FINAL
DATA GAP ANALYSIS AND ADDITIONAL FIELD STUDIES WORK PLAN

OPERABLE UNIT 3

OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

Prepared for:

Olin Corporation
3855 North Ocoee Street; Suite 200
Cleveland, TN 37312

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.
271 Mill Road
Chelmsford, MA 01824

Project No. 6107150016.001.007

July 3, 2015

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LIST OF ACRONYMS

Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
AOC	Administrative Order on Consent
BEHP	Bis(2-ethylhexyl)phthalate
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COI	Chemical of Interest
CSM	Conceptual Site Model
DAPL	Dense Aqueous Phase Liquid
ft	feet
LNAPL	Light Non-Aqueous Phase Liquid
MACTEC	MACTEC Engineering and Consulting, Inc.
Mass DEP	Massachusetts Department of Environmental Protection
MBTA	Massachusetts Bay Transportation Authority
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MMB	Maple Meadow Brook
MMBA	Maple Meadow Brook Aquifer
MTBE	Methyl Tert-Butyl Ether
NAPL	Non-Aqueous Phase Liquid
NDMA	N-nitrosodimethylamine
NDPhA	N-nitrosodiphenylamine
ng/L	nanograms per Liter
NPL	National Priorities List
OCSS	Olin Chemical Superfund Site
off-PWD	off-Property West Ditch
Olin	Olin Corporation
OU	Operable Unit
PCE	tetrachloroethene
Property	Olin Property
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
RSL	Regional Screening Levels

SMB	Sawmill Brook
SOW	Statement of Work
SVOC	Semi-volatile Organic Compounds
the Site	Olin Chemical Superfund Site
TMPs	Trimethylpentenes
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WBV	Western Bedrock Valley

1.0 INTRODUCTION

This document summarizes the nature and extent of Chemicals of Interest (COI) associated with groundwater in Operable Unit 3 (OU3) at the Olin Chemical Superfund Site (OCSS or Site), presents an analysis of data gaps, and proposes additional studies in the form of a work plan to address those data gaps. The COIs are those chemicals that have been associated with the former facility (as a raw material, product, or a constituent of waste streams or accidental releases), and that have been released to one or more environmental media. The definition of OU3 and the scope of the Remedial Investigation/Feasibility Study (RI/FS) is described in the Statement of Work (SOW) (United States Environmental Protection Agency [USEPA], 2007a) and the Administrative Settlement Agreement and Order On Consent (AOC) dated July 3, 2007 (USEPA, 2007b).

Olin Corporation (Olin) had an initial meeting with USEPA On November 20, 2013 and reviewed the OU3 Conceptual Site Model and provided its preliminary assessment of potential data gaps to fulfill the RI. Olin agreed during the meeting to formalize the data gaps assessment and provide USEPA with a draft Work Plan. This document is intended to fulfill that agreement.

This section summarizes OU3 Work Plan Objectives and work completed. Section 2.0 presents Site data supporting the data gap analysis. Analytical data presented in this analysis includes historical data that may be used in the RI report and RI data collected in accordance with the approved RI/FS Work Plan. Section 3.0 identifies proposed field studies to address data gaps.

1.1 OU3 Work Plan Objectives

OU3 as defined in the AOC/SOW encompasses all on- and off-Property groundwater areas including the Maple Meadow Brook Aquifer (MMBA), groundwater beneath the Olin Property, and groundwater located south and east of the Olin Property. Based on discussion during development of the Operable Unit 1 (OU1) / Operable Unit 2 (OU2) RI, soils located at and below the water table will be evaluated under OU3. Combined, OU1 and OU2 address unsaturated soils, surface water and sediment associated with the Olin Property (OU1) and off-Property surface water and sediment (OU2).

According to the SOW, (taking into consideration existing information regarding the Site) the objectives of the RI are to:

1. define the sources, nature, extent, and distribution of contaminants at the Site;
2. provide sufficient information for USEPA to assess the current and future potential risks to human health and to the environment; and
3. provide sufficient information to evaluate remedial alternatives, complete a conceptual design of remedial actions, select a remedy, and issue a record of decision.

Section 3.0 of the SOW identified some 26 specific topics or items that should be characterized or described by conducting remedial investigations and writing a RI Report. To some extent,

many of the objectives will be accomplished by compiling and evaluating information collected previously and during the RI, collecting additional published technical and scientific information from existing literature, and summarizing and critically evaluating the information in order to draw appropriate conclusions. Table 1.1-1 reproduces Table 3.2-1 from Volume I of the RI/FS Work Plan which contains a list the specific objectives of the RI and indicates which of the proposed activities in the Work Plan will contribute to the achievement of each of the objectives. Specific objectives that pertain to OU3 are identified and indicate whether the objective(s) was to be satisfied from new or historical data or other available published information. A status column has been added to that table to indicate whether the specific objective has been satisfied.

In addition to those requirements identified in the SOW, Volume I of the RI/FS Work Plan also identified the following additional general Objectives for OU3:

- The installation and sampling of two monitoring wells on the east side of the East Ditch to investigate lateral extent of groundwater impacts on this side of the Site.
- Installation of one monitoring well to the south east of the Property in proximity to East Ditch south of Presidential Way.
- The installation and sampling of two monitoring well clusters to delineate the down gradient extent of impacted groundwater along the Western Bedrock Valley (WBV) under the MMBA,
- A broader, representative sampling approach for the “specialty compounds” (now referred to as “additional Site-specific analytes”) in the RI Analyte List including dimethylformamide (DMF), phthalic anhydride, hydrazine, acetaldehyde, formaldehyde, nonylphenol, perchlorate, diphenylamine, tin, and the products Opex® and Kempore®.
- Additional investigation of the bedrock groundwater system to better understand the nature and extent of Site-related impacts to bedrock groundwater, including areas under the MMBA; and areas near dense aqueous phase liquid (DAPL) pools.
- Verifying that the area immediately west of former Lake Poly is not a source of and does not contain DAPL.
- Better definition of the geometry of the WBV to locate down gradient monitoring wells in vicinity of MMB, and Main Street east of the MBTA passenger rail line.
- Conduct investigations to better understand the impact of the cessation of pumping of the municipal water supply wells on groundwater quality in the MMB wetland.

1.2 OU3 Summary of Work Completed

The work identified for OU3 in the RI Work Plan has been completed including:

- Two rounds of groundwater sampling at each of the wells identified in Table 6.2-4 of the RI/FS Work Plan (referred to as the RI sampling program).

- Two rounds of synoptic water level measurements at wells identified in Table 6.3-1 of the RI/FS Work Plan
- Installing three overburden wells east of the Site (GW-401, GW-402, and GW-403)
- Conducting seismic refraction along the western property line west of Lake Poly to show that a bedrock depression is not present there
- Installing an overburden (GW-406) and bedrock well couplet (GW-406BR S/D) north of the Off-Property West Ditch (Off-PWD) DAPL Pool and West of Lake Poly to assess DAPL impacts in that area
- Installing a bedrock well couplet (GW-202BR S/D) adjacent to the on-Property DAPL pool to better understand the nature of impacts to bedrock groundwater near sources
- Installing a deep bedrock well triplet (GW-405BR S/M/D) between the off-Property DAPL pools and Cooke Ave to document bedrock pathways for N-nitrosodimethylamine (NDMA) and related COIs
- Installing a deeper bedrock well couplet (GW-65BRSD/GW-65BRDD) adjacent to GW-65BR
- Installing a bedrock well couplet (GW-407 S/D) by the Wilmington Municipal Water Treatment Plant (MWTP) to better define nature and extent on groundwater impacts on the west side of the WBV
- Conducting seismic refraction investigations across MMB near the MBTA tracks and Maine Street to guide installation of overburden triplets and bedrock wells GW-400 S/M/D/BR and GW-404 S/M/D/BR to evaluate downgradient nature and extent of groundwater impacts and installation of same
- Re-placing damaged wells (GW-10DR, and GW-43DR) as agreed upon with USEPA under separate correspondence, and
- Installing an additional overburden couplet (GW-408 S/D) on the south western side of the containment area.

Table 1.2-1 provides a summary of the RI sampling analytical program listing locations, sample collection dates, field QC samples (duplicates) and the analyses performed. Since the RI report will also consider data collected under the Interim Response Step Work Plan (IRSWP) including data from the quarterly Slurry Wall and Cap monitoring, Plant B Monitoring, and the Calcium Sulfate Landfill, the data available from that program is summarized in Table **1.2-2**. A summary of the analytical program for the quarterly residential sampling is included in **Table 1.2-3**. As described in the RI Work Plan, the RI sampling program was designed to supplement historical data and the RI sampling program did not re-sample all wells that existed at the time the RI sampling was performed. When the RI report is prepared, historical data will be reviewed for consistency with more recent data at locations where both historical and RI sampling data exist. The RI will also evaluate the most recent data from wells that were not sampled as part of the RI sampling program. **Table 1.2-4** summarizes the most recent data available from these wells.

The actual data used in the RI report from this or other historical data will be determined at a later date.

Data collected for OU3 are consistent with proposed investigations in the Work Plan with the following exceptions described below. During execution of the groundwater sampling program, it was identified to USEPA that a number of wells that were in the proposed RI sampling program had been destroyed over time. Discussions with USEPA resulted in the re-installation of some but not all of these wells since the data objectives could be met by other nearby wells that were in the OU3 sampling program.

- The wells that were replaced (R) included GW-10DR and GW-43DR.
- GW-33S on the west side of the West Warehouse was destroyed but not replaced as it was immediately upgradient of GW-34SR which was sampled.
- GW-36 and GW-37 located along the west side of the Containment Area had also been destroyed and a new well GW-408S/D was installed nearby as a placement.
- GW-1 located in the far northeast corner of the Olin property could not be located and was assumed destroyed. The data from nearby GW-32S/D satisfied the objectives for that corner of the Site.
- The data objectives for GW-48D, also destroyed and located on the east side of the East Ditch were met collectively by the GW-402 and GW-403 located downgradient from GW-48D.
- GW-75S, along Breed Avenue had also been destroyed and the paired well GW-75D was sampled for that location.
- GW-40D downgradient of the CSL was paved over and could not be located and but the data objectives for this well were met collectively by SL-1S/D, SL-2, and SL-3, all located nearby and upgradient.
- GW-98 east of former Plant C had also been destroyed but this well was immediately adjacent to GW-52S/D which were sampled.
- Finally, MP-4 Port 1 was replaced with MP-4 Port 2 as Port 1 was not yielding adequate flow for sampling.

All other proposed samples in the RI program were collected and analyzed for the parameters in the work plan.

2.0 DATA GAP ANALYSIS

This section presents a brief overview of the Conceptual Site Model (CSM), provides summary data tables with information on the frequency of detection of chemicals of interest and introduces figures depicting the distribution of those chemicals that are detected most frequently. The CSM is summarized in Section 2.1. Section 2.2 presents tabulated groundwater analytical results. Section 2.3 discusses distribution of contaminants in groundwater and presents groundwater contaminant distribution figures as the framework for identifying potential data gaps. Section 2.4 summarizes identified data gaps and Section 2.5 provides a section summary.

2.1 Conceptual Site Model

Olin presented a review of the OU3 CSM during a meeting on November 20, 2013 held at USEPA Region 1 offices in Boston. That discussion presented supporting figures primarily from the RI/FS Work Plan and other previously published reports. The groundwater investigations conducted pursuant to the work plan confirm the CSM described in the Focused RI Report and the work plan and provide refinements to the understanding of the overburden groundwater flow conditions and the nature and consistency of fracturing of the underlying bedrock aquifer. These investigations also update chemical data concerning the nature and extent of groundwater impacts associated with OU3.

Presented below are key elements of the CSM that were reviewed in the November 20, 2013 meeting. A detailed discussion of the OU3 CSM including history of site operations, releases, investigations and remedial actions will be included in the OU3 RI report. The OU1 RI report provided detailed information on the geologic and hydrologic settings of the Site, some of which is repeated here in the form of figures. These figures focus on the relationship between the Olin property, the location of DAPL pools and the bedrock surfaces, unconsolidated and bedrock geology underlying MMB and general groundwater flow conditions in overburden and bedrock.

2.1.1 Site Geology and Hydrogeology

The presentation of information related to Site hydrogeology includes figures and data presented in previous reports (Appendix A) and new or updated figures that reflect new data acquired for OU3. These Appendix A figures include:

- Site topography (Figure 3.1-1 from the Focused RI),
- a 3-D orthophotographic figure indicating site features (Figure 3.1-3 from the Focused RI),
- a 3-D contour figure of the bedrock surface depicting the Western Bedrock Valley and the general location of the DAPL pools (Figure 3.2-4 from the Focused RI)

- a cross section location figure (Figure 3.2-7) and two sections showing overburden geology along and across the Western Bedrock Valley (Figures 3.2-8, and 3.2-9 from the Draft Final OU1/OU2 RI report).
- May and October 2011 potentiometric surface maps for shallow overburden groundwater based on synoptic datasets (Figures 3.3-2 and 3.3-3 from the Draft Final OU1/OU2 RI report).
- Geologic cross sections from the OU1/OU2 RI/FS Report which depict surficial geology in the northern half of the Olin Property (Figures 3.2-1 through 3.2-3).
- Revised geologic cross sections from the OU1/OU2 RI/FS Work Plan which depict the vertical distribution of ammonia, sulfate and NDMA within the MMBA (Figures 6.2-26 through 6.2-31).

New and updated figures include additional interpreted groundwater potentiometric maps for deep overburden groundwater (Figures 2.1-1 and 2.1-2), and for bedrock groundwater (Figures 2.1-3 and 2.1-4) and a revised bedrock surface topography map (Figure 2.1-5). The bedrock topographic surface was revised to reflect new data collected in the area of the Off-Property DAPL pool at 10 Jewel Drive, and seismic investigations, including verification borings, in vicinity of MMB and Main Street. An additional seismic refraction line was conducted along the western property boundary from the Containment Area to a point north of former Lake Poly to investigate indications of additional bedrock lows west of Lake Poly. This study confirmed existing interpreted depths to bedrock along the western property boundary and did not result in revisions to the interpreted bedrock surface. Both seismic studies and the previously submitted report for the MMB/Main Street area are included in Appendix C.

2.1.1.1. Overburden Geology and Bedrock Topography

Most of the overburden wells installed as part of the OU3 investigation were shallow wells. Information collected from these well installations generally confirm rather than refine previously known information. The three wells installed on the east side of East Ditch (GW-401, GW-402 and GW-403) encountered overburden consisting of sandy outwash deposits and shallow depths to bedrock. Each well was proposed as a shallow and deep couplet, but due to the shallow depth to bedrock each were completed as a single screened well. Another shallow overburden well was installed behind 1 Jewel drive (GW-406). Two deep well clusters were also installed during the OU3 RI (GW-400 S/M/D/BR and GW-400 S/M/D/BR) at the outlet end of the WBV along Main Street just upstream from where MMB crosses under the MBTA rail line. These well installations were preceded by seismic investigations that refined the bedrock topography in that portion of the Site, including the presence of a small bedrock ridge underlying MMB that bisects the WBV. The well clusters were installed on either side of the bedrock ridge within deeper portions of the bedrock channel. Well GW-404, which was installed on the eastern side, encountered a thicker section of till above bedrock than is normally encountered within the WBV, but this is likely a localized feature related to the adjacent bedrock high that underlies Town Park. As indicated above, the seismic reports and data are provided in Appendix C. A revised bedrock topographic map is included as Figure 2.1-5.

Discussion of surficial geology at the Olin property and a review of the overburden geology west of the property from the Main Street DAPL pool through the MMBA is provided below.

Olin Property. The surficial geology underlying the Olin property was discussed in the OU1/OU2 RI report and is summarized below with figures from that Report. Additional sections will be prepared for the OU3 RI report. These deposits consist generally of fill, a limited amount of organic peat and silts, and glacial outwash and till deposits overlying bedrock. The locations of on-Property geologic and hydrogeologic cross sections are indicated on **Figure 3.2-1** in Appendix A. The actual cross sections are provided on **Figures 3.2-1** through **3.2-6**.

Fill material was identified over the entire developed portion of the site ranging in thickness from 1–12 feet. The sub-grade material beneath the asphalt and concrete slabs is a well graded sand and gravel material (i.e., wide range of grain size). The sub-grade material is typically underlain by uniform sand that appears to be native soil or a locally reworked native soil. Unless debris or foreign materials were present in this uniform sandy material, it was often difficult to distinguish fill, including reworked native soil, from undisturbed native material.

Backfill at former Lake Poly includes geotextile fabric at 2.5 feet (ft) below ground surface (bgs), gravel rip-rap fill from 2.5–9 ft bgs and another layer of geotextile fabric at 9 feet. Sand and more riprap fill were encountered under the geotextile to a depth of approximately 13 ft bgs. The fill materials were underlain by the native soils consisting of sandy till with varying amounts of fines. Bedrock was encountered at approximately 19 ft bgs.

Locally, peat deposits are encountered in the western portion of the former facility and the eastern portion of the facility located south of Plant B. The organic peat layer is typically encountered at or just below the ground surface and ranges from very dark brown, organic peat to dark brown stratified organic silt and sand. The organic materials encountered on site were generally quite thin (less than 0.5 feet). However thicker units (2–4 feet) were encountered at the edges of the facility property nearest the boggy swales. These deposits pinch out towards the center of the site.

Generally, the glacial ice contact and outwash deposits underlying the fill at the site were composed of 2–10 feet of uniform fine to coarse sand that grade into a coarser sandy gravel material with depth, although the nature of these transitions vary locally. As little as 5 feet of fill and outwash material was encountered in the central part of the Property in the vicinity the former Plant B Production Area, and over thirty feet of outwash deposits were encountered at the south end of the Property. Cross section S-N on **Figure 3.2-2** and Section E-W on **Figure 3.2-3** indicate that the overburden thickens in the southern and southeastern portions of the developed facility property in the vicinity of East Warehouse and Former Plant D. The thickest sequences of transmissive clean sandy gravels were encountered in SB-459, SB-461, SB-470, and SB-472 (see Section S-N).

Both basal till and ablation till have been identified in the overburden soils within the site. The ablation till encountered at the site was characterized by the presence of cobbles and silt and was well graded compared to the relatively uniform gradation of the ice contact and outwash

deposits. Basal till is located directly over the bedrock and may have a lower transmissivity than the ablation till depending on its density and fines content.

MMBA: Figure 3.2-7 in Appendix A presents the location of cross sections along the WBV within the MMBA. Figure 3.2-8 presents cross section A-A', which is oriented along the Western Bedrock Valley from the Main Street DAPL Pool to the GW-65 well cluster. The section is drawn with a vertical to horizontal exaggeration which accentuates the vertical relief of topographic features. Within upland areas adjacent to the MMB Wetland complex, surficial soils consisting of fine sands, grade vertically into sands and gravels which overlie medium to coarse sands with increasing depth. Moving down the WBV, these gravels and sandy deposits grade into fine to coarse sands and fine to medium sands with some gravel. The shallow surficial soils grade laterally into a thick section of peat with silt and clay (muck) in the interior of the MMB Wetland complex. An intermittent series of coarse sand and gravel deposits persists down the WBV at elevations ranging from -10 to 30 feet MSL, and at one location, these gravel deposits overly silt. These relationships suggest an origin for the gravel deposits as ice contact deposits formed as retreating ice became stranded, which included formation of small quiescent water bodies within the WBV. The bedrock is mantled by a basal till composed of gravel and cobbles supported in a clayey sand matrix. The till deposits appear thickest in the deepest incised portions of the bedrock valley. Cross section B-B', included as Figure 3.2-9, is aligned across the WBV and the MMB Wetland complex and shows similar geologic relationships

2.1.1.2. Bedrock Geology and Structure

Generally, bedrock below the Site is associated with the Composite Platform of Southeast New England or more specifically the Milford-Dedham Zone (Smith, 1997). This zone includes late Proterozoic and early Paleozoic rocks that lie between the Bloody Bluff Fault and the Northern Boundary Fault of the Boston Basin. The area northwest of the Bloody Bluff Fault is called the Nashoba Zone and is predominantly made up of late Proterozoic mafic meta-volcanic and metavolcaniclastics and intrusive rocks, primarily diorites (i.e. Andover Granites). The area southeast of the Bloody Bluff Fault is called the Milford-Dedham Zone and is predominantly made up of schists and gneisses representing metamorphosed sediments, and metamorphosed gabbro-diorites. The Milford-Dedham Zone and the Nashoba Zone were separate tectonic plates that were joined together at the Bloody Bluff Fault, creating a mylonite fault zone. The Burlington Mylonite Zone has been characterized as a 3-mile wide zone around the Bloody Bluff Zone where the bedrock has been severely deformed. The bedrock lithologies encountered in bedrock wells are consistent with published geologic information. Wells installed adjacent to resistant bedrock ridges (GW-405BR and GW-202BR) encountered competent, sparsely fractured mylonites and metamorphosed diorite with relatively low transmissivity. Bedrock wells installed on the western side of the WBV encountered Andover Granite that was more weathered and fractured with higher transmissivity.

To support the updated site-wide CSM, new borehole geophysical data collected in 2010 (see Appendix D) was compiled and reviewed along with published bedrock lithologic and structure mapping. Figure 2.1-6 summarizes the results of this effort with a rose diagram of all fracture features measured in five boreholes at the Site and in the eastern portion of the MMBA

presented on an enlarged portion of the Bedrock Geologic Quadrangle of the Wilmington Quadrangle (Massachusetts Geologic Survey, 2005). The fracture orientation data and complete borehole logs in individual boreholes are provided in Appendix D and fracture orientations are consistent with the information provided in Figure 2.1-6.

In summary, the measured site-specific bedrock structure conditions are consistent with and generally align with mapped regional bedrock structure. Site-specific bedrock structure shows a northeasterly strike of foliation (rock layers) ranging from 30 to 50 degrees east of true north, with dips to the northwest ranging from 30 to 70 degrees from horizontal. Foliation measured at outcrops presented on the geologic map indicate northeasterly strikes with northwesterly to vertical dipping surfaces. To the northwest of the MMBA, the Bloody Bluff Fault zone trends east/northeasterly, separating metasedimentary and meta-volcanic rocks beneath the MMBA from intrusive rocks to the northwest.

The above structural fabric provides preferential flow paths where bedrock fractures (or partings along foliation) are interconnected. At a local scale (10's of feet) these flow paths are anticipated to be tortuous and varied in direction. At the more meaningful scale of the Site (100s to 1000 feet or more) the flow paths are anticipated to align with the above northeasterly strike of foliation and structure. This condition is consistent with groundwater elevations and observed chemical detections.

Updated potentiometric maps (discussed and presented below) indicate a consistent low groundwater elevation north and west of MMBA (at GW-63 and GW-103) in the vicinity of the Chestnut Street municipal wells. Review of boring/core logs for wells in this area along with borehole geophysical data indicate the presence of several horizontal to shallow dipping fracture zones, and downward flow in open boreholes. These features indicate the northwestern wall of the WBV, being proximate to the Bloody Bluff Fault zone, may drain groundwater from the overburden deposits of the MMBA.

2.1.1.3. Overburden and Bedrock Groundwater Flow

The 2011 potentiometric data and figures collectively depict the degree to which the location of the shallow overburden groundwater divide that separates the Ipswich and Aberjona watershed varies seasonally. The location of the divide is generally consistent with the Zone II definition of the zone of contribution to the Wilmington Municipal Water Supply Wells. Groundwater north and west of the groundwater divide flows within the Ipswich watershed and groundwater south and east of the divide flows within the Aberjona watershed. Lateral overburden groundwater gradients on the Aberjona side of the divide are generally steeper and reflect a thinning of the saturated thickness of the overburden aquifer to the east and flow of shallow overburden groundwater to South Ditch and East Ditch within and adjacent to the Olin property. Groundwater gradients are upward from deep to shallow overburden groundwater and from shallow overburden groundwater to surface waters of the South Ditch and presumably East Ditch, although there are no piezometers in the East Ditch to prove this presumption. Piezometers have not been installed in East Ditch due to frequent maintenance of the ditch ballast by the MBTA railroad. Visual observation of South Ditch during summer months indicate

that the stream bed may go dry seasonally along the middle reach as groundwater elevations fall below the physical elevation of the stream bottom. During these periods, South Ditch becomes a losing stream.

Lateral groundwater gradients in vicinity of the groundwater divide and on the Ipswich side of the groundwater divide are very small flat. These small gradients occur in response to the thick section of saturated and highly transmissive glacial outwash deposits that occupy the WBV, which becomes deeper and broader to the northwest and underlies the MMB wetland. As the WBV and the MMB wetland complex turns to the northeast and exists past the Middlesex canal, both the surface water outlet and the width of the bedrock valley become constricted, which further restricts the bulk movement of groundwater and surface water from the MMBA. This condition contributes to the broad and flat shallow hydraulic gradients beneath MMB.

Other features within the groundwater flow field of interest are related to underlying bedrock topography and include the presence of bedrock ridges that protrude through the overburden in the area underlying Cooke Avenue, the northern end of Jewel Drive, the southern side of the Containment Area, east of the CSL, and by Town Park east of Main Street near its intersection with the MBTA rail line. In these areas, overburden groundwater is either not present or is locally limited in extent and saturated thickness. In addition, a small localized groundwater divide is present along the south western corner of the CSL adjacent to the Woburn Sanitary landfill. On-property, the Plant B groundwater extraction and treatment system imposes a small groundwater pumping cone of depression that intercepts groundwater locally adjacent to East Ditch.

Additional figures have been developed to depict the seasonal variability in the location of the deep overburden groundwater divide. Figure 2.1-1 depicts the interpreted potentiometric surface of deep overburden groundwater from May 2011 and Figure 2.1-2 depicts the potentiometric surface from synoptic data collected in October 2011. Similar figures have been developed for bedrock groundwater data collected during the same synoptic events (Figure 2.1-3 and 2.1-4, respectively).

2.1.1.4. Hydraulic Changes Since Cessation of Municipal Well Pumping

To provide a direct comparison of hydraulic changes since cessation of pumping from the five Municipal wells located in the MMBA, the groundwater flow maps presented above (non-pumping conditions) were reviewed along with water level maps prepared by Smith in May 1997 for the Phase II Supplemental Investigation Report reflecting pumping conditions (see Appendix E). The review focused on two key areas – the MMBA area downgradient of the Site, and the groundwater divide area near Jewel Drive and the Olin property. Primary observations from this review are discussed below.

Groundwater flow conditions for deep monitoring wells in April/May 1996 are generally similar to those mapped for May 2011, except for the areas around the Butters Row and Town Park wells where modest drawdowns (to approximately elevation 79 feet MSL) can be seen on the 1996 maps, whereas no drawdown is seen in the 2011 maps. Both maps show a localized area of low

groundwater at the Chestnut Street wells. While the 1996 maps do not provide resolution regarding the location of the groundwater divide area near the Site, the water level data presented on the Smith Plates indicates the April/May 1996 divide is several hundred feet east of its locations in May 2011. This condition could be caused by pumping at the Altron wells (Sanmina) at the time of the 1996 mapping and the associated capture zone which in turn would cause the divide to move further east toward the Olin property. Review of the shallow monitoring well data for April/May for the two time periods indicates similar conditions to that reported above except that the May 2011 map shows the groundwater divide area has moved further west in the absence of pumping influences.

Review of the deep monitoring well data for October 1995 and October 2011 indicate larger drawdowns at all of the pumping wells (to lower than elevation 70 feet), presumably due to low water conditions in the MMBA. A pronounced difference can also be seen regarding the location of the divide, with the 1996 data showing the divide extending east onto the Olin property, approximately 800 feet east of its non-pumping location in October 2011. The shallow monitoring well data for October for the two time periods show a similar pattern as the deep wells with the divide located on the Olin property in 1995, but being more than 1000 feet west in 2011. It is important to note that this lateral shift in the divide is a function of pumping of groundwater from the two Altron wells on the adjacent property. That groundwater was captured by those wells and did not migrate to the MMBA.

2.1.2 Summary of Sources of Contamination for OU3

The following section summarizes the sources of groundwater impacts associated with past manufacturing activities at the Site. The primary source of groundwater impacts was the historical releases of process waste waters to unlined lagoons such as Lake Poly, the East and West Pits under the East and West Warehouses and the Acid Pits within the footprint of the Containment Area. The lagoons were constructed in native soils consisting of sandy glacial outwash deposits and exfiltration from these lagoons resulted in the formation of DAPL and Diffuse Layer material, (also referred to as Diffuse groundwater) that migrated to topographic low points along the bedrock surface. Additional sources of impacts to groundwater include releases of light non-aqueous phase liquids (LNAPL) in the vicinity of Plant B, the presence of DAPL located below the water table in the Containment Area, and the Calcium Sulfate Landfill, which was permitted and closed under the Massachusetts solid waste regulations.

2.1.2.1. DAPL

DAPL is a highly concentrated brine with a low pH and density slightly greater than water. DAPL is typically dark green in color. DAPL has specific conductance typically 20,600 µmhos/cm or greater and is vertically stratified with increasing concentrations and density with increasing depth within the DAPL pools. These properties of the DAPL cause it to move by gravity rather than with groundwater allowing it to accumulate and remain within bedrock depressions.

Work conducted under the RI Work Plan for OU3 does not modify or refine the definition of DAPL. DAPL is defined by specific gravity which, if not measured, can be estimated as discussed in the following paragraphs from its predominant constituents (sulfate, chloride, sodium and ammonia). Since DAPL is an aqueous material, ionic strength and specific conductance increase with increasing constituent concentrations. Therefore, specific conductivity has also been used as an indicator of DAPL, in lieu of other measurements. Since DAPL is defined principally by density and secondarily by specific conductivity, the definition does not include minor dissolved organic constituents including NDMA, and most metals, since inclusion or exclusion of these chemicals does not affect the primary definition of density.

DAPL was first technically defined in a report titled "Results of the August, 1998 Multilevel Piezometer Sampling Event and DAPL/Diffuse Layer Discrimination Analysis" (Geomega, 1999). The physical characteristics and chemical data were used to derive a technical basis for discriminating DAPL from the diffuse layer and overlying groundwater. The term "diffuse layer" refers to the zone immediately above the DAPL, into which DAPL constituents diffuse prior to being transported in groundwater subject to reactive transport mechanisms. The Diffuse Layer is typically 3 to 5 feet thick in the vicinity of the DAPL pools. Groundwater samples with specific gravity greater than or equal to 1.025 represented a statistically distinguishable population compared to the groundwater samples from diffuse/ambient groundwater based on a comprehensive statistical analysis of data collected during the August 1998 Multilevel Piezometer (MLP) sampling event (Geomega, 1999). Therefore, the working definition of DAPL identifies samples with specific gravity greater than or equal to 1.025 as DAPL material. A number of DAPL parameters were correlated with specific gravity, and the following cutoff concentrations corresponding to a specific gravity of 1.025 have been identified:

- Ammonia concentration greater than 1,250 mg/l;
- Chloride concentration greater than 2,800 mg/l;
- Magnesium concentration greater than 270 mg/l;
- Sodium concentration greater than 1,700 mg/l;
- Sulfate concentration greater than 16,000 mg/l; and
- Specific conductance greater than 20,600 µmhos/cm.

Specific conductance has been used frequently in the absence of specific gravity data to discriminate DAPL samples from diffuse layer groundwater samples.

A predictive equation was developed for calculating specific gravity based on concentration data for multiple chemicals rather than on concentration data for a single parameter (Geomega, 1999). The equation is:

$$SG = 2.6 \times 10^{-7} \times SO_4^{2-} + 1.3 \times 10^{-6} \times Na^{+} + 3.7 \times 10^{-6} \times Cl^{-} + 7.4 \times 10^{-7} \times NH_3 + 1.01$$

Concentrations of sulfate, sodium, chloride, and ammonia are in dimensions of mg/l.

In addition to these major constituents, other COIs including NDMA, chromium, iron, aluminum, calcium, and low concentrations of several VOCs and SVOCs are present in DAPL. The OU3 RI report will provide a comprehensive assessment of constituents present in DAPL. Based on density, and specific conductivity which is a function of the major ions and dissolved species present, DAPL is known to be density stratified vertically within the DAPL pools. This aspect of DAPL is also confirmed by increases in fluid conductivity with depth as measured over multiple years through inductance logging of wells located in the DAPL pools and multilevel well sampling, including sampling conducted under the DAPL Pilot Test. The vertical distribution of minor constituents in DAPL, including NDMA, has not been studied from a statistical perspective and neither recent work or former evaluations provide additional data that warrant modification of the definition of DAPL based on inclusion of, or distribution of, these relatively minor constituents. The definition of DAPL as originally developed remains accurate and appropriate.

NDMA is detected frequently in DAPL and the highest concentrations of NDMA detected at the Site occur in DAPL. Elevated NDMA concentrations also occur in the Diffuse material. As discussed in detail in the OU1/OU2 RI report a significant effort has been made to determine the origin of NDMA. These efforts were not conclusive due to several possible formation mechanisms. There is no identified path forward to answer that question since it would likely result in the same outcome. A search for more recent information has not revealed any information that adds to our understanding of how NDMA was formed.

The DAPL, once formed, migrated by gravity along the bedrock surface collecting in a series of cascading (progressively lower) bedrock depressions within the upper elevation of the WBV. DAPL is present as a result of historic industrial disposal practices that ceased around 1972 and DAPL is no longer being formed. Boring programs to delineate the DAPL pools have identified a bedrock saddle (a transverse topographic ridge in bedrock) that separates the Upper DAPL pool (on-Property DAPL pool in the Containment Area and the off-Property West Ditch DAPL pool) and the Main Street DAPL pool. Another saddle, known as the Main Street bedrock saddle, forms the down slope barrier or “dam” to the Main Street pool. Low spots in these saddles, allowed DAPL to flow to the next lower bedrock depression as the up slope DAPL pool elevation reached the saddle. The elevations of the DAPL surface in these pools have remained stable within measurement sensitivity over the last decade.

The location of the DAPL Pools is shown in **Figure 2.1-7** in context to the bedrock surface. This figure shows the revised bedrock topography from bedrock and seismic studies discussed previously.

2.1.2.2. Diffuse Material

The interface of DAPL with overlying groundwater is gradational, with constituents that dissolve from the DAPL being transferred vertically upward by diffusion resulting in a layer known as Diffuse material above and around the DAPL. Diffuse material has chemical properties that are transitional between DAPL and overlying groundwater. This Diffuse material is defined as having specific conductance between 20,600 and 3,000 µmhos/cm and is typically several feet in thickness (3-5 feet) above the DAPL. Since the Diffuse material forms a distinct layer above

DAPL it is also referred to as the Diffuse Layer or Diffuse Layer material. The Diffuse material can be transported laterally by advective groundwater movement. As groundwater moves over the surface of the DAPL and Diffuse material is displaced advectively (i.e., moves with groundwater flow), constituents continue to diffuse from the DAPL, thereby replenishing the Diffuse Layer. When density driven fluids such as DAPL migrate, convective currents develop which can result in convective mixing with the overlying boundary fluid, which in this case is groundwater. Therefore, when the DAPL pools were originally formed decades ago, and DAPL was actively moving through overburden to its present location, a larger volume of Diffuse material was created by these more dynamic transport processes. In the ensuing decades it is believed the volume of Diffuse material has decreased due to normal groundwater and solute transport processes (attenuation through advection, dispersion and dilution). Consequently, Diffuse material remains present occupying the bottom of the aquifer system downgradient of DAPL areas, and the presence of Diffuse material does not necessarily indicate an underlying DAPL or immediate proximity to a DAPL. Since DAPL is no longer being formed and its movement has long been arrested by the bedrock depressions it occupies, Diffuse material is no longer being formed by convective mixing mechanisms, and the primary mechanism for its continued presence is replenishment by diffusion from DAPL and advective movement with groundwater, with subsequent attenuation by advection, dispersion, dilution and precipitation /adsorption for those dissolved constituents that are affected by pH and aquifer oxidation / reduction (redox) conditions.

Installation of bedrock boreholes adjacent to the on-Property DAPL pools (GW-202BR) and within the bedrock saddle of the Main Street pool (MP-4) confirm the presence of Diffuse material within fractured bedrock to depths of 137 feet below ground surface in the immediate vicinity of the DAPL pools. Boreholes located at a greater lateral distances from DAPL pools (GW-406BR and GW-405BR) do not indicate the presence of Diffuse material at similar depths in fractured bedrock.

Where the overburden aquifer is relatively thin (twenty feet or less) shallow groundwater can also be impacted by Diffuse material in the vicinity of groundwater discharge areas such as South Ditch. Where the overburden aquifer is relatively thick (up to 80 feet) such as MMB, the shallow overburden groundwater is typically not impacted. The saturated thickness depth of twenty feet is typically used as a demarcation between shallow and deep over burden groundwater. When the groundwater saturated thickness is less than twenty feet, the use of the term shallow versus deep groundwater is relative to the position of the wells screens for paired wells.

Therefore the distribution of Diffuse material in deep overburden is associated with the deeper portion of the WBV within the MMBA, in the area overlying the Main Street DAPL pool, the off-PWD DAPL pool, within the Containment Area, and down gradient along the South Ditch. The interpreted distribution of Diffuse material is presented in **Figure 2.1-8** and is based on specific conductance of groundwater and topographic constraints around the DAPL pools (an elevation of five feet above DAPL). **Figure 2.1-9** provides a graphical illustration of the conceptual relationship between DAPL and Diffuse material and the advective movement of Diffuse material with groundwater.

2.1.2.3. Plant B

The former Plant B Production Area and Tank Farm was an area of a former release of a process oil, 2,4,4-Trimethyl-1-pentene and 2,4,4-Trimethyl-2-pentene (TMPs) and Bis(2-Ethylhexyl)phthalate (BEHP), and N-Nitrosodiphenylamine (NDPA). The process oil, BEHP and NDPA are primarily associated with the Tank Farm and the TMPs are associated with both areas. Ammonia is also present in groundwater. Collectively, the Plant B area has been the subject of extensive remediation including air sparging /soil vapor extraction, nutrient injection for bioremediation, and LNAPL recovery. The current Plant B groundwater treatment system captures groundwater from three extraction wells with a combined flow rate typically between 5 and 8 gallons per minute to create a groundwater cone of depression of limited extent to control LNAPL migration toward the East Ditch. As a consequence of groundwater extraction, dissolved TMPs, Bis-(2-ethylhyxyl) phthalate (BEHP), n-Nitrosodiphenylamine (NDPA), ammonia and other constituents are captured and require removal / treatment prior to discharge. The system has been operated successfully and little LNAPL remains. LNAPL recovery is typically on the order of one gallon per year. LNAPL is only measurable in a few wells and the distribution of LNAPL and water levels are measured monthly and reported semi-annually in the Semi-Annual Status Report. Groundwater is pretreated by granular activated carbon, followed by ammonia destruction by break-point chlorination, final carbon polishing followed by ion exchange to remove naturally-occurring arsenic. Groundwater is discharged under a Remediation General Permit (RGP) to Upper South Ditch behind a weir via the on-Property West Ditch (on-PWD).

2.1.2.4. Containment Area

The Containment Area consists of a soil bentonite slurry wall installed to bedrock with a temporary cap that surrounds the on-Property portion of the Upper DAPL pool and overlying Diffuse Layer material. A gravel equalization window is present in the slurry wall across the water table on the western side that allows groundwater heads to equalize inside and outside of the containment structure. The elevation of the top of the diffuse layer is well below the bottom of the equalization window. Shallow groundwater within the equalization window has been characterized in OU3 and is also monitored quarterly for a shorter list of parameters that are reported in the SASR and dissolved constituent concentrations are consistent with shallow groundwater both inside and outside the Containment Area. As discussed previously, bedrock groundwater immediately outside the Containment Area is impacted by Diffuse material.

2.1.2.5. Calcium Sulfate Landfill

The Calcium Sulfate Landfill (CSL) was permitted and closed under the Massachusetts State Solid Waste regulations and is currently in a post closure monitoring and maintenance program. Groundwater wells from the CSL are monitored twice a year, the cap is inspected and maintained and the results of these activities are reported biennially to the Massachusetts Department of Environmental Protection (Mass DEP). The most recent biennial report was included Attachment C of the Draft Final OU1 /OU2 RI. The CSL contains gypsum (calcium sulfate) and cover system is a vegetated soil cover. Groundwater is monitored for aluminum,

calcium, chromium, iron, manganese, nickel, sodium, sulfate, chloride, alkalinity, and total dissolved solids. The principal impacts to groundwater for constituents with regulatory criteria include sulfate and manganese. Iron is elevated in two wells but based on the collective data, it is interpreted that the iron is associated with a component of groundwater flow from the adjacent Woburn Sanitary Landfill. A localized groundwater divide occurs in the southwest portion of the CSL and the primary groundwater flow direction is toward the northeast. The highest dissolved concentrations for calcium and sulfate occur in wells SL-5 and SL-6 and is consistent with this groundwater flow direction. The CSL landfill wells that are monitored in the post closure monitoring program were sampled for OU3 for the full comprehensive list of analytes.

2.1.2.6. Other Areas

There are several areas within the Olin property that are impacted by other types of sources and are associated with TMPs, BEHP and NDPA, hydrazine and other constituents. These areas of groundwater impacts are typically small and of limited extent and show a more typical pattern of a shallow groundwater impacted in addition to underlying deeper groundwater. These areas include:

- TMPs associated with EA7 at OU1, which is a release of TMPs from the former Plant B Production Area that has migrated under the parking lot adjacent to the former Administration Building,

- Dissolved TMPs and NDPA in both shallow and deep overburden groundwater along the west side of the Containment Area that is down gradient of the former Drum Storage and Debris Disposal Areas,

- Several detections of hydrazine in shallow groundwater and to a lesser extent deeper overburden groundwater downgradient of Plants C and D where hydrazine day storage tanks were historically present or where hydrazine was made and used in various manufacturing processes,

- Slightly elevated concentrations of arsenic in shallow overburden groundwater downgradient of areas where process oil was released in the former Plant B Production Area, and the small area identified in OU1 investigations immediately east of the East Warehouse. The arsenic located in these areas is naturally-occurring since arsenic was never used in past Site operations.

2.2 Summary of OU3 Groundwater Analytical Results

The most comprehensive and current groundwater data set is associated with the OU3 RI sampling program. These data are presented in a series of tables that identify detected analytes, their frequency of detection and number of results that were at concentrations equal to or greater than a USEPA tap water regional screening level (RSL) or a Maximum Contaminant Level (MCL). These data include specialty compounds that are associated with samples collected from DAPL and Diffuse Layer material since these media were identified as the most

likely locations for the positive identification of specialty compounds. The OU3 RI will include a comprehensive evaluation of all the constituents detected in DAPL, Diffuse material and overlying groundwater, including those metals whose mobility may be pH and/or Eh dependent, but not necessarily part of the waste stream at the former facility.

The analysis of data gaps must focus necessarily on those constituents that are most mobile and most persistent and therefore, define the extent of contaminant migration in groundwater. The extent of contamination is defined most conservatively by NDMA. The analysis of data gaps also presents tabulated and graphical rendering of those constituents that are most frequently detected above screening guidance and regulatory standards to provide focus on which analytes will be most likely to contribute to human health risks from exposure to groundwater. The OU3 RI report will include, as indicated above, a more encompassing discussion of detected analytes. Through its comments to USEPA on the draft OU3 data gaps analysis, the Wilmington Environmental Restoration Committee (WERC) inquired whether the existence of elevated detection limits for some analytes above tap water RSLs and MCLs posed a concern for the evaluation of OU3 data. A comprehensive quantitative evaluation to address those comments was provided under separate cover to USEPA.

Table 2.1-1 presents a summary table of all RI sampling program data identifying frequency of detection, range of detection limits and detected concentrations, average values and a list of the tap water RSLs and MCLs including secondary MCLs and Mass DEP Office of Research and Standards Guidelines (ORSG) values. Table 2.1-2 presents summary statistics of only those analytes detected and indicates by shading which analytes were present at a concentration equal to or greater than an RSL and/or an MCL. The table also identifies the number of samples and sampling locations with concentrations equal to or greater than the RSLs and the number of samples with concentrations equal to or greater than the MCLs. All constituents detected above an RSL or MCL will be considered in the OU3 RI report as well as those constituents that are detected at concentrations below an RSL or MCL. The significance of analytes that are detected but have no screening levels or regulatory criteria will also be evaluated in the OU3 RI. Table 2.1-3 is a refinement of the same table and shows only those analytes with concentrations that are greater than an RSL and/or MCL. Table 2.1-4 tabulates the concentrations of detected analytes from the RI sampling program.

The analytes that have an RSL and/or MCL and are considered to be detected frequently (> 10%) are highlighted in Table 2.1-3. While these percentage thresholds are arbitrary, their use has the benefit of focusing attention on constituents that are likely to be most relevant to the evaluation of nature and extent, and quantifying risk for OU3. These include:

- nine (9) volatile organic compounds (VOCs) including 1,2-dichloroethane, benzene chloroform, cis-1,2-Dichloroethene, methyl-tertbutyl-ether, methylene chloride, toluene trichloroethene and vinyl chloride;
- three (3) semi-volatile organic compounds (SVOCs) including bis(2-ethylhexyl)phthalate, N-nitrosodimethylamine (NDMA) and N-nitrosodiphenylamine (NDPhA),

- fifteen (15) metals including aluminum, antimony, arsenic, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, vanadium and zinc,
- one inorganic (nitrate) and
- one specialty compound (hydrazine).

Of the VOCs, 1,2-dichloroethane, benzene, methylene chloride, trichloroethene and vinyl chloride were the most frequently detected above an MCL (>2%). Of the SVOCs, only NDMA was detected frequently above an RSL. For metals, arsenic, beryllium, cadmium, chromium and copper were detected most frequently above an MCL (>2%) while hexavalent chromium, cobalt and manganese were detected most frequently above an RSL (>10%). Nitrate was detected above its MCL at a frequency of 2% and hydrazine was detected above its RSL at a frequency of 14%.

Other analytes that do not have an RSL or an MCL are also present in groundwater. Some of these analytes are associated with known releases at the Olin Property or are major components of the DAPL and are also considered to be COIs. These include TMPs associated with soil located at or below the water table in OU1 Exposure Area (EA) 7 and EA3 associated with Plant B, and saturated soil near the former drum storage area and former debris area in OU1 EA2. BEHP, which has an RSL and MCL, and NDPhA, which also has an RSL, are also associated with these general areas. Although neither NDPhA nor BEHP are detected frequently above an RSL or MCL, these constituents are relevant to understanding the distribution of groundwater impacts associated with the Site. COIs associated with DAPL (historically referred to as indicator parameters) include ammonia, calcium, chloride, sodium, sulfate, nitrate and iron.

2.3 Distribution of Chemicals of Interest in Groundwater

The overburden groundwater system evaluation conducted under the OU3 RI will consider and will be based on Mass DEP groundwater use classification (GW-1 groundwater and Non-GW-1 groundwater). GW-1 groundwater, by definition, is a current or potential source of potable groundwater including the zone of contribution to the Wilmington water supply wells in the MMB aquifer and the default zone of contribution (500 foot radius) from residential wells located in the town Wilmington. All residences in Woburn are connected to public water. The zone of contribution for the Wilmington public water supply wells is roughly coincident with the groundwater divide that separates the Ipswich and Aberjona (Mystic River) watershed basins. The GW-1 demarcation line will be established in the OU3 RI report. The overburden groundwater is further divided into shallow and deep overburden groundwater based on proximity to and depth below groundwater discharge areas including the on- and off-property ditch system and MMB. Based on a review of COIs detected in groundwater as described in Section 2.1 above, separate groundwater distribution figures were developed for the constituents listed in the following table for shallow overburden, deep overburden, and bedrock groundwater. The figures are located in Appendix B (alphabetical order by chemical name), and

are preceded by figures that identify the location of wells considered representative of shallow overburden, deep overburden and bedrock groundwater, respectively.

Constituent	Shallow Overburden	Deep Overburden	Bedrock
VOCs			
1,2-Dichloroethane	X	X	X
Trichloroethene	X	X	X
2,4,4-Trimethyl-1-pentene	X	X	X
SVOCs			
Bis(2-Ethylhexyl)phthalate	X	X	X
N-Nitrosodimethylamine	X	X	X
N-Nitrosodiphenylamine	X	X	X
Metals			
Arsenic	X	X	X
Beryllium	X	X	X
Cadmium	X	X	X
Chromium	X	X	X
Cobalt	X	X	X
Copper	X	X	X
Hexavalent Chromium	X	X	X
Manganese	X	X	X
Sodium	X	X	X
Inorganics			
Ammonia	X	X	X
Chloride	X	X	X
Nitrate	X	X	X
Sulfate	X	X	X
Specialty Compounds			
Hydrazine	X	X	X
Formaldehyde	X	X	X
Opex	X	X	X
Kempore	X	X	

The groundwater distribution figures have data groupings that have concentration classes depicted with a scaled symbology. The data within each of the classes was “binned” using the Jenkins Natural Break procedure that automatically creates classes with equal variances based on an ordered data set, and that tries to maximize the variance between classes; in essence based on the number of classes specified, it attempts to locate “natural breaks” in the data. Five classes were specified, so each figure has a unique grouping as requested by USEPA in its comments on draft figures. Each figure also lists the actual sample collection date and posts the result at each location. The figures include, in addition to the two rounds of RI sample data, the most recent data for wells that were not included in the RI sampling program. The date of all samples included are indicated on the figures. The information presented on these figures is discussed in Section 2.4 with respect to data gaps.

The maximum extent of groundwater impacts is defined by NDMA and is presented in Figure 2.3-1 for shallow and deep overburden groundwater and Figure 2.3-2 for bedrock groundwater, including detections at residential wells. The maximum extent of all other analytes detected in groundwater and that are contaminants of interest at the Site fall within these boundaries, and therefore their extent is also defined by the current well network.

The generally low level, and in many cases sporadic, detections of NDMA in samples collected from residential wells in fractured bedrock are most likely related to the presence of long term and persistent pumping stresses caused by groups of wells, particularly those that are deep and aligned parallel to the primary fracture orientation in the fractured bedrock aquifer. This primary fracture direction is to the northeast and will result in preferential migration along that orientation toward wells that are pumping. Over large distances, the movement of groundwater in fractured bedrock will approach that of an equivalent porous media, and groundwater movement will be governed by prevailing hydraulic gradients. The fractured bedrock groundwater adjacent to DAPL pools and as far over as the western side of the WBV is impacted and contains NDMA. Residential wells that have shown impacts from NDMA are located to the southwest of these areas along the WBV and south-southwest of the off-PWD DAPL pool closer to the Olin property.,. Bedrock potentiometric data in the WBV indicate a possible draining condition in the vicinity of GW-103 BR, which is an open bedrock borehole.

In addition USEPA has commented that there has been a concern raised about the possibility of NDMA migration to the Burlington Reservoir, which we assume is the Mill Pond Reservoir near Winter Street. Readily available aerial imagery shows the reservoir was constructed behind a large dam with an elevation of approximately 150 feet MSL. NDMA detections in nearby wells could result from the same processes described previously. However, the high head in the reservoir would preclude migration of NDMA to that surface water body.

2.4 Data Gaps

The available information was reviewed to determine if it is adequate to meet the stated objectives of the OU3 investigation (shown below).

1. define the sources, nature, extent, and distribution of contaminants at the Site;
2. provide sufficient information for USEPA to assess the current and future potential risks to human health and to the environment; and
3. provide sufficient information to evaluate remedial alternatives, complete a conceptual design of remedial actions, select a remedy, and issue a record of decision.

The contaminant distribution figures presented in Appendix B, were reviewed to ascertain if the nature and distribution of the individual constituents detected above RSLs and MCLs was adequately understood and characterized to be able to define the cores of the contaminant plumes both laterally and vertically such that risks associated with exposure to groundwater could be quantified consistent with recent (2014) USEPA guidance for future exposures. The quarterly monitoring program data for residential wells has been evaluated and will be used to

conduct risk assessments for those residences. Based on the recent OU1/OU2 risk assessments, and the current OU3 data set, sufficient data exists to evaluate risks associated with groundwater /surface water interaction for the South Ditch. The horizontal and lateral distribution of other constituents that are considered COIs and good indicators of dissolved groundwater impacts associated with DAPL and Diffuse Layer material was also reviewed to understand if general distribution of impacts from the DAPL pools and areas of Diffuse Layer material is adequately demonstrated. Finally the distribution of certain VOCs that are not believed to be Olin COIs was reviewed to verify that those constituents are not attributable to the OCSS.

VOCs

Based on this review it is apparent that while there are indications of the presence of some low levels of chlorinated VOCs associated with the Olin Property, the presence and distribution of chlorinated benzene compounds, 1,2-DCA, TCE, and its daughter products (cis 1,2 –DCE and vinyl chloride) and fuel related VOCs (benzene, MTBE, and ethylbenzene) have sources in the MMB aquifer other than the OCSS. Groundwater in the Aberjona watershed impacted with chlorinated solvents including chlorinated benzene compounds is located in proximity to and downgradient of the Whitney Barrel property.

The distribution of TMPs in shallow and deep overburden groundwater and bedrock groundwater is well defined and related to residual sources located below the water table associated with former Plant B area, the former Buried Debris and Drum Storage Areas, and to a lesser extent DAPL.

Although the majority of VOCs in the aquifer are unrelated to the OCSS, the VOC data are adequate to define distribution sufficiently to complete a quantitative assessment of risk associated with exposure to VOCs that are potentially related to the OCSS and evaluate remedial alternatives if required.

With the possible exception of TMPs in shallow groundwater in the EA7 and EA3 exposure areas identified in the OU1/OU2 RI report, the available data for dissolved-phase VOCs in groundwater indicate that the vapor intrusion pathway (groundwater to indoor air) is not of concern and that no additional groundwater characterization of that pathway is required. This conclusion is based on comparison of maximum shallow groundwater VOC concentrations to values obtained from the USEPA VI web based screening level calculator.

SVOCs

The distribution of SVOCs including BEHP, NDMA and NDPhA is also sufficiently understood to define the contaminant plume, calculate exposure point concentrations, and conduct a quantitative evaluation of risk from exposure to groundwater. NDMA has the broadest distribution due to the low level detection limits and its conservative transport characteristics, and it is present over a broadly distributed area in bedrock and in deep overburden groundwater. Quarterly residential sampling has shown NDMA to be more widely distributed in

bedrock groundwater south and south west of MMB at low concentrations both below and slightly above the method reporting limit of 2 ng/L. In deep overburden and bedrock along the southeastern portion of the Olin property within the Aberjona watershed, NDMA is present at relatively high concentrations in GW-80D/BR. The distribution of NDMA in this portion of the Site is not sufficiently understood to define the extent of the contaminant plume.

The nature and extent of SVOCs in groundwater are adequate to define distribution sufficiently to complete a quantitative assessment of risk associated with exposure to SVOCs in groundwater and evaluate remedial alternatives if required. An additional deep overburden and shallow bedrock well couplet should be installed in Woburn to better define the direction of groundwater flow in that portion of the Site and to develop a better understanding of the distribution groundwater impacts. Since all residences in Woburn are on public water, this will not affect conclusions related to quantitative risk assessment for groundwater.

Metals

The distribution of metals in overburden and bedrock groundwater that have published RSLs and MCLs as well as those without RSLs or MCLs has been reviewed and are sufficiently defined to support risk characterization. All metals are naturally occurring since they are elements and widely distributed in geologic materials. Several metals in particular, including aluminum, arsenic, cobalt and manganese may be more widely distributed because of this reason and elevated at certain locations due to other factors such as low pH of DAPL in contact bedrock and unconsolidated aquifer materials; with biologically mediated changes in oxidation-reduction (redox) conditions in the aquifers due to the presence of other organic constituents (such as TMPs near Plant B, chlorinated solvents near Whitney Barrel or leachate (Woburn landfill and Spinazzola Trust landfill)). These metals, excepting arsenic, do not have MCLs and their distribution is well defined.

Beryllium and cadmium have been detected in both shallow and deep overburden groundwater at concentrations above the MCL and highest concentrations are associated with DAPL in the northern portions of the Main Street DAPL Pool. The distribution of both metals are similar and more limited in extent that other COIs.

Chromium is more widely distributed in on-Property overburden groundwater, and is similarly elevated in concentration in DAPL and to a lesser extent Diffuse Layer material. Several species, including chromium, sulfate, iron and aluminum have been demonstrated to precipitate within aquifer materials in the geochemical transition from DAPL through the Diffuse Layer to overlying groundwater. Therefore the concentration of dissolved chromium in groundwater can attenuate rapidly over relatively short distances. The distribution of chromium is well defined.

Hexavalent chromium is inconsistently detected in groundwater, and is typically at low concentrations producing an irregular distribution pattern in both shallow and deep overburden groundwater. Detections of hexavalent chromium are well constrained by the existing data set.

Sodium is a component of DAPL and is therefore elevated in concentration where associated with DAPL, Diffuse Layer material and impacted deep overburden groundwater. Elevated sodium concentrations are also present in shallow groundwater where the saturated thickness is thin in proximity to areas where groundwater actively discharges such as along South Ditch. Sodium will have a natural background concentration that will vary in accordance with soil materials and other anthropogenic inputs such as road salt. Sodium, which is very conservative from a transport perspective, is widely distributed in groundwater and the distribution of sodium is well established by the RI sampling and historical data sets.

Inorganics

Ammonia, nitrate, and sulfate are all major components of DAPL as well as being soluble compounds, and their distribution in groundwater reflect impacts to groundwater associated with the DAPL. All three analytes also commonly have other natural sources or anthropogenic inputs into the environment and therefore these inorganic compounds tend to be widely distributed in groundwater. The distribution of these inorganics in groundwater are well defined by the RI sampling and historical data sets.

Specialty Compounds

Of the specialty compounds, only hydrazine and acetaldehyde have RSLs, and of these constituents only hydrazine was detected at a frequency >10%. Consistent with site history, the highest concentrations of hydrazine are in shallow groundwater behind Plant D, and at lower concentrations in the vicinity of Plants B and C. Detections of hydrazine tend to be at low concentration and inconsistent from one sampling event to another. Hydrazine is limited in its distribution and is well defined by the RI sample data set in deep and shallow overburden groundwater, as well as in bedrock where it is detected infrequently.

OPEX and Kempore distributions are also depicted on figures. Although OPEX was detected infrequently and inconsistently in shallow and deep groundwater, the pattern of detections may suggest an association with Diffuse material. Kempore is also infrequently and inconsistently detected but follows a similar pattern of distribution. The distributions of OPEX and Kempore are well defined.

2.5 Summary

Based on review of the distribution of frequently detected COIs and some other constituents (primarily VOCs) that do not appear to be associated with the OCSS, the current data are adequate to support quantitative assessment of risks from exposure to constituents in groundwater. This includes evaluating potential vapor intrusion pathways from VOCs in groundwater associated with the OCSS. In addition, the distribution of monitoring wells on the Olin property compared to the large number of soil borings on the property that were evaluated under OU1, a large and sufficient data base exists in which to compare constituents detected in groundwater to constituents detected in saturated soil located below the water table. That comparison may include on a location-specific basis calculation of equilibrium partitioning of

multiple organic constituents to determine expected equilibrium concentrations in soil and groundwater contained in soil pores and comparison of those values to actual groundwater data. The purpose of such evaluation would be to determine the relationship between saturated soil concentrations and groundwater concentrations. Based on completion of these evaluations specific to saturated soils underlying the Olin property, these data are sufficiently complete and adequate to support evaluation of remedial alternatives in a FS for saturated soils underlying OU1/OU2.

Although, the extensive groundwater data set combined with other existing hydrogeologic data, results of the DAPL extraction pilot test, and groundwater modeling conducted previously, represent a largely complete data set to support risk characterization and development and analysis of remedial alternatives for groundwater in a FS, potential data gaps have been identified.

These include:

1. Refining the direction of groundwater flow southeast of GW-80 D/BR in the Aberjona watershed.
2. Given the error encountered in interpreted extent of the off-Property West Ditch DAPL Pool, confirmation of the extent of the Main Street DAPL Pool needs to be conducted.

3.0 PROPOSED SUPPLEMENTAL INVESTIGATIONS

Subsections 3.1 and 3.2 address data gaps identified in Section 2.5. Subsection 3.3 address additional data gaps that have been identified by USEPA and which have been agreed to by Olin.

3.1 Monitoring Well Installation

As discussed previously, the well network southeast of GW-80D/BR is not sufficient to determine the direction of groundwater movement precisely enough to evaluate where impacted groundwater is migrating to. The suite of constituents observed in well GW-80D/BR are not observed in wells GW-74S/D and GW-401D. This leaves only two possibilities: 1) Groundwater south of GW-80D/BR turns southeast towards South Pond (the water body immediately south of North Pond) or 2) Groundwater turns sharply to the south and southwest toward East Ditch. We propose that an additional shallow/deep overburden well couplet and a shallow bedrock triplet be installed between these two wells and closer to South Pond. A proposed location, pending negotiation of an access agreement, is shown on Figure 3.1-1.

This location was developed based on topography and an expectation of where groundwater was expected to flow in the area, and considered older groundwater potentiometric data developed by TETRA TECH NUS in 2002 for a part of the remedial Investigation report for the Industri-Plex Site in Woburn, Massachusetts. These TETRA TECH figures are presented in Appendix F. Additional data on bedrock depth was not identified, although it is known from the installation of GW-401D that bedrock is relatively shallow in this area. Figure 3-5, which includes the TETRA TECH April 2002 data, matches the Olin May 2011 synoptic elevation data for GW-74S and GW-401 fairly closely. The TETRA TECH figures do not have good control along East Ditch so the data that was considered most closely was the data immediately west and east of North Pond, and south of South Pond. By considering this information with topography a re-interpretation of TETRA-TECH's 72 foot and 73 foot contours near South Pond was drawn which suggests groundwater in the vicinity of GW-80S/D could potentially flow toward South Pond. This is also consistent with the groundwater lows in P-1, P-2, and P-3 on Figure 3-5 and lack of NDMA detections in GW-401D and GW-74S. The proposed well location is positioned to intercept that potential groundwater flow path prior to South Pond. If groundwater flows more southerly, this well location should be acceptable also.

The overburden boring would be advanced to bedrock using Sonic drilling methods consistent with the RI/FS Work Plan. Depending upon the thickness of saturated overburden, either a shallow well or a paired shallow and deep paired well will be installed. Once the overburden well is installed, another adjacent borehole will be advanced into bedrock, and a bedrock well will be installed that is screened across the first water bearing fracture zone encountered. It is anticipated that the first water bearing zone will be encountered in the first fifty feet of bedrock and the installation will not require borehole geophysical logging and the water bearing zone will be identified by inspection of sonic core and observation of return water flows or water loss to the formation. This is the same approach used for the bedrock wells installed at GW-400 and

GW-404. All aspects of drilling, IDW management, well development and sampling will be conducted consistent with the RI/FS Work Plan.

3.2 Main Street DAPL Pool Delineation

Olin has compared the current interpretation of bedrock contours to the underlying data set and has re-estimated contours using only confirmed bedrock refusal data from soil borings and wells and excluding seismically interpreted bedrock elevations. Although this evaluation indicated good correlation with the interpreted bedrock depression, the data density is limited and at a minimum the edges of the DAPL Pool and the depth of the DAPL pool should be confirmed by a series of direct push borings.

It is proposed that a series of direct push borings be conducted to refusal with an SPF-15 slotted screen or a slotted rod, and that at the bottom of each boring the rods be pulled back to allow water to enter the screen. The water conductivity would be measured in-situ with a conductivity probe to confirm the presence or absence of DAPL or Diffuse Material. In order to confirm that refusal either one of two methods will be employed depending on the contractor and equipment selected to conduct the work. Either a dual wall direct push system will be used with the capability of coring the top of bedrock with a small diameter diamond core bit, or a second boring will be completed several feet away allowing the refusal depth of the two adjacent boring to be compared as confirmation. The borings would be located by GPS and ground surface elevation surveyed. Proposed locations are shown on Figure 3.2-2.

As discussed with USEPA, the proposed location have been positioned to the extent possible to coincide with public right of ways to facilitate access agreements. Given the current shape of the bedrock depression, this approach should provide an adequate level of certainty in the delineation.

3.3 Final Additional Data Gaps Identified by USEPA and Agreed to By Olin

Based on the original September 5, 2014 OU3 Data Gaps Work Plan prepared and submitted by AMEC on behalf of Olin, USEPA provided Olin with a listing of additional data gaps in a November 13, 2014 comment letter. On December 16, 2014 AMEC submitted the OU3 Data Gap Analysis and Additional Field Studies Work Plan which addressed data gaps to USEPA's satisfaction except those that were provided by USEPA to Olin in a May 13, 2015 Conditional Approval letter. Olin responded to USEPA comments and provided additional information in a letter to USEPA dated May 29, 2015. In a June 18, 2015 letter USEPA provided Olin with a review of those responses and conditional approval of data gaps. In the same letter USEPA summarized remaining data gaps it believed need to be addressed and requested a written response to each along with a Final Work Plan and schedule to complete the OU3 Field Work.

The following information lists the remaining data gaps and Olin's response to address all remaining data gaps contained in a written Response to Comment letter dated July 3, 1015 (see Appendix G):

Additional Data Gap No. 1: Additional Well Cluster, Well Construction Details and Analysis. EPA's November 13, 2014 comment letter identified the area generally North of Eames Street as a potential data gap for groundwater. Olin has agreed to install an overburden and shallow bedrock well cluster at the location shown on Figure 3.3-1 contingent upon negotiation of an access agreement with the property owner. In its June 18, 2015 letter EPA concurred with this location. Figure 3.3-2 provides proposed well construction options depending on the saturated thickness of overburden groundwater. This construction detail also applies to the well location shown on Figure 3.1-1.

Based on discussions with EPA Olin will analyze groundwater samples from the new well clusters for the full analytical list. The exception to this is OPEX and Kempore, for which a commercial analytical method is not currently available as more fully described in the July 3, 2015 Response to Comment Letter contained in Appendix G.

Additional Data Gap No. 2: Borehole Geophysical Logging. USEPA repeated its request that borehole geophysical logging be completed at GW-80BR, GW-103R and at the new bedrock wells to be installed to the southeast of the Site (as proposed by Olin) and to the north (as proposed by USEPA). Olin has agreed to complete borehole logging of well GW-80BR, GW-103BR and the new bedrock wells, to include the standard suite of parameters (caliper, temperature, single point resistance, fluid conductivity, acoustic/optical televiewer and heat pulse flow meter logging).

Additional Data Gap No. 3: BR-1 Sampling and Analysis. EPA has requested that two rounds of specific conductivity measurements be collected from BR-1, to which Olin has agreed. USEPA, in a different comment, also requested that this well be sampled and analyzed for the full analytical list, to which Olin also agrees noting that OPEX and Kempore analysis is not currently available as more fully described in the July 3, 2015 Response to Comment Letter contained in Appendix G.

Additional Data Gap No. 4: Additional Synoptic Water Levels. USEPA has requested that two additional seasonal rounds of synoptic water levels be conducted. Olin has agreed to this request. One will be conducted this fall (2015) and the other in the spring of 2016 to obtain high and low seasonal water levels as requested by USEPA.

Additional Data Gap No. 5: GW-57D Sampling and Analysis. USEPA has requested that GW-57D be sampled for hydrazine. Olin has agreed to sample GW-57D as requested to determine presence or absence at this location and provide additional bounding of hydrazine in groundwater.

Additional Data Gap No. 6: GW-85, GW-86D, and GW-59D Sampling and Analysis. USEPA has requested a current sampling round for the full analytical suite of chemicals (including specialty compounds) for MMB wetland monitoring wells GW-85, GW-86D, and GW-59D. Olin has agreed to this request noting that OPEX and Kempore analysis is not currently available as more fully described in the July 3, 2015 Response to Comment Letter contained in Appendix G.

ADDITIONAL INFORMATION REQUESTS

Additional Information Request 1. USEPA has requested a schedule for completion of this OU3 Field Work. A schedule is provided in Appendix H.

Additional Information Request 2: Condition No. 2: USEPA November 13, 2014 Comment Letter. USEPA has identified a lack of recent groundwater analytical data from the former municipal wells and former Sanmina wells as a data gap. EPA has expressed its belief that recent data from these wells is necessary to assess existing conditions and determine the need and efficacy for remediation. While these wells are not currently in use, USEPA has also indicated its belief that representative data is also necessary to determine the need to establish administrative restrictions (commonly referred to as institutional controls) to prevent unsafe use of these wells if existing conditions do not allow for unrestricted use. Olin proposed in the December 14, 2015 Draft Work Plan (Page 3-3) to prepare a Technical Memorandum to support Olin's rationale for why this data is not necessary. USEPA has requested that this memorandum be submitted for further consideration by USEPA and the stakeholders. USEPA has requested that this technical memorandum also include information in Olin's files regarding the design and configuration of these wells. Olin proposes to provide a technical memorandum relative to the former operation of the Sanmina and municipal wells under separate cover by August 31, 2015.

4.0 REFERENCES

AMEC, 2014. Draft Final Remedial Investigation Report Operable Unit 1 & Operable Unit 2, Olin Chemical Superfund Site, Wilmington, Massachusetts. April 10, 2014.

MACTEC, 2009a. *Final Remedial Investigation/Feasibility Study Work Plan*, Olin Chemical Superfund Site, Wilmington, Massachusetts. August 14, 2009.

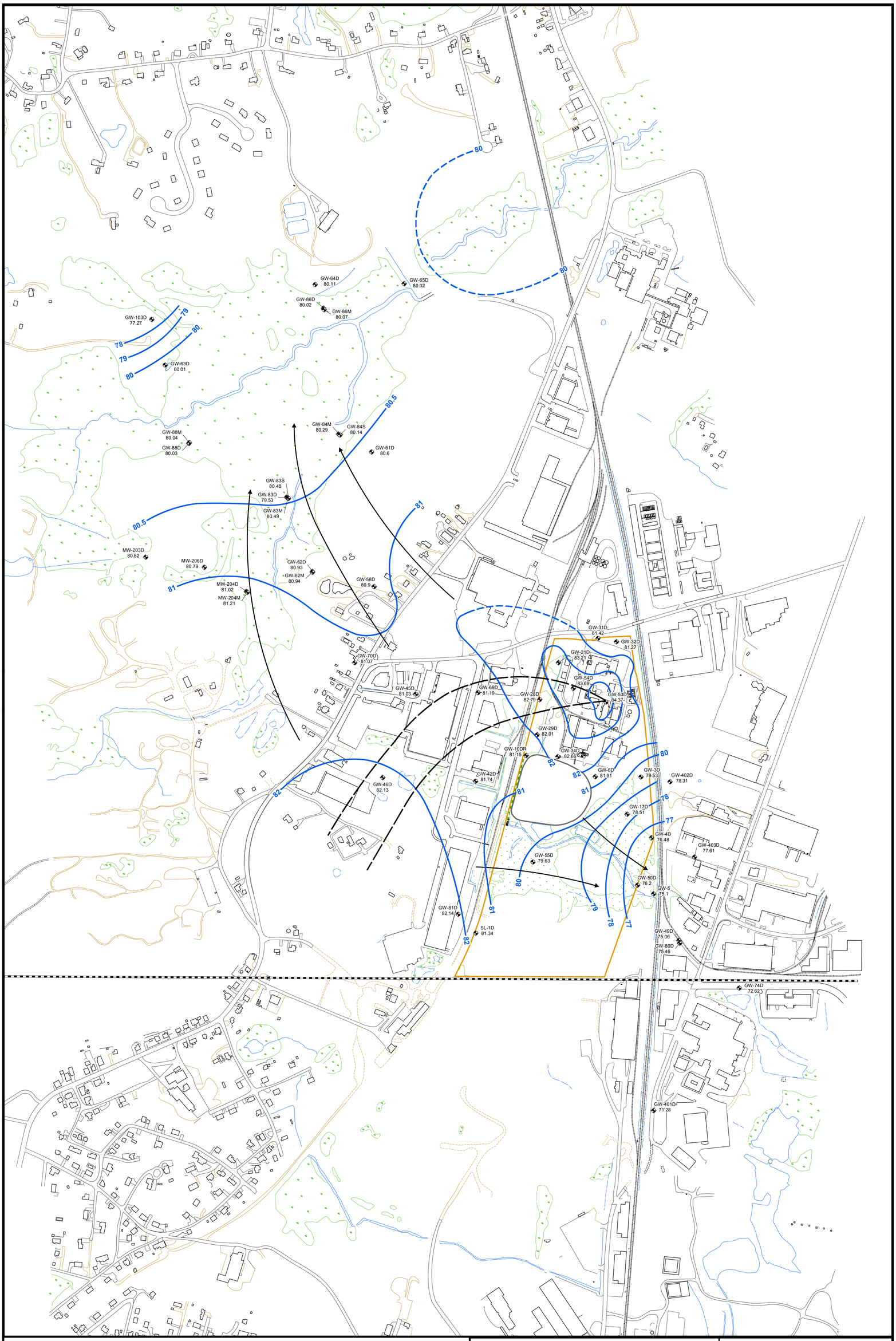
USEPA, 2007a. Statement of Work, Remedial Investigation and Feasibility Study, Olin Chemical Superfund Site, June.

USEPA, 2007b. Administrative Settlement Agreement and Order On Consent For Remedial Investigation/Feasibility Study.

USEPA, 2013. "Regional Screening Levels for Chemical Contaminants at Superfund Sites"; USEPA Regions 3, 6, and 9; EPA Office of Superfund. November.

USEPA, 2014. Determining Groundwater Exposure Point Concentrations, OSWER Directive 9283.1-42, February.

FIGURES



Legend

- Deep Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Note: Deep well screen data used at all locations except GW-83 where midlevel screen data was used.

AMEC Environment & Infrastructure
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Chelmsford, MA 01824

N

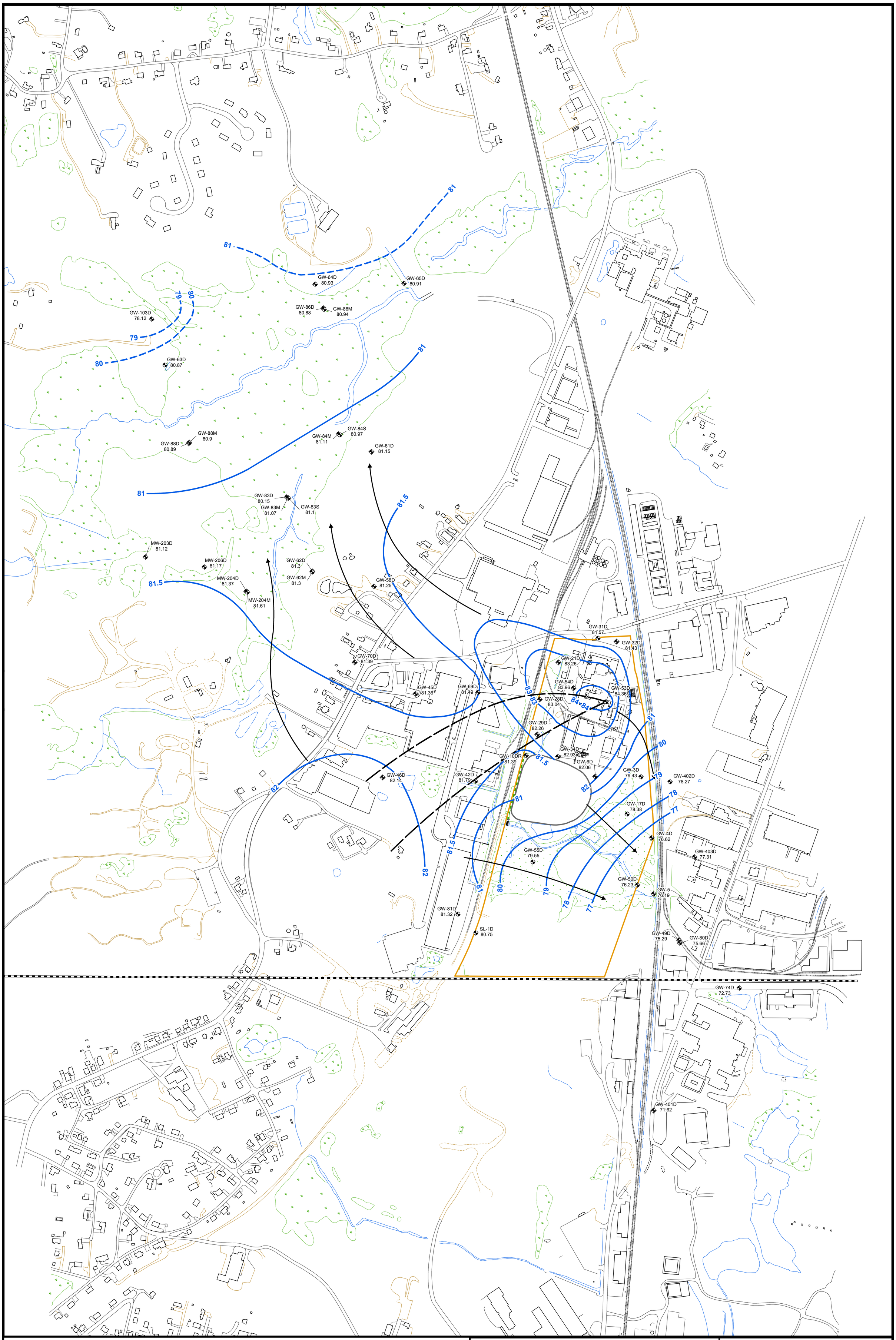
0 300 600 Feet

Figure 2.1-1
Groundwater Elevations in Deep Monitoring Wells - May 2011

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 12/11/14 | Checked/Date: JBR 12/11/14

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\Map\Documents\Groundwater\Olin_22x34P_GroundwaterContours.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CSS 2014\4.0_Deliverables\4.2_Work_Plans\OU3 Data Gap Work Plan\December 15 2014 Deliverable\Figures\Figure 2.1-1 Groundwater Elevations in Deep Monitoring Wells - May 2011.pdf 12/11/2014 9:48 AM brian.peters



Legend

- Deep Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

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N

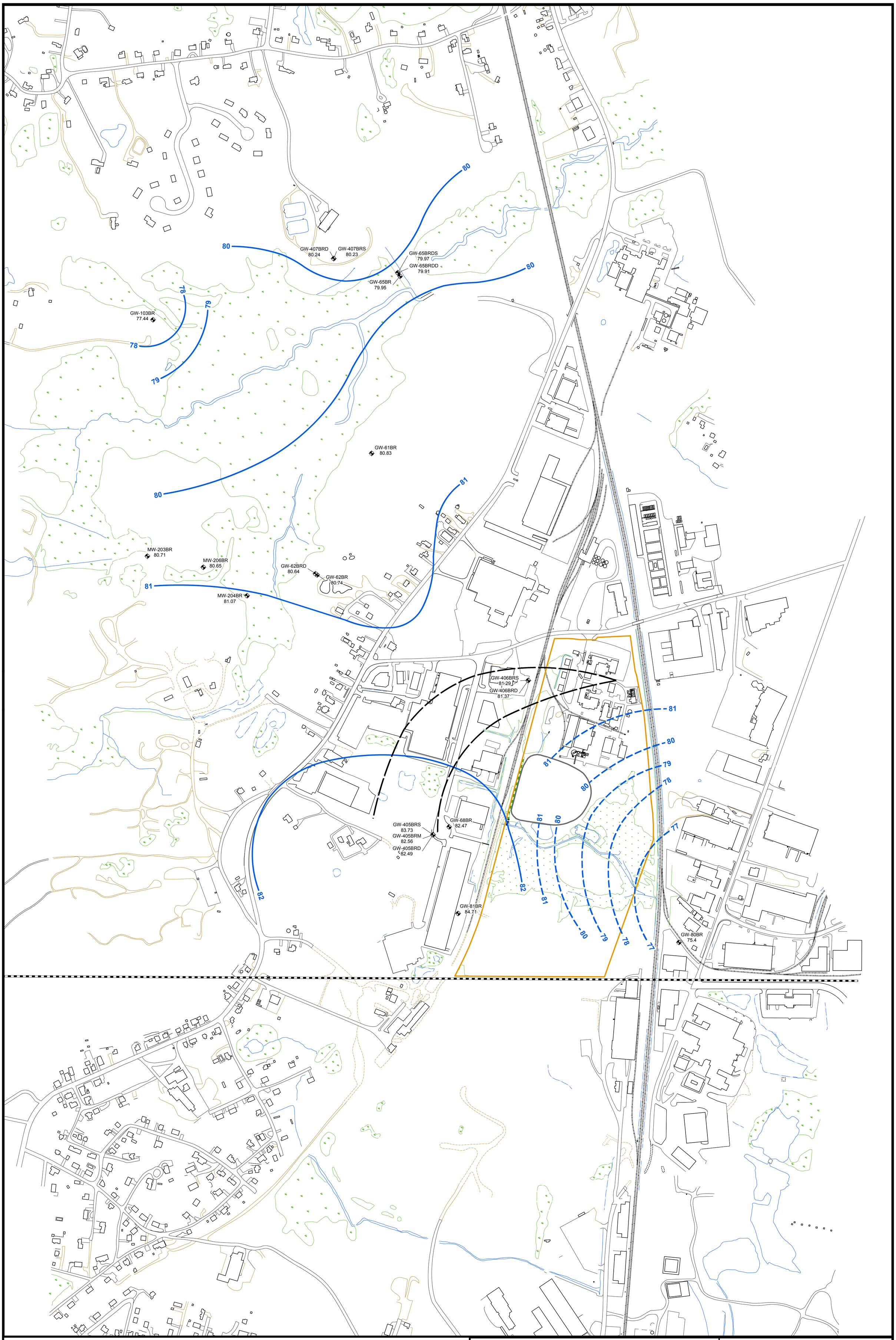
0 300 600 Feet

Figure 2.1-2
Groundwater Elevations in Deep Monitoring Wells - October 2011

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 12/11/14 | Checked/Date: JBR 12/11/14

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\MapDocuments\Groundwater\Olin_22x34P_GroundwaterContours.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CSS 2014\4.0_Deliverables\4.2_Work_Plans\OU3 Data Gap Work Plan\December 15 2014 Deliverable\Figures\Figure 2.1-2 Groundwater Elevations in Deep Monitoring Wells - October 2011.pdf 12/11/2014 9:42 AM brian.peters



Legend

- Bedrock Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

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N

0 300 600 Feet

Figure 2.1-3
Groundwater Elevations in Bedrock Monitoring Wells - May 2011

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 12/11/14 | Checked/Date: JBR 12/11/14

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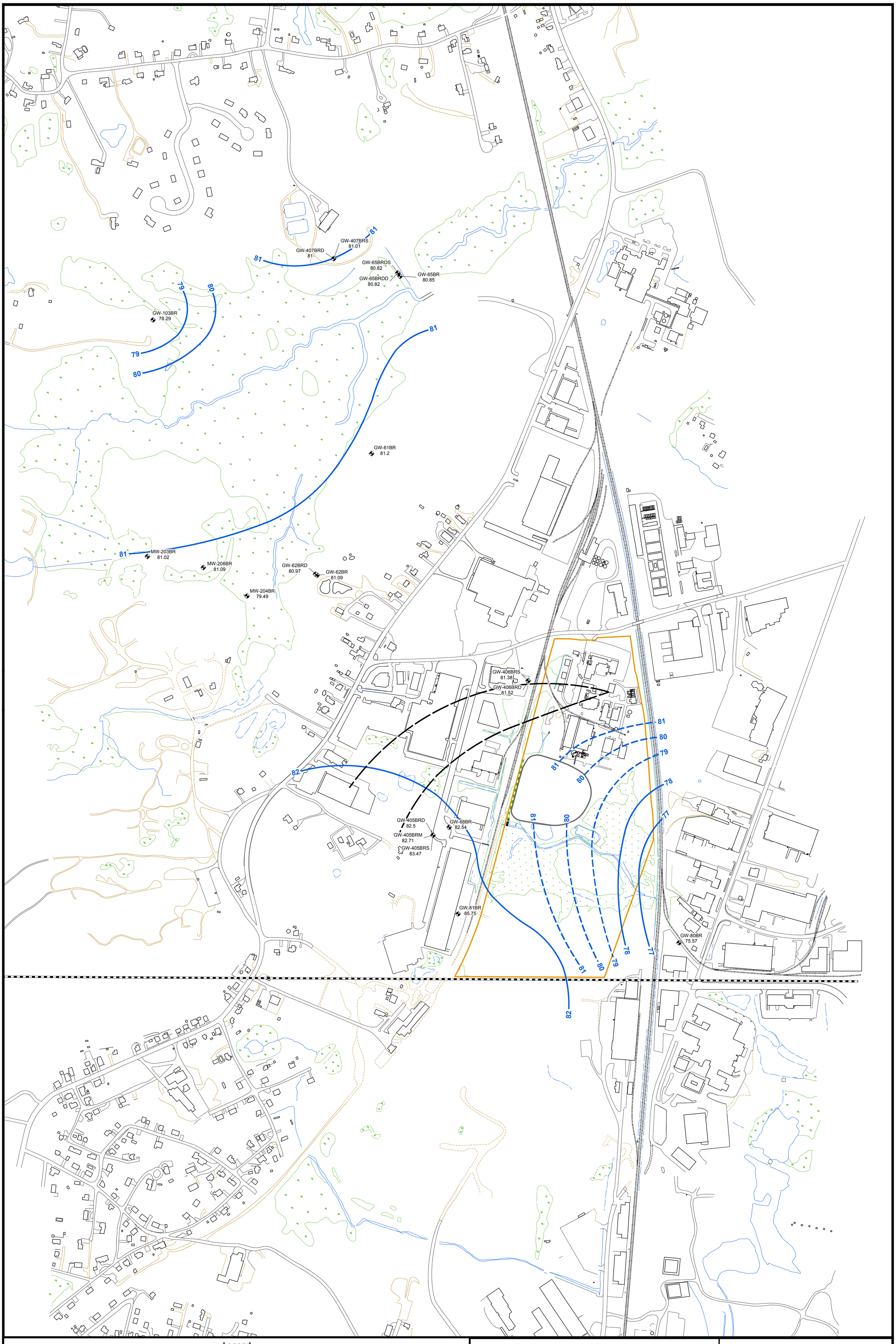

Legend

- Bedrock Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

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N

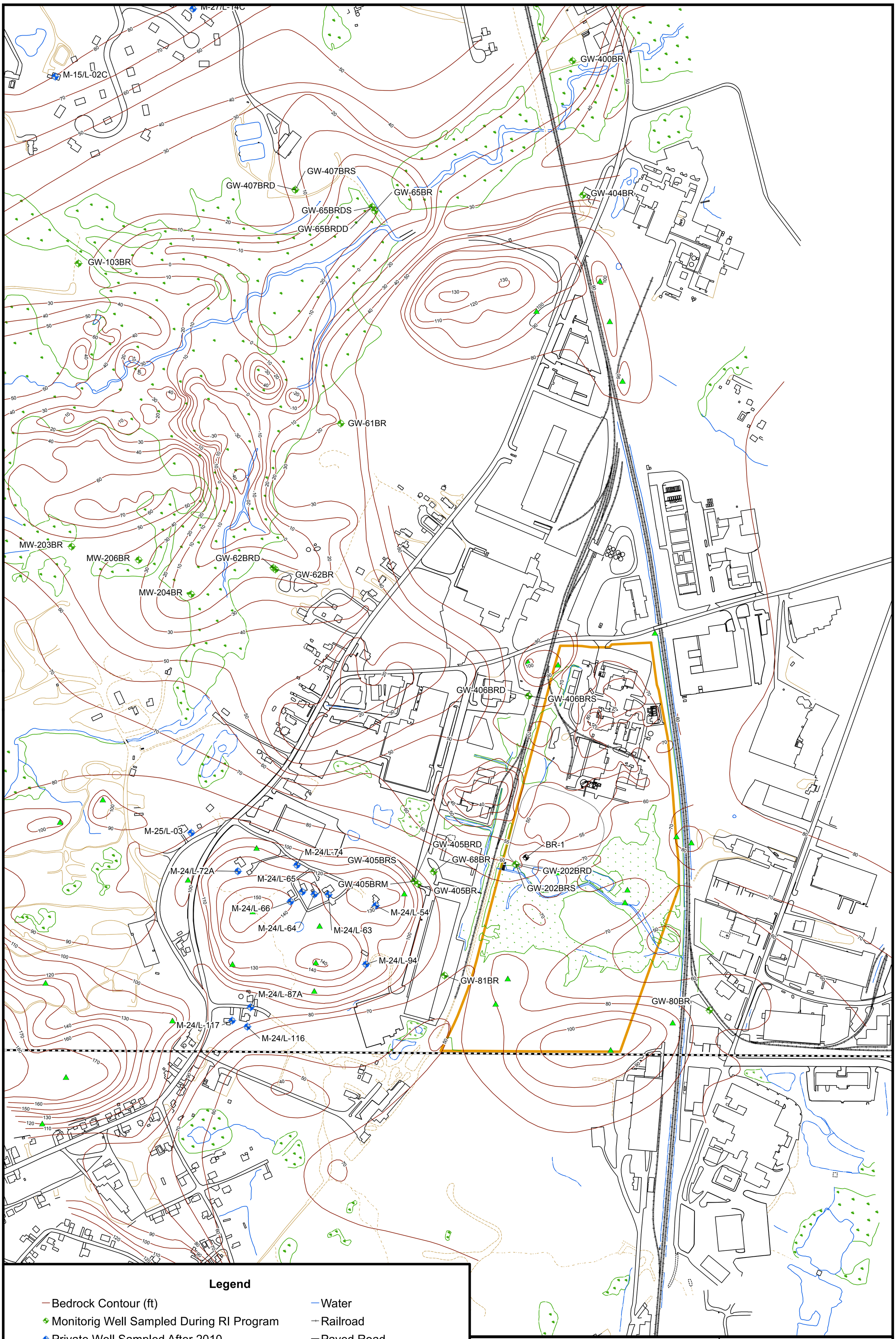
0 300 600 Feet

Figure 2.1-4
Groundwater Elevations in Bedrock Monitoring Wells - October 2011

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 12/11/14 | Checked/Date: JBR 12/11/14

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\MapDocuments\Groundwater\Olin_22x34P_GroundwaterContours.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CSS 2014\4.0_Deliverables\4.2_Work_Plans\OU3 Data Gap Work Plan\December 15 2014 Deliverable\Figures\Figure 2.1-4 Groundwater Elevations in Bedrock Monitoring Wells - Oct 2011.pdf 12/11/2014 9:21 AM brian.peters



Legend

- Bedrock Contour (ft)
- Monitorig Well Sampled During RI Program
- Private Well Sampled After 2010
- Monitoring Well Not Sampled During RI Program
- Bedrock Outcrop
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

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N

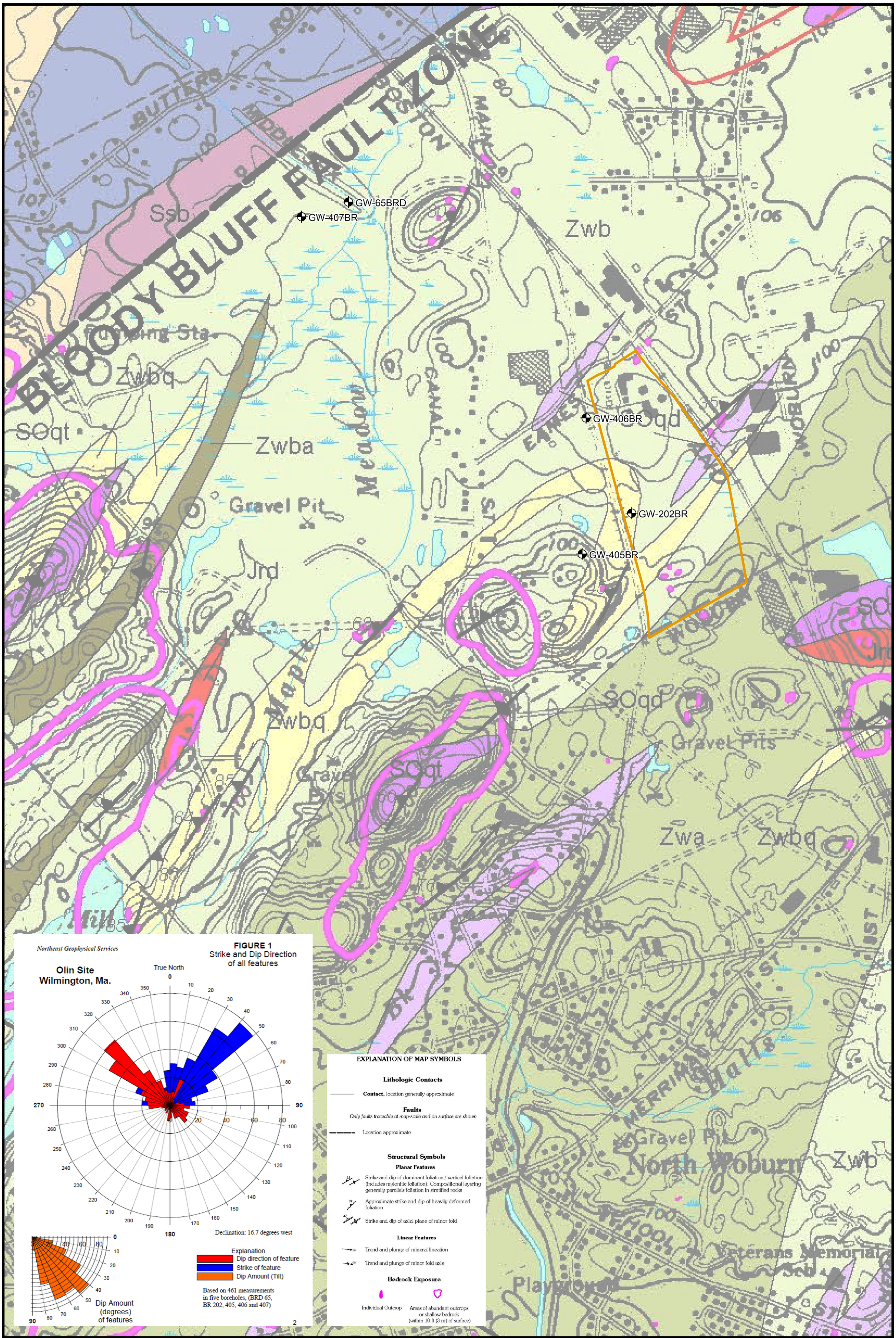
0 250 500 Feet

Figure 2.1-5
Bedrock Topography

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 12/11/14 | Checked/Date: PHT 12/11/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_2014_22x341.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\Draft Figures\Figure 2.1-5 - Bedrock Topography.pdf 12/11/2014 9:02 PM brian.roden



Legend

- Bedrock Monitoring Well/Borehole Geophysics Location
- 51 Eames St. Property Boundary

- Ssb - Intrusive rocks (Diorite)
- Zwa - Metamorphic rocks (Gneiss)
- Zwb - Metamorphic rocks (Schist)

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N
0 400 800
Feet

Figure 2.1-6
Bedrock Geology and Borehole Structure Rose Diagram

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 12/11/14 | Checked/Date: JBR 12/11/14

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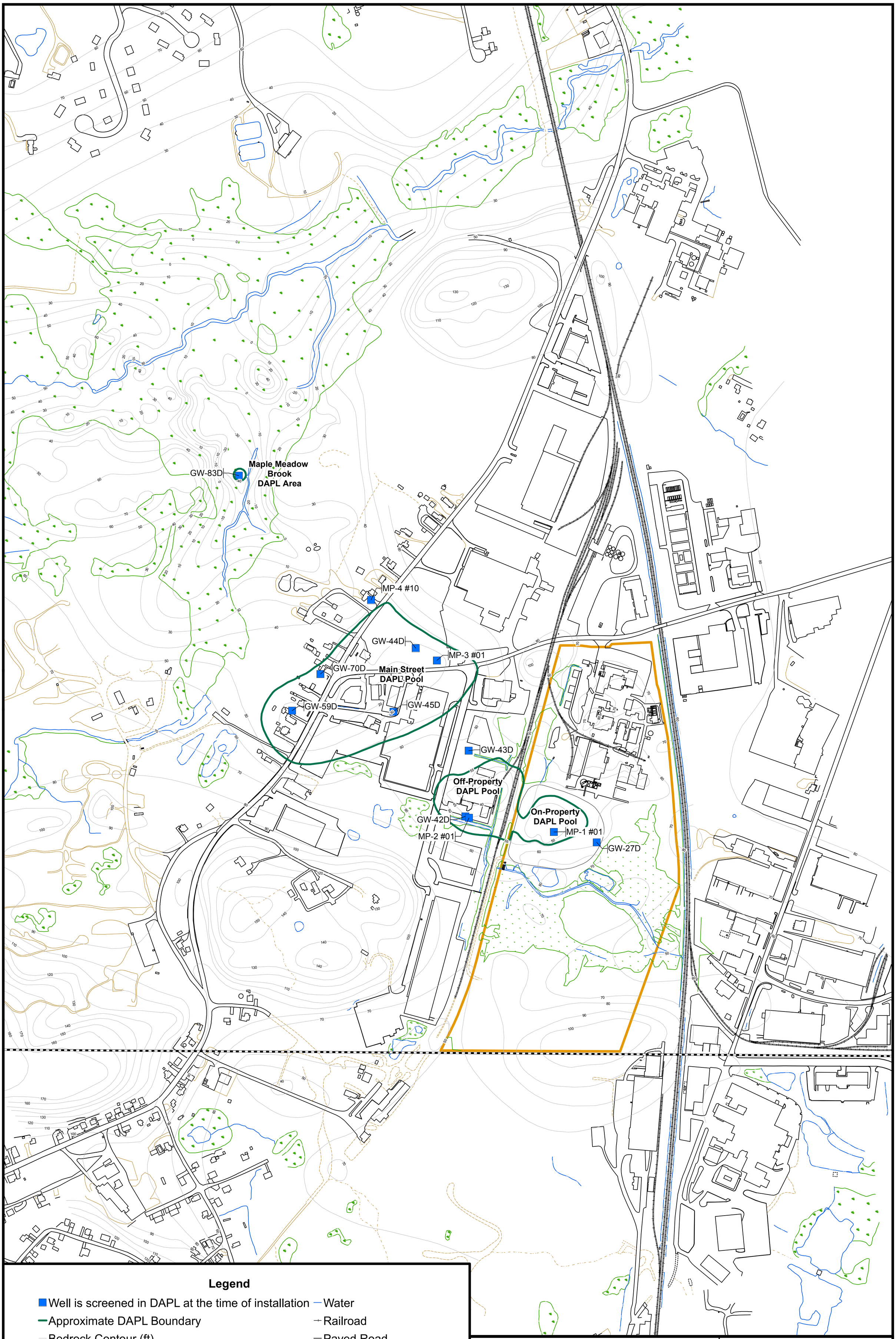

amec foster wheeler

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Figure 2.1-7
Current Location of DAPL Pools

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/29/15 | Checked/Date: JR 06/29/15

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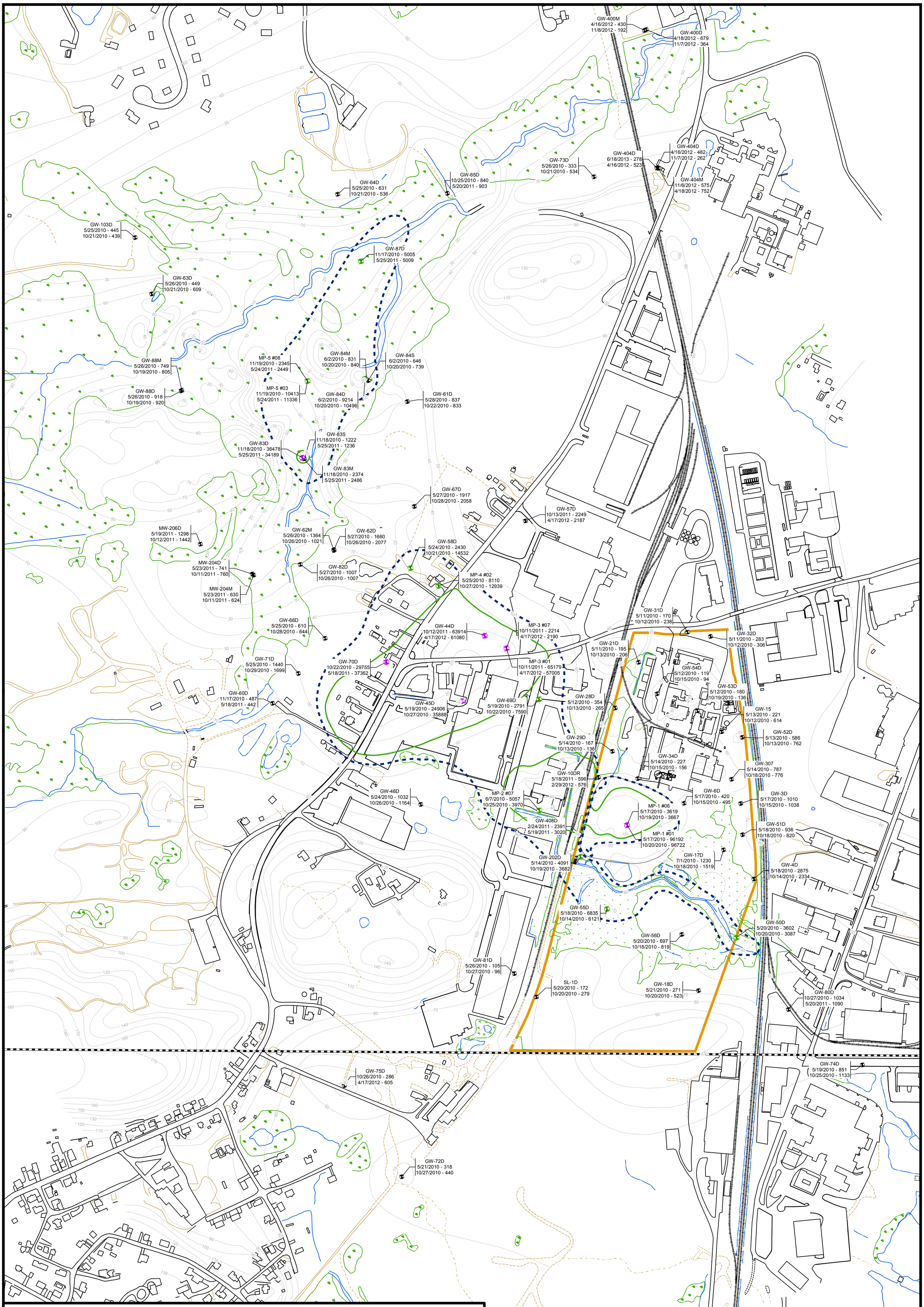

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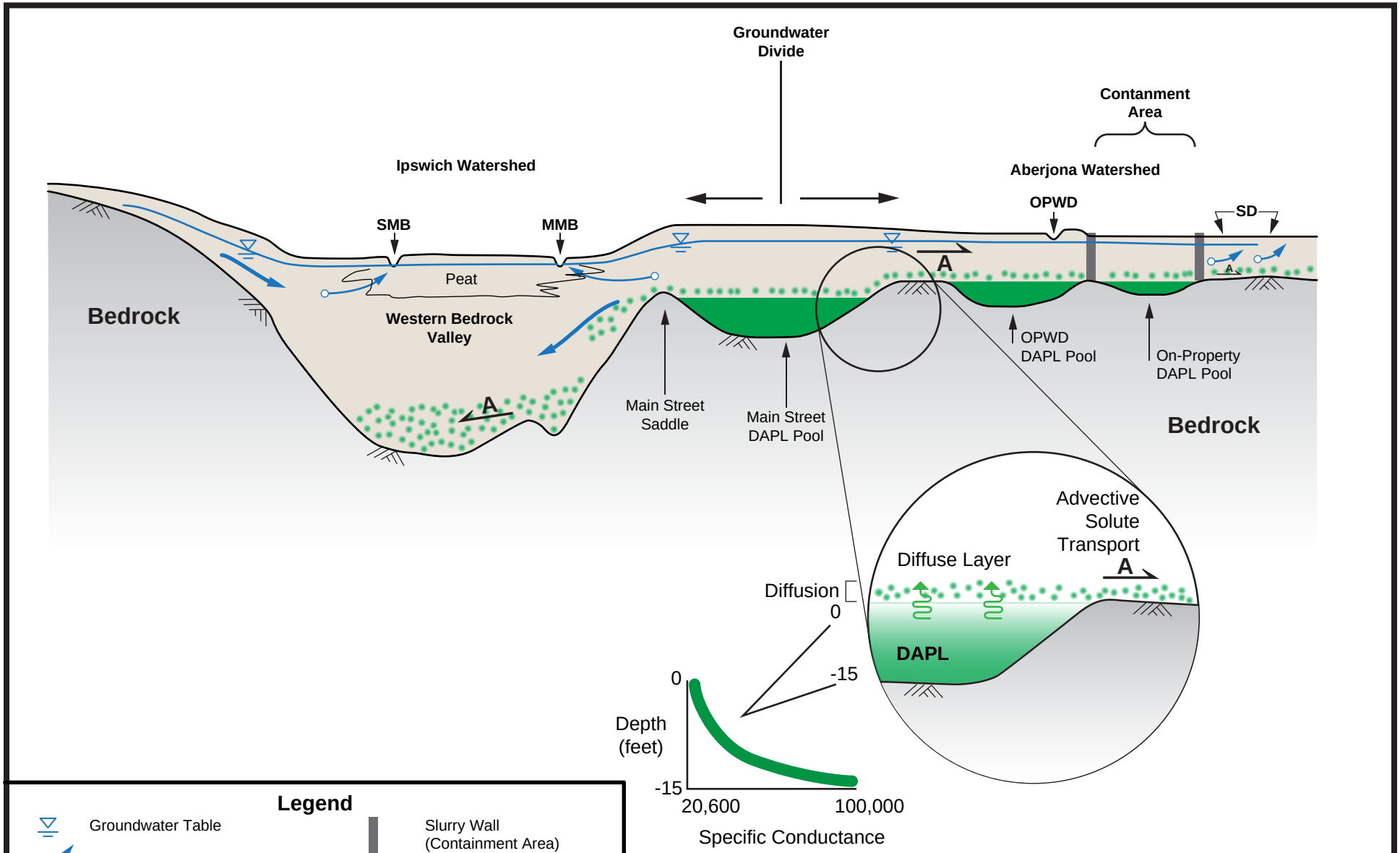
Figure 2.1-8
Distribution of Diffuse Material

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 12/11/14 | Checked/Date: PHT 12/11/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_Wake_22x34.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\Draft Figures\Figure 2.1-8 - Distribution of Diffuse Material.pdf 12/11/2014 9:19 PM brian.roden



Legend

- Groundwater Table
- Discharging Groundwater
- Groundwater Flow Path
- A — Advective Solute Transport
- Diffusion of Solutes
- Slurry Wall (Containment Area)
- **SMB** — Saw Mill Brook
- **MMB** — Maple Meadow Brook
- **OPWD** — Off-Property West Ditch
- **SD** — South Ditch

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Figure 2.1-9
Conceptual Model of Diffusion from DAPL Pools and Advection of Diffuse Material in Groundwater

Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: PHT 12/16/14 | Checked/Date: JBR 12/16/14

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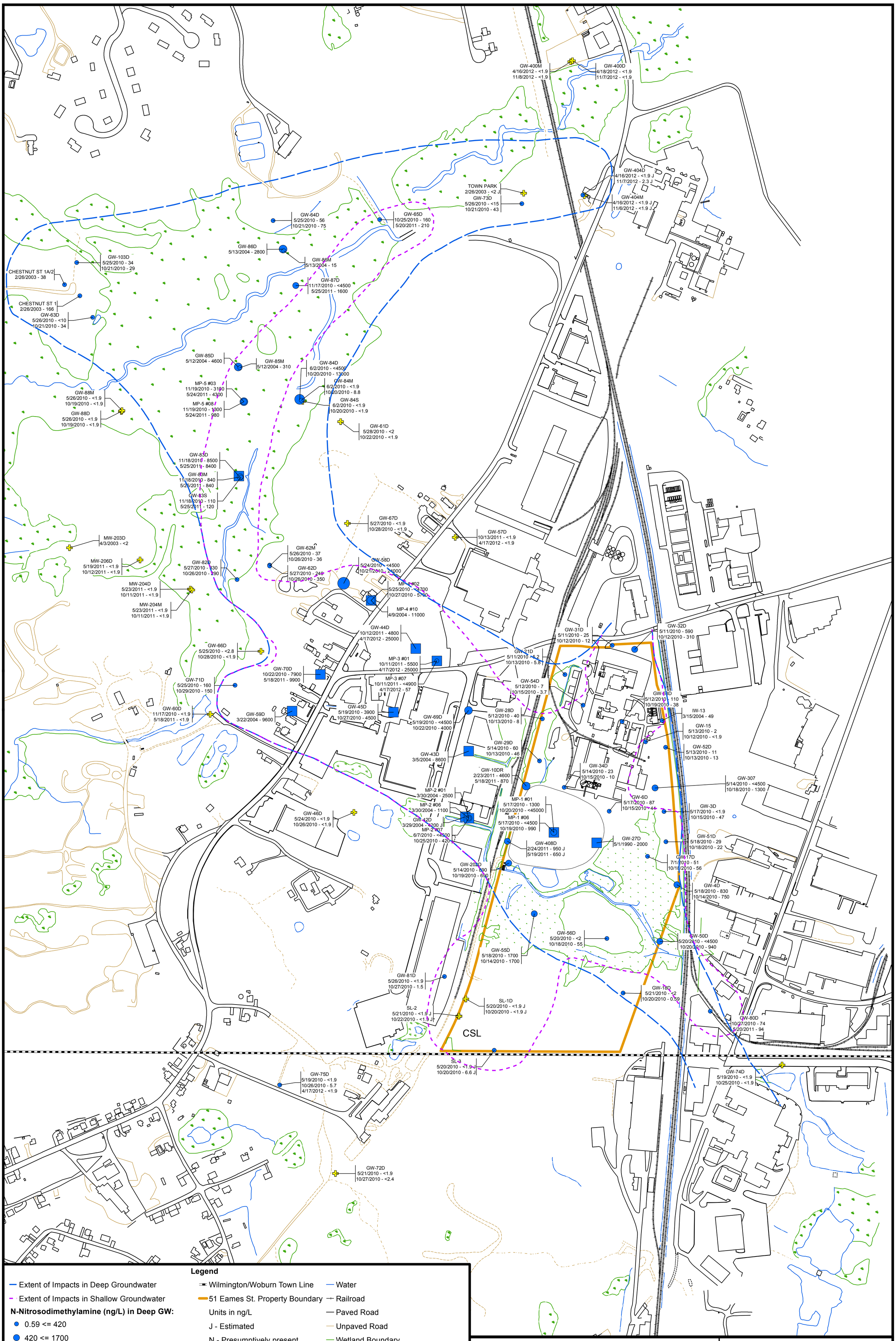
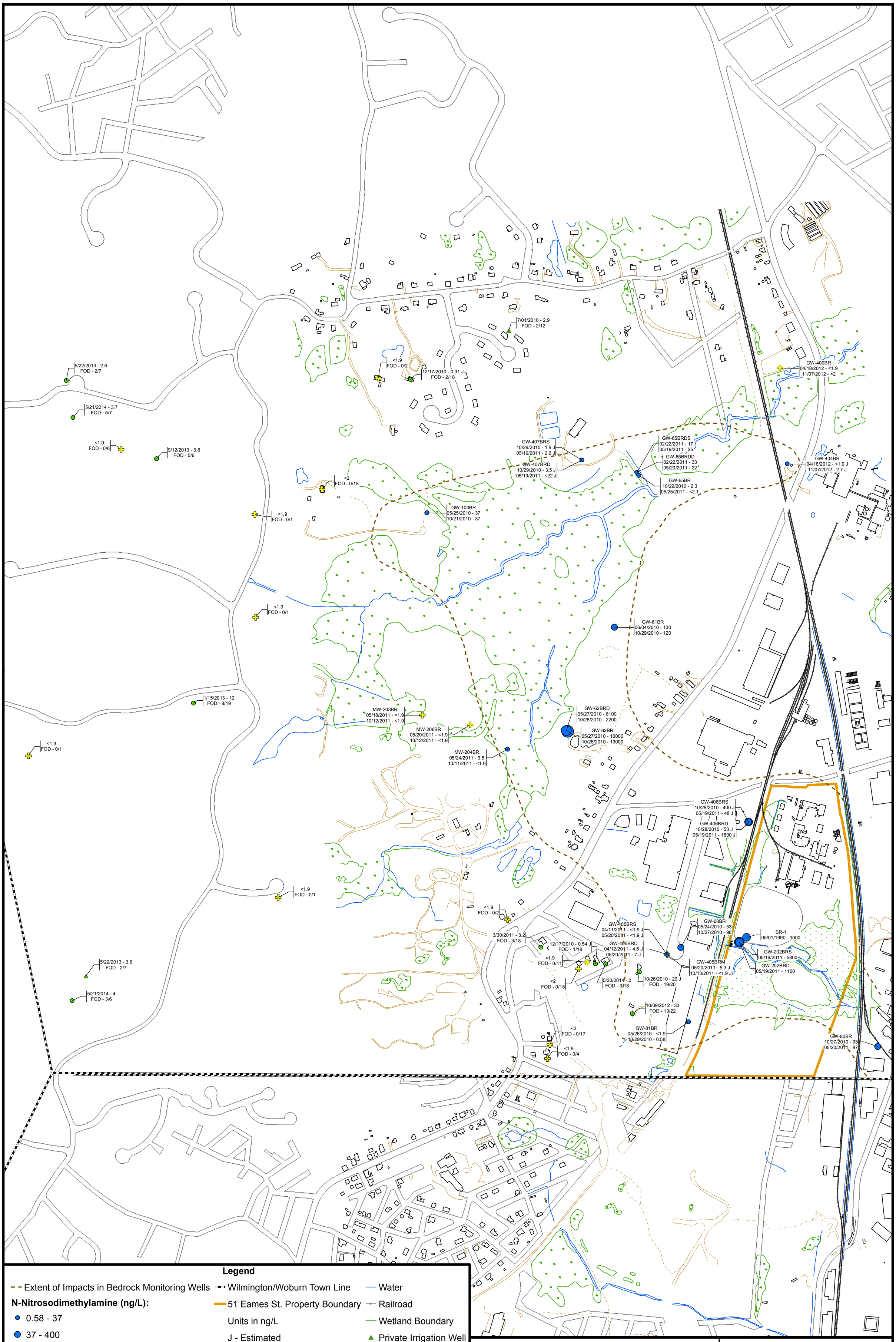


Figure 2.3-1
Extent of Impact to Shallow and Deep Overburden Groundwater
OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 07/02/15 | Checked/Date: JR 07/02/15

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_NDMA_22x34.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\RTC Figures\Figure 2.3-1 - Extent of Impact to Shallow and Deep Overburden Groundwater.pdf 7/2/2015 1:09 PM brian.roden



Legend

- Extent of Impacts in Bedrock Monitoring Wells
- Wilmington/Woburn Town Line
- Water
- Railroad
- 51 Eames St. Property Boundary
- Wetland Boundary
- Private Irrigation Well
- Residential Well

N-Nitrosodimethylamine (ng/L):

- 0.58 - 37
- 37 - 400
- 400 - 1800
- 1800 - 8100
- 8100 - 16000

Units in ng/L

J - Estimated

N - Presumptively present

Non-Detect

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.
2. FOD = Frequency of Detection.
3. Residential well data include samples collected from 2008 to 2014.
4. NDMA concentration shown for residential/private wells are the maximum detected concentration from 2008 to 2014.

