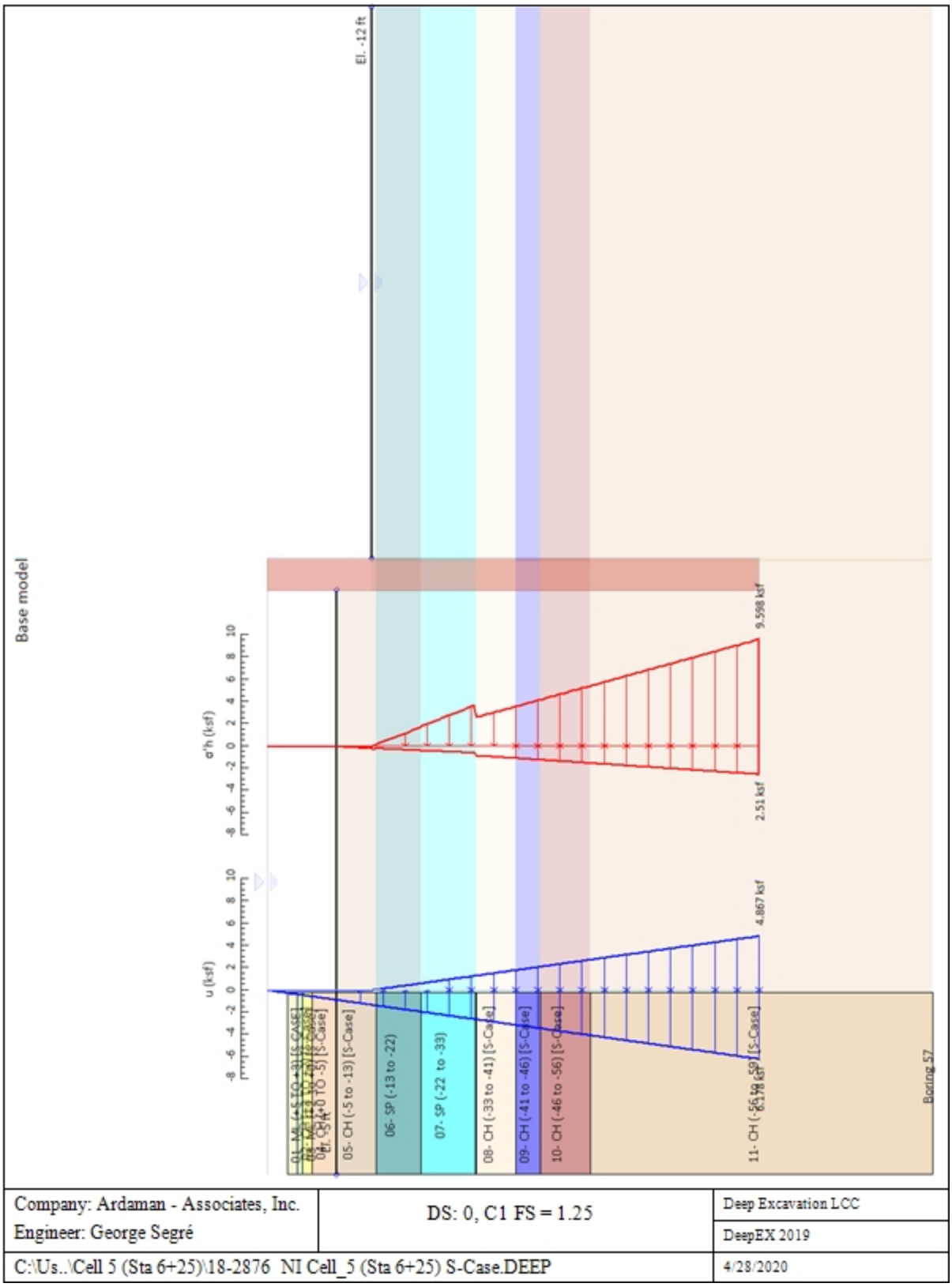
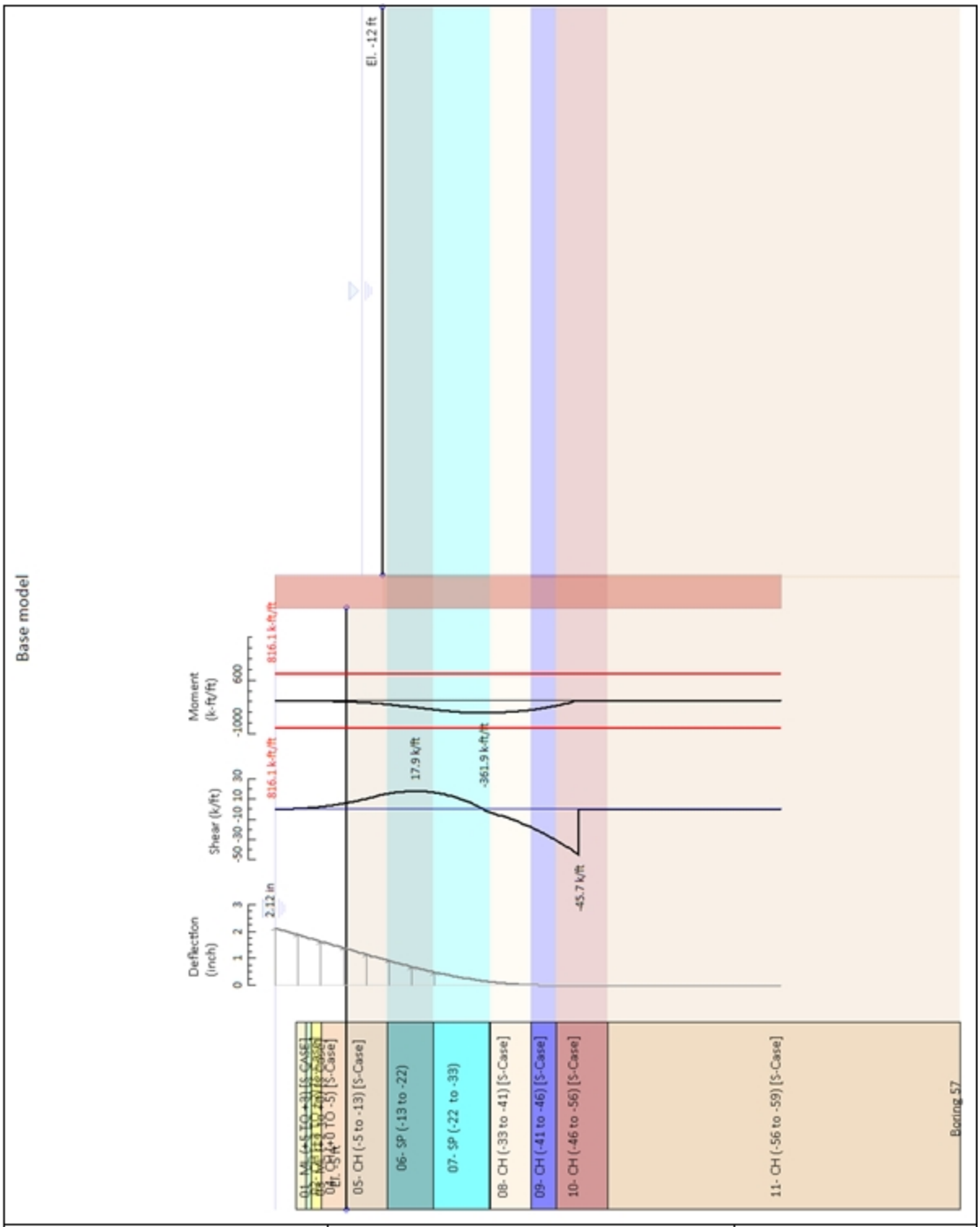