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N

0 350 700 Feet

Figure 2.3-2
Extent of Impact to Bedrock Groundwater
OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/29/15 | Checked/Date: JR 06/29/15

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_BedrockExtent.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\RTC Figures\Figure 2.3-2 - Extent of Impact to Bedrock Groundwater.pdf 6/29/2015 1:57 PM brian.roden

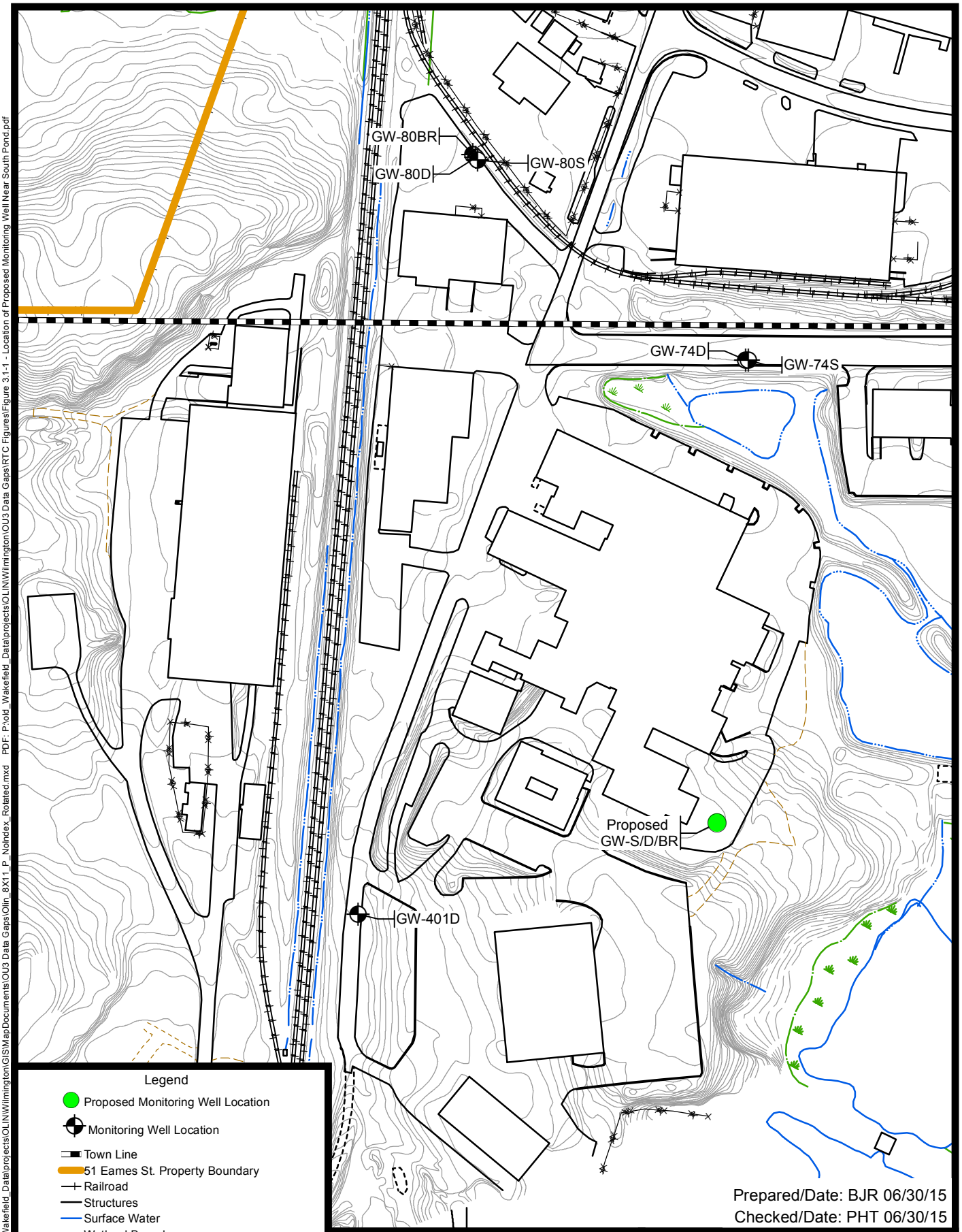

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Figure 3.1-1
Location of Proposed Monitoring Well
Near South Pond
Olin Chemical Superfund Site
Wilmington, Massachusetts

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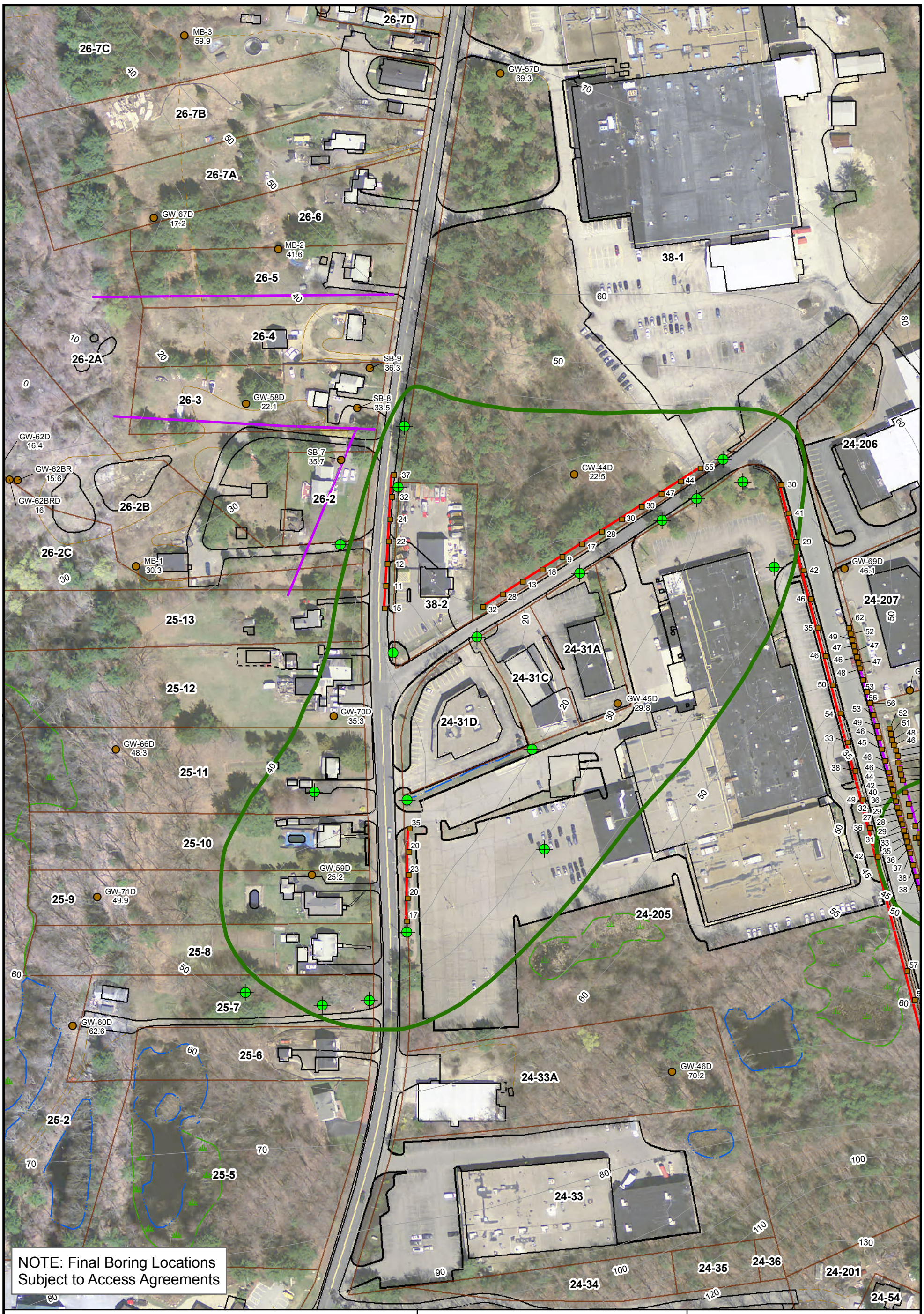

Legend

- Proposed Direct Push Location
- Seismic point (Bedrock Elevation ft)
- Bedrock Contour Elevation (ft)
- Seismic Refraction Line
- Seismic Reflection Line
- Bedrock Outcrop
- Paved Road
- Unpaved Road
- Approximate DAPL Pool Delinelation
- 51 Eames St. Property Boundary
- Structures
- Parcel Boundary
- **24-33** Map and Lot
- Surface Water
- Trails
- Wetland Boundary
- Railroad
- Sidewalks
- Wooded Areas

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N

0 75 150 300 Feet

Figure 3.2-1
Proposed Locations for Confirmation of Main Street DAPL Pool

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/30/15 | Checked/Date: PHT 06/30/15

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\Bedrock_MainStreet.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\RTC Figures\Figure 3.2-1 - Proposed Locations for Confirmation of Main Street DAPL Pool.pdf

Legend

- Approximate Parcel Boundary
- Shallow Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- 5' Elevation Contour
- 1' Elevation Contour
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

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N

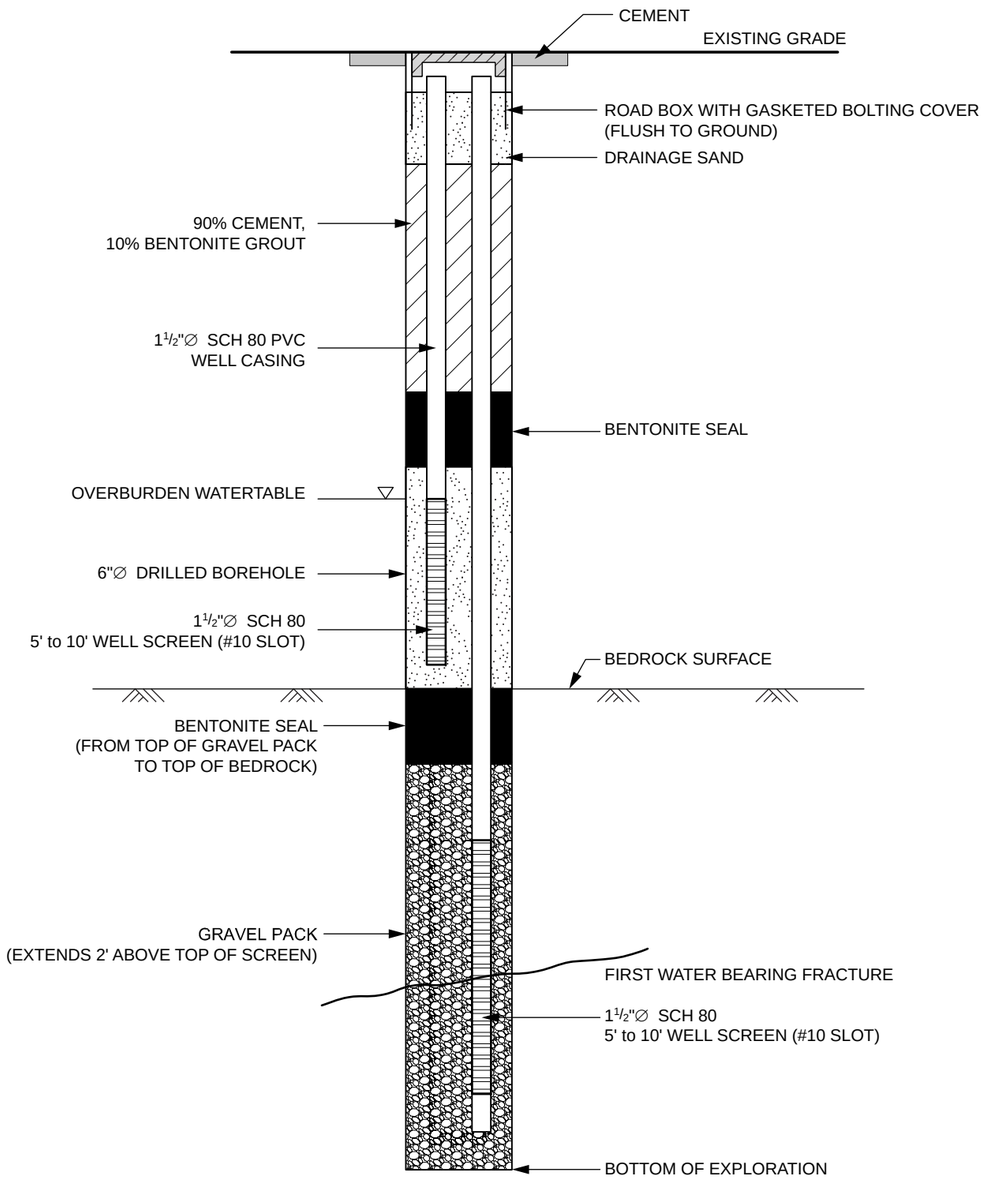
0 50 100 Feet

Figure 3.3-1
Location of Proposed Monitoring Well North of Olin Property
OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

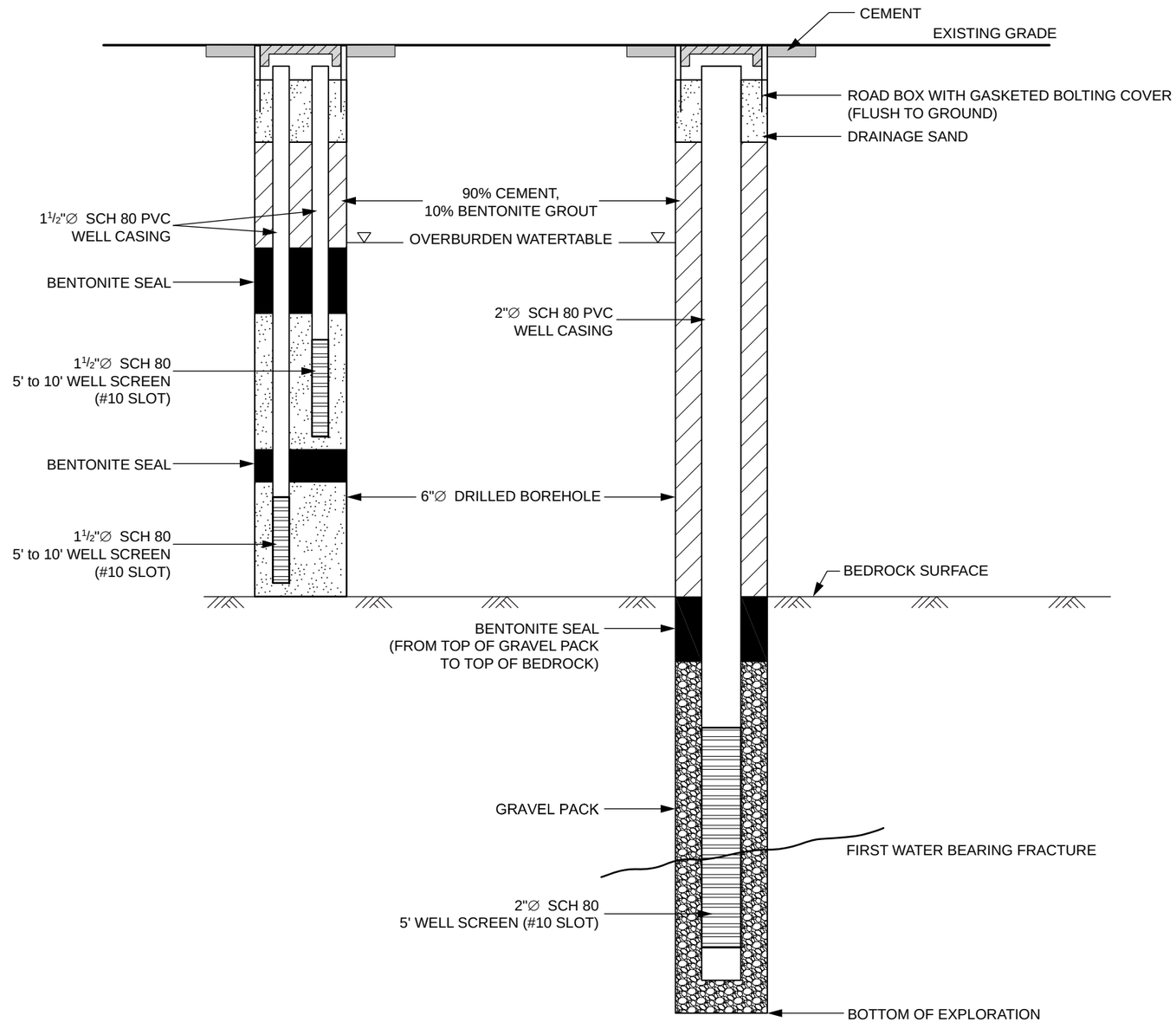
Prepared/Date: BJR 07/01/15 | Checked/Date: PHT 07/01/15

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\Olin_22x34P_Proposed Well Location.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\RTC Figures\Figure 3.3-1 - Location of Proposed Monitoring Well North of Olin Property.pdf 7/1/2015 8:24 AM brian.roden

Option 1
Single Overburden Well with Bedrock Well



Option 2
Two Overburden Wells with Bedrock Well



NOTE:
WELL CONSTRUCTION DEPTHS AND RELATED WELL CONSTRUCTION ITEMS (i.e., SCREEN LENGTHS, GRAVEL PACK) ARE APPROXIMATE. WELL DESIGN WILL BE FINALIZED BASED ON GEOLOGIC LOGGING AND THICKNESS OF SATURATED OVERBURDEN.

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Figure 3.3-2
Proposed Monitoring Well Construction Diagram
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: JPH 06/30/15 | Checked/Date: JBR 06/30/15

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TABLES

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
I.	**REMEDIAL INVESTIGATION OBJECTIVES**		
1	nature and extent of hazardous substance source areas	Additional sampling was proposed for each medium in all areas of the Site as described in the RI/FS WP Vol III (FSP) for OU1, OU2 and OU3 (FSP, Sections 4.0, 5.0, and 6.0). OU1/OU2 data collection has defined all remaining sources at the Site. OU3 proposes additional delineation of the bedrock surface to define extent at the Main Street DAPL pool.	All remaining source areas have been defined under OU1/OU2. Additional boring locations and methodology is proposed for OU3 confirmation of the Main Street DAPL pool.
2	lateral and vertical extent, concentration, environmental fate, transport (e.g., bioaccumulation, persistence, mobility), phase (e.g., solid, liquid), and other physical and chemical characteristics of hazardous substances identified at the Site	The physical and chemical characteristics of the hazardous substances will be described in the RI based on literature information. The RI data collection efforts produced data characterizing lateral and vertical extent of hazardous substances in soil, surface water, sediment, groundwater, and, potentially, air. The fate and transport of hazardous substances will be discussed using literature information and the nature and extent information collected in the RI, and that information previously discussed in Section 5.0 of the Draft FRI, and the OU1/OU2 RI. The OU3 RI report will contain a separate section summarizing the fate and transport of contaminants in groundwater.	With exception of areas identified as data gaps, the nature and extent of OU3 impacts have been identified and no additional information is required to complete these requirements in the OU3 RI.
3	the media of occurrence, interface zones between media, and important parameters for treatment (e.g., soil chemistry, soil types, estimated porosity)	The fate and transport of constituents at the Site are presented in Section 5 in the OU1/OU2 RI. This discussion relates chemical and media properties and cross media transport (e.g., from DAPL to groundwater, groundwater to surface water). The medium of occurrence associated with the vapor intrusion pathway is the air, directly influenced by the water table, through the capillary fringe into the vadose zone. Impacted groundwater to surface water in surface water in the South Ditch and East Ditch. Soils have been sufficiently studied to delineate soil types and estimate soil porosity and other relevant parameters affecting transport and treatment for both OU1 and OU3	Data required is complete
4	hydrogeologic factors for overburden and bedrock (e.g., depth to water table and water table fluctuations, hydraulic gradients, hydraulic conductivity, estimated porosity, and estimated recharge)	The depth to water table and extent of seasonal water table fluctuation has been studied and documented Site wide. Additional synoptic water levels were collected to unify the current understanding of vertical and horizontal gradients across the Site. Recharge has been estimated and hydraulic conductivity, and media porosity estimated, in a manner sufficient to calibrate a detailed groundwater flow and solute transport model (FEFLOW) which was presented in Appendix A of the Draft FRI.	Data required is complete
5	the delineation of any contaminant plume present and monitoring information that allows assessment of the spatial stability of constituent concentrations over time	The delineation of groundwater impacts has been conducted as part of the data gap analysis. Comparable historical and current OU3 RI data are sufficient to evaluate changes in contaminant mass and concentration with time to evaluate plume stability. If warranted current data are adequate to do a spatial moment analysis which provides a plan view of the plume mass with time.	Data required is complete
6	identification of chemical, physical, and biological processes that may work to limit the continued transport, diminish the concentration, or otherwise attenuate contamination. Identification of the degree to which these processes can be expected to provide adequate natural attenuation and how these processes may be enhanced	The fate and transport is described in detail in Section 5 of the Draft FRI and the OU1/OU2 RI. The section includes discussions on contaminant persistence in the environment, biological and chemical processes that degrade or attenuate the concentrations of specific compounds. Additional chemical, physical and biological processes will be described in detail in the risk assessments, as necessary. The fate and transport discussion will be updated in the OU3 RI report. Assessment of processes to enhance natural attenuation will be discussed in the FS, as applicable.	Data required is complete
7	climate and water table fluctuation (e.g., precipitation, run-off, stream flow, water budget)	Precipitation measurements are on-going by Olin personnel at the Site. Stream gauging was conducted under OU3 to refine previous modeled estimates of the hydrogeological water budget.	Data required is complete
8	extent to which the hazardous substances have migrated or are expected to migrate from their original location, and identify probable receptor areas	The extent to which contaminant migration has effected OU1 and OU2 and receptors has been identified. Data to evaluate potential receptor areas for OU3 has been collected and residential well sampling is on-going on a quarterly basis.	Data required is complete
9	extent to which buildings, foundations, or other underground structures may contain or may overlie hazardous substances or contaminant plumes and the potential for vapor intrusion from the contaminant plume (this evaluation shall include existing and proposed structures)	An assessment of potential vapor migration from soil at on-Property locations was conducted in the OU1/ OU2 RI and potential VI issued related to OU3 groundwater will be conducted in the OU3 RI.	Data required is complete
10	contaminant(s) concentration in soil, sediment, surface water and groundwater, and potential impacts to aquatic, semi-aquatic and terrestrial receptors, and potential for higher trophic level organisms in the food web to be exposed	Objective for OU1 and OU2. Not applicable to OU3	Not applicable
11	flood plain and wetland delineation, if necessary, surface water classifications and their existing use designations	Objective for OU1 and OU2. Not applicable to OU3	Not applicable
12	groundwater characteristics and current and potential groundwater uses (e.g., characteristics related to the groundwater classes described in the Ground Water Protection Strategy, (EPA, 1984) and under Massachusetts law)	MA groundwater classification has been outlined in Section 3.6.3 of the Draft FRI and discussed with USEPA. The Draft FRI also discussed past groundwater uses as well as current groundwater uses. Any additional evaluation of groundwater classes pertinent to the USEPA Groundwater Protection Strategy and future potential uses will be developed as part of the RI and HHRA documents for OU3	Data required is complete
13	waste characteristics that affect the type of treatment possible (e.g., BTU values, pH, BOD)	Objective for OU1 and OU2. DAPL Pilot demonstrated acceptable methods to manage DAPL are available. Otherwise, not applicable to OU3. Groundwater is fully characterized.	Data required is complete

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
14	potential extent and risk of future releases of substances or residuals remaining on-site and off-site	Available historical information have been reviewed regarding the potential for future releases. The two remaining known source areas are DAPL and LNAPL in the Plant B area. The site is no longer an active site, and therefore, there is no expected potential for future releases from these two source areas. The RI will include this information in the Site Background section.	Data required is complete
15	physical characteristics of the Site, including important surface features, soils, geology, hydrogeology, meteorology, and ecology	The physical characteristics of the Site will be described in the OU3 RI based on historical information included in previously submitted reports, soil and bedrock information collected during the RI and results of groundwater sampling.	Data required is complete
16	characteristics or classifications of air, surface water, and groundwater	Such classification will be incorporated from existing information. Relevant specifically to groundwater use classification.	Data required is complete
17	location of public and private water wells	Location of public and private water wells were identified in the Draft FRI and undated by a private well inventory program facilitated by USEPA. The RI will include a section (with a figure and table) to show the most up-to-date information.	Data required is complete
18	extent to which contamination levels exceed appropriate health-based levels	Contaminant concentrations will be compared to health-based levels as part of the BHHRA upon completion of RI activities for OU3. Data are adequate to evaluate HH Risks for OU3. Questions concerning detection limits for specific compounds that were higher than RSLs are addressed in the Data Gap analysis.	Data required is complete
19	extent to which substances at the Site may be reused or recycled	The wastes at the Site include principally VOCs, SVOCs, metals, and other inorganics and organic chemicals. The substances present are not generally amenable to re-use. During the RI/FS, if soil excavation and disposal alternatives are developed for OU1/OU2, alternatives to disposal such a asphalt batching, and onsite treatment will be considered and evaluated. Not applicable to OU3.	Not applicable
20	potential future risk posed by substances remaining onsite	The potential future risk was addressed in the OU1 BHHRA and BERA.	Not Applicable
21	general characteristics of the waste, including quantities, type, phase, concentration, toxicity, propensity to bioaccumulate, persistence, and mobility	Waste quantities (DAPL) have been quantified and presented in the Draft FRI and in the DAPL Pilot report. The fate and transport and general characteristics of the contaminants was presented in Section 5 of the Draft FRI and in the Phase II Supplemental Investigation Report (Smith, 1997). The propensity of constituents to bioaccumulation was discussed in the BHHRA and BERA for OU1/OU2.	Data required is complete
22	extent to which the source areas can be adequately identified and characterized	Source areas have been adequately identified and characterized. The remaining source areas for OU3 are DAPL, LNAPL in the Plant B area, TMPs at the water table in EA7, the CSL, and soils within the Contaionment Area which will be discussed in the OU3 RI.	Data required is complete
23	actual and potential exposure pathways through environmental media	Exposure pathways are presented on the Draft CSMs in the RI/FS Work plan. Upon completion of RI activities, the CSM will be revised based on additional information obtained.	Data required is complete
24	actual and potential exposure routes (for example, inhalation and ingestion)	Exposure routes are for OU3 will be presented in the OU3 RI and include ingestion, dermal contact and inhalation for groundwater, and inhalation for VI.	Data required is complete
25	other factors, such as sensitive populations, that pertain to the characterization of the Site or support the analysis of potential remedial action alternatives	The identification of sensitive populations, as applicable, will be evaluated as part of the BHHRA for OU3 based upon chemical results of groundwater sampling, nature and extent of impacted groundwater, and residential well locations.	Data required is complete
26	identification of potential additional source areas at both on- and off-Property locations	Source areas have been adequately identified and characterized as described in the OU1/OU2 RI. Off-property sources are restricted to the DAPL pools. See objective 22	Data required is available but may be expanded based on future requests to sample additional residential wells
II.	**SOIL AND SOURCES OF CONTAMINANTS OBJECTIVES**		
1	the nature and concentration of contaminants in the surface soils (0-6 inches), and subsurface soils (6-inches to 10 feet below ground surface or to four feet below waste or contaminated soils, whichever one is greater) over the entire Site, and focused on areas expected to have been impacted by Site contamination	Applicable to OU1	Not applicable
2	the phase in which the contaminants exist, whether as free products (NAPL), dense liquids (DAPL or diffuse layer) or chemical complexes (e.g., dissolved in groundwater, adsorbed by grains)	The physical and chemical characteristics of the hazardous substances have been analyzed and will be described in the OU3 RI considering additional information from literature.	Data required is complete
3	the physical parameters for each soil type and layer that is contaminated (e.g., soil moisture, soil profile, soil type, density, porosity (estimated), grain size, distribution, total organic carbon, mineralogy). This information may be reported on charts, maps, and cross sections	The physical parameters necessary for identification and evaluation of contaminated soils requiring remedial action below the water table are known and will be reported in the FS based on historical information and investigations proposed for OU1 and OU3 in the RI/FS Work Plan.	Data required is complete
4	the waste characteristics and mixtures that affect the type of treatment possible (pertinent physical and chemical characteristics of each compound may be reported in a chart)	Waste characteristics will be assessed after sampling conducted as part of the RI/FS. DAPL and LNAPL have been characterized. Recovery of LNAPL has been ongoing since 1981 and enhanced remediation (including AS/SVE) began in 2000. DAPL extraction was evaluated under the DAPL pilot test.	Data required is complete

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
5	the extent to which the contaminants may be reused and/or recycled	Not applicable to OU3	Not Applicable
6	the background concentrations for all naturally occurring contaminants, to be obtained from soils at the relevant OU unless EPA determines (on its own initiative or in response to a proposal by Respondents) that it is necessary to derive background concentrations from other soils	The Site is on a groundwater divide and therefore upgradient groundwater for use as background is not available.	Data required is available or complete
7	the physical limitations and other materials handling aspects of the soil and other sources that are contaminated	Not applicable to OU3	Not applicable to OU3
8	the estimated volumes of soils and other sources of contamination	The volume estimates of DAPL will be updated in the OU3 RI.	Additional boring locations and methodology is proposed for OU3 confirmation of the Main Street DAPL pool.
9	the ecological setting of the sampled location including types of vegetation present, depth to water table, local water flow regimes and any anthropogenic alterations	Discussed in the OU1/OU2 RI. Not Applicable to OU3	Not applicable to OU3
III.	**SUBSURFACE AND HYDROGEOLOGICAL INVESTIGATIONS OBJECTIVES**		
1	the nature and extent of contamination (lateral and vertical, in each hydrologic unit) sufficiently to define the boundaries of contaminant plumes located on the Site and to characterize the aquifers in three dimensions, including bedrock	Historical data that been used to develop estimates on the extent of groundwater impact in both overburden and bedrock groundwater systems have been confirmed and updated with new data collected under OU3. Overburden is a series of glacial outwash deposits underlain by a thin veneer of till and which, collectively, can be considered one hydrostratigraphic unit. The bedrock is a metamorphosed sequence of mylonites intruded by granitic and gabbroic bodies. The bedrock lithology may be treated as one hydrologic unit, distinct from overburden. There for there are two major hydrologic groups, overbden and bedrock. Overburden is subdivided between shallow and deep overburden.	The existing body of groundwater data, from both historical groundwater analytical data, new OU3 data, and data from residential quarterly sampling indicate the nature and extent are sufficiently defined to evaluate extent of groundwater impacts in each hydrologic unit and quantify risks associated with exposure to groundwater. The extent delineation evaluation has identified the need for additional wells as discussed in the data gap work plan.
2	populations and environments at risk and potential risks associated with future releases, if applicable	The environmental and demographic setting surrounding the Site was discussed and presented in Section 3 of the Draft FRI and the OU1 /OU2 RI. The CSMs for human health and ecological exposure routes were also presented in Volume I of the RI/FS Work Plan. The facility has been closed for several decades, and these are no activities that would result in a future release. The DAPL pools reside within in bedrock depressions.	Not applicable. Future releases are not expected since the facility is no longer in operation. Groundwater modeling indicates that there is little potential for future movement of DAPL (SHARP model described in Section 2.3.2.1) of the FRI.
3	an estimate of the number of years necessary to achieve clean-up goals for groundwater alternatives, including extraction and treatment remedial alternatives	A finite element groundwater flow and solute transport model (FEFLOW) has been implemented at the Site and may be utilized to aid the assessment of clean up time frames for groundwater. The most recent update of the model was presented in Appendix A of the Draft FRI. Column studies to simulate extraction of DAPL have also been completed and have related solute changes and mass removal to the pore volumes of DAPL extracted and displaced. These data and tools are available to assist development of reasonable and realistic clean up time frame estimates in the FS.	Will be determined as part of the OU3 FS
4	the subsurface stratigraphy, structure and properties for each hydrologic unit. The following may be included in this analysis: thickness, lithology, grain size distribution (glacial deposits), soil index properties (e.g. plasticity index), porosity, hydraulic conductivity, fraction of organic carbon, storativity, sorting, fracturing (orientation, frequency), and moisture content. Depending on initial screening results, other properties may be evaluated as warranted by data requirements of potential remedies or fate and transport evaluation	The subsurface stratigraphy at the site has been presented in a series of detailed cross sections of the glacial deposits within the MMBA and on-Property areas. The material is dominated by fine to medium sands with coarser sand and gravels, and some silty sands. The material is the result of transgression and recession of ice sheets during the last glaciation, and development of associated ice contact and outwash deposits. This material is underlain by a thin veneer of dense basal till that mantles bedrock. The sands and gravels are non-plastic, and their hydraulic properties have been extensively studied in support of development of the FEFLOW model (see Appendix A of the Draft FRI for compilation of hydraulic conductivity test results for overburden and bedrock wells, and estimates of storativity, transmissivity, and porosity for overburden system. Organic carbon (foc) data have been collected in previous investigations. The bedrock has been extensively cored and evaluated by thin section analysis to determine geologic relationships at the Site. Fracture assessments have also been conducted by surface mapping and borehole geophysical studies. Additional borehole geophysics and seismic studies were completed for the OU3 RI. Extensive seismic studies have been conducted to evaluate the bedrock surface and contribute to the understanding of the structural geologic setting of the Site. Site specific data correlates well with published geologic studies of the region.	Data required is available or compete
5	the concentration, transport mechanisms, potential receptor locations, and other significant characteristics of each contaminant	Concentrations of all detected chemicals were presented in the Draft FRI. Fate and transport of Site-related contaminants is discussed in Section 5 of Draft FRI and the OU1/OU2 RI. Potential receptor locations and any additional characteristics will be further described in the risk assessments for OU3. Any additional chemical of potential concerns that are identified as a result of the RI/FS activities will be researched to document fate and transport characteristics.	Data required is available or complete

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
6	the waste mixtures and partitioning of contaminants between groundwater and soil or rock, and whether NAPL is present	The nature of the contaminants present have been well studied with respect to their transport characteristics. To the extent required, partitioning calculations of contaminants between sources, soils and groundwater can be completed in the RI/FS using published literature values, and reasonable estimated ranges for such values when unavailable. Precipitation mechanisms have been documented to be important and the mineral composition of the precipitates have been studies, as well as the solubility of some of the precipitates when exposed in the environment (e.g., floc). Additional media or material specific studies are not required at this time. NAPL is present at Plant B and its extent is known. partitioning of contaminants between groundwater and soil (or rock) can be calculated using soil concentration data, foc data, and estimates of porosity.	Data required is available
7	the waste mixtures and partitioning of contaminants between the shallow groundwater, diffuse layer and dense aqueous-phase layer (DAPL)	Site specific diffusion coefficients were established for principal constituents in DAPL, diffuse and overlying groundwater and are discussed in the Supplemental Phase II Investigation Report (Smith, 1997).	Data required is available
8	the extent of, and character and controls of the migration of, any NAPL or DAPL	LNAPL (Plant B) is currently contained by a groundwater extraction system. Currently, the DAPL material remains in isolated bedrock depressions (the Upper DAPL pool , the Main Street pool, and the area of GW-83D) and is no longer migrating horizontally by gravity-driven migration.	Data required is available or complete for Plant B and the upper DAPL pool. Additional verification of the Maine Street DAPL pool is proposed.
9	a quantification of the hydrogeological factors (e.g., in-situ hydraulic conductivity, storativity, conductivity, and storage capacity of each hydrologic unit; aquifer thickness; hydraulic and pressure gradients; and degree of interconnection between the different hydrogeologic units (e.g., bedrock and specific overburden strata)	The implementation of the FEFLOW groundwater flow and solute transport model presented in Appendix A of the Draft FRI compiled the hydrologic properties of the overburden and bedrock groundwater systems. Additional study of bedrock and overburden groundwater was conducted for OU3 including borehole geophysical studies, and synoptic water level gauging allowing evaluation of hydraulic gradients within and between units.	Data required is available
10	the routes of groundwater migration, transport rates, and potential receptors. Also determine or qualitatively describe the locations, flow rates, contaminant concentrations, variability for discharge to bodies of surface water and wetlands, and head distributions within the geohydrologic units	Hydrologic and chemical data collected under the RI/FS Work Plan, for OU2 and OU3, in conjunction with prior data discussed in Sections 2, 3, 4 and Appendix A of the Draft FRI are designed to understand the groundwater flow conditions within the hydrologic units, and the flux of groundwater to surface water.	Data required is available
11	depth to and seasonal fluctuations in the water table, flow gradients, and contaminant concentrations, simultaneously with other factors such as precipitation, run-off, and stream flow	These data exist from historical studies and were supplemented with monthly stream gauging in MMB, onsite precipitation measurements, synoptic water levels gauging and synoptic groundwater sample collection and analysis.	Data required is available and complete
12	the condition of any existing monitoring wells and the need to replace or abandon them (utilizing data from any previous investigations)	Data will be collected during sampling and monitoring activities. Olin and USEPA agreed on which wells required replacement and those wells were re-installed	Completed
13	the construction location, and proximity, of residential, municipal, and previously installed monitoring wells, if available	These data have been compiled and presented to USEPA previously (Olin Well Logs). The USEPA residential well survey forms provided additional data on private well depths, where known.	Data required is available
14	an assessment of plume stability and the migration potential of hazardous substances (analytical and/or numerical models and a process for modeling should be identified. The parameters, assumptions, accuracy, contingencies of the studies must be explicitly stated, and a plan established to verify the modeling if a significant risk is indicated for a specific population or environment)	If required, the sufficient historical and recent OU3 data is available for statistical evaluation of the mass and centroid of mass of the groundwater plume to evaluate plume stability in addition to statistical assessments that can, and have historically been conducted, at specific wells.	Data required is available and complete
15	a review and illustration of groundwater classifications (the need for institutional controls on ground-water use, considering such controls as adjuncts to remedial action, must be assessed)	MCP groundwater classifications were presented and discussed in the Draft FRI and are a topic of ongoing discussion between Olin and USEPA	Data required is available and complete
16	physical and chemical characteristics that may affect the possible type of treatment (this information must be reported in a chart)	This information has been previously discussed under prior objectives. These data will be updated and presented in the OU3 FS. The DAPL Pilot Test provided information pertinent to DAPL extraction. Initial evaluation of NDMA treatment options were presented in a preliminary evaluation of treatment alternatives similar in from to an EE/CA.	Data required is available and complete
17	the background concentrations of naturally occurring contaminants in groundwater at a sufficient number of horizontal and vertical locations at the relevant OU (including at least one for the saturated unconsolidated overburden and bedrock), unless EPA determines (either on its own initiative or in response to a proposal by Respondents) that it is necessary to derive background concentrations from other areas	OU3 does not have an upgradient location due to the presence of a groundwater divide that bisects the Site. Alternative approaches have been proposed to USEPA such as use of Industri-plex background or data from wells not impacted by NDMA and will warrant continued discussion.	Data evaluation approach has yet to be agreed upon with USEPA, however this issue does not rise to the level of a data gap since there is no upgradient groundwater by definition due to the location of the groundwater divide.
18	engineering properties of soils and wastes for settlement and slope stability analyses if capping is considered	Not Applicable to OU3. CSL is already capped and closed.	Not applicable to OU3

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
IV.	**AIR QUALITY ASSESSMENT OBJECTIVES**		
1	identification of any likely or detected point and area emissions of particulate, volatiles, and semi-volatiles for the existing Site, including volatilization from soil, leachate, contaminated water, landfills, waste piles, and other contaminant areas	The VI assessment conducted for OU1/OU2 will be supplemented with a VI assessment for groundwater in the OU3 RI.	Groundwater data for VOCs is adequate for this assessment
2	identification of any existing or planned structures, or areas where potential structures could be built, located above the plume area where intrusion of vapor may result in a potential unacceptable inhalation risk. The Respondents shall use the Johnson and Ettinger Model for Subsurface Vapor Intrusion into Buildings as required by EPA's Draft Guidance for Evaluating Vapor Intrusion from Groundwater and Soil (Nov. 2002), or any revisions to such, to support this assessment	Not applicable to OU3	Not applicable to OU3
3	provision for monitoring concentrations (before or after any intrusive field work performed during non-summer months) at a sufficient number of locations	Not applicable to OU3	Not applicable to OU3
4	characterization of emissions as indicated above (i.e., particulate, vapors, precipitates, and gases)	Not applicable to OU3	Not applicable to OU3
5	estimation of the emission rates and worst case impacts on and off-site for the existing Site (detailed techniques for the characterizing of air emissions and impacts shall be used if screening data indicate a potentially significant concentration)	Not applicable to OU3	Not applicable to OU3
6	supplementation of ambient air monitoring with the collection of on-site meteorological data including ambient temperature, wind speed, wind direction, and barometric pressure, if necessary	Not applicable to OU3	Not applicable to OU3
7	provision for monitoring of ambient air quality as described in the Work Plan that shall include a description of (a) the sampling methodology (including instrumentation, sampling times, locations, detection limits, QA/QC procedures) and (b) the analytical methodology including instrumentation, detection limits and QA/QC procedures	Not applicable to OU3	Not applicable to OU3
8	provision for modeling for potential emission sources (if necessary), including documentation of (a) source characteristics (e.g., emission rates, release height, velocity, temperature, source configuration, etc.), (b) meteorological conditions, (c) receptor locations, and (d) background concentrations at the relevant OU, unless EPA determines (on its own initiative or in response to a proposal by Respondents) that it is necessary to derive background concentrations from other areas	Not applicable to OU3	Not applicable to OU3
9	evaluation of the factors that are critical in characterizing the nature and extent of airborne contaminants from the Site, if any, such as background air quality	Not applicable to OU3	Not applicable to OU3
V.	**SURFACE WATER AND SEDIMENTS OBJECTIVES**		
1	the nature and extent of surface waters and sediments sufficient to define impacted locations and quantity of contaminants	Not applicable to OU3	Not applicable to OU3
2	populations and environments at risk and potential risks associated with continued exposure	Not applicable to OU3	Not applicable to OU3
3	an estimate of the amount of flow, including seasonal variations, and the destination of those surface waters	Not applicable to OU3	Not applicable to OU3
4	the concentration, transport mechanisms, potential receptor locations, and other significant characteristics of each contaminant in surface water and sediment	Not applicable to OU3	Not applicable to OU3
5	a review and illustration of surface water classifications (the need for institutional controls on exposure, considering such controls as adjuncts to remedial action, must be assessed)	Not applicable to OU3	Not applicable to OU3
6	physical and chemical characteristics that may affect the possible type of treatment (this information must be reported in a chart)	Not applicable to OU3	Not applicable to OU3
VI.	**RISK ASSESSMENT OBJECTIVES**		
1	to characterize, and quantify where appropriate, the current and potential human health and environmental risks that would prevail if no further remedial action is taken	The potential future risk will be addressed in the BHHRA and BERA upon completion of RI activities.	Data required is available and complete

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
VII.	**ECOLOGICAL ASSESSMENT OBJECTIVES**		
1	an accurate delineation of the wetland boundary using the U.S. ACE, 1987, Wetlands Delineation Manual with N.E. Division Field Data Collection Sheets, and classification of the wetland types using the Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS-79/3I, US Fish and Wildlife Service, 1979) and determination of the functions and values of the wetlands and an accurate description and delineation of the ten (10) year and hundred (100) year floodplain	Not applicable to OU3	Not applicable to OU3
2	a description of habitat types including a map of major habitats present at the Site and a list of plant and animal species, both resident and transient	Not applicable to OU3	Not applicable to OU3
3	a determination of the status of those species identified in terms of sport or commercial usage. protected status, endangered, threatened, or of special concern	Not applicable to OU3	Not applicable to OU3
4	sampling of environmental receptors for analysis of community composition, abundance, or body burden of contaminants	Not applicable to OU3	Not applicable to OU3
5	sampling of chemical and physical parameters for surface water and sediments (e.g., grain size, total organic carbon, dissolved oxygen, etc.)	Not applicable to OU3	Not applicable to OU3
6	toxicity testing of indicator species, if required, to determine effects of contaminated Site media on the environment	Not applicable to OU3	Not applicable to OU3
7	an evaluation of how the contamination from the Site has affected the receptors, including a discussion of fate and transport of the contaminants to the various habitat types or organisms	The OU3 RI report will discuss contaminant fate and transport from groundwater to surface water.	Data required is available and complete
8	an evaluation of whether contamination has affected the health of the wetland and other major habitats present at the Site (e.g., reduced plant growth or vigor or contributed contaminants to the food web)	Not applicable to OU3	Not applicable to OU3
9	a discussion of how each remedial alternative under consideration affects the wetland, biota, and their functions and values	This topic will be addressed in the OU1/OU2/OU3 FS	Data required is available and complete
VIII.	**FEASIBILITY STUDY OBJECTIVES**		
1	If remediation is determined to be necessary, the Respondents shall develop a range of alternatives through performance of a feasibility study, as described below, for the appropriate Operable Unit	The FS shall be developed in accordance with USEPA guidance as specified in the SOW.	
IX.	**ALTERNATIVES OJECTIVES**		
1	protect human health and the environment by recycling waste or by, eliminating, reducing, and/or controlling risks to human health and the environment posed through each pathway at the Site	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete
2	consider the long-term uncertainties associated with land disposal	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete
3	consider the goals, objectives, and requirements of the Solid Waste Disposal Act	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete
4	consider the persistence, toxicity, mobility, and propensity to bioaccumulate of hazardous substances and their constituents	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete
5	consider the short- and long-term potential for human exposure	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete

Table 1.1-1
RI/FS Objectives Table
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

	OBJECTIVES LISTED IN STATEMENT OF WORK (SOW)	PROPOSED INVESTIGATIONS AND HISTORICAL INFORMATION TO ACHIEVE RI/FS OBJECTIVE	STATUS
6	consider the potential threat to human health and the environment if the remedial alternative proposed was to fail	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete
7	consider the threat to human health and the environment associated with the excavation, transportation, and re-disposal or containment of contaminated substances and/or media	The FS shall be developed in accordance with USEPA guidance as specified in the SOW, including developing RAO, PRGs, initial screening of alternatives, development and detailed analysis of alternatives, comparative analysis of alternatives including cost, and recommendation of a preferred alternative.	Data required is available and complete

Notes:
ANOEC - Acute-No Observed-Effects Concentrations
ARAR - Applicable or Relevant and Appropriate Requirements
BERA - Baseline Ecological Risk Assessment
BHHRA - Baseline Human Health Risk Assessment
CSA - Comprehensive Site Assessment
CSL - Calcium Sulfate Landfill
CSM - Conceptual Site Model
ERA - Ecological Risk Assessment
ERC - Environmental Risk Characterization
FRI - Focused Remedial Investigation
FS - Feasibility Study
FSP - Field Sampling Plan
IRSWP - Interim Response Steps Work Plan
MMB - Maple Meadow Brook
MMBW - Maple Meadow Brook Wetland
off-PWD - off-Property West Ditch
OHMPC - oil and/or hazardous materials of potential concern
on-PWD - on-Property West Ditch
PPE - Personal protective equipment
RI - Remedial Investigation
SWMU - Solid Waste Management Unit
US ACE - United States Army Corp of Engineers
USEPA - United States Environmental Protection Agency
USFWS - United States Fish and Wildlife Service

Prepared by/Date: MH 04/29/09
Revised and Checked by/Date: PHT 12/15/14

Table 1.2-1
Summary of OU3 Analytical Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
B-03	OC-B-03-XXX	5/10/2010	77	71	9	24	6							2		
B-03	OC-B-03-XXX	10/11/2010	77	71	9	24	6							2		
B-07-A	OC-B-07-A-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
B-07-A	OC-B-07-A-XXX	10/11/2010	77	72		25	7			4	1	2	3	2	2	1
B-10	OC-B-10-XXX	5/11/2010	77	71		24	6	6	5					2		
B-10	OC-B-10-XXX	5/18/2011	77	71		24	6	6	5					2		
ECS-6	OC-ECS-6-XXX	5/13/2010			9											
ECS-6	OC-ECS-6-DUP	10/14/2010			9											
ECS-6	OC-ECS-6-XXX	10/14/2010			9											
GW-101	OC-GW-101-XXX	5/12/2010	77	72		25	7	6	5	4	1	2	3	2	2	1
GW-101	OC-GW-101-XXX	10/11/2010	77	72		25	7	6	5	4	1	2	3	2	2	1
GW-103BR	OC-GW-103BR-XXX	5/25/2010	77	72		25	7			4	1	2	3	2	2	1
GW-103BR	OC-GW-103BR-XXX	10/21/2010	77	72		25	7			4	1	2	3	2	2	1
GW-103D	OC-GW-103D-XXX	5/25/2010	77	72		25	7			4	1	2	3	2	2	1
GW-103D	OC-GW-103D-XXX	10/21/2010	77	72		25	7			4	1	2	3	2	2	1
GW-10DR	OC-GW-10DR-XXX	2/23/2011	77	72	9	25	7			4	1	2	3	2	2	1
GW-10DR	OC-GW-10DR-XXX	5/18/2011	77	72	9	25	7			4	1	2	3	2	2	1
GW-10DR	OC-GW-10D-DUP	2/29/2012												6		
GW-10DR	OC-GW-10D-XXX	2/29/2012												6		
GW-10S	OC-GW-10S-XXX	5/14/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-10S	OC-GW-10S-XXX	10/18/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-10S	OC-GW-10S-XXX	2/29/2012												7		
GW-13	OC-GW-13-XXX	5/10/2010	77	71		24	6							2		
GW-13	OC-GW-13-XXX	10/12/2010	77	71		24	6							2		
GW-14	OC-GW-14-XXX	5/13/2010	77	71	9	24	6	6	5					2		
GW-14	OC-GW-14-XXX	10/13/2010	77	71	9	24	6	6	5					2		
GW-15	OC-GW-15-DUP	5/13/2010						6	5							
GW-15	OC-GW-15-XXX	5/13/2010	77	71		24	6	6	5					2		
GW-15	OC-GW-15-XXX	10/12/2010	77	71		48	6	6	5					2		
GW-16R	OC-GW-16R-XXX	5/10/2010				24	6							2		
GW-16R	OC-GW-16R-XXX	10/11/2010				24	6							2		
GW-17D	OC-GW-17D-XXX	7/1/2010	77	71		24	6							2		
GW-17D	OC-GW-17D-XXX	10/18/2010	77	71		24	6							2		
GW-17S	OC-GW-17S-XXX	5/19/2010	77	71		24	6							2		
GW-17S	OC-GW-17S-XXX	10/19/2010	77	71		24	6							2		
GW-18D	OC-GW-18D-XXX	5/21/2010	77	71		24	6							2		
GW-18D	OC-GW-18D-XXX	10/20/2010	77	71		24	6							2		
GW-202BRD	OC-GW-202BRD-XXX	2/24/2011	77	74		49	7			4	1	2	3		2	1
GW-202BRD	OC-GW-202BRD-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-202BRS	OC-GW-202BRS-XXX	2/24/2011	77	74		49	7			4	1	2	3		2	1
GW-202BRS	OC-GW-202BRS-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-202D	OC-GW-202D-XXX	5/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-202D	OC-GW-202D-XXX	10/19/2010	77	72		25	7			4	1	2	3	2	2	1
GW-202S	OC-GW-202S-XXX	5/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-202S	OC-GW-202S-XXX	10/19/2010	77	72		25	7			4	1	2	3	2	2	1
GW-21D	OC-GW-21D-XXX	5/11/2010	77	72		25	7			4	1	2	3	2	2	1
GW-21D	OC-GW-21D-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-21S	OC-GW-21S-XXX	5/11/2010	77	72		25	7			4	1	2	3	2	2	1
GW-21S	OC-GW-21S-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-24	OC-GW-24-XXX	5/18/2010	77	71		24	6							2		
GW-24	OC-GW-24-XXX	10/14/2010	77	71		24	6							2		
GW-25	OC-GW-25-XXX	6/1/2010	77	71		24	6							2		
GW-25	OC-GW-25-XXX	10/14/2010	77	71		24	6							2		
GW-28D	OC-GW-28D-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-28D	OC-GW-28D-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-28S	OC-GW-28S-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1

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Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-28S	OC-GW-28S-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-29D	OC-GW-29D-XXX	5/14/2010	77	71		24	6							2		
GW-29D	OC-GW-29D-XXX	10/13/2010	77	71		24	6							2		
GW-29S	OC-GW-29S-XXX	5/14/2010	77	71		24	6							2		
GW-29S	OC-GW-29S-XXX	10/13/2010	77	71		24	6							2		
GW-301	OC-GW-301-XXX	5/11/2010	77	71	9	24	6							2		
GW-301	OC-GW-301-XXX	10/12/2010	77	71	9	24	6							2		
GW-302	OC-GW-302-XXX	5/11/2010	77	71		24	6							2		
GW-302	OC-GW-302-XXX	10/12/2010	77	71		24	6							2		
GW-303	OC-GW-303-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-303	OC-GW-303-XXX	10/12/2010	77	71		25	7			4	1	2	3	2	2	1
GW-304	OC-GW-304-XXX	5/13/2010	77	71		24	6							2		
GW-304	OC-GW-304-XXX	10/13/2010	77	71		24	6							2		
GW-305	OC-GW-305-XXX	5/13/2010	77	71		24	6							2		
GW-305	OC-GW-305-XXX	10/13/2010	77	71		24	6							2		
GW-306	OC-GW-306-XXX	5/13/2010	77	71		24	6							2		
GW-306	OC-GW-306-XXX	10/13/2010	77	71		24	6							2		
GW-307	OC-GW-307-XXX	5/14/2010	77	74		49	7			4	1	2	3		2	1
GW-307	OC-GW-307-XXX	10/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-308	OC-GW-308-XXX	5/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-308	OC-GW-308-DUP	10/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-308	OC-GW-308-XXX	10/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-31D	OC-GW-31D-XXX	5/11/2010	77	71		48	6							2		
GW-31D	OC-GW-31D-XXX	10/12/2010	77	71		24	6							2		
GW-31S	OC-GW-31S-XXX	5/11/2010	77	71		24	6							2		
GW-31S	OC-GW-31S-XXX	10/12/2010	77	71		48	6							2		
GW-32D	OC-GW-32D-XXX	5/11/2010	77	72		25	7			4	1	2	3	2	2	1
GW-32D	OC-GW-32D-XXX	10/12/2010	77	72		49	7			4	1	2	3	2	2	1
GW-32S	OC-GW-32S-XXX	5/11/2010	77	72		25	7			4	1	2	3	2	2	1
GW-32S	OC-GW-32S-XXX	10/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-34D	OC-GW-34D-DUP	5/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-34D	OC-GW-34D-XXX	5/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-34D	OC-GW-34D-XXX	10/15/2010	77	72		25	7			4	1	2	3	2	2	1
GW-34SR	OC-GW-34SR-XXX	5/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-34SR	OC-GW-34SR-XXX	10/15/2010	77	72		25	7			4	1	2	3	2	2	1
GW-39	OC-GW-39-XXX	5/26/2010	77	71		24	6							2		
GW-39	OC-GW-39-XXX	10/18/2010	77	71		24	6							2		
GW-3D	OC-GW-3D-XXX	5/17/2010	77	72		25	7			4	1	2	3	2	2	1
GW-3D	OC-GW-3D-XXX	10/15/2010	77	72		25	7			4	1	2	3	2	2	1
GW-3S	OC-GW-3S-XXX	5/17/2010	77	72		25	7			4	1	2	3	2	2	1
GW-3S	OC-GW-3S-XXX	10/15/2010	77	72		25	7			4	1	2	3	2	2	1
GW-4	OC-GW-4-XXX	5/18/2010	77	71		24	6							2		
GW-4	OC-GW-4-XXX	10/14/2010	77	71		24	6							2		
GW-400BR	OC-GW-400BR-XXX	4/18/2012	77	72		25	7			4	1	2	3	2	2	1
GW-400BR	OC-GW-400BR-XXX	11/7/2012	77	73		25	7			5	1	2	3	2	2	1
GW-400D	OC-GW-400D-XXX	4/18/2012	77	72		25	7			4	1	2	3	2	2	1
GW-400D	OC-GW-400D-XXX	11/7/2012	77	73		25	7			5	1	2	3	2	2	1
GW-400M	OC-GW-400M-XXX	4/16/2012	77	72		25	7			4	1	2	3	2	2	1
GW-400M	OC-GW-400M-DUP	11/8/2012	77	73		24	7			5	1	2	3	2	2	1
GW-400M	OC-GW-400M-XXX	11/8/2012	77	73		25	7			5	1	2	3	2	2	1
GW-400S	OC-GW-400S-XXX	4/16/2012	77	72		25	7			4	1	2	3	2	2	1
GW-400S	OC-GW-400S-XXX	11/8/2012	77	73		25	7			5	1	2	3	2	2	1
GW-401D	OC-GW-401D-XXX	11/22/2010	77	72		25	7			4	1	2	3	2	2	1
GW-401D	OC-GW-401D-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-402D	OC-GW-402D-XXX	11/23/2010	77			1	6			4	1	2	3	2	2	1
GW-402D	OC-GW-402D-XXX	11/24/2010		72		48	1									

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OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-402D	OC-GW-402D-XXX	5/23/2011	77	72		25	7			4	1	2	3	2	2	1
GW-403D	OC-GW-403D-XXX	6/1/2010	77	72		25	7			4	1	2	3	2	2	1
GW-403D	OC-GW-403D-XXX	10/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-404BR	OC-GW-404BR-XXX	4/16/2012	77	72		25	7			4	1	2	3	2	2	1
GW-404BR	OC-GW-404BR-XXX	11/7/2012	77	73		25	7			5	1	2	3	2	2	1
GW-404BR	OC-GW-404BR-XXX	6/18/2013												2		
GW-404D	OC-GW-404D-XXX	4/16/2012	77	72		25	7			4	1	2	3	2	2	1
GW-404D	OC-GW-404D-XXX	11/7/2012	77	73		25	7			5	1	2	3	2	2	1
GW-404D	OC-GW-404D-XXX	6/18/2013												2		
GW-404M	OC-GW-404M-XXX	4/16/2012	77	72		25	7			4	1	2	3	2	2	1
GW-404M	OC-GW-404M-XXX	11/6/2012	77	72		25	7			5	1	2	3	2	2	1
GW-404S	OC-GW-404S-DUP	4/18/2012	77	72		25	7			4	1	2	3	2	2	1
GW-404S	OC-GW-404S-XXX	4/18/2012	77	72		25	7			4	1	2	3	2	2	1
GW-404S	OC-GW-404S-XXX	11/6/2012	77	72		25	7			5	1	2	3	2	2	1
GW-405BR	OC-GW-405BR-10/20	12/15/2010												2		
GW-405BR	OC-GW-405BR-47/57	12/15/2010												2		
GW-405BR	OC-GW-405BR-130/140	12/16/2010												2		
GW-405BR	OC-GW-405BR-152/162	12/16/2010												2		
GW-405BR	OC-GW-405BR-235/245	12/17/2010												2		
GW-405BRD	OC-GW-405BRD-XXX	4/12/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRD	OC-GW-405BRD-XXX	5/20/2011	77	72		49	7			4	1	2	3	2	2	1
GW-405BRD	OC-GW-405BRD-XXX	10/13/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRM	OC-GW-405BRM-XXX	4/11/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRM	OC-GW-405BRM-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRM	OC-GW-405BRM-XXX	10/13/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRS	OC-GW-405BRS-XXX	4/11/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRS	OC-GW-405BRS-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-405BRS	OC-GW-405BRS-XXX	10/11/2011	77	72		25	7			4	1	2	3	2	2	1
GW-406	OC-GW-406-XXX	6/1/2010	77	72		25	7			4	1	2	3	2	2	1
GW-406	OC-GW-406-XXX	10/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-406BRD	OC-GW-406BRD-XXX	10/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-406BRD	OC-GW-406BRD-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-406BRS	OC-GW-406BRS-XXX	10/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-406BRS	OC-GW-406BRS-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-407BRD	OC-GW-407BRD-XXX	10/29/2010	77	72		25	7			4	1	2	3	2	2	1
GW-407BRD	OC-GW-407BRD-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-407BRS	OC-GW-407BRS-XXX	10/29/2010	77	72		25	7			4	1	2	3	2	2	1
GW-407BRS	OC-GW-407BRS-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-408D	OC-GW-408D-XXX	2/24/2011	77	70		49	7			4	1	2	3	2	2	1
GW-408D	OC-GW-408D-DUP	5/19/2011	77	72		25	7			4	1	2		2	2	1
GW-408D	OC-GW-408D-XXX	5/19/2011	77	72		25	7			4	1	2		2	2	1
GW-408D	OC-GW-408D-DUP	5/25/2011											3			
GW-408D	OC-GW-408D-XXX	5/25/2011											3			
GW-408S	OC-GW-408S-XXX	2/23/2011	77	72		25	7			4	1	2	3	2	2	1
GW-408S	OC-GW-408S-XXX	5/18/2011	77	72		25	7			4	1	2	3	2	2	1
GW-40S	OC-GW-40S-XXX	5/27/2010	77	71		24	6							2		
GW-40S	OC-GW-40S-XXX	10/27/2010	77	71		24	6							2		
GW-42S	OC-GW-42S-XXX	6/7/2010	77	71		24	6							2		
GW-42S	OC-GW-42S-XXX	10/25/2010	77	71		24	6							2		
GW-43SR	OC-GW-43S-XXX	11/22/2010	77	71		24	6							2		
GW-43SR	OC-GW-43SR-XXX	5/18/2011	77	71		24	6							2		
GW-44D	OC-GW-44D-DUP	10/12/2011	77	74		25	7			4	1	2	3		2	1
GW-44D	OC-GW-44D-XXX	10/12/2011	77	74		25	7			4	1	2	3		2	1
GW-44D	OC-GW-44D-XXX	4/17/2012	77	72		25	7			4	1	2	3	2	2	1
GW-44S	OC-GW-44S-XXX	10/12/2011	77	72		25	7			4	1	2	3	2	2	1
GW-44S	OC-GW-44S-XXX	4/17/2012	77	72		25	7			4	1	2	3	2	2	1

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-45D	OC-GW-45D-XXX	5/19/2010	77	73		24	6									
GW-45D	OC-GW-45D-DUP	10/27/2010	77	73		24	6									
GW-45D	OC-GW-45D-XXX	10/27/2010	77	73		24	6									
GW-45S	OC-GW-45S-XXX	5/19/2010	77	71		24	6							2		
GW-45S	OC-GW-45S-XXX	10/27/2010	77	71		24	6							2		
GW-46D	OC-GW-46D-DUP	5/24/2010	77	71		24	6							2		
GW-46D	OC-GW-46D-XXX	5/24/2010	77	71		24	6							2		
GW-46D	OC-GW-46D-XXX	10/26/2010	77	71		24	6							2		
GW-47	OC-GW-47-XXX	5/25/2010	77	71		24	6							2		
GW-47	OC-GW-47-XXX	10/25/2010	77	71		24	6							2		
GW-48S	OC-GW-48S-XXX	5/21/2010	77	71		24	6							2		
GW-48S	OC-GW-48S-XXX	10/25/2010	77	71		24	6							2		
GW-4D	OC-GW-4D-XXX	5/18/2010	77	71		24	6							2		
GW-4D	OC-GW-4D-XXX	10/14/2010	77	71		24	6							2		
GW-50D	OC-GW-50D-DUP	5/20/2010	77	74		25	7			4	1	2	3		2	1
GW-50D	OC-GW-50D-XXX	5/20/2010	77	74		25	7			4	1	2	3		2	1
GW-50D	OC-GW-50D-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1
GW-50S	OC-GW-50S-XXX	5/20/2010	77	72		25	7			4	1	2	3	2	2	1
GW-50S	OC-GW-50S-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1
GW-51D	OC-GW-51D-XXX	5/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-51D	OC-GW-51D-XXX	10/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-51S	OC-GW-51S-DUP	5/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-51S	OC-GW-51S-XXX	5/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-51S	OC-GW-51S-XXX	10/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-52D	OC-GW-52D-XXX	5/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-52D	OC-GW-52D-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-52S	OC-GW-52S-XXX	5/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-52S	OC-GW-52S-XXX	10/13/2010	77	72		25	7			4	1	2	3	2	2	1
GW-53D	OC-GW-53D-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-53D	OC-GW-53D-DUP	10/19/2010	77	72		25	7			4	1	2	3	2	2	1
GW-53D	OC-GW-53D-XXX	10/19/2010	77	72		25	7			4	1	2	3	2	2	1
GW-53S	OC-GW-53S-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-53S	OC-GW-53S-XXX	10/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-54D	OC-GW-54D-XXX	5/12/2010	77	72		25	7			4	1	2	3	2	2	1
GW-54D	OC-GW-54D-XXX	10/15/2010	77	72		25	7			4	1	2	3	2	2	1
GW-54S	OC-GW-54S-DUP	5/12/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-54S	OC-GW-54S-XXX	5/12/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-54S	OC-GW-54S-XXX	10/15/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-55D	OC-GW-55D-XXX	5/18/2010	77	71		24	6							2		
GW-55D	OC-GW-55D-XXX	10/14/2010	77	71		24	6							2		
GW-55S	OC-GW-55S-XXX	5/18/2010	77	71		24	6							2		
GW-55S	OC-GW-55S-XXX	10/14/2010	77	71		24	6							2		
GW-56D	OC-GW-56D-XXX	5/20/2010	77	71		24	6							2		
GW-56D	OC-GW-56D-XXX	10/18/2010	77	71		24	6							2		
GW-56S	OC-GW-56S-XXX	5/20/2010	77	71		24	6							2		
GW-56S	OC-GW-56S-XXX	10/18/2010	77	71		24	6							2		
GW-57D	OC-GW-57D-XXX	10/13/2011	77	71		24	6							2		
GW-57D	OC-GW-57D-XXX	4/17/2012	77	71		24	6							2		
GW-58D	OC-GW-58D-XXX	5/24/2010	77	73		24	6									
GW-58D	OC-GW-58D-XXX	10/21/2010	77	71		24	6							2		
GW-58S	OC-GW-58S-XXX	5/24/2010	77	71		24	6							2		
GW-58S	OC-GW-58S-XXX	10/21/2010	77	71		24	6							2		
GW-60D	OC-GW-60D-XXX	11/17/2010	77	71		24	6							2		
GW-60D	OC-GW-60D-XXX	5/18/2011	77	71		24	6							2		
GW-60S	OC-GW-60S-XXX	11/17/2010	77	71		24	6							2		
GW-60S	OC-GW-60S-XXX	5/18/2011	77	71		24	6							2		

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-61BR	OC-GW-61BR-XXX	6/4/2010	77	72		25	7			4	1	2	3	2	2	1
GW-61BR	OC-GW-61BR-XXX	10/29/2010	77	72		25	7			4	1	2	3	2	2	1
GW-61D	OC-GW-61D-XXX	5/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-61D	OC-GW-61D-XXX	10/22/2010	77	72		25	7			4	1	2	3	2	2	1
GW-61S	OC-GW-61S-XXX	5/28/2010	77	71		24	6							2		
GW-61S	OC-GW-61S-XXX	10/22/2010	77	71		24	6							2		
GW-62BR	OC-GW-62BR-XXX	5/27/2010	77	71		24	6							2		
GW-62BR	OC-GW-62BR-XXX	10/26/2010	77	71		24	6							2		
GW-62BRD	OC-GW-62BRD-XXX	5/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62BRD	OC-GW-62BRD-XXX	10/28/2010	77	73		25	7			4	1	2	3	1	2	1
GW-62D	OC-GW-62D-XXX	5/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62D	OC-GW-62D-DUP	10/26/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62D	OC-GW-62D-XXX	10/26/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62M	OC-GW-62M-XXX	5/26/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62M	OC-GW-62M-XXX	10/26/2010	77	72		25	7			4	1	2	3	2	2	1
GW-62S	OC-GW-62S-XXX	5/26/2010	77	71		24	6							2		
GW-62S	OC-GW-62S-XXX	10/26/2010	77	71		24	6							2		
GW-63D	OC-GW-63D-XXX	5/26/2010	77	71		24	6							2		
GW-63D	OC-GW-63D-XXX	10/21/2010	77	71		24	6							2		
GW-63S	OC-GW-63S-XXX	5/26/2010	77	71		24	6							2		
GW-63S	OC-GW-63S-XXX	10/21/2010	77	71		24	6							2		
GW-64D	OC-GW-64D-XXX	5/25/2010	77	71		24	6							2		
GW-64D	OC-GW-64D-XXX	10/21/2010	77	71		24	6							2		
GW-64S	OC-GW-64S-XXX	5/25/2010	77	71		24	6							2		
GW-64S	OC-GW-64S-XXX	10/21/2010	77	71		24	6							2		
GW-65BR	OC-GW-65BR-XXX	10/29/2010	77	71		24	6							2		
GW-65BR	OC-GW-65BR-XXX	5/25/2011	77	71		24	6							2		
GW-65BRDD	OC-GW-65BRDD-XXX	2/22/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65BRDD	OC-GW-65BRDD-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65BRDS	OC-GW-65BRDS-XXX	2/22/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65BRDS	OC-GW-65BRDS-XXX	5/19/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65D	OC-GW-65D-XXX	10/25/2010	77	72		25	7			4	1	2	3	2	2	1
GW-65D	OC-GW-65D-DUP	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65D	OC-GW-65D-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-65S	OC-GW-65S-XXX	10/25/2010	77	71		24	6							2		
GW-65S	OC-GW-65S-XXX	5/20/2011	77	71		24	6							2		
GW-66D	OC-GW-66D-DUP	5/25/2010	77	71		24	6							2		
GW-66D	OC-GW-66D-XXX	5/25/2010	77	71		24	6							2		
GW-66D	OC-GW-66D-XXX	10/28/2010	77	71		24	6							2		
GW-66S	OC-GW-66S-XXX	5/25/2010	77	71		24	6							2		
GW-66S	OC-GW-66S-XXX	10/28/2010	77	71		24	6							2		
GW-67D	OC-GW-67D-XXX	5/27/2010	77	71		24	6							2		
GW-67D	OC-GW-67D-XXX	10/28/2010	77	71		24	6							2		
GW-67S	OC-GW-67S-XXX	5/27/2010	77	71		24	6							2		
GW-67S	OC-GW-67S-DUP	10/28/2010	77	71		24	6							2		
GW-67S	OC-GW-67S-XXX	10/28/2010	77	71		24	6							2		
GW-68BR	OC-GW-68BR-XXX	5/24/2010	77	72		25	7			4	1	2	3	2	2	1
GW-68BR	OC-GW-68BR-XXX	10/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-68D	OC-GW-68D-XXX	5/24/2010	77	72		25	7			4	1	2	3	2	2	1
GW-68D	OC-GW-68D-XXX	10/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-69D	OC-GW-69D-XXX	5/19/2010	77	73		24	6									
GW-69D	OC-GW-69D-XXX	10/22/2010	77	71		24	6							2		
GW-69S	OC-GW-69S-XXX	5/19/2010	77	71		24	6							2		
GW-69S	OC-GW-69S-XXX	10/22/2010	77	71		24	6							2		
GW-6D	OC-GW-6D-XXX	5/17/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-6D	OC-GW-6D-XXX	10/15/2010	77	72	9	25	7			4	1	2	3	2	2	1

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-6S	OC-GW-6S-XXX	5/17/2010	77	71		24	6							2		
GW-6S	OC-GW-6S-XXX	10/15/2010	77	71		24	6							2		
GW-70D	OC-GW-70D-XXX	10/22/2010	77	73		24	6									
GW-70D	OC-GW-70D-XXX	5/18/2011	77	73		24	6									
GW-70S	OC-GW-70S-XXX	10/22/2010	77	71		24	6							2		
GW-70S	OC-GW-70S-XXX	5/18/2011	77	71		24	6							2		
GW-71D	OC-GW-71D-XXX	5/25/2010	77	71		24	6							2		
GW-71D	OC-GW-71D-XXX	10/29/2010	77	71		24	6							2		
GW-71S	OC-GW-71S-XXX	5/25/2010	77	71		24	6							2		
GW-71S	OC-GW-71S-XXX	10/29/2010	77	71		24	6							2		
GW-72D	OC-GW-72D-XXX	5/21/2010	77	71		24	6							2		
GW-72D	OC-GW-72D-XXX	10/27/2010	77	71		24	6							2		
GW-73D	OC-GW-73D-XXX	5/26/2010	77	71		24	6							2		
GW-73D	OC-GW-73D-XXX	10/21/2010	77	71		24	6							2		
GW-73S	OC-GW-73S-XXX	5/26/2010	77	71		24	6							2		
GW-73S	OC-GW-73S-XXX	10/21/2010	77	71		24	6							2		
GW-74D	OC-GW-74D-XXX	5/19/2010	77	71		24	6							2		
GW-74D	OC-GW-74D-XXX	10/25/2010	77	71		24	6							2		
GW-74S	OC-GW-74S-XXX	5/19/2010	77	71		24	6							2		
GW-74S	OC-GW-74S-XXX	10/25/2010	77	71		24	6							2		
GW-75D	OC-GW-75D-XXX	5/19/2010	77	71		24	6							2		
GW-75D	OC-GW-75D-XXX	10/26/2010	77	71		24	6							2		
GW-75D	OC-GW-75D-XXX	4/17/2012												2		
GW-76S	OC-GW-76S-XXX	6/9/2010	77	71		24	6							2		
GW-76S	OC-GW-76S-XXX	10/14/2010	77	71		24	6									
GW-76S	OC-GW-76S-XXX	10/18/2010												2		
GW-79S	OC-GW-79S-XXX	5/17/2010	77	72		25	7			4	1	2	3	2	2	1
GW-79S	OC-GW-79S-DUP	10/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-79S	OC-GW-79S-XXX	10/14/2010	77	72		25	7			4	1	2	3	2	2	1
GW-80BR	OC-GW-80BR-XXX	10/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-80BR	OC-GW-80BR-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-80D	OC-GW-80D-XXX	10/27/2010	77	72		25	7			4	1	2	3	2	2	1
GW-80D	OC-GW-80D-DUP	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-80D	OC-GW-80D-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
GW-80S	OC-GW-80S-XXX	10/28/2010	77	72		25	7			4	1	2	3	2	2	1
GW-80S	OC-GW-80S-XXX	5/24/2011	77	72		25	7			4	1	2	3	2	2	1
GW-81BR	OC-GW-81BR-XXX	5/26/2010	77	72		25	7			4	1	2	3	2	2	1
GW-81BR	OC-GW-81BR-XXX	10/29/2010	77	72		25	7			4	1	2	3	2	2	1
GW-81D	OC-GW-81D-DUP	5/26/2010	77	71		24	6							2		
GW-81D	OC-GW-81D-XXX	5/26/2010	77	71		24	6							2		
GW-81D	OC-GW-81D-XXX	10/27/2010	77	71		24	6							2		
GW-82D	OC-GW-82D-XXX	5/27/2010	77	71		24	6							2		
GW-82D	OC-GW-82D-XXX	10/26/2010	77	71		24	6							2		
GW-82S	OC-GW-82S-XXX	5/27/2010	77	71		24	6							2		
GW-82S	OC-GW-82S-XXX	10/26/2010	77	71		24	6							2		
GW-83D	OC-GW-83D-XXX	11/18/2010	77	74		25	7			4	1	2	3		2	1
GW-83D	OC-GW-83D-XXX	5/25/2011	77	74		25	7			4	1	2	3		2	1
GW-83M	OC-GW-83M-XXX	11/18/2010	77	72		25	7			4	1	2	3	2	2	1
GW-83M	OC-GW-83M-XXX	5/25/2011	77	72		25	7			4	1	2	3	2	2	1
GW-83S	OC-GW-83S-XXX	11/18/2010	77	72	9	25	7			4	1	2	3	2	2	1
GW-83S	OC-GW-83S-XXX	5/25/2011	77	72	9	25	7			4	1	2	3	2	2	1
GW-84D	OC-GW-84D-XXX	6/2/2010	77	73		24	6									
GW-84D	OC-GW-84D-XXX	10/20/2010	77	72		24	6							1		
GW-84M	OC-GW-84M-XXX	6/2/2010	77	71		24	6							2		
GW-84M	OC-GW-84M-XXX	10/20/2010	77	71		24	6							2		
GW-84S	OC-GW-84S-XXX	6/2/2010	77	71		24	6							2		

Table 1.2-1
Summary of OU3 Analytical Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-84S	OC-GW-84S-XXX	10/20/2010	77	71		24	6							2		
GW-86S	OC-GW-86S-XXX	5/25/2010	77	71		24	6							2		
GW-86S	OC-GW-86S-XXX	10/19/2010	77	71		24	6							2		
GW-87D	OC-GW-87D-XXX	11/17/2010	77	74		25	7			4	1	2	3		2	1
GW-87D	OC-GW-87D-DUP	5/25/2011		73												
GW-87D	OC-GW-87D-XXX	5/25/2011	77	74		25	7			4	1	2	3		2	1
GW-88D	OC-GW-88D-XXX	5/26/2010	77	71		24	6							2		
GW-88D	OC-GW-88D-XXX	10/19/2010	77	71		24	6							2		
GW-88M	OC-GW-88M-XXX	5/26/2010	77	71		24	6							2		
GW-88M	OC-GW-88M-XXX	10/19/2010	77	71		24	6							2		
GW-88S	OC-GW-88S-XXX	5/26/2010	77	71		24	6							2		
GW-88S	OC-GW-88S-XXX	10/19/2010	77	71		24	6							2		
GW-CA1	OC-GW-CA1-XXX	5/17/2010	77	72		25	7			4	1	2	3	2	2	1
GW-CA1	OC-GW-CA1-XXX	10/18/2010	77	72		25	7			4	1	2	3	2	2	1
MP-1 #01	OC-MP-1 #01-DUP	5/17/2010	77	74		25	7			4	1	2	3		2	1
MP-1 #01	OC-MP-1 #01-XXX	5/17/2010	77	74		25	7			4	1	2	3		2	1
MP-1 #01	OC-MP-1 #01-XXX	10/20/2010	77	74		25	7			4	1	2	3		2	1
MP-1 #06	OC-MP-1 #06-XXX	5/17/2010	77	74		25	7			4	1	2	3		2	1
MP-1 #06	OC-MP-1 #06-XXX	10/19/2010	77	72		25	7			4	1	2	3	2	2	1
MP-2 #07	OC-MP-2 #07-XXX	6/7/2010	77	74		25	7			4	1	2	3			1
MP-2 #07	OC-MP-2 #07-XXX	10/25/2010	77	72		25	7			4	1	2	3	2		1
MP-2 #17	OC-MP-2 #17-XXX	6/7/2010	77	72		25	7			4	1	2	3	2		1
MP-2 #17	OC-MP-2 #17-XXX	10/25/2010	77	72		25	7			4	1	2	3	2		1
MP-3 #01	OC-MP-3 #01-XXX	10/11/2011	77	74		25	7			4	1	2	3		2	1
MP-3 #01	OC-MP-3 #01-XXX	4/17/2012	77	72		25	7			4	1	2	3	2	2	1
MP-3 #07	OC-MP-3 #07-XXX	10/11/2011	77	73		24	6									
MP-3 #07	OC-MP-3 #07-XXX	4/17/2012	77	71		24	6							2		
MP-3 #21	OC-MP-3 #21-XXX	10/11/2011	77	71		24	6							2		
MP-3 #21	OC-MP-3 #21-XXX	4/17/2012	77	71		24	6							2		
MP-4 #02	OC-MP-4 #02-XXX	5/25/2010	77	74		25	7			4	1	2	3		2	1
MP-4 #02	OC-MP-4 #2-XXX	10/27/2010	77	72		25	7			4	1	2	3	2	2	1
MP-4 #12	OC-MP-4 #12-XXX	5/21/2010	77	71		24	6							2		
MP-4 #12	OC-MP-4 #12-XXX	10/27/2010	77	71		24	6							2		
MP-5 #03	OC-MP-5 #03-XXX	11/19/2010	77	74		25	7			4	1	2	3		2	1
MP-5 #03	OC-MP-5 #03-XXX	5/24/2011	77	74		25	7			4	1	2	3		2	1
MP-5 #08	OC-MP-5 #08-XXX	11/19/2010	77	71		24	6							2		
MP-5 #08	OC-MP-5 #08-XXX	5/24/2011	77	71		24	6							2		
MP-5 #15	OC-MP-5 #15-XXX	11/19/2010	77	71		24	6							2		
MP-5 #15	OC-MP-5 #15-XXX	5/24/2011	77	71		24	6							2		
MW-203BR	OC-MW-203BR-XXX	5/18/2011	77	71		24	6							2		
MW-203BR	OC-MW-203BR-XXX	10/12/2011	77	71		24	6							2		
MW-204BR	OC-MW-204BR-XXX	5/24/2011	77	71		24	6							2		
MW-204BR	OC-MW-204BR-XXX	10/11/2011	77	71		24	6							2		
MW-204D	OC-MW-204D-XXX	5/23/2011	77	71		24	6							2		
MW-204D	OC-MW-204D-XXX	10/11/2011	77	71		24	6							2		
MW-204M	OC-MW-204M-XXX	5/23/2011	77	71		24	6							2		
MW-204M	OC-MW-204M-XXX	10/11/2011	77	71		24	6							2		
MW-204S	OC-MW-204S-XXX	5/23/2011	77	71		24	6							2		
MW-204S	OC-MW-204S-XXX	10/11/2011	77	71		24	6							2		
MW-206BR	OC-MW-206BR-XXX	5/20/2011	77	71		24	6							2		
MW-206BR	OC-MW-206BR-XXX	10/12/2011	77	71		24	6							2		
MW-206D	OC-MW-206D-XXX	5/19/2011	77	71		24	6							2		
MW-206D	OC-MW-206D-XXX	10/12/2011	77	71		24	6							2		
MW-206S	OC-MW-206S-XXX	5/19/2011	77	71		24	6							2		
MW-206S	OC-MW-206S-XXX	10/12/2011	77	71		24	6							2		
SL-1D	OC-SL-1D-XXX	5/20/2010	77	72		25	7			4	1	2	3	2	2	1

Table 1.2-1
Summary of OU3 Analytical Program
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Olin Chemical Superfund Site
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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Metals	Inorganics/ Physical	VPH	EPH	Alkylphenols	Dimethylformamide	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
SL-1D	OC-SL-1D-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1
SL-1S	OC-SL-1S-XXX	5/20/2010	77	72		25	7			4	1	2	3	2	2	1
SL-1S	OC-SL-1S-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1
SL-2	OC-SL-2-XXX	5/21/2010	77	72		25	7			4	1	2	3	2	2	1
SL-2	OC-SL-2-DUP	10/22/2010	77	72		25	7			4	1	2	3	2	2	1
SL-2	OC-SL-2-XXX	10/22/2010	77	72		25	7			4	1	2	3	2	2	1
SL-3	OC-SL-3-XXX	5/20/2010	77	72		25	7			4	1	2	3	2	2	1
SL-3	OC-SL-3-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1
SL-5	OC-SL-5-XXX	5/21/2010	77	72		25	7			4	1	2	3	2	2	1
SL-5	OC-SL-5-XXX	5/20/2011	77	72		25	7			4	1	2	3	2	2	1
SL-6	OC-SL-6-XXX	5/21/2010	77	72		25	7			4	1	2	3	2	2	1
SL-6	OC-SL-6-XXX	10/20/2010	77	72		25	7			4	1	2	3	2	2	1

Notes:
Numbers indicates the number of analytes analyzed for each group.
NDMA group includes both N-Nitrosodimethylamine and N-Nitrosodi-n-propylamine.

Prepared by/Date: MH 04/29/09
Prepared by/Date: MH 04/30/09

Table 1.2-2
Summary of Data Collected Under Interim Response Steps Work Plan
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
SL-1D	OC-SL-1D-051809	5/18/2009					14	5			
SL-1D	OC-SL-1D-081909	8/19/2009					14	5			
SL-1D	OC-SL 1D- 112409	11/24/2009					14	5			
SL-1D	OC-SL1D-030310	3/3/2010					14	5			
SL-1D	OC-SL-1D-092910	9/29/2010					14	5			
SL-1D	OC-SL-1D	5/11/2011					7	5			
SL-1D	OC-SL1D	11/15/2011					7	5			
SL-1D	OC-SL-1D	5/21/2012					7	5			
SL-1D	OC-SL-1D	11/15/2012					7	3			
SL-1D	OC-SL-1D	5/14/2013					7	5			
SL-1D	OC-SL-1D	11/14/2013					7	5			
SL-2	OC-SL-2-051809	5/18/2009					14	5			
SL-2	OC-SL-2-081909	8/19/2009					14	5			
SL-2	OC-SL 2- 112409	11/24/2009					14	5			
SL-2	OC-SL2-030310	3/3/2010					14	5			
SL-2	OC-SL-2	5/11/2011					7	5			
SL-2	OC-SL2	11/15/2011					7	5			
SL-2	OC-SL-2	5/21/2012					7	5			
SL-2	OC-SL-2	11/15/2012					7	3			
SL-2	OC-SL-2	5/14/2013					7	5			
SL-3	OC-SL-3-051809	5/18/2009					14	5			
SL-3	OC-SL-3-051809-DUP	5/18/2009					14	5			
SL-3	OC-SL-3-081809	8/18/2009					14	5			
SL-3	OC-SL-3-dup-081809	8/18/2009					14	5			
SL-3	OC-SL 3- 112309	11/23/2009					14	5			
SL-3	OC-SL 3 DUP- 112309	11/23/2009					14	5			
SL-3	OC-SL3-030310	3/3/2010					14	5			
SL-3	OC-SL3DUP-030310	3/3/2010					14	5			
SL-3	OC-SL-3-092810	9/28/2010					14	5			
SL-3	OC-SL-3DUP-092810	9/28/2010					14	5			
SL-3	OC-SL-3	5/10/2011					7	5			
SL-3	OC-SL-3 DUP	5/10/2011					7	5			
SL-3	OC-SL3	11/14/2011					7	5			
SL-3	OC-SL3 DUP	11/14/2011					7	5			
SL-3	OC-SL-3	5/21/2012					7	5			
SL-3	OC-SL-3 DUP	5/21/2012					7	5			
SL-3	OC-SL-3	11/15/2012					7	3			
SL-3	OC-SL-3 DUP	11/15/2012					7	3			
SL-3	OC-SL-3	5/14/2013					7	5			
SL-3	OC-SL-3 DUP	5/14/2013					7	5			
SL-3	OC-SL-3	11/14/2013					7	5			
SL-3	OC-SL-3 DUP	11/14/2013					7	5			
SL-5	OC-SL-5-051909	5/19/2009					14	5			
SL-5	OC-SL-5-081809	8/18/2009					14	5			
SL-5	OC-SL 5- 112309	11/23/2009					14	5			
SL-5	OC-SL5-030210	3/2/2010					14	5			
SL-5	OC-SL-5	5/10/2011					7	5			
SL-5	OC-SL5	11/14/2011					7	5			
SL-5	OC-SL-5	5/21/2012					7	5			
SL-5	OC-SL-5	5/14/2013					7	5			
SL-6	OC-SL-6-051909	5/19/2009					14	5			
SL-6	OC-SL-6-081809	8/18/2009					14	5			
SL-6	OC-SL 6- 112309	11/23/2009					14	5			
SL-6	OC-SL6-030210	3/2/2010					14	5			
SL-6	OC-SL-6-092810	9/28/2010					14	5			
SL-6	OC-SL-6	5/10/2011					7	5			
SL-6	OC-SL6	11/14/2011					7	5			
SL-6	OC-SL-6	5/21/2012					7	5			
SL-6	OC-SL-6	11/15/2012					7	3			
SL-6	OC-SL-6	5/14/2013					7	5			
SL-6	OC-SL-6	11/14/2013					7	5			
GW-10S	OC-GW-10S	11/13/2007					2	4			
GW-10S	OC-GW-10S	5/21/2008					2	4			
GW-10S	OC-GW-10S	11/19/2008					2	4			
GW-10S	OC-GW-10S	5/13/2009					2	4			
GW-10S	OC-GW-10S	11/10/2009					2	4			
GW-10S	OC-GW-10S	6/8/2010					2	4			
GW-10S	OC-GW-10S	11/16/2010					2	4			
GW-10S	OC-GW-10S	5/18/2011					2	4			
GW-10S	OC-GW-10s	11/11/2011					2	4			
GW-10S	OC-GW-10S	5/30/2012					2	4			
GW-10S	OC-GW-DUP-10S	5/30/2012					2	4			
GW-10S	OC-GW-10S	11/14/2012					2	4			

Table 1.2-2
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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-10S	OC-GW-10S-XXX	5/7/2013					2	4			
GW-10S	OC-GW-10S	5/19/2014					2	4			
GW-201S	OC-GW-201S	11/14/2007					2	4			
GW-201S	OC-GW-201S	5/21/2008					2	4			
GW-201S	OC-GW-201S	11/21/2008					2	4			
GW-201S	OC-GW-201S	5/12/2009					2	4			
GW-201S	OC-GW-201S	11/9/2009					2	4			
GW-201S	OC-GW-201S	6/10/2010					2	4			
GW-201S	OC-GW-201S	11/16/2010					2	4			
GW-201S	OC-GW-201S	5/18/2011					2	4			
GW-201S	OC-GW-201S	11/9/2011					2	4			
GW-201S	OC-GW-201S-DUP	11/9/2011					2	4			
GW-201S	OC-GW-201S	5/29/2012					2	4			
GW-201S	OC-GW-201S	11/15/2012					2	4			
GW-201S	OC-GW-201S-XXX	5/8/2013					2	4			
GW-201S	OC-DUP GW	11/20/2013					2	4			
GW-201S	OC-GW-201S	11/20/2013					2	4			
GW-202D	OC-GW-202D	11/13/2007					2	4			
GW-202D	OC-GW-202D DUP	11/13/2007					2	4			
GW-202D	OC-GW-202D	5/20/2008					2	4			
GW-202D	OC-GW-202D	8/25/2008					2	4			
GW-202D	OC-GW-202D	11/21/2008					2	4			
GW-202D	OC-GW-202D	2/25/2009					2	4			
GW-202D	OC-GW-202D	5/15/2009					2	4			
GW-202D	OC-GW-202D	8/10/2009					2	4			
GW-202D	OC-GW-202D	11/11/2009					2	4			
GW-202D	OC-GW-202D	2/17/2010					2	4			
GW-202D	OC-GW-202D	6/10/2010					2	4			
GW-202D	OC-GW 202D	8/31/2010					2	4			
GW-202D	OC-GW-202D	11/17/2010					2	4			
GW-202D	OC-GW-202D	3/21/2011					2	4			
GW-202D	OC-GW-202D	5/17/2011					2	4			
GW-202D	OC-GW-202D	8/24/2011					2	4			
GW-202D	OC-GW-202D	11/10/2011					2	4			
GW-202D	OC-GW-202D	2/22/2012					2	4			
GW-202D	OC-GW-202D	5/23/2012					2	4			
GW-202D	OC-GW-202D DUP	5/23/2012					2	4			
GW-202D	OC-GW-202D	8/20/2012					2	4			
GW-202D	OC-DUP-202D	11/13/2012					2	4			
GW-202D	OC-GW-202D	11/13/2012					2	4			
GW-202D	OC-GW-202D	3/20/2013					2	4			
GW-202D	OC-GW-202D	5/7/2013					2	4			
GW-202D	OC-GW-202D	8/21/2013					2	4			
GW-202D	OC-DUP-GW	11/21/2013					2	4			
GW-202D	OC-GW-202D	11/21/2013					2	4			
GW-202D	OC-GW-202D	4/1/2014					2	4			
GW-202D	OC-GW-202D DUP	4/1/2014					2	4			
GW-202D	OC-GW-202D	5/20/2014					2	4			
GW-202D	OC-GW-202D DUP	5/20/2014					2	4			
GW-202S	GW-202S	8/21/2007					2	4			
GW-202S	GW-202S DUP	8/21/2007					2	4			
GW-202S	OC-GW-202S	11/13/2007					2	4			
GW-202S	OC-GW-202S	3/5/2008					2	4			
GW-202S	OC-GW-202S	5/20/2008					2	4			
GW-202S	OC-GW-202S DUP	5/20/2008					2	4			
GW-202S	OC-GW-202S	8/25/2008					2	4			
GW-202S	OC-GW-202S	11/21/2008					2	4			
GW-202S	OC-GW-202S DUP	11/21/2008					2	4			
GW-202S	OC-GW-202S	2/25/2009					2	4			
GW-202S	OC-GW-202S	5/15/2009					2	4			
GW-202S	OC-GW-202S	8/10/2009					2	4			
GW-202S	OC-GW-202S	11/11/2009					2	5			
GW-202S	OC-GW-202S DUP	11/11/2009					2	5			
GW-202S	OC-GW-202S	2/17/2010					2	4			
GW-202S	OC-GW-202S-DUP	2/17/2010					2	4			
GW-202S	OC-GW-202S	6/10/2010					2	4			
GW-202S	OC-GW-202S DUP	6/10/2010					2	4			
GW-202S	OC-GW 202S	8/31/2010					2	4			
GW-202S	OC-GW 202S DUP	8/31/2010					2	4			
GW-202S	OC-GW-202S	11/17/2010					2	4			
GW-202S	OC-GW-202S DUP	11/17/2010					2	4			
GW-202S	OC-GW-202S	3/21/2011					2	4			
GW-202S	OC-GW-202S	5/17/2011					2	4			

Table 1.2-2
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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-202S	OC-GW-202S DUP	5/17/2011					2	4			
GW-202S	OC-GW-202S	8/24/2011					2	4			
GW-202S	OC-GW-202S	11/10/2011					2	4			
GW-202S	OC-GW-202S	2/22/2012					2	4			
GW-202S	OC-GW-202SDUP	2/22/2012					2	4			
GW-202S	OC-GW-202S	5/23/2012					2	4			
GW-202S	OC-GW-202S	8/20/2012					2	4			
GW-202S	OC-GW-202S	11/13/2012					2	4			
GW-202S	OC-GW-202S	3/20/2013					2	4			
GW-202S	OC-GW-202S	5/7/2013					2	4			
GW-202S	OC-GW-202S	8/21/2013					2	4			
GW-202S	OC-GW-202S	11/18/2013					2	4			
GW-202S	OC-GW-202S	4/1/2014					2	4			
GW-202S	OC-GW-202S	5/20/2014					2	4			
GW-24	OC-GW-24	11/14/2007					2	4			
GW-24	OC-GW-24	5/21/2008					2	4			
GW-24	OC-GW-24	11/19/2008					2	4			
GW-24	OC-GW-24	5/14/2009					2	4			
GW-24	OC-GW-24	11/10/2009					2	4			
GW-24	OC-GW-24	6/8/2010					2	4			
GW-24	OC-GW-24	11/16/2010					2	4			
GW-24	OC-GW-24	5/18/2011					2	4			
GW-24	OC-GW-24	11/11/2011					2	4			
GW-24	OC-GW-24	6/1/2012					2	4			
GW-24	OC-GW-24	11/14/2012					2	4			
GW-24	OC-GW-24-XXX	5/7/2013					2	4			
GW-24	OC-GW-24	11/20/2013					2	4			
GW-24	OC-GW-24	5/19/2014					2	4			
GW-25	GW-25	8/21/2007					2	4			
GW-25	OC-GW-25	11/13/2007					2	4			
GW-25	OC-GW-25	3/5/2008					2	4			
GW-25	OC-GW-25DUP	3/5/2008					2	4			
GW-25	OC-GW-25	5/21/2008					2	4			
GW-25	OC-GW-25	8/26/2008					2	4			
GW-25	OC-GW-25	11/19/2008					2	4			
GW-25	OC-GW-25	2/24/2009					2	4			
GW-25	OC-GW-25	5/13/2009					2	4			
GW-25	OC-GW-25	8/11/2009					2	4			
GW-25	OC-GW-25 DUP	8/11/2009					2	4			
GW-25	OC-GW-25	11/10/2009					2	4			
GW-25	OC-GW-25	2/15/2010					2	4			
GW-25	OC-GW-25	6/8/2010					2	4			
GW-25	OC-GW 25	9/1/2010					2	4			
GW-25	OC-GW-25	11/16/2010					2	4			
GW-25	OC-GW-25	3/23/2011					2	4			
GW-25	OC-GW-25	5/18/2011					2	4			
GW-25	OC-GW-25	8/25/2011					2	4			
GW-25	OC-GW-25	11/11/2011					2	4			
GW-25	OC-GW-25	3/12/2012					2	4			
GW-25	OC-GW-25	6/1/2012					2	4			
GW-25	OC-GW-25	8/21/2012					2	4			
GW-25	OC-GW-25	11/14/2012					2	4			
GW-25	OC-GW-25	3/20/2013					2	4			
GW-25	OC-GW-25	5/7/2013					2	4			
GW-25	OC-GW-25	8/21/2013					2	4			
GW-25	OC-GW-25	11/20/2013					2	4			
GW-25	OC-GW-25	4/4/2014					2	4			
GW-25	OC-GW-25	5/19/2014					2	4			
GW-26	OC-GW-26	11/13/2007					2	4			
GW-26	OC-GW-26	5/20/2008					2	4			
GW-26	OC-GW-26	11/19/2008					2	4			
GW-26	OC-GW-26	5/13/2009					2	4			
GW-26	OC-GW-26	11/10/2009					2	4			
GW-26	OC-GW-26	6/8/2010					2	4			
GW-26	OC-GW-26	11/16/2010					2	4			
GW-26	OC-GW-26	5/18/2011					2	4			
GW-26	OC-GW-26	11/11/2011					2	4			
GW-26	OC-GW-26	5/30/2012					2	4			
GW-34D	OC-GW-34D	11/13/2007					2	4			
GW-34D	OC-GW-34D	5/22/2008					2	4			
GW-34D	OC-GW-34D	11/21/2008					2	4			
GW-34D	OC-GW-34D DUP	11/21/2008					2	4			
GW-34D	OC-GW-34D	5/13/2009					2	4			

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-34D	OC-GW-34D DUP	5/13/2009					2	4			
GW-34D	OC-GW-34D	11/11/2009					2	5			
GW-34D	OC-GW-34D DUP	11/11/2009					2	4			
GW-34D	OC-GW-34D	6/10/2010					2	4			
GW-34D	OC-GW-34D	11/17/2010					2	4			
GW-34D	OC-GW-34D DUP	11/17/2010					2	4			
GW-34D	OC-GW-34D	5/17/2011					2	4			
GW-34D	OC-GW-34D	11/10/2011					2	4			
GW-34D	OC-GW-34D	5/29/2012					2	4			
GW-34D	OC-GW-34D	11/15/2012					2	4			
GW-34D	OC-GW-34D-XXX	5/9/2013					2	4			
GW-34D	OC-GW-34D	11/19/2013					2	4			
GW-34D	OC-GW-34D	5/21/2014					2	4			
GW-34SR	OC-GW-34SR	11/13/2007					2	4			
GW-34SR	OC-GW-34SR	5/22/2008					2	4			
GW-34SR	OC-GW-34SR	11/21/2008					2	4			
GW-34SR	OC-GW-34SR	5/13/2009					2	4			
GW-34SR	OC-GW-34SR	11/11/2009					2	4			
GW-34SR	OC-GW-34SR	6/10/2010					2	4			
GW-34SR	OC-GW-34SR	11/17/2010					2	4			
GW-34SR	OC-GW-34SR	5/17/2011					2	4			
GW-34SR	OC-GW-34SR	11/10/2011					2	4			
GW-34SR	OC-GW-34SR	5/29/2012					2	4			
GW-34SR	OC-GW-34SR	11/15/2012					2	4			
GW-34SR	OC-GW-34SR-XXX	5/9/2013					2	4			
GW-34SR	OC-DUP GW	5/9/2013					2	4			
GW-34SR	OC-GW-34SR	11/19/2013					2	4			
GW-34SR	OC-DUP GW	5/21/2014					2	4			
GW-34SR	OC-GW-34SR	5/21/2014					2	4			
GW-35S	OC-GW-35S	11/14/2007					2	4			
GW-35S	OC-GW-35S	5/21/2008					2	4			
GW-35S	OC-GW-35S DUP	5/21/2008					2	4			
GW-35S	OC-GW-35S	11/20/2008					2	4			
GW-35S	OC-GW-35S	5/12/2009					2	4			
GW-35S	OC-GW-35S	11/11/2009					2	4			
GW-35S	OC-GW-35S	6/11/2010					2	4			
GW-35S	OC-GW-35S	11/16/2010					2	4			
GW-35S	OC-GW-35S	5/18/2011					2	4			
GW-35S	OC-GW-35S	11/9/2011					2	4			
GW-35S	OC-GW-35S	5/29/2012					2	4			
GW-35S	OC-GW-35S	11/15/2012					2	4			
GW-35S	OC-GW-35S-XXX	5/8/2013					2	4			
GW-35S	OC-GW-35S	11/20/2013					2	4			
GW-35S	OC-GW-35S	5/21/2014					2	4			
GW-39	OC-GW-39	11/13/2007					2	4			
GW-39	OC-GW-39 DUP	11/13/2007					2	4			
GW-39	OC-GW-39	5/20/2008					2	4			
GW-39	OC-GW-39	11/19/2008					2	4			
GW-39	OC-GW-39	5/13/2009					2	4			
GW-42D	OC-GW-42D	5/19/2008					1	3			
GW-42D	OC-GW-42D	6/2/2008				20					
GW-42D	OC-GW-42D	7/9/2008				11					
GW-42S	OC-GW-42S	11/12/2007					2	4			
GW-42S	OC-GW-42S	5/19/2008					2	4			
GW-42S	OC-GW-42S	11/17/2008					2	4			
GW-42S	OC-GW-42S	5/11/2009					2	4			
GW-42S	OC-GW-42S	11/9/2009					2	4			
GW-42S	OC-GW-42S	6/7/2010					2	4			
GW-42S	OC-GW-42S	11/22/2010					2	4			
GW-42S	OC-GW-42S	5/23/2011					2	4			
GW-42S	OC-GW-42S	11/10/2011					2	4			
GW-42S	OC-GW-42S	5/31/2012					2	4			
GW-43SR	OC-GW-43SR	5/18/2011					2	4			
GW-43SR	OC-GW-43SR	11/10/2011					2	4			
GW-43SR	OC-GW-43SR	5/31/2012					2	4			
GW-43SR	OC-GW-43SR	11/15/2012					2	4			
GW-43SR	OC-GW-43SR-XXX	5/9/2013					2	4			
GW-43SR	OC-GW-43SR	11/21/2013					2	4			
GW-55S	OC-GW-55S	11/13/2007					2	4			
GW-55S	OC-GW-55S	5/23/2008					2	4			
GW-55S	OC-GW-55S	11/20/2008					2	4			
GW-55S	OC-GW-55S	5/14/2009					2	4			
GW-76S	OC-GW-76S	11/13/2007					2	4			

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-76S	OC-GW-76S	5/21/2008					2	4			
GW-76S	OC-GW-76S	11/19/2008					2	4			
GW-76S	OC-GW-76S	5/13/2009					2	4			
GW-76S	OC-GW-76S	11/10/2009					2	4			
GW-76S	OC-GW-76S	6/9/2010					2	4			
GW-76S	OC-GW-76S	11/16/2010					2	4			
GW-76S	OC-GW-76S	5/18/2011					2	4			
GW-76S	OC-GW-76s	11/11/2011					2	4			
GW-76S	OC-GW-76S	5/30/2012					2	4			
GW-76S	OC-GW-76S	11/14/2012					2	4			
GW-76S	OC-GW-76S-XXX	5/7/2013					2	4			
GW-76S	OC-GW-76S	11/19/2013					2	4			
GW-76S	OC-GW-76S	5/19/2014					2	4			
GW-78S	OC-GW-78S	11/14/2007					2	4			
GW-78S	OC-GW-78S	5/23/2008					2	4			
GW-78S	OC-GW-78S	8/26/2008					2	4			
GW-78S	OC-GW-78S	11/20/2008					2	4			
GW-78S	OC-GW-78S	2/25/2009					2	5			
GW-78S	OC-GW-78S	5/14/2009					2	4			
GW-78S	OC-GW-78S	8/11/2009					2	4			
GW-78S	OC-GW-78S	11/11/2009					2	4			
GW-78S	OC-GW-78S	2/17/2010					2	4			
GW-78S	OC-GW-78S	6/10/2010					2	4			
GW-78S	OC-GW 78S	9/1/2010					2	4			
GW-78S	OC-GW-78S	11/17/2010					2	4			
GW-78S	OC-GW-78S	3/23/2011					2	4			
GW-78S	OC-GW-78S	5/17/2011					2	4			
GW-78S	OC-GW-78S	8/24/2011					2	4			
GW-78S	OC-GW-78S	11/9/2011					2	4			
GW-78S	OC-GW-78S	3/12/2012					2	4			
GW-78S	OC-GW-78S	5/24/2012					2	4			
GW-78S	OC-GW-78S	8/22/2012					2	4			
GW-78S	OC-GW-78S	11/13/2012					2	4			
GW-78S	OC-GW-78S	3/20/2013					2	4			
GW-78S	OC-GW-78S-XXX	5/9/2013					2	4			
GW-78S	OC-GW-78S	8/21/2013					2	4			
GW-78S	OC-GW-78S	11/19/2013					2	4			
GW-78S	OC-GW-78S	4/1/2014					2	4			
GW-79S	GW-79S	8/21/2007					2	4			
GW-79S	OC-GW-79S	11/14/2007					2	4			
GW-79S	OC-GW-79S	3/5/2008					2	4			
GW-79S	OC-GW-79S	5/21/2008					2	4			
GW-79S	OC-GW-79S	8/26/2008					2	4			
GW-79S	OC-GW-79S DUP	8/26/2008					2	4			
GW-79S	OC-GW-79S	11/20/2008					2	4			
GW-79S	OC-GW-79S	2/25/2009					2	4			
GW-79S	OC-GW-79S	5/15/2009					2	4			
GW-79S	OC-GW-79S	8/11/2009					2	4			
GW-79S	OC-GW-79S	11/10/2009					2	4			
GW-79S	OC-GW-79S	2/17/2010					2	4			
GW-79S	OC-GW-79S	6/10/2010					2	4			
GW-79S	OC-GW 79S	8/30/2010					2	4			
GW-79S	OC-GW-79S	11/17/2010					2	4			
GW-79S	OC-GW-79S	3/23/2011					2	4			
GW-79S	OC-GW-79S	5/17/2011					2	4			
GW-79S	OC-GW-79S	8/24/2011					2	4			
GW-79S	OC-GW-79S	11/9/2011					2	4			
GW-79S	OC-GW 79S	3/7/2012					2	4			
GW-79S	OC-GW-79S	5/24/2012					2	4			
GW-79S	OC-GW-79S	8/22/2012					2	4			
GW-79S	OC-GW-79S	11/14/2012					2	4			
GW-79S	OC-GW-79S	3/20/2013					2	4			
GW-79S	OC-GW-79S-XXX	5/9/2013					2	4			
GW-79S	OC-GW-79S	8/21/2013					2	4			
GW-79S	OC-GW-79S	11/19/2013					2	4			
GW-79S	OC-GW-79S	4/4/2014					2	4			
GW-CA1	OC-GW-CA1	11/14/2007					2	4			
GW-CA1	OC-GW-CA1	5/21/2008					2	4			
GW-CA1	OC-GW-CA1	11/20/2008					2	4			
GW-CA1	OC-GW-CA1	5/14/2009					2	4			
GW-CA1	OC-GW-CA-1	11/11/2009					2	4			
GW-CA1	OC-GW-CA1	6/11/2010					2	4			
GW-CA1	OC-GW-CA1	11/16/2010					2	4			

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-CA1	OC-GW-CA1	5/19/2011					2	4			
GW-CA1	OC-GW-CA1	11/10/2011					2	4			
GW-CA1	OC-GW-CA1	5/29/2012					2	4			
GW-CA1	OC-GW-CA1	11/15/2012					2	4			
GW-CA1	OC-GW-CA1-XXX	5/8/2013					2	4			
GW-CA1	OC-GW-CA1	11/20/2013					2	4			
GW-CA1	OC-GW-CA1	5/21/2014					2	4			
MP-2 #13	OC-MP-2PORT13-XXX	5/9/2013					2	4			
MP-2 #13	OC-MP2#13	11/21/2013					2	4			
PZ-16RR	PZ16RR	8/21/2007					2	4			
PZ-16RR	OC-PZ-16RR	11/14/2007					2	4			
PZ-16RR	OC-PZ-16RR	3/5/2008					2	4			
PZ-16RR	OC-PZ-16RR	5/20/2008					2	4			
PZ-16RR	OC-PZ-16RR	8/26/2008					2	4			
PZ-16RR	OC-PZ-16RR	11/20/2008					2	4			
PZ-16RR	OC-PZ-16RR	5/14/2009					2	4			
PZ-16RR	OC-PZ-16RR	8/11/2009					2	4			
PZ-16RR	OC-PZ-16RR	11/10/2009					2	4			
PZ-16RR	OC-PZ-16RR	6/10/2010					2	4			
PZ-16RR	OC-PZ 16RR	8/31/2010					2	4			
PZ-16RR	OC-PZ-16RR	11/17/2010					2	4			
PZ-16RR	OC-PZ-16RR	3/22/2011					2	4			
PZ-16RR	OC-PZ-16RR	5/18/2011					2	4			
PZ-16RR	OC-PZ-16RR	8/24/2011					2	4			
PZ-16RR	OC-PZ-16RR	11/9/2011					2	4			
PZ-16RR	OC-PZ 16RR	3/7/2012					2	4			
PZ-16RR	OC-PZ-16RR	5/24/2012					2	4			
PZ-16RR	OC-PZ-16RR	8/22/2012					2	4			
PZ-16RR	OC-PZ-16RR	11/14/2012					2	4			
PZ-16RR	OC-PZ-16RR	3/20/2013					2	4			
PZ-16RR	OC-PZ-16RR-XXX	5/10/2013					2	4			
PZ-16RR	OC-PZ-16RR	8/21/2013					2	4			
PZ-16RR	OC-PZ-16RR	11/21/2013					2	4			
PZ-16RR	OC-PZ-16RR	4/4/2014					2	4			
PZ-17RR	PZ17RR	8/21/2007					2	4			
PZ-17RR	OC-PZ-17RR	11/14/2007					2	4			
PZ-17RR	OC-PZ-17RR	3/5/2008					2	4			
PZ-17RR	OC-PZ-17RR	5/20/2008					2	4			
PZ-17RR	OC-PZ-17RR	8/26/2008					2	4			
PZ-17RR	OC-PZ-17RR	11/20/2008					2	4			
PZ-17RR	OC-PZ-17RR	2/25/2009					2	4			
PZ-17RR	OC-PZ-17RR	5/14/2009					2	4			
PZ-17RR	OC-PZ-17RR	8/11/2009					2	4			
PZ-17RR	OC-PZ-17RR	11/10/2009					2	4			
PZ-17RR	OC-PZ-17RR	2/15/2010					2	4			
PZ-17RR	OC-PZ-17RR	6/9/2010					2	4			
PZ-17RR	OC-PZ 17RR	9/1/2010					2	4			
PZ-17RR	OC-PZ-17RR	11/17/2010					2	4			
PZ-17RR	OC-PZ-17RR	3/22/2011					2	4			
PZ-17RR	OC-PZ-17RR	5/18/2011					2	4			
PZ-17RR	OC-PZ-17RR	8/24/2011					2	4			
PZ-17RR	OC-PZ-17RR	11/9/2011					2	4			
PZ-17RR	OC-PZ-17-RR	3/12/2012					2	4			
PZ-17RR	OC-PZ-17RR	5/24/2012					2	4			
PZ-17RR	OC-PZ-17RR	8/21/2012					2	4			
PZ-17RR	OC-PZ-17RR	11/14/2012					2	4			
PZ-17RRR	OC-PZ-17RRR	8/22/2013					2	4			
PZ-17RRR	OC-PZ-17R	11/21/2013					2	4			
PZ-17RRR	OC-PZ-17RR	4/4/2014					2	4			
PZ-18	OC-PZ-18R	5/13/2009					2	4			
PZ-18R	PZ18R	8/21/2007					2	4			
PZ-18R	OC-PZ18R	11/14/2007					2	4			
PZ-18R	OC-PZ-18R	3/5/2008					2	4			
PZ-18R	OC-PZ18R	5/20/2008					2	4			
PZ-18R	OC-PZ-18R	8/26/2008					2	4			
PZ-18R	OC-PZ-18R	11/20/2008					2	4			
PZ-18R	OC-PZ-18R	2/25/2009					2	4			
PZ-18R	OC-PZ-18R	8/11/2009					2	4			
PZ-18R	OC-PZ-18R	11/10/2009					2	4			
PZ-18R	OC-PZ-18R	6/9/2010					2	4			
PZ-18R	OC-PZ 18R	8/31/2010					2	4			
PZ-18R	OC-PZ-18R	11/16/2010					2	4			
PZ-18R	OC-PZ-18R	3/23/2011					2	4			

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
PZ-18R	OC-PZ-18R	5/18/2011					2	4			
PZ-18R	OC-PZ-18R DUP	5/18/2011					2	4			
PZ-18R	OC-PZ-18R	8/25/2011					2	4			
PZ-18R	OC-PZ-18R	11/9/2011					2	4			
PZ-18R	OC-PZ-18R	3/12/2012					2	4			
PZ-18R	OC-PZ-18R	5/24/2012					2	4			
PZ-18R	OC-PZ-18R	8/21/2012					2	4			
PZ-18R	OC-PZ-18R	11/14/2012					2	4			
PZ-18R	OC-PZ-18R	3/20/2013					2	4			
PZ-18R	OC-PZ-18R	5/8/2013					2	4			
PZ-18R	OC-PZ-18R	8/21/2013					2	4			
PZ-18R	OC-PZ-18R	11/21/2013					2	4			
PZ-18R	OC-PZ-18R	4/1/2014					2	4			
PZ-18R	OC-PZ-18R	5/21/2014					2	4			
PZ-24	OC-PZ-24	6/24/2011					2	4			
PZ-24	OC-PZ-24	8/25/2011					2	4			
PZ-24	OC-PZ-24	11/10/2011					2	4			
PZ-24	OC-PZ-24	2/22/2012					2	4			
PZ-24	OC-PZ-24	5/24/2012					2	4			
PZ-24	OC-PZ-24	8/21/2012					2	4			
PZ-24	OC-PZ-24	11/13/2012					2	4			
PZ-24	OC-PZ-24	3/20/2013					2	4			
PZ-24	OC-PZ-24	5/8/2013					2	4			
PZ-24	OC-PZ-24	8/21/2013					2	4			
PZ-24	OC-PZ-24	11/18/2013					2	4			
PZ-24	OC-PZ-24	4/1/2014					2	4			
PZ-25	OC-PZ-25	6/24/2011					2	4			
PZ-25	OC-PZ-25	8/25/2011					2	4			
PZ-25	OC-PZ-25	11/10/2011					2	4			
PZ-25	OC-PZ-25	2/22/2012					2	4			
PZ-25	OC-PZ-25	5/23/2012					2	4			
PZ-25	OC-PZ-25	8/20/2012					2	4			
PZ-25	OC-PZ-25	11/13/2012					2	4			
PZ-25	OC-PZ-25	3/20/2013					2	4			
PZ-25	OC-PZ-25	5/8/2013					2	4			
PZ-25	OC-PZ-25	8/21/2013					2	4			
PZ-25	OC-PZ-25	11/18/2013					2	4			
PZ-25	OC-PZ-25	4/1/2014					2	4			
PZ-25	OC-PZ-25	5/20/2014					2	4			
IW-11	IW-11	9/6/2013		1							
IW-12	IW-12	9/6/2013		1							
IW-13	IW-13	9/6/2013		1							
Plant B Influent	INF 71807	7/18/2007	12	36			1	4	1		
Plant B Influent	INF 81507	8/15/2007	13	36			1	4	1		
Plant B Influent	INF 91907	9/19/2007	13	36			1	4	1		
Plant B Influent	Inf 101707	10/17/2007	13	36			1	4	1		
Plant B Influent	OC-INF 112007	11/20/2007	13	36			1	4	1		
Plant B Influent	OC-INF 121907	12/19/2007	13	36			1	4	1		
Plant B Influent	OC-INF 011608	1/16/2008	13	36			1	4	1		
Plant B Influent	OC-INF 022008	2/20/2008	13	36			1	4	1		
Plant B Influent	OC-INF 031908	3/19/2008	13	36			1	4	1		
Plant B Influent	OC-INF 041608	4/16/2008	13	36			1	4	1		
Plant B Influent	OC-Inf 052108	5/21/2008	13	36			1	4	1		
Plant B Influent	OC-INF 061808	6/18/2008	13	36			1	4	1		
Plant B Influent	OC-Inf 071608	7/16/2008	13	36			1	4	1		
Plant B Influent	OC-Inf 082008	8/20/2008	13	36			1	4	1		
Plant B Influent	OC-inf 091708	9/17/2008	13	36			1	4	1		
Plant B Influent	OC-Inf 101508	10/15/2008	13	36			1	4	1		
Plant B Influent	OC-Inf 111908	11/19/2008	13	36			1	4	1		
Plant B Influent	OC-Inf102010	10/20/2010	27	37	7		14	5	1		
Plant B Influent	INF 11310	11/3/2010									1
Plant B Influent	OC-INF 042011	4/20/2011	29	36			9	3			
Plant B Influent	OC-INF051911	5/19/2011	13	36			8	5			
Plant B Influent	OC-INF061511	6/15/2011	12	36			4	5			
Plant B Influent	OC-INF 072111	7/21/2011	13	36			5	5			
Plant B Influent	OC INF 081711	8/17/2011	13	36			7	5			
Plant B Influent	OC-INF 092111	9/21/2011	26	36			7	5			
Plant B Influent	OC-INF 102511	10/25/2011	26	36			7	5			
Plant B Influent	OC-INF111611	11/16/2011	26	36			7	5			
Plant B Influent	OC-INF 122011	12/20/2011	14	36			10	5			
Plant B Influent	OC INF 12512	1/25/2012	27	36			10	5			
Plant B Influent	OC INF 22212	2/22/2012	14	36			10	5			
Plant B Influent	OC-INF 32112	3/21/2012	14	36			10	5			

Table 1.2-2
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OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
Plant B Influent	OC-INF-041812	4/18/2012	27	36			10	5			
Plant B Influent	OC INF 052312	5/23/2012	14	36			11	5			
Plant B Influent	OC INF 62012	6/20/2012	14	36			10	5			
Plant B Influent	OC INF 71812	7/18/2012	14	36			10	5			
Plant B Influent	OC-Influent exclusion list	7/18/2012	27	36	7		11	1	1		
Plant B Influent	OC-INF 82212	8/22/2012	27	36			10	5			
Plant B Influent	OC-INF91912	9/19/2012	27	36			10	5			
Plant B Influent	OC INF 1023	10/23/2012	29	35			10	4			
Plant B Influent	OC INF 1219	12/19/2012	14	37			10	5			
Plant B Influent	OC INF 021313	2/13/2013	26	38	7		14	5	1		
Plant B Influent	INF 32013	3/20/2013	14	36			10	5			
Plant B Influent	OC-INF 042313	4/23/2013	14	72			10	5			
Plant B Influent	OC-Inf 051513	5/15/2013	28	38	7		14	5	1		
Plant B Influent	OC-Inf 061913	6/19/2013	14	36	7		10	6	1		
Plant B Influent	OC Inf 071713	7/17/2013	14	36	7		10	6	1		
Plant B Influent	INF 082113	8/21/2013		6			4	4			
Plant B Influent	Influent	9/6/2013		1							
Plant B Influent	INF091913	9/19/2013		6			4	4			
Plant B Influent	Influent	10/4/2013					4				
Plant B Influent	inf 102413	10/24/2013		6			4	4			
Plant B Influent	INF 111413	11/14/2013		6			4	5			
Plant B Influent	Inf	11/15/2013					7	14			
Plant B Influent	INF 121713	12/17/2013		6			4	4			
Plant B Influent	INF 011414	1/14/2014		12			4	4			
Plant B Influent	INF 021914	2/19/2014		6			4	4			
Plant B Influent	INF 031914	3/19/2014		6			4	4			
Plant B Influent	INF 041714	4/17/2014		6			4	4			
Plant B Influent	OC-INF 050814	5/8/2014	28	38	7		14	5	1		
Plant B Influent	INF 052714	5/27/2014		6			4	4			
Plant B Influent	OC- Inf 060414	6/4/2014							1		
B-03	OC-B-03	11/15/2007	2	2			1	2		13	
B-03	OC-B-03	11/24/2008	2	2			2	2		13	
B-03	OC-B-03	11/12/2009	2	2			1	2		13	
B-03	OC-B-03	11/18/2010	2	2			1	2		13	
B-03	OC-B-03	11/9/2011	2	2			1	2		13	
B-03	OC-B-03	11/14/2012	2	2			1	2		12	
B-03	OC-B-03	11/19/2013		2			1	2			
B-03	OC-B-03	11/20/2013	2							12	
GW-101	OC-GW-101	11/15/2007	2	2			1	2		13	
GW-101	OC-GW-101	11/24/2008	2	2			2	2		13	
GW-101	OC-GW-101	11/13/2009	2	2			1	2		13	
GW-101	OC-GW-101	11/18/2010	2	2			1	2		13	
GW-101	OC-GW-101	11/9/2011	2	2			1	2		13	
GW-101	OC-GW-101	11/15/2012	2	2			1	2		12	
GW-101	OC-GW-101	11/20/2013	2	2			1	2		12	
GW-13	OC-GW-13	11/15/2007	2	2			1	2		13	
GW-13	OC-GW-13	11/24/2008	2	2			2	2		13	
GW-13	OC-GW-13	11/12/2009	2	2			1	2		13	
GW-13	OC-GW-13	11/18/2010	2	2			1	2		13	
GW-13	OC-GW-13	11/10/2011	2	2			1	2		13	
GW-13	OC-GW-13	11/14/2012	2	2			1	2		12	
GW-13	OC-GW-13	11/20/2013	2	2			1	2		12	
GW-16	GW16	8/21/2007	2	2			1	2		13	
GW-16	GW-16 DUP	8/21/2007	2	2			1	2		13	
GW-16	OC-GW-16	11/15/2007	2	2			1	2		13	
GW-16	OC-GW-16 DUP	11/15/2007	2	2			1	2		13	
GW-16	OC-GW-16R	5/10/2013	2	2			1	2		12	
GW-16R	OC-GW-16	5/23/2008	2	2			1	2		13	
GW-16R	OC-GW-16 DUP	5/23/2008	2	2			1	2		13	
GW-16R	OC-GW-16R	8/26/2008	2	2			2	2		13	
GW-16R	OC-GW-16	11/24/2008	2	2			2	2		13	
GW-16R	OC-GW-16R	2/24/2009	2	2			1	2		13	
GW-16R	OC-GW-16R	5/12/2009	2	2			1	2		13	
GW-16R	OC-GW-16R	8/12/2009	2	2			1	2		13	
GW-16R	OC-GW-16R	11/12/2009	2	2			1	2		13	
GW-16R	OC-GW-16R DUP	11/12/2009	2	2			1	2		13	
GW-16R	OC-GW-16R	2/17/2010	2	2			1	2		13	
GW-16R	OC-GW-16R	6/11/2010	2	2			1	2		13	
GW-16R	OC-GW 16	9/1/2010	2	2			1	1		13	
GW-16R	OC-GW-16R	11/18/2010	2	2			1	2		13	
GW-16R	OC-GW-16R-DUP	11/18/2010	2	2			1	2		13	
GW-16R	OC-GW-16R	3/22/2011	2	2			1	2		13	
GW-16R	OC-GW-16R	5/16/2011	2	2			1	2		13	

Table 1.2-2
Summary of Data Collected Under Interim Response Steps Work Plan
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Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Pesticides	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	NDMA
GW-16R	OC-GW-16R	8/23/2011	2	2			1	2		13	
GW-16R	OC-GW-16R	11/8/2011	2	2			1	2		13	
GW-16R	OC-GW-16R-DUP	11/8/2011	2	2			1	2		13	
GW-16R	OC-GW 16R	3/7/2012	2	2			1	2		13	
GW-16R	OC-GW-16R	5/31/2012	2	2			1	2		13	
GW-16R	OC-GW-16R	8/22/2012	2	2			1	2		13	
GW-16R	OC-GW-16R	11/15/2012	2	2			1	2		12	
GW-16R	OC-GW-16RDUP	11/15/2012	2	2			1	2		12	
GW-16R	OC-GW-16R	3/21/2013	2	2			1	2		12	
GW-16R	OC-GW-16R	8/22/2013	2	2			1	2		12	
GW-16R	OC-GW-16R	11/19/2013	2	2			1	2		12	
GW-16R	OC-GW-16R DUP	11/19/2013	2	2			1	2		12	
GW-16R	OC-GW-16R	4/2/2014	2	2			1	2		12	
IW-10	OC-IW-10	11/15/2007	2	2			1	2		13	
IW-10	OC-IW-10	11/24/2008	2	2			2	2		13	
IW-10	OC-IW-10	11/13/2009	2	2			1	2		13	
IW-10	OC-IW-10	11/18/2010	2	2			1	2		13	
IW-10	OC-IW-10	11/9/2011	2	2			1	2		13	
IW-10	OC-IW-10	11/14/2012	2	2			1	2		12	
IW-10	OC-IW-10	11/19/2013		2			1	2			
IW-10	OC-IW-10	11/20/2013	2							12	
IW-6	OC-IW-6	11/15/2007	2	2			1	2		13	
IW-6	OC-IW-6	11/24/2008	2	2			2	2		13	
IW-6	OC-IW-6	11/12/2009	2	2			1	2		13	
IW-6	OC-IW-6	11/18/2010	2	2			1	2		13	
IW-6	OC-IW-6	11/9/2011	2	2			1	2		13	
IW-6	OC-IW-6	11/14/2012	2	2			1	2		12	
IW-6	OC-IW-6	11/20/2013	2	2			1	2		12	

Notes:
Numbers indicates the number of analytes analyzed for each group.

Prepared by/Date: MH 04/29/09
Prepared by/Date: MH 04/30/09

Table 1.2-3
Summary of Wells Sampled Under Residential Sampling Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Metals	Inorganics/ Physical	Formaldehyde	Hydrazine	NDMA	Phthalic Anhydride
M-01/L-06C	OC-M01L6C	10/12/2011							1	
M-01/L-06C	OC-M01L6C	9/11/2013							2	
M-01/L-06C	OC-M01L6C	12/19/2013							2	
M-01/L-06C	OC-M01L6C	2/25/2014							1	
M-01/L-06D	OC-M01L6D	5/22/2013							2	
M-01/L-06D	OC-DUP	7/29/2013							2	
M-01/L-06D	OC-M01L6D	7/29/2013							2	
M-01/L-06D	OC-M01L6D	9/12/2013							2	
M-01/L-06D	OC-M01L6D	12/19/2013							2	
M-01/L-06D	OC-M01L6D	2/19/2014							1	
M-02/L-07E	OC-M02L07	12/5/2008	62	13	3	5			1	
M-02/L-07E	OC-M2L7	3/30/2010	77	71	3	5	2	3	2	1
M-02/L-07E	OC-M02L07	7/29/2010	77	71	3	5	2	3	2	
M-02/L-07E	OC-M02L07	11/5/2010	77	71	3	5	2	3	2	
M-02/L-07E	OC-M02L07	12/16/2010	77	71	3	5	2	3	2	
M-02/L-07E	OC-M02L07	3/30/2011	77	71	3	5	2	3	2	
M-02/L-07E	OC-M02L07	7/12/2011	77	71	3	5	2	3	2	
M-02/L-07E	OC-M02L07	10/12/2011		71	3	5			2	
M-02/L-07E	OC-M02L07	2/28/2012		71	3	5			2	
M-02/L-07E	OC-M02L07	5/16/2012		71	3	5			2	
M-02/L-07E	OC-M02L07	10/9/2012		71	3	5			2	
M-02/L-07E	OC-M02L07	1/15/2013		73	3	5			2	
M-02/L-07E	OC-M02L07	3/18/2013							2	
M-02/L-07E	OC-M02L07	5/21/2013		73	3	5			2	
M-02/L-07E	OC-M02L07	9/11/2013		78	3	5			2	
M-02/L-07E	OC-M02L07	12/19/2013		73	4	5			2	
M-02/L-07E	OC-M02L07	2/19/2014		73	3	5			2	
M-02/L-09A	OC-M02L9A	10/13/2011							1	
M-03/L-02	OC-M03L02	10/12/2011							1	
M-03/L-02	OC-M03L02	9/12/2013							2	
M-03/L-02	OC-M03L02	10/3/2013							2	
M-03/L-02	OC-M03L02	12/19/2013							2	
M-03/L-02	OC-M03L02	2/19/2014							1	
M-03/L-02D	OC-M03L2D	9/12/2013							2	
M-03/L-02D	OC-M03L2D	10/3/2013							2	
M-03/L-02D	OC-M03L2D	12/19/2013							2	
M-03/L-02D	OC-M03L2D	2/19/2014							1	
M-03/L-02F	OC-M03L2F	10/12/2011							1	
M-03/L-02F	OC-M03L2F	9/12/2013							2	
M-03/L-02F	OC-M03L2F	12/19/2013							2	
M-03/L-02F	OC-M03L2F	2/19/2014							1	
M-03/L-07	OC-M03L07	5/22/2013							2	
M-03/L-07	OC-M03L07	7/29/2013							2	
M-03/L-07	OC-M03L07	9/12/2013							2	
M-03/L-07	OC-M03L07	12/19/2013							2	
M-03/L-07	OC-M03L07	2/19/2014							1	
M-03/L-102	OC-M03L102	10/12/2011							1	
M-13/L-03G	OC-M13L3G	10/12/2011							1	
M-14/L-02B	OC-M14L2B	10/7/2008	62	13	3	5			1	
M-14/L-02B	OC-M14L2B	3/30/2010	77	71	3	5	2	3	2	1
M-14/L-02B	OC-M14L2B	8/9/2010	77	71	3	5	2	3	2	
M-14/L-02B	OC-M14L2B	10/26/2010	77	71	3	5	2	3	2	
M-14/L-02B	OC-M14L2B	12/16/2010	77	71	3	5	2	3	2	
M-14/L-02B	OC-M14L2B	4/11/2011	77	71	3	5	2	3	2	
M-14/L-02B	OC-M14L2B	7/12/2011	77	71	3	5	2	3	2	
M-14/L-02B	OC-M14L2B	10/14/2011			3	5			2	
M-14/L-02B	OC-M14L2B	2/28/2012			3	5			2	
M-14/L-02B	OC-M14L2B	5/16/2012			3	5			2	
M-14/L-02B	OC-M14L2B	11/14/2012			3	5			2	
M-14/L-02B	OC-M14L2B	1/16/2013			3	5			2	
M-14/L-02B	OC-M14L2B	5/22/2013			3	5			2	
M-14/L-02B	OC-M14L2B	9/11/2013			3	5			2	
M-14/L-02B	OC-M14L2B	12/18/2013			4	5			2	
M-14/L-02B	OC-M14L2B	2/19/2014			3	5			2	
M-14/L-05	OC-M14L05	10/12/2011							1	
M-15/L-02C	OC-M15L2C	10/7/2008	62	13	3	5			1	
M-15/L-02C	OC-M15L2C	3/30/2010	77	71	3	5	2	3	2	1
M-15/L-02C	OC-M15L02C	8/4/2010	77	71	3	5	2	3	2	
M-15/L-02C	OC-M15L2C	11/5/2010	77	71	3	5	2	3	2	
M-15/L-02C	OC-M15L02C	12/17/2010	77	71	3	5	2	3	2	
M-15/L-02C	OC-M15L2C	3/30/2011	77	71	3	5	2	3	2	
M-15/L-02C	OC-M15L2C	7/13/2011	77	71	3	5	2	3	2	
M-15/L-02C	OC-M15L2C	10/12/2011		71	3	5			2	

Table 1.2-3
Summary of Wells Sampled Under Residential Sampling Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Metals	Inorganics/ Physical	Formaldehyde	Hydrazine	NDMA	Phthalic Anhydride
M-15/L-02C	OC-M15L2C	2/28/2012		71	3	5			2	
M-15/L-02C	OC-M15L2C	5/16/2012		71	3	5			2	
M-15/L-02C	OC-M15L2C	10/8/2012		71	3	5			2	
M-15/L-02C	OC-M15L2C	1/15/2013		73	3	5			2	
M-15/L-02C	OC-M15L2C	5/21/2013		73	3	5			2	
M-15/L-02C	OC-M15L2C	9/11/2013		78	3	5			2	
M-15/L-02C	OC-M15L2C	12/18/2013		73	4	5			2	
M-15/L-02C	OC-M15L2C	2/18/2014		73	3	5			2	
M-15/L-03A	OC-M15L3A	2/21/2014							1	
M-24/L-116	OC-M24L116	12/23/2013							2	
M-24/L-116	OC-M24L116	2/20/2014							1	
M-24/L-54	OC-M24L54	10/9/2008	62	13	3	5			1	
M-24/L-54	OC-M24L54 DUP	10/9/2008	62	13	3	5			1	
M-24/L-54	OC-M24L54	3/18/2009		63			2	3	2	
M-24/L-54	OC-M24L54	11/10/2009	77	71	3	5	2	3	2	
M-24/L-54	OC-M24L54-DUP	11/10/2009	77	71	3	5	2	3	2	
M-24/L-54	OC-M24L54	3/30/2010			3	5			2	
M-24/L-54	OC-M24L54	8/4/2010			3	5			2	
M-24/L-54	OC-M24L54	10/26/2010			3	5			2	
M-24/L-54	OC-M24L54	12/16/2010			3	5			2	
M-24/L-54	OC-M24L54	3/30/2011			3	5			2	
M-24/L-54	OC-M24L54	7/19/2011			3	5			2	
M-24/L-54	OC-M24L54	10/12/2011		71	3	5			2	
M-24/L-54	OC-M24L54	2/28/2012		71	3	5			2	
M-24/L-54	OC-M24L54	5/16/2012		71	3	5			2	
M-24/L-54	OC-M24L54	10/8/2012		71	3	5			2	
M-24/L-54	OC-M24L54	1/15/2013		73	3	5			2	
M-24/L-54	OC-M24L54	5/21/2013		73	3	5			2	
M-24/L-54	OC-M24L54	9/11/2013		78	3	5			2	
M-24/L-54	OC-M24L54	12/19/2013		73	4	5			2	
M-24/L-54	OC-M24L54	2/25/2014		73	3	5			2	
M-24/L-63	OC-M24L63	10/7/2008	62	13	3	5			1	
M-24/L-63	OC-M24L63	3/30/2010	77	71	3	5	2	3	2	1
M-24/L-63	OC-M24L63	8/4/2010	77	71	3	5	2	3	2	
M-24/L-63	OC-M24L63	10/26/2010	77	71	3	5	2	3	2	
M-24/L-63	OC-M24L63	12/16/2010	77	71	3	5	2	3	2	
M-24/L-63	OC-M24L63	3/30/2011	77	71	3	5	2	3	2	
M-24/L-63	OC-M24L63	7/12/2011	77	71	3	5	2	3	2	
M-24/L-63	OC-M24L63	10/13/2011		71	3	5			2	
M-24/L-63	OC-M24L63	2/28/2012		71	3	5			2	
M-24/L-63	OC-M24L63	5/16/2012		71	3	5			2	
M-24/L-63	OC-M24L63	10/8/2012		71	3	5			2	
M-24/L-63	OC-M24L63	1/15/2013		73	3	5			2	
M-24/L-63	OC-M24L63	5/21/2013		73	3	5			2	
M-24/L-63	OC-M24L63	9/11/2013		78	3	5			2	
M-24/L-63	OC-M24L63	12/19/2013		73	4	5			2	
M-24/L-63	OC-M24L63	2/18/2014		73	3	5			2	
M-24/L-64	OC-M24L64	1/20/2009	62	13	3	5			1	
M-24/L-64	OC-M24L64	7/8/2010	77	71	3	5	2	3	2	1
M-24/L-64	OC-M24L64	8/4/2010	77	71	3	5	2	3	2	
M-24/L-64	OC-M24L64	11/9/2010	77	71	3	5	2	3	2	
M-24/L-64	OC-M24L64	12/17/2010	77	71	3	5	2	3	2	
M-24/L-64	OC-M24L64	3/30/2011	77	71	3	5	2	3	2	
M-24/L-64	OC-M24L64	7/12/2011	77	71	3	5	2	3	2	
M-24/L-64	OC-M24L64	10/13/2011		71	3	5			2	
M-24/L-64	OC-M24L64	2/28/2012		71	3	5			2	
M-24/L-64	OC-M24L64	5/16/2012		71	3	5			2	
M-24/L-64	OC-M24L64	10/8/2012		71	3	5			2	
M-24/L-64	OC-M24L64	1/15/2013		73	3	5			2	
M-24/L-64	OC-M24L64	5/21/2013		73	3	5			2	
M-24/L-64	OC-M24L64	9/11/2013		78	3	5			2	
M-24/L-64	OC-M24L64	12/18/2013		73	4	5			2	
M-24/L-64	OC-M24L64	2/19/2014		73	3	5			2	
M-24/L-65	OC-M24L65	3/31/2011	77	71	3	5	2	3	2	
M-24/L-65	OC-M24L65	7/12/2011	77	71	3	5	2	3	2	
M-24/L-65	OC-M24L65	10/12/2011			2	5			2	
M-24/L-65	OC-M24L65	2/28/2012			2	5			2	
M-24/L-65	OC-M24L65	5/16/2012			2	5			2	
M-24/L-65	OC-M24L65	10/8/2012			2	5			2	
M-24/L-65	OC-M24L65	1/15/2013			2	5			2	
M-24/L-65	OC-M24L65	12/18/2013			3	5			2	
M-24/L-65	OC-M24L65	2/18/2014			2	5			2	
M-24/L-66	OC-M24L66	12/5/2008	62	13	3	5			1	

Table 1.2-3
Summary of Wells Sampled Under Residential Sampling Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Metals	Inorganics/ Physical	Formaldehyde	Hydrazine	NDMA	Phthalic Anhydride
M-24/L-66	OC-M24L66	3/30/2010	77	71	3	5	2	3	2	1
M-24/L-66	OC-M24L66	8/23/2010	77	71	3	5	2	3	2	
M-24/L-66	OC-M24L66	11/5/2010	77	71	3	5	2	3	2	
M-24/L-66	OC-M24L66	12/16/2010	77	71	3	5	2	3	2	
M-24/L-66	OC-M24L66	3/31/2011	77	71	3	5	2	3	2	
M-24/L-66	OC-M24L66	7/12/2011	77	71	3	5	2	3	2	
M-24/L-66	OC-M24L66	10/13/2011			2	5			2	
M-24/L-66	OC-M24L66	2/28/2012			2	5			2	
M-24/L-66	OC-M24L66	5/16/2012			2	5			2	
M-24/L-66	OC-M24L66	10/8/2012			2	5			2	
M-24/L-66	OC-M24L66	1/15/2013			2	5			2	
M-24/L-66	OC-M24L66	5/21/2013			2	5			2	
M-24/L-66	OC-M24L66	9/11/2013			2	5			2	
M-24/L-66	OC-M24L66	12/18/2013			3	5			2	
M-24/L-66	OC-M24L66	2/18/2014			2	5			2	
M-24/L-72A	OC-M24L72A	10/8/2008	62	13	3	5			1	
M-24/L-72A	OC-M24L72A	3/30/2010	77	71	3	5	2	3	2	1
M-24/L-72A	OC-M24L72A	8/4/2010	77	71	3	5	2	3	2	
M-24/L-72A	OC-M24L72A	10/26/2010	77	71	3	5	2	3	2	
M-24/L-72A	OC-M24L72A	12/17/2010	77	71	3	5	2	3	2	
M-24/L-72A	OC-M24L72A	3/30/2011	77	71	3	5	2	3	2	
M-24/L-72A	OC-M24L72A	7/13/2011	77	71	3	5	2	3	2	
M-24/L-72A	OC-M24L72A	10/12/2011			2	5			2	
M-24/L-72A	OC-M24L72A	2/28/2012			2	5			2	
M-24/L-72A	OC-M24L72A	5/16/2012			2	5			2	
M-24/L-72A	OC-M24L72A	10/8/2012			2	5			2	
M-24/L-72A	OC-M24L72A	1/15/2013			2	5			2	
M-24/L-72A	OC-M24L72A	5/21/2013			2	5			2	
M-24/L-72A	OC-M24L72A	9/11/2013			2	5			2	
M-24/L-72A	OC-M24L72A	12/18/2013			3	5			2	
M-24/L-72A	OC-M24L72A	2/18/2014			2	5			2	
M-24/L-87A	OC-M24L87	10/7/2008	62	13	3	5			1	
M-24/L-87A	OC-M24L87	3/30/2010	77	71	3	5	2	3	2	1
M-24/L-87A	OC-M24L87	8/4/2010	77	71	3	5	2	3	2	
M-24/L-87A	OC-M24L87	11/5/2010	77	71	3	5	2	3	2	
M-24/L-87A	OC-M24L87	12/16/2010	77	71	3	5	2	3	2	
M-24/L-87A	OC-M24L87	3/30/2011	77	71	3	5	2	3	2	
M-24/L-87A	OC-M24L87	7/12/2011	77	71	3	5	2	3	2	
M-24/L-87A	OC-M24L87	10/12/2011			3	5			2	
M-24/L-87A	OC-M24L87	2/28/2012			3	5			2	
M-24/L-87A	OC-M24L87	5/16/2012			3	5			2	
M-24/L-87A	OC-M24L87	10/8/2012			3	5			2	
M-24/L-87A	OC-M24L87	1/15/2013			3	5			2	
M-24/L-87A	OC-M24L87	5/21/2013			3	5			2	
M-24/L-87A	OC-M24L87	9/11/2013			3	5			2	
M-24/L-87A	OC-M24L87	12/18/2013			4	5			2	
M-24/L-87A	OC-M24L87	2/18/2014			3	5			2	
M-24/L-94	OC-M24L94	12/5/2008	62	13	3	5			1	
M-24/L-94	OC-M24L94	3/18/2009		63			2	3	2	
M-24/L-94	OC-M24L94	11/10/2009	77	71	3	5	2	3	2	
M-24/L-94	OC-M24L94	7/8/2010			3	5			2	
M-24/L-94	OC-M24L94	8/4/2010			3	5			2	
M-24/L-94	OC-M24L94	9/29/2010			3	5			2	
M-24/L-94	OC-M24L94	10/26/2010			3	5			2	
M-24/L-94	OC-M24L94	12/17/2010			3	5			2	
M-24/L-94	OC-M24L94	3/30/2011			3	5			2	
M-24/L-94	OC-M24L94	7/12/2011			3	5			2	
M-24/L-94	OC-M24L94	10/12/2011		71	3	5			2	
M-24/L-94	OC-M24L94	2/28/2012		71	3	5			2	
M-24/L-94	OC-M24L94	5/16/2012		71	3	5			2	
M-24/L-94	OC-M24L94	10/9/2012		71	3	5			2	
M-24/L-94	OC-M24L94	1/15/2013		73	3	5			2	
M-24/L-94	OC-M24L94	3/18/2013							2	
M-24/L-94	OC-M24L94	5/21/2013		73	3	5			2	
M-24/L-94	OC-M24L94	9/11/2013		78	3	5			2	
M-24/L-94	OC-M24L94	12/18/2013		73	4	5			2	
M-24/L-94	OC-M24L94	2/18/2014		73	3	5			2	
M-25/L-03	OC-M25L03	2/28/2012			2	5			2	
M-25/L-03	OC-M25L03	5/16/2012			2	5			2	
M-27/L-14C	OC-M27L14C	10/7/2008	62	13	3	5			1	
M-27/L-14C	OC-M27L14C	7/1/2010	77	71	3	5	2	3	2	1
M-27/L-14C	OC-M27L14C	8/6/2010	77	71	3	5	2	3	2	
M-27/L-14C	OC-M27L14C	10/25/2010	77	71	3	5	2	3	2	

Table 1.2-3
Summary of Wells Sampled Under Residential Sampling Program
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	Metals	Inorganics/ Physical	Formaldehyde	Hydrazine	NDMA	Phthalic Anhydride
M-27/L-14C	OC-M27L14C	7/19/2011	77	71	4	5	2	3	2	
M-27/L-14C	OC-M27L14C	10/13/2011		71	3	5			2	
M-27/L-14C	OC-M27L14C	5/16/2012		71	3	5			2	
M-27/L-14C	OC-M27L14C	10/8/2012		71	3	5			2	
M-27/L-14C	OC-M27L14C	5/21/2013		73	3	5			2	
M-27/L-14C	OC-M27L14C	9/11/2013		78	3	5			2	

Notes:
Numbers indicates the number of analytes analyzed for each group.
Low level NDMA analysis began in 2002.
NDMA group includes both N-Nitrosodimethylamine and N-Nitrosodi-n-propylamine.

Prepared by/Date: MH 04/29/09
Prepared by/Date: MH 04/30/09

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
56/58 Butters Row	56/58 BUTTERS ROW	18-Nov-03	77	70	18	2			20	10		6				1		
56/58 Butters Row	56/58 BUTTERS ROW DUP	18-Nov-03														1		
ALTRON B1	ALTRON-B1	10-Mar-92							2	1								
ALTRON B1	ALTRON B1	15-Jul-93		59		21												
ALTRON B1	ALTRON WELL #1	17-Oct-96	1															
ALTRON B1	ALTRON B1	12-Nov-97	1															
ALTRON B1	B-1 SANMINA	20-Jul-99								1								
ALTRON B1	B1	22-Dec-99								1								
ALTRON B1	B1	21-Oct-04								1								
ALTRON B1	B1	17-Nov-04	77						21							1		
ALTRON B1	B1	15-Dec-04							2	7								
ALTRON B3	ALTRON-B3	10-Mar-92							2	1								
ALTRON B3	ALTRON B3	15-Jul-93		59		21												
ALTRON B3	ALTRON WELL #3	17-Oct-96	1															
ALTRON B3	ALTRON B3	12-Nov-97	1															
ALTRON B3	B-3 SANMINA	20-Jul-99								1								
ALTRON B3	B3	22-Dec-99								1								
ALTRON B3	B3	19-May-04	77						21									
ALTRON B3	SANMINA B3	19-May-04														1		
ALTRON B3	B3	21-Jul-04							2	8								
AN-1	AN-1	24-Apr-98							7	8								
AN-2	AN-2	24-Apr-98							7	8								
B-05-R	B-5R	03-Apr-03		65						2								
B-17	B-17	07-Dec-99										7	21					
B-17	B-17	15-Aug-01	64															
BR-1	BR-01	01-May-90	2	3														
BR-1	BR-01	19-Nov-92	36	65		21			22	3								
BUTTERS ROW 1	BUTTERS ROW 1	10-Sep-92							1							1		
BUTTERS ROW 1	BUTTERS ROW 1	24-Jun-97								1								
BUTTERS ROW 1	97598-BR1	25-Oct-00	140	66	16	38	7	23	20	17		12	21					
BUTTERS ROW 1	BUTTERS ROW 1	24-Jul-02	5	7						2	13							
BUTTERS ROW 1	BUTTERS ROW 1	26-Feb-03								2								
BUTTERS ROW 1	BUTTERS ROW 1	16-Apr-03							7	8								
BUTTERS ROW 2	BUTTERS ROW 2	03-Sep-92	63	56		4		2	14	2						1		
BUTTERS ROW 2	BUTTERS ROW 2	25-Feb-97							1									
BUTTERS ROW 2	BUTTERS ROW 2	24-Jun-97								1								
BUTTERS ROW 2	Butters Row #2	26-Feb-03								2								
BUTTERS ROW 2	BUTTERS ROW 2	16-Apr-03							7	8								
CHESTNUT ST 1	CHESTNUT ST 1	03-Sep-92							1							1		
CHESTNUT ST 1	CHESTNUT ST 1 DUP	03-Sep-92							1							1		
CHESTNUT ST 1	CHESTNUT ST 1	24-Jun-97								1								
CHESTNUT ST 1	97598-CHESTNUT 1	25-Oct-00		65	16	23	7	12	19	11		12	21					
CHESTNUT ST 1	97598-CHESTNUT1	25-Oct-00	140	1		15		11	1	6								
CHESTNUT ST 1	CHESTNUT ST 1	24-Jul-02	5	7						2	13							
CHESTNUT ST 1	Chestnut St #1	26-Feb-03								2								
CHESTNUT ST 1	Chestnut St. 1	26-Feb-03														1		
CHESTNUT ST 1	Chestnut St. Old	16-Apr-03							7	8								
CHESTNUT ST 1A/2	CHESTNUT ST 2/1A	03-Sep-92	63			4		2	14	5						1		
CHESTNUT ST 1A/2	CHESTNUT ST 1A/2	25-Feb-97							1									
CHESTNUT ST 1A/2	CHESTNUT ST 1A/2	24-Jun-97								1								
CHESTNUT ST 1A/2	Chestnut St #1A/2	26-Feb-03								2								
CHESTNUT ST 1A/2	Chestnut St. 1A/2	26-Feb-03														1		

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
CHESTNUT ST 1A/2	Chestnut St. 1A	16-Apr-03							7	8								
E-10	E10 (B3-B)	23-Nov-99				2												
E-10	E-10	21-Jan-00	37	66					22	9		12	22					
ECS-2	ECS-2-GW	10-Feb-04		73			9		8	5		12	21					
GT-4D	GT-04-D	01-May-89	2	7														
GT-4D	GT4D	01-May-90							1	3								
GT-4S	GT-04-S	01-May-89	2	7														
GT-4S	GT4S	01-May-90							1	3								
GT-5	GT-05	01-May-89	2	7														
GT-5	GT5D	01-May-90							1	3								
GT-6D	GT-06-D	01-May-89	2	7														
GT-6D	GT6D	01-May-90							1	3								
GT-6S	GT-06-S	01-May-89	2	7														
GT-6S	GT6S	01-May-90							1	3								
GT-7	GT-07	01-May-89	2	7														
GT-7	GT7	01-May-90							1	3								
GT-9D	G7-90	19-Jan-00							22	9								
GT-9D	GT-09D	19-Jan-00	37	66														
GT-9S	GT-09-S	01-May-89	2	7														
GT-9S	GT9S	01-May-90							1	3								
GW-1	GW-01	10-Apr-78								1								
GW-1	GW-01	01-Dec-84								1								
GW-1	GW-01	01-May-85							1									
GW-1	GW-01	26-Jun-86							1									
GW-1	GW-01 DUP	26-Jun-86							1									
GW-1	GW-01	01-May-89	2	7														
GW-1	GW-01	01-May-90							1	3								
GW-100	GW-100	23-May-03		65						2								
GW-102	GW102	23-May-03		65						2								
GW-10D	GW-10-D	01-Dec-86							1									
GW-10D	GW10D	16-Feb-90	1	3														
GW-10D	GW-10-D	09-Nov-92	8						1									
GW-10D	Blind	28-Jan-00		66	16	23	7	12	26			12	21					
GW-10D	BLIND DUP	28-Jan-00	62															
GW-10D	BLIND DUPLICATE	28-Jan-00								23								
GW-10D	GW-10D	28-Jan-00	62	66	16	23	7	12	26	23		12	21					
GW-11	GW-11	31-May-78								1								
GW-11	GW-11	24-Jul-86							1									
GW-11	GW-11	01-Dec-86							1									
GW-11	GW11	16-Feb-90	2	3														
GW-11	GW-11	09-Nov-92	1			21			1									
GW-11	BLIND DUPLICATE	20-Feb-98								1								
GW-11	GW 11	20-Feb-98								1								
GW-11	GW-11	25-Jan-00	37	66					20	2								
GW-11	GW-11	07-Nov-00							2	7								
GW-12	GW-12	10-Apr-78								1								
GW-12	GW-12	01-Aug-81							1									
GW-12	GW-12	01-May-85							1									
GW-12	GW-12	11-Nov-92	1			21			1									
GW-12	GW-12	25-Jan-00	37	66					22	9								
GW-16	GW-16	01-Jun-81							1									
GW-16	GW-16	01-May-85							1									

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
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Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-16	GW-16	24-Jul-97	1	1						1								
GW-16	GW-16	20-Oct-98	1															
GW-16	GW-16	26-May-99		2							1							
GW-16	GW-16	06-Aug-99	2															
GW-16	GW-16	07-Dec-99									3							
GW-16	GW-16	18-Jan-00							17									
GW-16	GW-16	10-Aug-00			1				4	6	5		5					
GW-16	GW-16-11/29/00	29-Nov-00	2															
GW-16	BLIND DUPLICATE	15-Aug-01	50															
GW-16	GW-16	15-Aug-01	50															
GW-16	GW-16	24-Mar-03		62														
GW-16	GW-16	15-Mar-04													3	1		
GW-16	GW-16	15-Nov-05										1						
GW-16	GW-16 DUPLICATE	15-Nov-05										1						
GW-16	OC-GW-16	15-Nov-07										1						
GW-16	OC-GW-16 DUP	15-Nov-07										1						
GW-16	OC-GW-16R	10-May-13	2	2					1	2		12						
GW-19D	GW-19-D	26-Jun-86							1									
GW-19D	GW-19-D	01-Dec-86							1									
GW-19D	GW-19-D	09-Nov-92	1			21			1									
GW-19D	GW-19-D DUP	09-Nov-92	1			21			1									
GW-19D	GW-19D	20-Jan-00	37	66					22	9								
GW-19S	GW-19-S	24-Jul-86							1									
GW-19S	GW-19-S	01-Dec-86							1									
GW-19S	GW-19-S	20-Feb-98								1								
GW-19S	GW-19-S	20-Jan-00	37	66														
GW-19S	GW-19-S	21-Jan-00							14	2								
GW-19S	GW-19-S	28-Apr-00							6									
GW-19S	GW-19-S	09-Aug-00							2	7								
GW-2	GW-02	10-Apr-78								2								
GW-2	GW-02	01-May-81							2	3								
GW-20	GW-20	01-Aug-81							1									
GW-20	GW-20	01-May-85							1									
GW-20	GW-20	09-Jul-98								1								
GW-20	GW-20	24-Jan-00	37	66					22	8								
GW-20	GW-20	16-Mar-04	2							1					3	1		
GW-201S	GW-201S	26-Feb-02								2								
GW-201S	GW-201S	14-Aug-02								1								
GW-201S	GW-201S	26-Nov-03								1								
GW-201S	GW-201S	19-Aug-04							1									
GW-201S	OC-DUP GW	20-Nov-13							2	4								
GW-201S	OC-GW-201S	20-Nov-13							2	4								
GW-22D	GW-22-D	26-Jun-86							1									
GW-22D	GW-22-D	01-Dec-86							1									
GW-22D	GW-22-D	16-Feb-90	2	3														
GW-22D	GW-22-D	05-Nov-92	1			21			1									
GW-22D	GW-22-D	02-May-96															2	
GW-22D	GW-22-D	19-Jan-00	37	66					22	9								
GW-22S	GW-22-S	26-Jun-86							1									
GW-22S	GW-22-S	01-Dec-86							1									
GW-22S	GW-22-S	16-Feb-90	1	3														
GW-22S	GW-22-S	05-Nov-92	1			21												

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-22S	GW-22-S	02-May-96															2	
GW-22S	GW-22-S DUP	02-May-96															2	
GW-22S	GW-22S	23-Nov-99	26						1	1								
GW-22S	GW-22S	19-Jan-00	37	66					22	9								
GW-23	GW-23	01-Aug-81							2									
GW-23	GW-23	01-Dec-87							1	3								
GW-26	GW-26	01-Dec-81							2									
GW-26	GW-26	13-Nov-92	36	65		21			1									
GW-26	GW-26	26-Jan-00							7									
GW-26	GW-26	05-Nov-02								1								
GW-26	GW-26	15-May-03							1									
GW-26	GW-26	14-Aug-03														1		
GW-26	GW-26	14-Aug-03							14	6								
GW-26	GW-26	25-Nov-03								1								
GW-26	GW-26	20-Aug-04							1									
GW-26	OC-GW-26	30-May-12							2	4								
GW-27D	GW-27-D	25-Jul-86							1									
GW-27D	GW-27-D	01-May-90	2	3														
GW-27D	GW-27-D	10-Dec-91				7				1								
GW-27D	GW-27-D	09-Nov-92	1			21			1									
GW-27D	GW-27-D	01-May-96															2	
GW-27D	GW-27-D	19-Jan-00	37	66					22	9								
GW-27S	GW-27-S	25-Jul-86							1									
GW-27S	GW-27-S	01-Dec-86							1									
GW-27S	GW-27-S	01-May-90	2	3														
GW-27S	GW-27-S	09-Nov-92	1			21			1									
GW-27S	GW-27-S	01-May-96															2	
GW-27S	GW-27-S	19-Jan-00	37	66					22	9								
GW-2A	GW-02A	01-Dec-81							2									
GW-2A	GW-02A	01-Jul-84		2						4								
GW-30DR	GW-30-DR	25-Jul-86							1									
GW-30DR	GW30DR	16-Feb-90	2	3														
GW-30DR	GW-30-DR	09-Nov-92	36	65		21			23	3								
GW-30DR	GW-30DR	24-Mar-93								1								
GW-30DR	GW-30DR DUP	24-Mar-93								1								
GW-30DR	GW-30DR	10-Apr-97								2								
GW-33D	GW33D	16-Feb-90	2	3														
GW-33D	GW-33-D	03-Nov-92	1			21			1									
GW-33D	GW-33D	19-Jan-00	37	66					22	9								
GW-33S	GW33S	16-Feb-90	2	3														
GW-33S	GW-33-S	03-Nov-92	1			21			1									
GW-33S	GW-33S	19-Jan-00	37	66					22	9								
GW-34S	GW34S	16-Feb-90	2	3														
GW-34S	GW-34-S	05-Nov-92	1			21			1									
GW-34S	GW-34-S	02-May-96															2	
GW-34S	GW-34S	19-Jan-00	37	66					22	9								
GW-35D	GW35D	16-Feb-90	2	3														
GW-35D	GW-35-D	05-Nov-92	36	65		21			15	2								
GW-35D	GW-35-D	02-May-96															2	
GW-35D	GW35D-DAPL	28-Nov-03							8	2								
GW-35S	GW35S	16-Feb-90	2	3														
GW-35S	GW-35-S	10-Dec-91				7				1								

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-35S	GW-35-S	05-Nov-92	1			21			1									
GW-35S	GW-35-S	01-May-96															2	
GW-35S	GW 35 S	20-Feb-98								1								
GW-35S	GW-35S	25-Jan-00	37	66					13	1								
GW-35S	GW-35S	28-Apr-00							6									
GW-35S	GW-35S	26-Feb-02								2								
GW-35S	GW-35S	14-Aug-02								1								
GW-35S	GW-35S	01-Dec-03								1								
GW-35S	GW-35S	17-Aug-04							1									
GW-35S	OC-GW-35S	21-May-14							2	4								
GW-36	GW36	21-Nov-90	2	3														
GW-36	GW-36	10-Dec-91				7				1								
GW-36	GW-36	16-Nov-92	1			21												
GW-36	GW-36	24-Mar-93								2								
GW-36	GW-36	13-Jan-95							4	8								
GW-36	GW-36	02-May-96															2	
GW-36	GW-36	27-Jan-00	37	66					22	9								
GW-37	GW37	21-Nov-90	2	3														
GW-37	GW-37	16-Nov-92	1			21			2									
GW-37	GW-37	02-May-96															2	
GW-37	GW-37	27-Jan-00	37	66					22	9								
GW-38	GW38	21-Nov-90	2	3														
GW-38	GW-38	09-Nov-92	36	65		21			23	3								
GW-40D	GW-40-D	10-Dec-91				7				1								
GW-40D	GW-40-D	11-Nov-92	36	65		21			12									
GW-40D	GW-40-D	11-Jan-95								1								
GW-40D	GW-40-D	17-Oct-95							12	7								
GW-40D	GW-40D	23-Apr-98							7	8								
GW-42D	GW-42-D	10-Dec-91				7				1								
GW-42D	GW-42-D DUP	10-Dec-91				7				1								
GW-42D	GW-42-D	11-Nov-92	36	64		21			1									
GW-42D	GW-42-D DUP	11-Nov-92	36	64		21			1									
GW-42D	GW-42-D	11-Jan-95								1								
GW-42D	GW-42-D	17-Oct-95							3	5								
GW-42D	GW-42-D DUP	17-Oct-95							3	5								
GW-42D	GW-42-D	10-Apr-97								2								
GW-42D	GW-42D	13-Aug-98							21	3								
GW-42D	GW-42D	29-Mar-04		1					1	4								
GW-42D	OC-GW-42D	12-Nov-07								1								
GW-42D	OC-GW-42D	19-May-08							1	3								
GW-42D	OC-GW-42D	02-Jun-08						2										
GW-42D	OC-GW-42D	09-Jul-08						11										
GW-43D	GW-43-D	11-Nov-92	36			21			12									
GW-43D	GW-43-D DUP	11-Nov-92	36			21			12									
GW-43D	GW-43-D	17-Oct-95							24	6								
GW-43D	GW-43-D	10-Apr-97								2								
GW-43D	GW-43D	24-Mar-03		65														
GW-43D	GW-43D	05-Mar-04		1					1	6					3			
GW-43D	GW-43D DUP	05-Mar-04		1					1	6					3			
GW-43S	GW-43-S	11-Nov-92				21												
GW-43S	GW-43-S	17-Oct-95							4	6								
GW-43S	GW-43S	16-Oct-96	36						8									

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-43S	GW-43S	06-Nov-02								1								
GW-43S	GW-43S	24-Mar-03		65														
GW-43S	GW-43S	14-May-03							1									
GW-43S	GW-43S	12-Aug-03							13	3								
GW-43S	GW-43S	03-Dec-03								1								
GW-43S	GW-43S	05-Mar-04							1	3					3	1		
GW-43S	GW-43S	13-Aug-04							1									
GW-43S	GW-43S	25-Jul-05							2	4								
GW-48D	GW-48-D	17-Nov-92	36	65		21			23	3								
GW-49D	GW-49-D	16-Nov-92	36	65		21			23	3								
GW-5	GW-05	10-Apr-78								1								
GW-5	GW-05	01-Dec-81							1									
GW-5	GW-05	01-Dec-84								1								
GW-5	GW-05	01-May-85							1									
GW-5	GW5	01-May-90	30	46					1	3								
GW-59D	GW-59-D	10-Nov-92	36	65		21			24	4								
GW-59D	GW-59-D DUP	10-Nov-92	36	65		21			24	4								
GW-59D	GW-59D	22-Mar-04		1						1					3			
GW-59S	GW-59-S	10-Nov-92				21												
GW-59S	GW-59S	22-Jul-97	36	66					23	5								
GW-59S	GW-59S DUP	22-Jul-97	36	66					23	4								
GW-59S	GW-59S	22-Mar-04								1					3	1		
GW-7	GW-07	31-May-78								1								
GW-7	GW-07	01-Aug-81							1									
GW-7	GW-07	01-Dec-86							1									
GW-7	GW-07	18-Dec-96	1						1									
GW-7	GW-7	24-Jan-00	37	66					22	9								
GW-75S	GW-75-S	07-May-93	36	65		21			15									
GW-75S	GW-75S	21-May-97							8	5								
GW-77S	GW-77-S	03-May-95								1								
GW-77S	GW-77-S	18-Oct-95							5	7								
GW-77S	GW-77S	16-Oct-96							8									
GW-77S	GW-77-S	17-Dec-96	36	65		21												
GW-77S	GW-77S	06-Nov-02								1								
GW-77S	GW-77S	04-Feb-03								3								
GW-77S	GW-77S	12-May-03							1									
GW-77S	GW-77S	19-Aug-03							17	8						1		
GW-78S	GW-78-S	01-Feb-95								1								
GW-78S	GW-78-S	03-May-95								1								
GW-78S	GW-78-S	18-Oct-95							6	7								
GW-78S	GW-78-S	17-Dec-96	1			21												
GW-78S	GW-78S	20-Jan-00	37	66					19	1								
GW-78S	GW-78S	12-Aug-02								1								
GW-78S	GW-78S Duplicate	12-Aug-02								1								
GW-78S	1140-GW-78S	30-Dec-02								2								
GW-78S	GW-78S	27-Aug-03														1		
GW-78S	GW-78S	17-Nov-03								1								
GW-78S	GW-78S DUP	17-Nov-03								1								
GW-78S	GW-78S	10-Aug-04							1									
GW-78S	GW-78S DUPLICATE	10-Aug-04							1									
GW-78S	OC-GW-78S	22-Aug-12								1								
GW-78S	OC-GW-78S	01-Apr-14							2	4								

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
GW-8	GW-08	10-Apr-78								1								
GW-8	GW-08	04-May-95								1								
GW-8	GW-08	19-Jul-95							6	7								
GW-8	GW-8	24-Jan-00	37	66					22	9								
GW-85D	GW-85-D	19-Nov-96	36	65					16	1								
GW-85D	GW-85D	25-Jun-97								1								
GW-85D	GW-85D	11-Nov-03								1								
GW-85D	GW-85D	02-Mar-04								2								
GW-85D	GW-85D	12-May-04		1														
GW-85D	GW-85D	16-Nov-04								1								
GW-85D	GW-85D	11-May-05	2															
GW-85D	GW-85D	13-Oct-05							7	6								
GW-85M	GW-85-M	19-Nov-96	36	65					16	1								
GW-85M	GW-85-M DUP	19-Nov-96	36	65					16	1								
GW-85M	GW-85M	25-Jun-97								1								
GW-85M	GW-85M	11-Nov-03								1								
GW-85M	GW-85M	02-Mar-04								2								
GW-85M	GW-85M	12-May-04														1		
GW-85M	GW-85M	11-May-05	2															
GW-85M	GW-85M	26-Jul-05								1								
GW-85M	GW-85M	13-Oct-05							7	6								
GW-86D	GW-86-D	19-Dec-96	36	65					16	1								
GW-86D	GW-86D	26-Jun-97								1								
GW-86D	GW-86D	13-Jun-02				1												
GW-86D	GW-86D	12-Nov-03								1								
GW-86D	GW-86D	03-Mar-04								2								
GW-86D	GW-86D DUP	03-Mar-04								2								
GW-86D	GW-86D	13-May-04		1														
GW-86D	GW-86D	17-Aug-04							1									
GW-86D	GW-86D	12-May-05	2															
GW-86D	GW-86D	17-May-06							7	7								
GW-86M	GW-86-M	19-Dec-96	36	65					16	1								
GW-86M	GW-86M	26-Jun-97								1								
GW-86M	GW-86M	12-Nov-03								1								
GW-86M	GW-86M	03-Mar-04								2								
GW-86M	GW-86M	13-May-04														1		
GW-86M	GW-86M	17-Aug-04							1									
GW-86M	GW-86M	12-May-05	2															
GW-86M	GW-86M	17-May-06							7	7								
GW-98	GW-98	01-Jun-87							1	3								
GW-CA2	GW-CA2	26-Feb-02							2	7								
GW-CA2	GW-CA2	28-Aug-03														1		
GW-LPB-11	1140-GW-LPB-11	27-Jul-01	66	65		21			8	1								
GW-LPB-11	GW-LPB11	25-Aug-03														1		
GW-LPB-11	GW-LPB-11	18-Dec-03	2												3			
IW-1	IW1	23-May-03		1														
IW-1	IWI	29-Sep-03		65						7								
IW-10	IW-10	24-Jul-97	1	1														
IW-10	BLIND DUPLICATE	11-Aug-98	3	2														
IW-10	IW-10	11-Aug-98	3	2							1							
IW-10	IW-10	06-Aug-99									1							
IW-10	IW-10	10-Aug-00			1				4	5	5		5					

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
IW-10	IW-10	23-May-01	2							6								
IW-10	IW-10 HPC	23-May-01								1								
IW-10	IW-10	15-Aug-01	55	62														
IW-10	IW-10	03-Aug-05										1						
IW-10	OC-IW-10	09-Nov-11										1						
IW-10	OC-IW-10	19-Nov-13		2					1	2								
IW-10	OC-IW-10	20-Nov-13	2									12						
IW-11	IW11	21-Nov-90	2	2														
IW-11	IW-11	17-Dec-91				7				1								
IW-11	IW-11	10-Nov-92							22									
IW-11	IW-11	18-Dec-96		64						1								
IW-11	IW-11	24-Jan-97	36			21			1	1								
IW-11	IW-11	15-Mar-04														1		
IW-11	IW-11	10-May-06								1								
IW-11	IW-11	06-Sep-13		1														
IW-12	IW12	21-Nov-90	2	2					2									
IW-12	IW-12	18-Dec-96	36						1									
IW-12	IW-12	24-Jan-97		64		21				2								
IW-12	IW-12	15-Mar-04														1		
IW-12	IW-12	10-May-06								1								
IW-12	IW-12	06-Sep-13		1														
IW-13	IW13	21-Nov-90	2	2					2									
IW-13	IW13-REP DUP	21-Nov-90		2					2									
IW-13	IW-13	18-Dec-96				21				1								
IW-13	IW-13	24-Jan-97	36	64					1	1								
IW-13	IW-13	15-Mar-04														1		
IW-13	IW-13	10-May-06								1								
IW-13	IW-13	06-Sep-13		1														
IW-2	1W2	30-Sep-03		65						7								
IW-3	IW3	03-Apr-03		1														
IW-3	1W3	30-Sep-03		65						7								
IW-4	IW-04	10-Nov-92	36	65		21			23	3								
IW-6	BLIND DUPLICATE	24-Jul-97	1	1														
IW-6	IW-6	24-Jul-97	1	1														
IW-6	IW-6	21-Oct-98	3															
IW-6	IW-6	18-Feb-99		2														
IW-6	IW-6	26-May-99									1							
IW-6	IW-6	06-Aug-99									1							
IW-6	IW-6	10-Aug-00			1				4	5	5		5					
IW-6	IW-6	23-May-01	2							6								
IW-6	IW-6 HPC	23-May-01								1								
IW-6	IW-6	16-Aug-01	55	62														
IW-6	IW-6	03-Aug-05										1						
IW-6	OC-IW-6	09-Nov-11										1						
IW-6	OC-IW-6	20-Nov-13	2	2					1	2		12						
LPB-40	GW-LPB-40	18-Dec-03	2												3	1		
LPB-44	GW-LPB-44	18-Dec-03	2												3	1		
LPB-44	GW-LPB-44 DUP	18-Dec-03	2												3			
LPB-47	GW-LPB-47	18-Dec-03	2												3	1		
M-01/L-06C	OC-M01L6C	19-Dec-13														1		
M-01/L-06C	OC-M01L6C	25-Feb-14														1		
M-02/L-07E	Marshall	30-Aug-02							4	4								

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Olin Chemical Superfund Site
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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
M-02/L-07E	OC-M02L07	05-Dec-08		8														
M-02/L-07E	OC-M2L7	30-Mar-10																1
M-02/L-07E	OC-M02L07	12-Jul-11	71											2	3			
M-02/L-07E	OC-M02L07	11-Sep-13		5														
M-02/L-07E	OC-M02L07	19-Dec-13							1									
M-02/L-07E	OC-M02L07	19-Feb-14		73					3	5						1		
M-02/L-09A	OC-M02L9A	13-Oct-11														1		
M-03/L-02	OC-M03L02	19-Dec-13														1		
M-03/L-02	OC-M03L02	19-Feb-14														1		
M-03/L-02F	OC-M03L2F	19-Dec-13														1		
M-03/L-02F	OC-M03L2F	19-Feb-14														1		
M-03/L-102	OC-M03L102	12-Oct-11														1		
M-13/L-03G	OC-M13L3G	12-Oct-11														1		
M-14/L-02B	234 Chestnut-14/2B	29-Oct-03	3	1		2			17	5		6						
M-14/L-02B	234 Chestnut-14/2B DUP	29-Oct-03	3	1					17	5		6						
M-14/L-02B	OC-M14L2B	07-Oct-08		8														
M-14/L-02B	OC-M14L2B	30-Mar-10																1
M-14/L-02B	OC-M14L2B	12-Jul-11	77	71										2	3			
M-14/L-02B	OC-M14L2B	18-Dec-13							1									
M-14/L-02B	OC-M14L2B	19-Feb-14							3	5						1		
M-14/L-05	OC-M14L05	12-Oct-11														1		
M-15/L-02C	86 BUTTERS ROW 15/2C	30-Oct-03	3	1		2			17	5		6						
M-15/L-02C	86 Butters Row 15/2C DUP	30-Oct-03	3	1					17	5		6						
M-15/L-02C	OC-M15L2C	07-Oct-08		8														
M-15/L-02C	OC-M15L2C	30-Mar-10																1
M-15/L-02C	OC-M15L2C	13-Jul-11	71											2	3			
M-15/L-02C	OC-M15L2C	11-Sep-13		5														
M-15/L-02C	OC-M15L2C	18-Dec-13							1									
M-15/L-02C	OC-M15L2C	18-Feb-14		73					3	5						1		
M-24/L-116	BAKER	01-Oct-96	61	17		16			16	1								
M-24/L-116	Baker	24-Apr-98								1								
M-24/L-116	Baker	11-Nov-99							7	9								
M-24/L-116	OC-M24L116	23-Dec-13														1		
M-24/L-116	OC-M24L116	20-Feb-14														1		
M-24/L-117	DW10DUP9	15-Oct-90		34														
M-24/L-117	DW9	15-Oct-90	6	44		19		2	1	5								
M-24/L-117	POPA	14-Aug-96	59	17		16			16									
M-24/L-117	Poppa	23-Apr-98								1								
M-24/L-117	Ciccariello 1	10-Mar-04							7	10						1		
M-24/L-117	Ciccariello 2 DUP	10-Mar-04							7	10						1		
M-24/L-33A	900 Main-24/33A	29-Oct-03	78	68	18	2			20	10		6						
M-24/L-33A	900 Main-24/33A DUP	29-Oct-03	78	68	18				20	10		6						
M-24/L-54	DW7	15-Oct-90	3	11		19		2	1	4								
M-24/L-54	CANNING	13-Aug-96	1			8			20	3								
M-24/L-54	OC-M24L54	09-Oct-08		8														
M-24/L-54	OC-M24L54 DUP	09-Oct-08		8														
M-24/L-54	OC-M24L54	10-Nov-09	71											2	3			
M-24/L-54	OC-M24L54-DUP	10-Nov-09	71											2	3			
M-24/L-54	OC-M24L54	11-Sep-13		5														
M-24/L-54	OC-M24L54	19-Dec-13							1									
M-24/L-54	OC-M24L54	25-Feb-14		73					3	5						1		
M-24/L-63	DW1	15-Oct-90	3	11		19		2	1	4								

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
M-24/L-63	DW1A DUP	15-Oct-90	3	11		19		2	1	4								
M-24/L-63	SPERANZA	14-Aug-96	1			8			16	1								
M-24/L-63	Speranza 1	29-Jan-04							4	5								
M-24/L-63	Speranza 2 DUP	29-Jan-04							4	5								
M-24/L-63	OC-M24L63	07-Oct-08		8														
M-24/L-63	OC-M24L63	30-Mar-10																1
M-24/L-63	OC-M24L63	12-Jul-11	71											2	3			
M-24/L-63	OC-M24L63	11-Sep-13		5														
M-24/L-63	OC-M24L63	19-Dec-13							1									
M-24/L-63	OC-M24L63	18-Feb-14		73					3	5						1		
M-24/L-64	DW3	15-Oct-90	3	11		19		2	1	4								
M-24/L-64	HARRIS	13-Aug-96	1			8			16	1								
M-24/L-64	Trites 1	29-Jan-04							4	5								
M-24/L-64	Trites 2 DUP	29-Jan-04							4	5								
M-24/L-64	OC-M24L64	20-Jan-09		8														
M-24/L-64	OC-M24L64	08-Jul-10																1
M-24/L-64	OC-M24L64	12-Jul-11	71											2	3			
M-24/L-64	OC-M24L64	11-Sep-13		5														
M-24/L-64	OC-M24L64	18-Dec-13							1									
M-24/L-64	OC-M24L64	19-Feb-14		73					3	5						1		
M-24/L-65	DW5	15-Oct-90	3	11		26		2	1	5								
M-24/L-65	DUP.	21-May-97	3	1					16									
M-24/L-65	M-24/L-65 WELL	21-May-97	3	1					16									
M-24/L-65	Syring 1	29-Jan-04							4	5								
M-24/L-65	Syring 2 DUP	29-Jan-04							4	5								
M-24/L-65	OC-M24L65	12-Jul-11	77	71										2	3			
M-24/L-65	OC-M24L65	18-Dec-13							1									
M-24/L-65	OC-M24L65	18-Feb-14							2	5						1		
M-24/L-66	DW4	15-Oct-90	3	11		19		2	1	5								
M-24/L-66	DUP#2	13-Aug-96	1			8			20	3								
M-24/L-66	KRUSE	13-Aug-96	1			8			20	3								
M-24/L-66	OC-M24L66	05-Dec-08		8														
M-24/L-66	OC-M24L66	30-Mar-10																1
M-24/L-66	OC-M24L66	12-Jul-11	77	71										2	3			
M-24/L-66	OC-M24L66	18-Dec-13							1									
M-24/L-66	OC-M24L66	18-Feb-14							2	5						1		
M-24/L-72A	DW2	15-Oct-90	3	11		19		2	1	5								
M-24/L-72A	INGRAM	14-Aug-96	1			8			16	1								
M-24/L-72A	Ingram 1	29-Jan-04							4	5								
M-24/L-72A	Ingram 2 DUP	29-Jan-04							4	5								
M-24/L-72A	OC-M24L72A	08-Oct-08		8														
M-24/L-72A	OC-M24L72A	30-Mar-10																1
M-24/L-72A	OC-M24L72A	13-Jul-11	77	71										2	3			
M-24/L-72A	OC-M24L72A	18-Dec-13							1									
M-24/L-72A	OC-M24L72A	18-Feb-14							2	5						1		
M-24/L-74	Syring	20-Jan-04	2															
M-24/L-87A	DW8	15-Oct-90	3	11		19		2	1	4								
M-24/L-87A	LESSARD	13-Aug-96	1			8			16									
M-24/L-87A	Lassard	23-Apr-98								1								
M-24/L-87A	Lessard 1	29-Jan-04							4	5								
M-24/L-87A	Lessard 2 DUP	29-Jan-04							4	5								
M-24/L-87A	OC-M24L87	07-Oct-08		8														

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Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
M-24/L-87A	OC-M24L87	30-Mar-10																1
M-24/L-87A	OC-M24L87	12-Jul-11	77	71										2	3			
M-24/L-87A	OC-M24L87	18-Dec-13							1									
M-24/L-87A	OC-M24L87	18-Feb-14							3	5						1		
M-24/L-94	DW6	15-Oct-90	2	10		19		2	1	4								
M-24/L-94	SULLIVAN	13-Aug-96	1			8			3									
M-24/L-94	SULLIVAN	23-Apr-98								1								
M-24/L-94	SULLIVAN	14-Sep-99								1								
M-24/L-94	23 Cook Ave - 24/94	02-Feb-05	2	1		2			17	5		6						
M-24/L-94	23 Cook Ave - 24/94 Dup	02-Feb-05	2						3	5		6						
M-24/L-94	OC-M24L94	05-Dec-08		8														
M-24/L-94	OC-M24L94	10-Nov-09	71											2	3			
M-24/L-94	OC-M24L94	11-Sep-13		5														
M-24/L-94	OC-M24L94	18-Dec-13							1									
M-24/L-94	OC-M24L94	18-Feb-14		73					3	5						1		
M-25/L-03	DW2	16-Sep-91	52					2	17	9						1		
M-25/L-03	OC-M25L03	16-May-12							2	5						1		
M-25/L-04	DW3	16-Sep-91	2					2	1	4						1		
M-25/L-04	GATTA	13-Aug-96	59	17		16			16	2								
M-25/L-04	GATTA	20-Oct-99							7	9								
M-25/L-05	905 Main St	27-May-04	2						7	9					3	1		
M-25/L-06	DW6	16-Sep-91	52					2	19	13						1		
M-25/L-07	DW1	16-Sep-91	2					2	1	3						1		
M-25/L-07	DW1A DUP	16-Sep-91	2					2	1	3						1		
M-25/L-07	SPINAZOLA	14-Aug-96	59	17		16			23	8								
M-25/L-08-IN	DW4	16-Sep-91	2					2	1	4						1		
M-25/L-08-IN	DUP#1	14-Aug-96	59	17		16			23	8								
M-25/L-08-IN	GRASSO	14-Aug-96	59	17		16			23	8								
M-25/L-08-OUT	DW5	16-Sep-91	52					2	19	13						1		
M-27/L-14C	OC-M27L14C	07-Oct-08		8														
M-27/L-14C	OC-M27L14C	01-Jul-10																1
M-27/L-14C	OC-M27L14C	19-Jul-11	71						2					2	3			
M-27/L-14C	OC-M27L14C	11-Sep-13		78					3	5						1		
M-38/L-01	850 Main-38/1	29-Oct-03	78	68	18	2			20	10		6						
M-38/L-01	850 Main-38/1 DUP	29-Oct-03	78	68	18				20	10		6						
M-38/L-01	850 MAIN ST	02-Dec-03														1		
M-38/L-01	850 MAIN ST DUP	02-Dec-03														1		
MB-1	MB-1	07-Oct-96							2	3								
MB-2	MB-2	11-Oct-96							2	3								
MB-3	MB-3	12-Nov-96							23	3								
MG-02-A	MG-2B	24-Apr-98							7	8								
MG-02-C	MG-2	24-Apr-98							7	8								
ML-1 #05	OC-ML1 PORT 5	07-Mar-13							4	3								
ML-1 #10	OC-ML-1 PORT 10	26-Oct-12							4	2								
ML-2 #05	OC-ML-2 PORT 5	06-Nov-12							4	2								
ML-2 #10	OC ML2 Port 10	12-Feb-13							4	3								
MP-1 #02	MP-1 #02	23-May-96							1	2								
MP-1 #02	MP-1 #02	11-Aug-98							23	6								
MP-1 #03	MP-1 #03	11-Aug-98								1								
MP-1 #03	MP1-#3	25-Mar-03							24	13								
MP-1 #04	MP-1 #04	11-Aug-98								1								
MP-1 #04	MP1-#4	25-Mar-03							18	7								

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Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
MP-1 #04	OC-MP-1 #4	09-Feb-12							6	6								
MP-1 #05	MP-1 #05	10-Aug-98								1								
MP-1 #05	MP1-#5	25-Mar-03							18	7								
MP-1 #05	OC-MP-1 #5	09-Feb-12							6	6								
MP-1 #07	MP-1 #07	10-Aug-98								1								
MP-1 #07	MP1-#7	25-Mar-03							18	7								
MP-1 #07	OC-MP-1 #7	09-Feb-12							6	6								
MP-1 #08	MP-1 #08	10-Aug-98								1								
MP-1 #08	MP-1-8	19-Jan-00	62	66	16	23	7	12	3	13		12	21					
MP-1 #08	MP-1-8	13-May-01							17	5								
MP-1 #08	MP-1-8 1245	13-May-01							1									
MP-1 #08	OC-MP-1 #8	09-Feb-12							6	6								
MP-1 #10	MP-1 #10	22-May-96								1								
MP-1 #10	MP-1 #10	10-Aug-98							24	6								
MP-1 #11	MP-1 #11	22-May-96								3								
MP-1 #11	MP-1 #11	10-Aug-98							24	6								
MP-1 #12	MP-1 #12	22-May-96							24	6								
MP-1 #13	MP-1 #13	22-May-96								1								
MP-1 #13	MP-1 #13	10-Aug-98							24	6								
MP-1 #14	MP-1 #14	22-May-96							18	3								
MP-1 #14	MP1-14	04-Sep-03	2															
MP-1 #14	OC-MP-1 #14	09-Feb-12							6	6								
MP-1 #16	MP-1 #16	10-Aug-98							1	1								
MP-1 #16	MP-1-16	28-Jan-00	62	66	16	23	7	12	26	23		12	21					
MP-1 #17	MP-1 #17	22-May-96								1								
MP-1 #17	MP1-#17	25-Mar-03							18	7								
MP-1 #17	MP-1 PORT 17	09-Apr-03														1		
MP-1 #17	MP-1 Port 17	03-May-05							6	6								
MP-1 #18	MP-1 #18	22-May-96								1								
MP-1 #18	MP-1 #18	10-Aug-98							23	3								
MP-1 #18	MP-1-OVR	24-Mar-04							1	5					3			
MP-1 #18	MP1-OVR	24-Mar-04														1		
MP-1 #18	MP-1-Port 18	25-May-05	2															
MP-2 #01	MP-2 #01	12-Aug-98								1								
MP-2 #01	MP-2 DAPL	25-Jul-02	4	7						2	13							
MP-2 #01	MLP2-#1	27-Mar-03							18	2								
MP-2 #01	MP2-1	31-Jul-03								5								
MP-2 #01	DAPL-Li	09-Mar-04							1									
MP-2 #01	MP2-DAPL	30-Mar-04		1											3			
MP-2 #01	MP2-Port1	24-May-05	2															
MP-2 #01	OC-MP-2-1	12-Nov-07								1								
MP-2 #01	OC-MP-2 #1	10-Jan-12							6	6								
MP-2 #02	MP-2 #02	12-Aug-98								1								
MP-2 #02	MLP2-#2	27-Mar-03							24	13								
MP-2 #02	MP2-PORT2	23-Aug-04							1									
MP-2 #03	MP-2 #03	12-Aug-98								1								
MP-2 #03	MLP2-#3	27-Mar-03							24	13								
MP-2 #04	MP-2 #04	12-Aug-98								1								
MP-2 #04	MLP2-#4	27-Mar-03							18	7								
MP-2 #04	OC-MP-2-4	12-Nov-07								1								
MP-2 #04	OC-MP-2 #4	10-Jan-12							2	4								
MP-2 #04	OC-MP-2 PORT 4	02-Nov-12							4	2								

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MP-2 #06	MP-2 #06	12-Aug-98								1								
MP-2 #06	MLP2-#6	27-Mar-03							18	7								
MP-2 #06	MP2-DIFF	30-Mar-04													3	1		
MP-2 #06	OC-MP-2 #6	10-Jan-12							2	3								
MP-2 #06	OC MP2 Port 6	30-Jan-13							4	3								
MP-2 #08	MP-2 #08	11-Aug-98								1								
MP-2 #08	MLP2-#8	27-Mar-03							24	13								
MP-2 #09	MP-2 #09	11-Aug-98								1								
MP-2 #09	MLP2-#9	27-Mar-03							18	2								
MP-2 #09	MP-2 PORT 9	09-Apr-03														1		
MP-2 #09	MP2-9	31-Jul-03								5								
MP-2 #09	MP2-PORT9	23-Aug-04							1									
MP-2 #09	MP2-Port9	24-May-05	2															
MP-2 #09	OC-MP-2 #9	10-Jan-12							6	6								
MP-2 #10	MP-2 #10	11-Aug-98								1								
MP-2 #10	MLP2-#10	27-Mar-03							18	7								
MP-2 #10	MLP50-#1 DUP	27-Mar-03							18	7								
MP-2 #10	MLP-2-10	19-Jul-10							6	6								
MP-2 #11	MP-2 #11	11-Aug-98								1								
MP-2 #11	MLP2-#11	27-Mar-03							18	7								
MP-2 #11	MP2-PORT11	23-Aug-04							1									
MP-2 #11	MP2-Port11	24-May-05	2															
MP-2 #11	OC-MP-2 #11	10-Jan-12							6	6								
MP-2 #12	MP-2 #12	20-May-96								1								
MP-2 #12	MLP2-#12	27-Mar-03							24	13								
MP-2 #12	DZW-Li	09-Mar-04							1									
MP-2 #13	MP-2 #13	11-Aug-98								1								
MP-2 #13	MLP2-#13	27-Mar-03							22	9								
MP-2 #13	OC-MP2#13	21-Nov-13							2	4								
MP-2 #14	MP-2 #14	20-May-96								1								
MP-2 #14	MLP2-#14	27-Mar-03							24	13								
MP-2 #15	MP-2 #15	11-Aug-98								1								
MP-2 #15	MLP2-#15	27-Mar-03							18	7								
MP-2 #15	MP-2 PORT 15	09-Apr-03														1		
MP-2 #15	MLP-2-15	19-Jul-10							6	6								
MP-2 #16	MP-2 #16	20-May-96								1								
MP-2 #16	MLP2-#16	27-Mar-03							18	7								
MP-2 #16	OC-MP-2 #16	10-Jan-12							6	6								
MP-3 #02	MP-3 #02	13-Aug-98								1								
MP-3 #02	MLP3-#2	26-Mar-03							24	13								
MP-3 #03	MP-3 #03	22-May-96							1	1								
MP-3 #03	MP-3 #03	13-Aug-98							17	3								
MP-3 #03	OC-MP-3 #3	11-Jan-12							6	6								
MP-3 #04	MP-3 #04	13-Aug-98								1								
MP-3 #04	MLP3-#4	26-Mar-03							18	7								
MP-3 #04	OC-MP-3 #4	11-Jan-12							6	6								
MP-3 #05	MP-3 #05	21-May-96							1	1								
MP-3 #05	MP-3 #05	13-Aug-98							17	3								
MP-3 #05	MP3-5	08-Sep-03	2															
MP-3 #05	OC-MP-3 #5	11-Jan-12							6	6								
MP-3 #06	MP-3 #06	13-Aug-98								1								
MP-3 #06	MLP3-#6	26-Mar-03							23	8								

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MP-3 #06	MP3-DIFF	31-Mar-04							1	5								
MP-3 #06	MP-3-Port 6	24-May-05	2															
MP-3 #08	MP-3 #08	13-Aug-98								1								
MP-3 #08	MP3-#8	26-Mar-03							24	13								
MP-3 #09	MP-3 #09	13-Aug-98								1								
MP-3 #09	MP3-#9	26-Mar-03							24	13								
MP-3 #10	MP-3 #10	21-May-96							6	1								
MP-3 #10	MP-3 #10	12-Aug-98							18	6								
MP-3 #11	MP-3 #11	12-Aug-98								1								
MP-3 #11	MP3-#11	26-Mar-03							24	13								
MP-3 #12	MP-3 #12	21-May-96							24	6								
MP-3 #13	MP-3 #13	21-May-96							6	1								
MP-3 #13	MP-3 #13	12-Aug-98							12	3								
MP-3 #13	OC-MP-3 #13	11-Jan-12							6	6								
MP-3 #14	MP-3 #14	21-May-96							24	6								
MP-3 #15	MP-3 #15	21-May-96							6	1								
MP-3 #15	MP-3 #15	12-Aug-98							18	6								
MP-3 #16	MP-3 #16	21-May-96							24	6								
MP-3 #17	MP-3 #17	21-May-96							6	3								
MP-3 #17	MP-3 #17	12-Aug-98							18	6								
MP-3 #18	MP-3 #18	21-May-96							23	3								
MP-3 #18	MP3-OVR	30-Mar-04							1	5						1		
MP-3 #18	MP-3-Port 18	24-May-05	2															
MP-3 #19	MP-3 #19	12-Aug-98								1								
MP-3 #19	MP3-#19	26-Mar-03							18	7								
MP-3 #19	MP-3 PORT 19	09-Apr-03														1		
MP-3 #19	OC-MP-3 #19	11-Jan-12							6	6								
MP-3 #20	MP-3 #20	21-May-96							24	6								
MP-4 #01	MLP-4-#1	28-Mar-03							24	13								
MP-4 #01	MP4-1	08-Sep-03	2															
MP-4 #03	MLP-4-#3	28-Mar-03							18	7								
MP-4 #03	OC-MP-4 #3	09-Jan-12							6	6								
MP-4 #05	MLP-4-#5	28-Mar-03							18	7								
MP-4 #05	MLP-4-5	21-Jul-10							6	6								
MP-4 #08	MP-4 #8	29-Jun-00							24	10								
MP-4 #09	MP-4 #9	29-Jun-00							24	10								
MP-4 #10	MLP4-#10	27-Mar-03							18	7								
MP-4 #10	MLP-50-#2 DUP	28-Mar-03							18	7								
MP-4 #10	MP4-DIFF	09-Apr-04													3	1		
MP-4 #10	MP-4-Port 10	25-May-05	2															
MP-4 #10	OC-MP-4 #10	09-Jan-12							6	6								
MP-4 #11	DUP A	28-Jun-00	43															
MP-4 #11	MP-4 #11	28-Jun-00	43															
MP-4 #11	MLP4-#11	27-Mar-03							24	13								
MP-4 #13	MP-4 #13	28-Jun-00	43															
MP-4 #13	MLP4-#13	27-Mar-03							18	7								
MP-4 #13	MP-4 PORT 13	09-Apr-03														1		
MP-4 #13	OC-MP-4 #13	09-Jan-12							6	6								
MP-4 #14	MP-4 #14	28-Jun-00	43															
MP-4 #14	MLP4-#14	27-Mar-03							23	8								
MP-4 #14	MP4-OVR	09-Apr-04							1	5					3	1		
MP-4 #14	MP4-Port 14	25-May-05	2															

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
MP-5	CMP-5	28-Sep-05							8	14								
MP-5	CMP-5 DUP	28-Sep-05							8	14								
MP-5 #05	MP-5-PORT5	12-Oct-05							8	12								
MP-5 #06	MP-5-PORT6	11-Oct-05							8	12								
MP-5 #09	MP-5-PORT9	11-Oct-05							8	12								
MP-5 #11	MP-5-PORT11	12-Oct-05							8	12								
MP-5 #12	MP-5-PORT12	11-Oct-05							8	12								
MW-203D	MW-203D	03-Apr-03														1		
MW-203S	SD-MW-203S	03-Apr-03														1		
MW-3	BLIND DUPLICATE	29-Apr-98							7	8								
MW-3	MW-03	29-Apr-98							7	8								
MW-5	MW-05	29-Apr-98							7	8								
MW-8D	MW-08D	29-Apr-98							7	8								
OB-1	OB-01	01-May-89	2	7														
OB-1	OB1	01-May-90							2	3								
OB-2	OB2	01-May-90							2	3								
OB-3	OB-03	01-May-89	2	7														
OB-3	OB3	01-May-90							2	3								
OB-4	OB-04	01-May-89	2	7														
OB-4	OB4	01-May-90							2	3								
P5	P5	23-May-03		1														
P5	P5	29-Sep-03		65						7								
Plant B Influent	Plant B Influent	09-Dec-97							1	2	5	4	4					
Plant B Influent	PL-B GW	02-Sep-98	1															
Plant B Influent	PL-B GW	04-Nov-98		1														
Plant B Influent	PL-B	12-Feb-03		1														
Plant B Influent	PL-B	19-Mar-03		3														
Plant B Influent	PL-B Groundwater	21-Dec-05	1		1													
Plant B Influent	PL-B Groundwater	15-Mar-06		1														
Plant B Influent	PL-B Groundwater	10-May-06	43	29														
Plant B Influent	OC-Inf 111908	19-Nov-08								1								
Plant B Influent	INF 11310	03-Nov-10														1		
Plant B Influent	OC-INF 042011	20-Apr-11	2															
Plant B Influent	OC-Influent exclusion list	18-Jul-12									1							
Plant B Influent	OC-INF 042313	23-Apr-13	1															
Plant B Influent	INF 111413	14-Nov-13								1								
Plant B Influent	Inf	15-Nov-13							6	11								
Plant B Influent	OC-INF 050814	08-May-14	28	32		7			10	1								
Plant B Influent	INF 052714	27-May-14		6					4	4								
Plant B Influent	OC- Inf 060414	04-Jun-14									1							
PW-1	PW-01	01-May-89	2	7					1	3								
PW-2	PW-02	19-May-88							1									
PW-2	PW-02	08-Dec-88								3								
PW-2	PW-02	01-May-89	2	7														
PZ-16RR	OC-PZ-16RR	22-Aug-12								1								
PZ-16RR	OC-PZ-16RR	04-Apr-14							2	4								
PZ-17RR	OC-PZ-17RR	21-Aug-12								1								
PZ-17RR	OC-PZ-17RR	14-Nov-12							2	4								
PZ-18	OC-PZ-18R	13-May-09							2	4								
PZ-18R	OC-PZ-18R	21-Aug-12								1								
PZ-18R	OC-PZ-18R	21-May-14							2	4								
PZ-24	PZ-24	22-Sep-05							1	2								

Table 1.2-4
Summary of Recent Data of Wells Not Sampled Under OU3
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Location Name	Field Sample ID	Field Sample Date	Volatiles	Semivolatiles	PAHs	Pesticides	PCBs	Herbicides	Metals	Inorganics/ Physical	TPH	VPH	EPH	Formaldehyde	Hydrazine	NDMA	Opex/ Kempore	Phthalic Anhydride
PZ-24	OC-PZ-24	21-Aug-12								1								
PZ-24	OC-PZ-24	01-Apr-14							2	4								
PZ-25	PZ-25	22-Sep-05							1	2								
PZ-25	OC-PZ-25	20-Aug-12								1								
PZ-25	OC-PZ-25	20-May-14							2	4								
PZ-W1	PZ-W1	10-May-04							2									
PZ-W2	PZ-W2	08-Dec-05							5	6								
PZ-W3	PZ-W3	08-Dec-05							5	6								
SB-1	SB-1	26-Aug-98							24	5								
SB-2	SB-2	28-Aug-98	59						24	6								
SB-2	SB-2 DUP	28-Aug-98	59						24	6								
SB-3	SB-3	31-Aug-98	59	67														
SB-3	SB-3	01-Sep-98							24	5								
SB-4	SB-4	02-Sep-98	59	67					24	5								
SB-5	SB-5	24-Aug-98							23	5								
SB-6	SB-6	03-Sep-98	59	67					24	5								
SL-7	SL-7	23-Apr-98								1								
SL-7	SL-7	09-Jul-98								1								
SL-8	SL-8	23-Apr-98								1								
SVEMW-9	SVEMW-9	22-Jul-04	2									14						
TOWN PARK	TOWN PARK	03-Sep-92	63			4		2	14	5						1		
TOWN PARK	TOWN PARK	25-Feb-97							1									
TOWN PARK	TOWN PARK	24-Jun-97								1								
TOWN PARK	Town Park	26-Feb-03								2						1		
TOWN PARK	Town Dup	16-Apr-03							7	8								
TOWN PARK	Town Park	16-Apr-03							7	8								
W-10	W10 (B1-D)	23-Nov-99				2												
W-10	W10 (B1-D) Duplicate	23-Nov-99				2												
W-10	W-10	21-Jan-00	37	66					22	9		12	22					

Notes:
Numbers indicates the number of analytes analyzed for each group.
Low level NDMA analysis began in 2002.