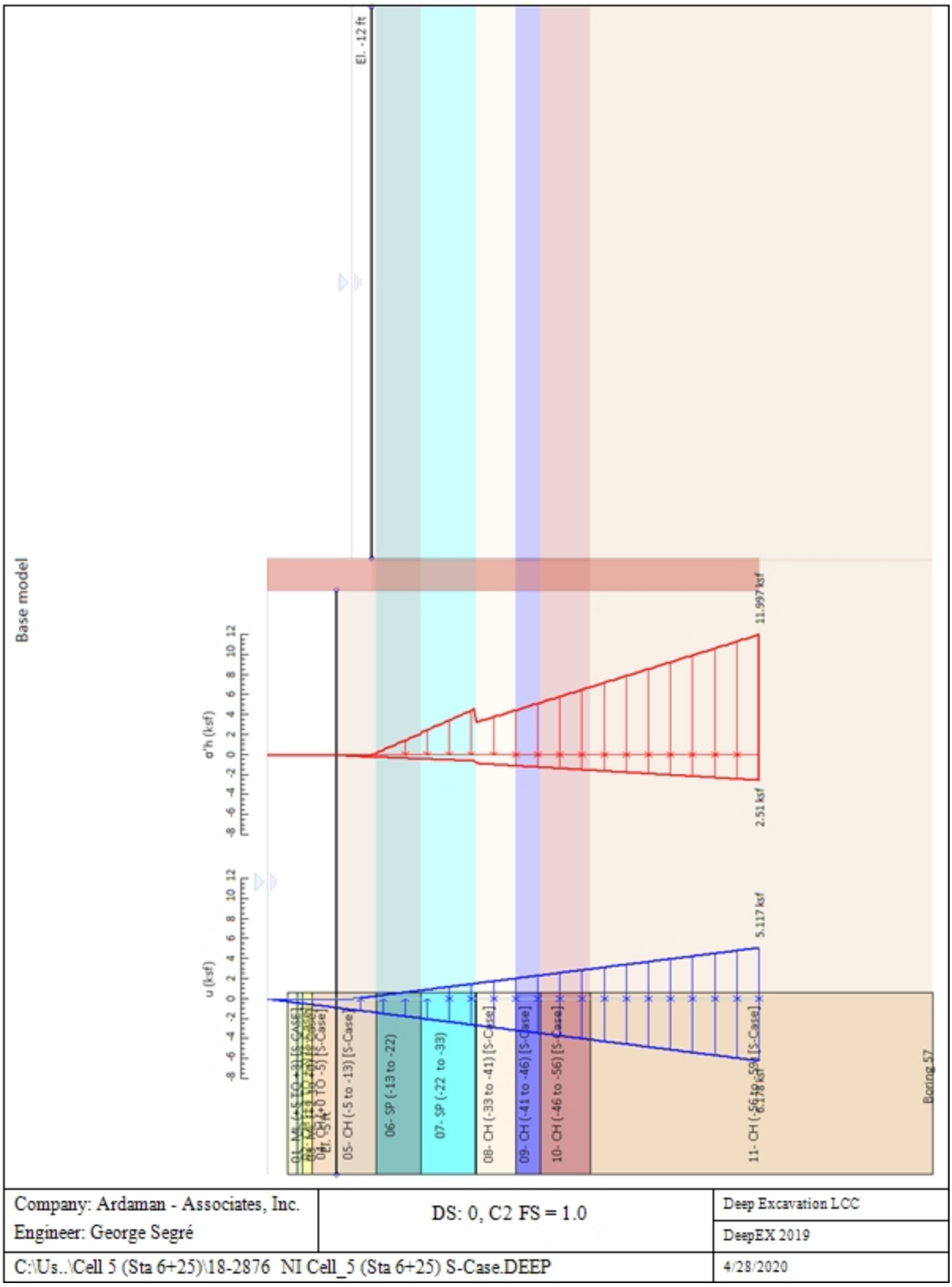
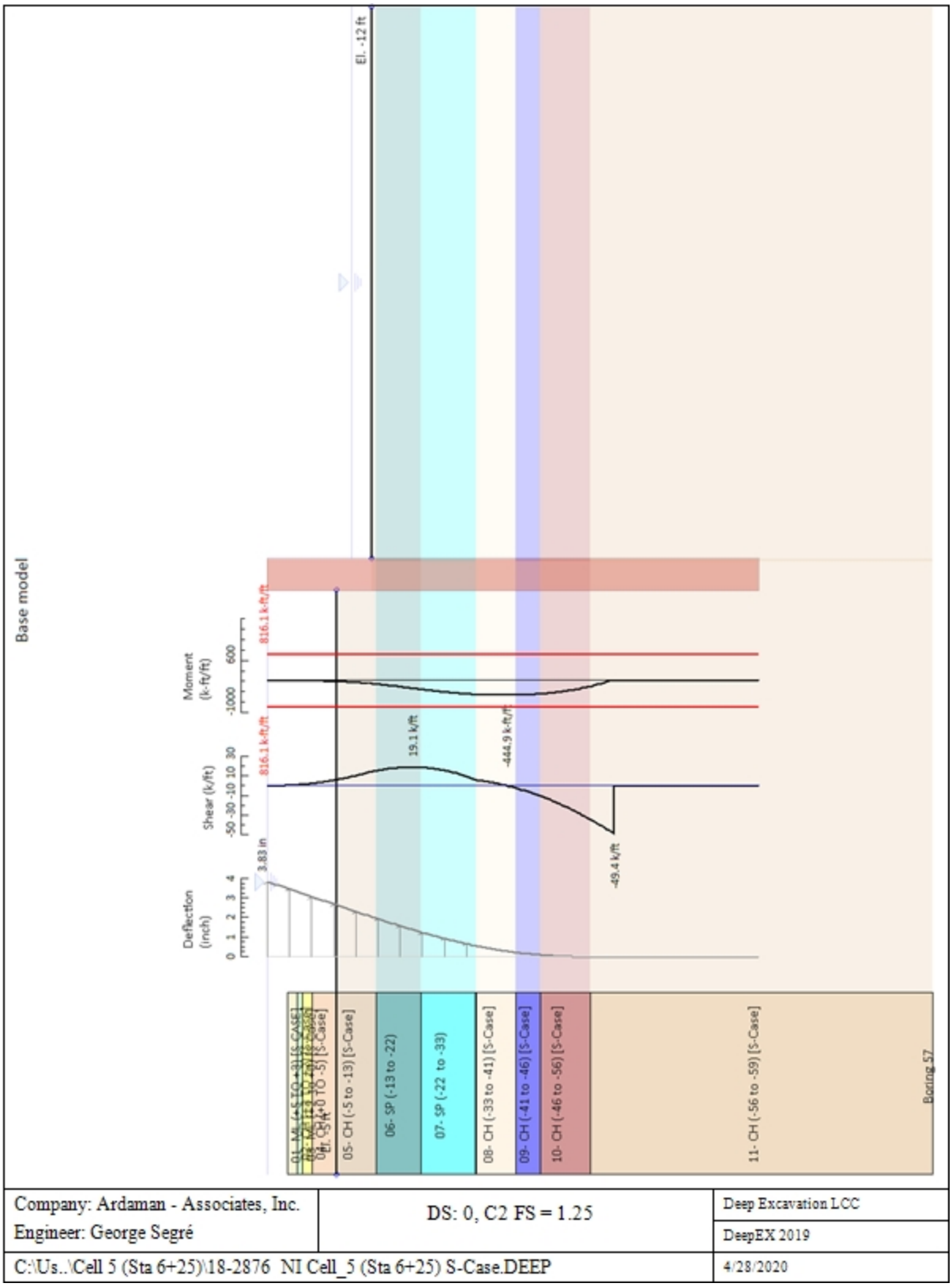

Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-60
-20
20
816.1 k-ft/ft
21.8 k/ft
-572.3 k-ft/ft
-60 k/ft
Deflection (inch)
0 1 2 3 4 5 6
5.98 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

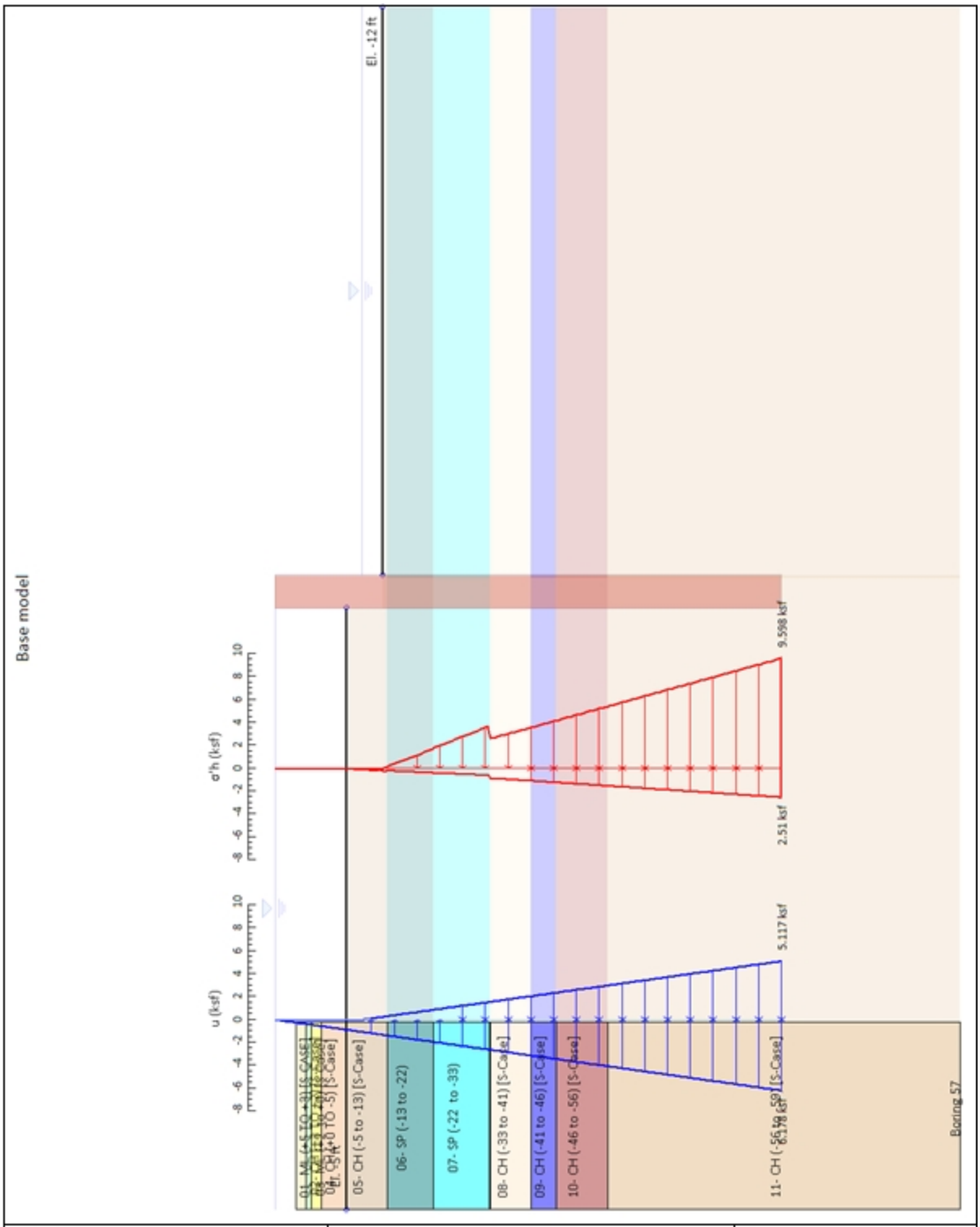

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
9.598 ksf
2.51 ksf
4.867 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -61) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C1 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
17.9 k/ft
-361.9 k-ft/ft
-45.7 k/ft
Deflection (inch)
0 1 2 3
2.12 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

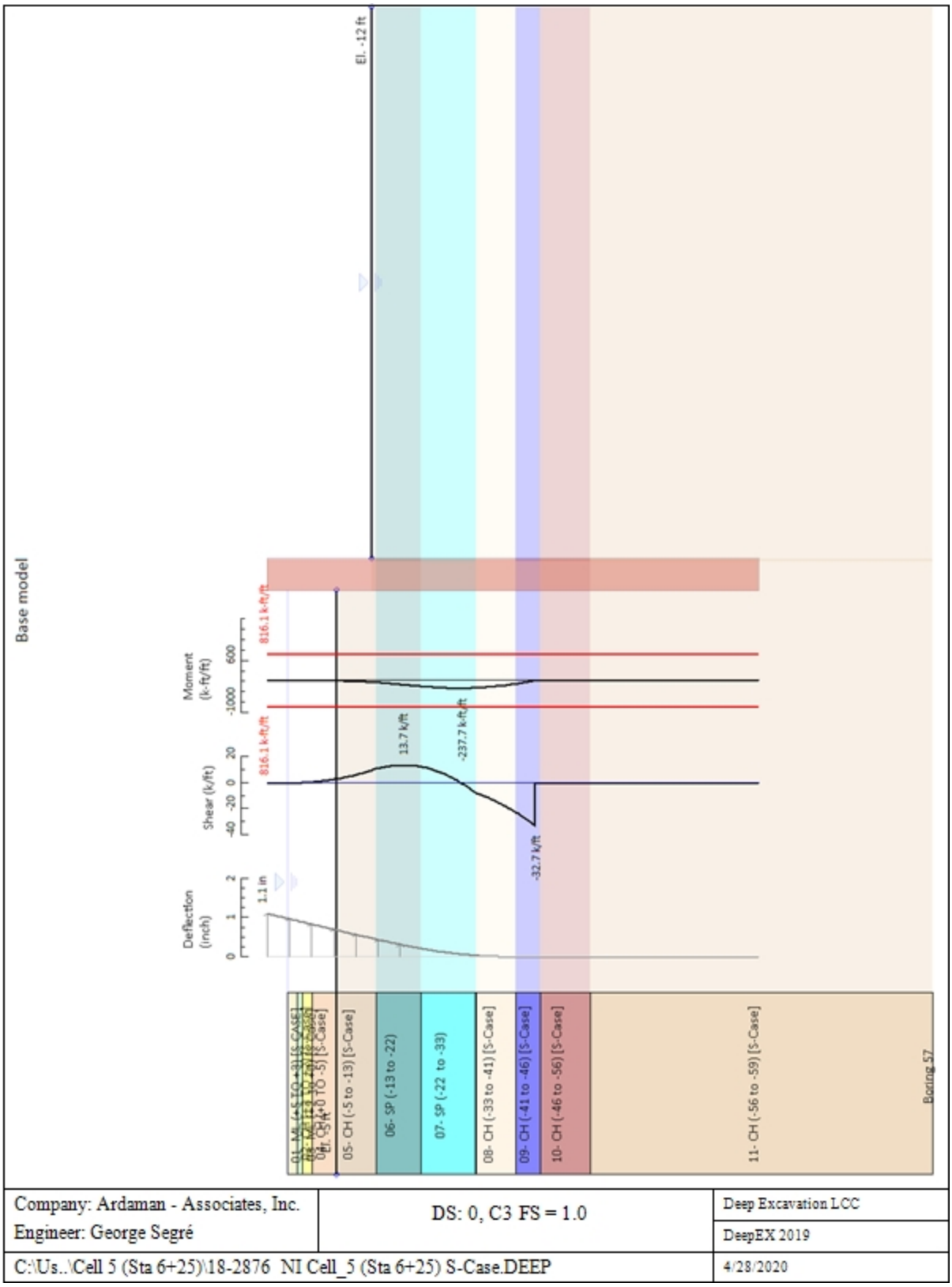


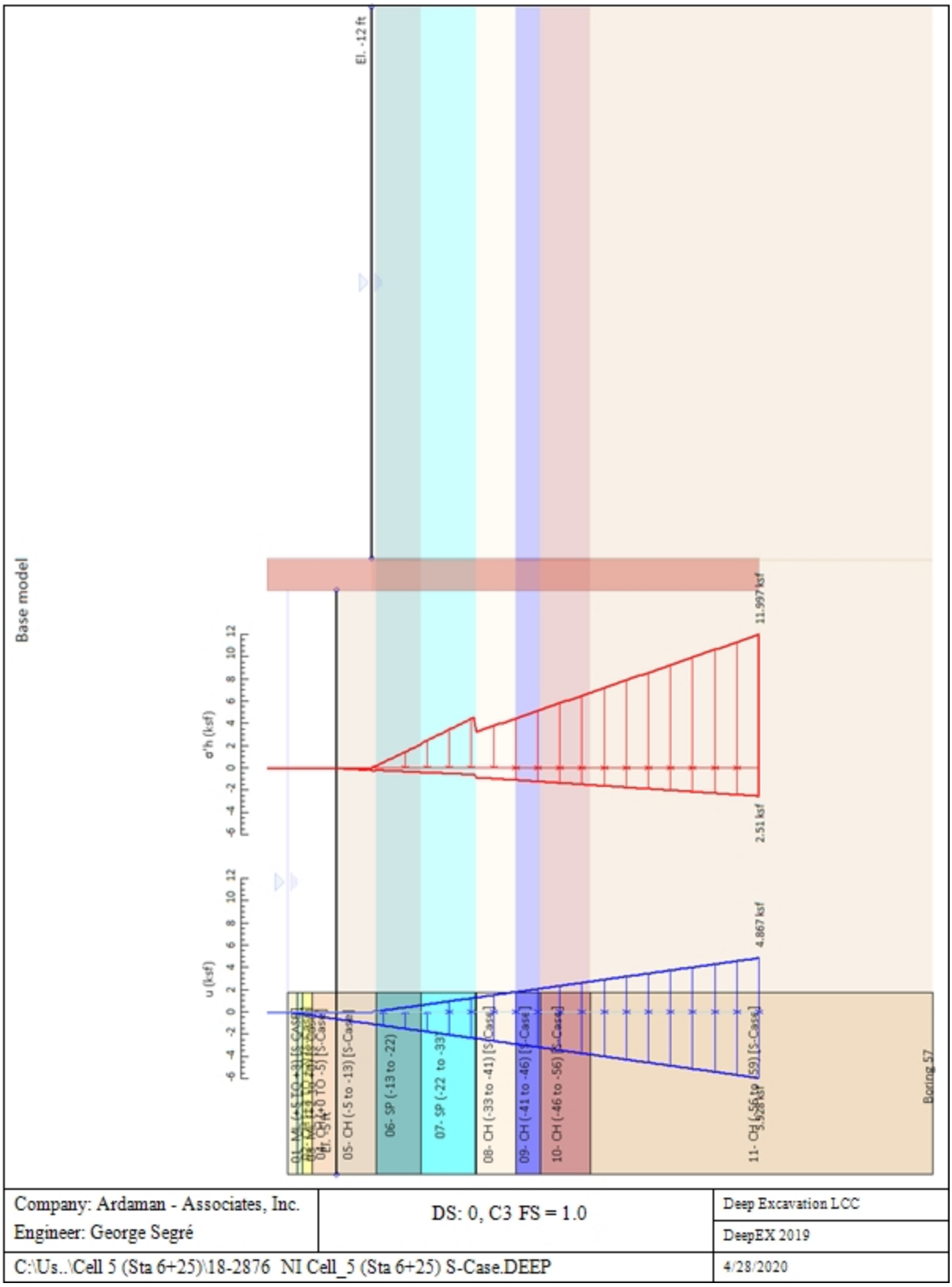
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP		4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
-1000
600
816.1 k-ft/ft
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
19.1 k/ft
-444.9 k-ft/ft
-49.4 k/ft
Deflection (inch)
0 1 2 3 4
3.83 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C2 FS = 1.25
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