Prepared by/Date: MH 04/29/09
Prepared by/Date: PHT 04/30/09

Table 2.1-1
Summary Statistics of Analytical Results in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter Name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number Exceeding Tap Water RSL Nov 2013	EPA MCL	Number Exceeding EPA MCL	EPA SMCL	MassDEP ORSG
Volatile Organics (mg/L)										
1,1,1,2-Tetrachloroethane	0 / 408	0.001 : 0.25		0.00132598	0.0005	0		0		
1,1,1-Trichloroethane	2 / 408	0.001 : 0.25	0.0004 - 0.0038	0.001330147	7.5	0	0.2	0		
1,1,2,2-Tetrachloroethane	0 / 408	0.0005 : 0.12		0.000650735	0.000066	0		0		
1,1,2-Trichloro-1,2,2-Trifluoroethane	3 / 408	0.001 : 0.25	0.00081 - 0.015	0.001362525	53	0		0		210
1,1,2-Trichloroethane	0 / 408	0.001 : 0.25		0.00132598	0.00024	0	0.005	0		
1,1-Dichloroethane	40 / 408	0.001 : 0.05	0.00021 - 0.23	0.001584118	0.0024	6		0		0.07
1,1-Dichloroethene	11 / 408	0.001 : 0.25	0.0002 - 0.0011	0.001321716	0.26	0	0.007	0		
1,1-Dichloropropene	0 / 408	0.001 : 0.25		0.00132598		0		0		
1,2,3-Trichlorobenzene	0 / 408	0.001 : 0.25		0.00132598	0.0052	0		0		
1,2,3-Trichloropropane	0 / 408	0.001 : 0.25		0.00132598	0.00000065	0		0		
1,2,4-Trichlorobenzene	10 / 408	0.001 : 0.25	0.00026 - 0.002	0.001336422	0.00099	3	0.07	0		
1,2,4-Trimethylbenzene	16 / 408	0.001 : 0.25	0.00021 - 0.015	0.001446324	0.015	0		0		
1,2-Dibromo-3-chloropropane	0 / 408	0.005 : 1.2		0.006507353	0.00000032	0	0.0002	0		
1,2-Dibromoethane	0 / 408	0.001 : 0.25		0.00132598	0.0000065	0	0.00005	0		
1,2-Dichlorobenzene	19 / 408	0.001 : 0.05	0.00021 - 0.2	0.001727034	0.28	0	0.6	0		
1,2-Dichloroethane	43 / 408	0.001 : 0.25	0.00029 - 0.023	0.001730123	0.00015	43	0.005	11		
1,2-Dichloropropane	0 / 408	0.001 : 0.25		0.00132598	0.00038	0	0.005	0		
1,3,5-Trimethylbenzene	6 / 408	0.001 : 0.25	0.00026 - 0.0023	0.001322966	0.087	0		0		
1,3-Dichlorobenzene	4 / 408	0.001 : 0.25	0.00061 - 0.0024	0.001330245		0	0.6	0		
1,3-Dichloropropane	0 / 408	0.001 : 0.25		0.00132598	0.29	0		0		
1,4-Dichlorobenzene	19 / 408	0.001 : 0.25	0.00035 - 0.005	0.001353088	0.00042	15	0.075	0		
1,4-Dioxane	1 / 189	0.05 : 12	0.085 - 0.085	0.065793651	0.00067	1		0		0.003
2,2-Dichloropropane	0 / 408	0.001 : 0.25		0.00132598		0		0		
2,4,4-Trimethyl-1-pentene	71 / 408	0.001 : 0.25	0.00051 - 0.55	0.007756544		0		0		
2,4,4-Trimethyl-2-pentene	50 / 408	0.001 : 0.25	0.00038 - 0.16	0.003031397		0		0		
2-Butanone	9 / 407	0.01 : 2.5	0.0013 - 0.025	0.013062162	4.9	0		0		4
2-Chlorotoluene	2 / 408	0.001 : 0.25	0.0021 - 0.0022	0.001326716	0.18	0		0		
2-Hexanone	0 / 407	0.01 : 2.5		0.013169533	0.034	0		0		
4-Chlorotoluene	2 / 408	0.001 : 0.25	0.00084 - 0.00087	0.001320368	0.19	0		0		
4-iso-Propyltoluene	3 / 408	0.001 : 0.25	0.00037 - 0.00043	0.001325319		0		0		
4-Methyl-2-pentanone	0 / 407	0.01 : 2.5		0.013169533	1	0		0		0.35
Acetic acid, methyl ester	0 / 408	0.02 : 5		0.026519608	16	0		0		
Acetone	11 / 407	0.05 : 12	0.0048 - 0.77	0.068237838	12	0		0		6.3
Benzene	48 / 408	0.001 : 0.05	0.0002 - 0.11	0.001667279	0.00039	37	0.005	11		
Bromobenzene	1 / 408	0.001 : 0.25	0.00021 - 0.00021	0.00132527	0.054	0		0		
Bromochloromethane	13 / 408	0.001 : 0.25	0.0002 - 0.0016	0.001328211	0.083	0		0		
Bromodichloromethane	23 / 408	0.0005 : 0.25	0.00022 - 0.0075	0.001124338	0.00012	23	0.08	0		
Bromoform	21 / 408	0.001 : 0.25	0.00059 - 0.055	0.001852108	0.0079	11	0.08	0		
Bromomethane	0 / 408	0.002 : 0.5		0.002651961	0.007	0		0		0.01
Butane, 2-methoxy-2-methyl-	5 / 408	0.005 : 1.2	0.00034 - 0.002	0.006491201		0		0		0.09
Carbon disulfide	74 / 408	0.01 : 2.5	0.00025 - 0.024	0.011999387	0.72	0		0		
Carbon tetrachloride	2 / 408	0.001 : 0.25	0.003 - 0.0031	0.00133848	0.00039	2	0.005	0		
Chlorobenzene	23 / 408	0.001 : 0.05	0.00036 - 1.4	0.007297377	0.072	3	0.1	2		
Chlorodibromomethane	21 / 408	0.0005 : 0.12	0.00024 - 0.17	0.001222108	0.00015	21	0.08	1		
Chloroethane	12 / 408	0.002 : 0.1	0.00029 - 1.8	0.009618088	21	0		0		
Chloroform	47 / 408	0.001 : 0.25	0.0002 - 0.093	0.002957377	0.00019	47	0.08	4		0.07
Chloromethane	20 / 408	0.00055 : 0.5	0.0002 - 0.003	0.002601446	0.19	0		0		
Cis-1,2-Dichloroethene	70 / 408	0.001 : 0.25	0.00025 - 0.19	0.00447598	0.028	10	0.07	7		
cis-1,3-Dichloropropene	0 / 408	0.0004 : 0.1		0.000530392		0		0		
Cyclohexane	7 / 408	0.001 : 2.5	0.0002 - 0.0084	0.012682255	13	0		0		
Dibromomethane	18 / 408	0.001 : 0.25	0.00033 - 0.011	0.00146625	0.0079	3		0		
Dichlorodifluoromethane	0 / 408	0.001 : 0.25		0.00132598	0.19	0		0		1.4
Diethyl ether	13 / 408	0.001 : 2.5	0.0002 - 0.0043	0.01266826	3.1	0		0		
Ethyl benzene	25 / 408	0.001 : 0.05	0.00021 - 0.26	0.002244951	0.0013	18	0.7	0		
Ethyl-t-Butyl Ether	0 / 408	0.005 : 1.2		0.006507353		0		0		

Table 2.1-1
Summary Statistics of Analytical Results in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter Name	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number Exceeding Tap Water RSL Nov 2013	EPA MCL	Number Exceeding EPA MCL	EPA SMCL	MassDEP ORSG
Hexachlorobutadiene	0	/	408	0.0004	:	0.1				0.000530392	0.00026	0		0		
Isopropyl ether	2	/	408	0.01	:	2.5	0.0039	-	0.0046	0.013182598	1.5	0		0		
Isopropylbenzene	8	/	408	0.001	:	0.25	0.00034	-	0.0047	0.001331569	0.39	0		0		
Methyl cyclohexane	5	/	408	0.001	:	2.5	0.0024	-	0.0086	0.012714461		0		0		
Methyl Tertbutyl Ether	105	/	408	0.001	:	0.25	0.00019	-	0.039	0.002017328	0.012	3		0		0.07
Methylene chloride	28	/	408	0.001	:	0.5	0.0014	-	0.27	0.003082353	0.0099	9	0.005	15		
Naphthalene	7	/	408	0.005	:	1.2	0.00035	-	0.013	0.006461789	0.00014	7		0		0.14
n-Butylbenzene	2	/	408	0.001	:	0.25	0.0008	-	0.0011	0.00132451	0.78	0		0		
Propylbenzene	11	/	408	0.001	:	0.25	0.00029	-	0.0056	0.001335368	0.53	0		0		
sec-Butylbenzene	1	/	408	0.001	:	0.25	0.0015	-	0.0015	0.001324755	1.6	0		0		
Styrene	1	/	408	0.001	:	0.25	0.00021	-	0.00021	0.00132527	1.1	0	0.1	0		
tert-Butylbenzene	0	/	408	0.001	:	0.25				0.00132598	0.51	0		0		
Tetrachloroethene	14	/	408	0.001	:	0.25	0.00022	-	0.0031	0.001343529	0.0097	0	0.005	0		
Tetrahydrofuran	9	/	408	0.01	:	0.5	0.00068	-	22	0.11993598	3.2	3		0		1.3
Toluene	46	/	408	0.001	:	0.01	0.0002	-	13	0.05953777	0.86	2	1	2		
trans-1,2-Dichloroethene	15	/	408	0.001	:	0.05	0.00026	-	0.078	0.001081225	0.086	0	0.1	0		
trans-1,3-Dichloropropene	0	/	408	0.0004	:	0.1				0.000530392		0		0		
Trichloroethene	61	/	408	0.001	:	0.25	0.00021	-	0.27	0.003639534	0.00044	50	0.005	25		
Trichlorofluoromethane	0	/	408	0.001	:	0.25				0.00132598	1.1	0		0		
Vinyl chloride	34	/	408	0.0005	:	0.12	0.00024	-	0.083	0.001162451	0.000015	34	0.002	9		
Xylene, o	18	/	408	0.001	:	0.05	0.0002	-	0.2	0.00170098	0.19	1	10	0		
Xylenes (m&p)	13	/	408	0.002	:	0.1	0.00052	-	0.85	0.005818922		0	10	0		
Semivolatile Organics (mg/L)																
1,2,4,5-Tetrachlorobenzene	1	/	455	0.00094	:	0.05	0.0048	-	0.0048	0.002503088	0.0012	1		0		
1,2,4-Trichlorobenzene	0	/	7	0.0048	:	0.0051				0.002442857	0.00099	0	0.07	0		
1,2-Dichlorobenzene	0	/	26	0.00094	:	0.0051				0.001982885	0.28	0	0.6	0		
1,3-Dichlorobenzene	0	/	7	0.0048	:	0.0051				0.002442857		0	0.6	0		
1,4-Dichlorobenzene	0	/	7	0.0048	:	0.0051				0.002442857	0.00042	0	0.075	0		
1-Methylnaphthalene	7	/	455	0.00094	:	0.05	0.000045	-	0.00024	0.00246424	0.00097	0		0		
2,3,4,6-Tetrachlorophenol	0	/	429	0.00094	:	0.05				0.002512483	0.17	0		0		
2,4,5-Trichlorophenol	0	/	429	0.00094	:	0.05				0.002512483	0.89	0		0		
2,4,6-Trichlorophenol	5	/	429	0.00094	:	0.05	0.00048	-	0.001	0.002493998	0.0035	0		0		
2,4-Dichlorophenol	20	/	430	0.00094	:	0.05	0.00046	-	0.0031	0.002459663	0.035	0		0		
2,4-Dimethylphenol	5	/	430	0.00094	:	0.05	0.00049	-	0.0086	0.002521453	0.27	0		0		
2,4-Dinitrophenol	1	/	358	0.00094	:	0.05	0.00046	-	0.00046	0.002551718	0.03	0		0		
2,4-Dinitrotoluene	0	/	455	0.00094	:	0.05				0.002497813	0.0002	0		0		
2,6-Dinitrotoluene	9	/	455	0.00094	:	0.05	0.00015	-	0.0095	0.002489396	0.000042	9		0		
2-Chloronaphthalene	0	/	455	0.00094	:	0.05				0.002497813	0.55	0		0		
2-Chlorophenol	11	/	430	0.00094	:	0.05	0.00075	-	0.0076	0.002478988	0.071	0		0		
2-Methylnaphthalene	9	/	455	0.00091	:	0.01	0.000046	-	0.00032	0.000501387	0.027	0		0		
2-Methylphenol	17	/	432	0.00094	:	0.05	0.00048	-	0.024	0.002555752	0.72	0		0		
2-Nitroaniline	0	/	455	0.0045	:	0.05				0.002522967	0.15	0		0		
2-Nitrophenol	22	/	432	0.00094	:	0.026	0.00052	-	0.15	0.003556725		0		0		
3 & 4 Methylphenol	21	/	430	0.00094	:	0.026	0.00019	-	0.03	0.002613942		0		0		
3,3'-Dichlorobenzidine	0	/	447	0.0019	:	0.05				0.002507606	0.00011	0		0		
3-Nitroaniline	0	/	454	0.0045	:	0.05				0.002523018		0		0		
4,6-Dinitro-2-methylphenol	1	/	356	0.0045	:	0.05	0.0011	-	0.0011	0.002588343	0.0012	0		0		
4-Bromophenyl phenyl ether	10	/	455	0.00094	:	0.05	0.0005	-	0.0041	0.002486473		0		0		
4-Chloro-3-methylphenol	0	/	428	0.0019	:	0.05				0.002519159	1.1	0		0		
4-Chloroaniline	1	/	454	0.0019	:	0.05	0.00085	-	0.00085	0.002500991	0.00032	1		0		
4-Chlorophenyl phenyl ether	2	/	455	0.00094	:	0.05	0.00063	-	0.0017	0.002493044		0		0		
4-Methylphenol	0	/	20	0.00094	:	0.0051				0.001855	1.4	0		0		
4-Nitroaniline	2	/	454	0.0045	:	0.05	0.00045	-	0.00061	0.00251522	0.0033	0		0		
4-Nitrophenol	21	/	422	0.0045	:	0.026	0.00076	-	0.054	0.003129787		0		0		
Acenaphthene	2	/	455	0.00091	:	0.01	0.000048	-	0.000067	0.00050611	0.4	0		0		
Acenaphthylene	2	/	455	0.00027	:	0.003	0.000065	-	0.00009	0.000155626		0		0		

Table 2.1-1
Summary Statistics of Analytical Results in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter Name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number Exceeding Tap Water RSL Nov 2013	EPA MCL	Number Exceeding EPA MCL	EPA SMCL	MassDEP ORSG
Acetophenone	18 / 455	0.00094 : 0.026	0.00063 - 0.011	0.002410077	1.5	0		0		
Aniline	6 / 452	0.00094 : 0.05	0.00068 - 0.0011	0.002482201	0.012	0		0		
Anthracene	2 / 455	0.00091 : 0.01	0.00008 - 0.00011	0.000506275	1.3	0		0		
Atrazine	1 / 455	0.00094 : 0.05	0.00094 - 0.00094	0.002494934	0.00026	1	0.003	0		
Azobenzene	4 / 454	0.00094 : 0.05	0.00057 - 0.0031	0.002489526	0.0001	4		0		
Benzaldehyde	11 / 455	0.00094 : 0.045	0.000096 - 0.02	0.002510046	1.5	0		0		
Benzo(a)anthracene	11 / 455	0.00027 : 0.003	0.000064 - 0.0011	0.000161844	0.000029	11		0		
Benzo(a)pyrene	26 / 455	0.00018 : 0.002	0.000094 - 0.0012	0.000115119	0.0000029	26	0.0002	9		
Benzo(b)fluoranthene	18 / 455	0.00027 : 0.003	0.00013 - 0.0017	0.000166011	0.000029	18		0		
Benzo(ghi)perylene	24 / 455	0.00045 : 0.005	0.000092 - 0.00082	0.000256097		0		0		
Benzo(k)fluoranthene	14 / 455	0.00027 : 0.003	0.00013 - 0.00061	0.000159648	0.00029	4		0		
Benzoic Acid	47 / 322	0.0045 : 0.045	0.00063 - 0.046	0.002586304	58	0		0		
Benzyl alcohol	10 / 455	0.0019 : 0.091	0.00046 - 0.006	0.004771538	1.5	0		0		
Biphenyl	28 / 455	0.00094 : 0.05	0.00048 - 0.027	0.002519681	0.00083	20		0		
Bis(2-Chloroethoxy)methane	0 / 455	0.00094 : 0.05		0.002497813	0.046	0		0		
Bis(2-Chloroethyl)ether	0 / 455	0.00094 : 0.05		0.002497813	0.000012	0		0		
Bis(2-Chloroisopropyl)ether	0 / 455	0.00094 : 0.05		0.002497813	0.00031	0		0		
Bis(2-Ethylhexyl)phthalate	55 / 455	0.0018 : 0.038	0.00041 - 0.012	0.001464725	0.0048	5	0.006	3		
Butylbenzylphthalate	12 / 455	0.00094 : 0.05	0.0002 - 0.00088	0.002450209	0.014	0		0		
Caprolactam	13 / 345	0.00094 : 0.045	0.00033 - 0.0064	0.002419522	7.7	0		0		
Carbazole	2 / 455	0.00094 : 0.05	0.00055 - 0.0015	0.002492429		0		0		
Chrysene	16 / 455	0.00091 : 0.01	0.00015 - 0.0015	0.000505835	0.0029	0		0		
Dibenz(a,h)anthracene	29 / 455	0.00045 : 0.005	0.000059 - 0.00054	0.000251486	0.0000029	29		0		
Dibenzofuran	0 / 455	0.00094 : 0.05		0.002497813	0.0058	0		0		
Diethylphthalate	17 / 455	0.00094 : 0.05	0.000065 - 0.0028	0.002637213	11	0		0		
Dimethylphthalate	2 / 455	0.00094 : 0.05	0.00049 - 0.00053	0.002489945		0		0		
Di-n-butylphthalate	19 / 455	0.0045 : 0.05	0.00059 - 0.00093	0.002459758	0.67	0		0		
Di-n-octylphthalate	1 / 455	0.00094 : 0.05	0.00046 - 0.00046	0.002493659	0.16	0		0		
Diphenyl ether	98 / 455	0.00094 : 0.045	0.00051 - 0.26	0.004917769		0		0		
Diphenylamine	12 / 181	0.0045 : 0.05	0.00049 - 0.067	0.003179227	0.24	0		0		
Diphenylmethanone	45 / 455	0.00094 : 0.05	0.00049 - 0.056	0.002711747		0		0		
Fluoranthene	18 / 455	0.00091 : 0.01	0.000084 - 0.0024	0.000512965	0.63	0		0		
Fluorene	7 / 455	0.00091 : 0.01	0.000063 - 0.00013	0.000501987	0.22	0		0		
Hexachlorobenzene	0 / 455	0.00091 : 0.01		0.000507857	0.000042	0	0.001	0		
Hexachlorobutadiene	0 / 7	0.00038 : 0.00041		0.000195	0.00026	0		0		
Hexachlorocyclopentadiene	0 / 454	0.0019 : 0.05		0.002504626	0.022	0	0.05	0		
Hexachloroethane	0 / 455	0.00094 : 0.03		0.001549132	0.00079	0		0		
Indeno(1,2,3-cd)pyrene	29 / 455	0.00045 : 0.005	0.000078 - 0.00093	0.00025616	0.000029	29		0		
Isophorone	0 / 454	0.00094 : 0.05		0.002498359	0.067	0		0		
Naphthalene	0 / 7	0.00095 : 0.001		0.000486429	0.00014	0		0		0.14
Nitrobenzene	0 / 455	0.00094 : 0.05		0.002497813	0.00012	0		0		
N-Nitrosodiethylamine	0 / 2	1.9E-06 : 1.9E-06		0.00000095	0.00000014	0		0		
N-Nitrosodimethylamine	226 / 530	1.9E-06 : 0.045	4.2E-07 - 0.025	0.000539524	0.00000042	224		0		0.00001
N-Nitrosodi-n-butylamine	1 / 2	1.9E-06 : 1.9E-06	0.0000049 - 4.9E-06	0.000002925	0.0000024	1		0		
N-Nitrosodi-n-propylamine	16 / 526	7.7E-07 : 0.045	4.9E-07 - 5.3E-06	0.000158171	0.0000093	0		0		
N-Nitrosodiphenylamine	51 / 454	0.00094 : 0.05	0.00026 - 0.13	0.003341795	0.01	7		0		
N-Nitrosomethylethylamine	1 / 2	1.9E-06 : 1.9E-06	0.0000005 - 5E-07	0.000000725	0.000003	0		0		
N-Nitrosopiperidine	0 / 2	1.9E-06 : 1.9E-06		0.00000095	0.0000071	0		0		
N-Nitrosopyrrolidine	0 / 2	4.8E-06 : 4.8E-06		0.0000024	0.000032	0		0		
Pentachlorophenol	2 / 399	0.00091 : 0.01	0.00094 - 0.0034	0.000519837	0.000035	2	0.001	1		
Phenanthrene	19 / 455	0.00018 : 0.002	0.000077 - 0.00097	0.00011698		0		0		
Phenol	29 / 427	0.00094 : 0.026	0.00011 - 0.46	0.006946007	4.5	0		0		
Pyrene	15 / 455	0.00094 : 0.05	0.00019 - 0.0025	0.002441769	0.087	0		0		

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Wilmington, MA

Parameter Name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number Exceeding Tap Water RSL Nov 2013	EPA MCL	Number Exceeding EPA MCL	EPA SMCL	MassDEP ORSG
PCBs (mg/L)										
Aroclor-1016	0 / 18	0.00023 : 0.00029		0.0001325	0.00096	0		0		
Aroclor-1221	0 / 18	0.00023 : 0.00029		0.0001325	0.000004	0		0		
Aroclor-1232	0 / 18	0.00023 : 0.00029		0.0001325	0.000004	0		0		
Aroclor-1242	0 / 18	0.00023 : 0.00029		0.0001325	0.000034	0		0		
Aroclor-1248	0 / 18	0.00023 : 0.00029		0.0001325	0.000034	0		0		
Aroclor-1254	0 / 18	0.00023 : 0.00029		0.0001325	0.000034	0		0		
Aroclor-1260	0 / 18	0.00023 : 0.00029		0.0001325	0.000034	0		0		
Aroclor-1262	0 / 18	0.00023 : 0.00029		0.0001325		0		0		
Aroclor-1268	0 / 18	0.00023 : 0.00029		0.0001325		0		0		
Metals, Total (mg/L)										
Aluminum	250 / 363	0.1 : 2	0.014 - 1800	27.31788154	16	11		0	0.05	
Antimony	20 / 363	0.006 : 6	0.0015 - 0.015	0.01493168	0.006	2	0.006	2		
Arsenic	174 / 363	0.0001 : 5	0.00034 - 0.26	0.021014573	0.000045	174	0.01	39		
Barium	344 / 363	0.01 : 10	0.0035 - 0.29	0.058342975	2.9	0	2	0		
Beryllium	47 / 363	0.001 : 1	0.00019 - 0.21	0.004721818	0.016	7	0.004	12		
Cadmium	65 / 363	0.001 : 1	0.00014 - 0.11	0.003440275	0.0069	9	0.005	11		
Calcium	423 / 423		0.78 - 630	86.70598109		0		0		
Chromium	116 / 504	0.005 : 0.1	0.00066 - 1800	11.84598706		0	0.1	21		
Chromium, Hexavalent	30 / 238	0.001 : 0.05	0.00045 - 0.0028	0.000904916	0.000031	30		0		
Cobalt	177 / 363	0.004 : 0.05	0.00072 - 12	0.207592617	0.0047	115		0		
Copper	70 / 363	0.01 : 0.2	0.0017 - 9.3	0.145573829	0.62	8	1.3	8	1	
Iron	310 / 363	0.1 : 0.5	0.014 - 3100	64.79475482	11	66		0	0.3	
Lead	45 / 363	0.005 : 5	0.0013 - 0.034	0.012509091		0	0.015	3		
Magnesium	360 / 363	0.4 : 0.4	0.11 - 1600	42.12396694		0		0		
Manganese	353 / 363	0.01 : 0.011	0.0018 - 250	8.004814601	0.32	207		0	0.05	
Mercury	32 / 363	0.0002 : 0.00058	0.00006 - 0.0031	0.000123366	0.00063	3	0.002	2		
Nickel	191 / 363	0.01 : 0.05	0.0012 - 9.3	0.17107438	0.3	16		0		0.1
Potassium	289 / 363	4 : 4000	0.57 - 390	18.37107438		0		0		
Selenium	9 / 363	0.01 : 10	0.0027 - 0.0073	0.024955923	0.078	0	0.05	0		
Silver	17 / 363	0.005 : 0.5	0.002 - 32	0.248969421	0.071	8		0	0.1	
Sodium	504 / 504		0.85 - 23000	330.2484921		0		0		20
Thallium	18 / 363	0.00005 : 0.25	0.00012 - 0.0056	0.000924366	0.00016	16	0.002	2		
Tin	15 / 363	0.01 : 5	0.007 - 890	2.570589807	9.3	2		0		
Vanadium	106 / 363	0.01 : 10	0.0013 - 0.28	0.026818182	0.063	8		0		
Zinc	144 / 363	0.05 : 0.25	0.0017 - 25	0.51865124	4.7	11		0	5	
Metals, Dissolved (mg/L)										
Aluminum	8 / 10	0.2 : 0.5	0.029 - 110	11.3786	16	1		0	0.05	
Antimony	0 / 10	0.006 : 0.03		0.0057	0.006	0	0.006	0		
Arsenic	5 / 10	0.0016 : 0.2	0.0027 - 0.0073	0.0142	0.000045	5	0.01	0		
Barium	10 / 10		0.005 - 0.12	0.03296	2.9	0	2	0		
Beryllium	4 / 10	0.001 : 0.005	0.00017 - 0.012	0.001845	0.016	0	0.004	1		
Cadmium	2 / 10	0.001 : 0.005	0.00019 - 0.011	0.001769	0.0069	1	0.005	1		
Calcium	10 / 10		1.8 - 520	114.07		0		0		
Chromium	6 / 10	0.005 : 0.025	0.0011 - 23	2.34216		0	0.1	2		
Cobalt	8 / 10	0.01 : 0.05	0.0017 - 0.71	0.09368	0.0047	4		0		
Copper	1 / 10	0.01 : 0.05	0.21 - 0.21	0.0286	0.62	0	1.3	0	1	
Iron	10 / 10		0.14 - 260	34.685	11	4		0	0.3	
Lead	0 / 10	0.005 : 0.025		0.00475		0	0.015	0		
Magnesium	10 / 10		0.36 - 150	28.729		0		0		
Manganese	10 / 10		0.063 - 22	3.5208	0.32	6		0	0.05	
Mercury	3 / 10	0.0002 : 0.00035	0.00006 - 0.00014	0.0001045	0.00063	0	0.002	0		
Nickel	7 / 10	0.01 : 0.05	0.002 - 0.74	0.09656	0.3	1		0		0.1
Potassium	7 / 10	4 : 20	0.78 - 38	8.958		0		0		
Selenium	0 / 10	0.01 : 0.05		0.0095	0.078	0	0.05	0		
Silver	2 / 10	0.005 : 0.025	0.0042 - 0.38	0.04167	0.071	1		0	0.1	

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Wilmington, MA

Parameter Name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number Exceeding Tap Water RSL Nov 2013	EPA MCL	Number Exceeding EPA MCL	EPA SMCL	MassDEP ORSG
Sodium	10 / 10		15 - 2200	396		0		0		20
Thallium	1 / 10	0.0001 : 0.006	0.0013 - 0.0013	0.000785	0.00016	1	0.002	0		
Tin	0 / 10	0.05 : 0.25		0.0475	9.3	0		0		
Vanadium	4 / 10	0.01 : 0.05	0.0015 - 0.018	0.01171	0.063	0		0		
Zinc	6 / 10	0.05 : 0.25	0.045 - 23	3.86	4.7	2		0	5	
Inorganics (mg/L)										
Bromide	144 / 362	0.1 : 100	0.1 - 32	1.046104972		0		0		
Chloride	501 / 504	10 : 100	1.3 - 17000	334.7668651		0		0	250	
Nitrate as N	286 / 503	0.05 : 50	0.02 - 38	1.32387674	25	4	10	10		
Nitrite as N	16 / 502	0.01 : 10	0.01 - 1	0.066810757	1.6	0	1	0		
Nitrogen, as Ammonia	274 / 504	0.02 : 1.6	0.009 - 5400	78.0139121		0		0		
Perchlorate	18 / 183	0.001 : 1	0.00021 - 0.014	0.01084623	0.011	4		0		
Sulfate	490 / 504	2 : 200	2.1 - 100000	1120.925198		0		0	250	
VPH (mg/L)										
C5-C8 Aliphatics	2 / 8	0.05 : 0.2	0.17 - 0.94	0.166875		0		0		0.3
C5-C8 Aliphatics (unadj.)	4 / 8	0.05 : 0.2	0.16 - 0.94	0.224375		0		0		0.3
C9-C10 Aromatics	0 / 8	0.05 : 0.2		0.034375		0		0		0.2
C9-C12 Aliphatics	0 / 8	0.05 : 0.2		0.034375		0		0		0.7
C9-C12 Aliphatics (unadj.)	1 / 8	0.05 : 0.2	0.055 - 0.055	0.038125		0		0		0.7
Volatile Petroleum Hydrocarbons, Total	2 / 8	0.05 : 0.2	0.17 - 0.94	0.166875		0		0		
EPH (mg/L)										
C11-C22 Aromatics	5 / 8	0.091 : 0.091	0.12 - 0.43	0.1570625		0		0		0.2
C11-C22 Aromatics (unadj.)	5 / 8	0.091 : 0.091	0.12 - 0.43	0.1570625		0		0		0.2
C19-C36 Aliphatics	0 / 8	0.091 : 0.095		0.04575		0		0		14
C9-C18 Aliphatics	0 / 8	0.091 : 0.095		0.04575		0		0		0.7
Extractable Petroleum Hydrocarbons, Total	5 / 8	0.091 : 0.091	0.12 - 0.43	0.1570625		0		0		
Site Specific Compounds (mg/L)										
Hydrazine	32 / 230	0.0001 : 0.00022	0.000054 - 0.23	0.0016303	0.000022	32		0		
Monomethylhydrazine (MMH)	1 / 230	0.0005 : 0.00055	0.00031 - 0.00031	0.00025037	0.016	0		0		
UDMH	3 / 230	0.0005 : 0.001	0.00041 - 0.06	0.000513587	0.0016	1		0		
Acetaldehyde	6 / 230	0.03 : 0.75	0.013 - 0.075	0.024930435	0.0022	6		0		
Formaldehyde	34 / 230	0.03 : 0.75	0.0051 - 2.4	0.061233043	3.1	0		0		
Dimethylformamide	16 / 183	0.02 : 0.04	0.0058 - 0.38	0.017154098	1.6	0		0		
Phthalic Acid/Phthalic anhydride	17 / 184	0.01 : 0.01	0.00086 - 0.0047	0.004740924	15	0		0		
4-(1,1,3,3-Tetramethylbutyl)phenol	4 / 175	0.00086 : 0.0061	0.02 - 0.036	0.001104286		0		0		
4,4'-Isopropylidenediphenol	15 / 175	0.00086 : 0.0061	0.00043 - 0.072	0.001982371	0.58	0		0		
4-Nonylphenol (Tech.)	60 / 175	0.0043 : 0.048	0.0016 - 0.038	0.005675429		0		0		
Nonylphenol Diethoxylate	4 / 164	0.017 : 0.19	0.0032 - 0.045	0.012246951		0		0		
Nonylphenol Diethoxylate (Tech.)	0 / 11	0.018 : 0.019		0.009409091		0		0		
Kempore (Azodicarbonamide)	11 / 178	1 : 50	0.25 - 5.2	0.926123596		0		0		
OPEX	11 / 178	0.1 : 5	0.029 - 0.28	0.072421348		0		0		

mg/L = milligram per Liter
Tapwater RSL - USEPA Regional Screening Level - USEPA, 2013.
MCL - Federal and Massachusetts Maximum Contaminant Level - USEPA, 2013; MassDEP, 2012.
SMCL - Federal and Massachusetts Secondary Maximum Contaminant Level - USEPA, 2013; MassDEP, 2012.
ORSG - Massachusetts Drinking Water Guideline - MassDEP, 2012.

Prepared by / Date: KJC 05/02/14
Checked by / Date: BJR 09/05/14

Table 2.1-2
Summary Statistics of Detected Compounds in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	MCL	Number Exceeding EPA MCL	SMCL	MassDEP ORSG
Volatile Organics (mg/L)											
1,1,1-Trichloroethane	2 / 408	0.001 : 0.25	0.0004 - 0.0038	0.0013	7.5	0		0.2	0		
1,1,2-Trichloro-1,2,2-Trifluoroethane	3 / 408	0.001 : 0.25	0.00081 - 0.015	0.0014	53	0					210
1,1-Dichloroethane	40 / 408	0.001 : 0.05	0.00021 - **0.23**	0.0016	0.0024	6	3				0.07
1,1-Dichloroethene	11 / 408	0.001 : 0.25	0.0002 - 0.0011	0.0013	0.26	0		0.007	0		
1,2,4-Trichlorobenzene	10 / 408	0.001 : 0.25	0.00026 - **0.002**	0.0013	0.00099	3	3	0.07	0		
1,2,4-Trimethylbenzene	16 / 408	0.001 : 0.25	0.00021 - 0.015	0.0014	0.015	0					
1,2-Dichlorobenzene	19 / 408	0.001 : 0.05	0.00021 - 0.2	0.0017	0.28	0		0.6	0		
1,2-Dichloroethane	43 / 408	0.001 : 0.25	0.00029 - **0.023**	0.0017	0.00015	43	24	0.005	11		
1,3,5-Trimethylbenzene	6 / 408	0.001 : 0.25	0.00026 - 0.0023	0.0013	0.087	0					
1,3-Dichlorobenzene	4 / 408	0.001 : 0.25	0.00061 - 0.0024	0.0013				0.6	0		
1,4-Dichlorobenzene	19 / 408	0.001 : 0.25	0.00035 - **0.005**	0.0014	0.00042	15	9	0.075	0		
1,4-Dioxane	1 / 189	0.05 : 12	0.085 - **0.085**	0.066	0.00067	1	1				0.003
2,4,4-Trimethyl-1-pentene	71 / 408	0.001 : 0.25	0.00051 - 0.55	0.0078							
2,4,4-Trimethyl-2-pentene	50 / 408	0.001 : 0.25	0.00038 - 0.16	0.0030							
2-Butanone	9 / 407	0.01 : 2.5	0.0013 - 0.025	0.013	4.9	0					4
2-Chlorotoluene	2 / 408	0.001 : 0.25	0.0021 - 0.0022	0.0013	0.18	0					
4-Chlorotoluene	2 / 408	0.001 : 0.25	0.00084 - 0.00087	0.0013	0.19	0					
4-iso-Propyltoluene	3 / 408	0.001 : 0.25	0.00037 - 0.00043	0.0013							
Acetone	11 / 407	0.05 : 12	0.0048 - 0.77	0.068	12	0					6.3
Benzene	48 / 408	0.001 : 0.05	0.0002 - **0.11**	0.0017	0.00039	37	21	0.005	11		
Bromobenzene	1 / 408	0.001 : 0.25	0.00021 - 0.00021	0.0013	0.054	0					
Bromochloromethane	13 / 408	0.001 : 0.25	0.0002 - 0.0016	0.0013	0.083	0					
Bromodichloromethane	23 / 408	0.0005 : 0.25	0.00022 - **0.0075**	0.0011	0.00012	23	15	0.08	0		
Bromoform	21 / 408	0.001 : 0.25	0.00059 - **0.055**	0.0019	0.0079	11	7	0.08	0		
Butane, 2-methoxy-2-methyl-	5 / 408	0.005 : 1.2	0.00034 - 0.002	0.0065							0.09
Carbon disulfide	74 / 408	0.01 : 2.5	0.00025 - 0.024	0.012	0.72	0					
Carbon tetrachloride	2 / 408	0.001 : 0.25	0.003 - **0.0031**	0.0013	0.00039	2	2	0.005	0		
Chlorobenzene	23 / 408	0.001 : 0.05	0.00036 - **1.4**	0.0073	0.072	3	2	0.1	2		
Chlorodibromomethane	21 / 408	0.0005 : 0.12	0.00024 - **0.17**	0.0012	0.00015	21	13	0.08	1		
Chloroethane	12 / 408	0.002 : 0.1	0.00029 - 1.8	0.0096	21	0					
Chloroform	47 / 408	0.001 : 0.25	0.0002 - **0.093**	0.0030	0.00019	47	34	0.08	4		0.07
Chloromethane	20 / 408	0.00055 : 0.5	0.0002 - 0.003	0.0026	0.19	0					
Cis-1,2-Dichloroethene	70 / 408	0.001 : 0.25	0.00025 - **0.19**	0.0045	0.028	10	6	0.07	7		
Cyclohexane	7 / 408	0.001 : 2.5	0.0002 - 0.0084	0.013	13	0					
Dibromomethane	18 / 408	0.001 : 0.25	0.00033 - **0.011**	0.0015	0.0079	3	3				
Diethyl ether	13 / 408	0.001 : 2.5	0.0002 - 0.0043	0.013	3.1	0					
Ethyl benzene	25 / 408	0.001 : 0.05	0.00021 - **0.26**	0.0022	0.0013	18	9	0.7	0		
Isopropyl ether	2 / 408	0.01 : 2.5	0.0039 - 0.0046	0.013	1.5	0					
Isopropylbenzene	8 / 408	0.001 : 0.25	0.00034 - 0.0047	0.0013	0.39	0					
Methyl cyclohexane	5 / 408	0.001 : 2.5	0.0024 - 0.0086	0.013							
Methyl Tertbutyl Ether	105 / 408	0.001 : 0.25	0.00019 - **0.039**	0.0020	0.012	3	2				0.07
Methylene chloride	28 / 408	0.001 : 0.5	0.0014 - **0.27**	0.0031	0.0099	9	7	0.005	15		
Naphthalene	7 / 408	0.005 : 1.2	0.00035 - **0.013**	0.0065	0.00014	7	5				0.14
n-Butylbenzene	2 / 408	0.001 : 0.25	0.0008 - 0.0011	0.0013	0.78	0					
Propylbenzene	11 / 408	0.001 : 0.25	0.00029 - 0.0056	0.0013	0.53	0					
sec-Butylbenzene	1 / 408	0.001 : 0.25	0.0015 - 0.0015	0.0013	1.6	0					
Styrene	1 / 408	0.001 : 0.25	0.00021 - 0.00021	0.0013	1.1	0		0.1	0		
Tetrachloroethene	14 / 408	0.001 : 0.25	0.00022 - 0.0031	0.0013	0.0097	0		0.005	0		
Tetrahydrofuran	9 / 408	0.01 : 0.5	0.00068 - **22**	0.12	3.2	3	2				1.3
Toluene	46 / 408	0.001 : 0.01	0.0002 - **13**	0.060	0.86	2	1	1	2		

Table 2.1-2
Summary Statistics of Detected Compounds in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	MCL	Number Exceeding EPA MCL	SMCL	MassDEP ORSG
trans-1,2-Dichloroethene	15 / 408	0.001 : 0.05	0.00026 - 0.078	0.0011	0.086	0		0.1	0		
Trichloroethene	61 / 408	0.001 : 0.25	0.00021 - **0.27**	0.0036	0.00044	50	30	0.005	25		
Vinyl chloride	34 / 408	0.0005 : 0.12	0.00024 - **0.083**	0.0012	0.000015	34	21	0.002	9		
Xylene, o	18 / 408	0.001 : 0.05	0.0002 - **0.2**	0.0017	0.19	1	1	10	0		
Xylenes (m&p)	13 / 408	0.002 : 0.1	0.00052 - 0.85	0.0058				10	0		
Semivolatile Organics (mg/L)											
1,2,4,5-Tetrachlorobenzene	1 / 455	0.00094 : 0.05	0.0048 - **0.0048**	0.0025	0.0012	1	1				
1-Methylnaphthalene	7 / 455	0.00094 : 0.05	0.000045 - 0.00024	0.0025	0.00097	0					
2,4,6-Trichlorophenol	5 / 429	0.00094 : 0.05	0.00048 - 0.001	0.0025	0.0035	0					
2,4-Dichlorophenol	20 / 430	0.00094 : 0.05	0.00046 - 0.0031	0.0025	0.035	0					
2,4-Dimethylphenol	5 / 430	0.00094 : 0.05	0.00049 - 0.0086	0.0025	0.27	0					
2,4-Dinitrophenol	1 / 358	0.00094 : 0.05	0.00046 - 0.00046	0.0026	0.03	0					
2,6-Dinitrotoluene	9 / 455	0.00094 : 0.05	0.00015 - **0.0095**	0.0025	0.000042	9	8				
2-Chlorophenol	11 / 430	0.00094 : 0.05	0.00075 - 0.0076	0.0025	0.071	0					
2-Methylnaphthalene	9 / 455	0.00091 : 0.01	0.000046 - 0.00032	0.00050	0.027	0					
2-Methylphenol	17 / 432	0.00094 : 0.05	0.00048 - 0.024	0.0026	0.72	0					
2-Nitrophenol	22 / 432	0.00094 : 0.026	0.00052 - 0.15	0.0036							
3 & 4 Methylphenol	21 / 430	0.00094 : 0.026	0.00019 - 0.03	0.0026							
4,6-Dinitro-2-methylphenol	1 / 356	0.0045 : 0.05	0.0011 - 0.0011	0.0026	0.0012	0					
4-Bromophenyl phenyl ether	10 / 455	0.00094 : 0.05	0.0005 - 0.0041	0.0025							
4-Chloroaniline	1 / 454	0.0019 : 0.05	0.00085 - **0.00085**	0.0025	0.00032	1	1				
4-Chlorophenyl phenyl ether	2 / 455	0.00094 : 0.05	0.00063 - 0.0017	0.0025							
4-Nitroaniline	2 / 454	0.0045 : 0.05	0.00045 - 0.00061	0.0025	0.0033	0					
4-Nitrophenol	21 / 422	0.0045 : 0.026	0.00076 - 0.054	0.0031							
Acenaphthene	2 / 455	0.00091 : 0.01	0.000048 - 0.000067	0.00051	0.4	0					
Acenaphthylene	2 / 455	0.00027 : 0.003	0.000065 - 0.00009	0.00016							
Acetophenone	18 / 455	0.00094 : 0.026	0.00063 - 0.011	0.0024	1.5	0					
Aniline	6 / 452	0.00094 : 0.05	0.00068 - 0.0011	0.0025	0.012	0					
Anthracene	2 / 455	0.00091 : 0.01	0.00008 - 0.00011	0.00051	1.3	0					
Atrazine	1 / 455	0.00094 : 0.05	0.00094 - **0.00094**	0.0025	0.00026	1	1	0.003	0		
Azobenzene	4 / 454	0.00094 : 0.05	0.00057 - **0.0031**	0.0025	0.0001	4	4				
Benzaldehyde	11 / 455	0.00094 : 0.045	0.000096 - 0.02	0.0025	1.5	0					
Benzo(a)anthracene	11 / 455	0.00027 : 0.003	0.000064 - **0.0011**	0.00016	0.000029	11	11				
Benzo(a)pyrene	26 / 455	0.00018 : 0.002	0.000094 - **0.0012**	0.00012	0.0000029	26	24	0.0002	9		
Benzo(b)fluoranthene	18 / 455	0.00027 : 0.003	0.00013 - **0.0017**	0.00017	0.000029	18	16				
Benzo(ghi)perylene	24 / 455	0.00045 : 0.005	0.000092 - 0.00082	0.00026							
Benzo(k)fluoranthene	14 / 455	0.00027 : 0.003	0.00013 - **0.00061**	0.00016	0.00029	4	4				
Benzoic Acid	47 / 322	0.0045 : 0.045	0.00063 - 0.046	0.0026	58	0					
Benzyl alcohol	10 / 455	0.0019 : 0.091	0.00046 - 0.006	0.0048	1.5	0					
Biphenyl	28 / 455	0.00094 : 0.05	0.00048 - **0.027**	0.0025	0.00083	20	12				
Bis(2-Ethylhexyl)phthalate	55 / 455	0.0018 : 0.038	0.00041 - **0.012**	0.0015	0.0048	5	5	0.006	3		
Butylbenzylphthalate	12 / 455	0.00094 : 0.05	0.0002 - 0.00088	0.0025	0.014	0					
Caprolactam	13 / 345	0.00094 : 0.045	0.00033 - 0.0064	0.0024	7.7	0					
Carbazole	2 / 455	0.00094 : 0.05	0.00055 - 0.0015	0.0025							
Chrysene	16 / 455	0.00091 : 0.01	0.00015 - 0.0015	0.00051	0.0029	0					
Dibenz(a,h)anthracene	29 / 455	0.00045 : 0.005	0.000059 - **0.00054**	0.00025	0.0000029	29	29				
Diethylphthalate	17 / 455	0.00094 : 0.05	0.000065 - 0.0028	0.0026	11	0					
Dimethylphthalate	2 / 455	0.00094 : 0.05	0.00049 - 0.00053	0.0025							
Di-n-butylphthalate	19 / 455	0.0045 : 0.05	0.00059 - 0.00093	0.0025	0.67	0					
Di-n-octylphthalate	1 / 455	0.00094 : 0.05	0.00046 - 0.00046	0.0025	0.16	0					
Diphenyl ether	98 / 455	0.00094 : 0.045	0.00051 - 0.26	0.0049							

Table 2.1-2
Summary Statistics of Detected Compounds in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	MCL	Number Exceeding EPA MCL	SMCL	MassDEP ORSG
Diphenylamine	12 / 181	0.0045 : 0.05	0.00049 - 0.067	0.0032	0.24	0					
Diphenylmethanone	45 / 455	0.00094 : 0.05	0.00049 - 0.056	0.0027							
Fluoranthene	18 / 455	0.00091 : 0.01	0.000084 - 0.0024	0.00051	0.63	0					
Fluorene	7 / 455	0.00091 : 0.01	0.000063 - 0.00013	0.00050	0.22	0					
Indeno(1,2,3-cd)pyrene	29 / 455	0.00045 : 0.005	0.000078 - **0.00093**	0.00026	0.000029	29	28				
N-Nitrosodimethylamine	226 / 530	1.9E-06 : 0.045	4.2E-07 - **0.025**	0.00054	0.00000042	224	125				0.00001
N-Nitrosodi-n-butylamine	1 / 2	1.9E-06 : 1.9E-06	4.9E-06 - **4.9E-06**	0.0000029	0.0000024	1	1				
N-Nitrosodi-n-propylamine	16 / 526	7.7E-07 : 0.045	4.9E-07 - 5.3E-06	0.00016	0.0000093	0					
N-Nitrosodiphenylamine	51 / 454	0.00094 : 0.05	0.00026 - **0.13**	0.0033	0.01	7	4				
N-Nitrosomethylethylamine	1 / 2	1.9E-06 : 1.9E-06	5E-07 - 5E-07	0.00000073	0.000003	0					
Pentachlorophenol	2 / 399	0.00091 : 0.01	0.00094 - **0.0034**	0.00052	0.000035	2	2	0.001	1		
Phenanthrene	19 / 455	0.00018 : 0.002	0.000077 - 0.00097	0.00012							
Phenol	29 / 427	0.00094 : 0.026	0.00011 - 0.46	0.0069	4.5	0					
Pyrene	15 / 455	0.00094 : 0.05	0.00019 - 0.0025	0.0024	0.087	0					
Metals, Total (mg/L)											
Aluminum	250 / 363	0.1 : 2	0.014 - **1800**	27	16	11	6			0.05	
Antimony	20 / 363	0.006 : 6	0.0015 - **0.015**	0.015	0.006	2	2	0.006	2		
Arsenic	174 / 363	0.0001 : 5	0.00034 - **0.26**	0.021	0.000045	174	104	0.01	39		
Barium	344 / 363	0.01 : 10	0.0035 - 0.29	0.058	2.9	0		2	0		
Beryllium	47 / 363	0.001 : 1	0.00019 - **0.21**	0.0047	0.016	7	4	0.004	12		
Cadmium	65 / 363	0.001 : 1	0.00014 - **0.11**	0.0034	0.0069	9	6	0.005	11		
Calcium	423 / 423		0.78 - 630	87							
Chromium	116 / 504	0.005 : 0.1	0.00066 - **1800**	11.8	16			0.1	21		
Chromium, Hexavalent	30 / 238	0.001 : 0.05	0.00045 - **0.0028**	0.00090	0.000031	30	26				
Cobalt	177 / 363	0.004 : 0.05	0.00072 - **12**	0.21	0.0047	115	66				
Copper	70 / 363	0.01 : 0.2	0.0017 - **9.3**	0.15	0.62	8	4	1.3	8	1	
Iron	310 / 363	0.1 : 0.5	0.014 - **3100**	65	11	66	37			0.3	
Lead	45 / 363	0.005 : 5	0.0013 - 0.034	0.013				0.015	3		
Magnesium	360 / 363	0.4 : 0.4	0.11 - 1600	42							
Manganese	353 / 363	0.01 : 0.011	0.0018 - **250**	8.0	0.32	207	113			0.05	
Mercury	32 / 363	0.0002 : 0.00058	0.00006 - **0.0031**	0.00012	0.00063	3	2	0.002	2		
Nickel	191 / 363	0.01 : 0.05	0.0012 - **9.3**	0.17	0.3	16	9				0.1
Potassium	289 / 363	4 : 4000	0.57 - 390	18.4							
Selenium	9 / 363	0.01 : 10	0.0027 - 0.0073	0.025	0.078	0		0.05	0		
Silver	17 / 363	0.005 : 0.5	0.002 - **32**	0.25	0.071	8	5			0.1	
Sodium	504 / 504		0.85 - 23000	330							20
Thallium	18 / 363	0.00005 : 0.25	0.00012 - **0.0056**	0.00092	0.00016	16	11	0.002	2		
Tin	15 / 363	0.01 : 5	0.007 - **890**	2.6	9.3	2	2				
Vanadium	106 / 363	0.01 : 10	0.0013 - **0.28**	0.027	0.063	8	6				
Zinc	144 / 363	0.05 : 0.25	0.0017 - **25**	0.52	4.7	11	6			5	
Metals, Dissolved (mg/L)											
Aluminum	8 / 10	0.2 : 0.5	0.029 - **110**	11.4	16	1	1			0.05	
Arsenic	5 / 10	0.0016 : 0.2	0.0027 - **0.0073**	0.014	0.000045	5	5	0.01	0		
Barium	10 / 10		0.005 - 0.12	0.033	2.9	0		2	0		
Beryllium	4 / 10	0.001 : 0.005	0.00017 - **0.012**	0.0018	0.016	0		0.004	1		
Cadmium	2 / 10	0.001 : 0.005	0.00019 - **0.011**	0.0018	0.0069	1	1	0.005	1		
Calcium	10 / 10		1.8 - 520	114							
Chromium	6 / 10	0.005 : 0.025	0.0011 - **23**	2.3	16			0.1	2		
Cobalt	8 / 10	0.01 : 0.05	0.0017 - **0.71**	0.094	0.0047	4	4				
Copper	1 / 10	0.01 : 0.05	0.21 - 0.21	0.029	0.62	0		1.3	0	1	
Iron	10 / 10		0.14 - **260**	34.7	11	4	4			0.3	

Table 2.1-2
Summary Statistics of Detected Compounds in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, MA

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	MCL	Number Exceeding EPA MCL	SMCL	MassDEP ORSG
Magnesium	10 / 10		0.36 - 150	28.7							
Manganese	10 / 10		0.063 - **22**	3.5	0.32	6	6			0.05	
Mercury	3 / 10	0.0002 : 0.00035	0.00006 - 0.00014	0.00010	0.00063	0		0.002	0		
Nickel	7 / 10	0.01 : 0.05	0.002 - **0.74**	0.097	0.3	1	1				0.1
Potassium	7 / 10	4 : 20	0.78 - 38	9.0							
Silver	2 / 10	0.005 : 0.025	0.0042 - **0.38**	0.042	0.071	1	1			0.1	
Sodium	10 / 10		15 - 2200	396							20
Thallium	1 / 10	0.0001 : 0.006	0.0013 - **0.0013**	0.00079	0.00016	1	1	0.002	0		
Vanadium	4 / 10	0.01 : 0.05	0.0015 - 0.018	0.012	0.063	0					
Zinc	6 / 10	0.05 : 0.25	0.045 - **23**	3.9	4.7	2	2			5	
Inorganics (mg/L)											
Bromide	144 / 362	0.1 : 100	0.1 - 32	1.0							
Chloride	501 / 504	10 : 100	1.3 - 17000	335						250	
Nitrate as N	286 / 503	0.05 : 50	0.02 - **38**	1.3	25	4	3	10	10		
Nitrite as N	16 / 502	0.01 : 10	0.01 - 1	0.067	1.6	0		1	0		
Nitrogen, as Ammonia	274 / 504	0.02 : 1.6	0.009 - 5400	78							
Perchlorate	18 / 183	0.001 : 1	0.00021 - **0.014**	0.011	0.011	4	2				
Sulfate	490 / 504	2 : 200	2.1 - 100000	1121						250	
VPH (mg/L)											
C5-C8 Aliphatics	2 / 8	0.05 : 0.2	0.17 - 0.94	0.17							0.3
Volatile Petroleum Hydrocarbons, Total	2 / 8	0.05 : 0.2	0.17 - 0.94	0.17							
EPH (mg/L)											
C11-C22 Aromatics	5 / 8	0.091 : 0.091	0.12 - 0.43	0.16							0.2
Extractable Petroleum Hydrocarbons, Total	5 / 8	0.091 : 0.091	0.12 - 0.43	0.16							
Site Specific Compounds (mg/L)											
Hydrazine	32 / 230	0.0001 : 0.00022	0.000054 - **0.23**	0.0016	0.000022	32	24				
Monomethylhydrazine (MMH)	1 / 230	0.0005 : 0.00055	0.00031 - 0.00031	0.00025	0.016	0					
UDMH	3 / 230	0.0005 : 0.001	0.00041 - **0.06**	0.00051	0.0016	1	1				
Acetaldehyde	6 / 230	0.03 : 0.75	0.013 - **0.075**	0.025	0.0022	6	4				
Formaldehyde	34 / 230	0.03 : 0.75	0.0051 - 2.4	0.061	3.1	0					
Dimethylformamide	16 / 183	0.02 : 0.04	0.0058 - 0.38	0.017	1.6	0					
Phthalic Acid/Phthalic anhydride	17 / 184	0.01 : 0.01	0.00086 - 0.0047	0.0047	15	0					
4-(1,1,3,3-Tetramethylbutyl)phenol	4 / 175	0.00086 : 0.0061	0.02 - 0.036	0.0011							
4,4'-Isopropylidenediphenol	15 / 175	0.00086 : 0.0061	0.00043 - 0.072	0.0020	0.58	0					
4-Nonylphenol (Tech.)	60 / 175	0.0043 : 0.048	0.0016 - 0.038	0.0057							
Nonylphenol Diethoxylate	4 / 164	0.017 : 0.19	0.0032 - 0.045	0.012							
Kempore (Azodicarbonamide)	11 / 178	1 : 50	0.25 - 5.2	0.93							
OPEX	11 / 178	0.1 : 5	0.029 - 0.28	0.072							

mg/L - milligram per Liter
Bold and shaded cells indicate the maxiumum concentration is greater than the Tapwater RSL or MCL.

Prepared by / Date: KJC 05/02/14
Checked by / Date: BJR 05/05/14
Revised by / Date: BJR 06/29/15

Tapwater RSL - USEPA Regional Screening Level - USEPA, 2013.
MCL - Federal and Massachusetts Maximum Contaminant Level - USEPA, 2013; MassDEP, 2012.
SMCL - Federal and Massachusetts Secondary Maximum Contaminant Level - USEPA, 2013; MassDEP, 2012.
ORSG - Massachusetts Drinking Water Guideline - MassDEP, 2012.

Table 2.1-3
Summary Statistics of Compounds with RSL and/or MCL Excedances in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
Olin Chemical Superfund Site
Wilmington, MA

param_name	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	EPA MCL	Number ETGT EPA MCL	EPA SMCL	MassDEP ORSG
Volatile Organics (mg/L)																	
1,1-Dichloroethane	40	/	408	0.001	:	0.05	0.00021	-	0.23	0.001584118	0.0024	6	3				0.07
1,2,4-Trichlorobenzene	10	/	408	0.001	:	0.25	0.00026	-	0.002	0.001336422	0.00099	3	3	0.07	0		
1,2-Dichloroethane	43	/	408	0.001	:	0.25	0.00029	-	0.023	0.001730123	0.00015	43	24	0.005	11		
1,4-Dichlorobenzene	19	/	408	0.001	:	0.25	0.00035	-	0.005	0.001353088	0.00042	15	9	0.075	0		
1,4-Dioxane	1	/	189	0.05	:	12	0.085	-	0.085	0.065793651	0.00067	1	1				0.003
Benzene	48	/	408	0.001	:	0.05	0.0002	-	0.11	0.001667279	0.00039	37	21	0.005	11		
Bromodichloromethane	23	/	408	0.0005	:	0.25	0.00022	-	0.0075	0.001124338	0.00012	23	15	0.08	0		
Bromoform	21	/	408	0.001	:	0.25	0.00059	-	0.055	0.001852108	0.0079	11	7	0.08	0		
Carbon tetrachloride	2	/	408	0.001	:	0.25	0.003	-	0.0031	0.00133848	0.00039	2	2	0.005	0		
Chlorobenzene	23	/	408	0.001	:	0.05	0.00036	-	1.4	0.007297377	0.072	3	2	0.1	2		
Chlorodibromomethane	21	/	408	0.0005	:	0.12	0.00024	-	0.17	0.001222108	0.00015	21	13	0.08	1		
Chloroform	47	/	408	0.001	:	0.25	0.0002	-	0.093	0.002957377	0.00019	47	34	0.08	4		0.07
Cis-1,2-Dichloroethene	70	/	408	0.001	:	0.25	0.00025	-	0.19	0.00447598	0.028	10	6	0.07	7		
Dibromomethane	18	/	408	0.001	:	0.25	0.00033	-	0.011	0.00146625	0.0079	3	3				
Ethyl benzene	25	/	408	0.001	:	0.05	0.00021	-	0.26	0.002244951	0.0013	18	9	0.7	0		
Methyl cyclohexane	5	/	408	0.001	:	2.5	0.0024	-	0.0086	0.012714461		0					
Methyl Tertbutyl Ether	105	/	408	0.001	:	0.25	0.00019	-	0.039	0.002017328	0.012	3	2				0.07
Methylene chloride	28	/	408	0.001	:	0.5	0.0014	-	0.27	0.003082353	0.0099	9	7	0.005	15		
Naphthalene	7	/	408	0.005	:	1.2	0.00035	-	0.013	0.006461789	0.00014	7	5				0.14
Tetrahydrofuran	9	/	408	0.01	:	0.5	0.00068	-	22	0.11993598	3.2	3	2				1.3
Toluene	46	/	408	0.001	:	0.01	0.0002	-	13	0.05953777	0.86	2	1	1	2		
Trichloroethene	61	/	408	0.001	:	0.25	0.00021	-	0.27	0.003639534	0.00044	50	30	0.005	25		
Vinyl chloride	34	/	408	0.0005	:	0.12	0.00024	-	0.083	0.001162451	0.000015	34	21	0.002	9		
Xylene, o	18	/	408	0.001	:	0.05	0.0002	-	0.2	0.00170098	0.19	1	1	10	0		
Semivolatile Organics (mg/L)																	
1,2,4,5-Tetrachlorobenzene	1	/	455	0.00094	:	0.05	0.0048	-	0.0048	0.002503088	0.0012	1	1				
2,6-Dinitrotoluene	9	/	455	0.00094	:	0.05	0.00015	-	0.0095	0.002489396	0.000042	9	8				
4-Chloroaniline	1	/	454	0.0019	:	0.05	0.00085	-	0.00085	0.002500991	0.00032	1	1				
Atrazine	1	/	455	0.00094	:	0.05	0.00094	-	0.00094	0.002494934	0.00026	1	1	0.003	0		
Azobenzene	4	/	454	0.00094	:	0.05	0.00057	-	0.0031	0.002489526	0.0001	4	4				
Benzo(a)anthracene	11	/	455	0.00027	:	0.003	0.000064	-	0.0011	0.000161844	0.000029	11	11				
Benzo(a)pyrene	26	/	455	0.00018	:	0.002	0.000094	-	0.0012	0.000115119	0.0000029	26	24	0.0002	9		
Benzo(b)fluoranthene	18	/	455	0.00027	:	0.003	0.00013	-	0.0017	0.000166011	0.000029	18	16				
Benzo(k)fluoranthene	14	/	455	0.00027	:	0.003	0.00013	-	0.00061	0.000159648	0.00029	4	4				
Biphenyl	28	/	455	0.00094	:	0.05	0.00048	-	0.027	0.002519681	0.00083	20	12				
Bis(2-Ethylhexyl)phthalate	55	/	455	0.0018	:	0.038	0.00041	-	0.012	0.001464725	0.0048	5	5	0.006	3		
Dibenz(a,h)anthracene	29	/	455	0.00045	:	0.005	0.000059	-	0.00054	0.000251486	0.0000029	29	29				
Indeno(1,2,3-cd)pyrene	29	/	455	0.00045	:	0.005	0.000078	-	0.00093	0.00025616	0.000029	29	28				
N-Nitrosodimethylamine	226	/	530	0.0000019	:	0.045	0.00000042	-	0.025	0.000539524	0.00000042	224	125				0.00001
N-Nitrosodi-n-butylamine	1	/	2	0.0000019	:	0.0000019	0.0000049	-	0.0000049	0.000002925	0.0000024	1	1				
N-Nitrosodiphenylamine	51	/	454	0.00094	:	0.05	0.00026	-	0.13	0.003341795	0.01	7	4				
Pentachlorophenol	2	/	399	0.00091	:	0.01	0.00094	-	0.0034	0.000519837	0.000035	2	2	0.001	1		
Phenanthrene	19	/	455	0.00018	:	0.002	0.000077	-	0.00097	0.00011698		0					
Metals, Total (mg/L)																	
Aluminum	250	/	363	0.1	:	2	0.014	-	1800	27.31788154	16	11	6			0.05	
Antimony	20	/	363	0.006	:	6	0.0015	-	0.015	0.01493168	0.006	2	2	0.006	2		
Arsenic	174	/	363	0.0001	:	5	0.00034	-	0.26	0.021014573	0.000045	174	104	0.01	39		
Beryllium	47	/	363	0.001	:	1	0.00019	-	0.21	0.004721818	0.016	7	4	0.004	12		
Cadmium	65	/	363	0.001	:	1	0.00014	-	0.11	0.003440275	0.0069	9	6	0.005	11		
Chromium	116	/	504	0.005	:	0.1	0.00066	-	1800	11.84598706		0		0.1	21		
Chromium, Hexavalent	30	/	238	0.001	:	0.05	0.00045	-	0.0028	0.000904916	0.000031	30	26				
Cobalt	177	/	363	0.004	:	0.05	0.00072	-	12	0.207592617	0.0047	115	66				
Copper	70	/	363	0.01	:	0.2	0.0017	-	9.3	0.145573829	0.62	8	4	1.3	8	1	
Iron	310	/	363	0.1	:	0.5	0.014	-	3100	64.79475482	11	66	37			0.3	
Lead	45	/	363	0.005	:	5	0.0013	-	0.034	0.012509091		0		0.015	3		
Manganese	353	/	363	0.01	:	0.011	0.0018	-	250	8.004814601	0.32	207	113			0.05	
Mercury	32	/	363	0.0002	:	0.00058	0.00006	-	0.0031	0.000123366	0.00063	3	2	0.002	2		
Nickel	191	/	363	0.01	:	0.05	0.0012	-	9.3	0.17107438	0.3	16	9				0.1
Silver	17	/	363	0.005	:	0.5	0.002	-	32	0.248969421	0.071	8	5			0.1	
Thallium	18	/	363	0.00005	:	0.25	0.00012	-	0.0056	0.000924366	0.00016	16	11	0.002	2		
Tin	15	/	363	0.01	:	5	0.007	-	890	2.570589807	9.3	2	2				
Vanadium	106	/	363	0.01	:	10	0.0013	-	0.28	0.026818182	0.063	8	6				

Table 2.1-3
Summary Statistics of Compounds with RSL and/or MCL Excedances in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
Olin Chemical Superfund Site
Wilmington, MA

param_name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	EPA MCL	Number ETGT EPA MCL	EPA SMCL	MassDEP ORSG
Zinc	144 / 363	0.05 : 0.25	0.0017 - 25	0.51865124	4.7	11	6			5	

Table 2.1-3
Summary Statistics of Compounds with RSL and/or MCL Excedances in RI Groundwater and Residential Wells Sampling - May 2010 to September 2013
Olin Chemical Superfund Site
Wilmington, MA

param_name	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	Tap Water RSL Nov 2013 (mg/L)	Number of SAMPLES Exceeding Tap Water RSL Nov 2013	Number of LOCATIONS Exceeding Tap Water RSL Nov 2013	EPA MCL	Number ETGT EPA MCL	EPA SMCL	MassDEP ORSG
Metals, Dissolved (mg/L)											
Aluminum	8 / 10	0.2 : 0.5	0.029 - 110	11.3786	16	1	1			0.05	
Arsenic	5 / 10	0.0016 : 0.2	0.0027 - 0.0073	0.0142	0.000045	5	5	0.01	0		
Beryllium	4 / 10	0.001 : 0.005	0.00017 - 0.012	0.001845	0.016	0		0.004	1		
Cadmium	2 / 10	0.001 : 0.005	0.00019 - 0.011	0.001769	0.0069	1	1	0.005	1		
Chromium	6 / 10	0.005 : 0.025	0.0011 - 23	2.34216		0		0.1	2		
Cobalt	8 / 10	0.01 : 0.05	0.0017 - 0.71	0.09368	0.0047	4	4				
Iron	10 / 10		0.14 - 260	34.685	11	4	4			0.3	
Manganese	10 / 10		0.063 - 22	3.5208	0.32	6	6			0.05	
Nickel	7 / 10	0.01 : 0.05	0.002 - 0.74	0.09656	0.3	1	1				0.1
Silver	2 / 10	0.005 : 0.025	0.0042 - 0.38	0.04167	0.071	1	1			0.1	
Thallium	1 / 10	0.0001 : 0.006	0.0013 - 0.0013	0.000785	0.00016	1	1	0.002	0		
Zinc	6 / 10	0.05 : 0.25	0.045 - 23	3.86	4.7	2	2			5	
Inorganics (mg/L)											
Nitrate as N	286 / 503	0.05 : 50	0.02 - 38	1.32387674	25	4	3	10	10		
Perchlorate	18 / 183	0.001 : 1	0.00021 - 0.014	0.01084623	0.011	4	2				
Site Specific Compounds (mg/L)											
Hydrazine	32 / 230	0.0001 : 0.00022	0.000054 - 0.23	0.0016303	0.000022	32	24				
UDMH	3 / 230	0.0005 : 0.001	0.00041 - 0.06	0.000513587	0.0016	1	1				
Acetaldehyde	6 / 230	0.03 : 0.75	0.013 - 0.075	0.024930435	0.0022	6	4				

mg/L =milligram per Liter
Exceeding defined as equal to or greater than

Prepared by / Date: KJC 05/02/14
Checked by / Date: PHT 06/13/14

Analyte detected most frequently (>10%)

Analyted detected above MCL most frequently (> 2%)

No MCL; Analyted detecetd most frequently above RSL (>10%)

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-101 OC-GW-101-XXX 10/11/2010	GW-101 OC-GW-101-XXX 5/12/2010	GW-103BR OC-GW-103BR-XXX 10/21/2010	GW-103BR OC-GW-103BR-XXX 5/25/2010	GW-103D OC-GW-103D-XXX 10/21/2010	GW-103D OC-GW-103D-XXX 5/25/2010	GW-10DR OC-GW-10DR-XXX 2/23/2011	GW-10DR OC-GW-10DR-XXX 5/18/2011	GW-10DR OC-GW-10D-XXX 2/29/2012	GW-10S OC-GW-10S-XXX 10/18/2010
Volatile Organics (mg/L)										
1,1-Dichloroethane										
1,2,4-Trichlorobenzene										
1,2-Dichloroethane										
1,4-Dichlorobenzene										
Benzene										
Bromodichloromethane										
Bromoform										
Carbon tetrachloride										
Chlorodibromomethane										
Chloroform										
Cis-1,2-Dichloroethene										
Dibromomethane										
Ethyl benzene										
Methyl Tertbutyl Ether										
Methylene chloride										
Naphthalene										
Trichloroethene			0.0029	0.0018	0.0011	0.0011				
Vinyl chloride										
Semivolatile Organics (mg/L)										
1,2,4,5-Tetrachlorobenzene										
2,6-Dinitrotoluene										
4-Chloroaniline										
Semivolatile Organics (mg/L)										
Benzo(a)anthracene				0.00018 J		0.00031				
Benzo(a)pyrene				0.00014 J		0.00015 J				
Benzo(b)fluoranthene				0.00018 J		0.00018 J				
Benzo(k)fluoranthene										
Biphenyl							0.0018 J	0.0018 J		
Bis(2-Ethylhexyl)phthalate										
Dibenz(a,h)anthracene				0.000092 J		0.00011 J	0.0001 J			
Indeno(1,2,3-cd)pyrene				0.000097 J		0.000099 J				
N-Nitrosodimethylamine		0.000018	0.000037	0.000037	0.000029	0.000034	0.0046 J	0.00087 J		0.000031
N-Nitrosodi-n-butylamine									0.0000049 J	
N-Nitrosodiphenylamine		0.12					0.026	0.017		
Pentachlorophenol										
Metlas, Total (mg/L)										
Aluminum										

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-101 OC-GW-101-XXX 10/11/2010	GW-101 OC-GW-101-XXX 5/12/2010	GW-103BR OC-GW-103BR-XXX 10/21/2010	GW-103BR OC-GW-103BR-XXX 5/25/2010	GW-103D OC-GW-103D-XXX 10/21/2010	GW-103D OC-GW-103D-XXX 5/25/2010	GW-10DR OC-GW-10DR-XXX 2/23/2011	GW-10DR OC-GW-10DR-XXX 5/18/2011	GW-10DR OC-GW-10D-XXX 2/29/2012	GW-10S OC-GW-10S-XXX 10/18/2010
Antimony										
Arsenic	0.018 J	0.0059	0.0014	0.0013			0.0024	0.0033		
Beryllium										
Cadmium										
Chromium, Hexavalent	0.00071 J						0.00062 J			
Cobalt	0.012		0.021	0.012	0.0092 J	0.01				0.0063 J
Copper										
Iron										
Manganese	0.54		0.92	0.87	1.4	1.5				
Nickel										
Silver										
Thallium										
Tin										
Vanadium										
Zinc										
Metals, Filtered (mg/L)										
Aluminum										
Arsenic										
Cadmium										
Cobalt										
Iron										
Manganese										
Nickel										
Silver										
Thallium										
Zinc										
Inorganics (mg/L)										
Nitrate as N										
Perchlorate										
Hydrazine							0.000087 J	0.00014		
Acetaldehyde										

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-13 OC-GW-13-XXX 10/12/2010	GW-13 OC-GW-13-XXX 5/10/2010	GW-14 OC-GW-14-XXX 5/13/2010	GW-15 OC-GW-15-XXX 10/12/2010	GW-15 OC-GW-15-XXX 5/13/2010	GW-16R OC-GW-16R-XXX 10/11/2010	GW-16R OC-GW-16R-XXX 5/10/2010	GW-17D OC-GW-17D-XXX 10/18/2010	GW-17D OC-GW-17D-XXX 7/1/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl				0.027 J	0.0064				
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.000047 J	0.0000048			0.000002	0.00012 J	0.00004	0.000056	0.000051
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-13 OC-GW-13-XXX 10/12/2010	GW-13 OC-GW-13-XXX 5/10/2010	GW-14 OC-GW-14-XXX 5/13/2010	GW-15 OC-GW-15-XXX 10/12/2010	GW-15 OC-GW-15-XXX 5/13/2010	GW-16R OC-GW-16R-XXX 10/11/2010	GW-16R OC-GW-16R-XXX 5/10/2010	GW-17D OC-GW-17D-XXX 10/18/2010	GW-17D OC-GW-17D-XXX 7/1/2010
Antimony									
Arsenic			0.00059 J	0.016		0.014	0.0036		
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt				0.005 J				0.011	0.012
Copper									
Iron									
Manganese						0.46		4.1	4.1
Nickel									
Silver									
Thallium									0.00022 J
Tin									
Vanadium				0.067					
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic				0.0072					
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-17S OC-GW-17S-XXX 10/19/2010	GW-17S OC-GW-17S-XXX 5/19/2010	GW-18D OC-GW-18D-XXX 10/20/2010	GW-18D OC-GW-18D-XXX 5/21/2010	GW-202BRD OC-GW-202BRD-XXX 2/24/2011	GW-202BRD OC-GW-202BRD-XXX 5/19/2011	GW-202BRS OC-GW-202BRS-XXX 2/24/2011	GW-202BRS OC-GW-202BRS-XXX 5/19/2011	GW-202D OC-GW-202D-XXX 10/19/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane					0.0019	0.0012	0.0031	0.0033	0.0011
1,4-Dichlorobenzene									
Benzene							0.00054 J	0.00049 J	
Bromodichloromethane					0.0016	0.00055	0.0066	0.005	0.00096 J
Bromoform							0.017	0.017	
Carbon tetrachloride									
Chlorodibromomethane					0.00042 J		0.0064	0.0051	0.0044
Chloroform					0.0067	0.0031	0.025	0.022	
Cis-1,2-Dichloroethene									
Dibromomethane								0.0085	
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene							0.00059 J	0.00052 J	
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)								0.00057 J	
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate							0.0077		
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine		0.000084	0.00000059 J			0.0011		0.0058 J	0.00069
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum							120	83	

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-17S OC-GW-17S-XXX 10/19/2010	GW-17S OC-GW-17S-XXX 5/19/2010	GW-18D OC-GW-18D-XXX 10/20/2010	GW-18D OC-GW-18D-XXX 5/21/2010	GW-202BRD OC-GW-202BRD-XXX 2/24/2011	GW-202BRD OC-GW-202BRD-XXX 5/19/2011	GW-202BRS OC-GW-202BRS-XXX 2/24/2011	GW-202BRS OC-GW-202BRS-XXX 5/19/2011	GW-202D OC-GW-202D-XXX 10/19/2010
Antimony									
Arsenic				0.00081 J	0.0016 J			0.013	
Beryllium									
Cadmium			0.0087				0.012	0.0087	
Chromium, Hexavalent									
Cobalt	0.027	0.036			0.15	0.063	0.78	0.71	0.069
Copper									
Iron					49	19	260	270	12
Manganese	7.3	5.5 J	0.38	0.48 J	9.3	6	24	24	2.4
Nickel							0.81	0.73	
Silver							0.49		
Thallium									0.00041 J
Tin									
Vanadium									
Zinc					20	6.6	25	16	
Metals, Filtered (mg/L)									
Aluminum							110		
Arsenic					0.0027				
Cadmium							0.011		
Cobalt					0.13		0.71		
Iron					43		260		
Manganese					8.6		22		
Nickel							0.74		
Silver							0.38		
Thallium							0.0013		
Zinc					15		23		
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine					0.000064 J		0.000075 J		
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-202D OC-GW-202D-XXX 5/14/2010	GW-202S OC-GW-202S-XXX 10/19/2010	GW-202S OC-GW-202S-XXX 5/14/2010	GW-21D OC-GW-21D-XXX 10/13/2010	GW-21D OC-GW-21D-XXX 5/11/2010	GW-21S OC-GW-21S-XXX 10/13/2010	GW-21S OC-GW-21S-XXX 5/11/2010	GW-24 OC-GW-24-XXX 10/14/2010	GW-24 OC-GW-24-XXX 5/18/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane	0.0013								
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane	0.0018								
Bromoform	0.0084								
Carbon tetrachloride									
Chlorodibromomethane	0.003		0.00024 J						
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene								0.00013 J	
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene								0.00037 J	
Indeno(1,2,3-cd)pyrene								0.00033 J	
N-Nitrosodimethylamine	0.00089	0.00014	0.0002	0.0000058	0.0000052			0.000027	
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-202D OC-GW-202D-XXX 5/14/2010	GW-202S OC-GW-202S-XXX 10/19/2010	GW-202S OC-GW-202S-XXX 5/14/2010	GW-21D OC-GW-21D-XXX 10/13/2010	GW-21D OC-GW-21D-XXX 5/11/2010	GW-21S OC-GW-21S-XXX 10/13/2010	GW-21S OC-GW-21S-XXX 5/11/2010	GW-24 OC-GW-24-XXX 10/14/2010	GW-24 OC-GW-24-XXX 5/18/2010
Antimony									
Arsenic				0.004	0.004	0.002	0.0025	0.0015	0.0015 J
Beryllium									
Cadmium									
Chromium, Hexavalent	0.00046 J								
Cobalt	0.077								
Copper									
Iron	14								
Manganese	2.6	0.67	0.82						
Nickel									
Silver									
Thallium	0.00043 J								
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-25 OC-GW-25-XXX 10/14/2010	GW-28D OC-GW-28D-XXX 10/13/2010	GW-28D OC-GW-28D-XXX 5/12/2010	GW-28S OC-GW-28S-XXX 10/13/2010	GW-28S OC-GW-28S-XXX 5/12/2010	GW-29D OC-GW-29D-XXX 10/13/2010	GW-29D OC-GW-29D-XXX 5/14/2010	GW-29S OC-GW-29S-XXX 10/13/2010	GW-29S OC-GW-29S-XXX 5/14/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene	0.00013 J								
Indeno(1,2,3-cd)pyrene	0.00011 J								
N-Nitrosodimethylamine	0.000069	0.000008	0.00004	0.0000034	0.0000013 J	0.000046	0.00006	0.0000077	0.00078 J
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine						0.033	0.05 J		
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-25 OC-GW-25-XXX 10/14/2010	GW-28D OC-GW-28D-XXX 10/13/2010	GW-28D OC-GW-28D-XXX 5/12/2010	GW-28S OC-GW-28S-XXX 10/13/2010	GW-28S OC-GW-28S-XXX 5/12/2010	GW-29D OC-GW-29D-XXX 10/13/2010	GW-29D OC-GW-29D-XXX 5/14/2010	GW-29S OC-GW-29S-XXX 10/13/2010	GW-29S OC-GW-29S-XXX 5/14/2010
Antimony									
Arsenic			0.00052 J		0.001	0.0042	0.0038	0.0029 J	
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt									
Copper									
Iron									
Manganese				0.49					
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-301 OC-GW-301-XXX 10/12/2010	GW-301 OC-GW-301-XXX 5/11/2010	GW-302 OC-GW-302-XXX 10/12/2010	GW-302 OC-GW-302-XXX 5/11/2010	GW-303 OC-GW-303-XXX 10/12/2010	GW-303 OC-GW-303-XXX 5/12/2010	GW-304 OC-GW-304-XXX 10/13/2010	GW-304 OC-GW-304-XXX 5/13/2010	GW-305 OC-GW-305-XXX 10/13/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine		0.00000083 J			0.000012 J	0.000016	0.0000037		0.00031
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-301 OC-GW-301-XXX 10/12/2010	GW-301 OC-GW-301-XXX 5/11/2010	GW-302 OC-GW-302-XXX 10/12/2010	GW-302 OC-GW-302-XXX 5/11/2010	GW-303 OC-GW-303-XXX 10/12/2010	GW-303 OC-GW-303-XXX 5/12/2010	GW-304 OC-GW-304-XXX 10/13/2010	GW-304 OC-GW-304-XXX 5/13/2010	GW-305 OC-GW-305-XXX 10/13/2010
Antimony									
Arsenic	0.0005 J	0.00081 J		0.0011	0.00057 J				0.021
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.0067 J		0.0098 J						
Copper									
Iron									
Manganese					0.58	0.35			
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N								38	
Perchlorate									
Hydrazine					0.00025				
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-305 OC-GW-305-XXX 5/13/2010	GW-306 OC-GW-306-XXX 10/13/2010	GW-306 OC-GW-306-XXX 5/13/2010	GW-307 OC-GW-307-XXX 10/18/2010	GW-307 OC-GW-307-XXX 5/14/2010	GW-308 OC-GW-308-XXX 10/14/2010	GW-308 OC-GW-308-XXX 5/13/2010	GW-31D OC-GW-31D-XXX 10/12/2010	GW-31D OC-GW-31D-XXX 5/11/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.00023			0.0013				0.000012	0.000025
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum					17				

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-305 OC-GW-305-XXX 5/13/2010	GW-306 OC-GW-306-XXX 10/13/2010	GW-306 OC-GW-306-XXX 5/13/2010	GW-307 OC-GW-307-XXX 10/18/2010	GW-307 OC-GW-307-XXX 5/14/2010	GW-308 OC-GW-308-XXX 10/14/2010	GW-308 OC-GW-308-XXX 5/13/2010	GW-31D OC-GW-31D-XXX 10/12/2010	GW-31D OC-GW-31D-XXX 5/11/2010
Antimony									
Arsenic	0.0068	0.0012	0.00065 J	0.026 J		0.003	0.01	0.019	0.015
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt				0.013	0.019 J		0.0052 J		
Copper									
Iron				23	34		12		15
Manganese				2.2	1.1	0.4		0.59	0.34
Nickel									
Silver									
Thallium									
Tin									
Vanadium					0.066				
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									0.0073
Cadmium									
Cobalt					0.0069 J				
Iron					12				
Manganese					1.1				0.35
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine				0.23	0.12 J	0.00093	0.0024 J		
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-31S OC-GW-31S-XXX 10/12/2010	GW-32D OC-GW-32D-XXX 10/12/2010	GW-32D OC-GW-32D-XXX 5/11/2010	GW-32S OC-GW-32S-XXX 10/12/2010	GW-32S OC-GW-32S-XXX 5/11/2010	GW-34D OC-GW-34D-XXX 10/15/2010	GW-34D OC-GW-34D-XXX 5/14/2010	GW-34SR OC-GW-34SR-XXX 10/15/2010	GW-34SR OC-GW-34SR-XXX 5/14/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)		0.001 J							
Benzo(a)anthracene									
Benzo(a)pyrene							0.00014 J		
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0000092 J	0.00031 J	0.00059	0.000043 J		0.00001	0.000023 J		
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-31S OC-GW-31S-XXX 10/12/2010	GW-32D OC-GW-32D-XXX 10/12/2010	GW-32D OC-GW-32D-XXX 5/11/2010	GW-32S OC-GW-32S-XXX 10/12/2010	GW-32S OC-GW-32S-XXX 5/11/2010	GW-34D OC-GW-34D-XXX 10/15/2010	GW-34D OC-GW-34D-XXX 5/14/2010	GW-34SR OC-GW-34SR-XXX 10/15/2010	GW-34SR OC-GW-34SR-XXX 5/14/2010
Antimony									
Arsenic	0.003 J	0.0024	0.0018			0.01	0.0085		
Beryllium									
Cadmium									
Chromium, Hexavalent					0.00077 J				0.00065 J
Cobalt								0.0059 J	
Copper									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-39 OC-GW-39-XXX 10/18/2010	GW-39 OC-GW-39-XXX 5/26/2010	GW-3D OC-GW-3D-XXX 10/15/2010	GW-3D OC-GW-3D-XXX 5/17/2010	GW-3S OC-GW-3S-XXX 10/15/2010	GW-4 OC-GW-4-XXX 10/14/2010	GW-4 OC-GW-4-XXX 5/18/2010	GW-400BR OC-GW-400BR-XXX 11/7/2012	GW-400BR OC-GW-400BR-XXX 4/18/2012
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									0.00092 J
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene								0.00015 J	
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene		0.00014 J							
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0000044		0.000047		0.0000058	0.0000038	0.00011		
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-39 OC-GW-39-XXX 10/18/2010	GW-39 OC-GW-39-XXX 5/26/2010	GW-3D OC-GW-3D-XXX 10/15/2010	GW-3D OC-GW-3D-XXX 5/17/2010	GW-3S OC-GW-3S-XXX 10/15/2010	GW-4 OC-GW-4-XXX 10/14/2010	GW-4 OC-GW-4-XXX 5/18/2010	GW-400BR OC-GW-400BR-XXX 11/7/2012	GW-400BR OC-GW-400BR-XXX 4/18/2012
Antimony									
Arsenic								0.002	0.00049
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt			0.013	0.017	0.0056 J	0.066	0.013		
Copper									
Iron									
Manganese			7	8.7	2.1	1.8	2.3	1	0.59
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-400D OC-GW-400D-XXX 11/7/2012	GW-400D OC-GW-400D-XXX 4/18/2012	GW-400M OC-GW-400M-XXX 11/8/2012	GW-400M OC-GW-400M-XXX 4/16/2012	GW-400S OC-GW-400S-XXX 11/8/2012	GW-400S OC-GW-400S-XXX 4/16/2012	GW-401D OC-GW-401D-XXX 5/19/2011	GW-402D OC-GW-402D-XXX 11/23/2010	GW-402D OC-GW-402D-XXX 11/24/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane			0.0071	0.0059					
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene								0.00054 J	
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform		0.0012							
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene			0.00056 J						
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene	0.00018 J								
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine									
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-400D OC-GW-400D-XXX 11/7/2012	GW-400D OC-GW-400D-XXX 4/18/2012	GW-400M OC-GW-400M-XXX 11/8/2012	GW-400M OC-GW-400M-XXX 4/16/2012	GW-400S OC-GW-400S-XXX 11/8/2012	GW-400S OC-GW-400S-XXX 4/16/2012	GW-401D OC-GW-401D-XXX 5/19/2011	GW-402D OC-GW-402D-XXX 11/23/2010	GW-402D OC-GW-402D-XXX 11/24/2010
Antimony									
Arsenic	0.00094 J	0.0008 J	0.0027	0.0028	0.00083 J	0.00055	0.00061 J		
Beryllium									
Cadmium									
Chromium, Hexavalent							0.00066 J		
Cobalt									0.01
Copper									
Iron									14
Manganese	0.67	0.44				0.33			0.85
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									0.72
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-402D OC-GW-402D-XXX 5/23/2011	GW-403D OC-GW-403D-XXX 6/1/2010	GW-404BR OC-GW-404BR-XXX 11/7/2012	GW-404BR OC-GW-404BR-XXX 4/16/2012	GW-404BR OC-GW-404BR-XXX 6/18/2013	GW-404D OC-GW-404D-XXX 11/7/2012	GW-404D OC-GW-404D-XXX 4/16/2012	GW-404D OC-GW-404D-XXX 6/18/2013	GW-404M OC-GW-404M-XXX 11/6/2012
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform				0.00037 J			0.0022		
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene				0.00047 J					
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene			0.00021 J						
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene		0.00013 J							
Benzo(b)fluoranthene		0.00015 J							
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene		0.000061 J							
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine			0.0000027 N		0.0000015 J	0.0000023 N		0.00000054 J	
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-402D OC-GW-402D-XXX 5/23/2011	GW-403D OC-GW-403D-XXX 6/1/2010	GW-404BR OC-GW-404BR-XXX 11/7/2012	GW-404BR OC-GW-404BR-XXX 4/16/2012	GW-404BR OC-GW-404BR-XXX 6/18/2013	GW-404D OC-GW-404D-XXX 11/7/2012	GW-404D OC-GW-404D-XXX 4/16/2012	GW-404D OC-GW-404D-XXX 6/18/2013	GW-404M OC-GW-404M-XXX 11/6/2012
Antimony									
Arsenic			0.0055	0.0036		0.0066	0.0029		0.024
Beryllium									
Cadmium									
Chromium, Hexavalent	0.00076 J	0.00082 J		0.00066 J					
Cobalt									
Copper									
Iron									
Manganese			0.38	0.41		1	0.52		1.1
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-404M OC-GW-404M-XXX 4/16/2012	GW-404S OC-GW-404S-XXX 11/6/2012	GW-404S OC-GW-404S-XXX 4/18/2012	GW-405BR OC-GW-405BR-130/140 12/16/2010	GW-405BR OC-GW-405BR-235/245 12/17/2010	GW-405BRD OC-GW-405BRD-XXX 10/13/2011	GW-405BRD OC-GW-405BRD-XXX 4/12/2011	GW-405BRD OC-GW-405BRD-XXX 5/20/2011	GW-405BRM OC-GW-405BRM-XXX 10/13/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane							0.0031	0.0019 J	
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform	0.00037 J		0.00055 J			0.015	0.023	0.017	0.0013 J
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine				0.00000061 J	0.0000014 J	0.000015 J	0.0000046	0.000007 J	
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol								0.0034 J	
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-404M OC-GW-404M-XXX 4/16/2012	GW-404S OC-GW-404S-XXX 11/6/2012	GW-404S OC-GW-404S-XXX 4/18/2012	GW-405BR OC-GW-405BR-130/140 12/16/2010	GW-405BR OC-GW-405BR-235/245 12/17/2010	GW-405BRD OC-GW-405BRD-XXX 10/13/2011	GW-405BRD OC-GW-405BRD-XXX 4/12/2011	GW-405BRD OC-GW-405BRD-XXX 5/20/2011	GW-405BRM OC-GW-405BRM-XXX 10/13/2011
Antimony									
Arsenic	0.0027	0.00091 J	0.0016			0.012	0.0023	0.0051	0.0027 J
Beryllium									
Cadmium									
Chromium, Hexavalent		0.0011					0.00072 J		
Cobalt	0.0061 J	0.0058							
Copper									
Iron									
Manganese	1.3	0.75	0.96						
Nickel									
Silver									
Thallium			0.0004						
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic								0.0051	
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-405BRM OC-GW-405BRM-XXX 4/11/2011	GW-405BRM OC-GW-405BRM-XXX 5/20/2011	GW-405BRS OC-GW-405BRS-XXX 10/11/2011	GW-405BRS OC-GW-405BRS-XXX 4/11/2011	GW-405BRS OC-GW-405BRS-XXX 5/20/2011	GW-406 OC-GW-406-XXX 10/28/2010	GW-406 OC-GW-406-XXX 6/1/2010	GW-406BRD OC-GW-406BRD-XXX 10/28/2010	GW-406BRD OC-GW-406BRD-XXX 5/19/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene								0.002	0.0023
Bromodichloromethane				0.0003 J					
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform		0.0022 J		0.0036					
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene			0.0048 J						
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate						0.0074 J			
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0000014 J	0.0000053 J						0.000053	0.0018
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-405BRM OC-GW-405BRM-XXX 4/11/2011	GW-405BRM OC-GW-405BRM-XXX 5/20/2011	GW-405BRS OC-GW-405BRS-XXX 10/11/2011	GW-405BRS OC-GW-405BRS-XXX 4/11/2011	GW-405BRS OC-GW-405BRS-XXX 5/20/2011	GW-406 OC-GW-406-XXX 10/28/2010	GW-406 OC-GW-406-XXX 6/1/2010	GW-406BRD OC-GW-406BRD-XXX 10/28/2010	GW-406BRD OC-GW-406BRD-XXX 5/19/2011
Antimony									
Arsenic	0.0032	0.0024 J				0.0043		0.0019	0.00045 J
Beryllium									
Cadmium									
Chromium, Hexavalent				0.00058 J	0.00063 J				
Cobalt						0.0095 J	0.009 J		
Copper									
Iron									
Manganese						1.9	1.9	0.42	0.47
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									0.000067 J
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-406BRS OC-GW-406BRS-XXX 10/28/2010	GW-406BRS OC-GW-406BRS-XXX 5/19/2011	GW-407BRD OC-GW-407BRD-XXX 10/29/2010	GW-407BRD OC-GW-407BRD-XXX 5/19/2011	GW-407BRS OC-GW-407BRS-XXX 10/29/2010	GW-407BRS OC-GW-407BRS-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 2/24/2011	GW-408D OC-GW-408D-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 5/25/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane				0.00029 J			0.00051 J	0.00078 J	
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane							0.00041 J	0.00081	
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane							0.00065	0.0012	
Chloroform							0.0014	0.0019	
Cis-1,2-Dichloroethene			0.18	0.16	0.19	0.19			
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride						0.02			
Naphthalene									
Trichloroethene				0.0015					
Vinyl chloride				0.0019					
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene								0.00047 J	
4-Chloroaniline									
Semivolatile Organics (mg/L)								0.00057 J	
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0004	0.000048	0.0000035		0.0000019 J	0.0000026 J	0.00095 J	0.00065 J	
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-406BRS OC-GW-406BRS-XXX 10/28/2010	GW-406BRS OC-GW-406BRS-XXX 5/19/2011	GW-407BRD OC-GW-407BRD-XXX 10/29/2010	GW-407BRD OC-GW-407BRD-XXX 5/19/2011	GW-407BRS OC-GW-407BRS-XXX 10/29/2010	GW-407BRS OC-GW-407BRS-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 2/24/2011	GW-408D OC-GW-408D-XXX 5/19/2011	GW-408D OC-GW-408D-XXX 5/25/2011
Antimony									
Arsenic	0.0019	0.002	0.00096 J	0.0007 J	0.0017	0.0017 J	0.0044 J	0.0036	
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt							0.048	0.049	
Copper									
Iron							23	15	
Manganese			0.35		0.49	0.48	1.8	1.7	
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic							0.0039 J		
Cadmium									
Cobalt							0.051		
Iron							20		
Manganese							1.9		
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine							0.00019		0.00011
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-408S OC-GW-408S-XXX 2/23/2011	GW-408S OC-GW-408S-XXX 5/19/2011	GW-40S OC-GW-40S-XXX 10/27/2010	GW-40S OC-GW-40S-XXX 5/27/2010	GW-42S OC-GW-42S-XXX 10/25/2010	GW-42S OC-GW-42S-XXX 6/7/2010	GW-43SR OC-GW-43SR-XXX 5/18/2011	GW-43SR OC-GW-43S-XXX 11/22/2010	GW-44D OC-GW-44D-XXX 10/12/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									0.0044 J
1,4-Dichlorobenzene									
Benzene									0.0033 J
Bromodichloromethane									0.0015 J
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									0.0021 J
Chloroform									0.082
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									0.0037 J
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									0.0089
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene	0.00063 J	0.00063 J							
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene						0.00042 J			
Benzo(a)pyrene					0.00016 J	0.00052 J			
Benzo(b)fluoranthene					0.00028	0.0011 J			
Benzo(k)fluoranthene						0.0004 J			
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene	0.000066 J					0.00018 J			
Indeno(1,2,3-cd)pyrene						0.00048 J			
N-Nitrosodimethylamine	0.000088	0.00014							0.0048
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									1200

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-408S OC-GW-408S-XXX 2/23/2011	GW-408S OC-GW-408S-XXX 5/19/2011	GW-40S OC-GW-40S-XXX 10/27/2010	GW-40S OC-GW-40S-XXX 5/27/2010	GW-42S OC-GW-42S-XXX 10/25/2010	GW-42S OC-GW-42S-XXX 6/7/2010	GW-43SR OC-GW-43SR-XXX 5/18/2011	GW-43SR OC-GW-43S-XXX 11/22/2010	GW-44D OC-GW-44D-XXX 10/12/2011
Antimony									
Arsenic	0.0021	0.0017 J		0.001					0.2
Beryllium									0.16
Cadmium									
Chromium, Hexavalent									
Cobalt									5.7
Copper									5
Iron									2600
Manganese	0.43	0.46	0.49				0.91	0.87	170
Nickel									5.8
Silver									
Thallium									
Tin									
Vanadium									
Zinc									11
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									0.014
Hydrazine	0.000077 J	0.000072 J							0.00027
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-44D OC-GW-44D-XXX 4/17/2012	GW-44S OC-GW-44S-XXX 10/12/2011	GW-44S OC-GW-44S-XXX 4/17/2012	GW-45D OC-GW-45D-XXX 10/27/2010	GW-45D OC-GW-45D-XXX 5/19/2010	GW-45S OC-GW-45S-XXX 10/27/2010	GW-45S OC-GW-45S-XXX 5/19/2010	GW-47 OC-GW-47-XXX 10/25/2010	GW-47 OC-GW-47-XXX 5/25/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane	0.0045 J			0.022	0.023				
1,4-Dichlorobenzene									
Benzene	0.0034 J			0.0099	0.0076				
Bromodichloromethane				0.002 J	0.0025 J				
Bromoform	0.013			0.023	0.027				
Carbon tetrachloride									
Chlorodibromomethane	0.0023 J			0.017	0.0063				
Chloroform	0.086			0.033	0.023				
Cis-1,2-Dichloroethene									
Dibromomethane					0.0085				
Ethyl benzene	0.004 J			0.0046	0.003 J				
Methyl Tertbutyl Ether									
Methylene chloride				0.025	0.025				
Naphthalene				0.0033 J	0.013 J				
Trichloroethene	0.011			0.0078	0.0072				
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline					0.00085 J				
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene					0.0003	0.00032	0.00026 J		
Benzo(b)fluoranthene					0.00051	0.00033	0.00044 J		
Benzo(k)fluoranthene									
Biphenyl				0.0038 J	0.0044 J				
Bis(2-Ethylhexyl)phthalate	0.0053 J								
Dibenz(a,h)anthracene		0.00012 J			0.000085 J				0.000059 J
Indeno(1,2,3-cd)pyrene		0.00012 J			0.00026 J	0.00077	0.00021 J		
N-Nitrosodimethylamine	0.025 J			0.0045 J	0.0039 J	0.0000018 J			
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum	1200			420	190				