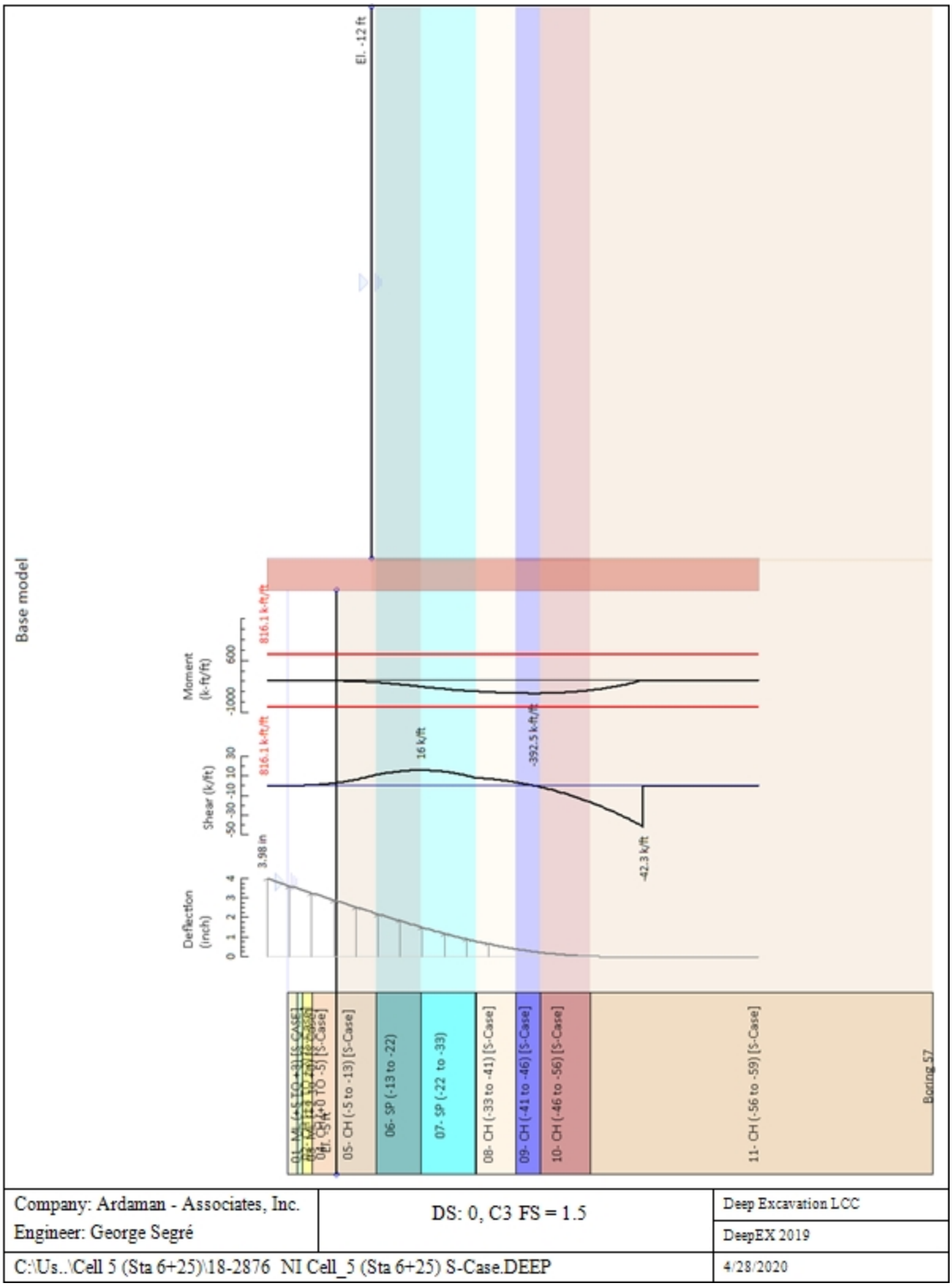


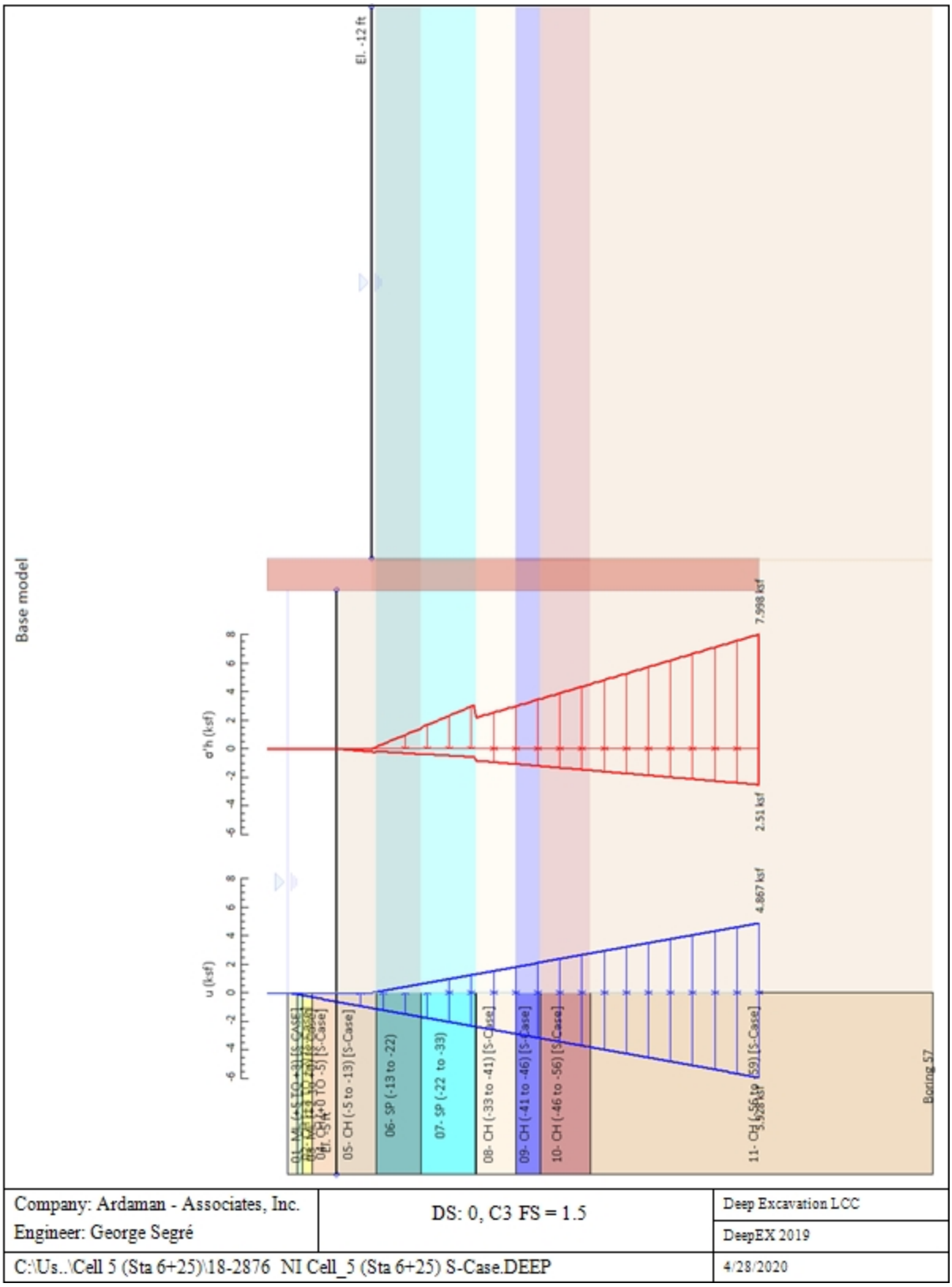
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C2 FS = 1.25	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP		4/28/2020

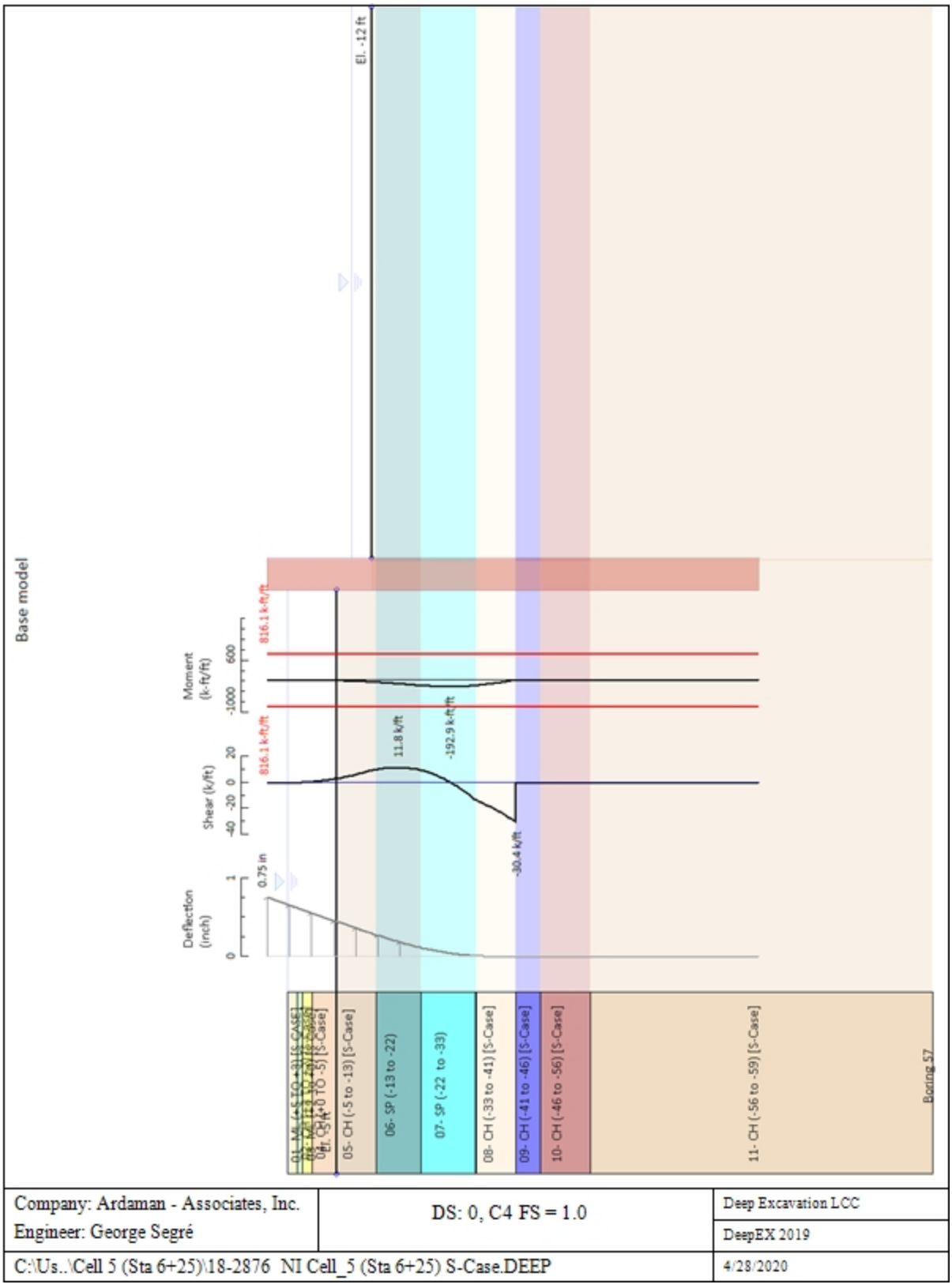

Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
13.7 k/ft
-237.7 k-ft/ft
-32.7 k/ft
Deflection (inch)
0
1
2
1.1 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