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-44D OC-GW-44D-XXX 4/17/2012	GW-44S OC-GW-44S-XXX 10/12/2011	GW-44S OC-GW-44S-XXX 4/17/2012	GW-45D OC-GW-45D-XXX 10/27/2010	GW-45D OC-GW-45D-XXX 5/19/2010	GW-45S OC-GW-45S-XXX 10/27/2010	GW-45S OC-GW-45S-XXX 5/19/2010	GW-47 OC-GW-47-XXX 10/25/2010	GW-47 OC-GW-47-XXX 5/25/2010
Antimony									
Arsenic	0.22	0.00058	0.00051						
Beryllium	0.17			0.062	0.04				
Cadmium	0.091			0.011	0.046				
Chromium, Hexavalent									
Cobalt	5.7			5	3.6			0.0071 J	0.0063 J
Copper	4.9			2.7	1.7				
Iron	2500			650	400				
Manganese	160		0.41	170	130	1.1			
Nickel	5.8			3.1	2.1				
Silver	11			2.9	0.76				
Thallium				0.0056	0.0045 J				
Tin					21				
Vanadium									
Zinc	11			5.3					
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N	27								
Perchlorate	0.013								
Hydrazine	0.00018								
Acetaldehyde	0.056								

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-48S OC-GW-48S-XXX 10/25/2010	GW-48S OC-GW-48S-XXX 5/21/2010	GW-4D OC-GW-4D-XXX 10/14/2010	GW-4D OC-GW-4D-XXX 5/18/2010	GW-50D OC-GW-50D-XXX 10/20/2010	GW-50D OC-GW-50D-XXX 5/20/2010	GW-50S OC-GW-50S-XXX 10/20/2010	GW-50S OC-GW-50S-XXX 5/20/2010	GW-51D OC-GW-51D-XXX 10/18/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane			0.00092 J		0.00085 J	0.0008 J			
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform				0.0002 J					
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene			0.00055 J						
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine			0.00075	0.00083	0.00094		0.000051	0.000078	0.000022
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-48S OC-GW-48S-XXX 10/25/2010	GW-48S OC-GW-48S-XXX 5/21/2010	GW-4D OC-GW-4D-XXX 10/14/2010	GW-4D OC-GW-4D-XXX 5/18/2010	GW-50D OC-GW-50D-XXX 10/20/2010	GW-50D OC-GW-50D-XXX 5/20/2010	GW-50S OC-GW-50S-XXX 10/20/2010	GW-50S OC-GW-50S-XXX 5/20/2010	GW-51D OC-GW-51D-XXX 10/18/2010
Antimony									
Arsenic	0.0095	0.019							
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.04	0.017	0.0068 J	0.063	0.021	0.014	0.0068 J	0.0072 J	0.06
Copper									
Iron	23	28							
Manganese	1.4	1.2 J	1.3	1.9	2.6	1.8 J	1	0.93 J	6.3
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-51D OC-GW-51D-XXX 5/18/2010	GW-51S OC-GW-51S-XXX 10/18/2010	GW-52D OC-GW-52D-XXX 10/13/2010	GW-52D OC-GW-52D-XXX 5/13/2010	GW-52S OC-GW-52S-XXX 10/13/2010	GW-52S OC-GW-52S-XXX 5/13/2010	GW-53D OC-GW-53D-XXX 10/19/2010	GW-53D OC-GW-53D-XXX 5/12/2010	GW-53S OC-GW-53S-XXX 10/12/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
Benzene									
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene									
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl			0.00096 J				0.0016 J	0.0022 J	
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.000029	0.0000023	0.000013	0.000011			0.000038	0.00011	0.000014 J
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-51D OC-GW-51D-XXX 5/18/2010	GW-51S OC-GW-51S-XXX 10/18/2010	GW-52D OC-GW-52D-XXX 10/13/2010	GW-52D OC-GW-52D-XXX 5/13/2010	GW-52S OC-GW-52S-XXX 10/13/2010	GW-52S OC-GW-52S-XXX 5/13/2010	GW-53D OC-GW-53D-XXX 10/19/2010	GW-53D OC-GW-53D-XXX 5/12/2010	GW-53S OC-GW-53S-XXX 10/12/2010
Antimony									
Arsenic			0.016 J	0.0091	0.0025	0.00089 J			0.00083 J
Beryllium									
Cadmium									
Chromium, Hexavalent						0.00096 J			
Cobalt	0.057								
Copper									
Iron									
Manganese	6.7	1.2						0.34	
Nickel									
Silver									
Thallium									
Tin									
Vanadium			0.07	0.088	0.28	0.18			
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine		0.00012 J	0.0023	0.0016 J	0.000095 J				0.000057 J
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-53S OC-GW-53S-XXX 5/12/2010	GW-54D OC-GW-54D-XXX 10/15/2010	GW-54D OC-GW-54D-XXX 5/12/2010	GW-54S OC-GW-54S-XXX 10/15/2010	GW-54S OC-GW-54S-XXX 5/12/2010	GW-55D OC-GW-55D-XXX 10/14/2010	GW-55D OC-GW-55D-XXX 5/18/2010	GW-55S OC-GW-55S-XXX 10/14/2010	GW-55S OC-GW-55S-XXX 5/18/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane						0.0019	0.0017	0.0006 J	
1,4-Dichlorobenzene									
Benzene						0.0004 J			
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene						0.00035 J			
Trichloroethene						0.0005 J			
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl						0.00092 J	0.0012 J		
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0000051	0.0000037	0.000007	0.0000006 J		0.0017	0.0017	0.00044	0.00022
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-53S OC-GW-53S-XXX 5/12/2010	GW-54D OC-GW-54D-XXX 10/15/2010	GW-54D OC-GW-54D-XXX 5/12/2010	GW-54S OC-GW-54S-XXX 10/15/2010	GW-54S OC-GW-54S-XXX 5/12/2010	GW-55D OC-GW-55D-XXX 10/14/2010	GW-55D OC-GW-55D-XXX 5/18/2010	GW-55S OC-GW-55S-XXX 10/14/2010	GW-55S OC-GW-55S-XXX 5/18/2010
Antimony									
Arsenic	0.00051 J				0.00073 J				
Beryllium									
Cadmium									
Chromium, Hexavalent	0.00071 J								
Cobalt						0.087	0.059	0.04	0.038
Copper									
Iron						55	67		
Manganese			0.46			2.8	3.3	1.2	1.5
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-56D OC-GW-56D-XXX 10/18/2010	GW-56D OC-GW-56D-XXX 5/20/2010	GW-56S OC-GW-56S-XXX 10/18/2010	GW-56S OC-GW-56S-XXX 5/20/2010	GW-57D OC-GW-57D-XXX 10/13/2011	GW-57D OC-GW-57D-XXX 4/17/2012	GW-58D OC-GW-58D-XXX 10/21/2010	GW-58D OC-GW-58D-XXX 5/24/2010	GW-58S OC-GW-58S-XXX 10/21/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene							0.002		
1,2-Dichloroethane							0.011		
1,4-Dichlorobenzene							0.00058 J		
Benzene							0.0057		
Bromodichloromethane							0.00024 J		
Bromoform									
Carbon tetrachloride							0.003 J		
Chlorodibromomethane							0.0035		
Chloroform							0.0083	0.00022 J	
Cis-1,2-Dichloroethene							0.051		
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether								0.033	
Methylene chloride									
Naphthalene									
Trichloroethene							0.27	0.0071	0.0017
Vinyl chloride							0.0061		
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl							0.00095 J		
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene	0.0001 J		0.000066 J						
Indeno(1,2,3-cd)pyrene	0.000093 J								
N-Nitrosodimethylamine	0.000055		0.000042				0.024 J		0.000029
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol									
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-56D OC-GW-56D-XXX 10/18/2010	GW-56D OC-GW-56D-XXX 5/20/2010	GW-56S OC-GW-56S-XXX 10/18/2010	GW-56S OC-GW-56S-XXX 5/20/2010	GW-57D OC-GW-57D-XXX 10/13/2011	GW-57D OC-GW-57D-XXX 4/17/2012	GW-58D OC-GW-58D-XXX 10/21/2010	GW-58D OC-GW-58D-XXX 5/24/2010	GW-58S OC-GW-58S-XXX 10/21/2010
Antimony									
Arsenic									
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt			0.0086 J	0.0098 J	0.0071 J	0.0084 J	0.47	0.049	
Copper									
Iron							140		
Manganese	0.94	0.84 J	1.1	0.39 J	2.2	3.1	32	4.4 J	0.37
Nickel							0.34		
Silver									
Thallium							0.00027 J		
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-58S OC-GW-58S-XXX 5/24/2010	GW-60D OC-GW-60D-XXX 11/17/2010	GW-60D OC-GW-60D-XXX 5/18/2011	GW-61BR OC-GW-61BR-XXX 10/29/2010	GW-61BR OC-GW-61BR-XXX 6/4/2010	GW-61D OC-GW-61D-XXX 5/28/2010	GW-61S OC-GW-61S-XXX 10/22/2010	GW-62BR OC-GW-62BR-XXX 10/26/2010	GW-62BR OC-GW-62BR-XXX 5/27/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane								0.0018	0.0012
1,4-Dichlorobenzene									
Benzene								0.0015	0.0011
Bromodichloromethane									
Bromoform									
Carbon tetrachloride									
Chlorodibromomethane									
Chloroform									0.00036 J
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Trichloroethene	0.00083 J							0.025	0.027
Vinyl chloride									
Semivolatile Organics (mg/L)									
1,2,4,5-Tetrachlorobenzene									
2,6-Dinitrotoluene									
4-Chloroaniline									
Semivolatile Organics (mg/L)									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene							0.00014 J		
Indeno(1,2,3-cd)pyrene							0.00013 J		
N-Nitrosodimethylamine				0.00012 J	0.00013 J			0.013 J	0.016 J
N-Nitrosodi-n-butylamine									
N-Nitrosodiphenylamine									
Pentachlorophenol					0.00094 J				
Metlas, Total (mg/L)									
Aluminum									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-58S OC-GW-58S-XXX 5/24/2010	GW-60D OC-GW-60D-XXX 11/17/2010	GW-60D OC-GW-60D-XXX 5/18/2011	GW-61BR OC-GW-61BR-XXX 10/29/2010	GW-61BR OC-GW-61BR-XXX 6/4/2010	GW-61D OC-GW-61D-XXX 5/28/2010	GW-61S OC-GW-61S-XXX 10/22/2010	GW-62BR OC-GW-62BR-XXX 10/26/2010	GW-62BR OC-GW-62BR-XXX 5/27/2010
Antimony								0.012 J	
Arsenic		0.0045	0.005	0.00079 J				0.0055 J	0.0046 J
Beryllium									
Cadmium									
Chromium, Hexavalent						0.00078 J			
Cobalt								0.12	0.059
Copper									
Iron									
Manganese		0.66	0.54					27	12
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Metals, Filtered (mg/L)									
Aluminum									
Arsenic									
Cadmium									
Cobalt									
Iron									
Manganese									
Nickel									
Silver									
Thallium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazine									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

casno	Group	fraction	ppm_uom	Parameter Name	B-07-A OC-B-07-A-XXX 10/11/2010	B-10 OC-B-10-XXX 5/11/2010	B-10 OC-B-10-XXX 5/18/2011	GW-70D OC-GW-70D-XXX 10/22/2010	GW-70D OC-GW-70D-XXX 5/18/2011	GW-70S OC-GW-70S-XXX 10/22/2010
				Volatile Organics (mg/L)						
75-34-3	1a-VOCs	N	MG/L	1,1-Dichloroethane						
120-82-1	1a-VOCs	N	MG/L	1,2,4-Trichlorobenzene						
107-06-2	1a-VOCs	N	MG/L	1,2-Dichloroethane				0.0027	0.0026	
106-46-7	1a-VOCs	N	MG/L	1,4-Dichlorobenzene			0.001	0.00075 J	0.0007 J	
123-91-1	1a-VOCs	N	MG/L	1,4-Dioxane						
71-43-2	1a-VOCs	N	MG/L	Benzene				0.0035	0.0035	
75-27-4	1a-VOCs	N	MG/L	Bromodichloromethane						
75-25-2	1a-VOCs	N	MG/L	Bromoform						
108-90-7	1a-VOCs	N	MG/L	Chlorobenzene						
124-48-1	1a-VOCs	N	MG/L	Chlorodibromomethane						
67-66-3	1a-VOCs	N	MG/L	Chloroform				0.021	0.018	
156-59-2	1a-VOCs	N	MG/L	Cis-1,2-Dichloroethene						
74-95-3	1a-VOCs	N	MG/L	Dibromomethane						
100-41-4	1a-VOCs	N	MG/L	Ethyl benzene		0.0031	0.013	0.0022	0.0021	
1634-04-4	1a-VOCs	N	MG/L	Methyl Tertbutyl Ether						
75-09-2	1a-VOCs	N	MG/L	Methylene chloride						
91-20-3	1a-VOCs	N	MG/L	Naphthalene				0.00078 J		
109-99-9	1a-VOCs	N	MG/L	Tetrahydrofuran						
108-88-3	1a-VOCs	N	MG/L	Toluene						
79-01-6	1a-VOCs	N	MG/L	Trichloroethene				0.007	0.0064	
75-01-4	1a-VOCs	N	MG/L	Vinyl chloride						
95-47-6	1a-VOCs	N	MG/L	Xylene, o						
				Semivolatile Organics (mg/L)						
606-20-2	2a-SVOCs	N	MG/L	2,6-Dinitrotoluene			0.0095			
1912-24-9	2a-SVOCs	N	MG/L	Atrazine						
103-33-3	2a-SVOCs	N	MG/L	Azobenzene						
56-55-3	2a-SVOCs	N	MG/L	Benzo(a)anthracene						
50-32-8	2a-SVOCs	N	MG/L	Benzo(a)pyrene						
205-99-2	2a-SVOCs	N	MG/L	Benzo(b)fluoranthene						
207-08-9	2a-SVOCs	N	MG/L	Benzo(k)fluoranthene						
92-52-4	2a-SVOCs	N	MG/L	Biphenyl		0.0022 J	0.0045			
117-81-7	2a-SVOCs	N	MG/L	Bis(2-Ethylhexyl)phthalate						
53-70-3	2a-SVOCs	N	MG/L	Dibenz(a,h)anthracene						
193-39-5	2a-SVOCs	N	MG/L	Indeno(1,2,3-cd)pyrene						
62-75-9	2a-SVOCs	N	MG/L	N-Nitrosodimethylamine		0.00000088 J		0.0079	0.0099	
86-30-6	2a-SVOCs	N	MG/L	N-Nitrosodiphenylamine		0.035	0.13			
				Metals, Total (mg/L)						

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

casno	Group	fraction	ppm_uom	Parameter Name	B-07-A OC-B-07-A-XXX 10/11/2010	B-10 OC-B-10-XXX 5/11/2010	B-10 OC-B-10-XXX 5/18/2011	GW-70D OC-GW-70D-XXX 10/22/2010	GW-70D OC-GW-70D-XXX 5/18/2011	GW-70S OC-GW-70S-XXX 10/22/2010
7429-90-5	6a-Metals	T	MG/L	Aluminum						
7440-36-0	6a-Metals	T	MG/L	Antimony						
7440-38-2	6a-Metals	T	MG/L	Arsenic	0.00079 J	0.00074 J	0.0043		0.0036	
7440-41-7	6a-Metals	T	MG/L	Beryllium						
7440-43-9	6a-Metals	T	MG/L	Cadmium						
18540-29-9	6a-Metals	T	MG/L	Chromium, Hexavalent						
7440-48-4	6a-Metals	T	MG/L	Cobalt				4.5	3.8	
7440-50-8	6a-Metals	T	MG/L	Copper						
7439-89-6	6a-Metals	T	MG/L	Iron				290	240	
7439-96-5	6a-Metals	T	MG/L	Manganese			1.4	250	210	1.1
7439-97-6	6a-Metals	T	MG/L	Mercury				0.00066		
7440-02-0	6a-Metals	T	MG/L	Nickel				2.5	2.1	
7440-22-4	6a-Metals	T	MG/L	Silver						
7440-28-0	6a-Metals	T	MG/L	Thallium						
7440-31-5	6a-Metals	T	MG/L	Tin						
7440-62-2	6a-Metals	T	MG/L	Vanadium	0.066					
7440-66-6	6a-Metals	T	MG/L	Zinc						
				Inorganics (mg/L)						
14797-55-8	7-Inorganic	N	MG/L	Nitrate as N						
14797-73-0	7-Inorganic	N	MG/L	Perchlorate						
				Hydrazines (mg/L)						
302-01-2	9a-Hydrazi	N	MG/L	Hydrazine						
57-14-7	9a-Hydrazi	N	MG/L	UDMH						
75-07-0	9b-Formalc	N	MG/L	Acetaldehyde						

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-70S OC-GW-70S-XXX 5/18/2011	GW-71D OC-GW-71D-XXX 10/29/2010	GW-71D OC-GW-71D-XXX 5/25/2010	GW-71S OC-GW-71S-XXX 5/25/2010	GW-72D OC-GW-72D-XXX 10/27/2010	GW-72D OC-GW-72D-XXX 5/21/2010	GW-73D OC-GW-73D-XXX 10/21/2010	GW-73D OC-GW-73D-XXX 5/26/2010	GW-74D OC-GW-74D-XXX 10/25/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene									
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene									
Vinyl chloride							0.00086	0.00056	
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine				0.00094 J					
Azobenzene									
Benzo(a)anthracene			0.00036	0.0006					
Benzo(a)pyrene			0.00017 J	0.00024					
Benzo(b)fluoranthene			0.00018 J	0.00025 J					
Benzo(k)fluoranthene			0.0003	0.00038					
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene			0.0001 J	0.00023 J					
Indeno(1,2,3-cd)pyrene			0.0001 J	0.00023 J					
N-Nitrosodimethylamine		0.00015	0.00016				0.000043		
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-70S OC-GW-70S-XXX 5/18/2011	GW-71D OC-GW-71D-XXX 10/29/2010	GW-71D OC-GW-71D-XXX 5/25/2010	GW-71S OC-GW-71S-XXX 5/25/2010	GW-72D OC-GW-72D-XXX 10/27/2010	GW-72D OC-GW-72D-XXX 5/21/2010	GW-73D OC-GW-73D-XXX 10/21/2010	GW-73D OC-GW-73D-XXX 5/26/2010	GW-74D OC-GW-74D-XXX 10/25/2010
Aluminum									
Antimony									
Arsenic		0.00062 J		0.0007 J			0.0015	0.00075 J	
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt		0.025	0.021				0.0051 J		0.012
Copper									
Iron									
Manganese	2	11	9.1		1	0.38 J	0.65		1.3
Mercury									
Nickel									
Silver									
Thallium						0.00025 J			
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-74D OC-GW-74D-XXX 5/19/2010	GW-74S OC-GW-74S-XXX 10/25/2010	GW-74S OC-GW-74S-XXX 5/19/2010	GW-75D OC-GW-75D-XXX 10/26/2010	GW-75D OC-GW-75D-XXX 5/19/2010	GW-76S OC-GW-76S-XXX 10/14/2010	GW-76S OC-GW-76S-XXX 10/18/2010	GW-76S OC-GW-76S-XXX 6/9/2010	GW-79S OC-GW-79S-XXX 10/14/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene									
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform					0.0013				
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene	0.00045 J	0.00048 J	0.00078 J						
Vinyl chloride									
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine				0.0000057 J			0.0000097	0.000049	0.000026
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-74D OC-GW-74D-XXX 5/19/2010	GW-74S OC-GW-74S-XXX 10/25/2010	GW-74S OC-GW-74S-XXX 5/19/2010	GW-75D OC-GW-75D-XXX 10/26/2010	GW-75D OC-GW-75D-XXX 5/19/2010	GW-76S OC-GW-76S-XXX 10/14/2010	GW-76S OC-GW-76S-XXX 10/18/2010	GW-76S OC-GW-76S-XXX 6/9/2010	GW-79S OC-GW-79S-XXX 10/14/2010
Aluminum									
Antimony									
Arsenic				0.0015	0.0029 J	0.00068 J			0.0057 J
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.022	0.0062 J	0.0065 J						
Copper									
Iron									
Manganese	1.2	1.5	1.3						1.5
Mercury									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-79S OC-GW-79S-XXX 5/17/2010	GW-80BR OC-GW-80BR-XXX 10/27/2010	GW-80BR OC-GW-80BR-XXX 5/20/2011	GW-80D OC-GW-80D-XXX 10/27/2010	GW-80D OC-GW-80D-XXX 5/20/2011	GW-80S OC-GW-80S-XXX 10/28/2010	GW-80S OC-GW-80S-XXX 5/24/2011	GW-81BR OC-GW-81BR-XXX 10/29/2010	GW-81BR OC-GW-81BR-XXX 5/26/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane		0.09 J	0.23 J	0.015	0.0052				
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene				0.0048	0.005				
1,4-Dioxane				0.085 J					
Benzene		0.1 J	0.11 J	0.055	0.056	0.0092	0.0053		
Bromodichloromethane									
Bromoform									
Chlorobenzene		1.4	1.1		0.086				
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene		0.11 J							
Dibromomethane									
Ethyl benzene		0.26	0.2 J	0.059	0.062	0.017	0.0071		
Methyl Tertbutyl Ether									
Methylene chloride			0.27 J				0.014		
Naphthalene				0.0028 J					
Tetrahydrofuran		22	18		3.6				
Toluene		13	9.8						
Trichloroethene					0.0014 J				
Vinyl chloride				0.0021	0.0055				
Xylene, o		0.2 J							
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene				0.00034		0.0011			
Benzo(a)pyrene		0.00026		0.00057		0.0012			
Benzo(b)fluoranthene				0.00078		0.0017			
Benzo(k)fluoranthene						0.00061			
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene				0.00054		0.00028 J			
Indeno(1,2,3-cd)pyrene				0.00093		0.00073			
N-Nitrosodimethylamine	0.00067	0.000093 J	0.000097 J	0.000074	0.000094	0.0000022		0.00000058 J	
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-79S OC-GW-79S-XXX 5/17/2010	GW-80BR OC-GW-80BR-XXX 10/27/2010	GW-80BR OC-GW-80BR-XXX 5/20/2011	GW-80D OC-GW-80D-XXX 10/27/2010	GW-80D OC-GW-80D-XXX 5/20/2011	GW-80S OC-GW-80S-XXX 10/28/2010	GW-80S OC-GW-80S-XXX 5/24/2011	GW-81BR OC-GW-81BR-XXX 10/29/2010	GW-81BR OC-GW-81BR-XXX 5/26/2010
Aluminum									
Antimony									
Arsenic		0.011	0.0069	0.022	0.011	0.026	0.038	0.0008 J	
Beryllium									
Cadmium									
Chromium, Hexavalent			0.00065 J					0.002 J	0.0028
Cobalt	0.015					0.021	0.0094 J		0.005 J
Copper									
Iron	35	29	29	45	58	65	51		
Manganese	2.4	6.4	6.3	4.2	4.8	2	2.3		
Mercury									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine							0.000054 J		
UDMH									
Acetaldehyde			0.013 J						

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-81D OC-GW-81D-XXX 10/27/2010	GW-81D OC-GW-81D-XXX 5/26/2010	GW-82D OC-GW-82D-XXX 10/26/2010	GW-82D OC-GW-82D-XXX 5/27/2010	GW-82S OC-GW-82S-XXX 10/26/2010	GW-82S OC-GW-82S-XXX 5/27/2010	GW-83D OC-GW-83D-XXX 11/18/2010	GW-83D OC-GW-83D-XXX 5/25/2011	GW-83M OC-GW-83M-XXX 11/18/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane							0.023	0.022	0.0006 J
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene							0.011	0.011	
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform							0.02	0.017	
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene							0.0041	0.0034 J	
Methyl Tertbutyl Ether									
Methylene chloride							0.012	0.016	
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene							0.099	0.088	0.0023
Vinyl chloride									
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene			0.00011 J						
Benzo(b)fluoranthene			0.00016 J						
Benzo(k)fluoranthene									
Biphenyl							0.0015 J	0.0016 J	
Bis(2-Ethylhexyl)phthalate	0.012 J								
Dibenz(a,h)anthracene			0.000064 J						
Indeno(1,2,3-cd)pyrene			0.00012 J						
N-Nitrosodimethylamine	0.0000015 J		0.00029 J	0.00033	0.000021	0.000055	0.0085 J	0.0084 J	0.00084
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-81D OC-GW-81D-XXX 10/27/2010	GW-81D OC-GW-81D-XXX 5/26/2010	GW-82D OC-GW-82D-XXX 10/26/2010	GW-82D OC-GW-82D-XXX 5/27/2010	GW-82S OC-GW-82S-XXX 10/26/2010	GW-82S OC-GW-82S-XXX 5/27/2010	GW-83D OC-GW-83D-XXX 11/18/2010	GW-83D OC-GW-83D-XXX 5/25/2011	GW-83M OC-GW-83M-XXX 11/18/2010
Aluminum									
Antimony									
Arsenic	0.00059 J	0.001						0.019 J	
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt			0.013	0.01			2.5	2.8	0.04
Copper									
Iron				13			1600	1900	
Manganese			2.6	2.7	1.9	1.8	140	170	6
Mercury									
Nickel							2.3	2.3	
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine							0.00013	0.000054 J	
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-83M OC-GW-83M-XXX 5/25/2011	GW-83S OC-GW-83S-XXX 11/18/2010	GW-83S OC-GW-83S-XXX 5/25/2011	GW-84D OC-GW-84D-XXX 10/20/2010	GW-84D OC-GW-84D-XXX 6/2/2010	GW-84M OC-GW-84M-XXX 10/20/2010	GW-84M OC-GW-84M-XXX 6/2/2010	GW-84S OC-GW-84S-XXX 6/2/2010	GW-86S OC-GW-86S-XXX 10/19/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene				0.0011					
1,2-Dichloroethane	0.0008 J			0.0075	0.0071				
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene				0.0033	0.0033				
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform	0.00047 J				0.00042 J		0.00043 J	0.00031 J	
Cis-1,2-Dichloroethene				0.041	0.051				
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene				0.00047 J	0.00071 J				
Tetrahydrofuran									
Toluene									
Trichloroethene	0.0055 J	0.0031	0.0043 J	0.055	0.05				
Vinyl chloride	0.00037 J		0.00031 J	0.01	0.015				
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene			0.0017 J						
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene						0.00011 J			
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl				0.0011 J	0.0012 J				
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene						0.00034 J			
Indeno(1,2,3-cd)pyrene						0.00034 J			
N-Nitrosodimethylamine	0.00084	0.00011	0.00012	0.013 J		0.0000088			
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-83M OC-GW-83M-XXX 5/25/2011	GW-83S OC-GW-83S-XXX 11/18/2010	GW-83S OC-GW-83S-XXX 5/25/2011	GW-84D OC-GW-84D-XXX 10/20/2010	GW-84D OC-GW-84D-XXX 6/2/2010	GW-84M OC-GW-84M-XXX 10/20/2010	GW-84M OC-GW-84M-XXX 6/2/2010	GW-84S OC-GW-84S-XXX 6/2/2010	GW-86S OC-GW-86S-XXX 10/19/2010
Aluminum									
Antimony					0.015 J				
Arsenic				0.0036 J	0.0031 J			0.00068 J	0.014 J
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.044			0.14	0.13				
Copper									
Iron									49
Manganese	7.2	1.3	1.3	29	29				0.85
Mercury									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-86S OC-GW-86S-XXX 5/25/2010	GW-87D OC-GW-87D-XXX 11/17/2010	GW-87D OC-GW-87D-XXX 5/25/2011	GW-88D OC-GW-88D-XXX 5/26/2010	GW-88M OC-GW-88M-XXX 10/19/2010	GW-88M OC-GW-88M-XXX 5/26/2010	GW-88S OC-GW-88S-XXX 10/19/2010	GW-88S OC-GW-88S-XXX 5/26/2010	MP-1 #01 OC-MP-1 #01-XXX 10/20/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane		0.0039 J	0.0039 J						
1,4-Dichlorobenzene					0.00059 J	0.00059 J			
1,4-Dioxane									
Benzene		0.002 J	0.0021 J						
Bromodichloromethane									
Bromoform									0.035 J
Chlorobenzene									
Chlorodibromomethane									0.17
Chloroform									
Cis-1,2-Dichloroethene		0.13	0.15						
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene									
Vinyl chloride		0.058	0.083		0.00041 J				
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene				0.00015 J					
Benzo(a)pyrene								0.000094 J	
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine			0.0016 J						
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	GW-86S OC-GW-86S-XXX 5/25/2010	GW-87D OC-GW-87D-XXX 11/17/2010	GW-87D OC-GW-87D-XXX 5/25/2011	GW-88D OC-GW-88D-XXX 5/26/2010	GW-88M OC-GW-88M-XXX 10/19/2010	GW-88M OC-GW-88M-XXX 5/26/2010	GW-88S OC-GW-88S-XXX 10/19/2010	GW-88S OC-GW-88S-XXX 5/26/2010	MP-1 #01 OC-MP-1 #01-XXX 10/20/2010
Aluminum									1800
Antimony									
Arsenic		0.029	0.033						
Beryllium									0.13
Cadmium									0.043 J
Chromium, Hexavalent									
Cobalt		0.076	0.1						10
Copper									8.6
Iron	52	23	26						3100
Manganese	0.86 J	6.8	7.1		3.4	3.3	3.3	3.3	220
Mercury									0.0031
Nickel									8.2
Silver									27
Thallium									
Tin									
Vanadium									0.25 J
Zinc									15
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									0.00015 J
UDMH									
Acetaldehyde									0.019 J

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-1 #01 OC-MP-1 #01-XXX 5/17/2010	MP-1 #06 OC-MP-1 #06-XXX 10/19/2010	MP-1 #06 OC-MP-1 #06-XXX 5/17/2010	MP-2 #07 OC-MP-2 #07-XXX 10/25/2010	MP-2 #07 OC-MP-2 #07-XXX 6/7/2010	MP-2 #17 OC-MP-2 #17-XXX 10/25/2010	MP-2 #17 OC-MP-2 #17-XXX 6/7/2010	MP-3 #01 OC-MP-3 #01-XXX 10/11/2011	MP-3 #01 OC-MP-3 #01-XXX 4/17/2012
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane		0.0018	0.00096 J					0.0038 J	0.0044
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene								0.0029 J	0.0027 J
Bromodichloromethane	0.0075 J	0.0026 J	0.002		0.00027 J			0.0017 J	0.0021
Bromoform	0.055 J	0.011						0.0096	0.016
Chlorobenzene									
Chlorodibromomethane	0.017	0.0063	0.0027		0.00076			0.0025	0.0031
Chloroform	0.065		0.0032		0.0023			0.093	0.093
Cis-1,2-Dichloroethene									
Dibromomethane		0.011							
Ethyl benzene								0.0037 J	0.0034 J
Methyl Tertbutyl Ether									
Methylene chloride	0.049								
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene								0.0076	0.0076
Vinyl chloride									
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene			0.0031 J						
Benzo(a)anthracene									
Benzo(a)pyrene					0.00013 J		0.00012 J		
Benzo(b)fluoranthene					0.00015 J				
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0013 J	0.00099 J		0.00042 J				0.0055	0.025 J
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-1 #01 OC-MP-1 #01-XXX 5/17/2010	MP-1 #06 OC-MP-1 #06-XXX 10/19/2010	MP-1 #06 OC-MP-1 #06-XXX 5/17/2010	MP-2 #07 OC-MP-2 #07-XXX 10/25/2010	MP-2 #07 OC-MP-2 #07-XXX 6/7/2010	MP-2 #17 OC-MP-2 #17-XXX 10/25/2010	MP-2 #17 OC-MP-2 #17-XXX 6/7/2010	MP-3 #01 OC-MP-3 #01-XXX 10/11/2011	MP-3 #01 OC-MP-3 #01-XXX 4/17/2012
Aluminum	1700							1400	1600
Antimony									
Arsenic						0.0046 J		0.21 J	0.26
Beryllium								0.17	0.21
Cadmium								0.1	0.11
Chromium, Hexavalent					0.00045 J				
Cobalt	12	0.056	0.036	0.074	0.15			5.4	6.3
Copper	9.3 J							7.7	9
Iron	3000			19	37			2000	2200
Manganese	240	1.9	1.4	3.9	6.4	0.61	0.49	170	190
Mercury	0.0023								
Nickel	9.3 J							5.7	6.5
Silver	32							0.63	14
Thallium		0.00021 J		0.00048 J	0.00075 J				
Tin	890								
Vanadium									
Zinc	17 J							12	14
Inorganics (mg/L)									
Nitrate as N								30	34
Perchlorate								0.014	0.013
Hydrazines (mg/L)									
Hydrazine								0.00028	
UDMH	0.06 J								
Acetaldehyde	0.03							0.056 J	0.075

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-3 #07 OC-MP-3 #07-XXX 10/11/2011	MP-3 #07 OC-MP-3 #07-XXX 4/17/2012	MP-3 #21 OC-MP-3 #21-XXX 10/11/2011	MP-3 #21 OC-MP-3 #21-XXX 4/17/2012	MP-4 #02 OC-MP-4 #02-XXX 5/25/2010	MP-4 #02 OC-MP-4 #2-XXX 10/27/2010	MP-4 #12 OC-MP-4 #12-XXX 10/27/2010	MP-4 #12 OC-MP-4 #12-XXX 5/21/2010	MP-5 #03 OC-MP-5 #03-XXX 11/19/2010
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane					0.0063	0.0063			0.0078
1,4-Dichlorobenzene									
1,4-Dioxane									
Benzene					0.0034	0.003			0.0034
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform			0.0004 J						
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene		0.0009 J			0.00076 J		0.014	0.011	0.1
Vinyl chloride					0.00037 J		0.00099	0.0012	0.00079
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl						0.00099 J			
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine		0.000057				0.0057 J	0.000055 J	0.000053	0.0031 J
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-3 #07 OC-MP-3 #07-XXX 10/11/2011	MP-3 #07 OC-MP-3 #07-XXX 4/17/2012	MP-3 #21 OC-MP-3 #21-XXX 10/11/2011	MP-3 #21 OC-MP-3 #21-XXX 4/17/2012	MP-4 #02 OC-MP-4 #02-XXX 5/25/2010	MP-4 #02 OC-MP-4 #2-XXX 10/27/2010	MP-4 #12 OC-MP-4 #12-XXX 10/27/2010	MP-4 #12 OC-MP-4 #12-XXX 5/21/2010	MP-5 #03 OC-MP-5 #03-XXX 11/19/2010
Aluminum									
Antimony									
Arsenic			0.0015 J	0.001 J		0.0028			0.012
Beryllium									
Cadmium									
Chromium, Hexavalent					0.00047 J				
Cobalt		0.0052 J					0.034	0.017	0.7
Copper									
Iron					140	140			67
Manganese	1.5	1.8			3.7 J	3.7	2.9	3.6 J	25
Mercury									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-5 #03 OC-MP-5 #03-XXX 5/24/2011	MP-5 #08 OC-MP-5 #08-XXX 11/19/2010	MP-5 #08 OC-MP-5 #08-XXX 5/24/2011	MP-5 #15 OC-MP-5 #15-XXX 11/19/2010	MP-5 #15 OC-MP-5 #15-XXX 5/24/2011	MW-203BR OC-MW-203BR-XXX 10/12/2011	MW-203BR OC-MW-203BR-XXX 5/18/2011	MW-204BR OC-MW-204BR-XXX 5/24/2011	MW-204D OC-MW-204D-XXX 10/11/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane	0.0078	0.00073 J	0.00065 J						
1,4-Dichlorobenzene						0.0016	0.0016		
1,4-Dioxane									
Benzene	0.0035					0.00059 J	0.00056 J		
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform			0.00053 J						
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether		0.039	0.035						
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene	0.1 J	0.011	0.01						
Vinyl chloride	0.0012					0.002	0.0016		
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine	0.0043 J	0.0013 J	0.00098	0.0000025				0.0000035	
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MP-5 #03 OC-MP-5 #03-XXX 5/24/2011	MP-5 #08 OC-MP-5 #08-XXX 11/19/2010	MP-5 #08 OC-MP-5 #08-XXX 5/24/2011	MP-5 #15 OC-MP-5 #15-XXX 11/19/2010	MP-5 #15 OC-MP-5 #15-XXX 5/24/2011	MW-203BR OC-MW-203BR-XXX 10/12/2011	MW-203BR OC-MW-203BR-XXX 5/18/2011	MW-204BR OC-MW-204BR-XXX 5/24/2011	MW-204D OC-MW-204D-XXX 10/11/2011
Aluminum									
Antimony									
Arsenic	0.012				0.0013 J	0.04	0.053		0.0096 J
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.83	0.11	0.14						0.005 J
Copper									
Iron	79			23	26	44	34		
Manganese	29	4.6	5.3	1.1	1.2	0.6	0.87		4.2
Mercury									
Nickel	0.34								
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MW-204D OC-MW-204D-XXX 5/23/2011	MW-204M OC-MW-204M-XXX 10/11/2011	MW-204M OC-MW-204M-XXX 5/23/2011	MW-204S OC-MW-204S-XXX 10/11/2011	MW-204S OC-MW-204S-XXX 5/23/2011	MW-206BR OC-MW-206BR-XXX 5/20/2011	MW-206D OC-MW-206D-XXX 10/12/2011	MW-206D OC-MW-206D-XXX 5/19/2011	MW-206S OC-MW-206S-XXX 10/12/2011
Volatile Organics (mg/L)									
1,1-Dichloroethane									
1,2,4-Trichlorobenzene									
1,2-Dichloroethane									
1,4-Dichlorobenzene							0.0012	0.0013	0.00081 J
1,4-Dioxane									
Benzene									
Bromodichloromethane									
Bromoform									
Chlorobenzene									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Dibromomethane									
Ethyl benzene									
Methyl Tertbutyl Ether									
Methylene chloride									
Naphthalene									
Tetrahydrofuran									
Toluene									
Trichloroethene									
Vinyl chloride						0.00024 J	0.0014	0.0012	0.002
Xylene, o									
Semivolatile Organics (mg/L)									
2,6-Dinitrotoluene									
Atrazine									
Azobenzene									
Benzo(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Biphenyl									
Bis(2-Ethylhexyl)phthalate									
Dibenz(a,h)anthracene									
Indeno(1,2,3-cd)pyrene									
N-Nitrosodimethylamine									
N-Nitrosodiphenylamine									
Metals, Total (mg/L)									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MW-204D OC-MW-204D-XXX 5/23/2011	MW-204M OC-MW-204M-XXX 10/11/2011	MW-204M OC-MW-204M-XXX 5/23/2011	MW-204S OC-MW-204S-XXX 10/11/2011	MW-204S OC-MW-204S-XXX 5/23/2011	MW-206BR OC-MW-206BR-XXX 5/20/2011	MW-206D OC-MW-206D-XXX 10/12/2011	MW-206D OC-MW-206D-XXX 5/19/2011	MW-206S OC-MW-206S-XXX 10/12/2011
Aluminum									
Antimony									
Arsenic	0.01 J	0.028 J	0.061 J	0.00051 J	0.0011 J	0.00042	0.11	0.11	0.097
Beryllium									
Cadmium									
Chromium, Hexavalent									
Cobalt	0.0052 J			0.0052 J	0.0051 J			0.0057 J	
Copper									
Iron						12	37	38	35
Manganese	4.3	3.8	4.2	0.33	0.36		1.7	2	2.6
Mercury									
Nickel									
Silver									
Thallium									
Tin									
Vanadium									
Zinc									
Inorganics (mg/L)									
Nitrate as N									
Perchlorate									
Hydrazines (mg/L)									
Hydrazine									
UDMH									
Acetaldehyde									

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MW-206S OC-MW-206S-XXX 5/19/2011	SL-1D OC-SL-1D-XXX 10/20/2010	SL-1S OC-SL-1S-XXX 10/20/2010	SL-1S OC-SL-1S-XXX 5/20/2010	SL-2 OC-SL-2-XXX 10/22/2010	SL-3 OC-SL-3-XXX 10/20/2010
Volatile Organics (mg/L)						
1,1-Dichloroethane						
1,2,4-Trichlorobenzene						
1,2-Dichloroethane						
1,4-Dichlorobenzene	0.00098 J					
1,4-Dioxane						
Benzene						
Bromodichloromethane						
Bromoform						
Chlorobenzene						
Chlorodibromomethane						
Chloroform						
Cis-1,2-Dichloroethene						
Dibromomethane						
Ethyl benzene						
Methyl Tertbutyl Ether						
Methylene chloride						
Naphthalene						
Tetrahydrofuran						
Toluene						
Trichloroethene						
Vinyl chloride	0.0013					0.00073
Xylene, o						
Semivolatile Organics (mg/L)						
2,6-Dinitrotoluene						
Atrazine						
Azobenzene						
Benzo(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(k)fluoranthene						
Biphenyl						
Bis(2-Ethylhexyl)phthalate						
Dibenz(a,h)anthracene		0.00037 J	0.0003 J			0.00019 J
Indeno(1,2,3-cd)pyrene		0.00034 J	0.00028 J		0.00012 J	0.00018 J
N-Nitrosodimethylamine						0.0000066
N-Nitrosodiphenylamine						
Metals, Total (mg/L)						

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	MW-206S OC-MW-206S-XXX 5/19/2011	SL-1D OC-SL-1D-XXX 10/20/2010	SL-1S OC-SL-1S-XXX 10/20/2010	SL-1S OC-SL-1S-XXX 5/20/2010	SL-2 OC-SL-2-XXX 10/22/2010	SL-3 OC-SL-3-XXX 10/20/2010
Aluminum						
Antimony						
Arsenic	0.087			0.00094 J		0.012 J
Beryllium						
Cadmium						
Chromium, Hexavalent						
Cobalt						0.034
Copper						
Iron	39					18
Manganese	2.7					3.8
Mercury						
Nickel						
Silver						
Thallium						
Tin						
Vanadium						
Zinc						
Inorganics (mg/L)						
Nitrate as N						
Perchlorate						
Hydrazines (mg/L)						
Hydrazine						
UDMH						
Acetaldehyde						

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	SL-3 OC-SL-3-XXX 5/20/2010	SL-5 OC-SL-5-XXX 5/20/2011	SL-6 OC-SL-6-XXX 10/20/2010	SL-6 OC-SL-6-XXX 5/21/2010
Volatile Organics (mg/L)				
1,1-Dichloroethane				
1,2,4-Trichlorobenzene				
1,2-Dichloroethane				
1,4-Dichlorobenzene				
1,4-Dioxane				
Benzene				
Bromodichloromethane				
Bromoform				
Chlorobenzene				
Chlorodibromomethane				
Chloroform				
Cis-1,2-Dichloroethene				
Dibromomethane				
Ethyl benzene				
Methyl Tertbutyl Ether				
Methylene chloride				0.019
Naphthalene				
Tetrahydrofuran				
Toluene				
Trichloroethene				
Vinyl chloride	0.0016			
Xylene, o				
Semivolatile Organics (mg/L)				
2,6-Dinitrotoluene				
Atrazine				
Azobenzene				
Benzo(a)anthracene				
Benzo(a)pyrene				
Benzo(b)fluoranthene				
Benzo(k)fluoranthene				
Biphenyl				
Bis(2-Ethylhexyl)phthalate				
Dibenz(a,h)anthracene			0.00017 J	
Indeno(1,2,3-cd)pyrene			0.00016 J	
N-Nitrosodimethylamine				
N-Nitrosodiphenylamine				
Metals, Total (mg/L)				

Table 2.1-4
Summary of Constituents Detected in Groundwater
OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter Name	SL-3 OC-SL-3-XXX 5/20/2010	SL-5 OC-SL-5-XXX 5/20/2011	SL-6 OC-SL-6-XXX 10/20/2010	SL-6 OC-SL-6-XXX 5/21/2010
Aluminum				
Antimony				
Arsenic	0.013 J	0.00034 J		
Beryllium				
Cadmium				
Chromium, Hexavalent				
Cobalt	0.04			
Copper				
Iron	26			
Manganese	3.2 J		3.9	2.2 J
Mercury				
Nickel				
Silver				
Thallium			0.00034 J	0.00021 J
Tin				
Vanadium				
Zinc				
Inorganics (mg/L)				
Nitrate as N				
Perchlorate				
Hydrazines (mg/L)				
Hydrazine		0.000088 J	0.000065 J	
UDMH				
Acetaldehyde				

mg/L = miligrams per liter
J = estimated concentration

Prepared by/Date: KJC 05/02/14
Checked by/Date: BJR 05/05/14

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	ALTRON B1 ALT-B1 2/18/1999	ALTRON B1 ALTRON B1 1/20/1999	ALTRON B1 ALTRON B1 10/20/1997	ALTRON B1 ALTRON B1 11/12/1997	ALTRON B1 ALTRON B1 3/12/1992	ALTRON B1 ALTRON B1 3/17/1999
Volatile Organics (mg/L)										
1,2-Dichloroethene (total)	2 / 2		0.005 - 0.016	0.011						
2,4,4-Trimethyl-1-pentene	2 / 28	0.001 : 0.01	0.004 - 0.004	0.0010	0.005 U		0.004 U	0.004		
2,4,4-Trimethyl-2-pentene	1 / 28	0.001 : 0.01	0.001 - 0.001	0.00075	0.005 U		0.001 U	0.001 U		
Acetone	1 / 14	0.01 : 0.05	0.007 - 0.007	0.015			0.02 U	0.02 U		
Bromodichloromethane	1 / 14	0.001 : 0.005	0.009 - 0.009	0.0014			0.001 U	0.001 U		
Chlorodibromomethane	1 / 13	0.001 : 0.005	0.0034 - 0.0034	0.0010				0.001 U		
Chloroform	1 / 14	0.001 : 0.005	0.031 - 0.031	0.0030			0.001 U	0.001 U		
Cis-1,2-Dichloroethene	3 / 12	0.001 : 0.001	0.0015 - 0.022	0.0029			0.022	0.007		
Methyl Tertbutyl Ether	11 / 12	0.001 : 0.001	0.003 - 0.034	0.019			0.001 U	0.003		
Methylene chloride	1 / 14	0.001 : 0.005	0.005 - 0.005	0.0013			0.001 U	0.001 U		
Tetrachloroethene	5 / 14	0.001 : 0.005	0.0005 - 0.002	0.0010			0.001 U	0.001 U		
Trichloroethene	7 / 14	0.001 : 0.001	0.001 - 0.05	0.0066			0.013	0.007		
Semi-volatile Organic (mg/L)										
N-Nitrosodimethylamine	13 / 13		0.0000076 - 0.000041	0.000018						
Metals, Total (mg/L)										
Aluminum	7 / 10	0.05 : 0.1	0.036 - 2.87	0.62						
Barium	10 / 10		0.027 - 0.099	0.064						
Beryllium	1 / 9	0.001 : 0.005	0.00069 - 0.00069	0.00085						
Cadmium	2 / 9	0.001 : 0.01	0.001 - 0.0016	0.0012						
Calcium	10 / 10		17 - 40	25						
Chromium	6 / 76	0.005 : 0.015	0.0009 - 0.01	0.0040	0.005 U	0.005 U			0.015 U	0.005 U
Cobalt	3 / 9	0.01 : 0.03	0.00078 - 0.037	0.0098						
Copper	5 / 10	0.01 : 0.025	0.01 - 0.45	0.072						
Iron	71 / 75	0.05 : 0.1	0.011 - 8	1.3	0.05 U	0.32				0.05 U
Lead	2 / 9	0.005 : 0.01	0.0047 - 0.006	0.0037						
Magnesium	10 / 10		3.62 - 6.3	4.4						
Manganese	10 / 10		0.39 - 2.3	1.4						
Nickel	6 / 8	0.01 : 0.04	0.01 - 0.188	0.059						
Potassium	9 / 10	4 : 4	2.55 - 6.6	4.4						
Silicon	1 / 1		10.39 - 10.39	10.4						
Sodium	10 / 10		59 - 100	73						
Strontium	1 / 1		0.14 - 0.14	0.14						
Vanadium	1 / 9	0.01 : 0.025	0.0009 - 0.0009	0.0054						
Zinc	7 / 9	0.05 : 0.05	0.032 - 6.7	1.1						
Metals, Dissolved (mg/L)										
Aluminum	14 / 14		0.11 - 0.61	0.30	0.45		0.28	0.3		
Arsenic	1 / 14	0.005 : 0.01	0.0052 - 0.0052	0.0045	0.005 U		0.0052	0.005 U		
Barium	12 / 14	0.1 : 0.2	0.045 - 0.096	0.065	0.067		0.1 U	0.045		
Calcium	15 / 15		17 - 26	21	21		21.5	25		
Cobalt	2 / 14	0.01 : 0.05	0.005 - 0.01	0.0082	0.01 U		0.05 U	0.005		
Copper	7 / 14	0.02 : 0.025	0.006 - 0.024	0.014	0.02 U		0.02 U	0.006		
Iron	3 / 8	0.05 : 0.1	0.046 - 0.22	0.066			0.046	0.05 U		
Magnesium	16 / 16		3.1 - 7.3	4.7	4.2		5.16	6.1		
Manganese	16 / 16		0.9 - 2.3	1.6	1.7		1.44	1.8		
Nickel	5 / 14	0.01 : 0.04	0.009 - 0.037	0.015	0.037		0.03 U	0.009		
Potassium	14 / 16	5 : 25	3.1 - 7.2	4.9	4.8		3.4	4		
Sodium	16 / 16		7.8 - 100	71	80		74.3	76		
Zinc	8 / 14	0.05 : 0.05	0.02 - 0.68	0.13	0.05 U		0.033	0.02		

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	ALTRON B1 ALT-B1 2/18/1999	ALTRON B1 ALTRON B1 1/20/1999	ALTRON B1 ALTRON B1 10/20/1997	ALTRON B1 ALTRON B1 11/12/1997	ALTRON B1 ALTRON B1 3/12/1992	ALTRON B1 ALTRON B1 3/17/1999
Inorganics (mg/L)										
Bicarbonate Alkalinity, as CaCO3	74 / 74		2 - 36	17.9	20					25
Chloride	81 / 81		20 - 180	121	20		97.5	150	110	120
Specific Conductance **(mS/cm)**	66 / 66		0.41 - 1.2	0.64	0.64	0.83				
Nitrate as N	1 / 1		13.2 - 13.2	13.2						
Nitrogen, as Ammonia	81 / 84	0.1 : 0.1	0.51 - 62	14.1	25	29	8.08	42.8	40	42
pH **(pH units)**	73 / 73		5.08 - 6.71	5.8	5.52					5.55
Sulfate	84 / 84		34 - 316	97	120	150	186	274	180	240
Total Alkalinity, as CaCO3	24 / 24		2.7 - 54	18.2			54	30		
Total Hardness	1 / 1		63 - 63	63						

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 ALTRON B1 4/21/1999	ALTRON B1 ALTRON B1 5/19/1999	ALTRON B1 ALTRON B1 6/16/1999	ALTRON B1 ALTRON B1 7/15/1993	ALTRON B1 ALTRON B1 8/6/1998	ALTRON B1 ALTRON B1 9/10/1998	ALTRON B1 ALTRON B3 9/23/2002	ALTRON B1 ALTRON WELL #1 10/17/1996	ALTRON B1 ALTRON-B1 3/10/1992	ALTRON B1 B1 1/15/2003	ALTRON B1 B1 1/16/2002
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)				0.016				0.005			
2,4,4-Trimethyl-1-pentene				0.01 U		0.001 U		0.004 J			
2,4,4-Trimethyl-2-pentene				0.01 U		0.001 U		0.001 J			
Acetone				0.015 U				0.007 J			
Bromodichloromethane				0.005 U				0.005 U			
Chlorodibromomethane				0.005 U				0.005 U			
Chloroform				0.005 U				0.005 U			
Cis-1,2-Dichloroethene											
Methyl Tertbutyl Ether											
Methylene chloride				0.005 JB				0.005 U			
Tetrachloroethene				0.002 J				0.005 U			
Trichloroethene				0.05				0.012			
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine							0.000027			0.000016	
Metals, Total (mg/L)											
Aluminum				0.17					0.036		
Barium				0.051					0.05		
Beryllium				0.005 U							
Cadmium				0.01 U							
Calcium				17					19.07		
Chromium	0.005 U	0.01 U	0.01 U	0.015 U					0.01 U	0.005 U	0.01 U
Cobalt				0.03 U							
Copper				0.025 U					0.01		
Iron	0.068	0.05	0.076	0.074					0.011	1.32	5.4
Lead				0.005 U							
Magnesium				3.7					4.11		
Manganese				1					0.95		
Nickel				0.04 U							
Potassium				2.6					2.55		
Silicon									10.39		
Sodium				65					75.7		
Strontium									0.14		
Vanadium				0.025 U							
Zinc				0.032							
Metals, Dissolved (mg/L)											
Aluminum		0.61						0.483			
Arsenic		0.01 U						0.01 U			
Barium		0.066						0.2 U			
Calcium						17		23.4			
Cobalt		0.01 U						0.05 U			
Copper		0.011						0.025 U			
Iron					0.22	0.1 U		0.115			
Magnesium		7.1				3.2		6.95			
Manganese		2.3				1.2		1.85			
Nickel		0.016						0.04 U			
Potassium		4				25 U		5 U			
Sodium		98				59		75.4			
Zinc		0.05 U						0.064			

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 ALTRON B1 4/21/1999	ALTRON B1 ALTRON B1 5/19/1999	ALTRON B1 ALTRON B1 6/16/1999	ALTRON B1 ALTRON B1 7/15/1993	ALTRON B1 ALTRON B1 8/6/1998	ALTRON B1 ALTRON B1 9/10/1998	ALTRON B1 ALTRON B3 9/23/2002	ALTRON B1 ALTRON WELL #1 10/17/1996	ALTRON B1 ALTRON-B1 3/10/1992	ALTRON B1 B1 1/15/2003	ALTRON B1 B1 1/16/2002
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	24	25	24			20		28	29.27	12	29
Chloride	120	140	150	100	111	85.4		156	116.4	116	115
Specific Conductance **(mS/cm)**			1.2		0.689	0.537				0.579	0.567
Nitrate as N									13.2		
Nitrogen, as Ammonia	62	42	56	34	15.3	10.4		60.7	53.7	3.14	6
pH **(pH units)**	5.69					5.84			6.1	5.46	6.27
Sulfate	200	260	290	140	109	77.4		316	188.2	65.2	70
Total Alkalinity, as CaCO3									24		
Total Hardness											

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 1/17/2001	ALTRON B1 B1 1/19/2000	ALTRON B1 B1 1/21/2004	ALTRON B1 B-1 10/15/1998	ALTRON B1 B1 10/15/2003	ALTRON B1 B1 10/16/2002	ALTRON B1 B1 10/17/2001	ALTRON B1 B1 10/18/2000	ALTRON B1 B1 10/20/1999	ALTRON B1 B1 10/21/2004	ALTRON B1 B-1 11/12/1998
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene											
2,4,4-Trimethyl-2-pentene											
Acetone											
Bromodichloromethane											
Chlorodibromomethane											
Chloroform											
Cis-1,2-Dichloroethene											
Methyl Tertbutyl Ether											
Methylene chloride											
Tetrachloroethene											
Trichloroethene											
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine											
Metals, Total (mg/L)											
Aluminum											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium	0.01 U	0.01 U	0.01		0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U	
Cobalt											
Copper											
Iron	0.18	0.056	3.16		1.33	4.84	7.6	0.5	0.18	0.35	
Lead											
Magnesium											
Manganese											
Nickel											
Potassium											
Silicon											
Sodium											
Strontium											
Vanadium											
Zinc											
Metals, Dissolved (mg/L)											
Aluminum											0.36
Arsenic											0.005 U
Barium											0.067
Calcium				22							20
Cobalt											0.01
Copper											0.021
Iron				0.05 U							0.05 U
Magnesium				5							4.1
Manganese				2							1.6
Nickel											0.018
Potassium				3.9							4.6
Sodium				94							7.8
Zinc											0.05 U

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 1/17/2001	ALTRON B1 B1 1/19/2000	ALTRON B1 B1 1/21/2004	ALTRON B1 B-1 10/15/1998	ALTRON B1 B1 10/15/2003	ALTRON B1 B1 10/16/2002	ALTRON B1 B1 10/17/2001	ALTRON B1 B1 10/18/2000	ALTRON B1 B1 10/20/1999	ALTRON B1 B1 10/21/2004	ALTRON B1 B-1 11/12/1998
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	13	20	17	22	10	2	22	12	13	15.1	
Chloride	110 J	120	147	118	115	138	110	110	100	160	100
Specific Conductance **(mS/cm)**	0.521	0.615	0.618	0.87	0.656	0.667	0.555	0.514	0.52	0.67	0.42
Nitrate as N											
Nitrogen, as Ammonia	4.7 J	18 J	7.59	30	7.56 J	3.34 J	8.2	6.7 J	16 J	1.5	17
pH **(pH units)**	5.66	5.57	5.6	5.44	5.42	5.27	5.63	6.07	6.03 J	6.53 J	
Sulfate	52	100	61	169	61.7	95.9	60 J	58	68	63	106
Total Alkalinity, as CaCO3			17		10					15.1	
Total Hardness											

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 11/17/1999	ALTRON B1 B1 11/17/2004	ALTRON B1 B1 11/19/2003	ALTRON B1 B1 11/28/2001	ALTRON B1 B1 11/29/2000	ALTRON B1 B-1 12/10/1998	ALTRON B1 B1 12/15/2004	ALTRON B1 B1 12/17/2003	ALTRON B1 B1 12/19/2001	ALTRON B1 B1 12/19/2002	ALTRON B1 B1 12/20/2000
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene		0.001 U	0.001 U		0.001 U	0.001 U			0.001 U		
2,4,4-Trimethyl-2-pentene		0.001 U	0.001 U		0.001 U	0.001 U			0.001 U		
Acetone		0.05 U	0.05 U								
Bromodichloromethane		0.009	0.001 U								
Chlorodibromomethane		0.0034	0.001 U								
Chloroform		0.031	0.001 U								
Cis-1,2-Dichloroethene		0.001 U	0.001 U								
Methyl Tertbutyl Ether		0.0066	0.033								
Methylene chloride		0.002 U	0.002 U								
Tetrachloroethene		0.001 U	0.001 U								
Trichloroethene		0.001 U	0.001 U								
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine		0.0000082								0.000017	
Metals, Total (mg/L)											
Aluminum		0.05 U	0.156						0.1 U		
Barium		0.027	0.068						0.046		
Beryllium		0.001 U	0.001 U						0.002 U		
Cadmium		0.001 U	0.001 U						0.001 U		
Calcium		40	22.7						21		
Chromium	0.01 U	0.005 U	0.005 U	0.01 U	0.01 U		0.005 U	0.005 U	0.01 U	0.005 U	0.01 U
Cobalt		0.01 U	0.01 U						0.01 U		
Copper		0.011	0.01 U						0.02 U		
Iron	8	0.16	0.317	5.5	0.34		0.42	2.23	7.2	1.08	0.052
Lead		0.005 U	0.005 U						0.01 U		
Magnesium		4.4	3.62						3.7		
Manganese		0.39	1.31						1.2		
Nickel		0.01 U	0.01						0.1		
Potassium		4 U	5.55						4.4		
Silicon											
Sodium		59 J	67						68		
Strontium											
Vanadium		0.01 U	0.01 U						0.01 U		
Zinc		0.05 U	0.051						6.7		
Metals, Dissolved (mg/L)											
Aluminum					0.11						
Arsenic					0.01 U						
Barium					0.071						
Calcium					23						
Cobalt					0.01 U						
Copper					0.02 J						
Iron						0.05 U					
Magnesium					3.5 J						
Manganese					1.2						
Nickel					0.02 U						
Potassium					6.4						
Sodium					67						
Zinc					0.19						

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 11/17/1999	ALTRON B1 B1 11/17/2004	ALTRON B1 B1 11/19/2003	ALTRON B1 B1 11/28/2001	ALTRON B1 B1 11/29/2000	ALTRON B1 B-1 12/10/1998	ALTRON B1 B1 12/15/2004	ALTRON B1 B1 12/17/2003	ALTRON B1 B1 12/19/2001	ALTRON B1 B1 12/19/2002	ALTRON B1 B1 12/20/2000
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	20	16.8	20	25	13		17.9	21	14	12	23
Chloride	110	110	129	120	110	120	160	151	110	115	150
Specific Conductance **(mS/cm)**	0.598		0.627	0.584		0.8		0.62		0.573	0.767
Nitrate as N											
Nitrogen, as Ammonia	19 J	1.1	5.06	6.5	5.8	27	4.2	5.68 J	6.2	2.35 J	12
pH **(pH units)**	5.75	6.65	5.78	5.57	5.51	5.5	5.29	5.43 J	6.19	5.43	5.76
Sulfate	94	63	45.8	79	52	149	40	48.4	83	76.6	100
Total Alkalinity, as CaCO3		16.8	20				17.9	21			
Total Hardness											

Notes:
1 - Average calculated using half the
reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 12/22/1999	ALTRON B1 B1 2/16/2000	ALTRON B1 B1 2/18/2004	ALTRON B1 B1 2/20/2002	ALTRON B1 B1 2/21/2001	ALTRON B1 B1 2/26/2003	ALTRON B1 B1 3/10/2004	ALTRON B1 B1 3/15/2000	ALTRON B1 B1 3/19/2003	ALTRON B1 B1 3/20/2002	ALTRON B1 B1 3/21/2001
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene			0.001 U								0.001 U
2,4,4-Trimethyl-2-pentene			0.001 U								0.001 U
Acetone	0.01 U		0.05 U								
Bromodichloromethane	0.001 U		0.001 U								
Chlorodibromomethane	0.001 U		0.001 U								
Chloroform	0.001 U		0.001 U								
Cis-1,2-Dichloroethene	0.0015		0.001 U								
Methyl Tertbutyl Ether	0.0051		0.026								
Methylene chloride	0.001 U		0.002 U								
Tetrachloroethene	0.001 U		0.001 U								
Trichloroethene	0.004		0.001 U								
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine						0.000025 J					
Metals, Total (mg/L)											
Aluminum			0.206								
Barium			0.075								
Beryllium			0.001 U								
Cadmium			0.001 U								
Calcium			29								
Chromium	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.005 U	0.0009 B	0.01 U	0.005 U	0.01 U	0.01 U
Cobalt			0.01 U								
Copper			0.01 U								
Iron	0.12	0.07	2.04	2.9	0.2	1.26	0.19	0.23	0.739	0.86	1.7
Lead			0.005 U								
Magnesium			5.09								
Manganese			1.64								
Nickel			0.055								
Potassium			5								
Silicon											
Sodium			88								
Strontium											
Vanadium			0.01 U								
Zinc			0.174								
Metals, Dissolved (mg/L)											
Aluminum	0.16										0.14
Arsenic	0.01 U										0.01 U
Barium	0.059										0.055
Calcium	18										19
Cobalt	0.01 U										0.01 U
Copper	0.021										0.02 U
Iron											
Magnesium	4.2										3.1
Manganese	1.5										1
Nickel	0.01 U										0.02 U
Potassium	3.1										6
Sodium	82 J										53
Zinc	0.055										0.68

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 12/22/1999	ALTRON B1 B1 2/16/2000	ALTRON B1 B1 2/18/2004	ALTRON B1 B1 2/20/2002	ALTRON B1 B1 2/21/2001	ALTRON B1 B1 2/26/2003	ALTRON B1 B1 3/10/2004	ALTRON B1 B1 3/15/2000	ALTRON B1 B1 3/19/2003	ALTRON B1 B1 3/20/2002	ALTRON B1 B1 3/21/2001
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	23	22	27	34	14	15	22	12	24	36	21
Chloride	130	140	148	120	100	132	150	96	126	100	88
Specific Conductance **(mS/cm)**	0.802	1	0.641	0.617	0.545	0.553	0.651	0.495	0.571	0.575	
Nitrate as N											
Nitrogen, as Ammonia	36	48 J	6.35	7.6	1.4	3.15	0.1 U	8.6	3.2	3.1	4
pH **(pH units)**	5.73 J	5.9	5.76	6	5.57	5.72	5.7 J	5.67	5.94	5.93	5.77
Sulfate	140	120	51.1	88	59	54.5	59	72.7	52.5	71	56
Total Alkalinity, as CaCO3			27				22				
Total Hardness	63										

Notes:
1 - Average calculated using half the
reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 4/16/2003	ALTRON B1 B1 4/17/2002	ALTRON B1 B1 4/18/2001	ALTRON B1 B1 4/19/2000	ALTRON B1 B1 4/21/2004	ALTRON B1 B1 5/15/2002	ALTRON B1 B1 5/16/2001	ALTRON B1 B1 5/17/2000	ALTRON B1 B1 5/19/2004	ALTRON B1 B1 5/21/2003	ALTRON B1 B1 6/16/2004
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene	0.001 U	0.001 U		0.001 U					0.001 U		
2,4,4-Trimethyl-2-pentene	0.001 U	0.001 U		0.001 U					0.001 U		
Acetone	0.01 U								0.05 U		
Bromodichloromethane	0.001 U								0.001 U		
Chlorodibromomethane	0.001 U								0.001 U		
Chloroform	0.001 U								0.001 U		
Cis-1,2-Dichloroethene	0.001 U								0.001 U		
Methyl Tertbutyl Ether	0.032								0.014		
Methylene chloride	0.002 U								0.002 U		
Tetrachloroethene	0.002								0.001 U		
Trichloroethene	0.002								0.001 U		
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine											
Metals, Total (mg/L)											
Aluminum		0.1 U							0.19		
Barium		0.062							0.078		
Beryllium		0.002 U							0.00069 BJ		
Cadmium		0.001 U							0.0016		
Calcium		20							28		
Chromium	0.005 U	0.01 U	0.01 U	0.01 U	0.0027 B	0.005 U	0.01 U	0.01 U	0.0016 BJ	0.005 U	0.0031 B
Cobalt		0.01 U							0.00078 BJ		
Copper		0.02 U							0.018		
Iron	0.909	1.1	0.47	0.24	0.66	0.77	0.056	0.48	0.63	6.73	1
Lead		0.01 U							0.0047 BJ		
Magnesium		3.7							4.2		
Manganese		1.5							1.4		
Nickel									0.03		
Potassium		4.6							5.5		
Silicon											
Sodium		64							82		
Strontium											
Vanadium		0.01 U							0.0009 BJ		
Zinc		2.2							0.18		
Metals, Dissolved (mg/L)											
Aluminum				0.15							
Arsenic				0.01 U							
Barium				0.052							
Calcium				18							
Cobalt				0.01 U							
Copper				0.024							
Iron											
Magnesium				3.2							
Manganese				0.9							
Nickel				0.02 U							
Potassium				3.8							
Sodium				62							
Zinc				0.15							

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 4/16/2003	ALTRON B1 B1 4/17/2002	ALTRON B1 B1 4/18/2001	ALTRON B1 B1 4/19/2000	ALTRON B1 B1 4/21/2004	ALTRON B1 B1 5/15/2002	ALTRON B1 B1 5/16/2001	ALTRON B1 B1 5/17/2000	ALTRON B1 B1 5/19/2004	ALTRON B1 B1 5/21/2003	ALTRON B1 B1 6/16/2004
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	9	29	13	14	28.1	24	13	13	11.6	21	9.4 J
Chloride	139	110	110	97	150	119	130 J	87	160	45.5	160
Specific Conductance **(mS/cm)**	0.587		0.48		0.638	0.569	0.654	0.486	0.635	0.58	0.599
Nitrate as N											
Nitrogen, as Ammonia	2.35	6.8	4.6	9.6	7.2	7.2	7.4	4.3	5.4	9.61	5.3
pH **(pH units)**	5.62	5.97	R	6.07	6.48 J	5.67	5.62	5.77	6.64	5.78	5.61
Sulfate	53	44	34	71	55	50	47	45	40	45.7	45
Total Alkalinity, as CaCO3	9				28.1				11.6	21	9.42 J
Total Hardness											

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 6/18/2003	ALTRON B1 B1 6/19/2002	ALTRON B1 B1 6/20/2001	ALTRON B1 B1 6/21/2000	ALTRON B1 B1 7/11/2001	ALTRON B1 B1 7/12/2000	ALTRON B1 B1 7/16/2003	ALTRON B1 B1 7/17/2002	ALTRON B1 B1 7/20/1999	ALTRON B1 B1 7/21/2004	ALTRON B1 B1 8/15/2001
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene		0.001 UJ	0.001 U				0.001 U				
2,4,4-Trimethyl-2-pentene		0.001 UJ	0.001 U				0.001 U				
Acetone							0.01 U				
Bromodichloromethane							0.001 U				
Chlorodibromomethane							0.001 U				
Chloroform							0.001 U				
Cis-1,2-Dichloroethene							0.001 U				
Methyl Tertbutyl Ether							0.034				
Methylene chloride							0.002 U				
Tetrachloroethene							0.0007 J				
Trichloroethene							0.001 U				
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine											
Metals, Total (mg/L)											
Aluminum											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U	0.01 U	0.01 U
Cobalt											
Copper											
Iron	0.357	3.47	0.076	0.095	1	0.064 J	0.307	0.379	0.1 U	1.2	1.3
Lead											
Magnesium											
Manganese											
Nickel											
Potassium											
Silicon											
Sodium											
Strontium											
Vanadium											
Zinc											
Metals, Dissolved (mg/L)											
Aluminum			0.12								
Arsenic			0.01 U								
Barium			0.096								
Calcium			22								
Cobalt			0.01 U								
Copper			0.02 U								
Iron											
Magnesium			4.2								
Manganese			1.5								
Nickel			0.02 U								
Potassium			7.2								
Sodium			87								
Zinc			0.05 U								

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 6/18/2003	ALTRON B1 B1 6/19/2002	ALTRON B1 B1 6/20/2001	ALTRON B1 B1 6/21/2000	ALTRON B1 B1 7/11/2001	ALTRON B1 B1 7/12/2000	ALTRON B1 B1 7/16/2003	ALTRON B1 B1 7/17/2002	ALTRON B1 B1 7/20/1999	ALTRON B1 B1 7/21/2004	ALTRON B1 B1 8/15/2001
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	20	28	16	16	24	14	11	13	23	4.4	17
Chloride	151	118	120	89	120	92	153	122	140	180	120
Specific Conductance **(mS/cm)**	0.544	0.547	0.589	0.476	0.583	0.468	1.04	0.627	1.1	0.846	0.555
Nitrate as N											
Nitrogen, as Ammonia	3.37	0.1 U	7.4	5.2 J	0.1 UJ	5.7	8.72	5.75	5.9 J	15 J	7.3
pH **(pH units)**	5.81	5.97	5.53	6.03	5.68	5.91	6.02	5.61	5.81	5.77 J	5.7
Sulfate	51.6	38.9	57	46	55	50	73.3	64.6	240	120	63
Total Alkalinity, as CaCO3	20						11			4.4	
Total Hardness											

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 8/16/2000	ALTRON B1 B1 8/18/1999	ALTRON B1 B1 8/18/2004	ALTRON B1 B1 8/20/2003	ALTRON B1 B1 8/21/2002	ALTRON B1 B1 9/15/2004	ALTRON B1 B1 9/17/2003	ALTRON B1 B1 9/18/2002	ALTRON B1 B1 9/19/2001	ALTRON B1 B1 9/20/2000	ALTRON B1 B-1 (Sanmina) 7/7/1999
Volatile Organics (mg/L)											
1,2-Dichloroethene (total)											
2,4,4-Trimethyl-1-pentene	0.001 U	0.001 U	0.001 UJ				0.001 U	0.001 U	0.001 U		0.001 U
2,4,4-Trimethyl-2-pentene	0.001 U	0.001 U	0.001 UJ				0.001 U	0.001 U	0.001 U		0.001 U
Acetone			0.05 UJ				0.05 U	0.01 U			
Bromodichloromethane			0.001 UJ				0.001 U	0.001 U			
Chlorodibromomethane			0.001 UJ				0.001 U	0.001 U			
Chloroform			0.001 UJ				0.001 U	0.001 U			
Cis-1,2-Dichloroethene			0.001 UJ				0.001 U	0.001 U			
Methyl Tertbutyl Ether			0.023 J				0.034	0.02			
Methylene chloride			0.002 UJ				0.002 U	0.002 U			
Tetrachloroethene			0.001 UJ				0.0005 J	0.002			
Trichloroethene			0.001 UJ				0.001 U	0.001			
Semi-volatile Organic (mg/L)											
N-Nitrosodimethylamine			0.000041								
Metals, Total (mg/L)											
Aluminum			2.4					2.87 J			
Barium			0.099					0.08			
Beryllium			0.001 U					0.001 U			
Cadmium			0.001 U					0.001			
Calcium			28					24.1			
Chromium	0.01 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.01 U	0.005 U
Cobalt			0.01					0.037			
Copper			0.45					0.187			
Iron	0.056	0.079	0.93	0.656	1.27	0.067	0.406	3.54 J	0.82	0.05 U	4.7
Lead			0.005 U					0.006			
Magnesium			6.3					5.58			
Manganese			2.3					1.95 J			
Nickel			0.064					0.188			
Potassium			6.6					5.29			
Silicon											
Sodium			100					65.5 J			
Strontium											
Vanadium			0.01 U					0.01 U			
Zinc			0.05 U					0.124			
Metals, Dissolved (mg/L)											
Aluminum	0.19	0.57							0.28		
Arsenic	0.01 U	0.01 U							0.01 U		
Barium	0.064	0.06							0.064		
Calcium	18	26							22		
Cobalt	0.01 U	0.01 U							0.01 U		
Copper	0.02 U	0.015							0.02 U		
Iron											
Magnesium	3.2	7.3							4		
Manganese	1.3	2.1							1.6		
Nickel	0.02 U	0.02 U							0.033		
Potassium	4.2	3.3							5.2		
Sodium	54	100							72		
Zinc	0.05 U	0.05 U							0.44		

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B1 8/16/2000	ALTRON B1 B1 8/18/1999	ALTRON B1 B1 8/18/2004	ALTRON B1 B1 8/20/2003	ALTRON B1 B1 8/21/2002	ALTRON B1 B1 9/15/2004	ALTRON B1 B1 9/17/2003	ALTRON B1 B1 9/18/2002	ALTRON B1 B1 9/19/2001	ALTRON B1 B1 9/20/2000	ALTRON B1 B-1 (Sanmina) 7/7/1999
Inorganics (mg/L)											
Bicarbonate Alkalinity, as CaCO3	10	24	2.7	11	6	23	11	4	21	14	
Chloride	110	120	170	144	128	120	132	121	110	110	
Specific Conductance **(mS/cm)**			0.823	0.679	0.626	0.552	0.635	0.677	0.573	0.603	0.41
Nitrate as N											
Nitrogen, as Ammonia	7.7	50 J	14	7.86	6.38	0.51	8.06	6.18 J	7.6	8.1	4.5
pH **(pH units)**	5.78	5.55	5.5	5.53	5.39	6.71	5.47	5.08	5.38	5.49	5.4
Sulfate	64	290	100	66.8	85.9	52	68.4	104	62	61	67
Total Alkalinity, as CaCO3			2.7	11		23	11				
Total Hardness											

Notes:
1 - Average calculated using half the
reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B-1 SANMINA 7/20/1999	ALTRON B1 B1SANMINA 9/15/1999	ALTRON B1 SANMINA B1 11/19/2003	ALTRON B1 SANMINA B1 2/18/2004	ALTRON B1 SANMINA B1 5/19/2004	ALTRON B1 SANMINA B1 5/21/2003	ALTRON B1 SANMINA B1 6/18/2003	ALTRON B1 SANMINA B1 7/16/2003	ALTRON B1 SANMINA B1 8/20/2003
Volatile Organics (mg/L)									
1,2-Dichloroethene (total)									
2,4,4-Trimethyl-1-pentene	0.001 U								
2,4,4-Trimethyl-2-pentene	0.001 U								
Acetone									
Bromodichloromethane									
Chlorodibromomethane									
Chloroform									
Cis-1,2-Dichloroethene									
Methyl Tertbutyl Ether									
Methylene chloride									
Tetrachloroethene									
Trichloroethene									
Semi-volatile Organic (mg/L)									
N-Nitrosodimethylamine			0.000013	0.000017	0.0000076	0.000014	0.000014	0.000012	0.000017
Metals, Total (mg/L)									
Aluminum									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium	0.01 U	0.0081							
Cobalt									
Copper									
Iron	0.072	0.12							
Lead									
Magnesium									
Manganese									
Nickel									
Potassium									
Silicon									
Sodium									
Strontium									
Vanadium									
Zinc									
Metals, Dissolved (mg/L)									
Aluminum									
Arsenic									
Barium									
Calcium									
Cobalt									
Copper									
Iron									
Magnesium									
Manganese									
Nickel									
Potassium									
Sodium									
Zinc									

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B1
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B1 B-1 SANMINA 7/20/1999	ALTRON B1 B1SANMINA 9/15/1999	ALTRON B1 SANMINA B1 11/19/2003	ALTRON B1 SANMINA B1 2/18/2004	ALTRON B1 SANMINA B1 5/19/2004	ALTRON B1 SANMINA B1 5/21/2003	ALTRON B1 SANMINA B1 6/18/2003	ALTRON B1 SANMINA B1 7/16/2003	ALTRON B1 SANMINA B1 8/20/2003
Inorganics (mg/L)									
Bicarbonate Alkalinity, as CaCO3		14							
Chloride		78							
Specific Conductance **(mS/cm)**	0.96	0.483							
Nitrate as N									
Nitrogen, as Ammonia	46	16							
pH **(pH units)**	5.64	6.13 J							
Sulfate	230	54							
Total Alkalinity, as CaCO3									
Total Hardness									

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection			Range of Reporting Limits for Non Detects			Range of Detected Concentrations			Average of All Samples (1)	ALTRON B3 31SANMINA 9/15/1999	ALTRON B3 ALT-B3 2/18/1999	ALTRON B3 ALTRON B1 9/23/2002	ALTRON B3 ALTRON B3 1/20/1999	ALTRON B3 ALTRON B3 10/20/1997	ALTRON B3 ALTRON B3 11/12/1997
Volatile Organics (mg/L)																
2,4,4-Trimethyl-1-pentene	1	/	26	0.001	:	0.01	0.004	-	0.004	0.00096		0.005 U			0.001 U	0.004
Cis-1,2-Dichloroethene	1	/	10	0.001	:	0.001	0.007	-	0.007	0.0012					0.001 U	0.007
Methyl Tertbutyl Ether	10	/	10				0.0079	-	0.026	0.017					0.008	0.008
Methylene chloride	2	/	12	0.001	:	0.002	0.002	-	0.009	0.0016					0.001 U	0.001 U
Trichloroethene	1	/	12	0.001	:	0.005	0.007	-	0.007	0.0014					0.001 U	0.007
Semi-volatile Organics (mg/L)																
Bis(2-Ethylhexyl)phthalate	1	/	1				0.005	-	0.005	0.0050						
Diethylphthalate	1	/	1				0.001	-	0.001	0.0010						
N-Nitrosodimethylamine	11	/	11				0.000019	-	0.000078	0.000039			0.000023			
Metals, Total (mg/L)																
Aluminum	8	/	8				0.038	-	1.2	0.36						
Antimony	1	/	7	0.005	:	0.01	0.0027	-	0.0027	0.0043						
Barium	8	/	8				0.04	-	0.079	0.053						
Beryllium	1	/	7	0.001	:	0.005	0.00039	-	0.00039	0.00091						
Cadmium	3	/	7	0.001	:	0.01	0.001	-	0.0019	0.0015						
Calcium	8	/	8				20	-	34	26						
Chromium	5	/	72	0.005	:	0.015	0.0007	-	0.074	0.0049	0.005 U	0.005 U		0.005 U		
Cobalt	1	/	7	0.01	:	0.03	0.012	-	0.012	0.0074						
Copper	8	/	8				0.037	-	0.17	0.079						
Iron	46	/	71	0.05	:	0.1	0.027	-	6.85	0.26	0.05 U	0.3		0.05 U		
Lead	2	/	7	0.005	:	0.01	0.0042	-	0.01	0.0045						
Magnesium	8	/	8				4.1	-	6.8	5.1						
Manganese	8	/	8				2.47	-	3.8	3.0						
Nickel	5	/	6	0.04	:	0.04	0.074	-	0.22	0.14						
Potassium	8	/	8				3.54	-	6	4.7						
Silicon	1	/	1				9.79	-	9.79	9.8						
Sodium	8	/	8				75	-	137	110						
Strontium	1	/	1				0.15	-	0.15	0.15						
Zinc	2	/	7	0.05	:	0.05	0.017	-	0.037	0.026						
Metals, Dissolved (mg/L)																
Aluminum	12	/	14	0.1	:	0.1	0.1	-	2	0.40		0.1 U			0.1	0.1
Barium	12	/	14	0.1	:	0.2	0.04	-	0.058	0.051		0.045			0.1 U	0.043
Cadmium	1	/	14	0.001	:	0.01	0.0022	-	0.0022	0.0014		0.001 U			0.01 U	0.005 U
Calcium	15	/	15				18	-	25	21		18			20.1	25
Cobalt	1	/	14	0.01	:	0.05	0.008	-	0.008	0.0081		0.01 U			0.05 U	0.008
Copper	14	/	14				0.026	-	0.89	0.14		0.89			0.042	0.066
Iron	4	/	8	0.05	:	0.1	0.124	-	0.84	0.22					0.124	0.05 U
Lead	3	/	14	0.003	:	0.01	0.003	-	0.056	0.0097		0.056			0.005 U	0.003 U
Magnesium	15	/	16	5	:	5	2.8	-	7	4.2		2.8			4.29	5.5
Manganese	16	/	16				0.26	-	3.4	2.2		1.8			2.77	3.4
Nickel	9	/	14	0.01	:	0.04	0.007	-	0.15	0.055		0.057			0.03 U	0.007
Potassium	15	/	16	25	:	25	3.3	-	5.29	4.7		3.9			4.1	5.2
Sodium	16	/	16				13	-	140	95		100			82.3	86
Zinc	4	/	14	0.02	:	0.05	0.02	-	0.99	0.11		0.99			0.02 U	0.02

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples (1)	ALTRON B3 31SANMINA 9/15/1999	ALTRON B3 ALT-B3 2/18/1999	ALTRON B3 ALTRON B1 9/23/2002	ALTRON B3 ALTRON B3 1/20/1999	ALTRON B3 ALTRON B3 10/20/1997	ALTRON B3 ALTRON B3 11/12/1997
Inorganics										
Bicarbonate Alkalinity, as CaCO3	70 / 70		12 - 26	22	23	25				
Chloride	77 / 77		28 - 300	188	150	28			131	156
Specific Conductance **(mS/cm)**	64 / 64		0.411 - 1.2	0.82	0.514	0.6		0.84		
Nitrate as N	1 / 1		5.8 - 5.8	5.8						
Nitrogen, as Ammonia	80 / 80		0.97 - 66	10.7	8.3	4.2		7.4	40.2	13.6
pH **(pH units)**	69 / 69		5.36 - 6.97	5.7	5.84 J	5.64				
Sulfate	80 / 80		12 - 407	89	78	42		56	86.7	113
Total Alkalinity, as CaCO3	19 / 19		12 - 42	22					42	20
Total Hardness	1 / 1		67 - 67	67						

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 ALTRON B3 3/12/1992	ALTRON B3 ALTRON B3 3/17/1999	ALTRON B3 ALTRON B3 4/22/1999	ALTRON B3 ALTRON B3 5/19/1999	ALTRON B3 ALTRON B3 6/16/1999	ALTRON B3 ALTRON B3 7/15/1993	ALTRON B3 ALTRON B3 8/6/1998	ALTRON B3 ALTRON B3 9/10/1998	ALTRON B3 ALTRON WELL #3 10/17/1996	ALTRON B3 ALTRON-B3 3/10/1992	ALTRON B3 B3 1/15/2003	ALTRON B3 B3 1/16/2002
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene						0.01 U		0.001 U	0.005 U			
Cis-1,2-Dichloroethene												
Methyl Tertbutyl Ether												
Methylene chloride						0.009 JB			0.002 JB			
Trichloroethene						0.005 U			0.005 U			
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate						0.005 J						
Diethylphthalate						0.001 J						
N-Nitrosodimethylamine											0.00004	
Metals, Total (mg/L)												
Aluminum						0.22				0.038		
Antimony						0.005 U						
Barium						0.04				0.04		
Beryllium						0.005 U						
Cadmium						0.01 U						
Calcium						20				20.1		
Chromium	0.015 U	0.005 U	0.005 U	0.01 U	0.01 U	0.015 U				0.01 U	0.005 U	0.01 U
Cobalt						0.03 U						
Copper						0.037				0.07		
Iron		0.42	0.064	0.14	0.06	0.84				0.027	0.154	0.05 U
Lead						0.01						
Magnesium						4.4				4.18		
Manganese						3				3.64		
Nickel						0.04 U						
Potassium						5				4.44		
Silicon										9.79		
Sodium						75				85.4		
Strontium										0.15		
Zinc						0.037						
Metals, Dissolved (mg/L)												
Aluminum				0.12					0.204			
Barium				0.047					0.2 U			
Cadmium				0.002 U					0.005 U			
Calcium								18	18.9			
Cobalt				0.01 U					0.05 U			
Copper				0.1					0.032			
Iron							0.34	0.1 U	0.1 U			
Lead				0.01 U					0.003			
Magnesium				3.2				3.3	5 U			
Manganese				1.8				2	2.79			
Nickel				0.02 U					0.04 U			
Potassium				3.4				25 U	5.29			
Sodium				88				98	69.7			
Zinc				0.05 U					0.027			

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 ALTRON B3 3/12/1992	ALTRON B3 ALTRON B3 3/17/1999	ALTRON B3 ALTRON B3 4/22/1999	ALTRON B3 ALTRON B3 5/19/1999	ALTRON B3 ALTRON B3 6/16/1999	ALTRON B3 ALTRON B3 7/15/1993	ALTRON B3 ALTRON B3 8/6/1998	ALTRON B3 ALTRON B3 9/10/1998	ALTRON B3 ALTRON WELL #3 10/17/1996	ALTRON B3 ALTRON-B3 3/10/1992	ALTRON B3 B3 1/15/2003	ALTRON B3 B3 1/16/2002
Inorganics												
Bicarbonate Alkalinity, as CaCO3		25	20	20	26			20	20.2	19.51	21	24
Chloride	120	140	180	150	170	110	172	133	180	126.4	207	266
Specific Conductance **(mS/cm)**					1.2		0.709	0.724			0.967	0.803
Nitrate as N										5.8		
Nitrogen, as Ammonia	8.6 +	1.6	2.8	7.4	56	7.8	3.48	3.72	9	9.6	13.5	2.2
pH **(pH units)**		5.63	5.36					5.69		5.8	5.58	5.68
Sulfate	90	51	36	62	300	91	47	59	86.8	85.1	92.3	67
Total Alkalinity, as CaCO3										16		
Total Hardness												

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 1/17/2001	ALTRON B3 B3 1/19/2000	ALTRON B3 B3 1/21/2004	ALTRON B3 B-3 10/15/1998	ALTRON B3 B3 10/15/2003	ALTRON B3 B3 10/16/2002	ALTRON B3 B3 10/17/2001	ALTRON B3 B3 10/18/2000	ALTRON B3 B3 10/20/1999	ALTRON B3 B-3 11/12/1998	ALTRON B3 B3 11/17/1999	ALTRON B3 B3 11/19/2003
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene												0.001 U
Cis-1,2-Dichloroethene												0.001 U
Methyl Tertbutyl Ether												0.019
Methylene chloride												0.002 U
Trichloroethene												0.001 U
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate												
Diethylphthalate												
N-Nitrosodimethylamine												
Metals, Total (mg/L)												
Aluminum												0.423
Antimony												0.01 U
Barium												0.063
Beryllium												0.001 U
Cadmium												0.001
Calcium												30.1
Chromium	0.01 U	0.01 U	0.005 U		0.005 U	0.005 U	0.01 U	0.01 U	0.01 U		0.01 U	0.005 U
Cobalt												0.01 U
Copper												0.085
Iron	0.15	0.05 U	0.158		0.095	0.062	0.054	0.05 U	0.05 U		0.057	0.153
Lead												0.005 U
Magnesium												5.45
Manganese												2.91
Nickel												0.207
Potassium												5.37
Silicon												
Sodium												128
Strontium												
Zinc												0.05 U
Metals, Dissolved (mg/L)												
Aluminum										0.1 U		
Barium										0.05		
Cadmium										0.001 U		
Calcium				19						18		
Cobalt										0.01 U		
Copper										0.25		
Iron				0.28						0.84		
Lead										0.028		
Magnesium				3.4						3.2		
Manganese				1.7						1.9		
Nickel										0.01 U		
Potassium				3.6						4.1		
Sodium				13						110		
Zinc										0.2		

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 1/17/2001	ALTRON B3 B3 1/19/2000	ALTRON B3 B3 1/21/2004	ALTRON B3 B-3 10/15/1998	ALTRON B3 B3 10/15/2003	ALTRON B3 B3 10/16/2002	ALTRON B3 B3 10/17/2001	ALTRON B3 B3 10/18/2000	ALTRON B3 B3 10/20/1999	ALTRON B3 B-3 11/12/1998	ALTRON B3 B3 11/17/1999	ALTRON B3 B3 11/19/2003
Inorganics												
Bicarbonate Alkalinity, as CaCO3	25	20	22	24	21	18	25	22	21		20	23
Chloride	210 J	160	244	202	253	107	230	150	140	180	160	244
Specific Conductance **(mS/cm)**	0.923	0.671	0.929	0.824	0.995	0.758	0.793	0.729	0.743	0.75	0.789	1
Nitrate as N												
Nitrogen, as Ammonia	20 J	9.6 J	11.8	3.1	3.46	6.75	7.2	12	11 J	3	13 J	11.2
pH **(pH units)**	5.87	5.46	5.63	5.64	5.59	5.59	5.45	5.9	5.73 J		5.61	5.75
Sulfate	140	91	90.4	32.2	78.9	114	73	81	97	38.8	94	92.4
Total Alkalinity, as CaCO3			22		21							23
Total Hardness												

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 11/20/2002	ALTRON B3 B3 11/28/2001	ALTRON B3 B3 11/29/2000	ALTRON B3 B-3 12/10/1998	ALTRON B3 B3 12/17/2003	ALTRON B3 B3 12/19/2001	ALTRON B3 B3 12/19/2002	ALTRON B3 B3 12/20/2000	ALTRON B3 B3 12/22/1999	ALTRON B3 B3 2/16/2000	ALTRON B3 B3 2/18/2004	ALTRON B3 B3 2/20/2002
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene			0.001 U	0.001 U		0.001 U					0.001 U	
Cis-1,2-Dichloroethene									0.001 U		0.001 U	
Methyl Tertbutyl Ether									0.0079		0.026	
Methylene chloride									0.001 U		0.002 U	
Trichloroethene									0.001 U		0.001 U	
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate												
Diethylphthalate												
N-Nitrosodimethylamine							0.00004					
Metals, Total (mg/L)												
Aluminum						0.23					0.298	
Antimony						0.01 U					0.01 U	
Barium						0.046					0.059	
Beryllium						0.002 U					0.001 U	
Cadmium						0.001 U					0.001 U	
Calcium						26					33.5	
Chromium	0.005 U	0.01 U	0.01 U		0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U	0.01 U
Cobalt						0.01 U					0.01 U	
Copper						0.06					0.075	
Iron	0.077	0.05	0.05 U		0.224	0.096	0.119	0.2	0.05 U	0.056	0.103	0.05 U
Lead						0.01 U					0.005 U	
Magnesium						4.9					6.28	
Manganese						2.8					2.81	
Nickel						0.074					0.115	
Potassium						4.2					4.57	
Silicon												
Sodium						120					137	
Strontium												
Zinc						0.05 U					0.05 U	
Metals, Dissolved (mg/L)												
Aluminum			1.1						0.17			
Barium			0.04						0.045			
Cadmium			0.001 U						0.002 U			
Calcium			22						20			
Cobalt			0.01 U						0.01 U			
Copper			0.066 J						0.092			
Iron				0.05 U								
Lead			0.01 U						0.01 U			
Magnesium			4.4 J						4.1			
Manganese			2.6						2.5			
Nickel			0.15						0.067			
Potassium			4.5						4.4			
Sodium			97						110 J			
Zinc			0.05 U						0.05 U			

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 11/20/2002	ALTRON B3 B3 11/28/2001	ALTRON B3 B3 11/29/2000	ALTRON B3 B-3 12/10/1998	ALTRON B3 B3 12/17/2003	ALTRON B3 B3 12/19/2001	ALTRON B3 B3 12/19/2002	ALTRON B3 B3 12/20/2000	ALTRON B3 B3 12/22/1999	ALTRON B3 B3 2/16/2000	ALTRON B3 B3 2/18/2004	ALTRON B3 B3 2/20/2002
Inorganics												
Bicarbonate Alkalinity, as CaCO3	17	24	21		22	16	21	16	21	22	23	23
Chloride	224	190	150	110	258	260	201	110	170	140	243	260
Specific Conductance **(mS/cm)**	0.785	0.784		0.84	0.987		0.938	0.523	0.758	1	0.894	0.809
Nitrate as N												
Nitrogen, as Ammonia	8.91	5.1	9.7	25	11.3	8.5	10.7 J	5.5	11	49 J	9.56	6.9
pH **(pH units)**	5.57	5.55	5.61	5.6	5.51 J	5.8	5.55	5.73	5.74 J	5.91	5.6	5.64
Sulfate	77.3	62	93	149	96	86	94.7	52	90	120	79	64
Total Alkalinity, as CaCO3					22						23	
Total Hardness									67			

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 2/21/2001	ALTRON B3 B3 2/26/2003	ALTRON B3 B3 3/10/2004	ALTRON B3 B3 3/15/2000	ALTRON B3 B3 3/19/2003	ALTRON B3 B3 3/20/2002	ALTRON B3 B3 3/21/2001	ALTRON B3 B3 4/16/2003	ALTRON B3 B3 4/17/2002	ALTRON B3 B3 4/18/2001	ALTRON B3 B3 4/19/2000	ALTRON B3 B3 4/21/2004
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene							0.001 U	0.001 U	0.001 U		0.001 U	
Cis-1,2-Dichloroethene								0.001 U				
Methyl Tertbutyl Ether								0.019				
Methylene chloride								0.002 U				
Trichloroethene								0.001 U				
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate												
Diethylphthalate												
N-Nitrosodimethylamine		0.000037										
Metals, Total (mg/L)												
Aluminum									0.23			
Antimony									0.01 U			
Barium									0.056			
Beryllium									0.002 U			
Cadmium									0.0011			
Calcium									26 J			
Chromium	0.01 U	0.005 U	0.0012 B	0.01 U	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.0007 B
Cobalt									0.01 U			
Copper									0.073			
Iron	0.14	0.068	0.19	0.05 U	0.071	0.05 U	0.05 U	0.122	0.05 U	0.05 U	0.066	0.19
Lead									0.01 U			
Magnesium									4.5			
Manganese									2.9			
Nickel												
Potassium									4.4			
Silicon												
Sodium									120			
Strontium												
Zinc									0.05 U			
Metals, Dissolved (mg/L)												
Aluminum							0.55				0.2	
Barium							0.043				0.043	
Cadmium							0.001 U				0.002 U	
Calcium							21				22	
Cobalt							0.01 U				0.01 U	
Copper							0.085				0.06	
Iron												
Lead							0.01 U				0.01 U	
Magnesium							4.2				4.8	
Manganese							2.3				2.7	
Nickel							0.11				0.082	
Potassium							4.4				4.2	
Sodium							100				110	
Zinc							0.05 U				0.05 U	

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 2/21/2001	ALTRON B3 B3 2/26/2003	ALTRON B3 B3 3/10/2004	ALTRON B3 B3 3/15/2000	ALTRON B3 B3 3/19/2003	ALTRON B3 B3 3/20/2002	ALTRON B3 B3 3/21/2001	ALTRON B3 B3 4/16/2003	ALTRON B3 B3 4/17/2002	ALTRON B3 B3 4/18/2001	ALTRON B3 B3 4/19/2000	ALTRON B3 B3 4/21/2004
Inorganics												
Bicarbonate Alkalinity, as CaCO3	23	23	23	22	21	23	22	22	22	22	22	22.1
Chloride	190	227	240	220	218	180	210	237 J	170	180	270	220
Specific Conductance **(mS/cm)**	0.835	0.852	0.978	0.775	0.884	0.85		0.906		0.73		0.97
Nitrate as N												
Nitrogen, as Ammonia	15	7.34	0.97	10	9.05	6.3	8.6	9.54	6.5	7	19	11
pH **(pH units)**	5.61	5.74	5.7 J	5.8	5.75	5.66	5.57	5.69	5.63	R	5.89	6.36 J
Sulfate	130	72.7	99	106	75.9	61	80	77.9	62	66	160	98
Total Alkalinity, as CaCO3			23					22				22.1
Total Hardness												

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 5/15/2002	ALTRON B3 B3 5/16/2001	ALTRON B3 B3 5/17/2000	ALTRON B3 B3 5/19/2004	ALTRON B3 B3 5/21/2003	ALTRON B3 B3 6/16/2004	ALTRON B3 B3 6/18/2003	ALTRON B3 B3 6/19/2002	ALTRON B3 B3 6/20/2001	ALTRON B3 B3 6/21/2000	ALTRON B3 B3 7/11/2001	ALTRON B3 B3 7/12/2000
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene				0.001 U				0.001 UJ	0.001 U			
Cis-1,2-Dichloroethene				0.001 U								
Methyl Tertbutyl Ether				0.02								
Methylene chloride				0.002 U								
Trichloroethene				0.001 U								
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate												
Diethylphthalate												
N-Nitrosodimethylamine												
Metals, Total (mg/L)												
Aluminum				1.2								
Antimony				0.0027 B								
Barium				0.079								
Beryllium				0.00039 B								
Cadmium				0.0019								
Calcium				34								
Chromium	0.005 U	0.01 U	0.01 U	0.002 B	0.005 U	0.0037 B	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U
Cobalt				0.012								
Copper				0.17								
Iron	0.166	0.05 U	0.059	0.34	6.85	0.29	0.05 U	0.1 U	0.053	0.066	0.05 U	0.07 J
Lead				0.0042 B								
Magnesium				6.8								
Manganese				3.8								
Nickel				0.22								
Potassium				6								
Silicon												
Sodium				130								
Strontium												
Zinc				0.017 B								
Metals, Dissolved (mg/L)												
Aluminum									0.26			
Barium									0.058			
Cadmium									0.001 U			
Calcium									25			
Cobalt									0.01 U			
Copper									0.06			
Iron												
Lead									0.01 U			
Magnesium									4.7			
Manganese									2.6			
Nickel									0.036			
Potassium									3.9			
Sodium									140			
Zinc									0.05 U			

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 5/15/2002	ALTRON B3 B3 5/16/2001	ALTRON B3 B3 5/17/2000	ALTRON B3 B3 5/19/2004	ALTRON B3 B3 5/21/2003	ALTRON B3 B3 6/16/2004	ALTRON B3 B3 6/18/2003	ALTRON B3 B3 6/19/2002	ALTRON B3 B3 6/20/2001	ALTRON B3 B3 6/21/2000	ALTRON B3 B3 7/11/2001	ALTRON B3 B3 7/12/2000
Inorganics												
Bicarbonate Alkalinity, as CaCO3	22	23	22	12	22	12.4 J	21	23	23	25	22	23
Chloride	174	150	220	260	45.7	270	260	276	190	150	260	150
Specific Conductance **(mS/cm)**	0.877	0.785	0.828	0.996	0.898	0.989	0.825	0.892	0.507	0.788	0.812	0.773
Nitrate as N												
Nitrogen, as Ammonia	6.1	8	13	14	9.62	13	7.33	2.09	6.5	11 J	0.97	13
pH **(pH units)**	5.59	5.69	5.77	6.33	5.68	5.68	5.75	5.66	5.73	5.93	5.65	5.77
Sulfate	64	65	99	110	46.6	110	73.9	66.5	68	100	49	12
Total Alkalinity, as CaCO3				12	22	12.4 J	21					
Total Hardness												

Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 7/16/2003	ALTRON B3 B3 7/17/2002	ALTRON B3 B3 7/20/1999	ALTRON B3 B3 7/21/2004	ALTRON B3 B3 8/15/2001	ALTRON B3 B3 8/16/2000	ALTRON B3 B3 8/18/1999	ALTRON B3 B3 8/20/2003	ALTRON B3 B3 8/21/2002	ALTRON B3 B3 9/17/2003	ALTRON B3 B3 9/18/2002	ALTRON B3 B3 9/19/2001
Volatile Organics (mg/L)												
2,4,4-Trimethyl-1-pentene	0.001 U					0.001 U	0.001 U			0.001 U	0.001 U	0.001 U
Cis-1,2-Dichloroethene	0.001 U									0.001 U	0.001 U	
Methyl Tertbutyl Ether	0.022									0.021	0.019	
Methylene chloride	0.002 U									0.002 U	0.002 U	
Trichloroethene	0.001 U									0.001 U	0.001 U	
Semi-volatile Organics (mg/L)												
Bis(2-Ethylhexyl)phthalate												
Diethylphthalate												
N-Nitrosodimethylamine												
Metals, Total (mg/L)												
Aluminum											0.264	
Antimony											0.01 U	
Barium											0.041	
Beryllium											0.001 U	
Cadmium											0.001 U	
Calcium											21.3	
Chromium	0.01 U	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
Cobalt											0.01 U	
Copper											0.06	
Iron	0.1 U	0.061	0.1 U	0.05 U	0.05 U	0.11	0.05 U	0.18	0.05 U	0.34	0.073	0.057
Lead											0.005 U	
Magnesium											4.1	
Manganese											2.47	
Nickel											0.216	
Potassium											3.54	
Silicon												
Sodium											88.2	
Strontium												
Zinc											0.05 U	
Metals, Dissolved (mg/L)												
Aluminum						2	0.46					0.26
Barium						0.043	0.058					0.05
Cadmium						0.002 U	0.002 U					0.0022
Calcium						22	25					24
Cobalt						0.01 U	0.01 U					0.01 U
Copper						0.063	0.026					0.068
Iron												
Lead						0.01 U	0.01 U					0.01 U
Magnesium						4.7	7					4.6
Manganese						2.7	2					0.26
Nickel						0.15	0.02 U					0.044
Potassium						4.2	3.3					4.1
Sodium						89	100					120
Zinc						0.05 U	0.05 U					0.05 U