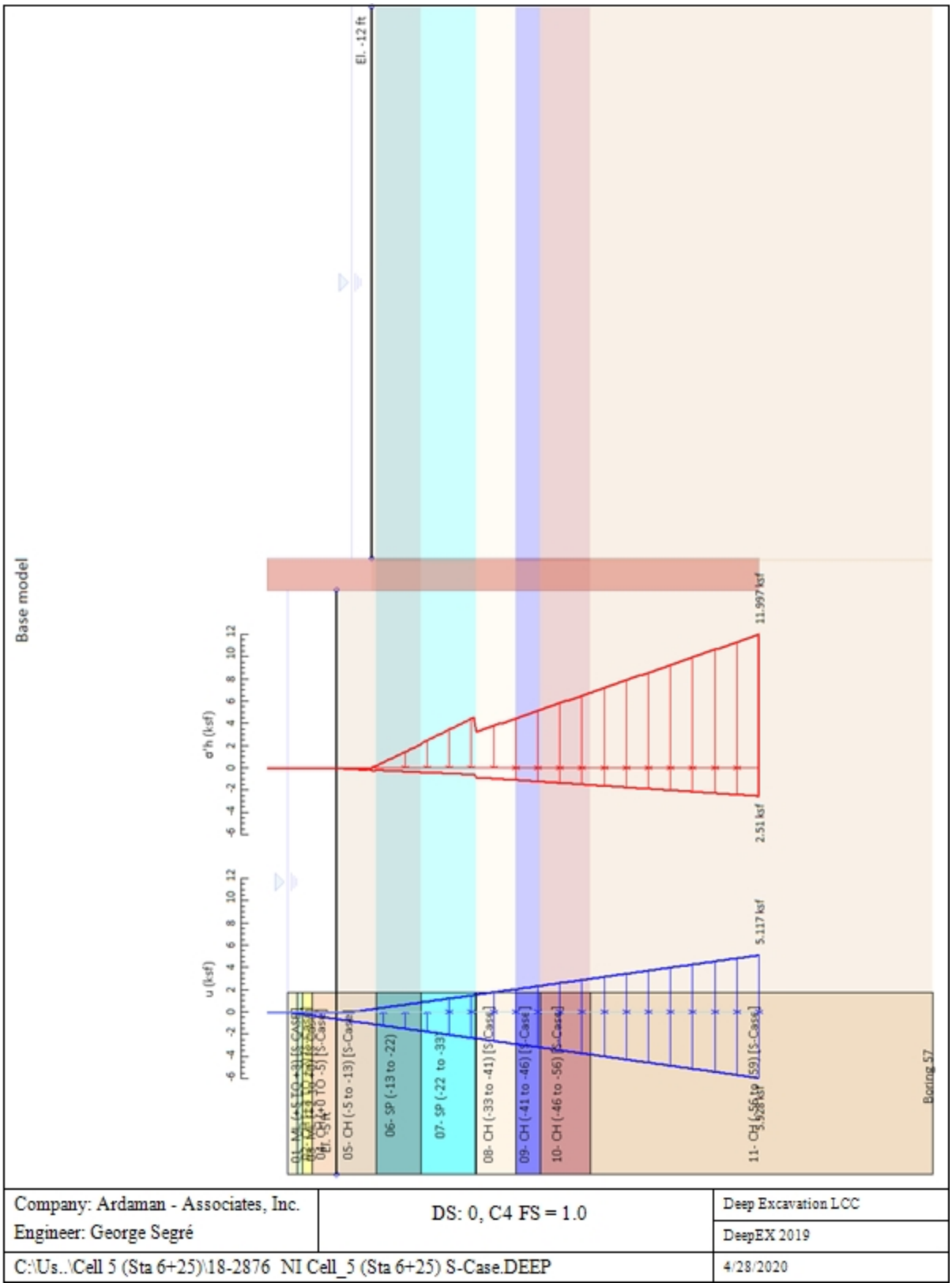


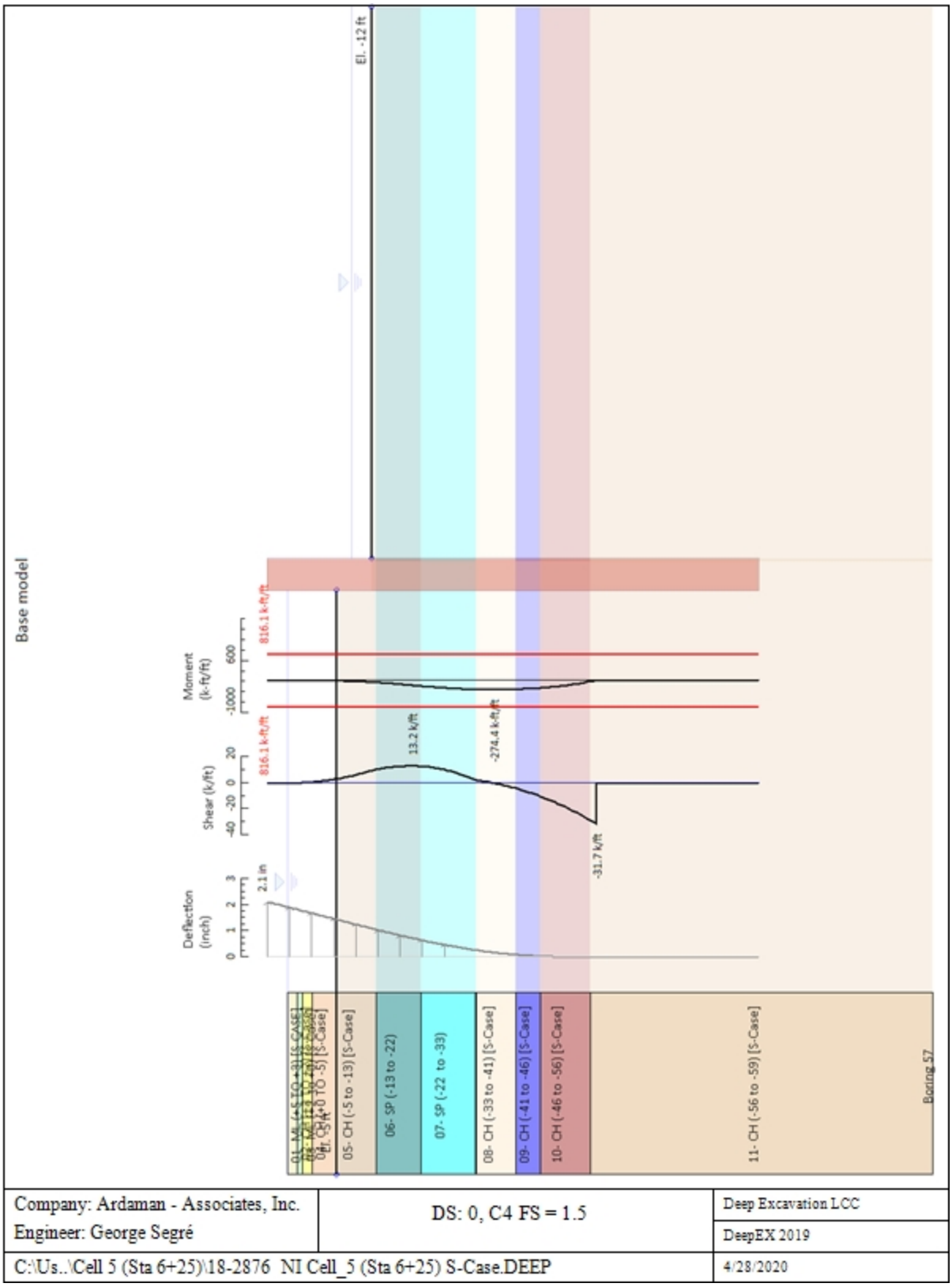
Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C3 FS = 1.0	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP		4/28/2020


Base model
El. -12 ft
Deflection (inch)
0 1 2 3 4
3.98 in
Shear (k/ft)
-50 -30 -10 10 30
816.1 k-ft/ft
16 k/ft
-42.3 k/ft
Moment (k-ft/ft)
-1000 600
816.1 k-ft/ft
-392.5 k-ft/ft
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020

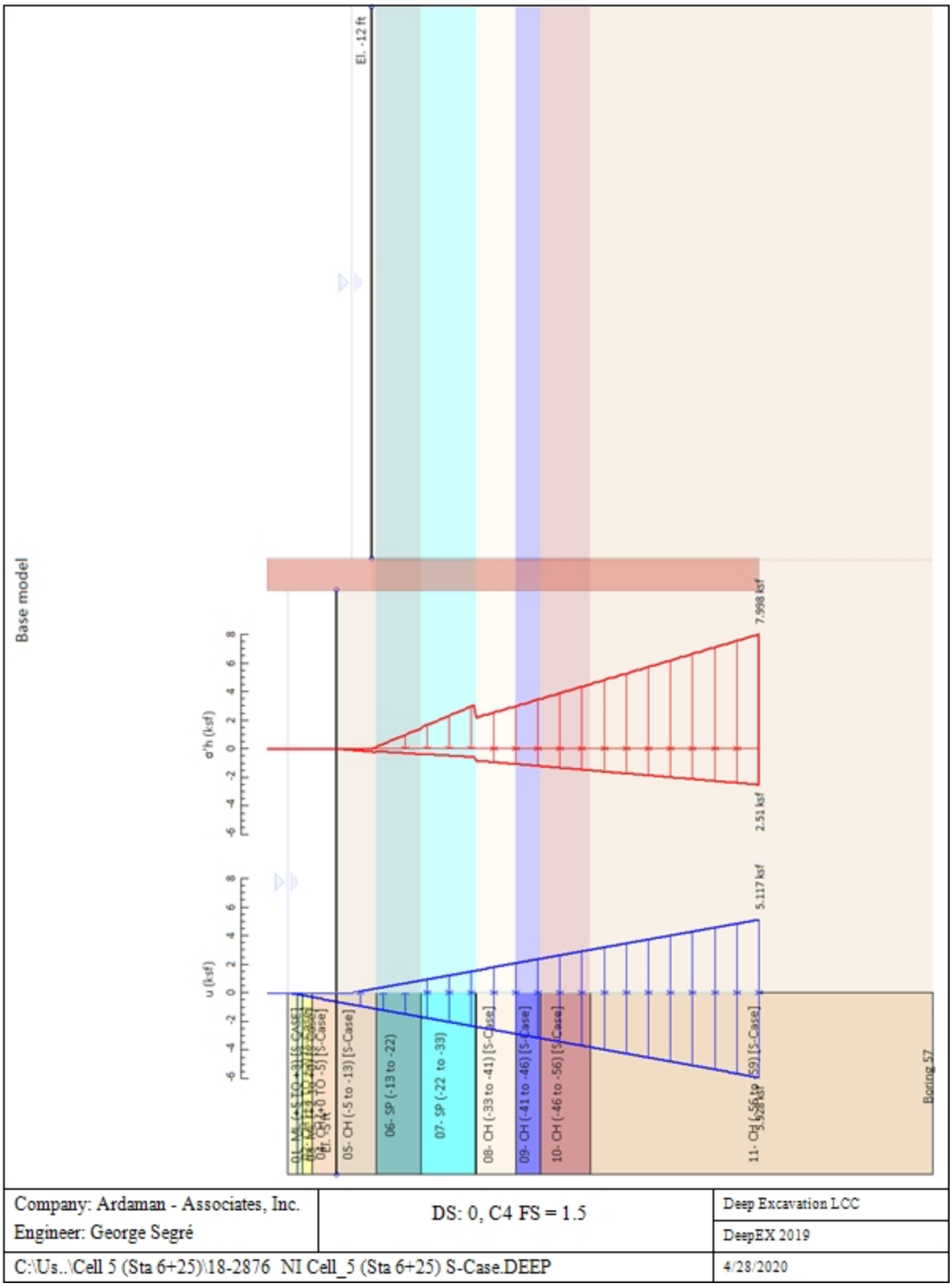

Base model
El. -12 ft
σ'h (ksf)
u (ksf)
7.998 ksf
2.51 ksf
4.867 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C3 FS = 1.5
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
Moment (k-ft/ft)
600
-1000
816.1 k-ft/ft
816.1 k-ft/ft
Shear (k/ft)
20
0
-20
-40
11.8 k/ft
-192.9 k-ft/ft
-30.4 k/ft
Deflection (inch)
1
0
0.75 in
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
11- CH (-56 to -59) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020