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 7/16/2003	ALTRON B3 B3 7/17/2002	ALTRON B3 B3 7/20/1999	ALTRON B3 B3 7/21/2004	ALTRON B3 B3 8/15/2001	ALTRON B3 B3 8/16/2000	ALTRON B3 B3 8/18/1999	ALTRON B3 B3 8/20/2003	ALTRON B3 B3 8/21/2002	ALTRON B3 B3 9/17/2003	ALTRON B3 B3 9/18/2002	ALTRON B3 B3 9/19/2001
Inorganics												
Bicarbonate Alkalinity, as CaCO3	22	23	21	21.8	21	17	24	21	22	22	21	24
Chloride	262	204	170	120	300	150	120	262	160	245	152	160
Specific Conductance **(mS/cm)**	0.411	0.895	0.75	0.545	0.795			1.04	0.803	1.03	0.761	0.826
Nitrate as N												
Nitrogen, as Ammonia	9.03	5.5	3.9 J	1.6	7	13	66 J	13.2	6.54	4.5	6.49	7.6
pH **(pH units)**	5.8	5.69	5.96	6.97 J	5.65	5.8	5.57	5.66	5.72	5.69	5.65	5.51
Sulfate	81.3	61.2	54	62	62	100	300	96.1	66.5	101	407	68
Total Alkalinity, as CaCO3	22			21.8				21		22		
Total Hardness												

Notes:
1 - Average calculated using half the
reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 9/20/2000	ALTRON B3 B-3 (Sanmina) 7/7/1999	ALTRON B3 B-3 SANMINA 7/20/1999	ALTRON B3 SANMINA B3 11/19/2003	ALTRON B3 SANMINA B3 2/18/2004	ALTRON B3 SANMINA B3 5/19/2004	ALTRON B3 SANMINA B3 5/21/2003	ALTRON B3 SANMINA B3 6/18/2003	ALTRON B3 SANMINA B3 7/16/2003	ALTRON B3 SANMINA B3 8/20/2003
Volatile Organics (mg/L)										
2,4,4-Trimethyl-1-pentene		0.001 UJ	0.001 U							
Cis-1,2-Dichloroethene										
Methyl Tertbutyl Ether										
Methylene chloride										
Trichloroethene										
Semi-volatile Organics (mg/L)										
Bis(2-Ethylhexyl)phthalate										
Diethylphthalate										
N-Nitrosodimethylamine				0.000043	0.00003	0.000078	0.000024 J	0.000051	0.000019 J	0.000046
Metals, Total (mg/L)										
Aluminum										
Antimony										
Barium										
Beryllium										
Cadmium										
Calcium										
Chromium	0.01 U	0.074	0.01 U							
Cobalt										
Copper										
Iron	0.064	4.6	0.05 U							
Lead										
Magnesium										
Manganese										
Nickel										
Potassium										
Silicon										
Sodium										
Strontium										
Zinc										
Metals, Dissolved (mg/L)										
Aluminum										
Barium										
Cadmium										
Calcium										
Cobalt										
Copper										
Iron										
Lead										
Magnesium										
Manganese										
Nickel										
Potassium										
Sodium										
Zinc										

Table 3-1
Summary of Detected Parameters in Groundwater - Altron B3
Olin Chemical Superfund Site
Wilmington, Massachusetts

Parameter	ALTRON B3 B3 9/20/2000	ALTRON B3 B-3 (Sanmina) 7/7/1999	ALTRON B3 B-3 SANMINA 7/20/1999	ALTRON B3 SANMINA B3 11/19/2003	ALTRON B3 SANMINA B3 2/18/2004	ALTRON B3 SANMINA B3 5/19/2004	ALTRON B3 SANMINA B3 5/21/2003	ALTRON B3 SANMINA B3 6/18/2003	ALTRON B3 SANMINA B3 7/16/2003	ALTRON B3 SANMINA B3 8/20/2003
Inorganics										
Bicarbonate Alkalinity, as CaCO3	23									
Chloride	150									
Specific Conductance **(mS/cm)**	0.854	0.65	0.68							
Nitrate as N										
Nitrogen, as Ammonia	15	2.7	5.1							
pH **(pH units)**	5.66	6.32	5.76							
Sulfate	130	20	52							
Total Alkalinity, as CaCO3										
Total Hardness										

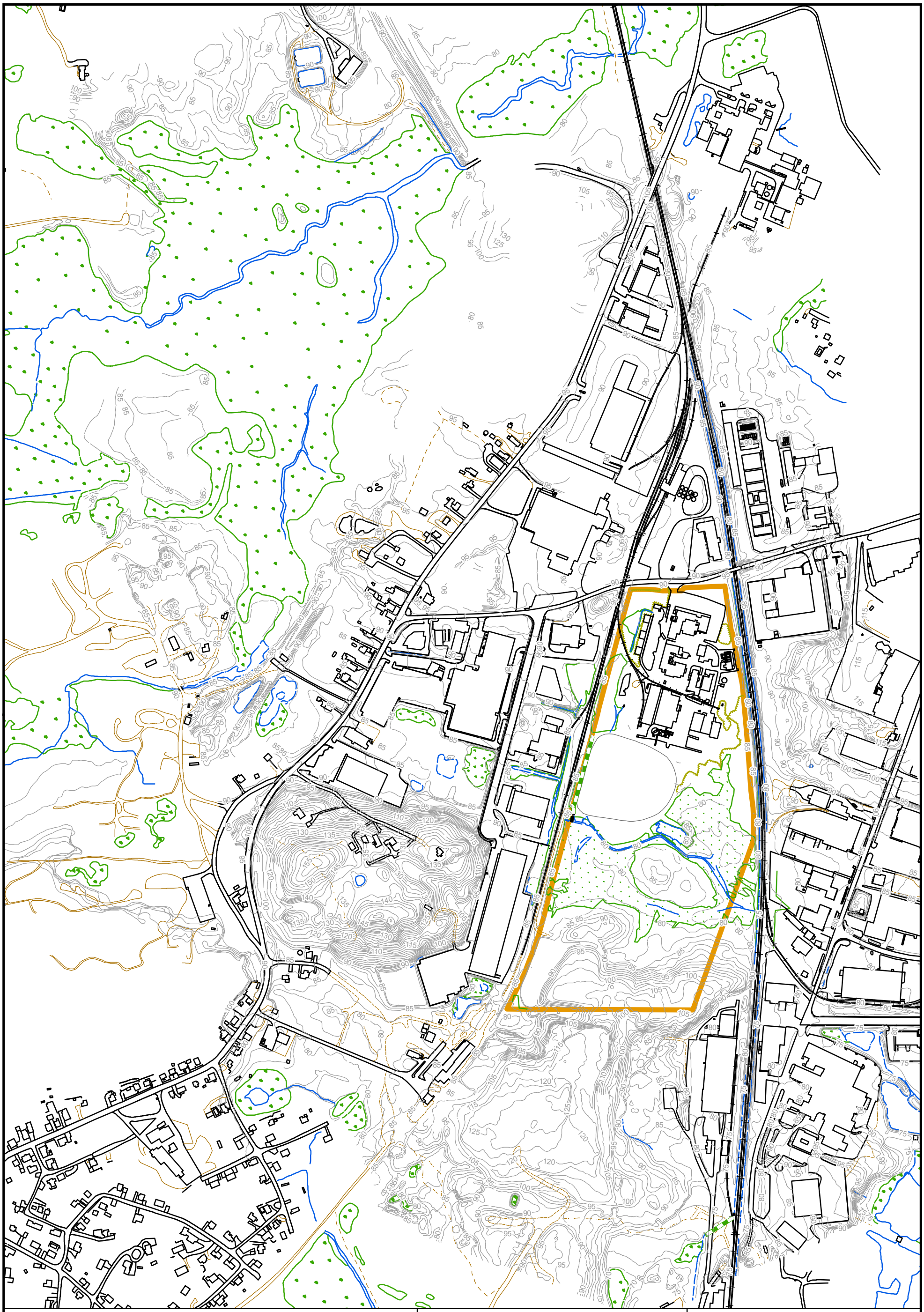
Notes:
1 - Average calculated using half the reporting limit for non-detects.
U - Not detected, value is reporting limit
J - Value is estimated
R - Result is rejected
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

Table 3-2
Summary of Detected Parameters in Groundwater - GW-75D
Olin Chemical Superfund Site
Wilmington, MA

Parameter	Frequency of Detection	Range of Reporting Limits for Non Detects	Range of Detected Concentrations	Average of All Samples	GW-75D GW-75D 4/22/1998	GW-75D GW-75D 5/21/1997	GW-75D GW-75-D 5/7/1993	GW-75D OC-GW-75D-XXX 10/26/2010	GW-75D OC-GW-75D-XXX 4/17/2012	GW-75D OC-GW-75D-XXX 5/19/2010
Volatile Organics (mg/L)										
Chloroform	1 / 3	0.001 : 0.005	0.0013 - 0.0013	0.0014			0.005 U	0.001 U		0.0013
Methyl Tertbutyl Ether	1 / 2	0.001 : 0.001	0.0064 - 0.0064	0.0035				0.0064		0.001 U
Semi-volatile Organics (mg/L)										
N-Nitrosodimethylamine	1 / 3	0.0000019 : 0.0000019	0.0000057 - 0.0000057	0.0000025				0.0000057 J	0.0000019 U	0.0000019 U
Metals, Total (mg/L)										
Arsenic	2 / 2		0.0015 - 0.0029	0.0022				0.0015		0.0029 J
Barium	2 / 2		0.013 - 0.052	0.033				0.013		0.052
Cadmium	1 / 2	0.001 : 0.001	0.00035 - 0.00035	0.00043				0.001 U		0.00035 J
Calcium	2 / 2		7.7 - 31	19.4				7.7		31
Cobalt	1 / 2	0.01 : 0.01	0.0028 - 0.0028	0.0039				0.01 U		0.0028 J
Copper	1 / 2	0.01 : 0.01	0.0025 - 0.0025	0.0038				0.01 U		0.0025 J
Iron	2 / 2		0.16 - 0.21	0.19				0.16		0.21
Magnesium	2 / 2		0.92 - 3.6	2.3				0.92		3.6
Manganese	2 / 2		0.055 - 0.15	0.10				0.055		0.15 J
Nickel	1 / 2	0.01 : 0.01	0.0028 - 0.0028	0.0039				0.01 U		0.0028 J
Potassium	2 / 2		1.7 - 2	1.9				2 J		1.7 J
Sodium	2 / 2		43 - 110	77				43		110
Metals, Dissolved (mg/L)										
Aluminum	1 / 2	0.2 : 0.2	0.22 - 0.22	0.16		0.2 U	0.22			
Barium	1 / 1		0.047 - 0.047	0.047			0.047			
Calcium	3 / 3		34 - 45.3	39	45.3	37.1	34			
Iron	3 / 3		1.1 - 5.94	4.3	5.94	5.77	1.1			
Magnesium	3 / 3		7.8 - 12.1	10.1	12.1	10.4	7.8			
Manganese	3 / 3		1.6 - 3.04	2.5	3.04	2.75	1.6			
Potassium	3 / 3		12 - 14.1	13.0	14.1	13	12			
Sodium	3 / 3		56 - 74.4	63	74.4	59.2	56			
Inorganics (mg/L)										
Bicarbonate Alkalinity, as CaCO3	2 / 2		298 - 305	302	298	305				
Chloride	5 / 5		60 - 250	111	104	75.7	64	60		250
Specific Conductance **(mS/cm)**	1 / 1		1.09 - 1.09	1.1	1.09					
Nitrate as N	2 / 2		0.19 - 2.3	1.2				0.19 J		2.3
Nitrogen, as Ammonia	3 / 5	0.11 : 0.32	35.6 - 46.9	24	35.6	46.9	37	0.32 U		0.11 U
pH **(pH units)**	1 / 1		6.76 - 6.76	6.8	6.76					
Sulfate	5 / 5		15 - 68.8	41	52.3	68.8	50	17		15
Total Dissolved Solids	1 / 1		478 - 478	478	478					

Notes:
mg/L - milligrams per liter
mS/cm - millisiemens per centimeter

APPENDIX A
PREVIOUSLY SUBMITTED FIGURES



Legend

- Elevation Contour
- 90 - Elevation (ft)
- 51 Eames St. Property Boundary
- Paved Road
- Unpaved Road
- Railroad
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary
- Wooded Areas
- Culvert

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107 Audubon Road Suite 301
Wakefield, MA 01880

N

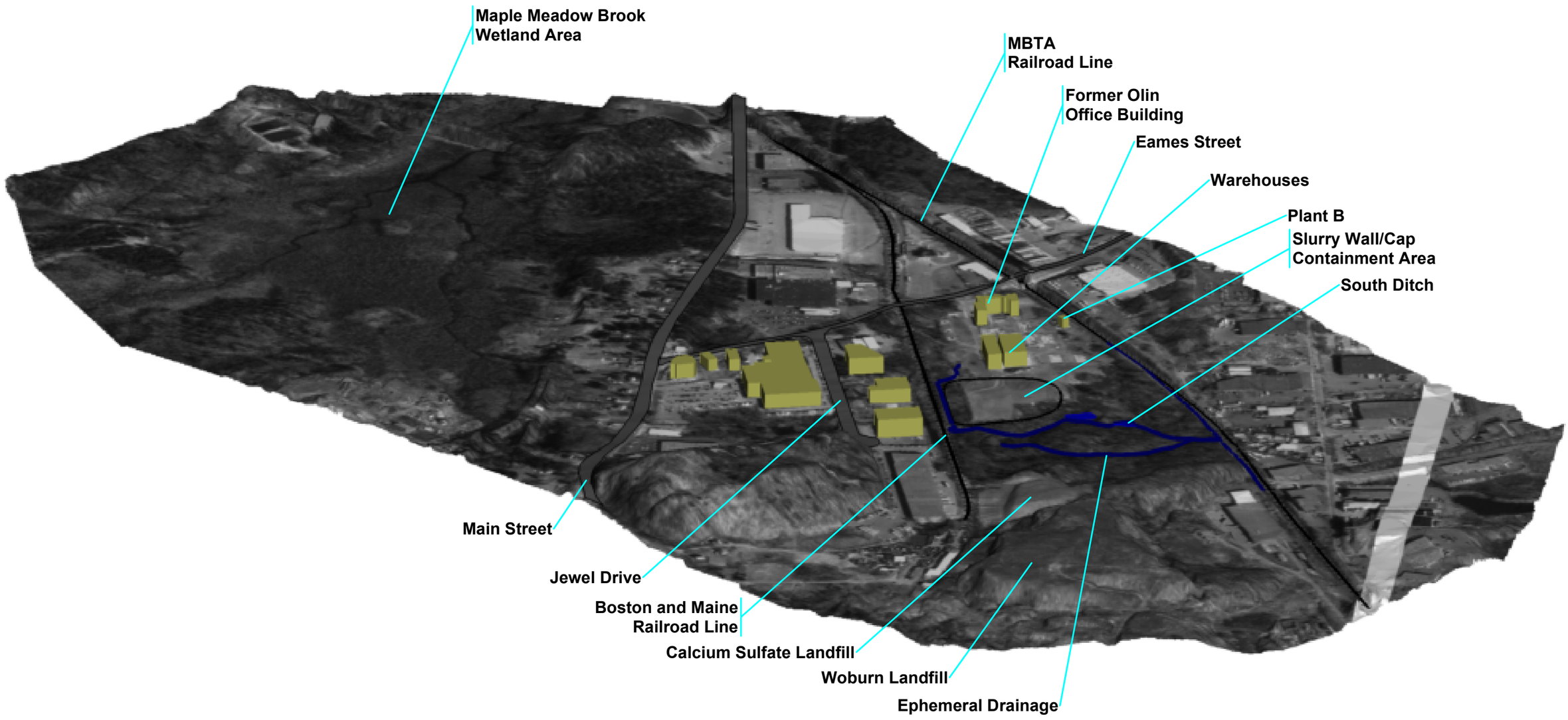
0 250 500 1,000 Feet

Figure 3.1-1
Site Topography

Draft Focused Remedial Investigation Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 09/24/07 | Checked/Date: PHT 09/24/07

Document: P:\OLIN\Wilmington\GIS\MapDocuments\Focused RI\Olin_11X17_P_rotated.mxd PDF: P:\OLIN\Wilmington\GIS\Figures\FocusedRI\Section 3\SiteTopography.pdf 09/24/2007 12:55 PM bjroden



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Wakefield, MA 01880

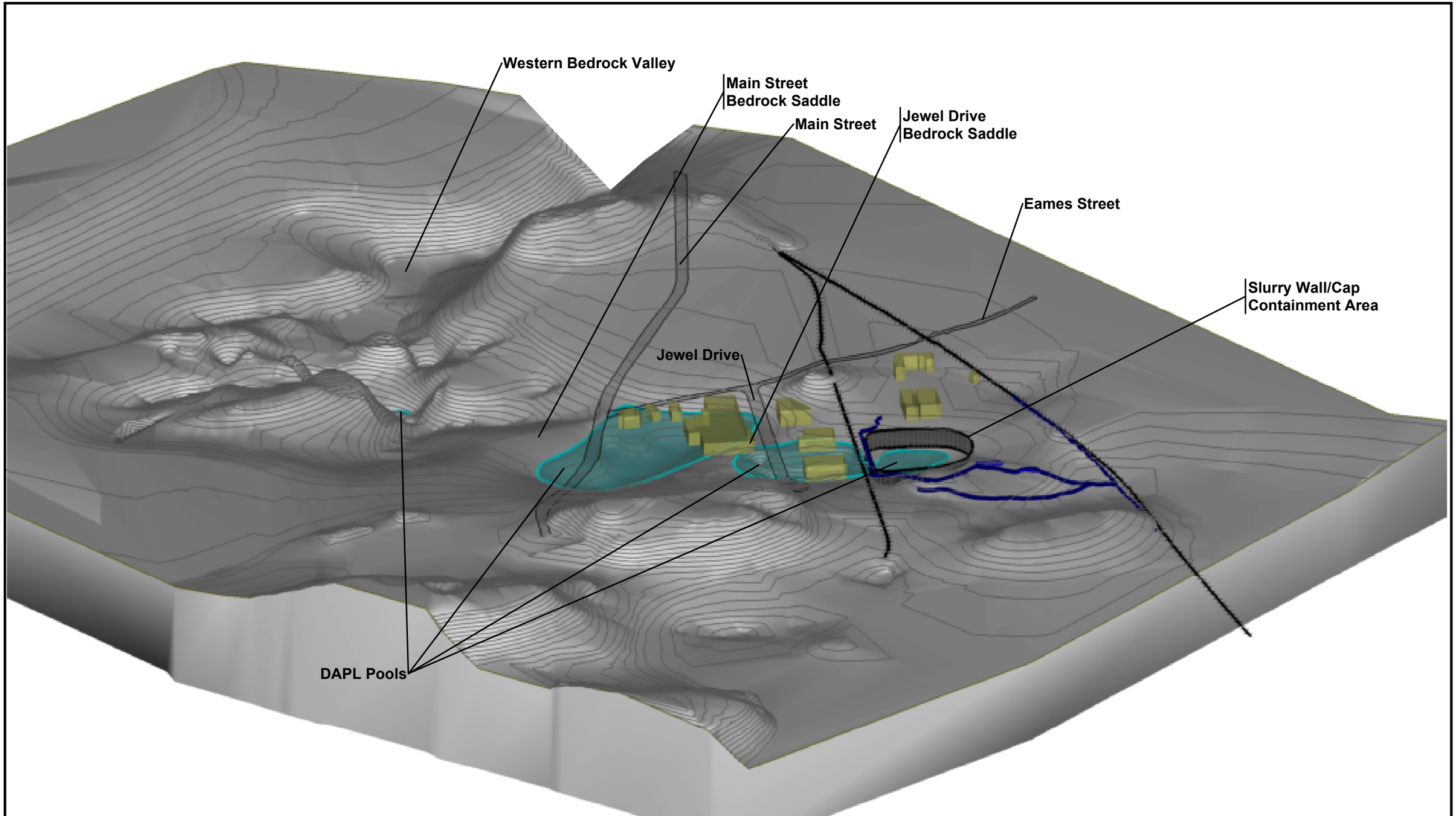
N

Figure 3.1-3
Orthophotographic Projection of Site

Draft Focused Remedial Investigation Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 09/25/07 | Checked/Date: PHT 09/25/07

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\MapDocuments\Focused RI\Olin_3D_Ortho_11X17_LS.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CERCLA\4.0_Deliverables\4.1_Reports\Focused RI Report\Figures\Section 3 Figures\Figure3.1-3.pdf 09/25/2007 3:00 PM brpeters



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Wakefield, MA 01880

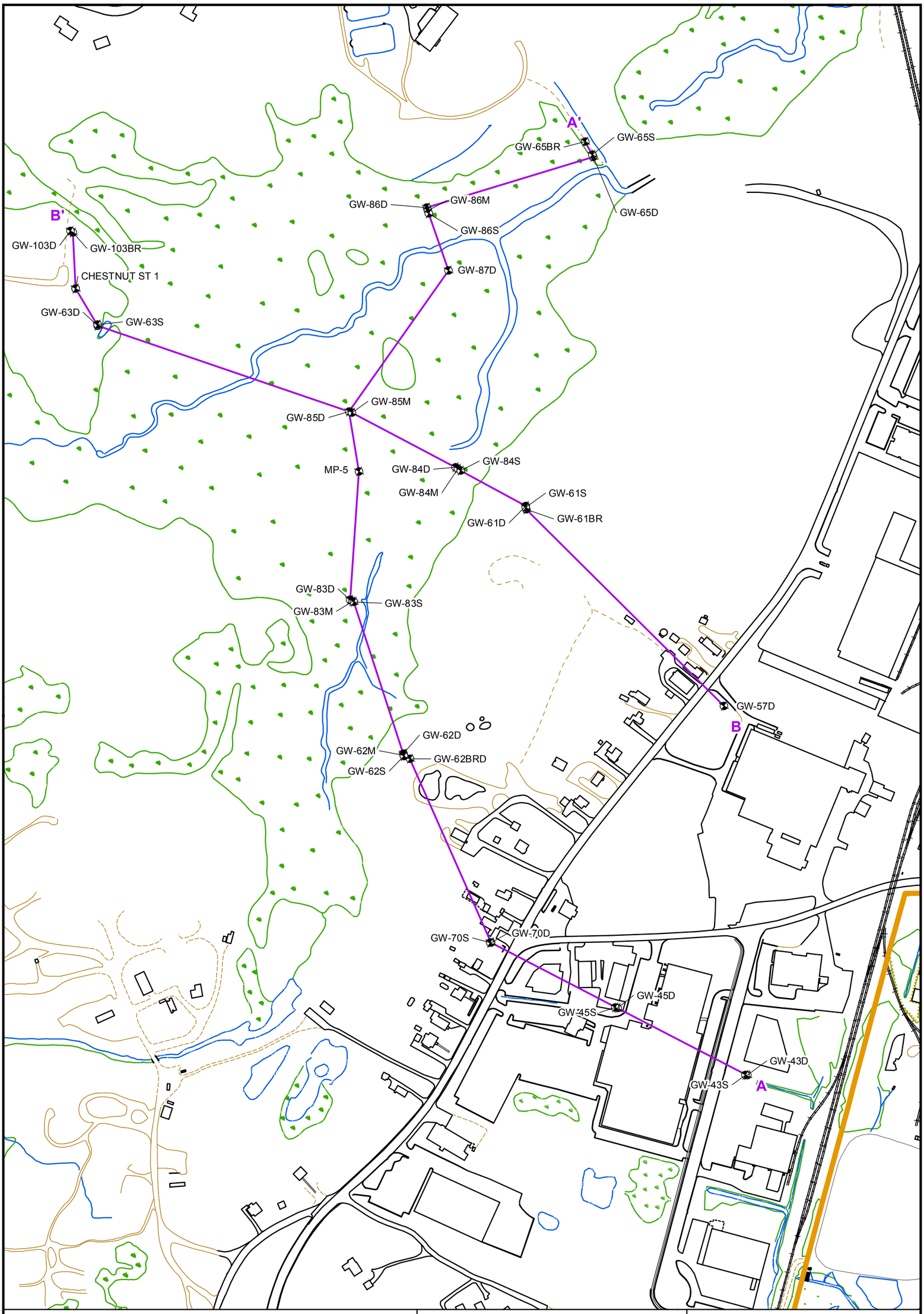
N

Figure 3.2-4
Bedrock Surface Features

Draft Focused Remedial Investigation Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BRP 09/25/07 | Checked/Date: PHT 09/25/07

Document: P:\Projects\olinwilm\Olin Wilmington CERCLA\GIS\MapDocuments\Focused RI\Olin_3D_Bedrock_11X17_LS.mxd PDF: P:\Projects\olinwilm\Olin Wilmington CERCLA\4.0_Deliverables\4.1_Reports\Focused RI Report\Figures\Section 3 Figures\Figure3.2-4.pdf 09/25/2007 3:15 PM brpeters



Legend

- 51 Eames St. Property Boundary
- Cross Section
- Monitoring Well
- Paved Road
- Unpaved Road
- Sidewalks
- Structures
- Surface Water
- Trails
- Wooded Areas
- Wetland Boundary

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271 Mill Road
Chelmsford, Massachusetts 01824

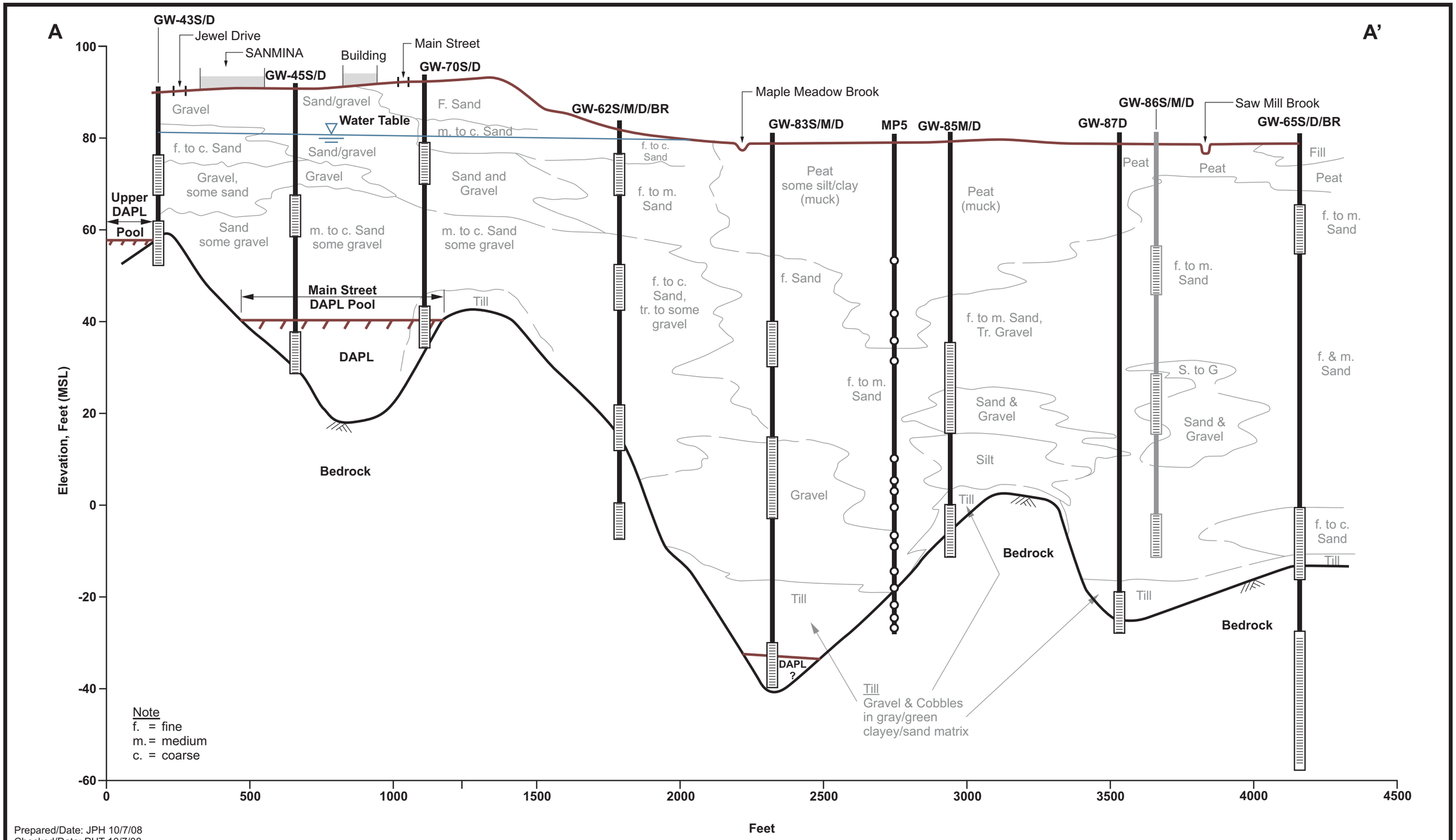
N

0 150 300 600 Feet

Figure 3.2-7
Cross Section Locations -
Maple Meadow Brook Area
Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 3/12/14 | Checked/Date: CTM 3/12/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\MMB_Xsections.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 3.2-7 - MMB Cross Sections.pdf



Prepared/Date: JPH 10/7/08
Checked/Date: PHT 10/7/08

Remedial Investigation Report – OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

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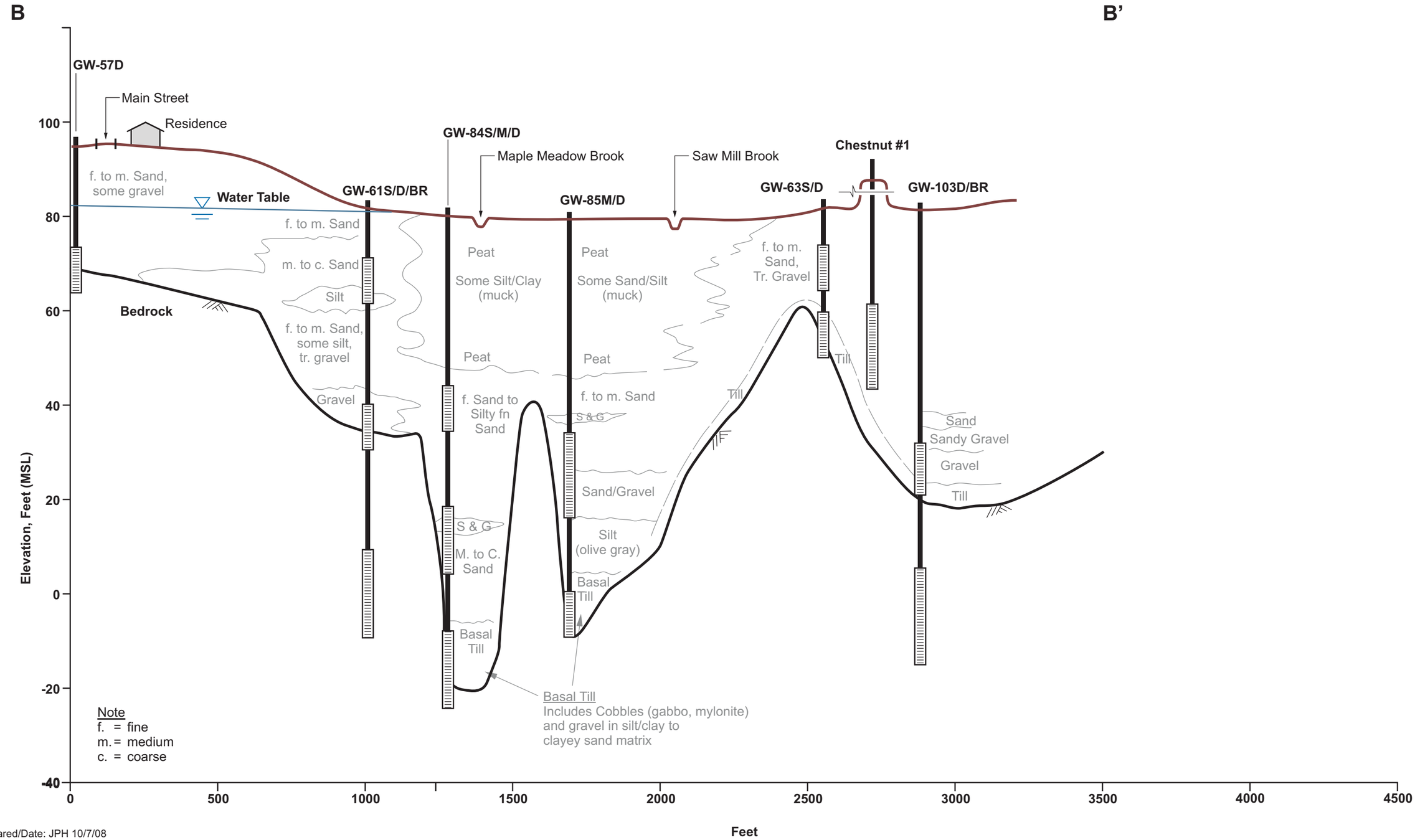
Surficial Geology Cross Section A - A'
Maple Meadow Brook Area
Project 6107-14-006
Figure 3.2-8

PORT2014008a.cdr



Prepared/Date: JPH 10/7/08
Checked/Date: PHT 10/7/08

Remedial Investigation Report – OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

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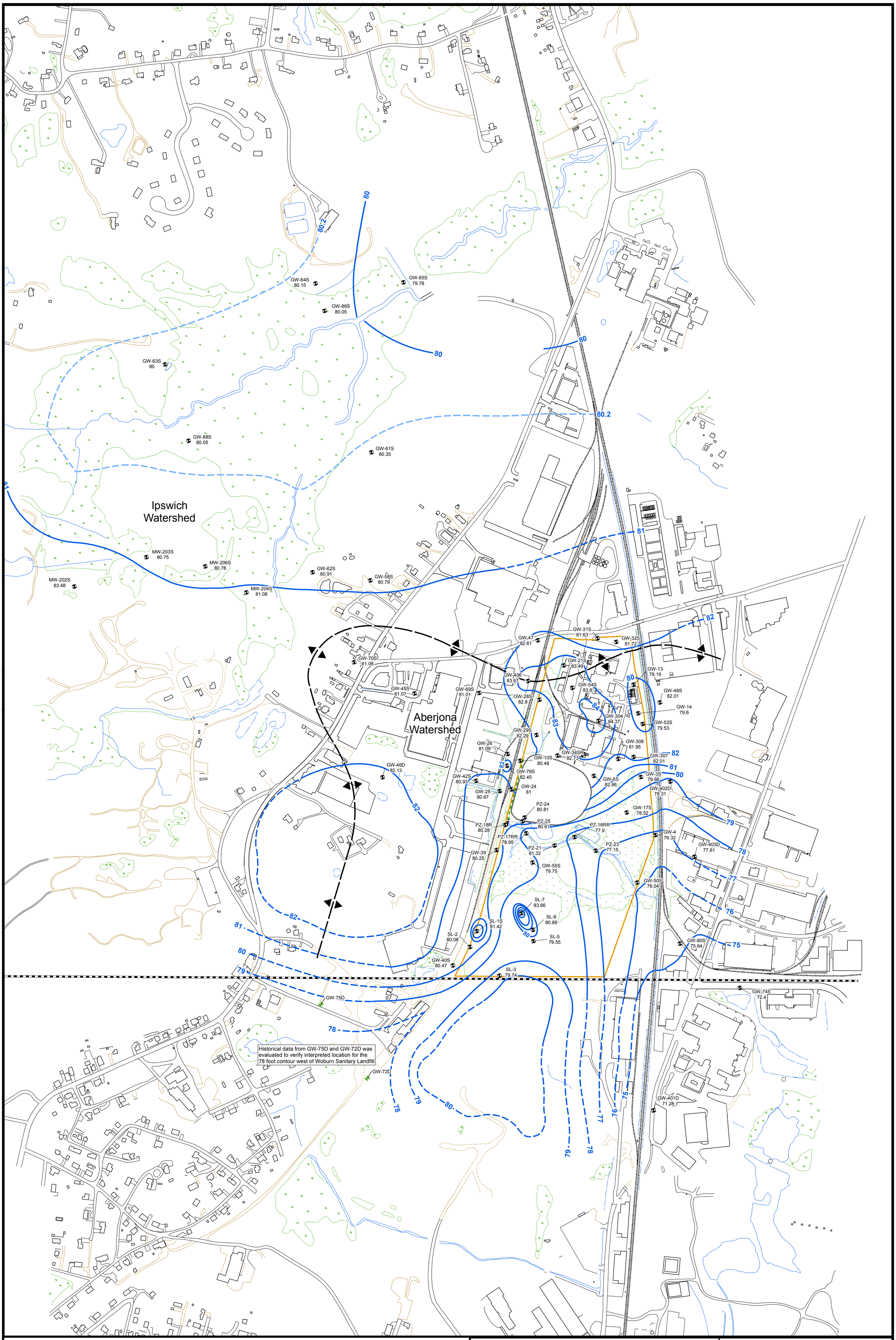
Surficial Geology Cross Section B - B'
Maple Meadow Brook Area
Project 6107-14-006
Figure 3.2-9

PORT2014008b.cdr



Legend

- Shallow Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Note: Water levels measured on 5/21/10 and 5/19/10 in GW-72D and GW-75D, respectively (wells not shown on map) were used to verify the shape of the potentiometric surface in the southwestern portion of the map.

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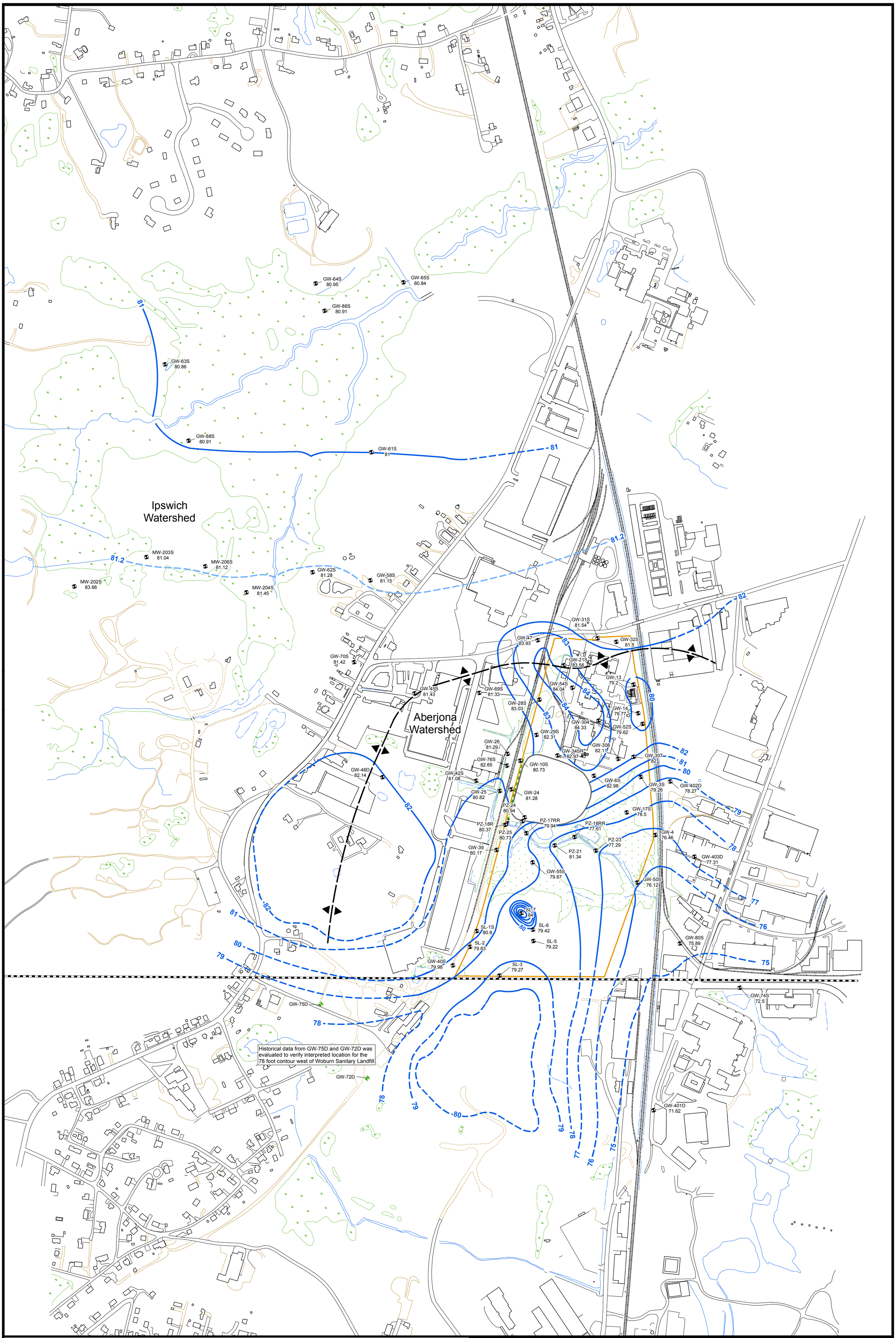
271 Mill Road
Chelmsford, MA 01824

0 300 600 Feet

Figure 3.3-2
Groundwater Elevations in
Shallow Monitoring Wells - May 2011
Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 04/04/14 | Checked/Date: PHT 04/02/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\Olin_22x34P_GroundwaterContours10_0.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 3.3-2 Groundwater Elevations Shallow Monitoring Wells - May 2011.pdf 4/4/2014 9:51 AM brian.roden



Legend

- Shallow Monitoring Well Location
- Interpreted Groundwater Contour (Dashed where inferred)
- Interpreted Groundwater Divide
- Slurry Wall
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Note: Water levels measured on 5/21/10 and 5/19/10 in GW-72D and GW-75D, respectively (wells not shown on map) were used to verify the shape of the potentiometric surface in the southwestern portion of the map.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

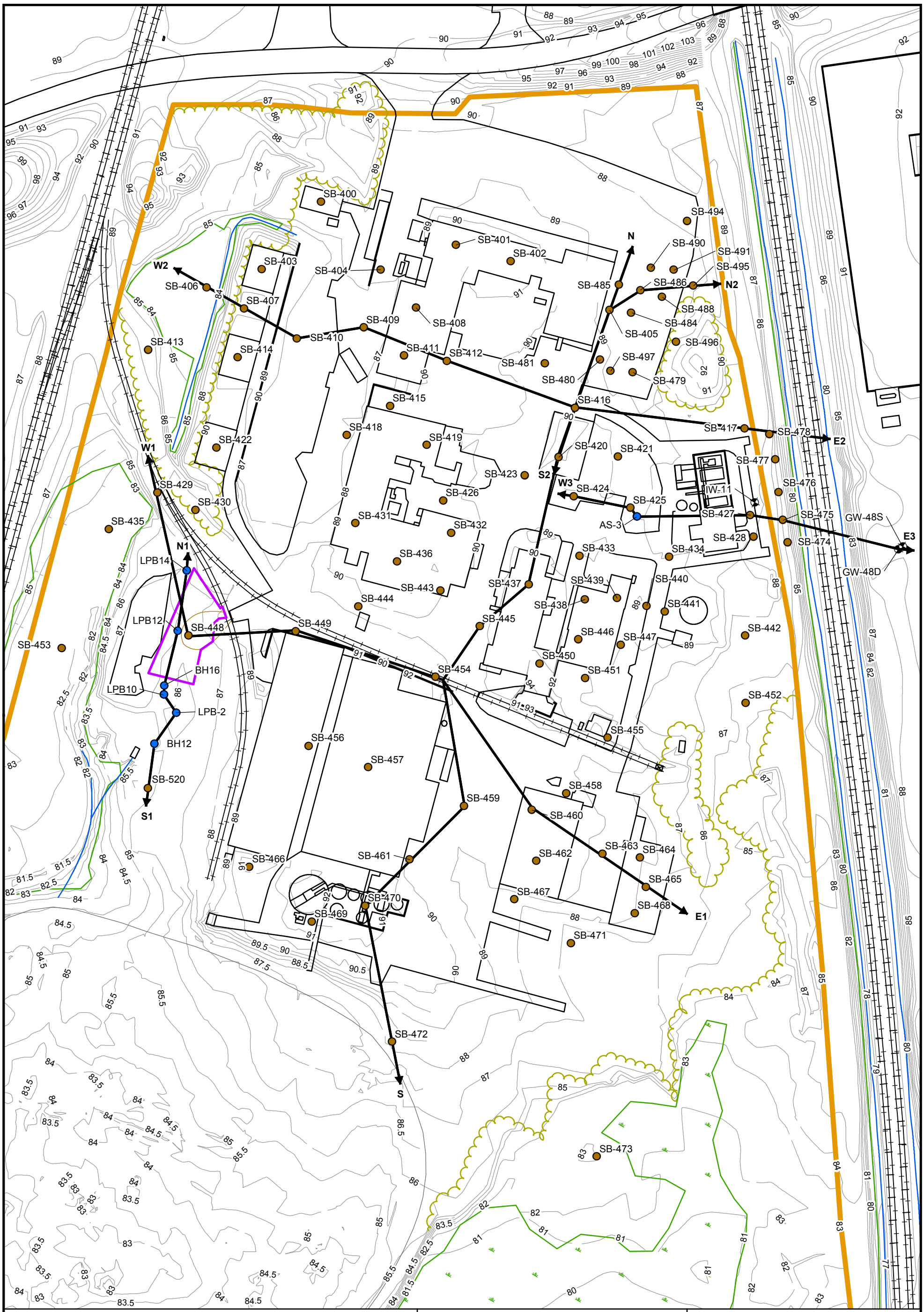
N

0 300 600 Feet

Figure 3.3-3
Groundwater Elevations in
Shallow Monitoring Wells - October 2011
Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 04/04/14 | Checked/Date: PHT 04/02/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\Olin_22x34P_GroundwaterContours10_0.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 3.3-3 Groundwater Elevations Shallow Monitoring Wells - Oct 2011.pdf 4/4/2014 9:37 AM brian.roden



Legend

- 2009-2010 Soil Boring Location
- Historic Soil Boring Location
- Cross Section
- Lake Poly Excavation Limits
- 51 Eames St. Property Boundary
- Paved Road
- Unpaved Road
- Railroad
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary
- Wooded Areas
- Culvert
- Elevation Contour (ft)

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AMEC Environment & Infrastructure
271 Mill Rd
Chelmsford, MA 01824

N

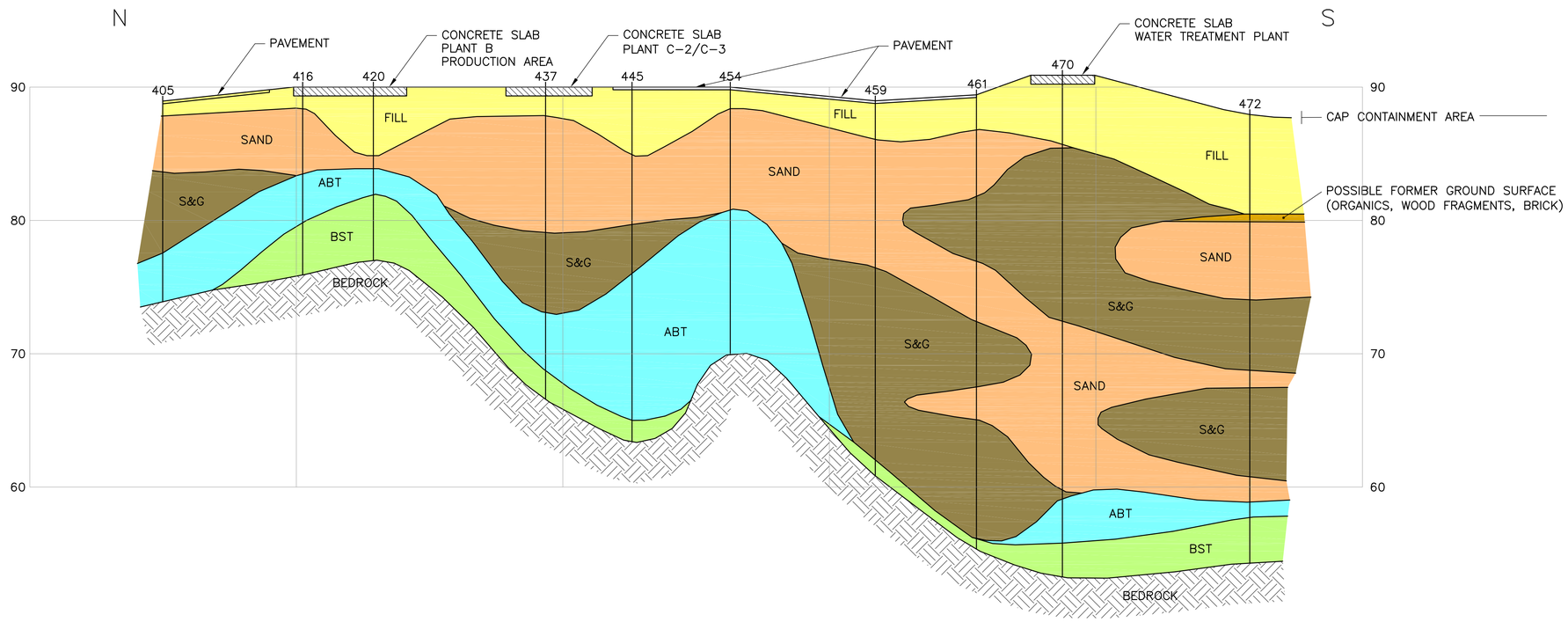
0 45 90 180 Feet

Figure 3.2-1
Location of Cross Sections

Remedial Investigation Report - OU1 and OU2
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 02/19/14 | Checked/Date: TL 02/19/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\RI OU1 OU2\PrelimRI_11X17_P_rotated.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\2013 Remedial Investigation Report\Revised_OU1_OU2_RI\Figures\Figure 3.2-1.pdf 2/19/2014 9:00 AM brian.roden



FILL MATERIAL (GENERALLY FINE TO COARSE SAND) WITH TRACES TO SOME GRAVEL

PEAT/ORGANICS

GLACIAL OUTWASH (SAND) UNIFORM FINE TO COARSE SAND

GLACIAL OUTWASH (S&G) SAND AND GRAVEL WITH OCCATIONAL COBBLES

ABLATION TILL (ABT) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND TRACES OF SILT

BASAL TILL (BST) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND SILT

NOTES:

405 = SOIL BORING SB-405

SEE FIGURE 3.2-1 FOR SECTION LINE LOCATION

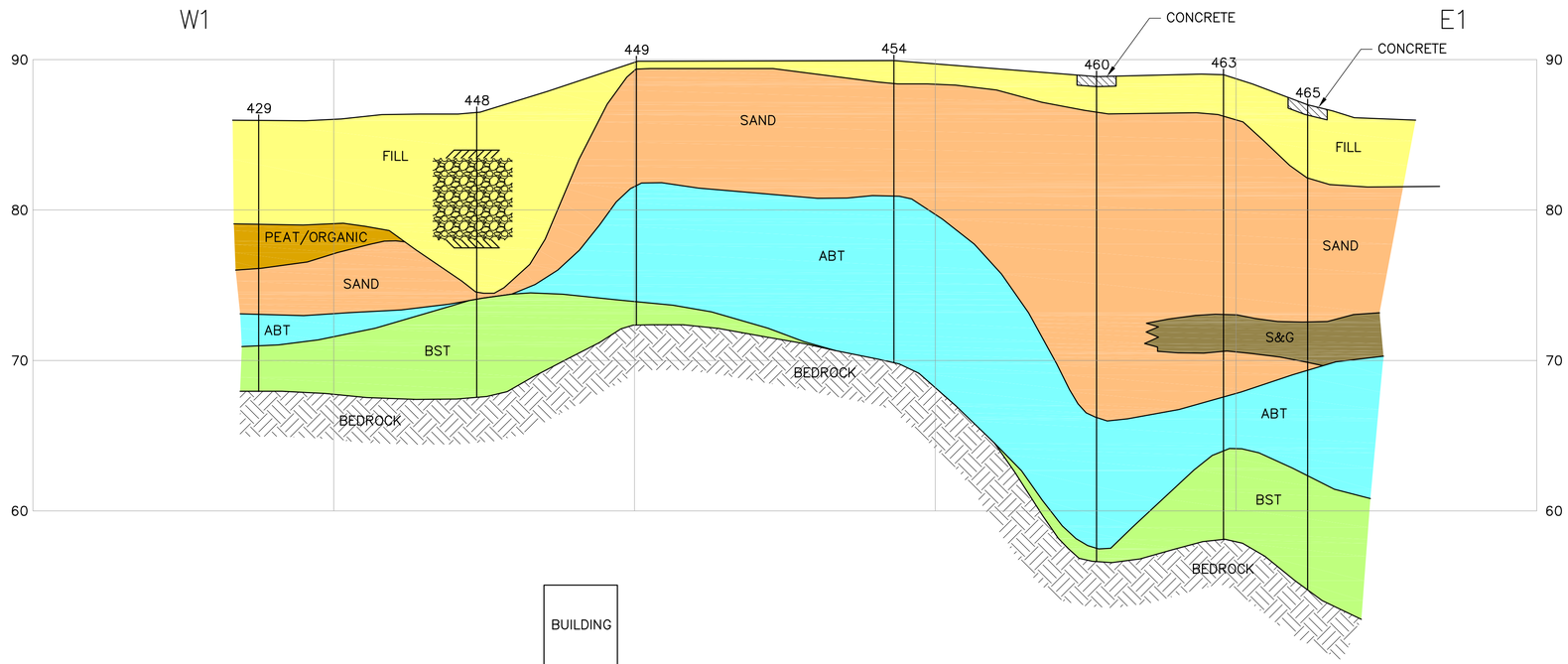
VERTICAL EXAGGERATION IS 10:1

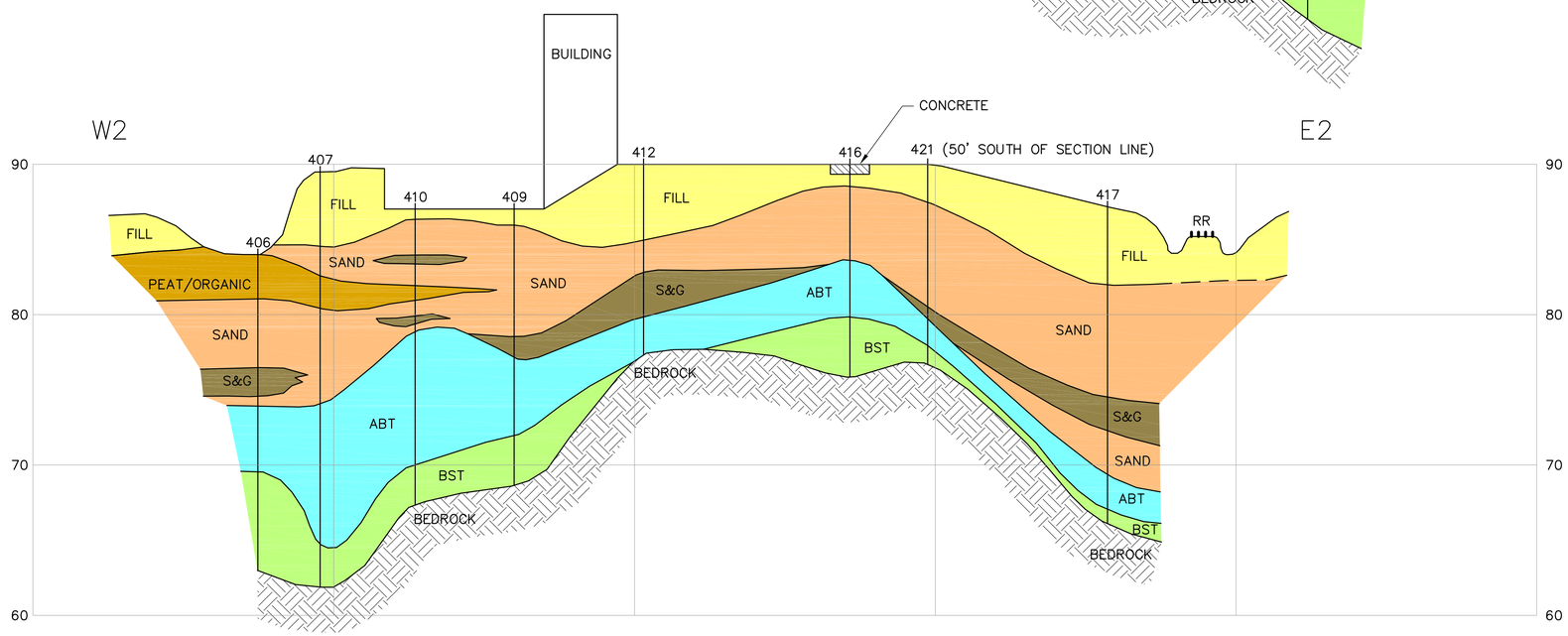
0 25 50 100
SCALE IN FEET

Prepared/Date: RHH 03/27/13
Checked/Date: PHT 03/27/13

REMEDIAL INVESTIGATION REPORT OU1 AND OU2 OLIN CHEMICAL SUPERFUND SITE WILMINGTON, MASSACHUSETTS	amec	INTERPRETED CROSS SECTION N-S Project 6107-14-0016 Figure 3.2-2

Z:\Projects\Olin-Wilmington\SOILS-C-502.dwg Wed, 27 Mar 2013 - 8:46am richard.holman





FILL MATERIAL (GENERALLY FINE TO COARSE SAND) WITH TRACES TO SOME GRAVEL

PEAT/ORGANICS

GLACIAL OUTWASH (SAND) UNIFORM FINE TO COARSE SAND

GLACIAL OUTWASH (S&G) SAND AND GRAVEL WITH OCCATIONAL COBBLES

ABLATION TILL (ABT) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND TRACES OF SILT

BASAL TILL (BST) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND SILT

NOTES:

429 = SOIL BORING SB-429

GEOFABRIC

LAKE POLY RIPRAP FILL

SEE FIGURE 3.2-1 FOR SECTION LINE LOCATION

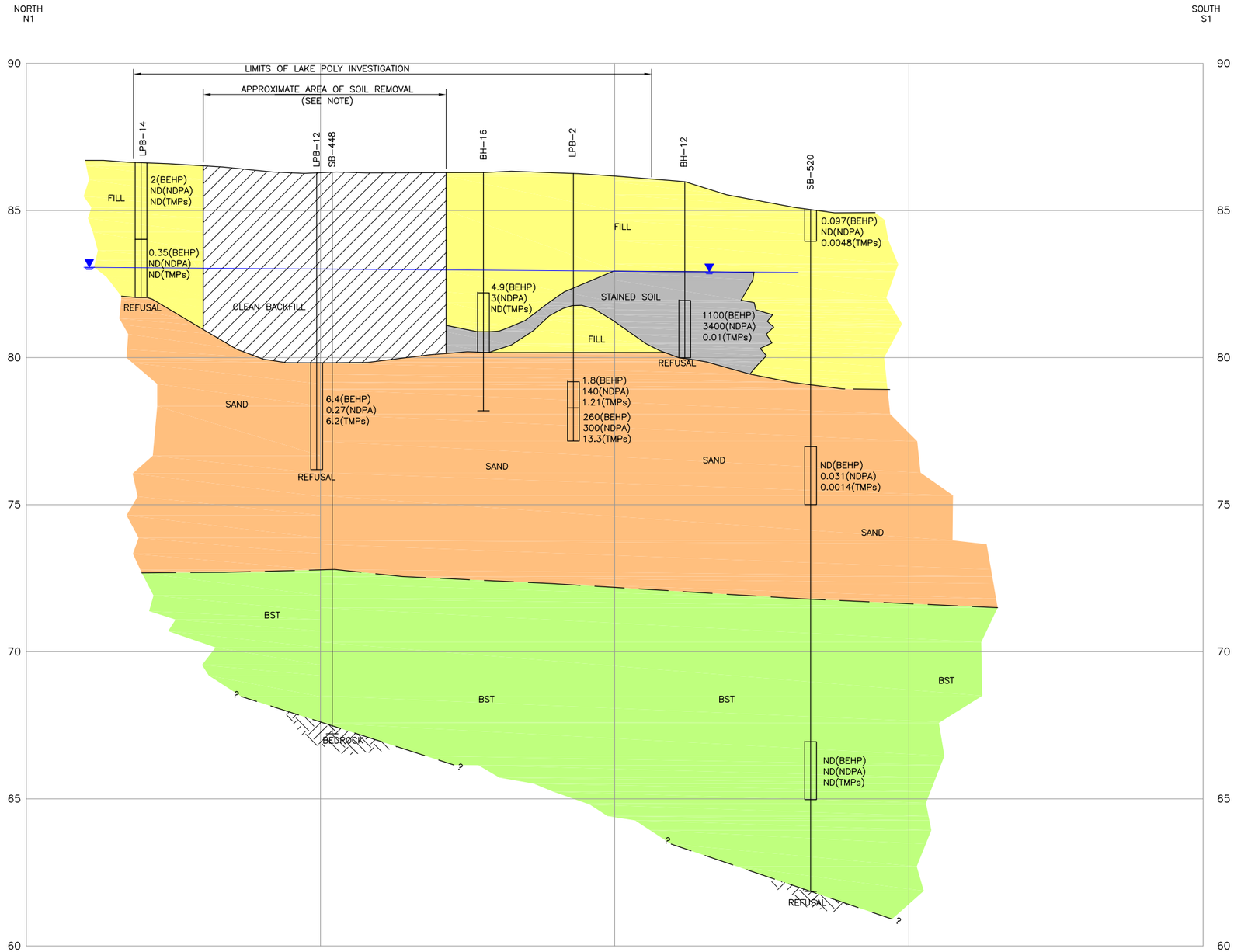
VERTICAL EXAGGERATION IS 10:1

0 25 50 100
SCALE IN FEET

Prepared/Date: RHH 03/27/13
Checked/Date: PHT 03/27/13

REMEDIAL INVESTIGATION REPORT OU1 AND OU2 OLIN CHEMICAL SUPERFUND SITE WILMINGTON, MASSACHUSETTS	amec	INTERPRETED CROSS SECTIONS W1-E1 AND W2-E2 Project 6107-14-0016 Figure 3.2-3

Z:\Projects\OLIN-Wilmington\SOILS-C-501.dwg Wed, 27 Mar 2013 - 8:47am richard.holman



NOTE
SOIL WAS REMOVED FROM THE LAKE POLY AREA IN 2000 AND 2004. THIS CROSS SECTION PASSES THROUGH A PORTION OF THE EXCAVATIED AREA, WHICH MOSTLY LIES TO THE EAST OF THIS SECTION.

NOTES:

SB-405 = EXPLORATION ID

SEE FIGURE 3.2-1 FOR SECTION LINE LOCATION

VERTICAL EXAGGERATION IS 10:1

FILL MATERIAL (GENERALLY FINE TO COARSE SAND) WITH TRACES TO SOME GRAVEL

GLACIAL OUTWASH (SAND) UNIFORM FINE TO COARSE SAND

BASAL TILL (BST) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND SILT

GENERALIZED GROUNDWATER ELEVATION BASED UPON OCTOBER 2011 DATA

0.031(BEHP)
ND(NDPA)
ND(TMPs)
SOIL SAMPLE INTERVAL WITH ANALYTICAL RESULTS FOR:

BEHP (Bis[2-ethylhexyl]phthalate)

NDPA (n-Nitrosodiphenylamine)

TMPs (Trimethylpentenes)(Total)

20 mg/kg TOTAL CONCENTRATION OF COMPOUND DETECTED AT SAMPLE INTERVAL

ND NOT DETECTED

-- NOT ANALYZED

0 10 20 40
SCALE IN FEET

Prepared/Date: JVM 01/31/14
Checked/Date: TDL 01/31/14

REMEDIAL INVESTIGATION REPORT
OU1 AND OU2
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

amec

INTERPRETED CROSS SECTION N1-S1
LAKE POLY AREA
Project 6107-14-0016
Figure 3.2-4

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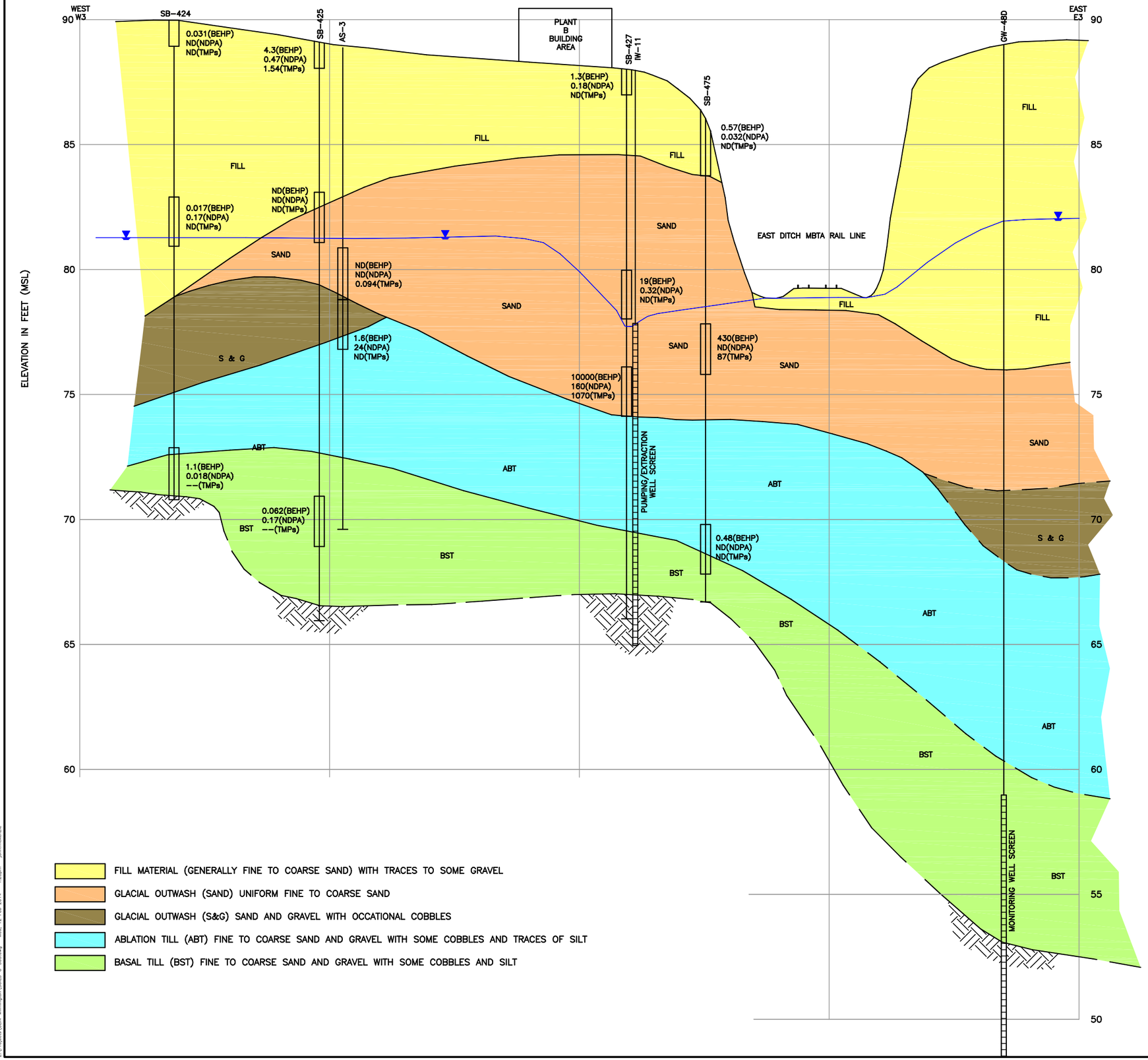


GENERALIZED GROUNDWATER ELEVATION BASED UPON AUGUST 2013 DATA

0.031(BEHP) ND(NDPA) ND(TMPs) SOIL SAMPLE INTERVAL WITH ANALYTICAL RESULTS FOR:

BEHP	(Bis[2-ethylhexyl]phthalate)
NDPA	(n-Nitrosodiphenylamine)
TMPs	(Trimethylpentenes)(Total)
20	mg/kg TOTAL CONCENTRATION OF COMPOUND DETECTED AT SAMPLE INTERVAL
ND	NOT DETECTED
--	NOT ANALYZED

NOTES:

SB-405 = EXPLORATION ID

SEE FIGURE 3.2-1 FOR SECTION LINE LOCATION

VERTICAL EXAGGERATION IS 10:1

FILL MATERIAL (GENERALLY FINE TO COARSE SAND) WITH TRACES TO SOME GRAVEL

GLACIAL OUTWASH (SAND) UNIFORM FINE TO COARSE SAND

GLACIAL OUTWASH (S&G) SAND AND GRAVEL WITH OCCATIONAL COBBLES

ABLATION TILL (ABT) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND TRACES OF SILT

BASAL TILL (BST) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND SILT

0 10 20 40
SCALE IN FEET

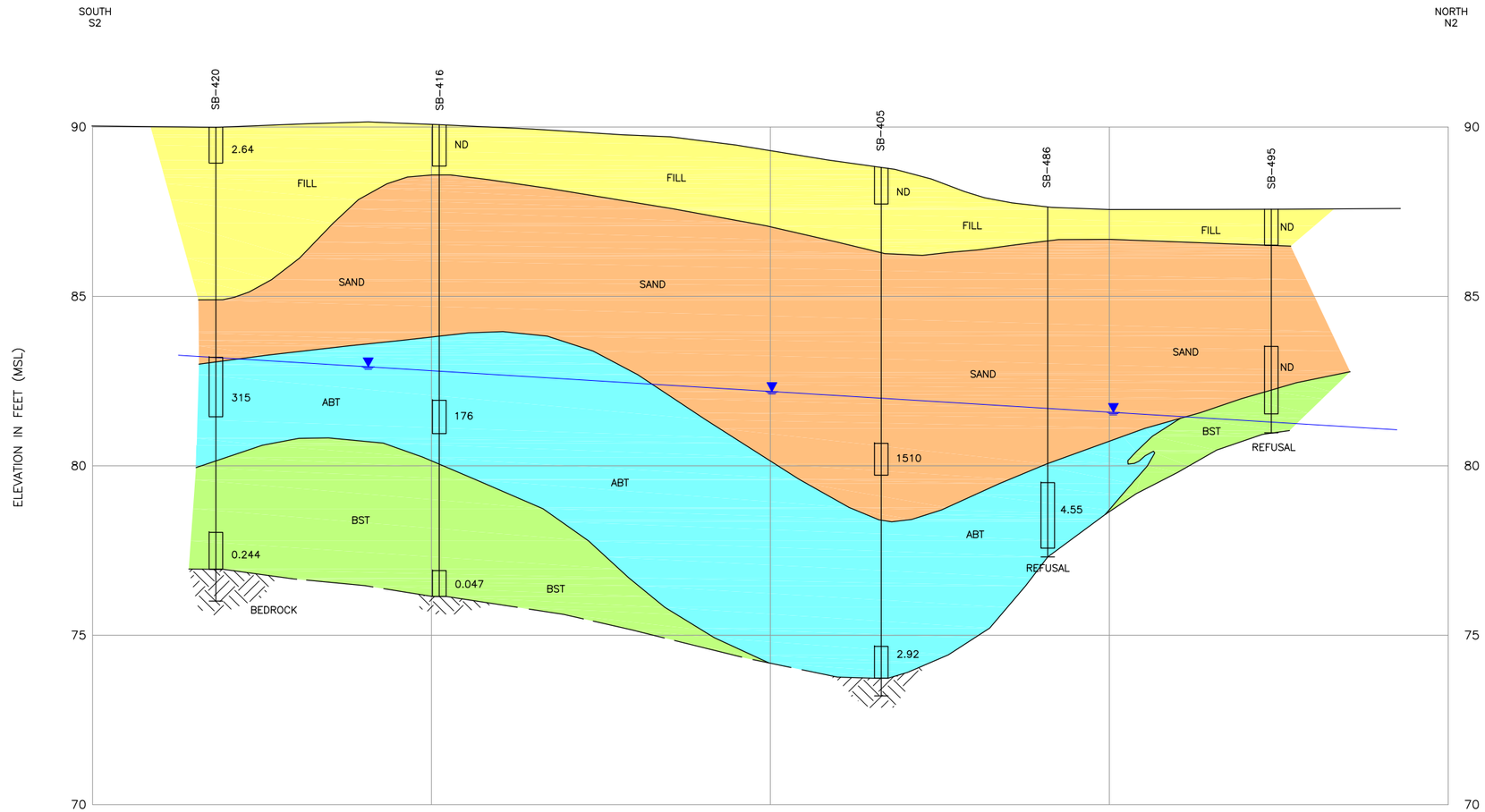
Prepared/Date: JVM 01/29/14
Checked/Date: TDL 01/30/14

REMEDIAL INVESTIGATION REPORT
OU1 AND OU2
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

amec

INTERPRETED CROSS SECTION W3-E3
PLANT B AREA
Project 6107-14-0016
Figure 3.2-5

Z:\Projects\OLIN-Wilmington\SOILS-C-505.dwg Wed, 12 Feb 2014 - 1:28pm john.mckenzie



FILL MATERIAL (GENERALLY FINE TO COARSE SAND) WITH TRACES TO SOME GRAVEL

GLACIAL OUTWASH (SAND) UNIFORM FINE TO COARSE SAND

ABLATION TILL (ABT) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND TRACES OF SILT

BASAL TILL (BST) FINE TO COARSE SAND AND GRAVEL WITH SOME COBBLES AND SILT

GENERALIZED GROUNDWATER ELEVATION BASED UPON OCTOBER 2011 DATA

2.5 SOIL SAMPLE INTERVAL WITH ANALYTICAL RESULTS FOR TMPs (Trimethylpentenes)(Total)

20 mg/kg TOTAL CONCENTRATION OF TRIMETHYLPENTENES DETECTED AT SAMPLE INTERVAL

ND NOT DETECTED

-- NOT ANALYZED

NOTES:

SB-405 = EXPLORATION ID

SEE FIGURE 3.2-1 FOR SECTION LINE LOCATION

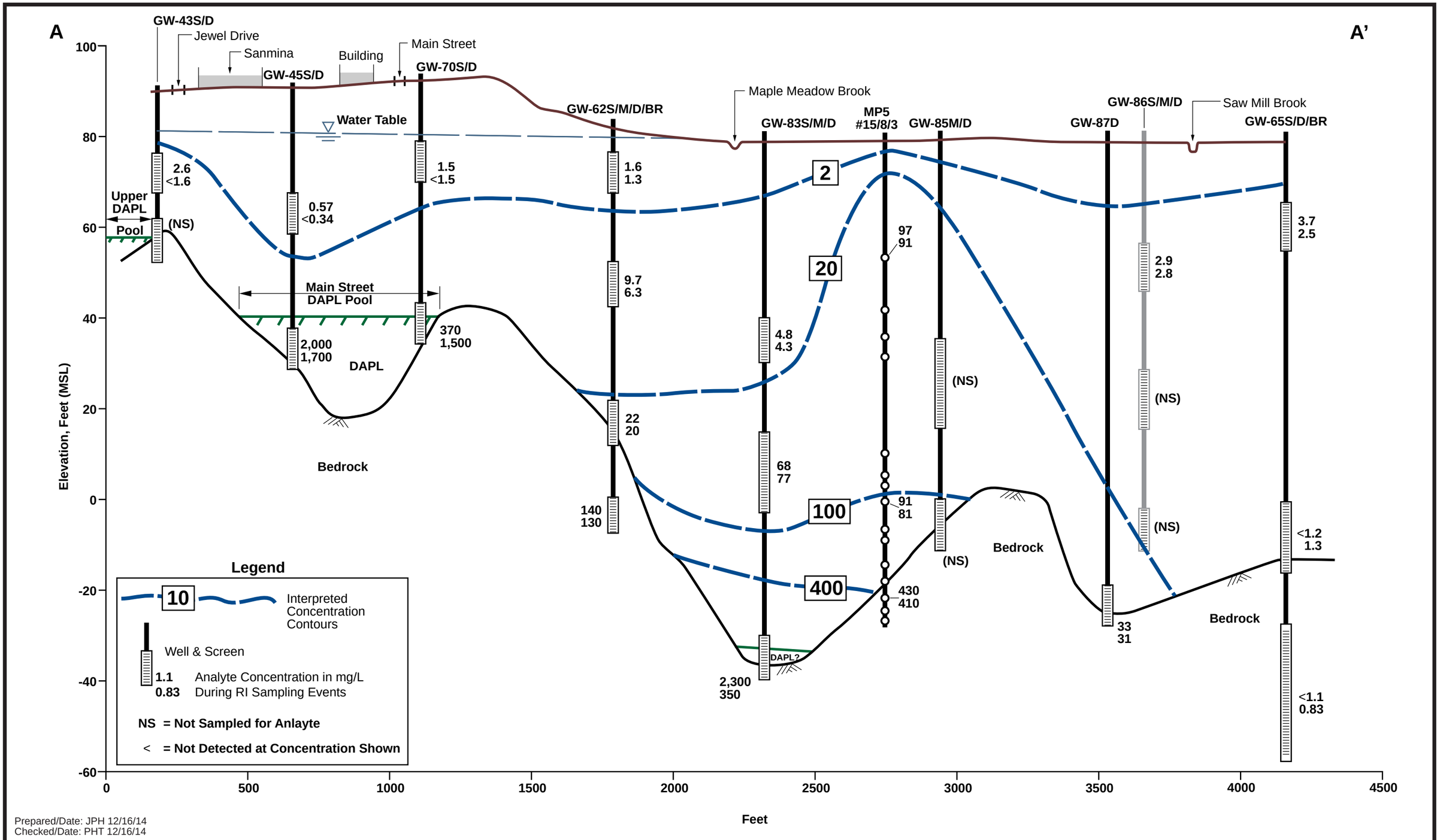
VERTICAL EXAGGERATION IS 10:1

0 10 20 40
SCALE IN FEET

Prepared/Date: JVM 01/29/14
Checked/Date: ???

REMEDIAL INVESTIGATION REPORT OU1 AND OU2 OLIN CHEMICAL SUPERFUND SITE WILMINGTON, MASSACHUSETTS	amec	INTERPRETED CROSS SECTION S2-N2 TRIMETHYLPENTENE AREA Project 6107-14-0016 Figure 3.2-6

Z:\Projects\Olin-Wilmington\SOILS-C-504.dwg Wed, 12 Feb 2014 - 1:29pm john.mckenzie



Prepared/Date: JPH 12/16/14
Checked/Date: PHT 12/16/14

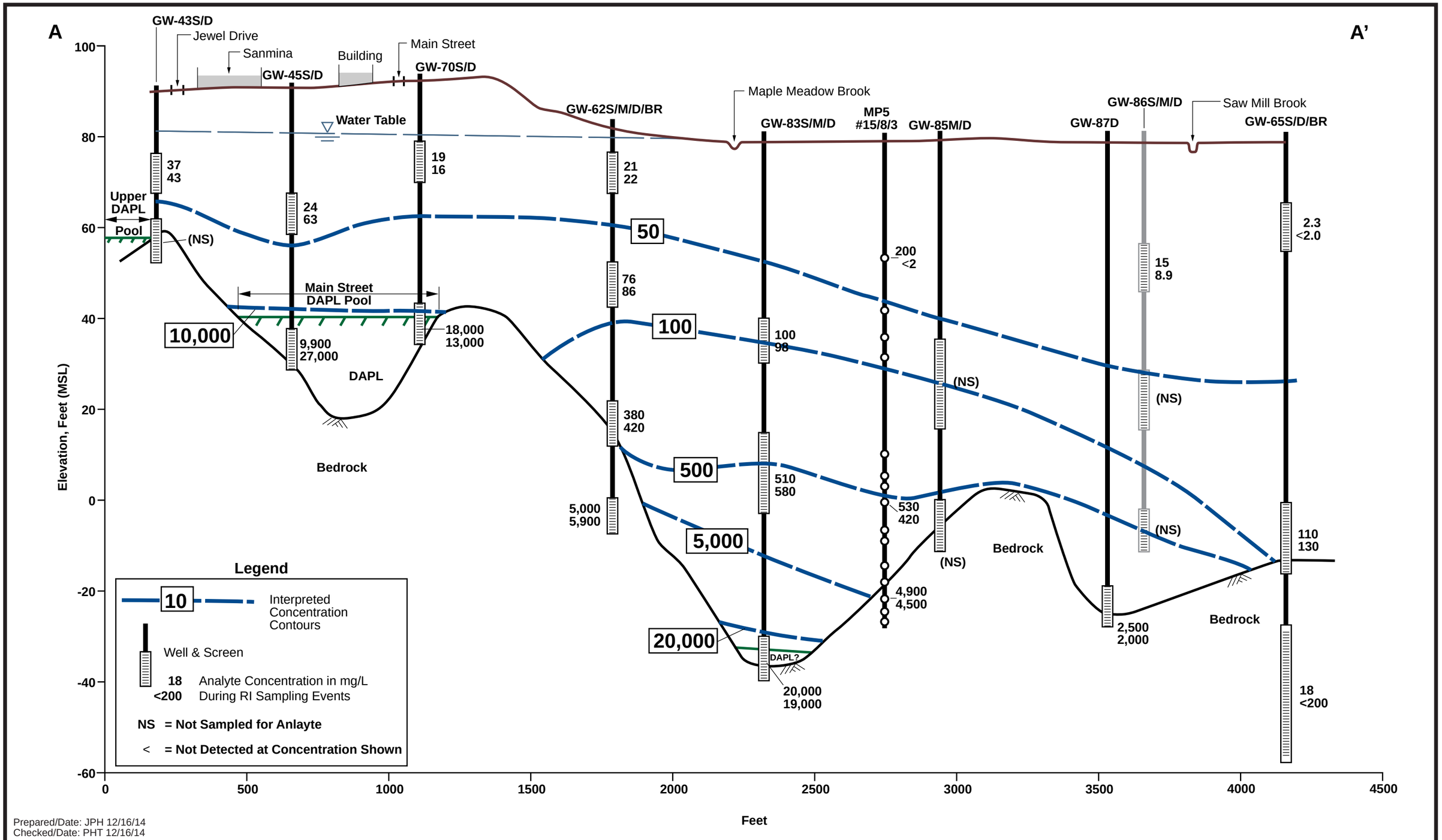
6107140016

amec

Ammonia Cross Section A - A'
OU-3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure 6.2-26

PORT2014036a.ai



Prepared/Date: JPH 12/16/14
Checked/Date: PHT 12/16/14

6107140016

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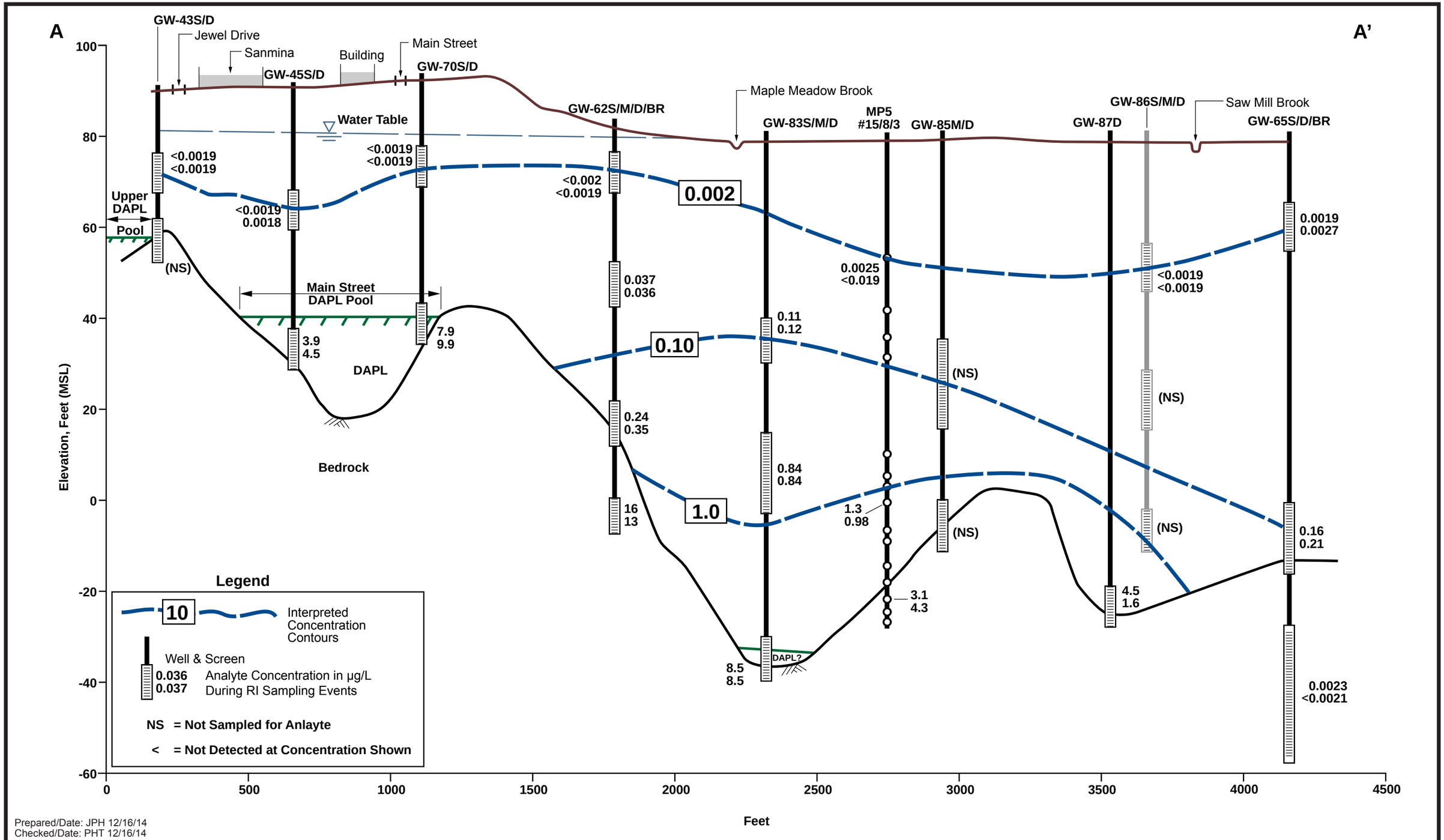
Sulfate Cross Section A - A'
OU-3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure 6.2-27

PORT2014036b.ai



Prepared/Date: JPH 12/16/14
Checked/Date: PHT 12/16/14

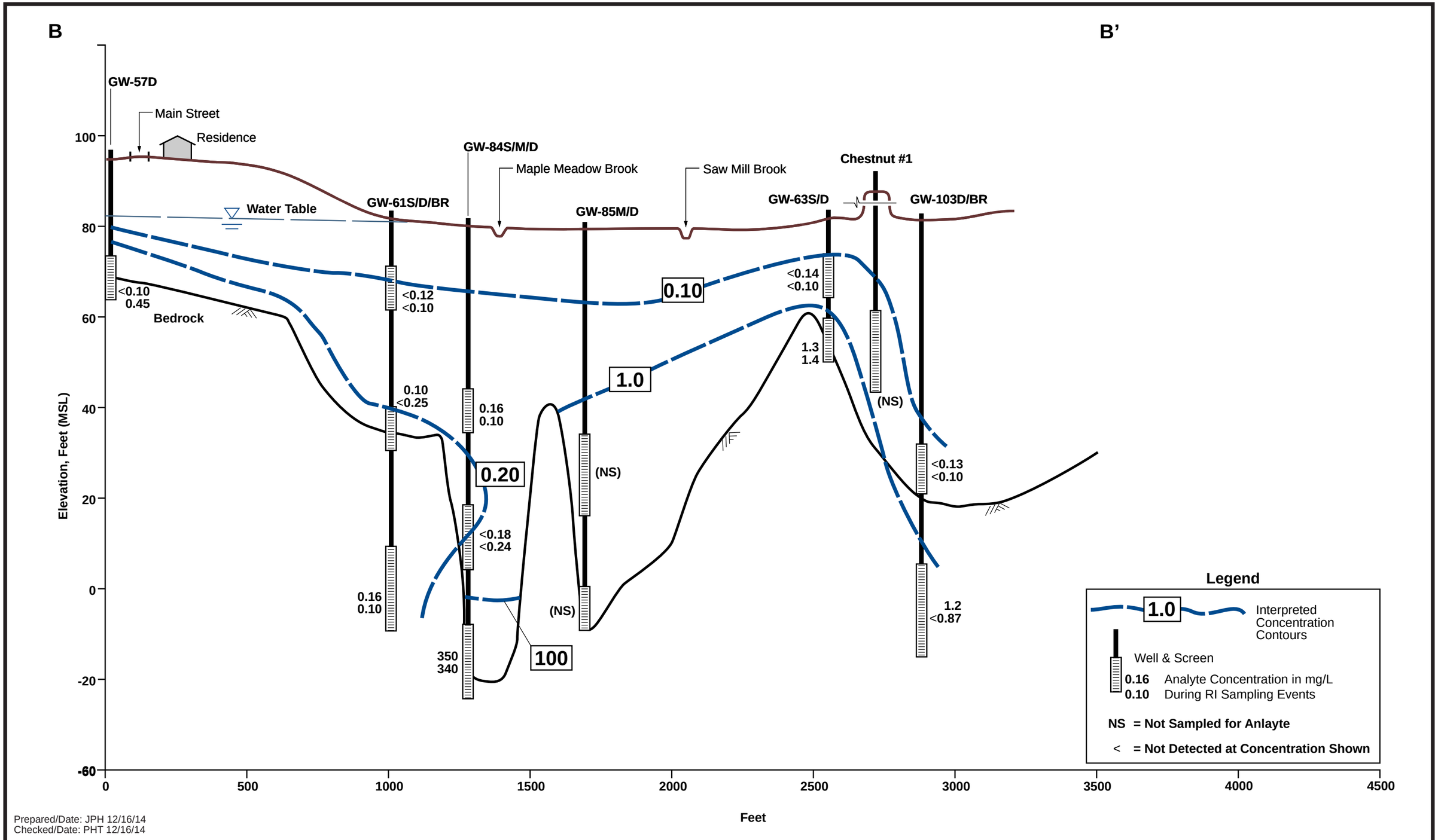
6107140016

amec

NDMA Cross Section A - A'
OU-3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure 6.2-28

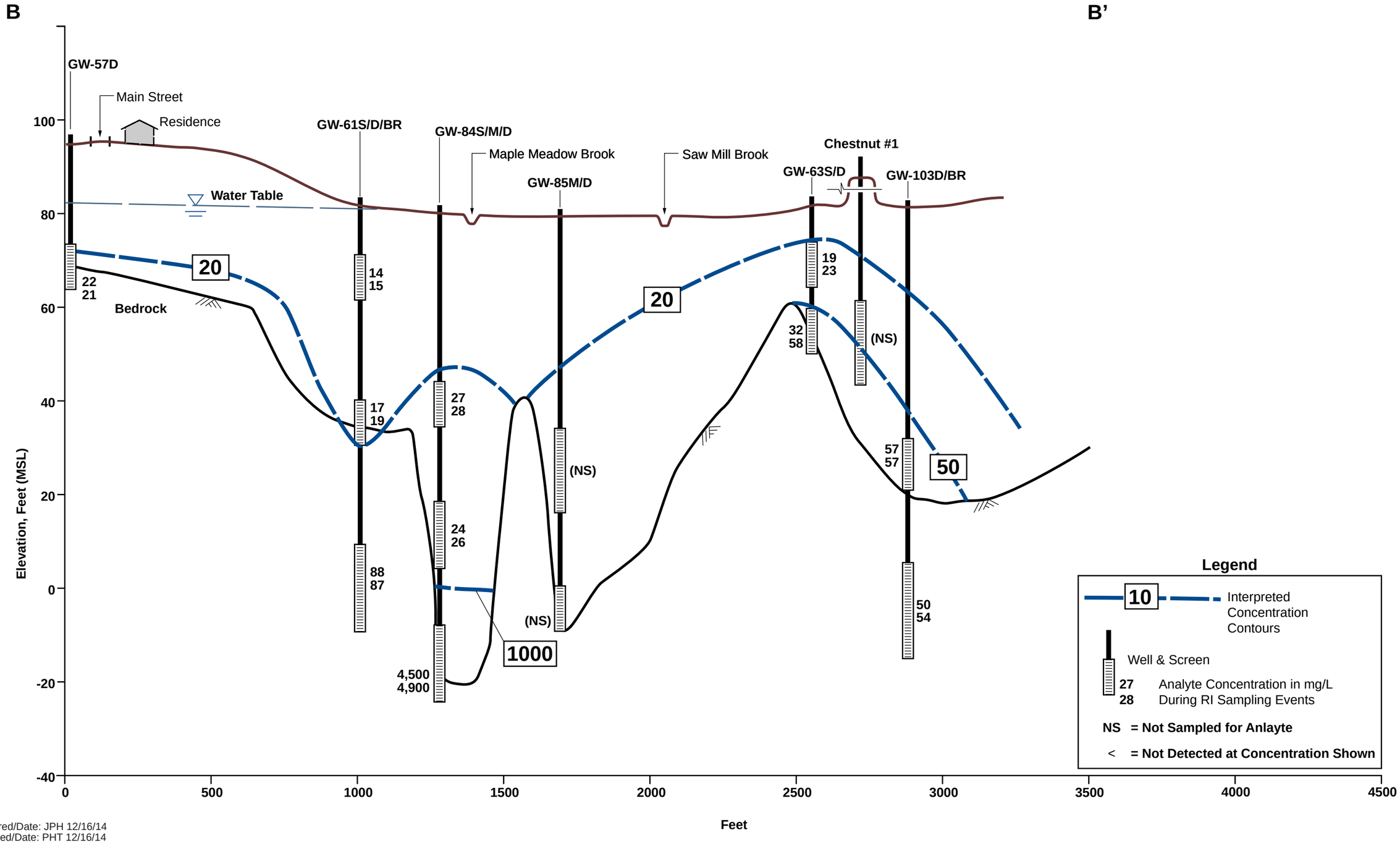
PORT2014036c.ai



Prepared/Date: JPH 12/16/14
Checked/Date: PHT 12/16/14

6107140016	amec	Ammonia Cross Section B - B' OU-3 Data Gaps Olin Chemical Superfund Site Wilmington, Massachusetts Figure 6.2-29

PORT2014036d.ai



Prepared/Date: JPH 12/16/14
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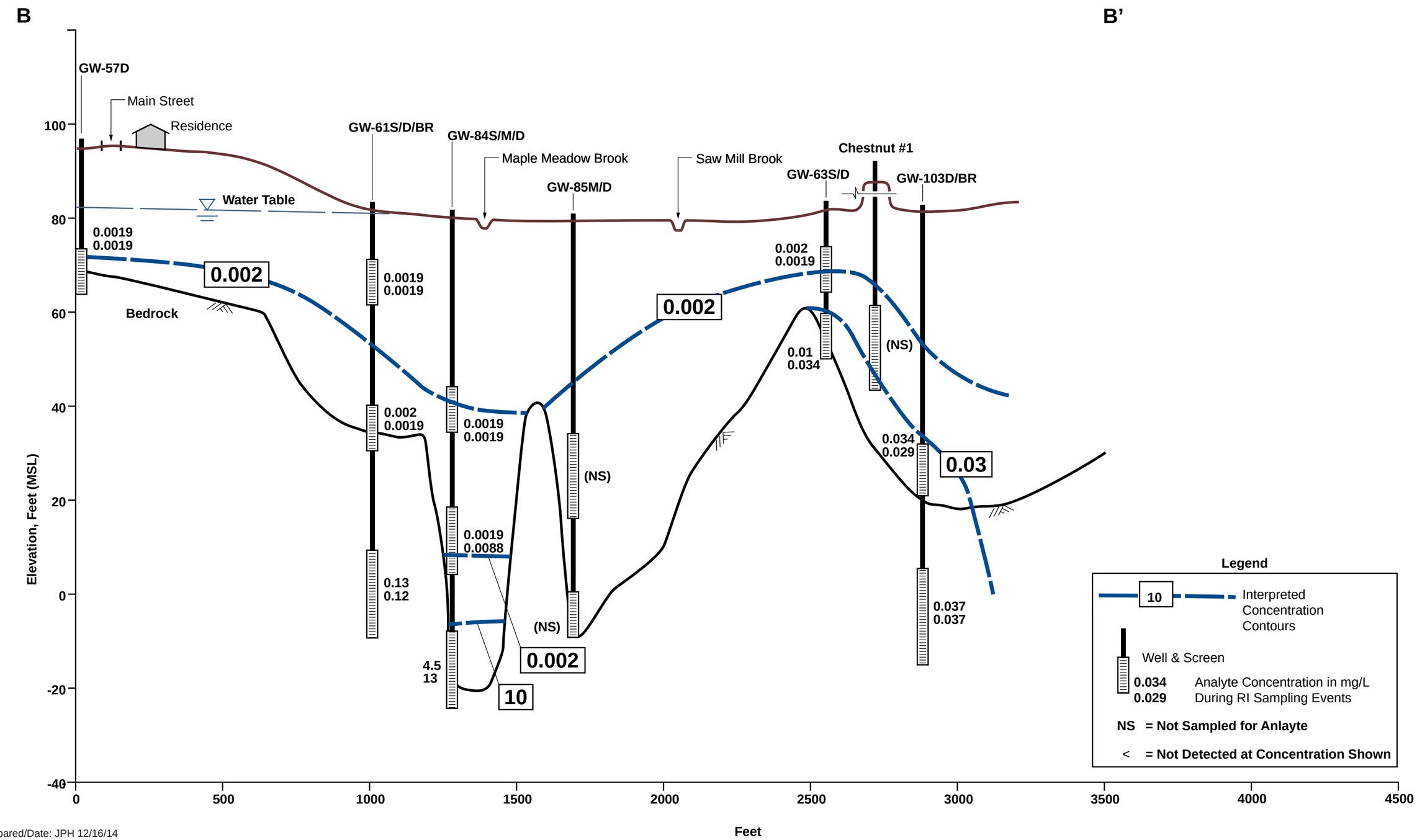
6107140016

amec

Sulfate Cross Section B - B'
OU-3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure 6.2-30

PORT2014036e.ai



Prepared/Date: JPH 12/16/14
Checked/Date: PHT 12/16/14

6107140016

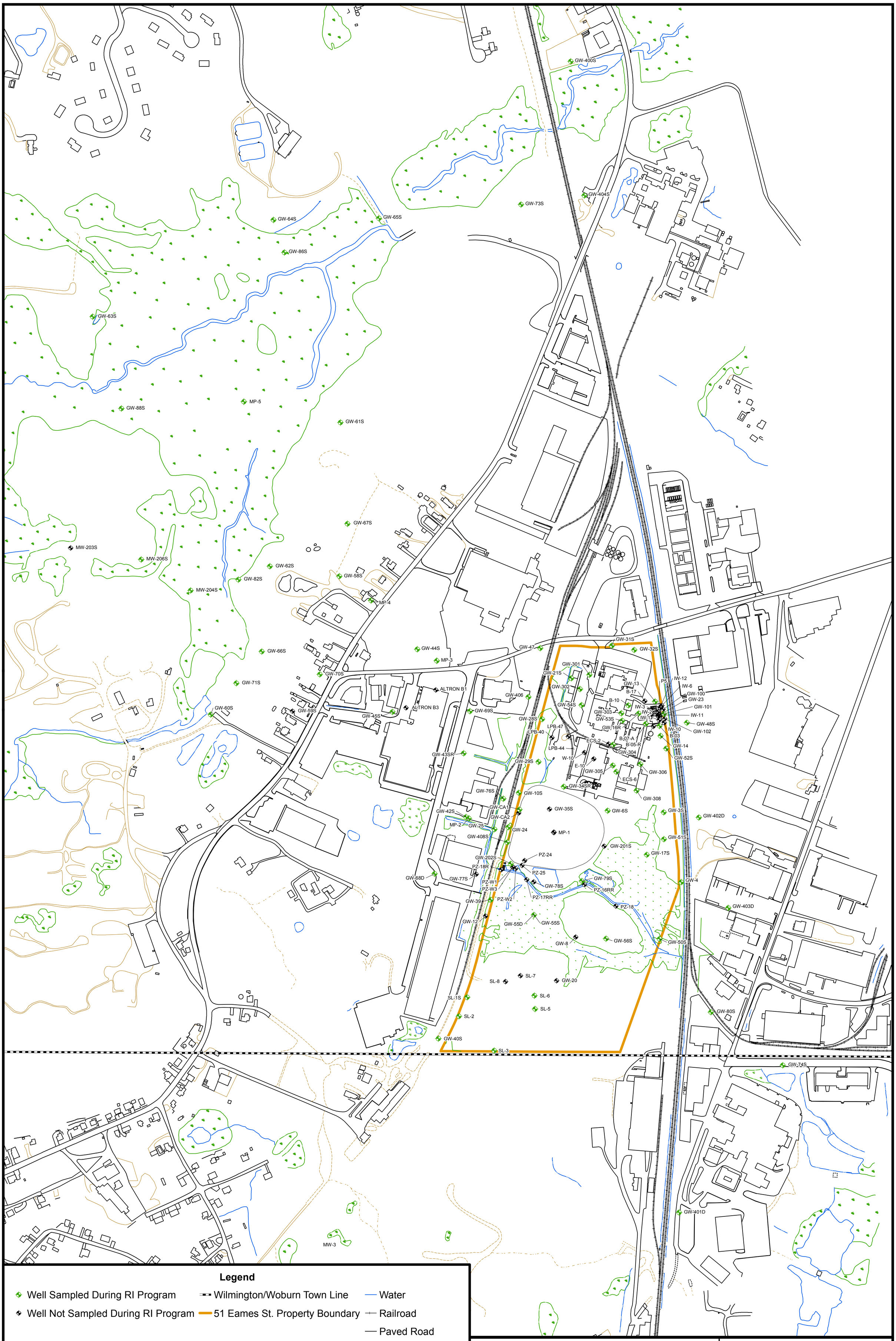
amec

NDMA Cross Section B - B'
OU-3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Figure 6.2-31

PORT2014036f.ai

APPENDIX B
GROUNDWATER DISTRIBUTION FIGURES



Legend

- Well Sampled During RI Program
- Well Not Sampled During RI Program
- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. MP wells are multi port wells with multiple screened intervals at each location.
2. Historic wells that are known to be destroyed are not shown. Some historic locations not sampled as part of the RI may not currently exist.

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271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Shallow Overburden Groundwater Wells

Olin Chemical Superfund Site
Wilmington, Massachusetts

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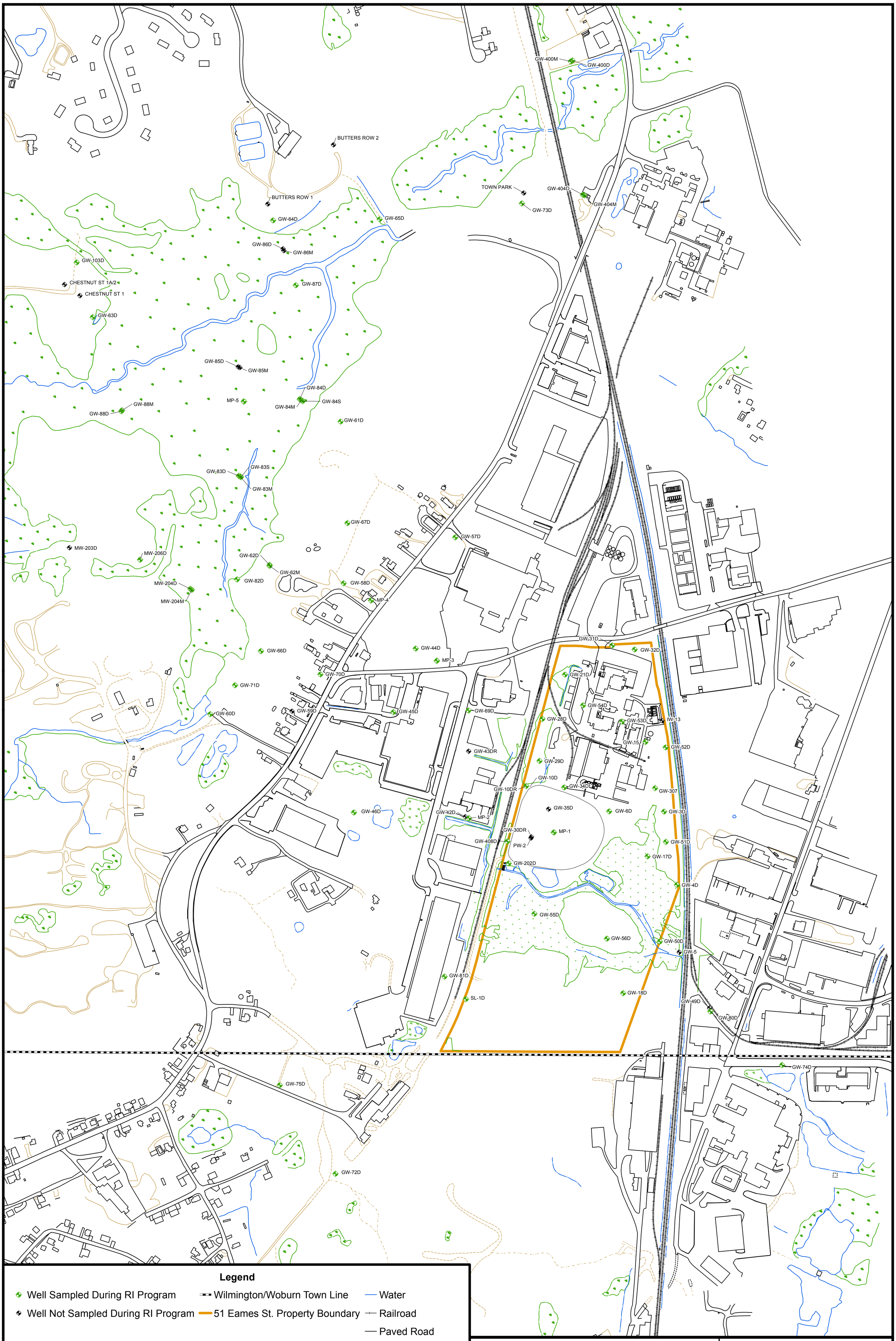

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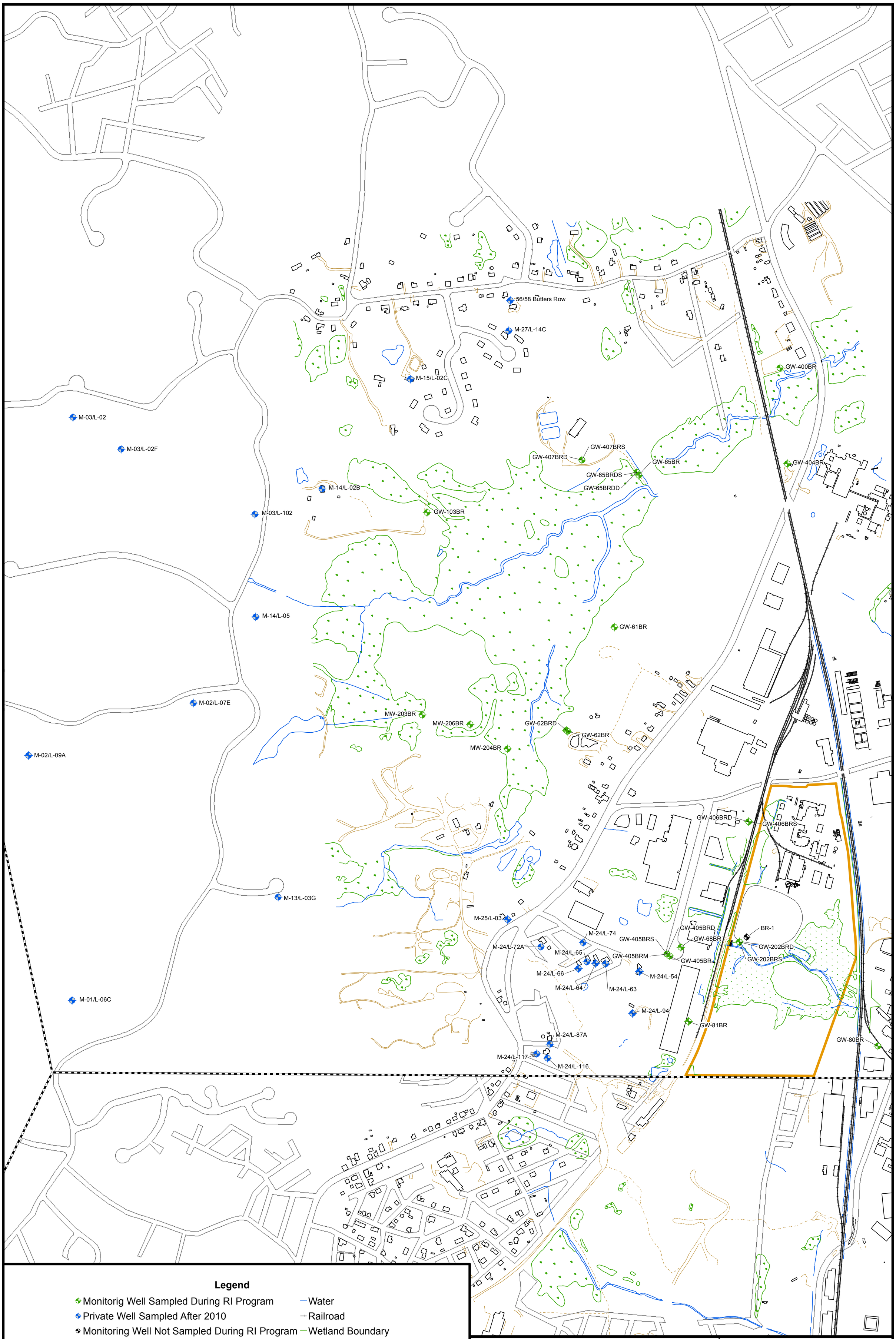

Legend

- Monitorig Well Sampled During RI Program
- Private Well Sampled After 2010
- Monitoring Well Not Sampled During RI Program
- 51 Eames St. Property Boundary
- Water
- Railroad
- Wetland Boundary

Note:
1. GW-1 Areas would include a 500 ft radius from residential wells and Zone II Areas.

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N

0 350 700 Feet

Bedrock Groundwater Wells

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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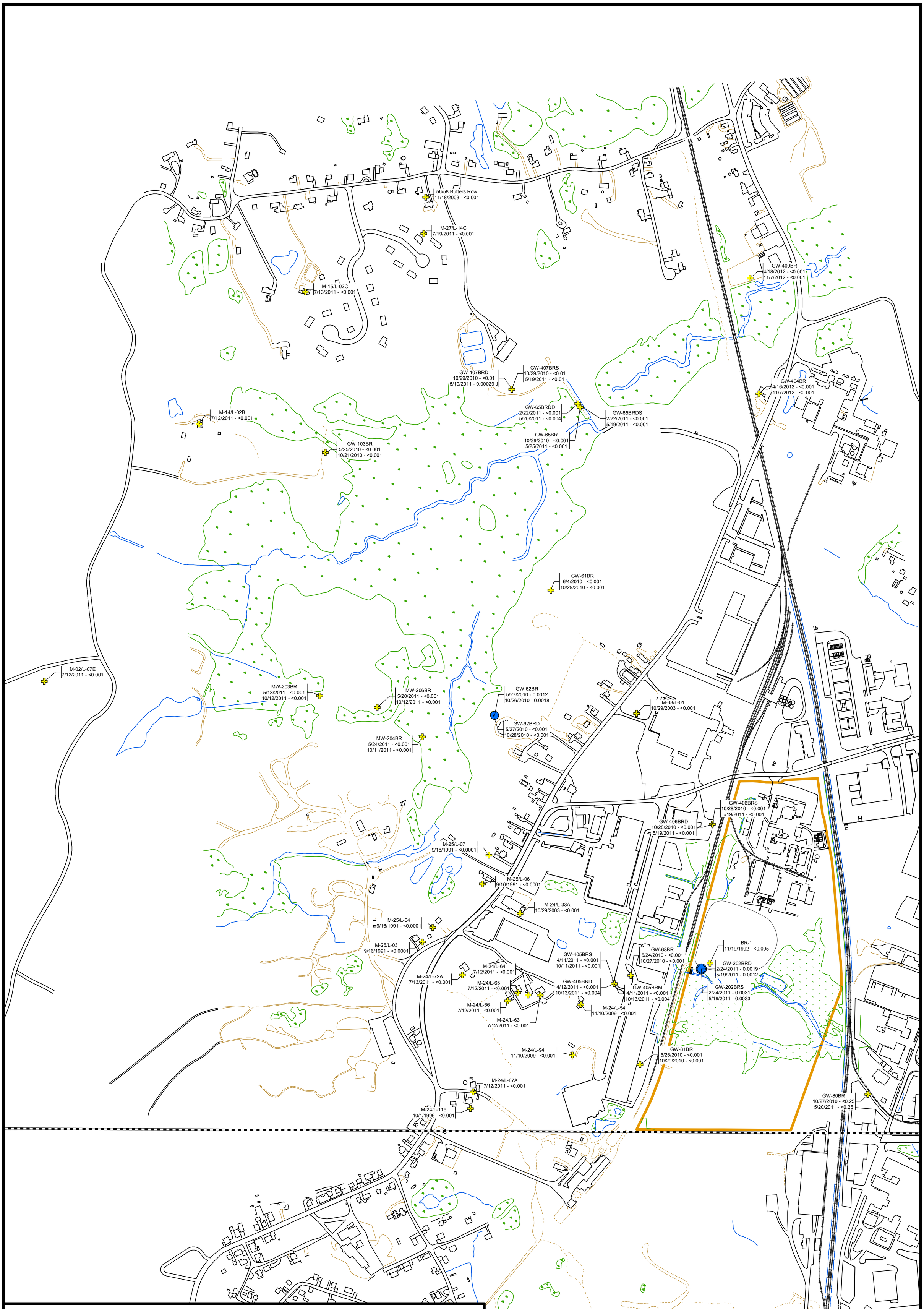
Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_2014_22x341.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\Draft Figures\Bedrock Groundwater Locations.pdf 11/10/2014 3:47 PM brian.roden



Legend

12DCA Concentration (mg/L)

- 0.00041 <= 0.00047
- 0.00047 <= 0.00059
- 0.00059 <= 0.0029
- 0.0029 <= 0.012
- 0.012 <= 0.027

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 300 600 Feet

Figure
1,2-Dichloroethane Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/20/14 | Checked/Date: PHT 06/20/14

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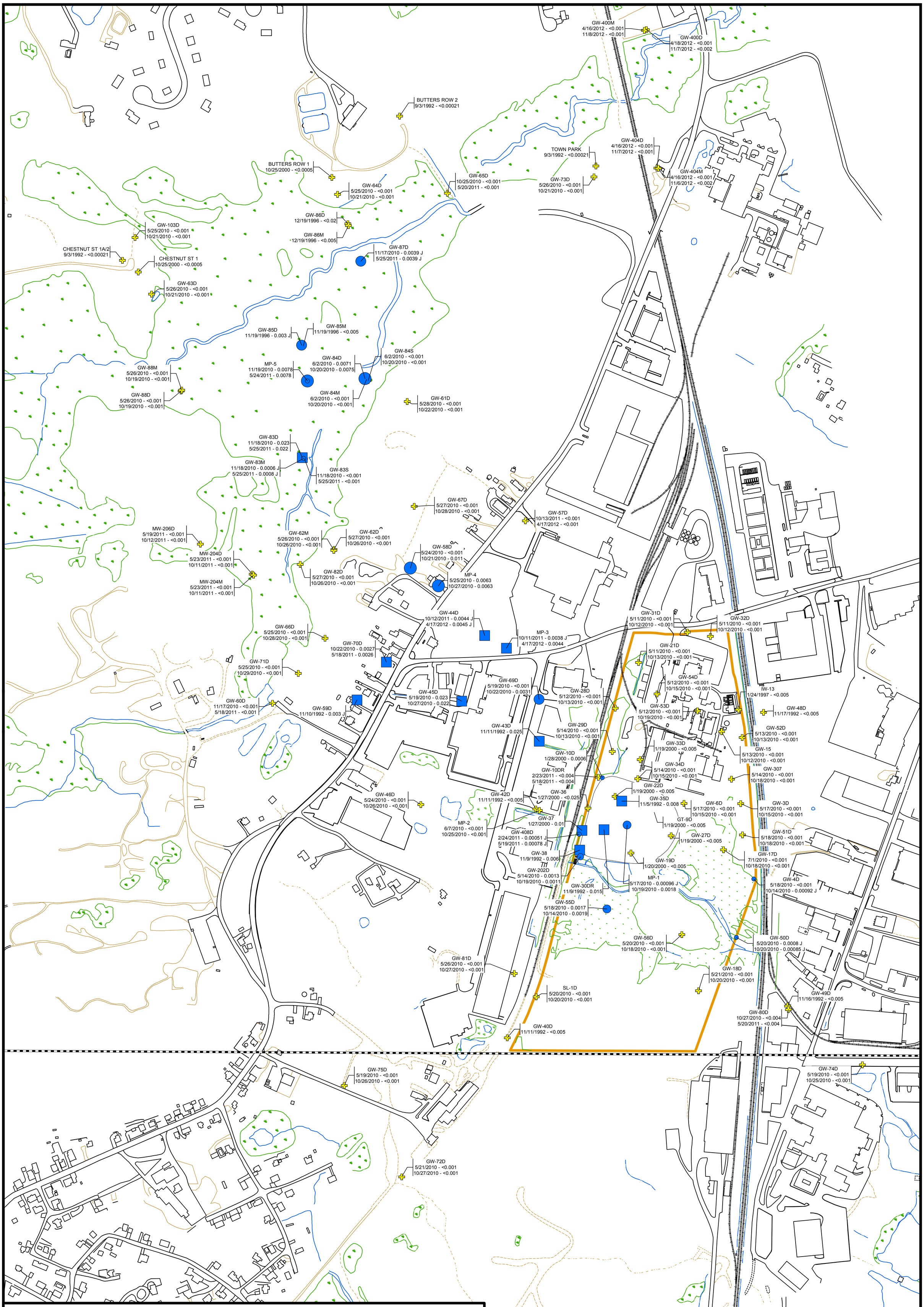

Legend

12DCE Concentration (mg/L)

- 0.00060 <= 0.00092
- 0.00092 <= 0.0013
- 0.0013 <= 0.0019
- 0.0019 <= 0.0039
- 0.0039 <= 0.011
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

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271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
1,2-Dichloroethane Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/20/14 | Checked/Date: PHT 06/20/14

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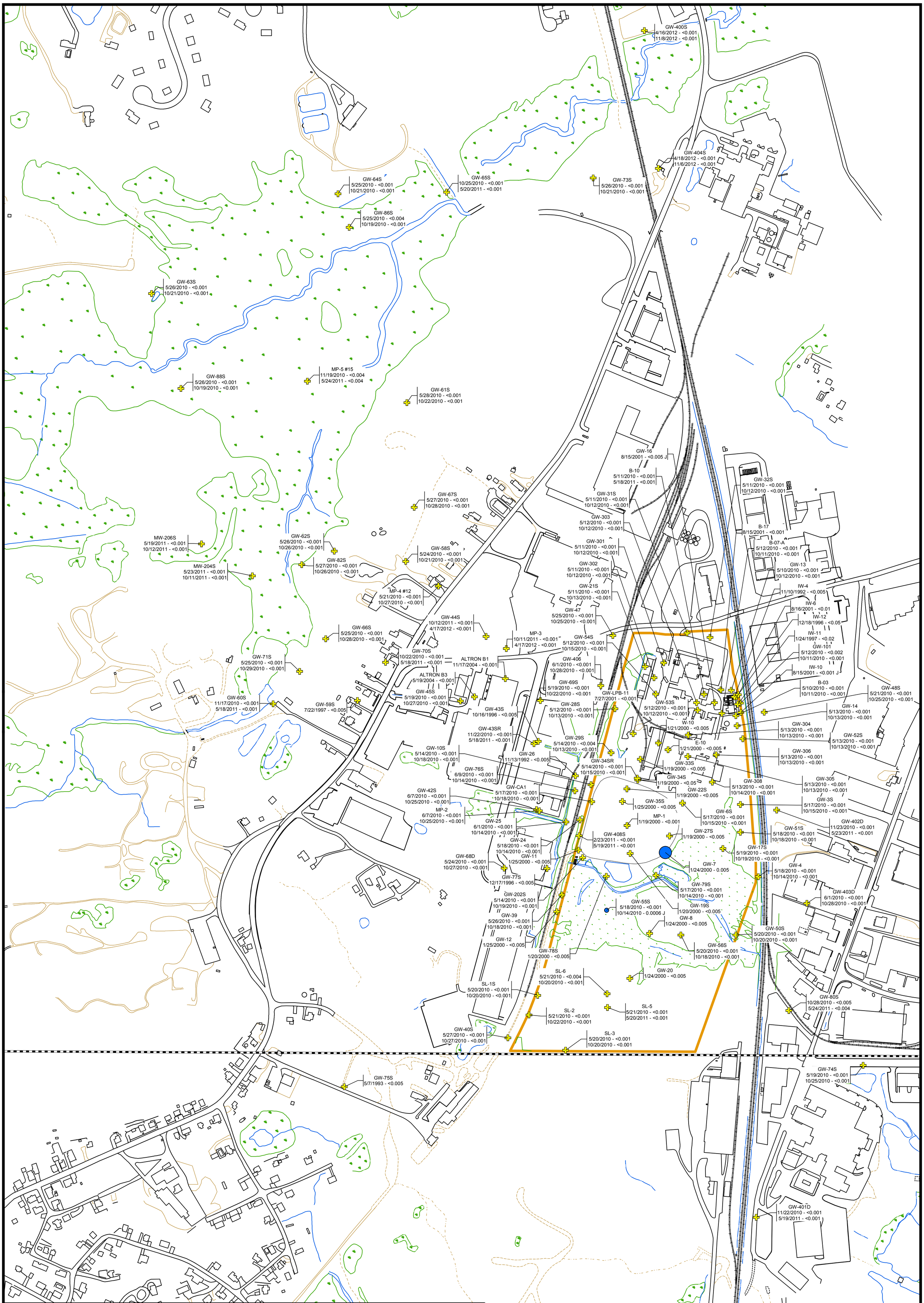

Legend

12DCA Concentration (mg/L)

- 0.00060
- 0.000601 <= 0.0050

Wilmington/Woburn Town Line
51 Eames St. Property Boundary
Units in mg/L
J - Estimated
Non-Detect
Water
Railroad
Paved Road
Unpaved Road
Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
1,2-Dichloroethane Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/20/14 | Checked/Date: PHT 06/20/14

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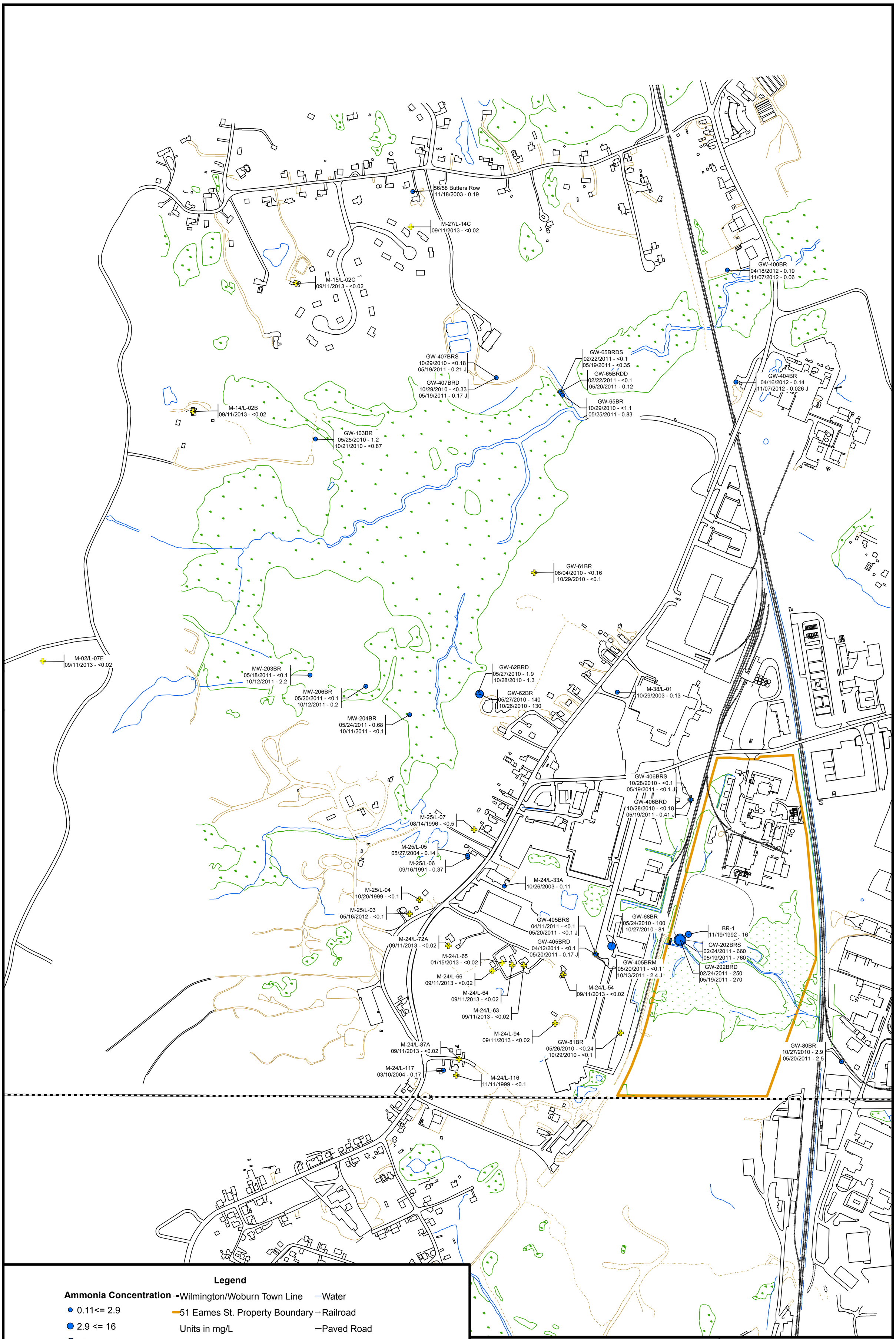

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Chelmsford, MA 01824

Figure
Ammonia Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/20/14 | Checked/Date: PHT 06/20/14

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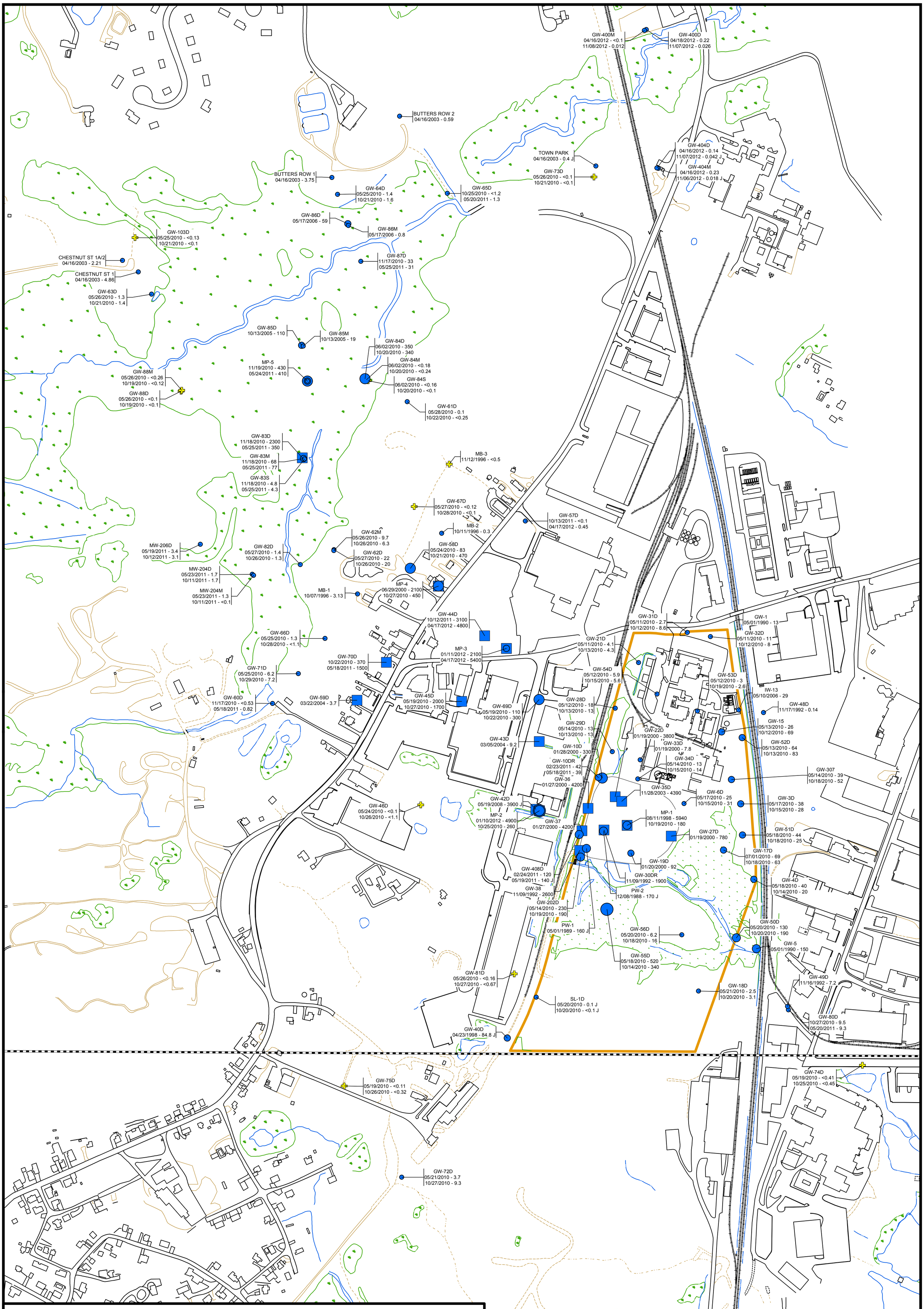

Legend

Ammonia Concentration (mg/L)

- 0.012 <= 33
- 33 <= 110 mg/L
- 110 <= 230 mg/L
- 230 <= 470 mg/L
- 470 <= 2000 mg/L
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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0 250 500 Feet

Figure
Ammonia Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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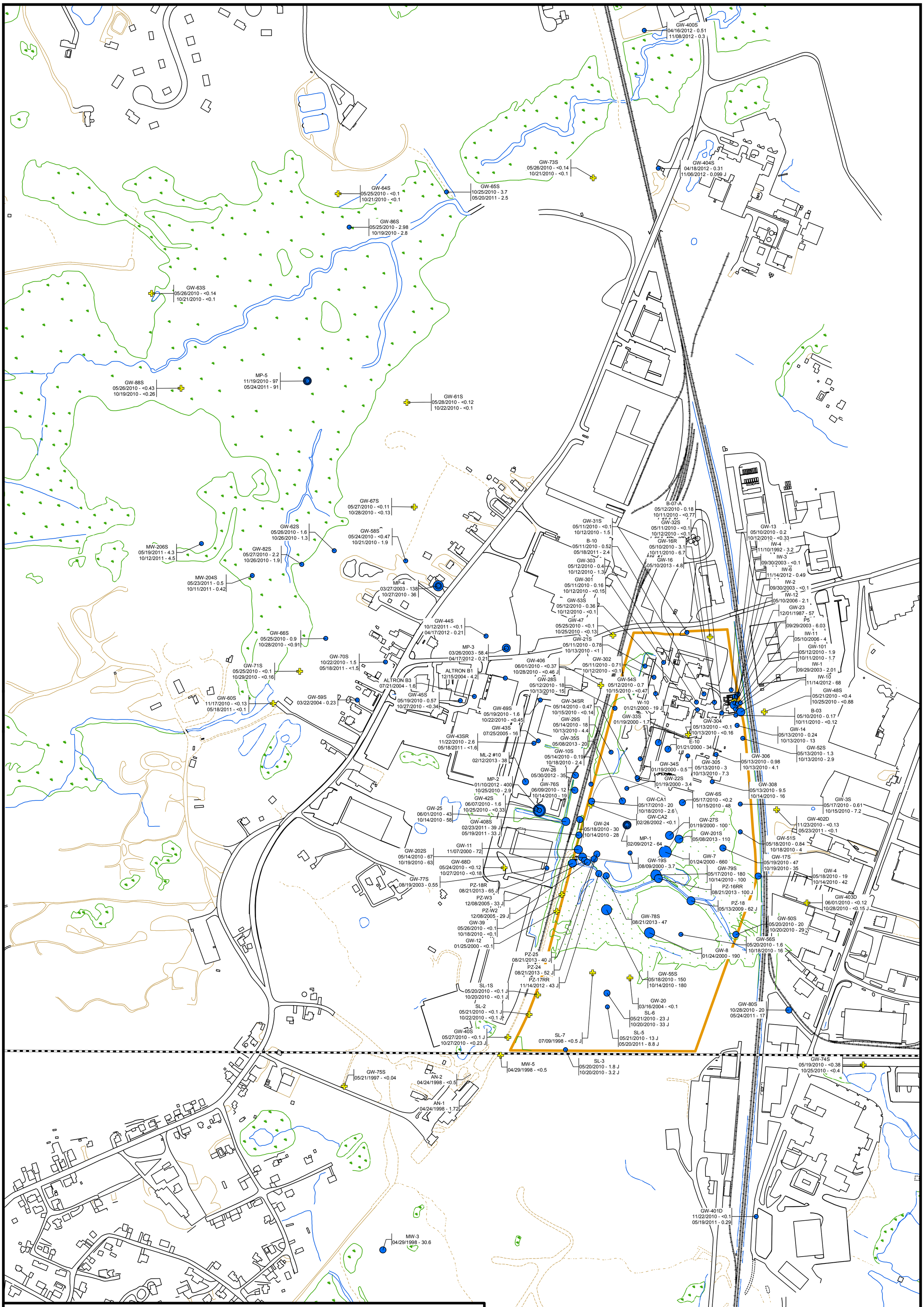

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

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Chelmsford, MA 01824

Figure
Ammonia Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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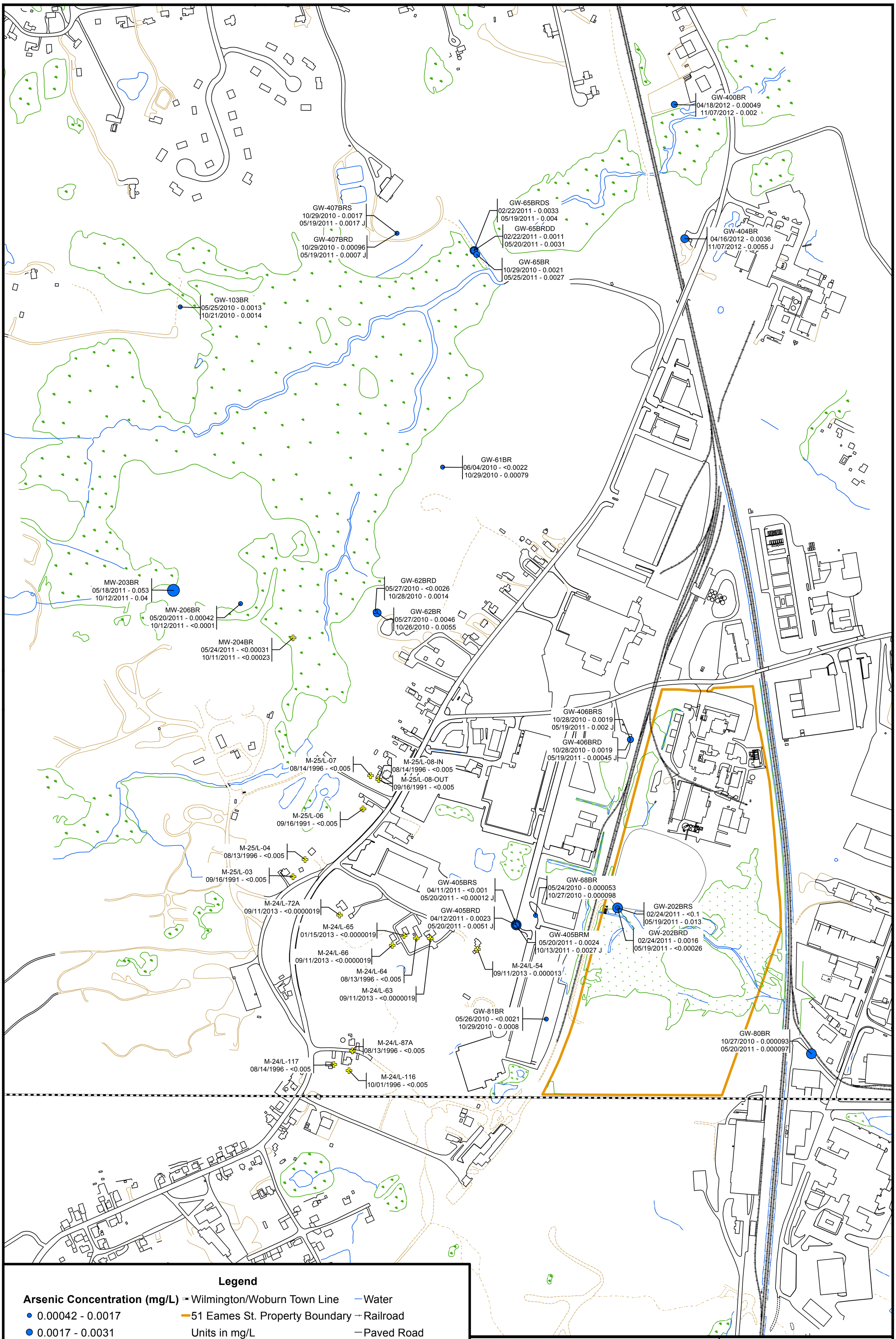

Legend

Arsenic Concentration (mg/L)

- 0.00042 - 0.0017
- 0.0017 - 0.0031
- 0.0031 - 0.0055
- 0.0055 - 0.013
- 0.013 - 0.053

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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N

0 250 500 Feet

Figure
Arsenic Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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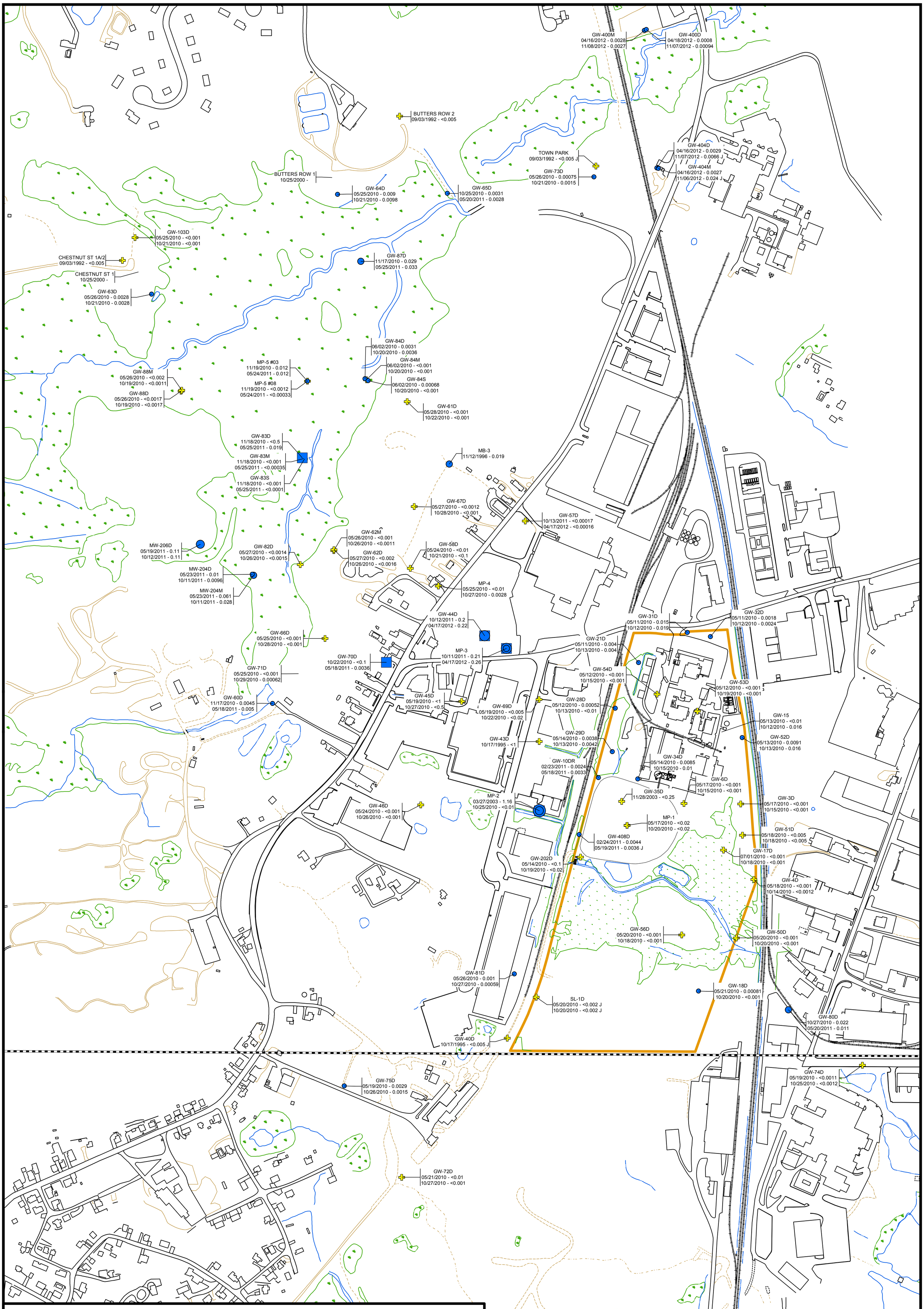

Legend

Arsenic Concentration (mg/L)

- 0.00052 <= 0.015
- 0.015 <= 0.061
- 0.061 <= 0.136
- 0.136 <= 0.21
- 0.21 <= 1.16
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Arsenic Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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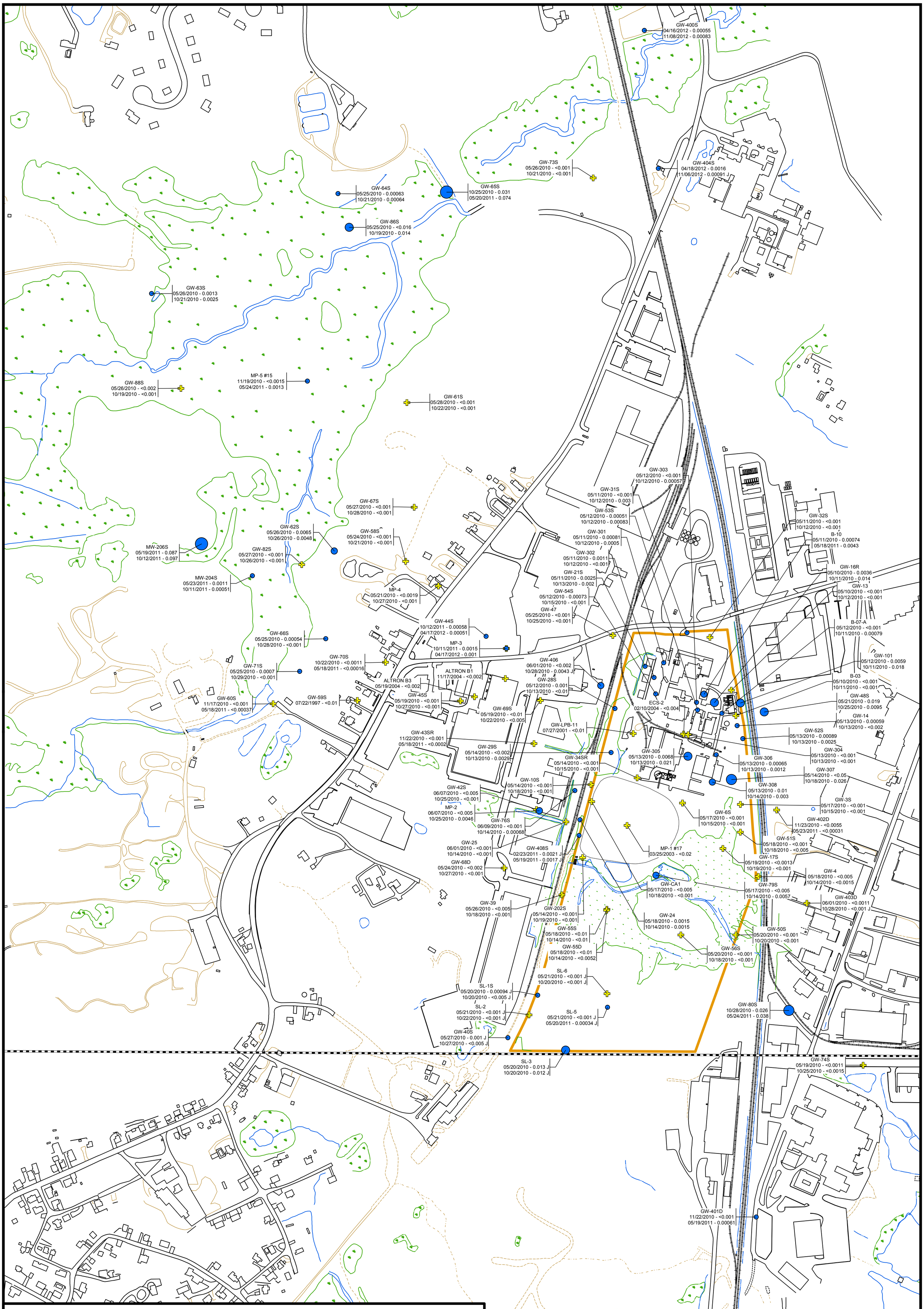

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Figure
Arsenic Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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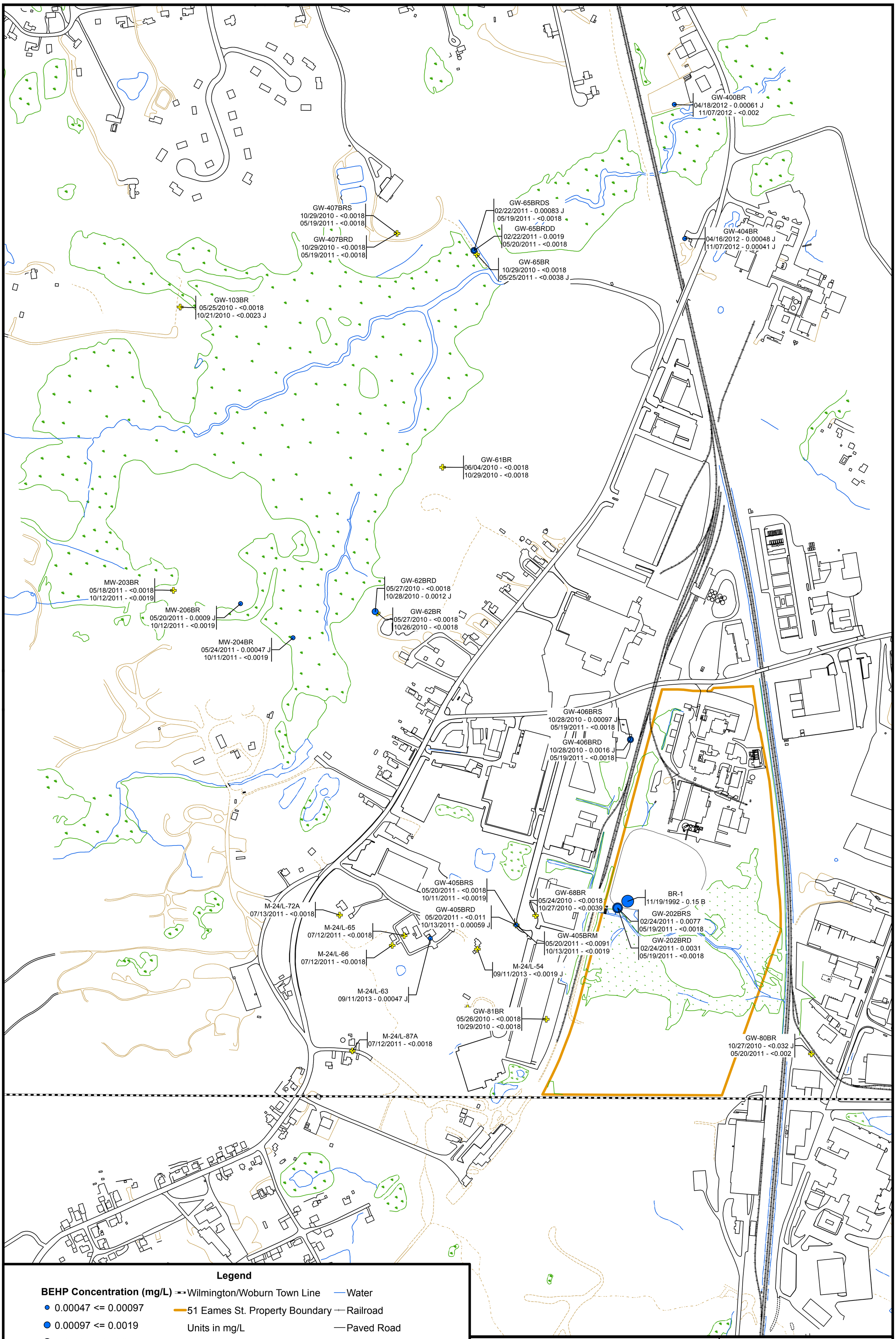

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Figure
Bis(2-Ethylhexyl)phthalate Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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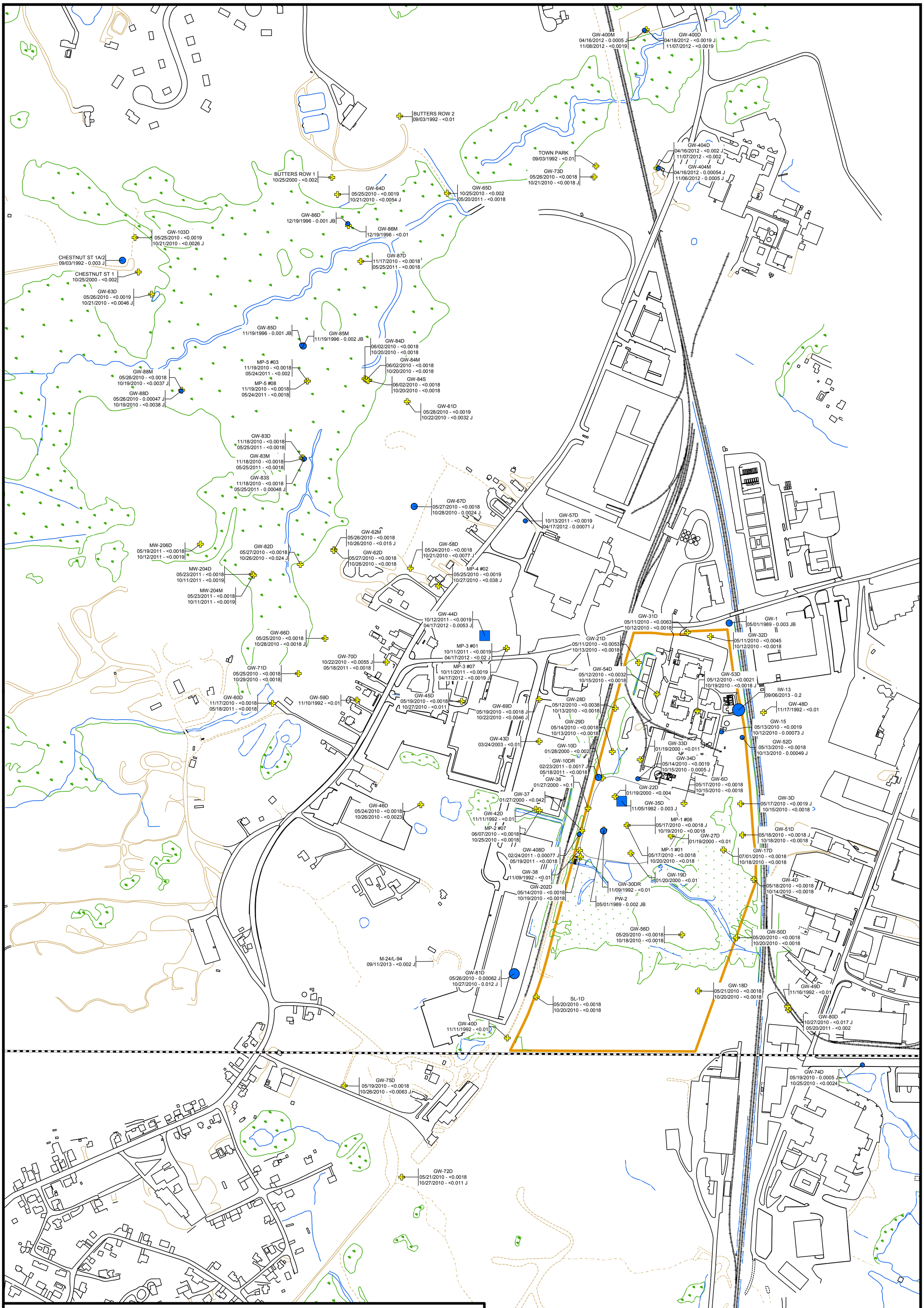

Legend

BHEP Concentration (mg/L)

- 0.00047 <= 0.0010
- 0.0010 <= 0.0030
- 0.0030 <= 0.0053
- 0.0053 <= 0.012
- 0.012 <= 0.20
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Bis(2-Ethylhexyl)phthalate Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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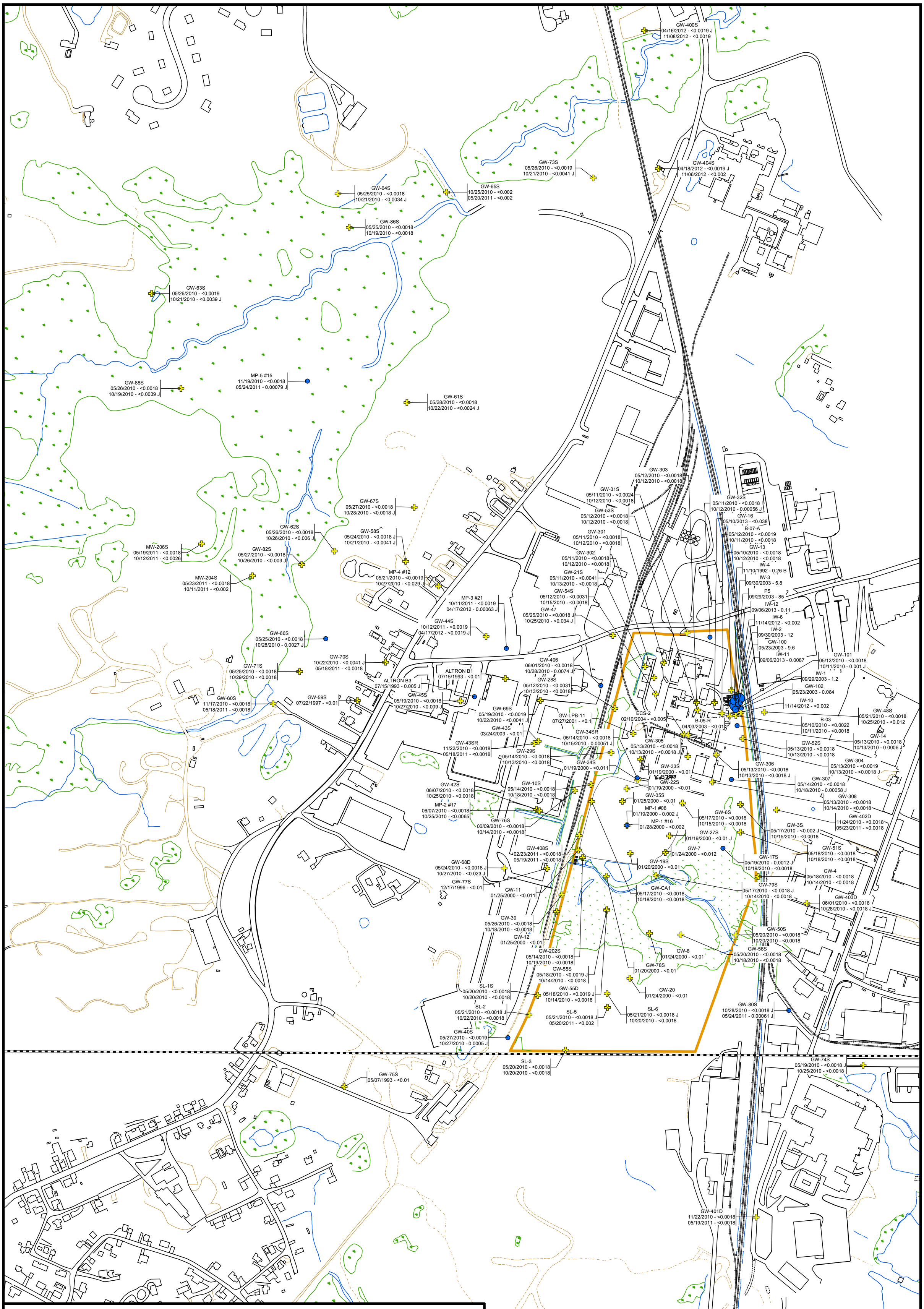

Legend

BHEP Concentration (mg/L)

- 0.00050 <= 0.26
- 0.26<= 1.2
- 1.2 <= 5.8
- 5.8 <= 12
- 12 <= 85

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Bis(2-Ethylhexyl)phthalate Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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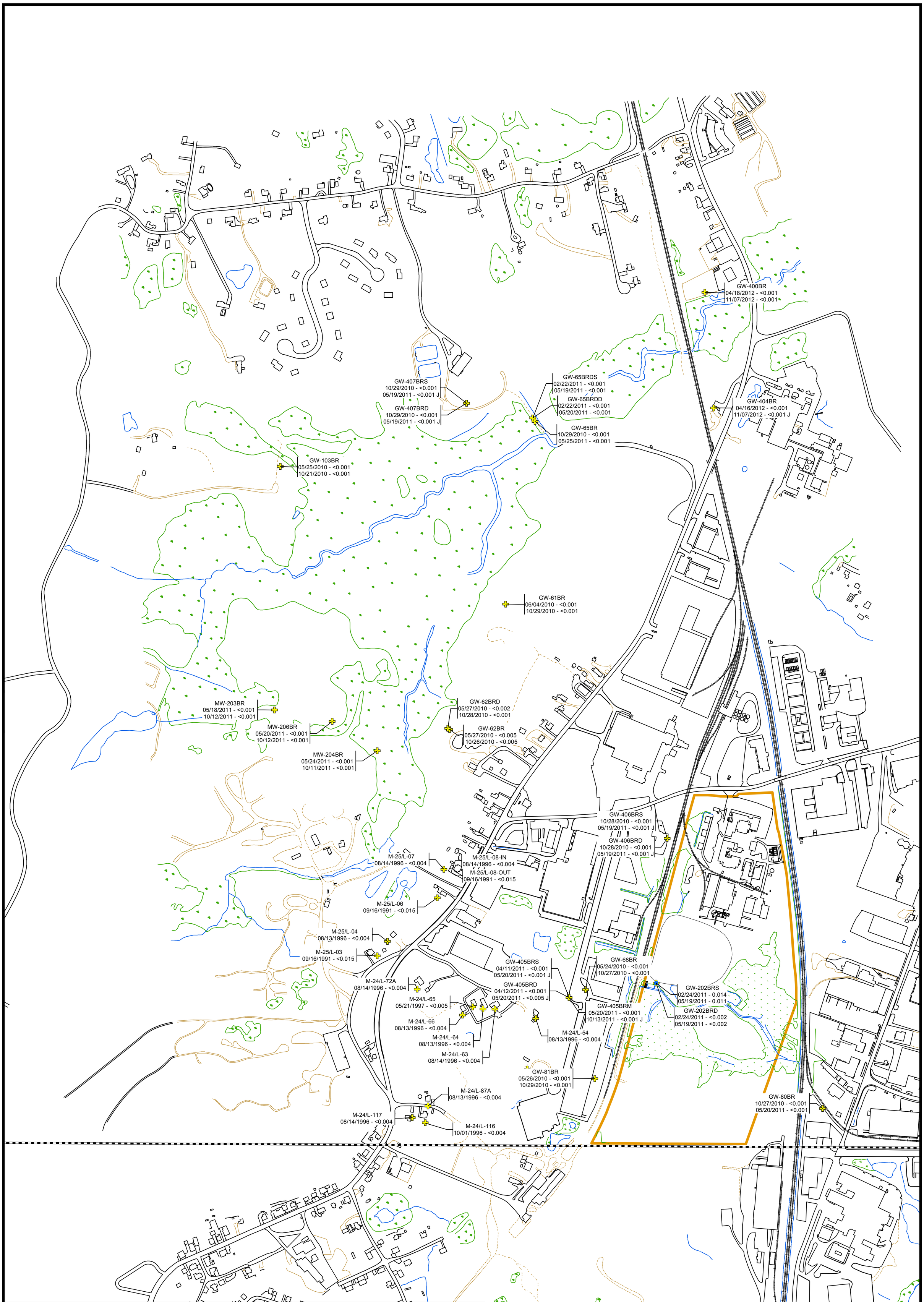

Legend

Beryllium Concentration (mg/L)

- 0.014

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 300 600 Feet

Figure
Beryllium Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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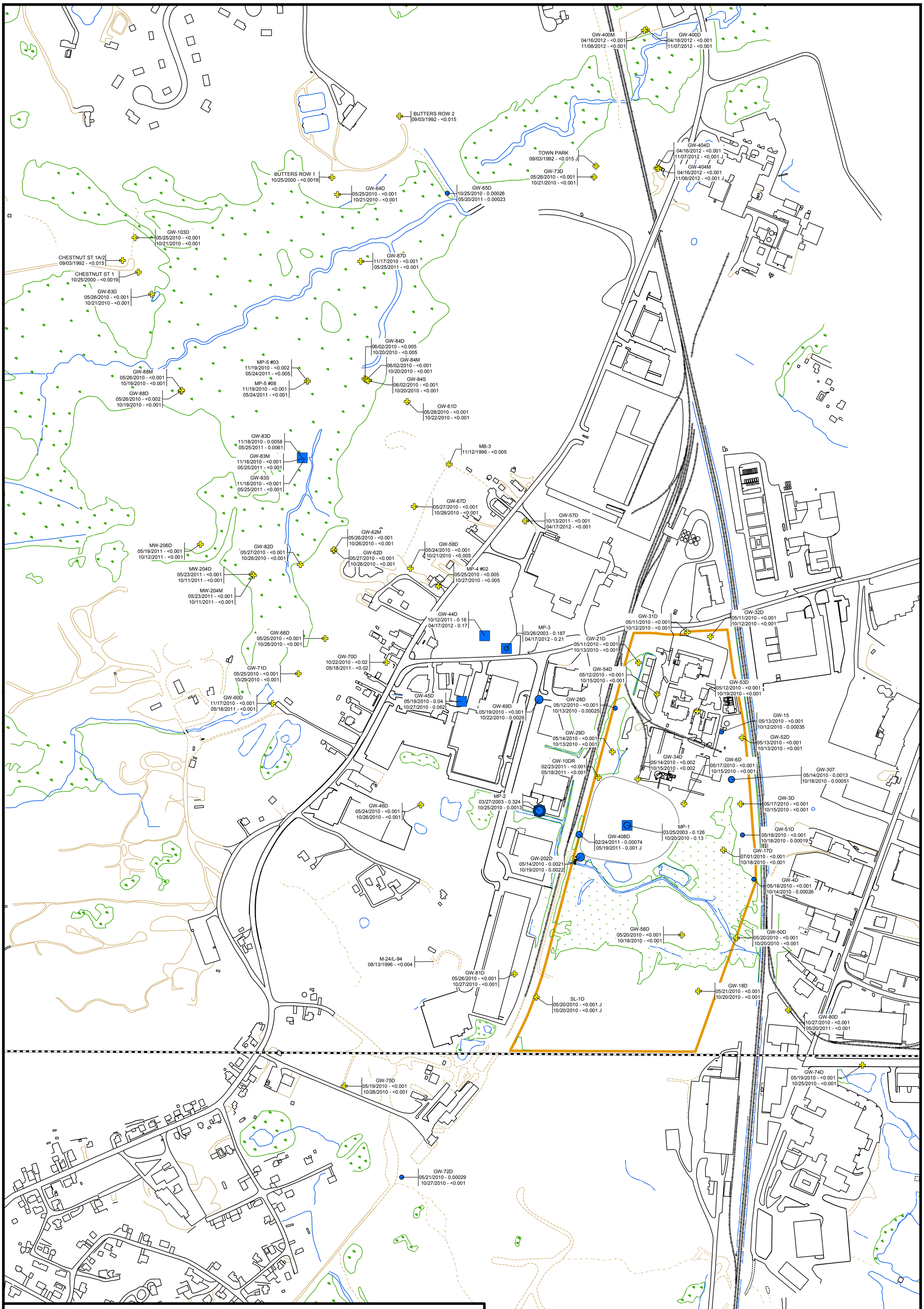

Legend

Beryllium Concentration (mg/L)

- 0.00019 <= 0.00035
- 0.00035 <= 0.0013
- 0.0013 <= 0.0044
- 0.0044 <= 0.062
- 0.062 <= 0.142
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Beryllium Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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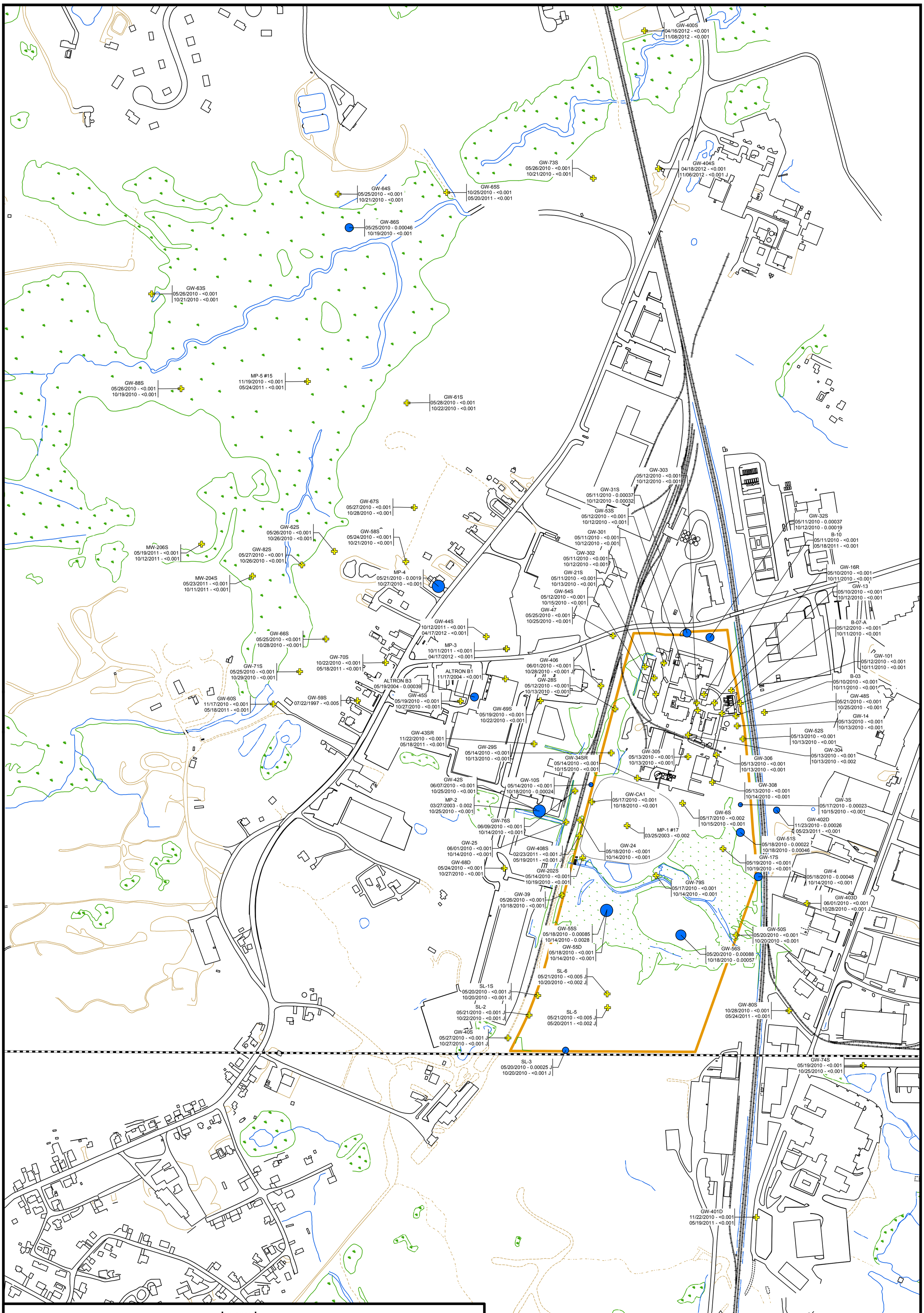

Legend

Beryllium Concentration (mg/L)

- 0.00023 <= 0.00024
- 0.00024 <= 0.00026
- 0.00026 <= 0.00048
- 0.00048 <= 0.00088
- 0.00088 <= 0.0028

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Beryllium Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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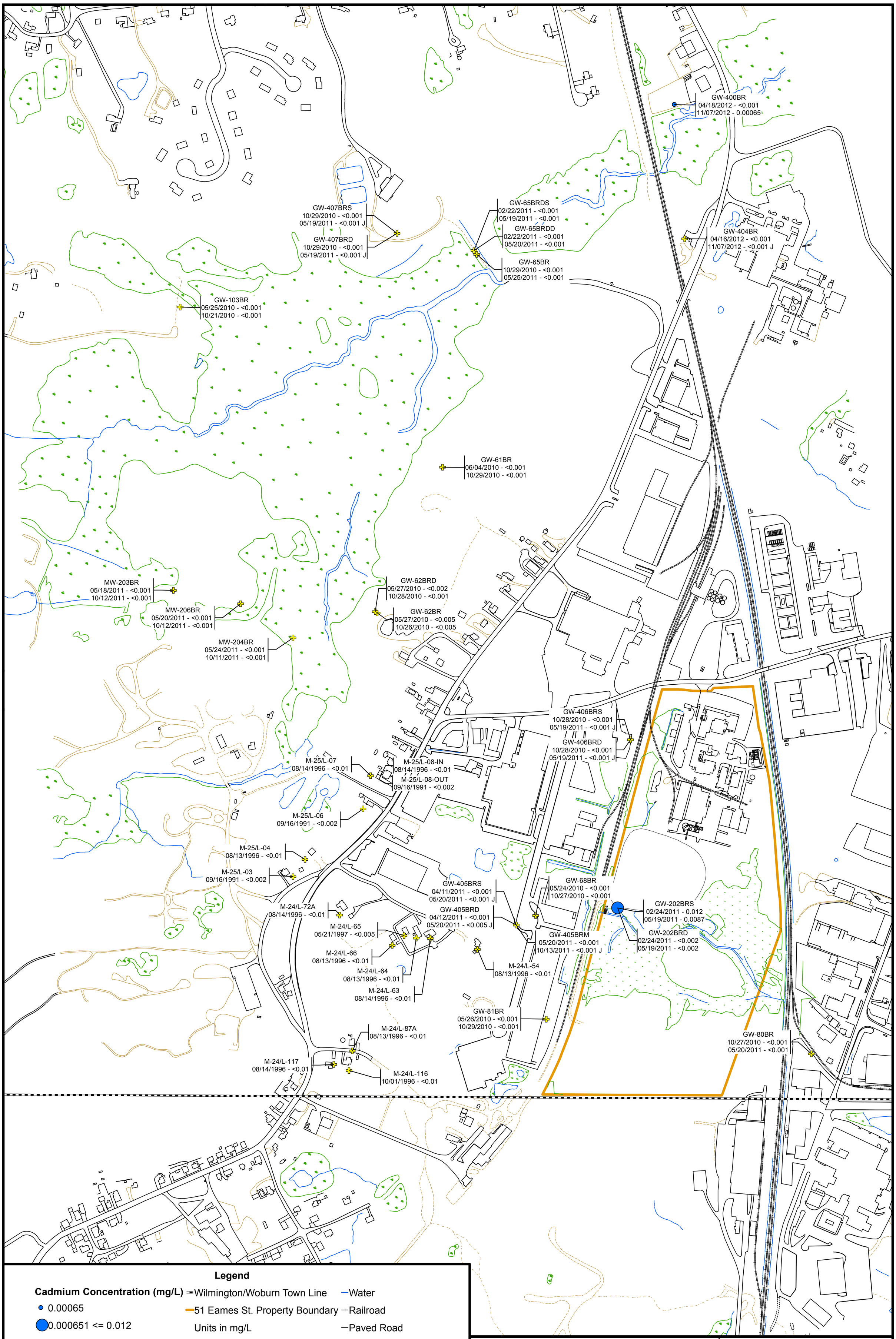

Legend

Cadmium Concentration (mg/L)

- 0.00065
- 0.000651 <= 0.012

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 250 500 Feet

Figure
Cadmium Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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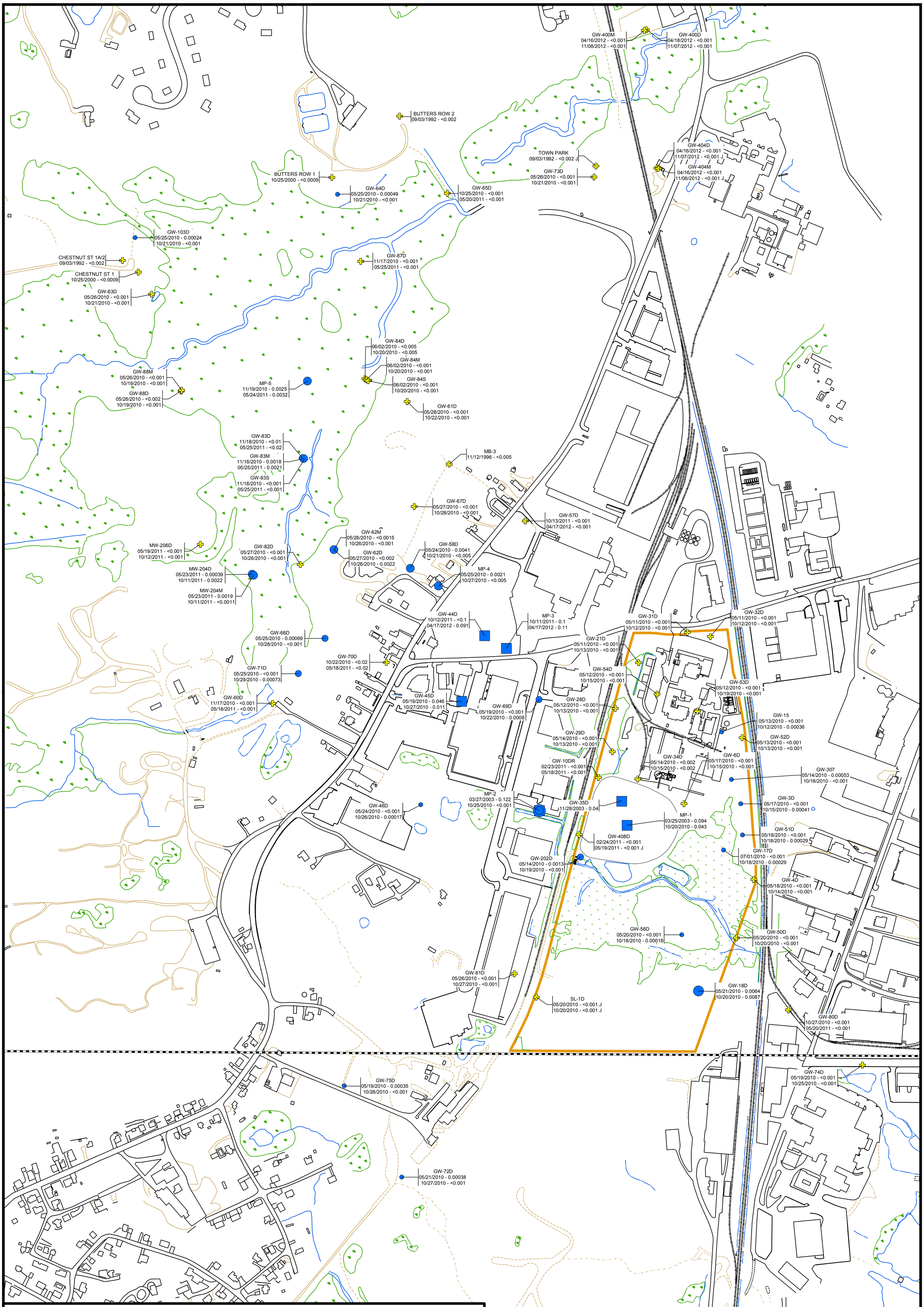

Legend

Cadmium Concentration (mg/L)

- 0.00017 <= 0.00053
- 0.00053 <= 0.0013
- 0.0013 <= 0.0041
- 0.0041 <= 0.0087
- 0.0087 <= 0.0370
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Cadmium Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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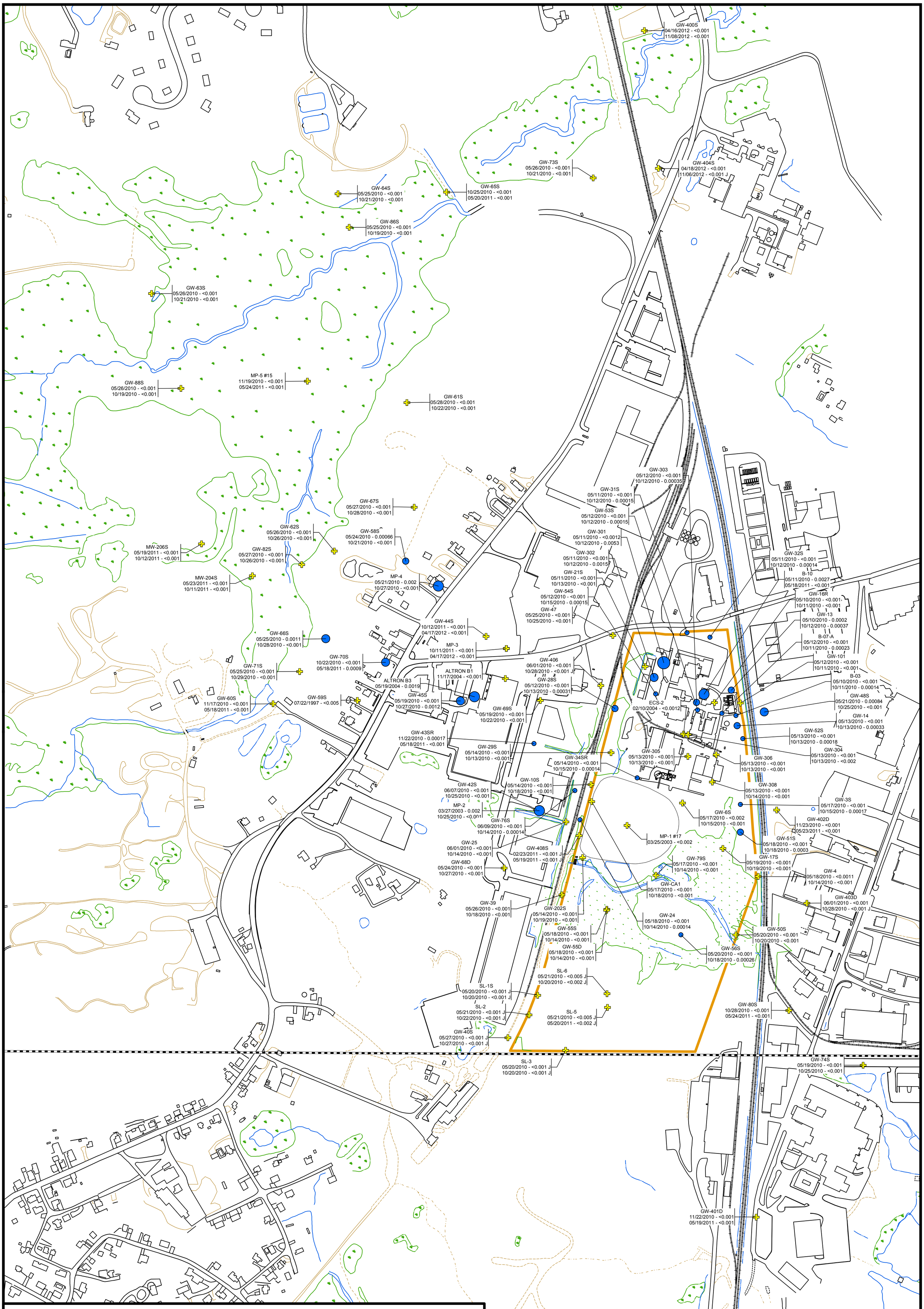

Legend

Cadmium Concentration (mg/L)

- 0.00014 <= 0.00026
- 0.00026 <= 0.00066
- 0.00066 <= 0.0015
- 0.0015 <= 0.0030
- 0.0030 <= 0.0053

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Cadmium Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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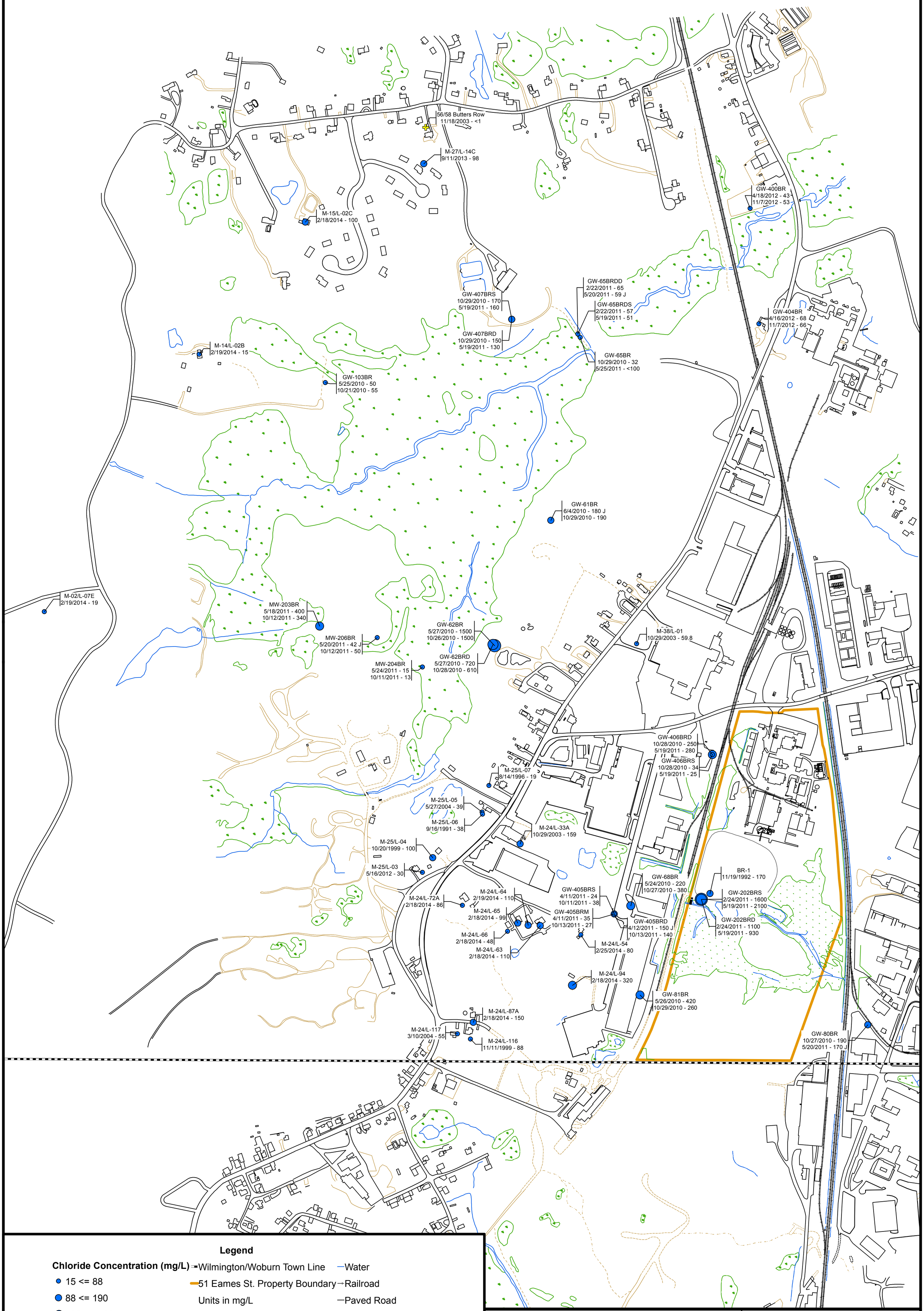

Legend

Chloride Concentration (mg/L)

- 15 <= 88
- 88 <= 190
- 190 <= 420
- 420 <= 1100
- 1100 <= 2100

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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N

0 300 600 Feet

Figure
Chloride Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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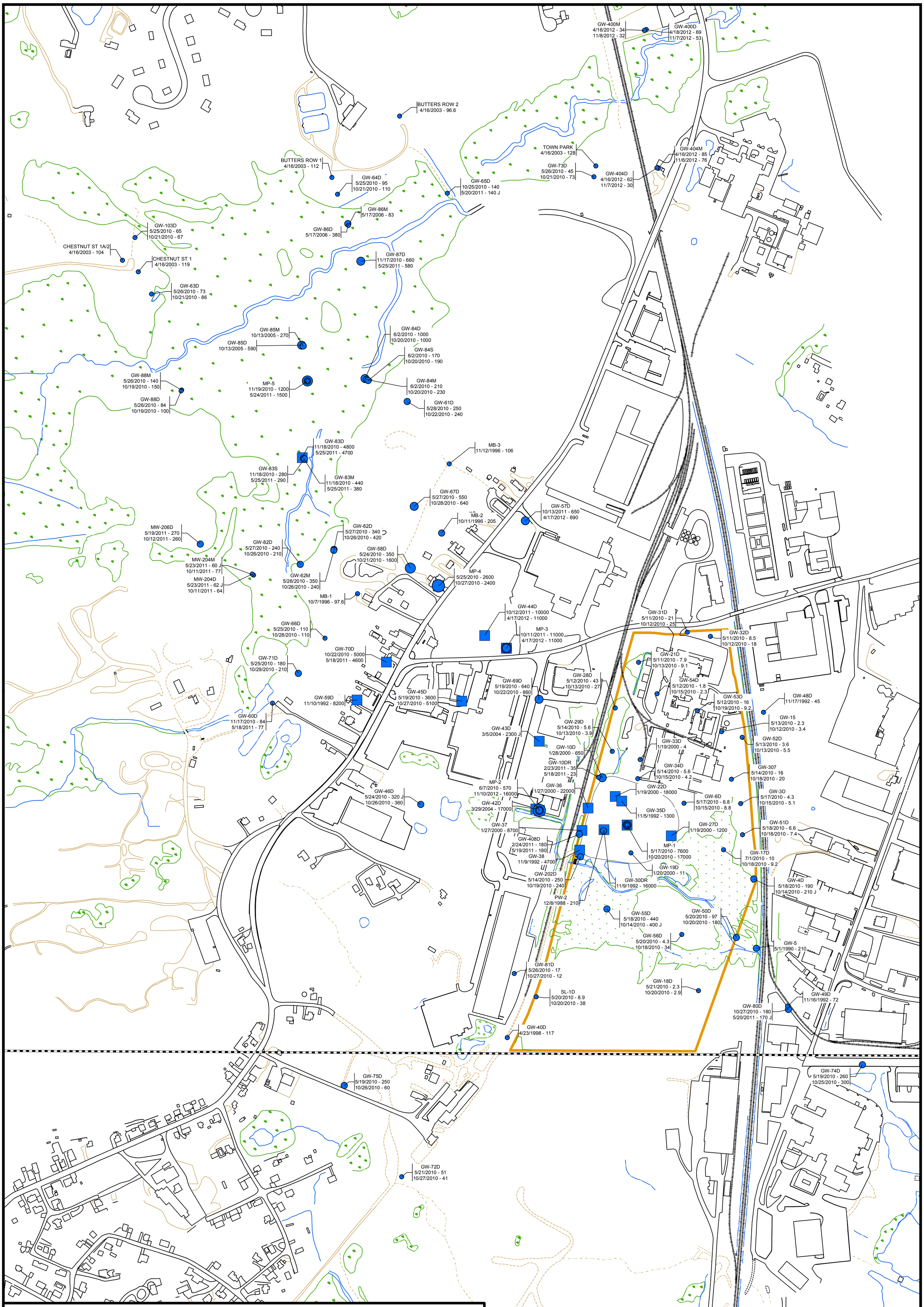

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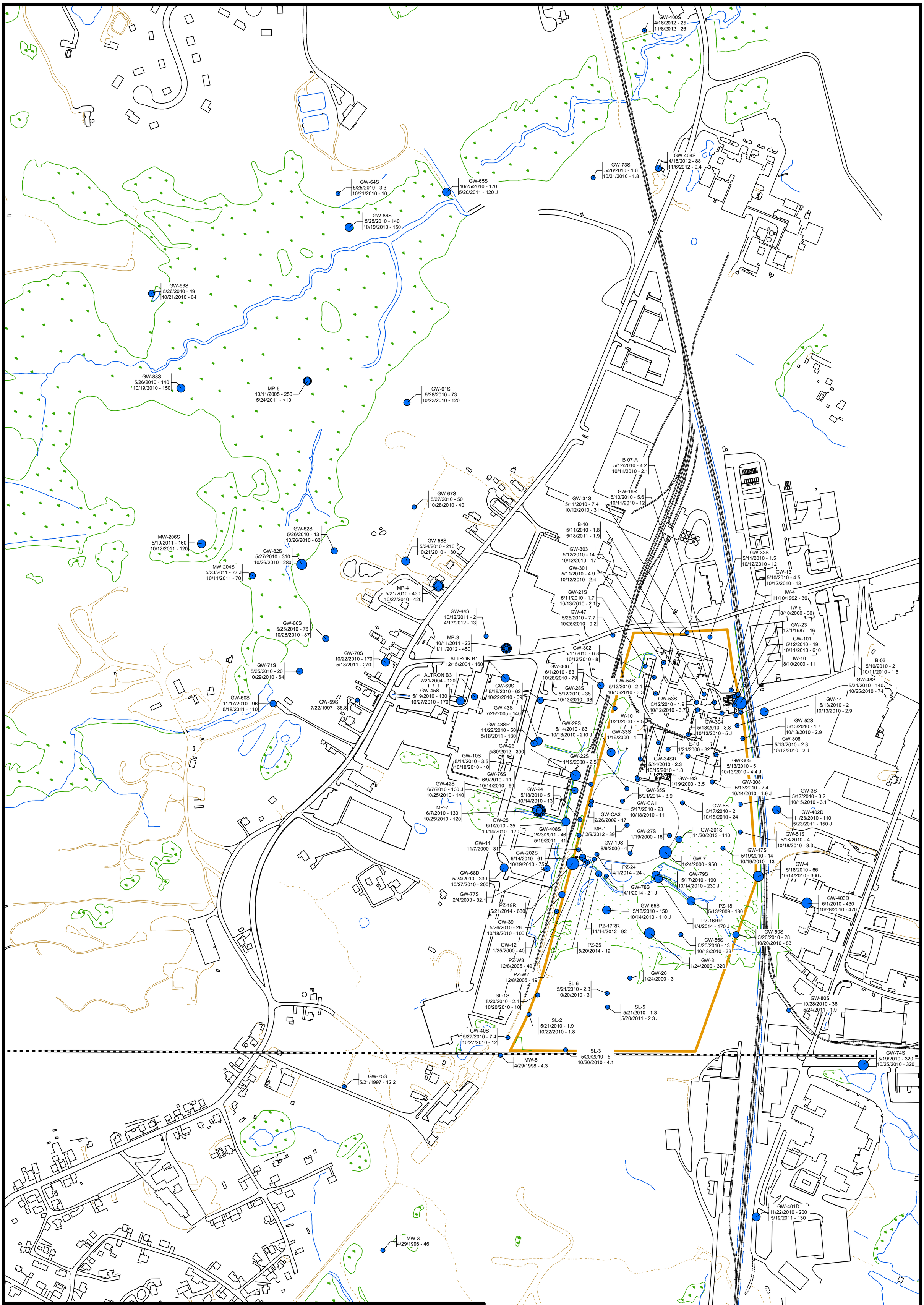

Legend

Chloride Concentration (mg/L)

- 1.8 <= 50
- 50 <= 130
- 130 <= 270
- 270 <= 530
- 530 <= 950

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 250 500 Feet

Figure
Chloride Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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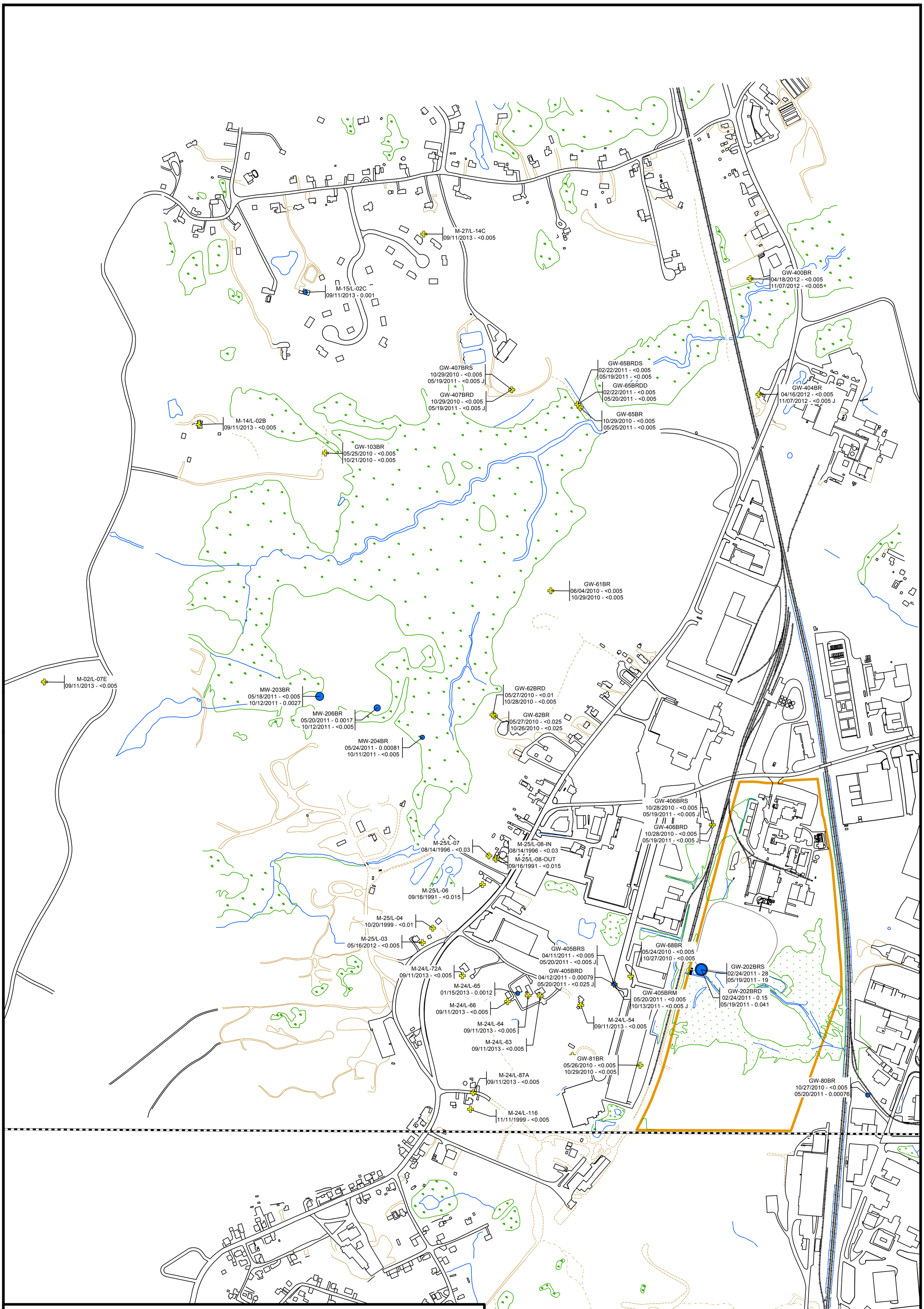

Legend

Chromium Concentration (mg/L)

- 0.00076 <= 0.0012
- 0.0012 <= 0.0017
- 0.0017 <= 0.0027
- 0.0027 <= 0.15
- 0.15 <= 28

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 300 600 Feet

Figure
Chromium Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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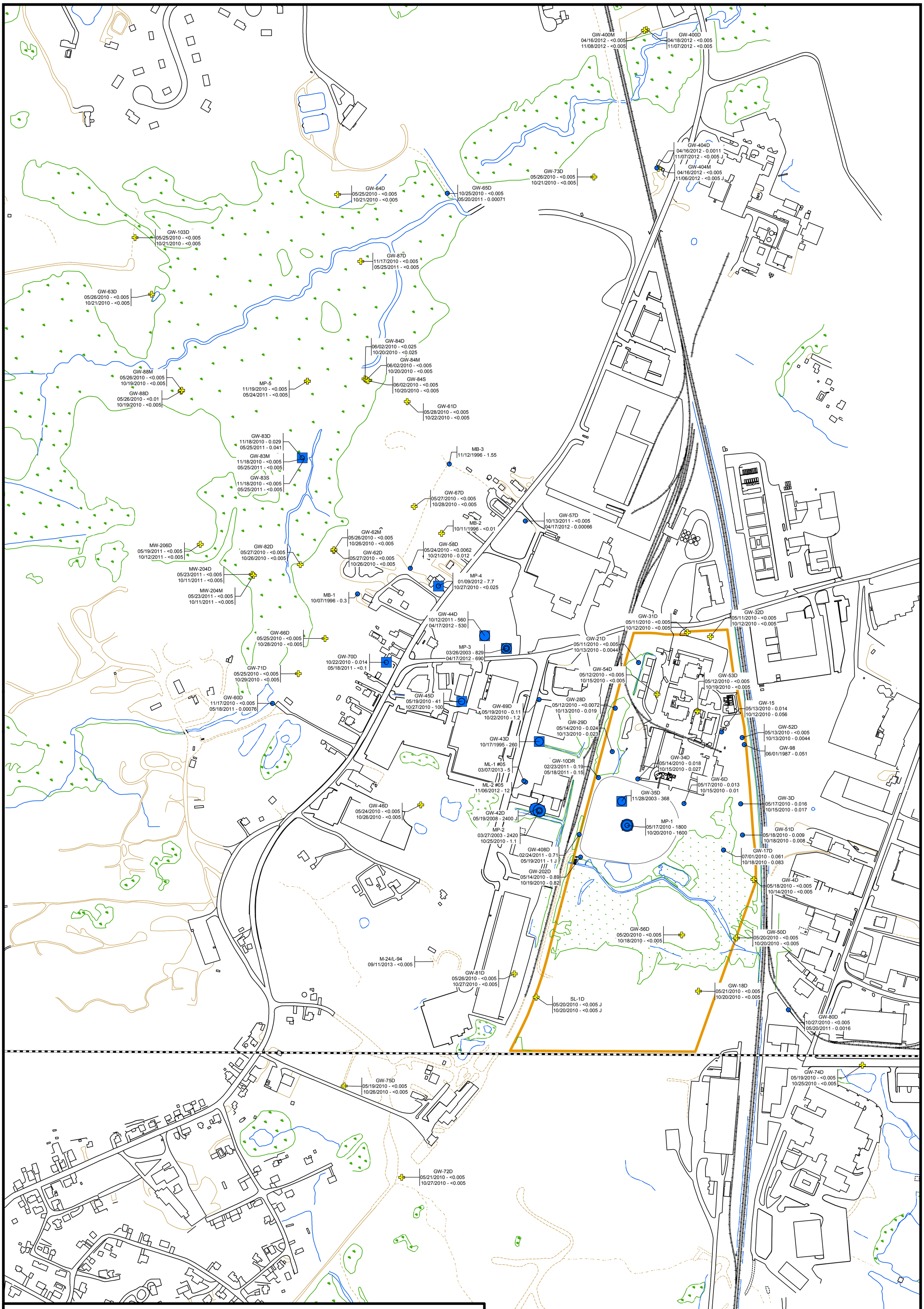

Legend

Chromium Concentration (mg/L)

- 0.00066 <= 12
- 12 <= 100
- 100 <= 368
- 368 <= 829
- 829 <= 2420
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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N

0 250 500 Feet

Figure
Chromium Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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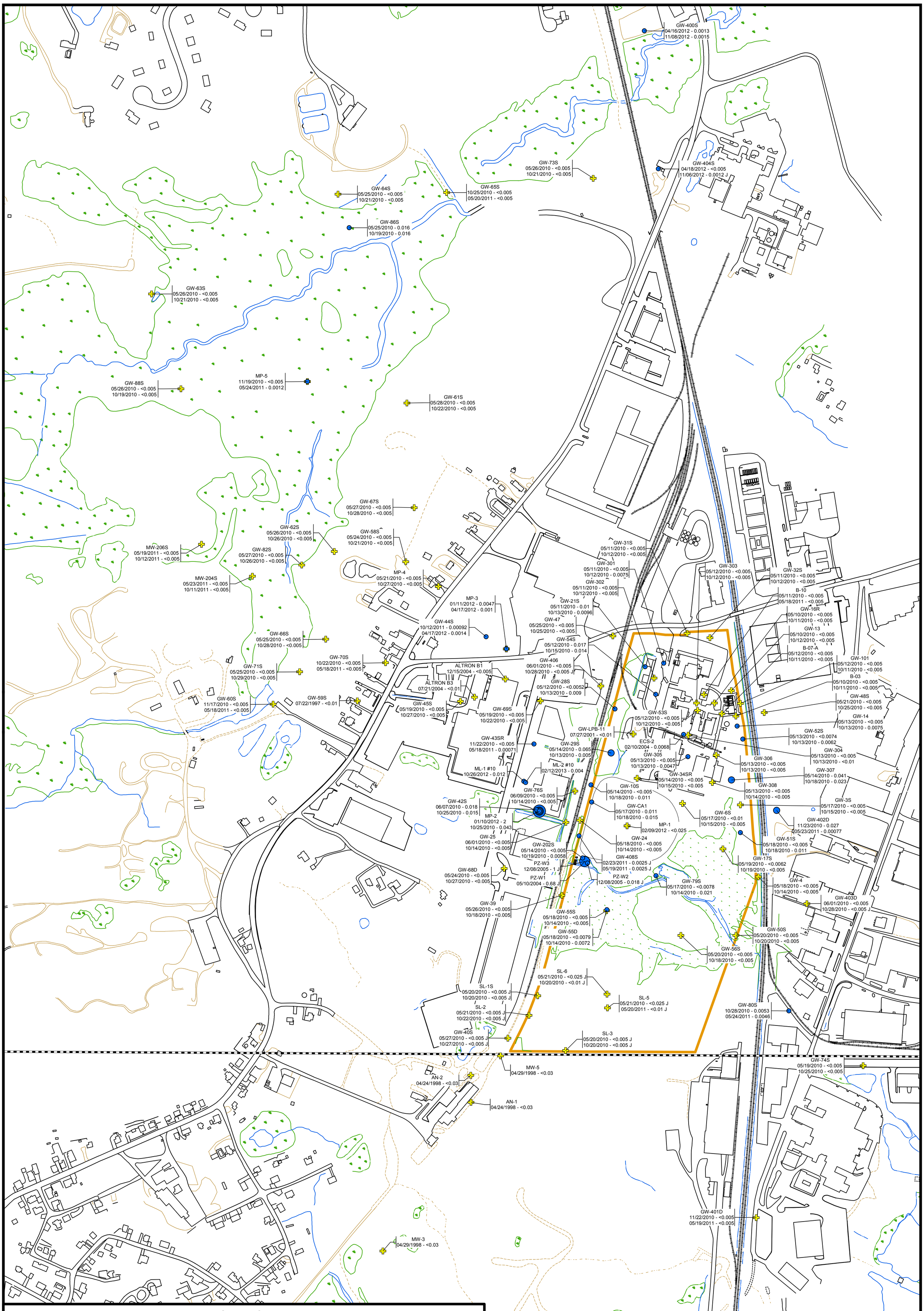