Base model
El. -12 ft
σ'h (ksf)
u (ksf)
11.997 ksf
2.51 ksf
5.117 ksf
05- CH (-5 to -13) [S-Case]
06- SP (-13 to -22)
07- SP (-22 to -33)
08- CH (-33 to -41) [S-Case]
09- CH (-41 to -46) [S-Case]
10- CH (-46 to -56) [S-Case]
Boring 57
Company: Ardaman - Associates, Inc.
Engineer: George Segré
DS: 0, C4 FS = 1.0
Deep Excavation LCC
DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP
4/28/2020



Attachment Figure C.5-101



Company: Ardaman - Associates, Inc. Engineer: George Segré	DS: 0, C4 FS = 1.5	Deep Excavation LCC DeepEX 2019
C:\Us..\Cell 5 (Sta 6+25)\18-2876 NI Cell_5 (Sta 6+25) S-Case.DEEP		4/28/2020

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/30/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D80-42 (SJGB053)

Depth ft	G-Ls G-Lt	Rult kips	Set inch	BlCt Bl/ft	TopFx kips	MxCS ksi	MxTS ksi	ENTHRU kip-ft	ActRes kips	Stroke ft
	Hammer+Pile Weight > Rult: Pile Runs									
0.1	1.00/1.00	0	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
2.0	1.00/1.00	2	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
2.0	1.00/1.00	4	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
5.0	1.00/1.00	17	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
8.0	1.00/1.00	31	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
8.0	1.00/1.00	34	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
9.0	1.00/1.00	37	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
10.0	1.00/1.00	41	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
10.0	1.00/1.00	38	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
12.0	1.00/1.00	47	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
14.0	1.00/1.00	56	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
14.0	1.00/1.00	63	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
	Hammer+Pile Weight > Rult: Pile Runs									
15.5	1.00/1.00	72	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
17.0	1.00/1.00	81	7.40	1.6	3285.2	16.088	10.982	97.9	81	6.47
17.0	1.00/1.00	101	6.55	1.8	3372.8	16.517	11.011	99.9	101	6.58
24.5	1.00/1.00	201	3.08	3.9	3934.6	19.295	11.565	88.4	201	7.29
32.0	1.00/1.00	300	1.66	7.2	4137.3	20.324	10.888	82.4	300	7.67
32.0	1.00/1.00	284	1.81	6.6	4121.5	20.220	10.934	82.7	284	7.63
39.5	1.00/1.00	421	1.03	11.7	4319.1	21.221	9.820	78.6	421	8.04
47.0	1.00/1.00	558	0.69	17.3	4471.3	21.981	9.190	76.5	558	8.36
47.0	1.00/1.00	562	0.68	17.5	4482.8	22.014	9.174	76.5	562	8.37
52.0	1.00/1.00	662	0.55	21.9	4543.7	22.323	8.780	75.2	662	8.50
57.0	1.00/1.00	762	0.44	27.0	4637.2	22.768	8.442	74.7	762	8.69
57.0	1.00/1.00	772	0.43	27.7	4623.5	22.781	8.451	74.7	772	8.70
59.5	1.00/1.00	870	0.37	32.1	4679.5	23.040	8.633	74.2	867	8.81
62.0	1.00/1.00	974	0.33	36.4	4725.1	23.198	8.675	73.4	969	8.89
62.0	1.00/1.00	1003	0.31	38.8	4736.8	23.257	8.555	73.3	991	8.90
67.0	1.00/1.00	1273	0.24	50.6	4821.0	23.694	8.110	72.7	1254	9.12
72.0	1.00/1.00	1567	0.21	57.8	4865.7	24.004	7.459	73.5	1545	9.25
72.0	1.00/1.00	1651	0.18	66.4	4899.5	24.078	7.180	73.8	1594	9.27
80.0	1.00/1.00	2415	0.12	97.7	5010.6	24.612	4.523	75.6	2341	9.52
88.0	1.00/1.00	3267	0.08	152.3	5106.5	25.246	4.562	77.8	3181	9.81
88.0	1.00/1.00	3164	0.10	125.8	5112.3	25.167	4.852	77.6	3145	9.80
90.5	1.00/1.00	3202	0.10	125.6	5128.1	25.274	6.456	77.5	3184	9.82
93.0	1.00/1.00	3241	0.10	126.0	5137.5	25.270	7.963	77.4	3222	9.84
93.0	1.00/1.00	3244	0.10	126.2	5151.7	25.268	8.000	77.5	3224	9.84
94.0	1.00/1.00	3259	0.09	126.8	5125.5	25.316	8.527	77.2	3239	9.83
95.0	1.00/1.00	3275	0.09	127.5	5137.2	25.253	8.898	76.9	3254	9.83

Attachment Figure C.6-1

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/30/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D100-42 (SJGB053)

Depth ft	G-Ls G-Lt	Rult kips	Set inch	BlCt Bl/ft	TopFx kips	MxCS ksi	MxTS ksi	ENTHRU kip-ft	ActRes kips	Stroke ft
Hammer+Pile Weight > Rult: Pile Runs										
0.1	1.00/1.00	0	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
2.0	1.00/1.00	2	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
2.0	1.00/1.00	4	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
5.0	1.00/1.00	17	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
8.0	1.00/1.00	31	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
8.0	1.00/1.00	34	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
9.0	1.00/1.00	37	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	41	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	38	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
12.0	1.00/1.00	47	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
14.0	1.00/1.00	56	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
14.0	1.00/1.00	63	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
15.5	1.00/1.00	72	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
17.0	1.00/1.00	81	10.59	1.1	3020.0	14.845	9.958	128.9	81	5.96
17.0	1.00/1.00	101	9.22	1.3	3202.1	15.762	10.444	132.3	101	6.18
24.5	1.00/1.00	201	3.97	3.0	3889.9	19.229	11.826	115.9	201	6.98
32.0	1.00/1.00	300	2.15	5.6	4151.5	20.582	11.409	107.0	300	7.48
32.0	1.00/1.00	284	2.32	5.2	4134.3	20.480	11.469	107.9	284	7.43
39.5	1.00/1.00	421	1.33	9.1	4345.4	21.593	10.378	101.2	421	7.88
47.0	1.00/1.00	558	0.89	13.5	4530.3	22.520	9.456	98.6	558	8.25
47.0	1.00/1.00	562	0.88	13.7	4538.2	22.526	9.449	98.6	562	8.26
52.0	1.00/1.00	662	0.70	17.1	4634.3	23.021	9.148	97.4	662	8.48
57.0	1.00/1.00	762	0.58	20.6	4675.5	23.351	8.918	95.6	762	8.59
57.0	1.00/1.00	772	0.57	21.1	4678.4	23.372	8.878	95.6	772	8.60
59.5	1.00/1.00	870	0.50	23.9	4731.2	23.604	9.038	95.2	870	8.71
62.0	1.00/1.00	974	0.44	27.4	4788.8	23.839	9.111	94.6	974	8.81
62.0	1.00/1.00	1003	0.41	29.1	4795.6	23.887	8.978	94.7	1001	8.83
67.0	1.00/1.00	1273	0.32	38.0	4909.4	24.408	8.624	93.8	1262	9.08
72.0	1.00/1.00	1567	0.27	45.3	4982.6	24.806	8.004	93.8	1550	9.25
72.0	1.00/1.00	1651	0.24	51.0	4997.3	24.885	7.657	94.2	1608	9.29
80.0	1.00/1.00	2415	0.18	68.5	5099.4	25.416	5.067	96.5	2354	9.52
88.0	1.00/1.00	3267	0.12	99.3	5167.5	25.722	3.542	98.0	3191	9.71
88.0	1.00/1.00	3164	0.14	86.5	5181.8	25.686	3.860	97.9	3148	9.70
90.5	1.00/1.00	3202	0.14	87.0	5190.5	25.709	5.181	97.9	3186	9.73
93.0	1.00/1.00	3241	0.14	87.8	5199.1	25.691	6.449	97.8	3225	9.75
93.0	1.00/1.00	3244	0.14	88.0	5203.8	25.658	6.486	97.9	3227	9.75
94.0	1.00/1.00	3259	0.14	88.3	5195.0	25.693	6.948	97.8	3241	9.75
95.0	1.00/1.00	3275	0.14	88.9	5208.1	25.674	7.454	97.5	3257	9.76

Attachment Figure C.6-2

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/20/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D80-42 (SJGB057)

Depth ft	G-Ls G-Lt	Rult kips	Set inch	BlCt Bl/ft	TopFx kips	MxCS ksi	MxTS ksi	ENTHRU kip-ft	ActRes kips	Stroke ft
Hammer+Pile Weight > Rult: Pile Runs										
5.0	1.00/1.00	6	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	20	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	25	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
11.0	1.00/1.00	30	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
12.0	1.00/1.00	36	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
12.0	1.00/1.00	47	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
19.5	1.00/1.00	190	3.32	3.6	4030.2	19.736	11.481	89.9	190	7.24
27.0	1.00/1.00	333	1.46	8.2	4338.4	21.246	10.578	82.6	333	7.78
27.0	1.00/1.00	334	1.45	8.3	4315.8	21.209	10.576	82.5	334	7.78
33.5	1.00/1.00	457	0.93	12.8	4512.8	22.100	9.481	79.3	457	8.13
40.0	1.00/1.00	580	0.67	17.9	4675.1	22.895	8.513	77.5	580	8.42
40.0	1.00/1.00	594	0.65	18.5	4678.2	22.910	8.453	77.4	594	8.44
42.5	1.00/1.00	627	0.60	19.8	4679.4	22.916	8.344	76.3	627	8.42
45.0	1.00/1.00	660	0.57	21.2	4700.0	23.017	8.434	76.1	660	8.49
45.0	1.00/1.00	639	0.59	20.2	4693.9	22.987	8.531	76.0	639	8.47
54.5	1.00/1.00	813	0.42	28.7	4863.3	23.816	8.347	75.1	812	8.79
64.0	1.00/1.00	988	0.30	40.4	4985.9	24.417	8.357	74.2	984	9.04
64.0	1.00/1.00	1110	0.23	53.2	4979.3	24.469	7.890	74.4	1068	9.10
65.5	1.00/1.00	1228	0.22	55.7	5020.7	24.610	7.561	74.1	1182	9.18
67.0	1.00/1.00	1348	0.20	58.7	5058.8	24.788	7.176	74.7	1299	9.24
67.0	1.00/1.00	1351	0.20	58.7	5079.2	24.874	7.166	74.7	1302	9.25
70.0	1.00/1.00	1604	0.18	65.8	5142.4	25.183	6.406	75.9	1548	9.38
73.0	1.00/1.00	1869	0.16	75.1	5167.8	25.337	5.771	76.9	1805	9.50
73.0	1.00/1.00	1751	0.20	61.2	5168.3	25.317	6.120	76.8	1744	9.48
75.0	1.00/1.00	1834	0.19	63.4	5196.2	25.447	6.311	77.1	1827	9.53
77.0	1.00/1.00	1920	0.18	66.0	5233.5	25.629	6.975	77.4	1913	9.57
77.0	1.00/1.00	1945	0.17	68.8	5237.4	25.648	6.902	77.4	1926	9.57
82.0	1.00/1.00	2018	0.17	71.6	5277.7	25.846	8.646	77.7	1998	9.64
87.0	1.00/1.00	2091	0.16	75.2	5310.8	26.008	9.545	77.8	2072	9.70
87.0	1.00/1.00	2096	0.16	75.5	5308.9	25.999	9.498	77.8	2075	9.70
90.0	1.00/1.00	2297	0.14	86.2	5315.3	26.030	9.109	77.9	2274	9.77
93.0	1.00/1.00	2505	0.12	100.2	5335.1	26.163	8.488	78.2	2481	9.83
93.0	1.00/1.00	2481	0.13	95.7	5330.9	26.151	8.559	78.2	2472	9.83
94.0	1.00/1.00	2501	0.12	97.4	5364.3	26.270	8.548	78.2	2492	9.84
95.0	1.00/1.00	2521	0.12	99.3	5387.2	26.382	8.513	78.2	2512	9.86

***** Press any key to continue *****

San Jacinto Waste Pits : 03/19/2020 : GF 03/20/2020

Ardaman and Associates, Inc. GRLWEAP VERSION 2010

Delmag D100-42 (SJGB057)

Depth ft	G-Ls G-Lt	Rult kips	Set inch	BlCt Bl/ft	TopFx kips	MxCS ksi	MxTS ksi	ENTHRU kip-ft	ActRes kips	Stroke ft
Hammer+Pile Weight > Rult: Pile Runs										
5.0	1.00/1.00	6	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	20	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
10.0	1.00/1.00	25	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
11.0	1.00/1.00	30	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
12.0	1.00/1.00	36	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
Hammer+Pile Weight > Rult: Pile Runs										
12.0	1.00/1.00	47	39.60	0.3	0.0	0.000	0.000	0.0	0	11.25
19.5	1.00/1.00	190	4.30	2.8	3858.2	19.100	11.638	117.6	190	6.92
27.0	1.00/1.00	333	1.86	6.5	4212.5	20.866	10.852	106.0	333	7.59
27.0	1.00/1.00	334	1.85	6.5	4211.2	20.885	10.852	106.0	334	7.60
33.5	1.00/1.00	457	1.19	10.1	4392.0	21.959	9.971	101.2	457	7.97
40.0	1.00/1.00	580	0.84	14.2	4551.1	22.777	9.197	98.6	580	8.29
40.0	1.00/1.00	594	0.81	14.8	4553.7	22.836	9.153	98.5	594	8.32
42.5	1.00/1.00	627	0.76	15.9	4594.4	22.943	9.400	97.9	627	8.40
45.0	1.00/1.00	660	0.71	17.0	4625.1	23.258	9.644	98.0	660	8.48
45.0	1.00/1.00	639	0.74	16.2	4616.0	23.218	9.758	97.9	639	8.45
54.5	1.00/1.00	813	0.53	22.6	4731.6	23.896	9.522	95.4	813	8.70
64.0	1.00/1.00	988	0.38	31.4	4844.5	24.427	9.068	93.8	986	8.95
64.0	1.00/1.00	1110	0.29	41.5	4888.5	24.574	8.500	94.0	1084	9.04
65.5	1.00/1.00	1228	0.26	46.0	4919.8	24.654	8.175	93.6	1193	9.12
67.0	1.00/1.00	1348	0.25	48.2	4953.8	24.965	7.812	93.5	1310	9.20
67.0	1.00/1.00	1351	0.25	48.3	4951.7	24.951	7.805	93.4	1313	9.20
70.0	1.00/1.00	1604	0.22	53.7	5007.9	25.169	6.958	94.5	1558	9.32
73.0	1.00/1.00	1869	0.20	60.2	5053.0	25.387	6.048	95.3	1815	9.42
73.0	1.00/1.00	1751	0.24	51.0	5037.2	25.287	6.462	94.8	1745	9.39
75.0	1.00/1.00	1834	0.23	52.2	5057.2	25.278	6.593	95.0	1828	9.42
77.0	1.00/1.00	1920	0.22	53.4	5071.0	25.520	6.646	95.4	1914	9.46
77.0	1.00/1.00	1945	0.22	55.2	5064.5	25.531	6.566	95.4	1929	9.46
82.0	1.00/1.00	2018	0.21	56.5	5106.7	25.572	7.399	95.7	2002	9.54
87.0	1.00/1.00	2091	0.21	58.4	5138.8	25.774	9.308	95.7	2075	9.59
87.0	1.00/1.00	2096	0.20	58.7	5136.1	25.792	9.310	95.7	2078	9.59
90.0	1.00/1.00	2297	0.19	63.7	5159.0	25.822	9.533	95.9	2278	9.65
93.0	1.00/1.00	2505	0.17	69.7	5185.4	25.925	9.088	96.0	2485	9.69
93.0	1.00/1.00	2481	0.18	67.5	5183.2	25.895	9.137	96.0	2474	9.69
94.0	1.00/1.00	2501	0.18	68.3	5184.7	25.907	9.144	96.0	2493	9.69
95.0	1.00/1.00	2521	0.17	69.2	5175.0	25.822	9.104	95.7	2513	9.70

Attachment Figure C.7-2