Legend

Chromium Concentration (mg/L)

- 0.00071 <= 0.021
- 0.021 <= 0.065
- 0.065 <= 0.17
- 0.17 <= 1.0
- 1.0 <= 2.0

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Chromium Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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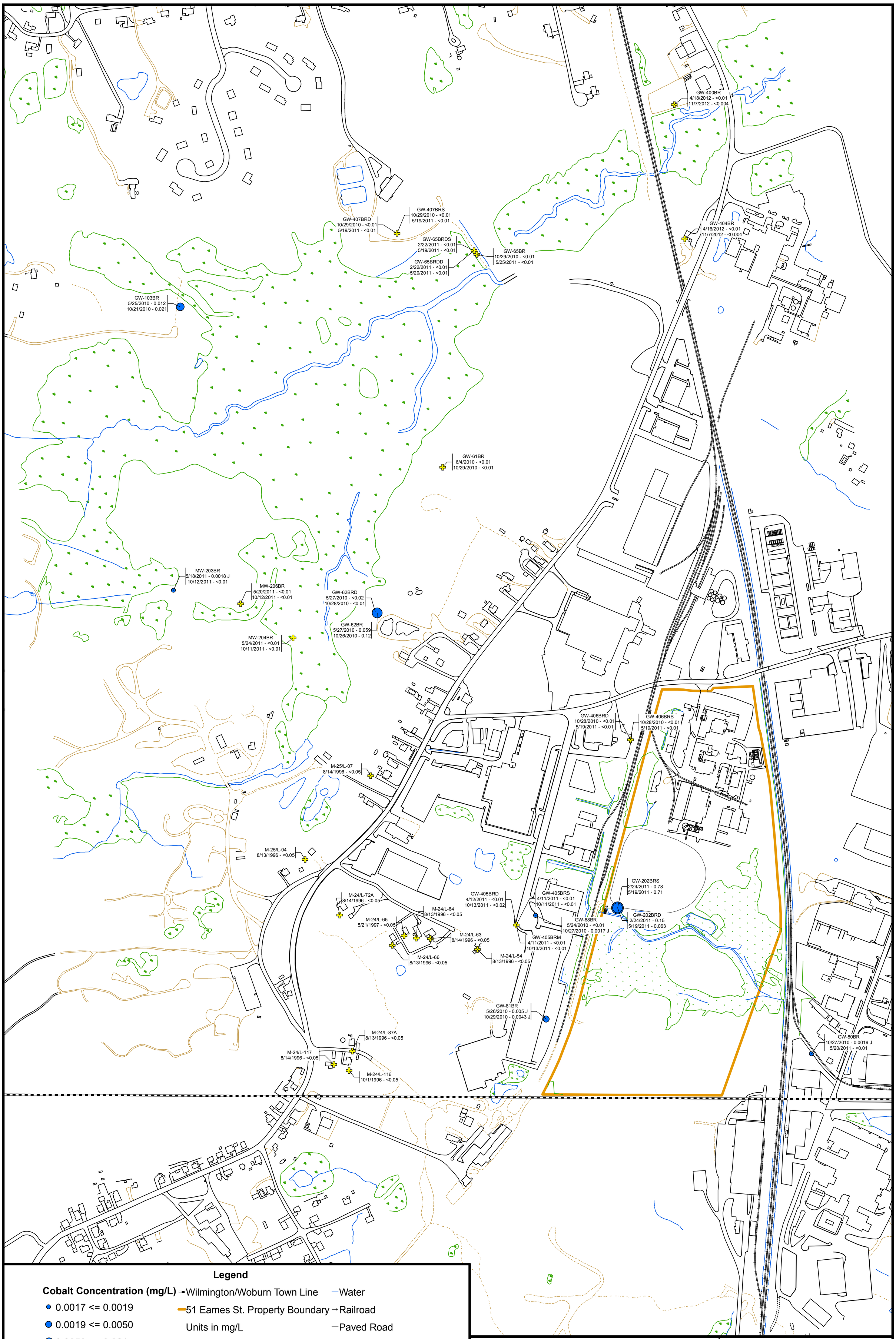

Legend

Cobalt Concentration (mg/L)

- 0.0017 <= 0.0019
- 0.0019 <= 0.0050
- 0.0050 <= 0.021
- 0.021 <= 0.15
- 0.15 <= 0.78

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

0 250 500 Feet

Figure
Cobalt Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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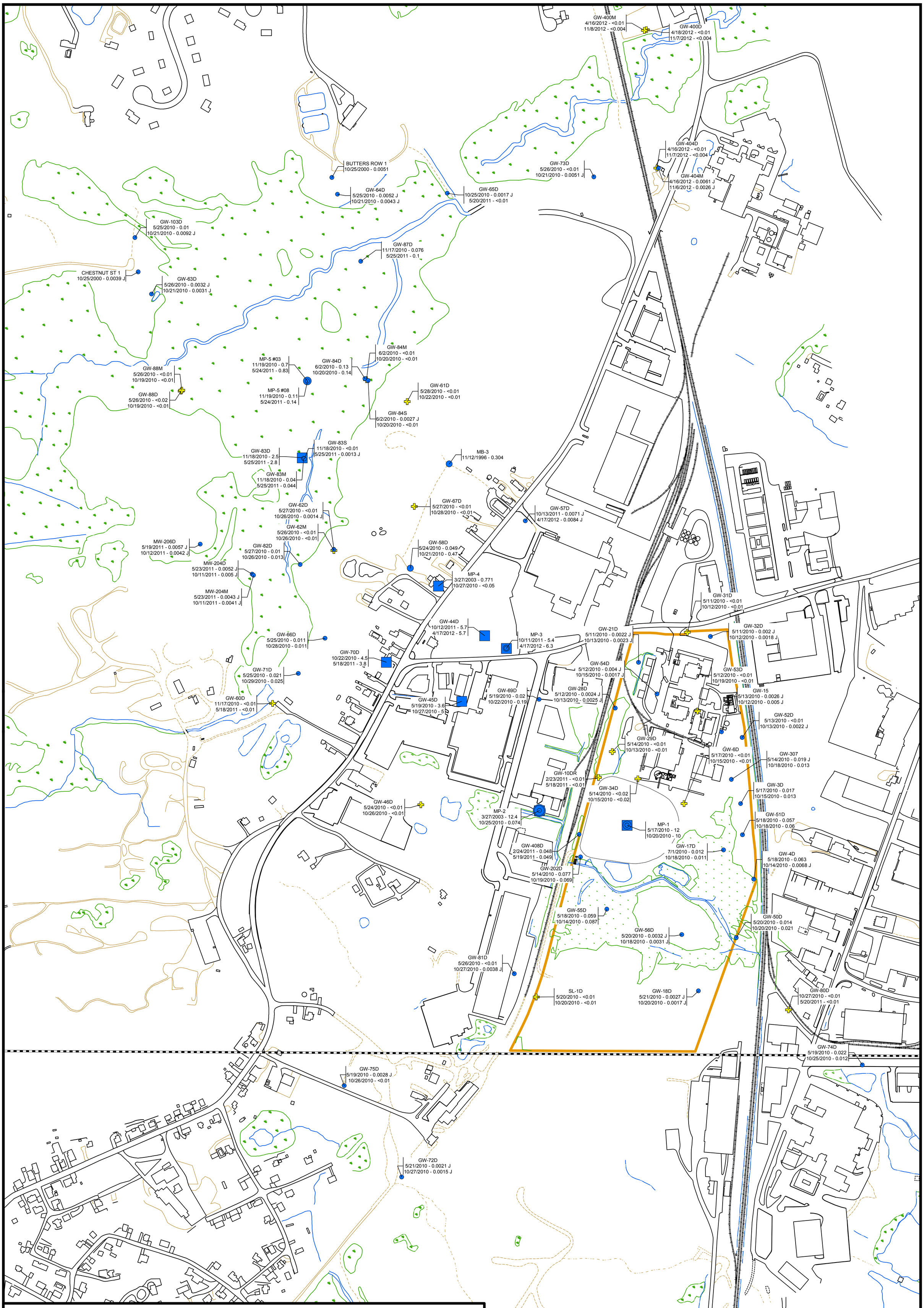

Legend

Cobalt Concentration (mg/L)

- 0.0013 <= 0.19
- 0.19 <= 0.47
- 0.47 <= 0.83
- 0.83 <= 2.28
- 2.28 <= 5.93

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Cobalt Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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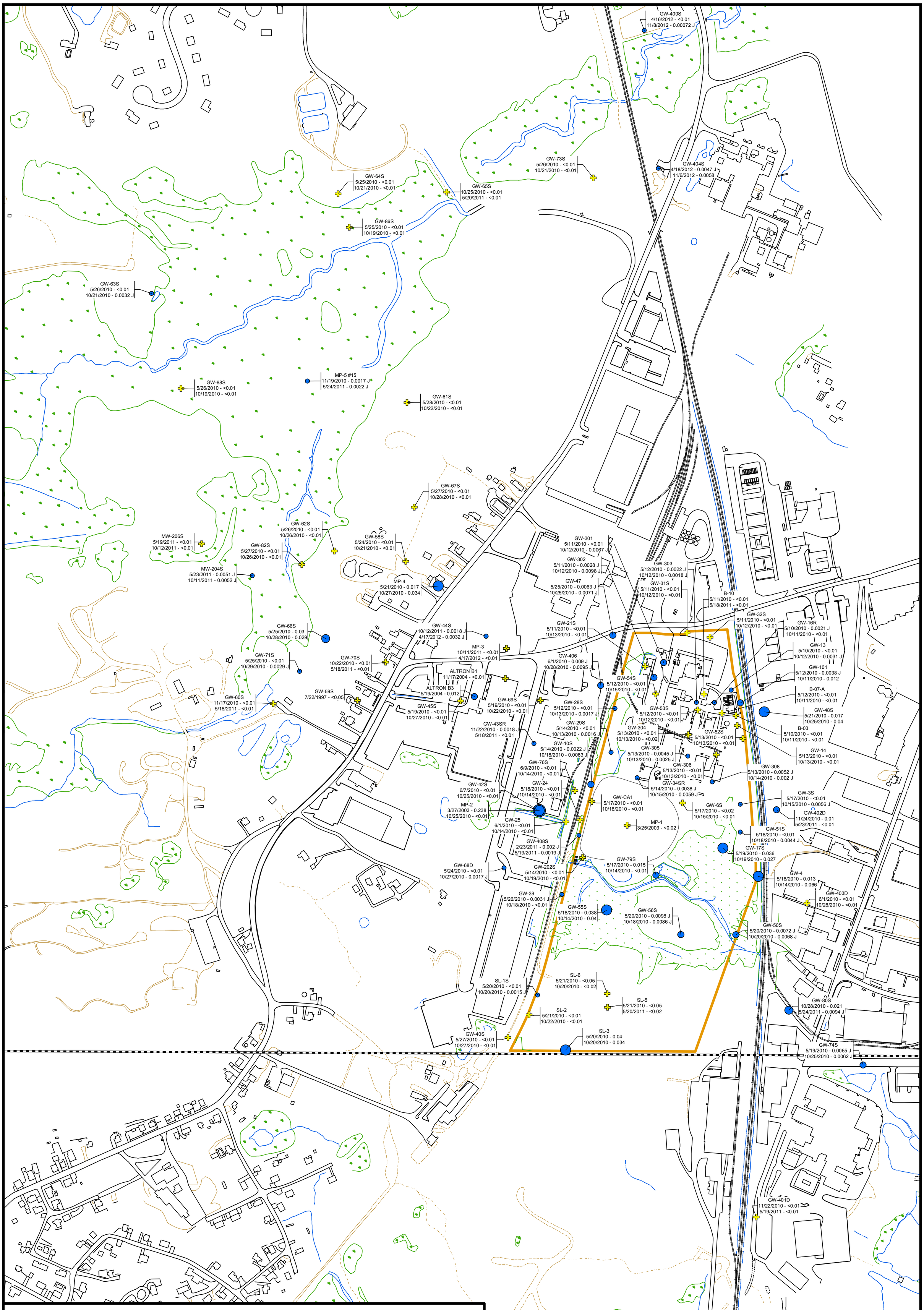

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GW-400BR
04/18/2012 - <0.01
11/07/2012 - <0.01

GW-407BRS
10/29/2010 - <0.01
05/19/2011 - <0.01 J

GW-407BRD
10/29/2010 - <0.01
05/19/2011 - <0.01 J

GW-65BRDS
02/22/2011 - <0.01
05/19/2011 - <0.01

GW-65BRDD
02/22/2011 - <0.01
05/20/2011 - <0.01

GW-65BR
10/29/2010 - <0.01
05/25/2011 - <0.01

GW-404BR
04/16/2012 - <0.01
11/07/2012 - <0.01 J

GW-103BR
05/25/2010 - <0.01
10/21/2010 - <0.01

GW-61BR
06/04/2010 - <0.01
10/29/2010 - <0.01

MW-203BR
05/18/2011 - <0.01
10/12/2011 - <0.01

MW-206BR
05/20/2011 - <0.01
10/12/2011 - <0.01

MW-204BR
05/24/2011 - <0.01
10/11/2011 - <0.01

GW-62BRD
05/27/2010 - <0.02
10/28/2010 - <0.01

GW-62BR
05/27/2010 - <0.05
10/26/2010 - <0.05

GW-406BRS
10/28/2010 - <0.01
05/19/2011 - <0.01 J

GW-406BRD
10/28/2010 - <0.01
05/19/2011 - <0.01 J

M-25/L-07
08/14/1996 - <0.02

M-25/L-06
09/16/1991 - 0.042

M-25/L-04
08/13/1996 - 0.043

M-25/L-03
09/16/1991 - 0.04

GW-405BRS
04/11/2011 - 0.0028
05/20/2011 - <0.01 J

GW-68BR
05/24/2010 - <0.01
10/27/2010 - <0.01

M-24/L-72A
08/14/1996 - <0.02

GW-405BRD
10/13/2011 - 0.013
04/11/2011 - 0.0026

GW-202BRS
02/24/2011 - 0.23
05/19/2011 - 0.11

GW-202BRD
02/24/2011 - <0.02
05/19/2011 - <0.02

M-24/L-65
05/21/1997 - 0.019

GW-405BRM
05/20/2011 - <0.01
10/13/2011 - <0.01 J

M-24/L-66
08/13/1996 - <0.02

M-24/L-54
08/13/1996 - <0.02

M-24/L-64
08/13/1996 - <0.02

M-24/L-63
08/14/1996 - <0.02

GW-81BR
05/26/2010 - 0.0072
10/29/2010 - <0.011

GW-80BR
10/27/2010 - <0.021
05/20/2011 - <0.01

M-24/L-87A
08/13/1996 - <0.02

M-24/L-117
08/14/1996 - <0.02

M-24/L-116
10/01/1996 - <0.02

Legend

Copper Concentration (mg/L)

- 0.0028
- 0.00281 <= 0.0073
- 0.0073 <= 0.019
- 0.019 <= 0.043
- 0.043 <= 0.23

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Copper Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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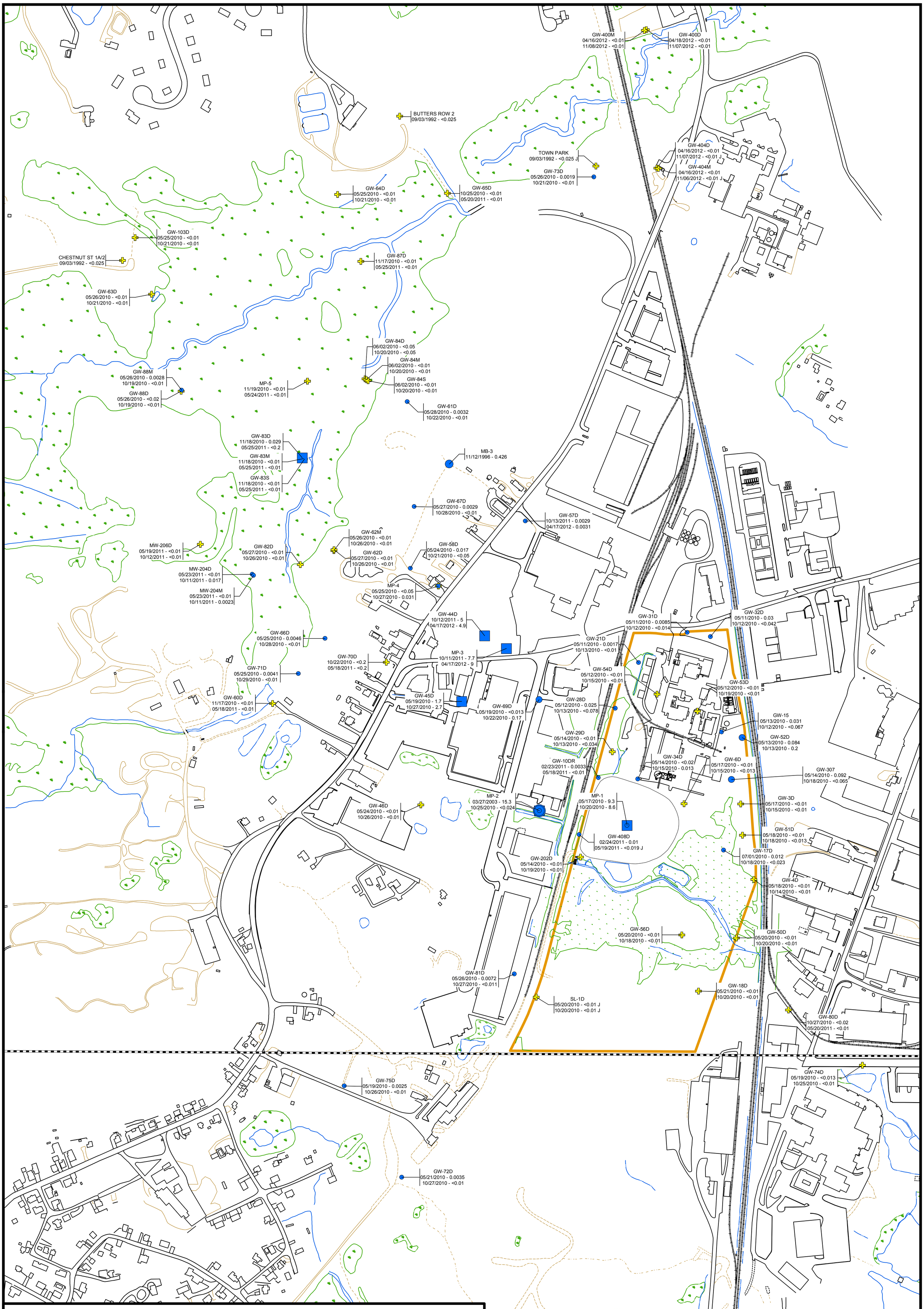

Legend

Copper Concentration (mg/L)

- 0.0017 <= 0.069
- 0.069 <= 0.20
- 0.20 <= 0.426
- 0.426 <= 1.47
- 1.47 <= 5.83
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Copper Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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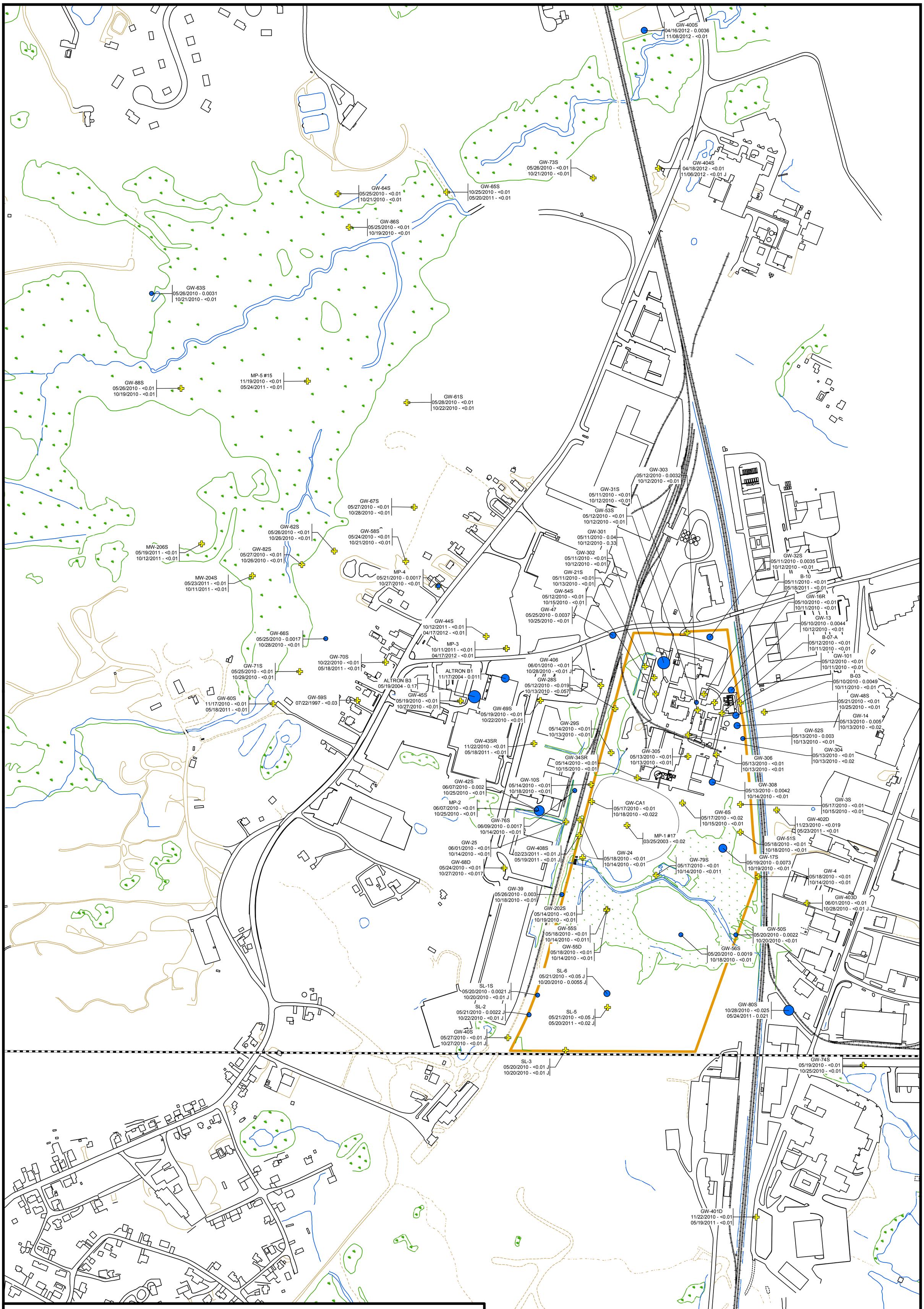

Legend

Copper Concentration (mg/L)

- 0.0017 <= 0.0032
- 0.0032 <= 0.0055
- 0.0055 <= 0.011
- 0.011 <= 0.029
- 0.029 <= 0.33

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Copper Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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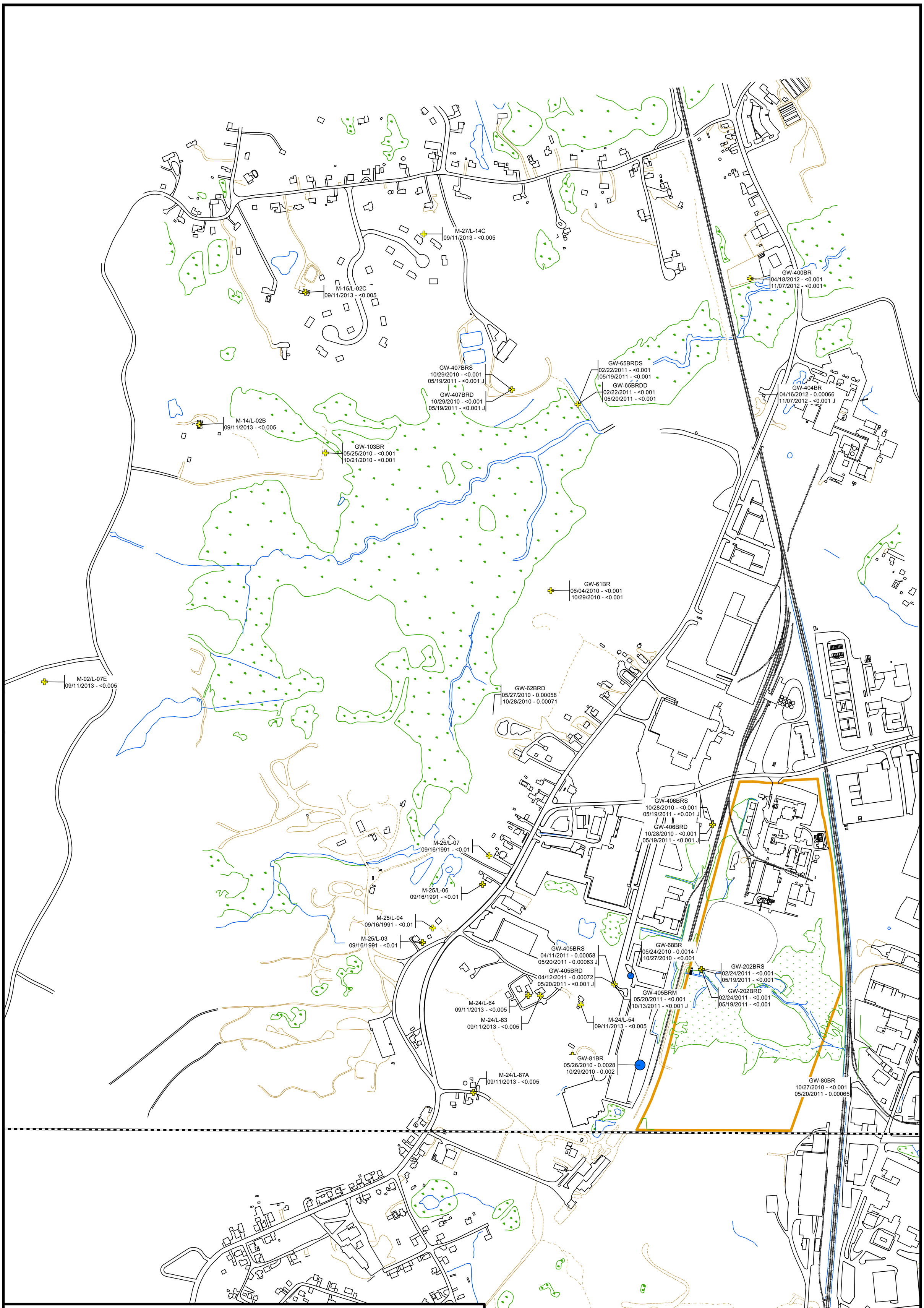

Legend

Hexavalent Chromium Concentration (mg/L)

- 0.00076 - 0.0012
- 0.0012 - 0.0017
- 0.0017 - 0.0027
- 0.0027 - 0.15
- 0.15 - 28

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 300 600 Feet

Figure
Hexavalent Chromium Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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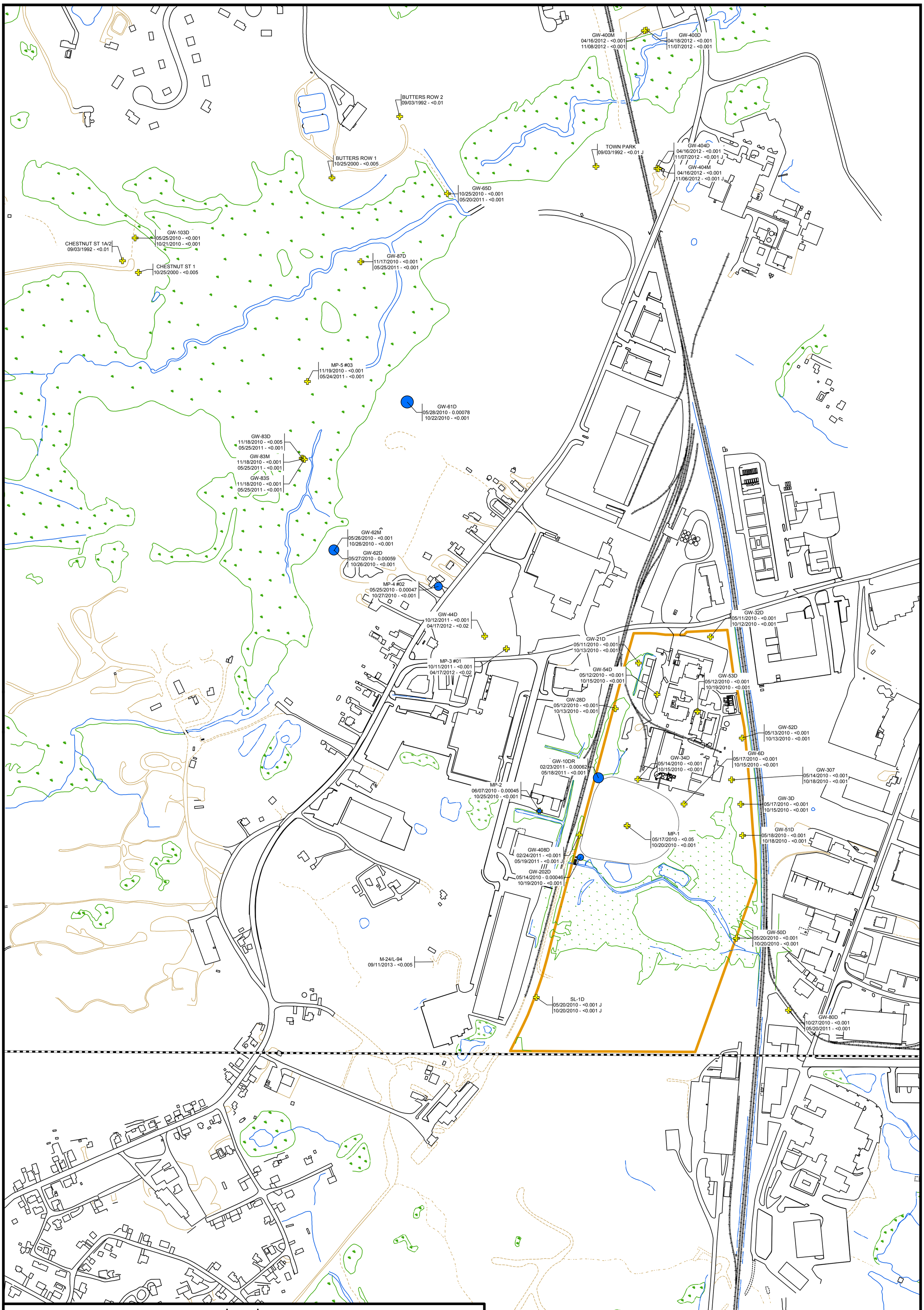

Legend

Hexavalent Chromium Concentration (mg/L)

- 0.00045
- 0.00045 <= 0.00046
- 0.00046 <= 0.00047
- 0.00047 <= 0.00062
- 0.00062 <= 0.00078

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Hexavalent Chromium Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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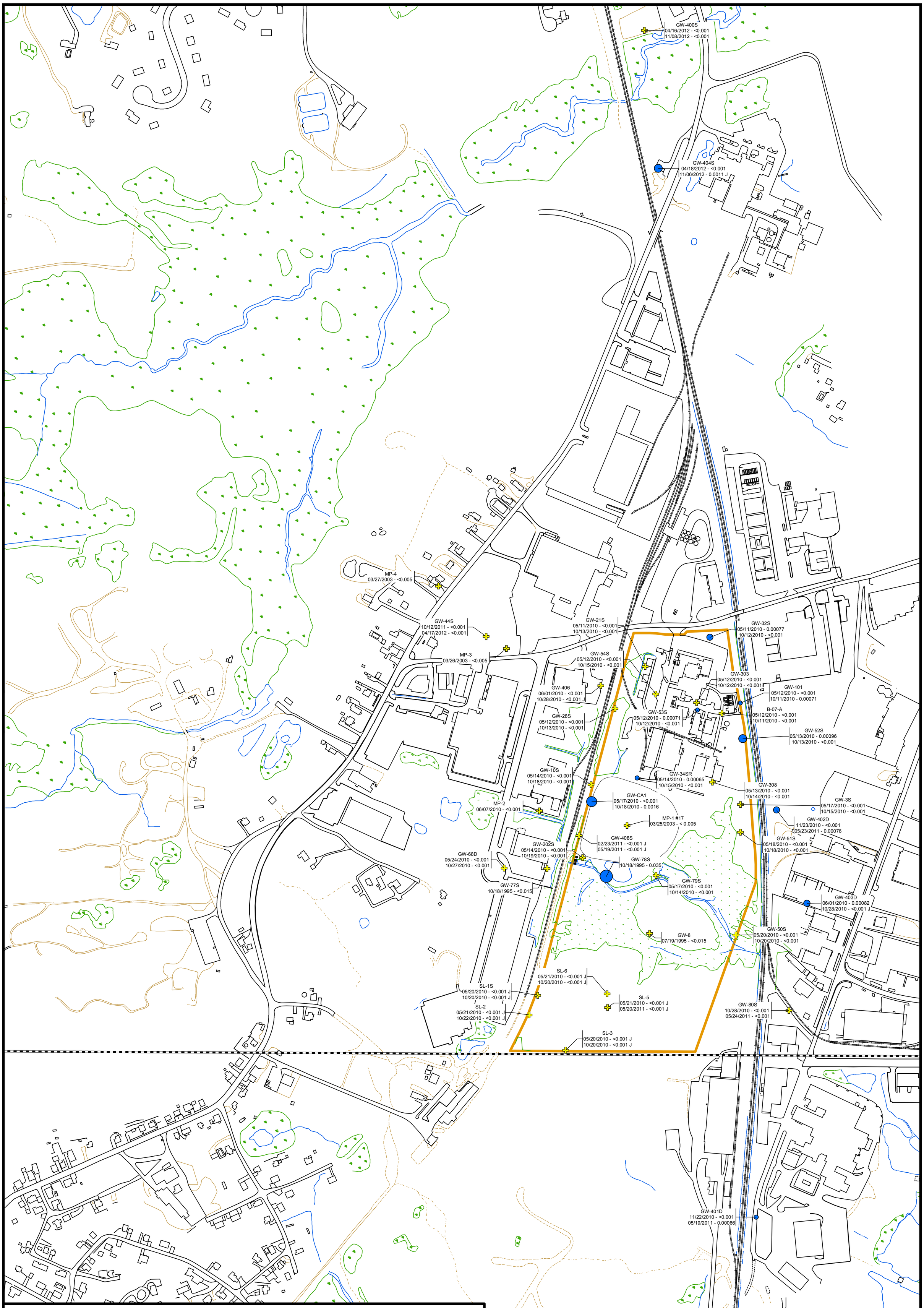

Legend

Hexavalent Chromium Concentration (mg/L)

- 0.00065 <= 0.00071
- 0.00071 <= 0.00082
- 0.00082 <= 0.0011
- 0.0011 <= 0.0016
- 0.0016 <= 0.035

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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0 250 500 Feet

Figure
Hexavalent Chromium Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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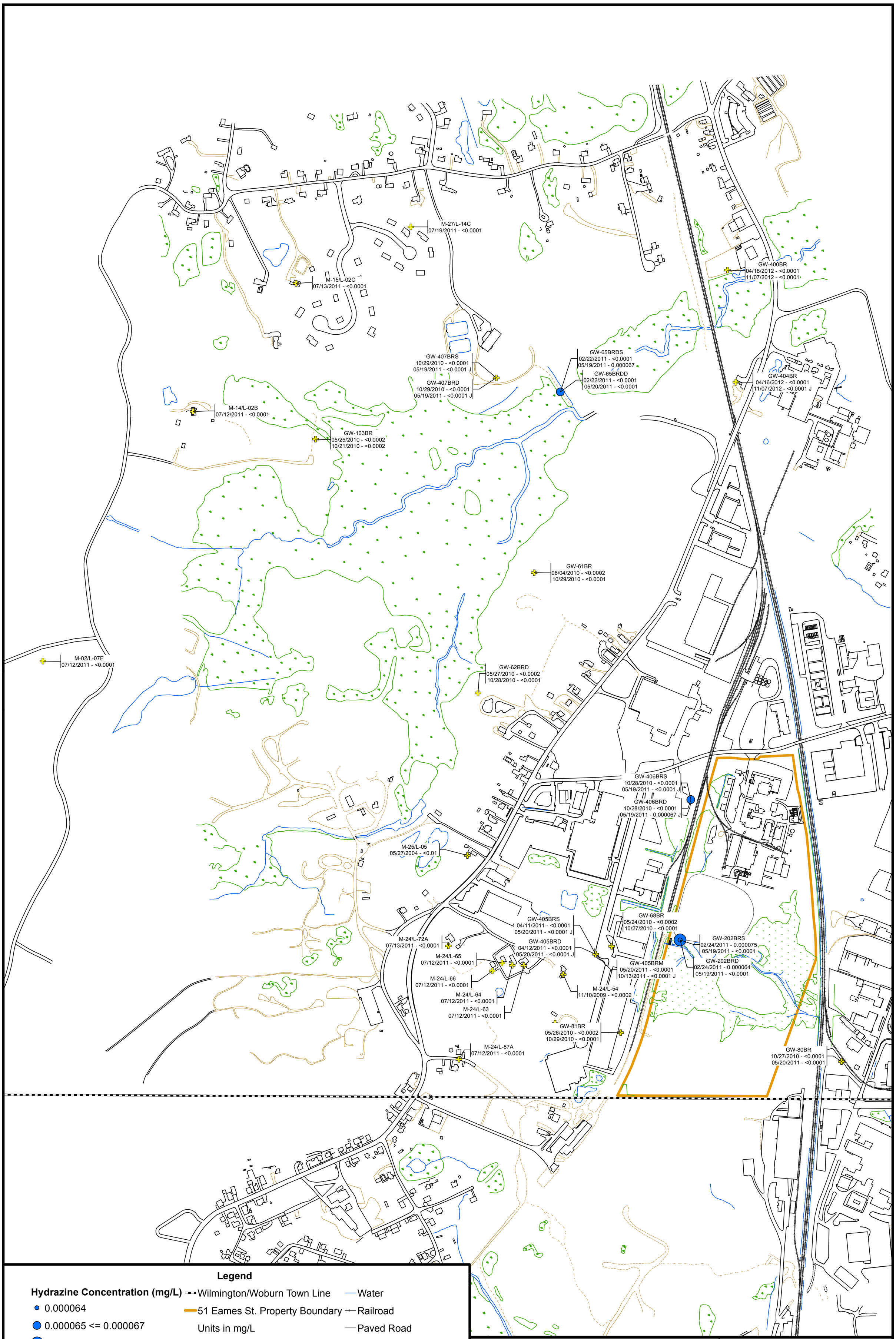

Legend

Hydrazine Concentration (mg/L)

- 0.000064
- 0.000065 <= 0.000067
- 0.000068 <= 0.000075

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 300 600 Feet

Figure
Hydrazine Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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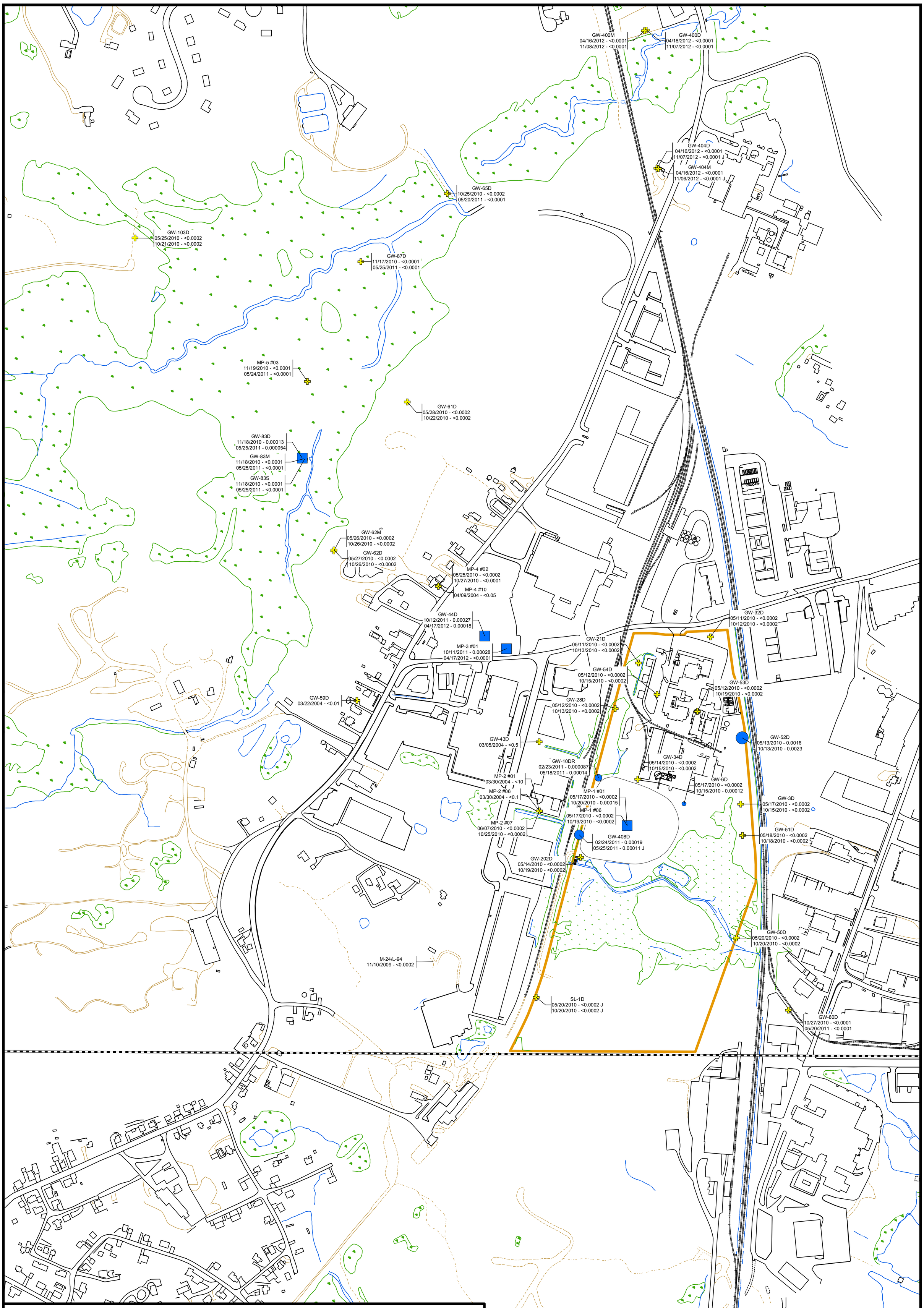

Legend

Hydrazine Concentration (mg/L)

- 0.00012
- 0.00012 <= 0.00014
- 0.00014 <= 0.00019
- 0.00019 <= 0.0023
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Hydrazine Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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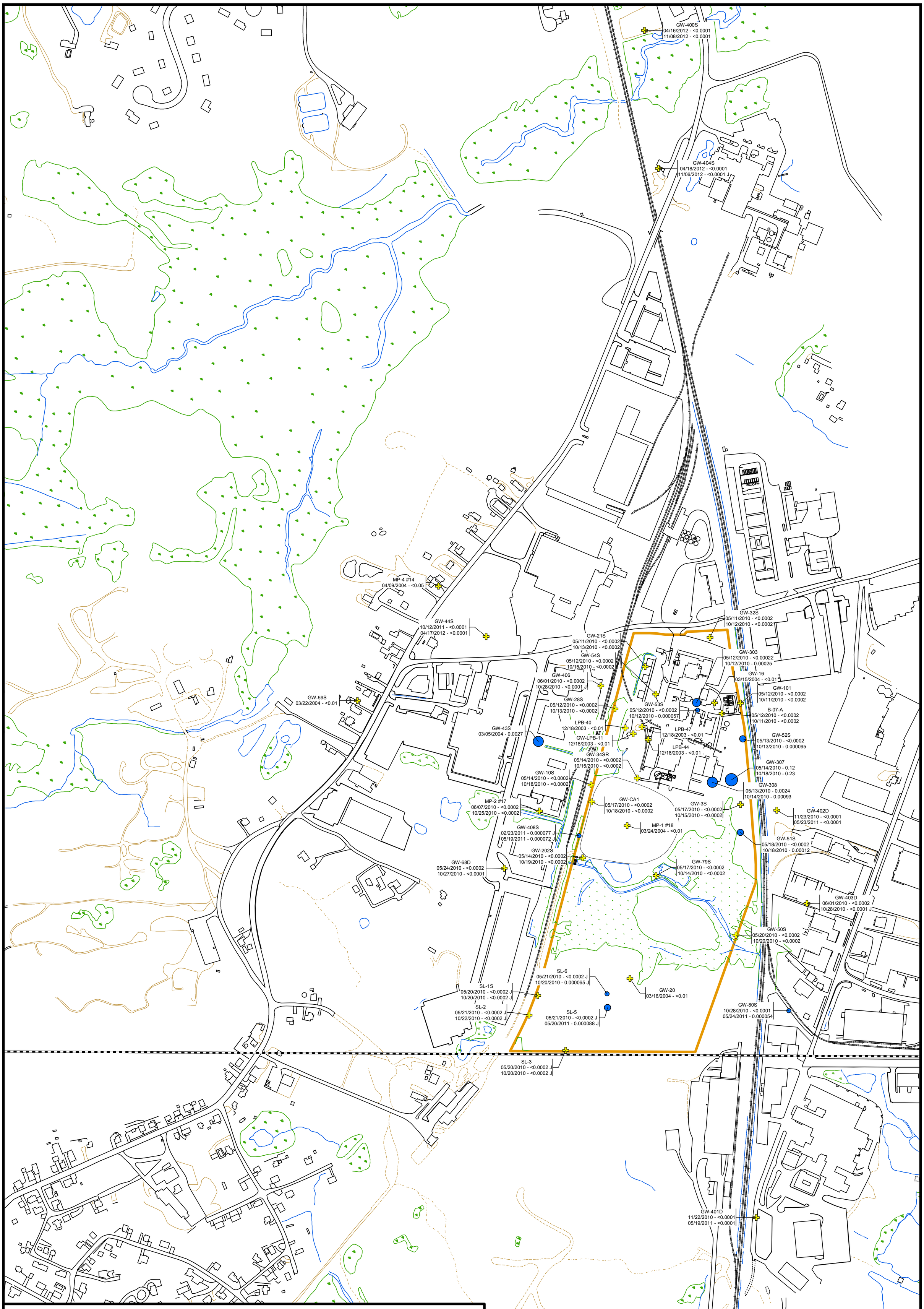

Legend

Hydrazine Concentration (mg/L)

- 0.000054 <= 0.000077
- 0.000078 <= 0.00012
- 0.00012 <= 0.00025
- 0.00025 <= 0.0027
- 0.0027 <= 0.23

Wilmington/Woburn Town Line
51 Eames St. Property Boundary
Units in mg/L
J - Estimated
Non-Detect
Water
Railroad
Paved Road
Unpaved Road
Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Hydrazine Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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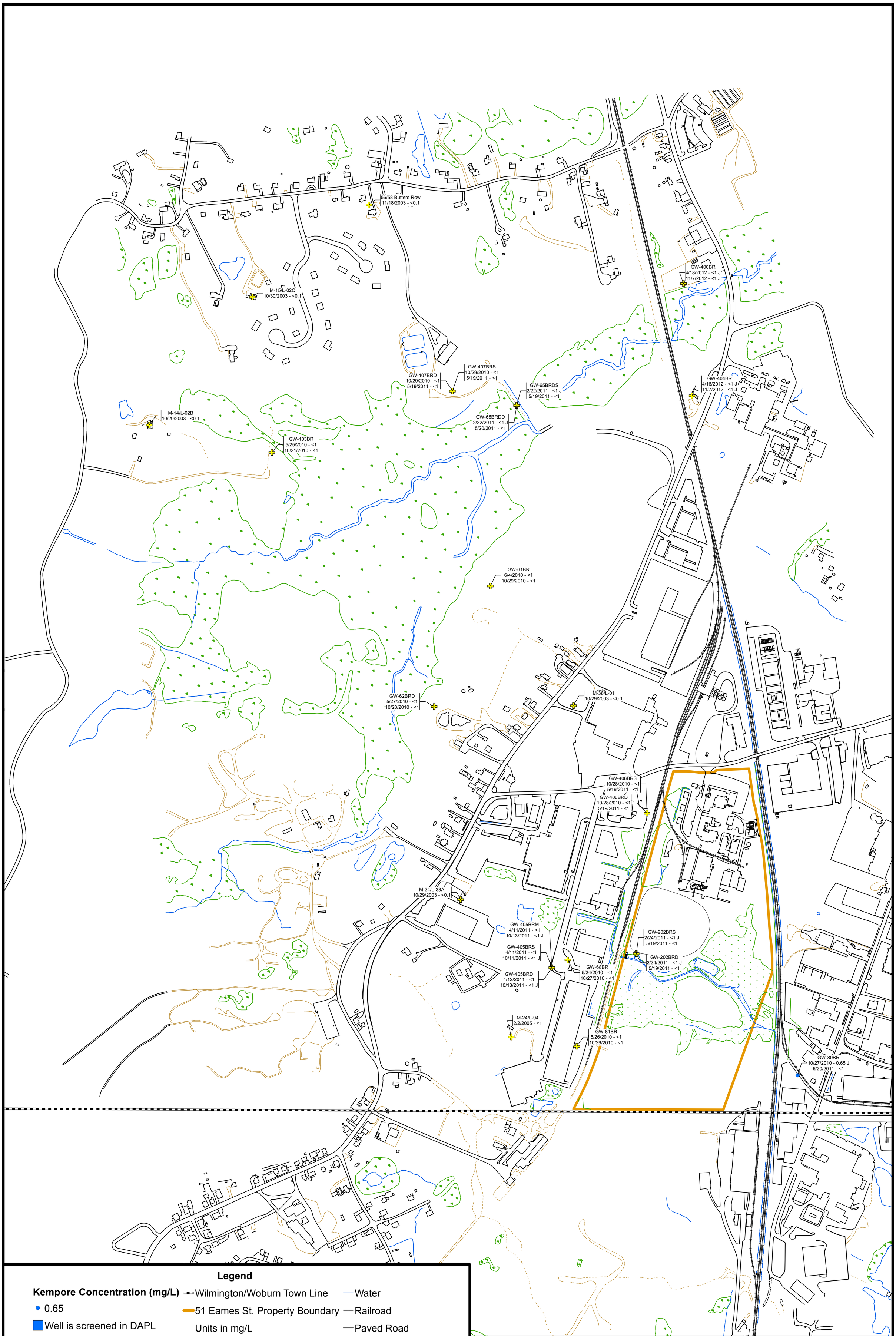

Legend

Kempore Concentration (mg/L)

- 0.65
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 300 600 Feet

Figure
Kempore Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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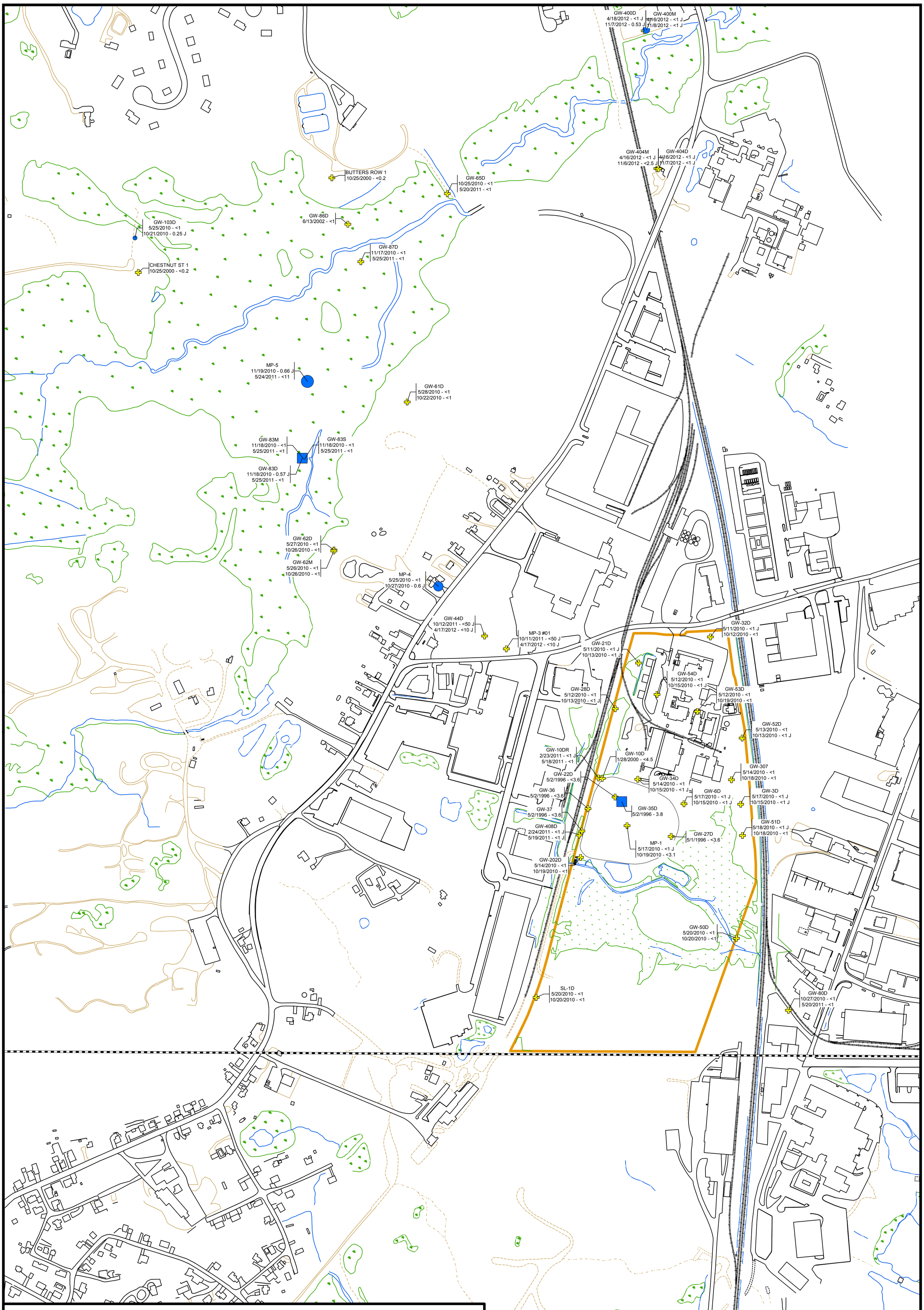

Legend

Kempore Concentration (mg/L)

- 0.25
- 0.25 <= 0.53
- 0.53 <= 0.60
- 0.60 <= 0.66
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Kempore Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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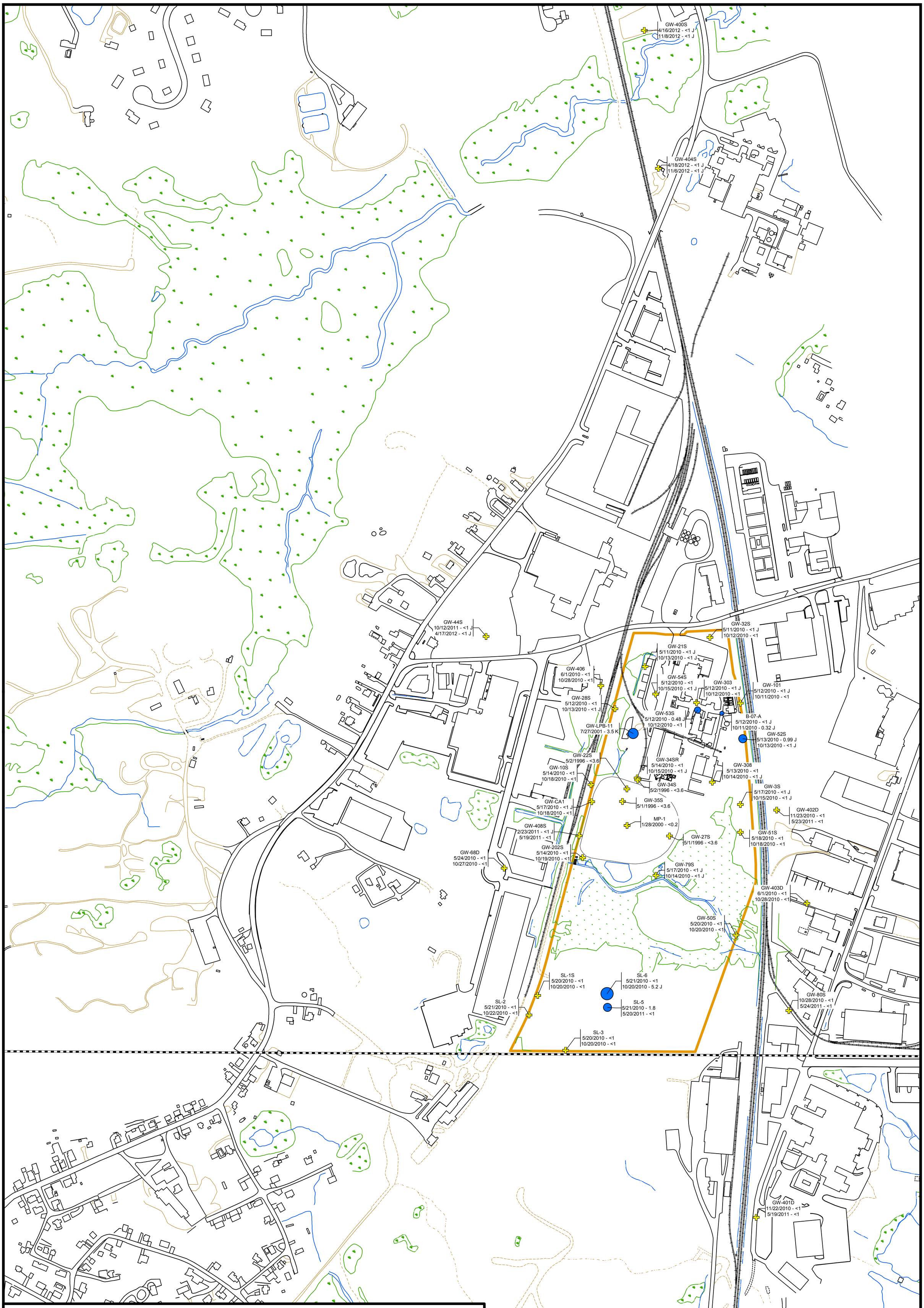

Legend

Kempore Concentration (mg/L)

- 0.32
- 0.33 <= 0.48
- 0.48 <= 1.8
- 1.8 <= 3.5
- 3.5 <= 5.2

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Kempore Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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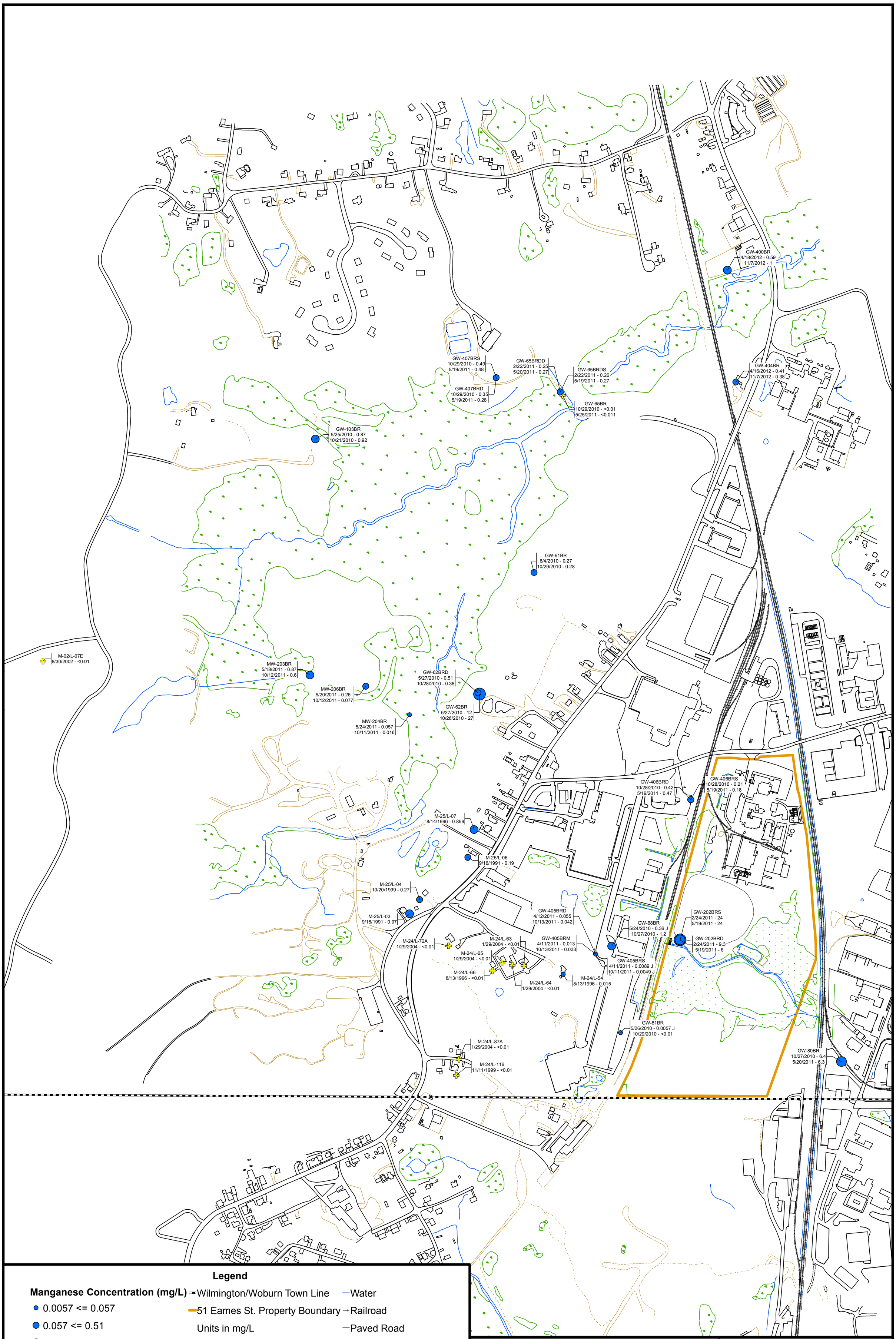

Legend

Manganese Concentration (mg/L)

- 0.0057 <= 0.057
- 0.057 <= 0.51
- 0.51 <= 1.2
- 1.2 <= 9.3
- 9.3 <= 27

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 300 600 Feet

Figure
Manganese Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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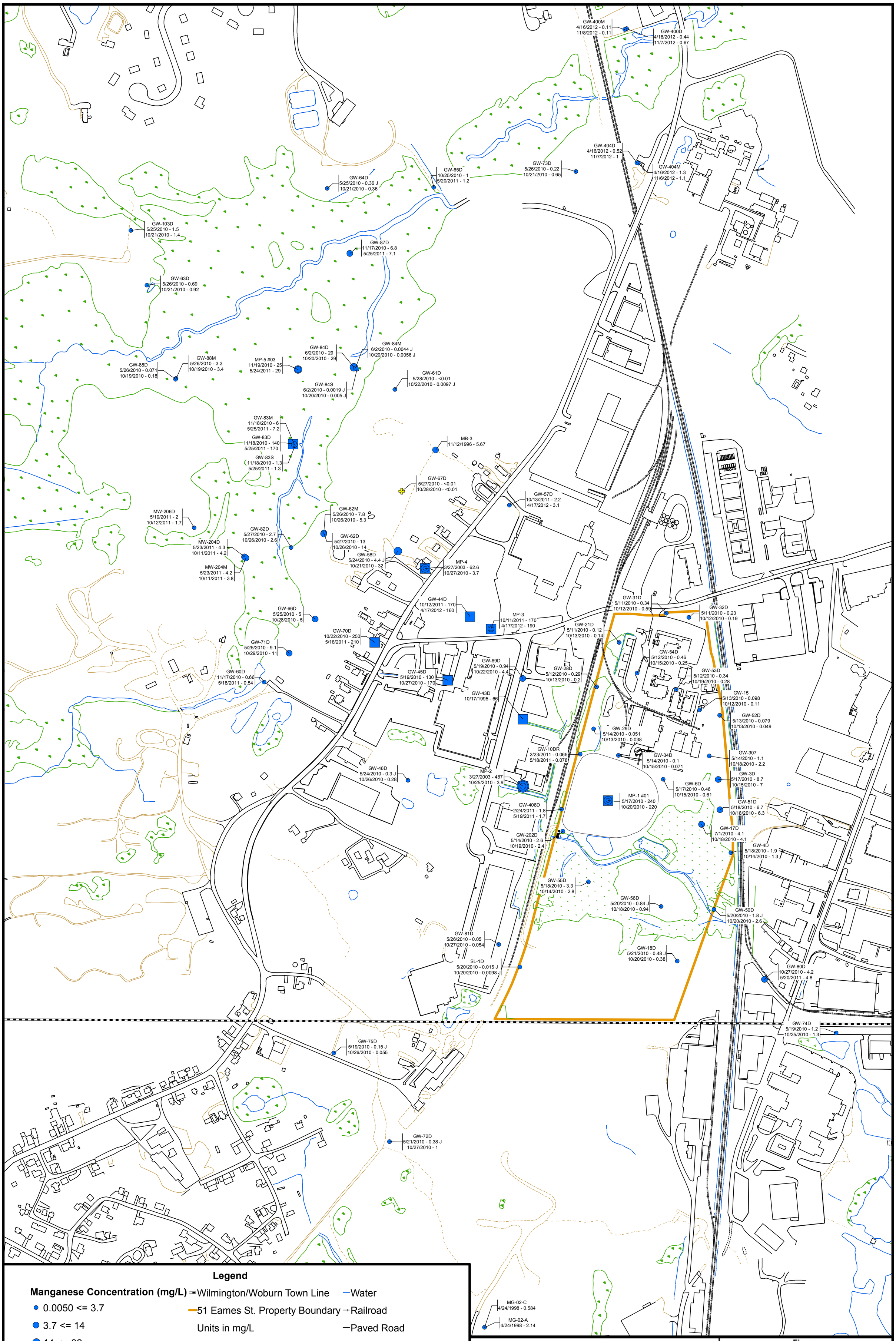

Legend

Manganese Concentration (mg/L)

- 0.0050 <= 3.7
- 3.7 <= 14
- 14 <= 32
- 32 <= 87.6
- 87.6 <= 212
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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0 250 500 Feet

Figure
Manganese Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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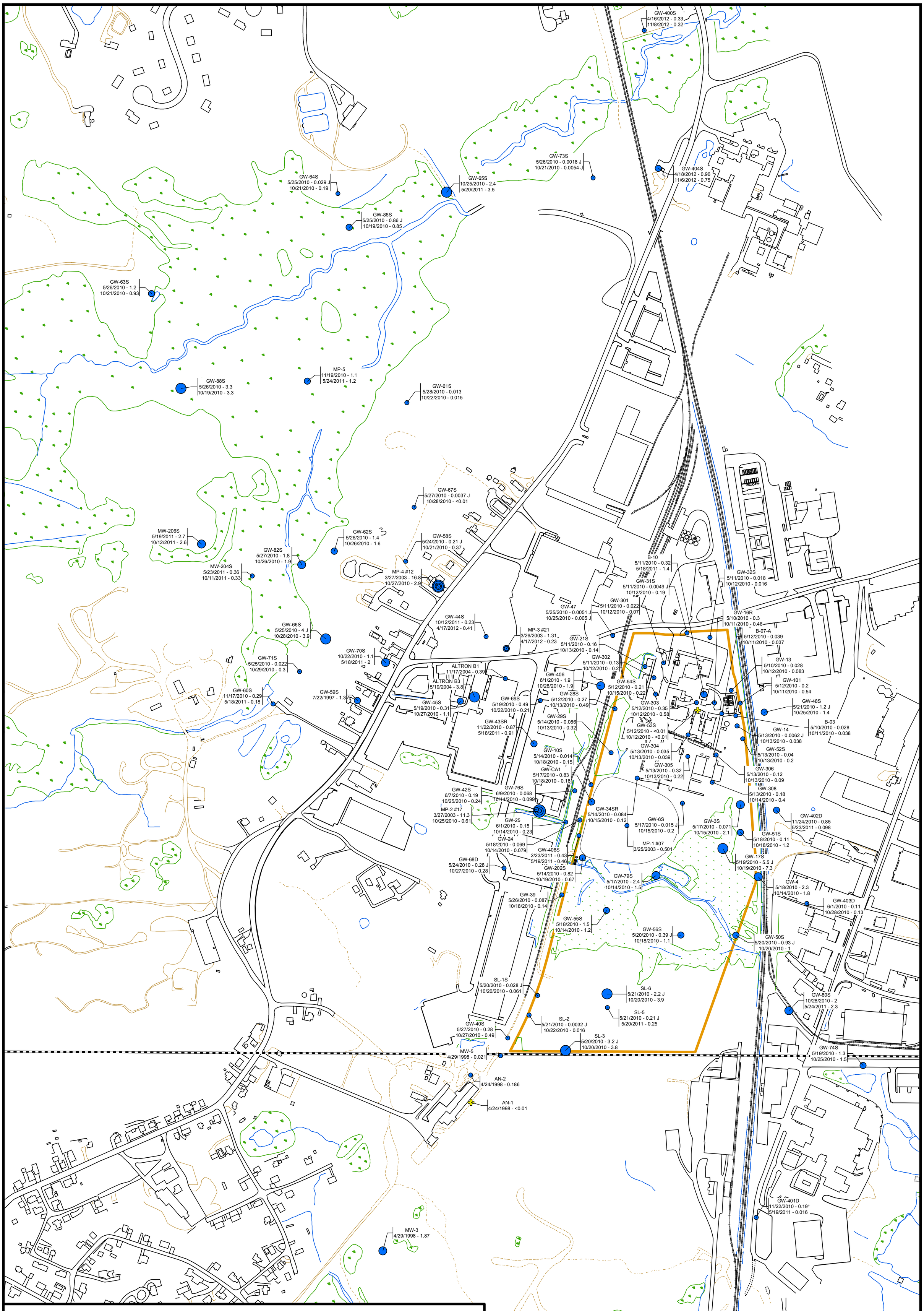

AMEC Environment & Infrastructure
271 Mill Road
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Figure
Manganese Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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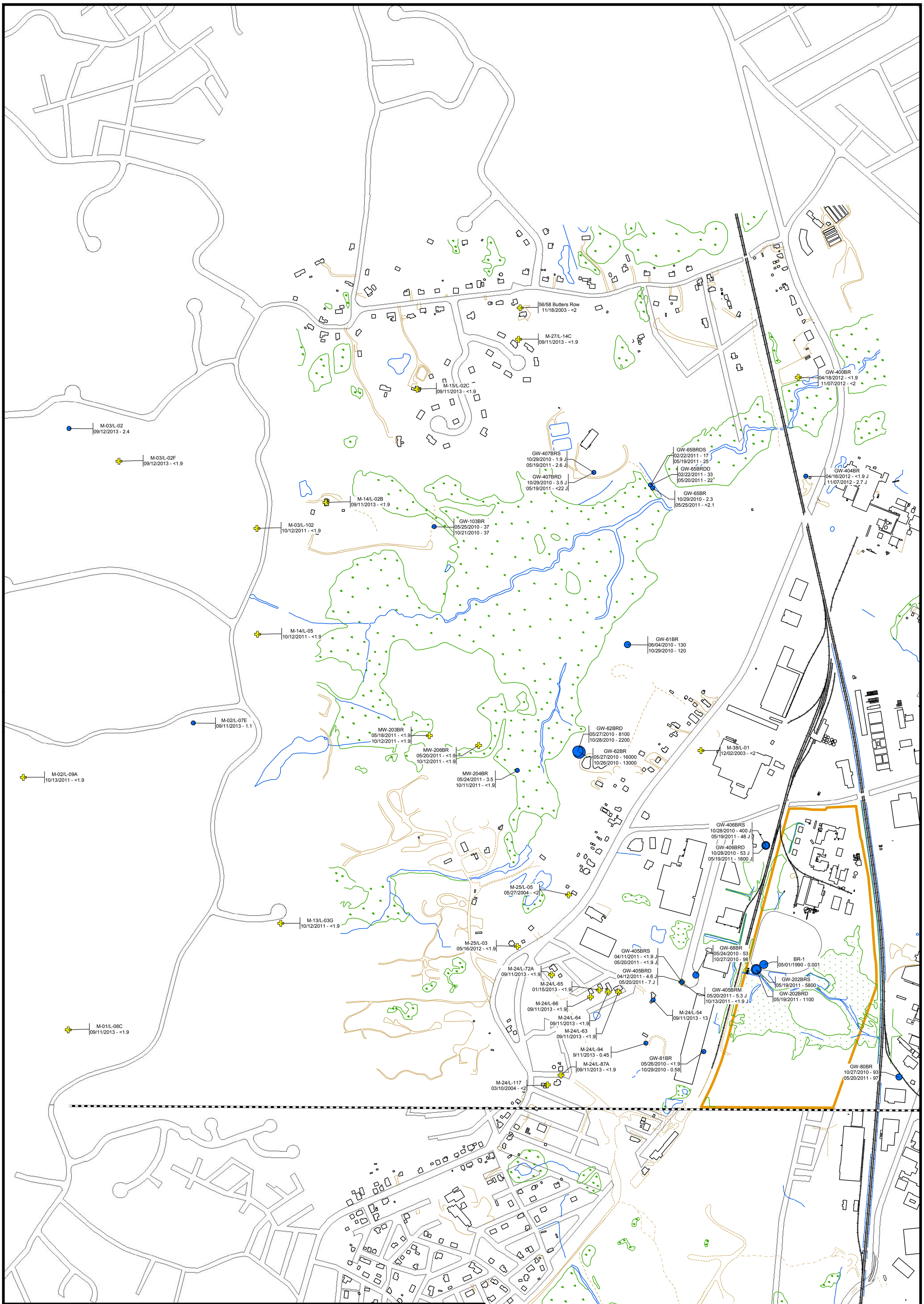

Legend

N-Nitrosodimethylamine (ng/L):

- 0.45 - 37
- 37 - 400
- 400 - 1800
- 1800 - 8100
- 8100 - 16000

Wilmington/Woburn Town Line

51 Eames St. Property Boundary

Units in ng/L

J - Estimated

N - Presumptively present

Non-Detect

Water

Railroad

Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 350 700 Feet

Figure
N-Nitrosodimethylamine Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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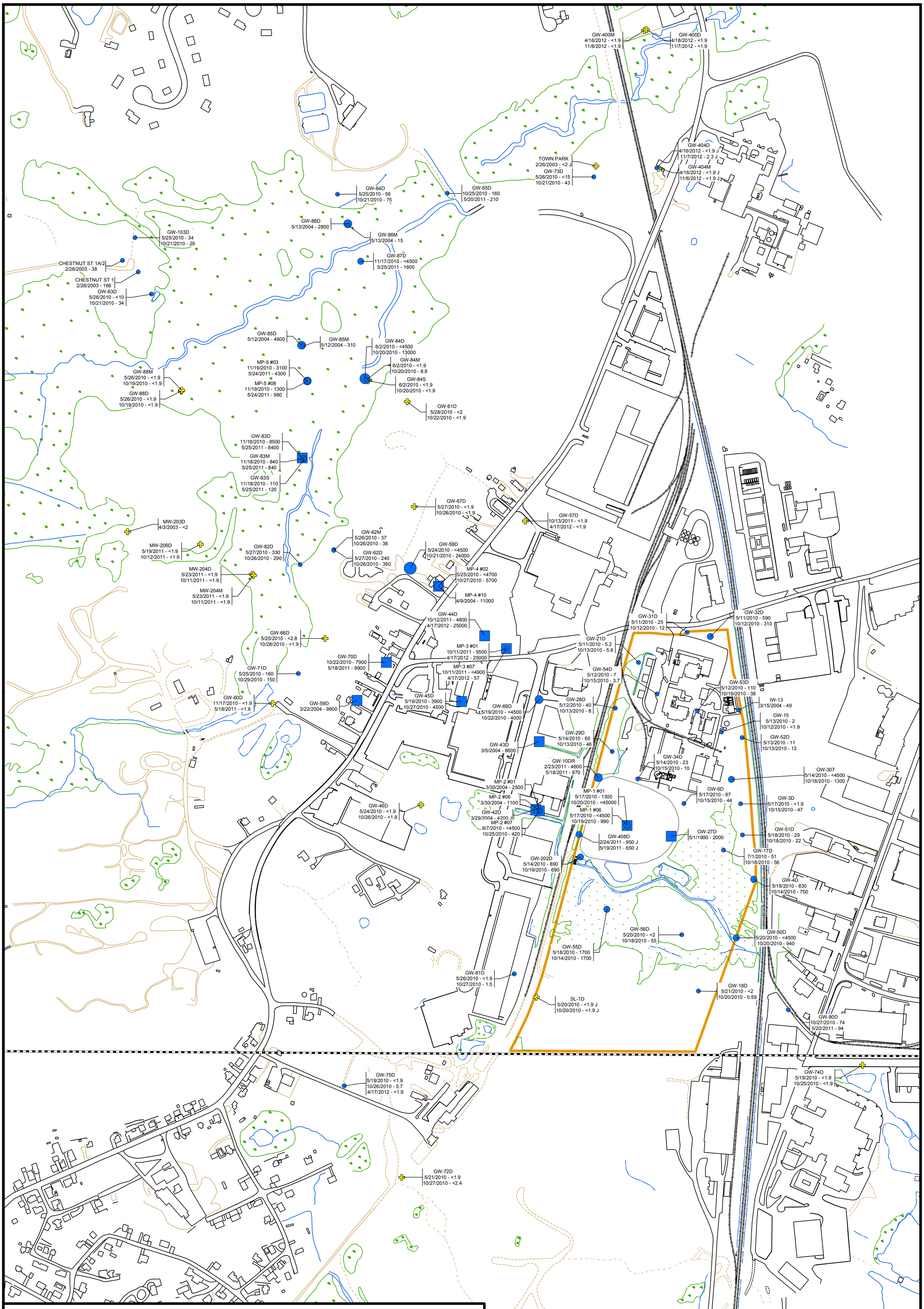

Legend

N-Nitrosodimethylamine (ng/L):

- 0.59 <= 420
- 420 <= 1700
- 1700 <= 5700
- 5700 <= 13000
- 13000 <= 24000

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in ng/L
- J - Estimated
- N - Presumptively present
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 250 500 Feet

Figure
N-Nitrosodimethylamine Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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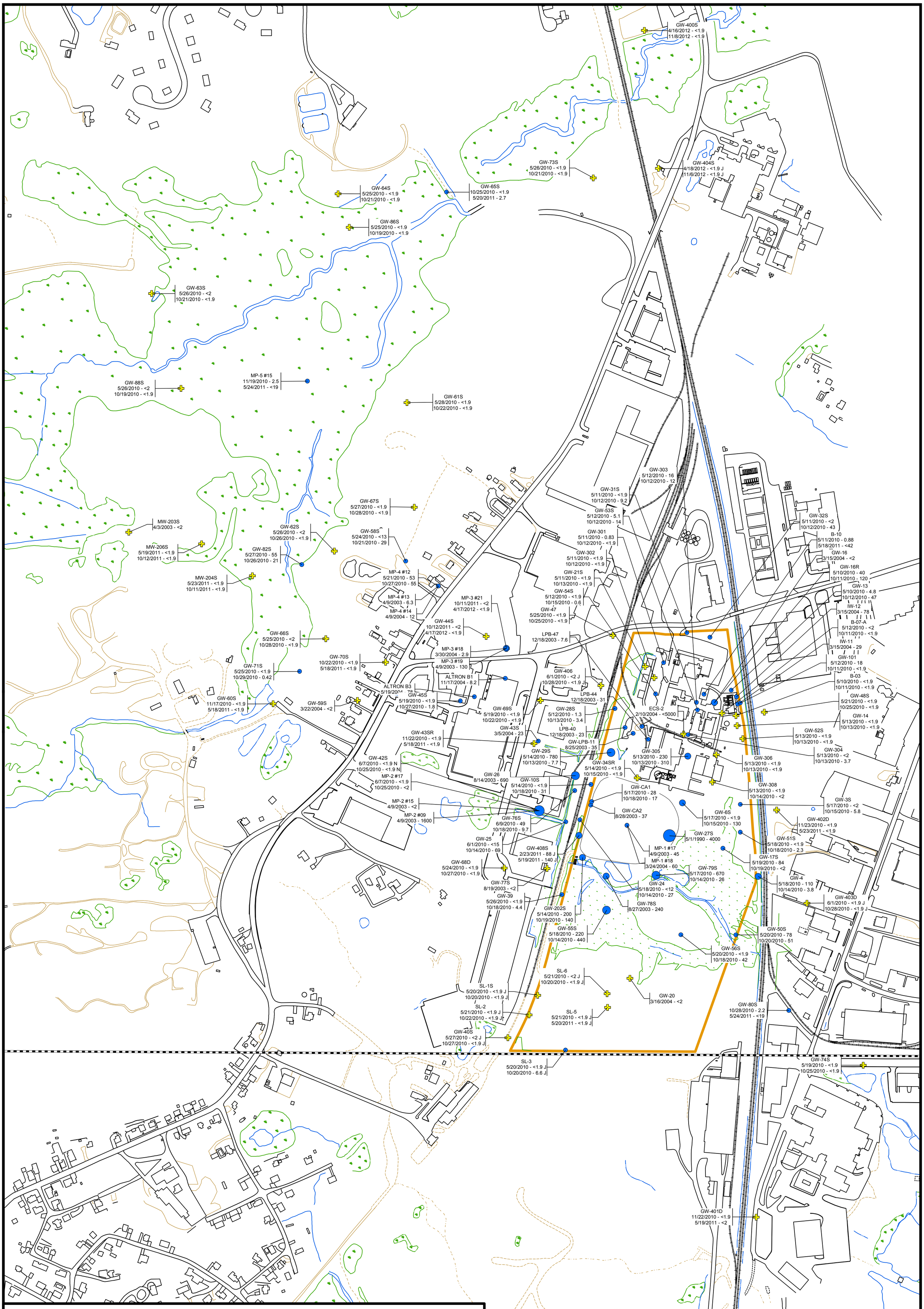

Legend

N-Nitrosodimethylamine (ng/L):

- 0.42 <= 84
- 85 <= 310
- 311 <= 780
- 781 <= 1600
- 1601 <= 4000

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in ng/L
- J - Estimated
- N - Presumptively present
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 250 500 Feet

Figure
N-Nitrosodimethylamine Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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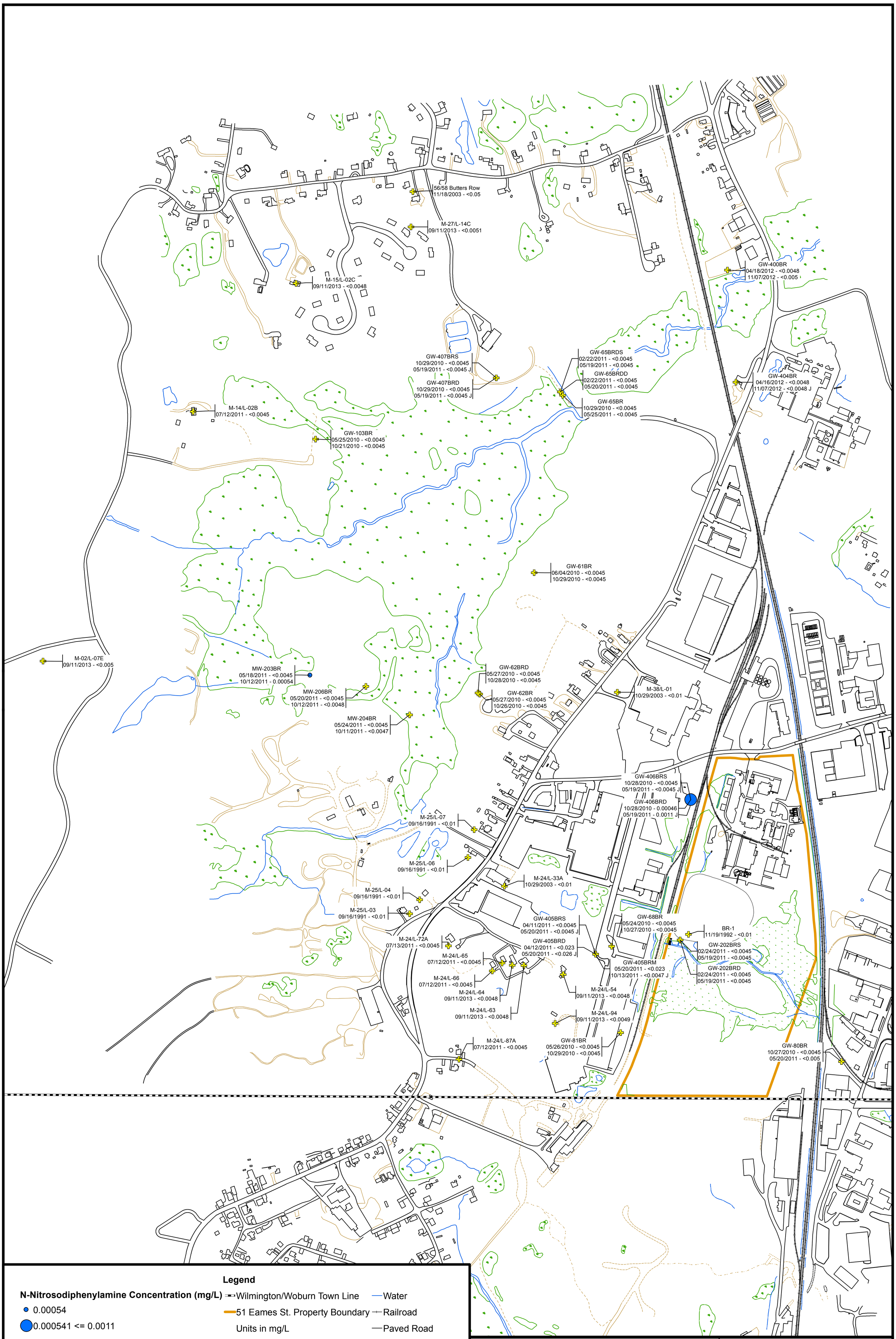

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Figure
N-Nitrosodiphenylamine Concentrations in Bedrock Groundwater

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Olin Chemical Superfund Site
Wilmington, Massachusetts

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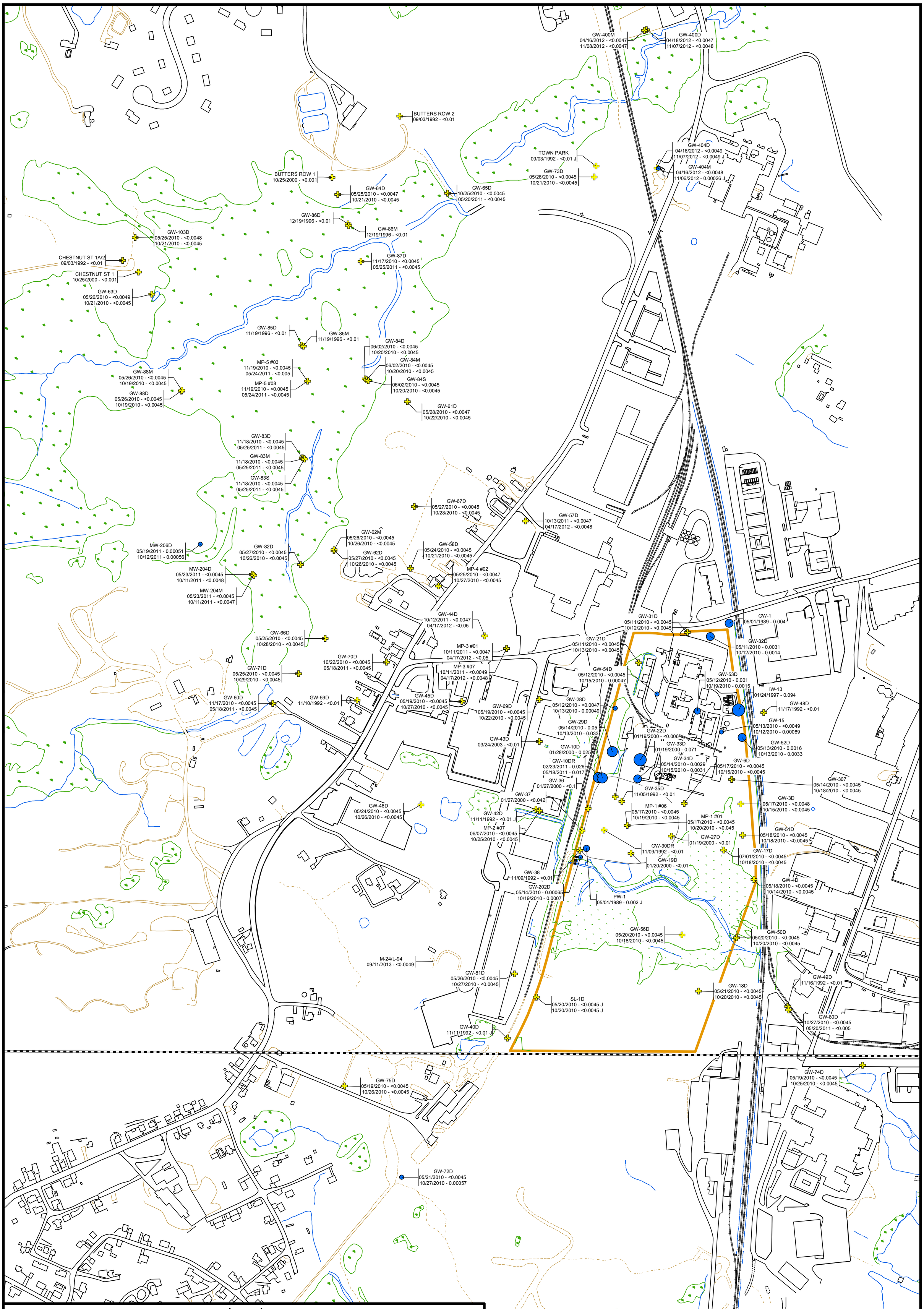

Legend

N-Nitrosodiphenylamine Concentration (mg/L)

- 0.00026 <= 0.00089
- 0.00089 <= 0.0020
- 0.0020 <= 0.0040
- 0.0040 <= 0.050
- 0.050 <= 0.094

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

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Chelmsford, MA 01824

N

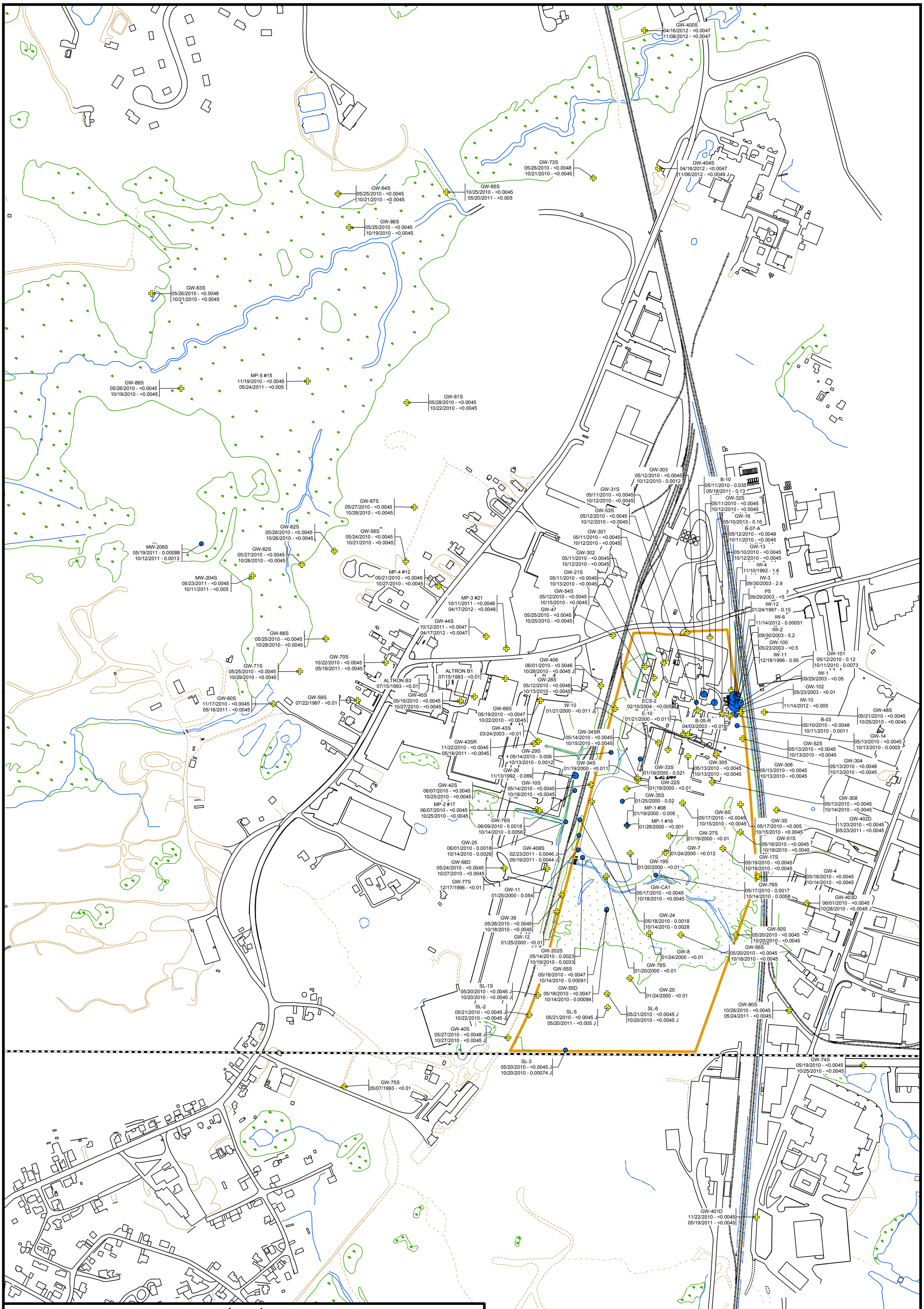
0 250 500 Feet

Figure
N-Nitrosodiphenylamine Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\OU3_Data_Gaps_Wake_22x34.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\OU3 Data Gaps\Draft Figures\NDPA - Deep.pdf 6/17/2014 4:04 PM brian.roden



Legend

N-Nitrosodiphenylamine Concentration (mg/L)

- 0.00050 <= 0.054
- 0.054 <= 0.16
- 0.16 <= 0.95
- 0.95 <= 2.9
- 2.9 <= 5.2

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

amec

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
N-Nitrosodiphenylamine Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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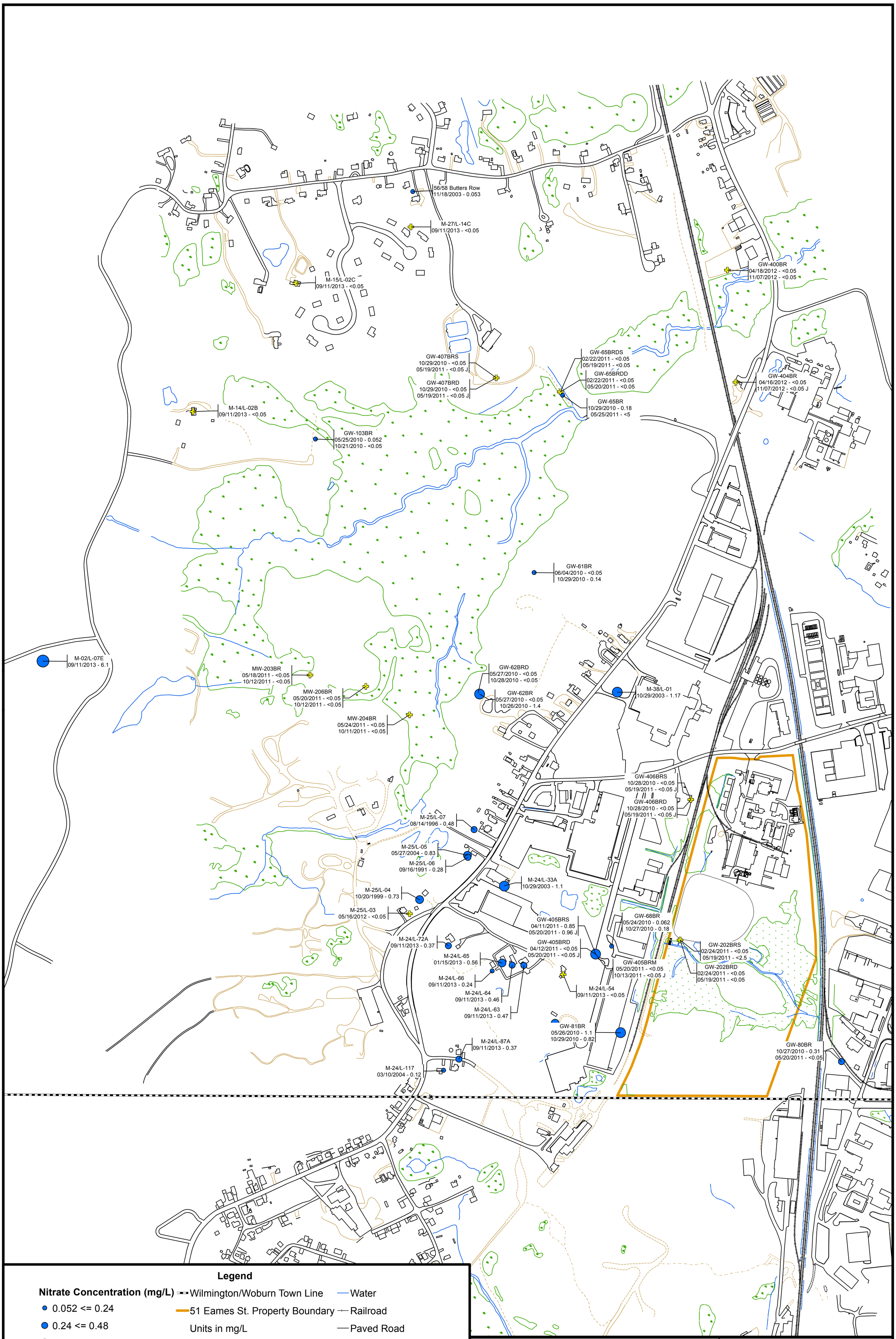

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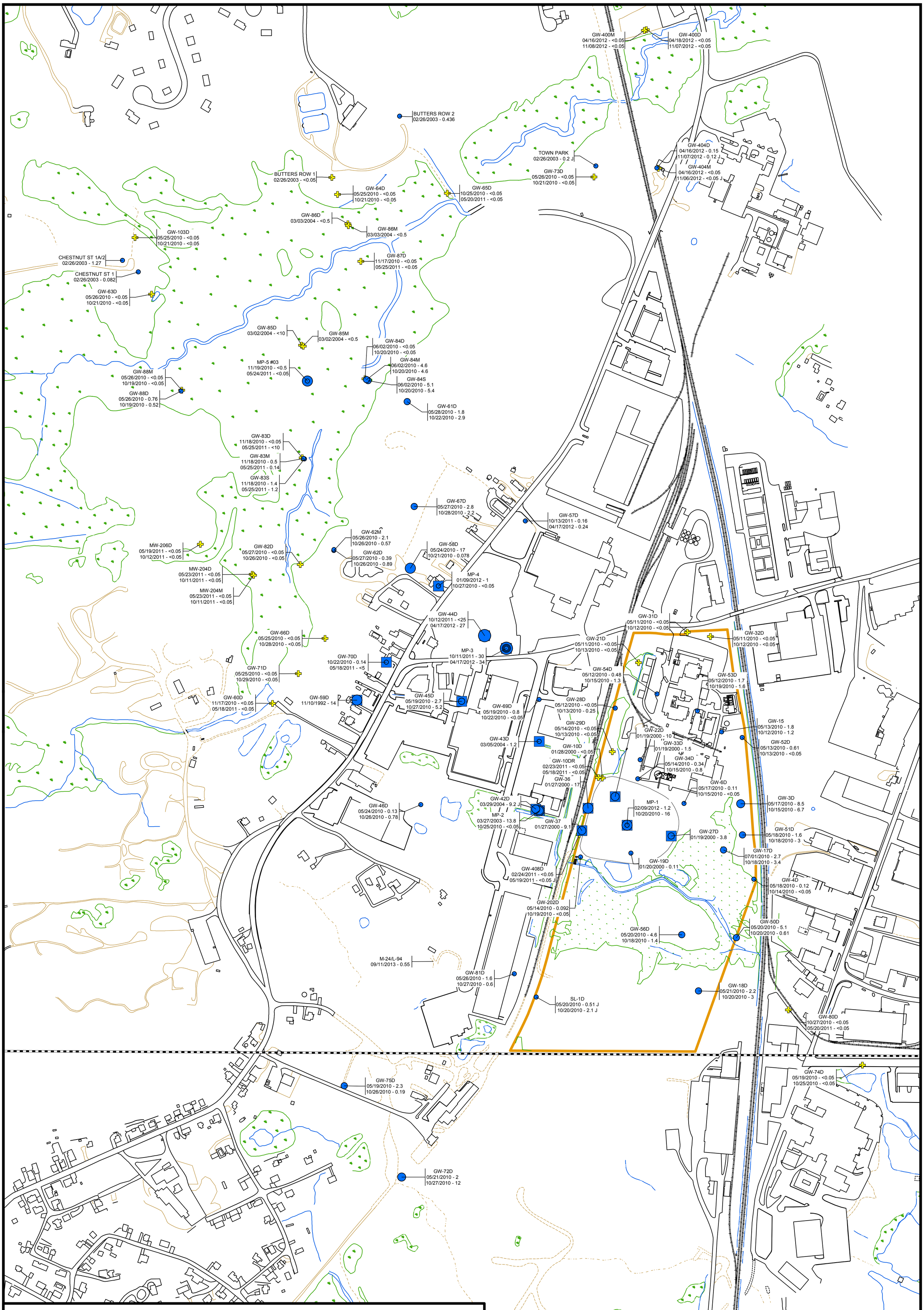

Legend

Nitrate Concentration (mg/L)

- 0.082 <= 2.1
- 2.1 <= 5.4
- 5.4 <= 12
- 12 <= 17
- 17 <= 34
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
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N

0 250 500 Feet

Figure
Nitrate Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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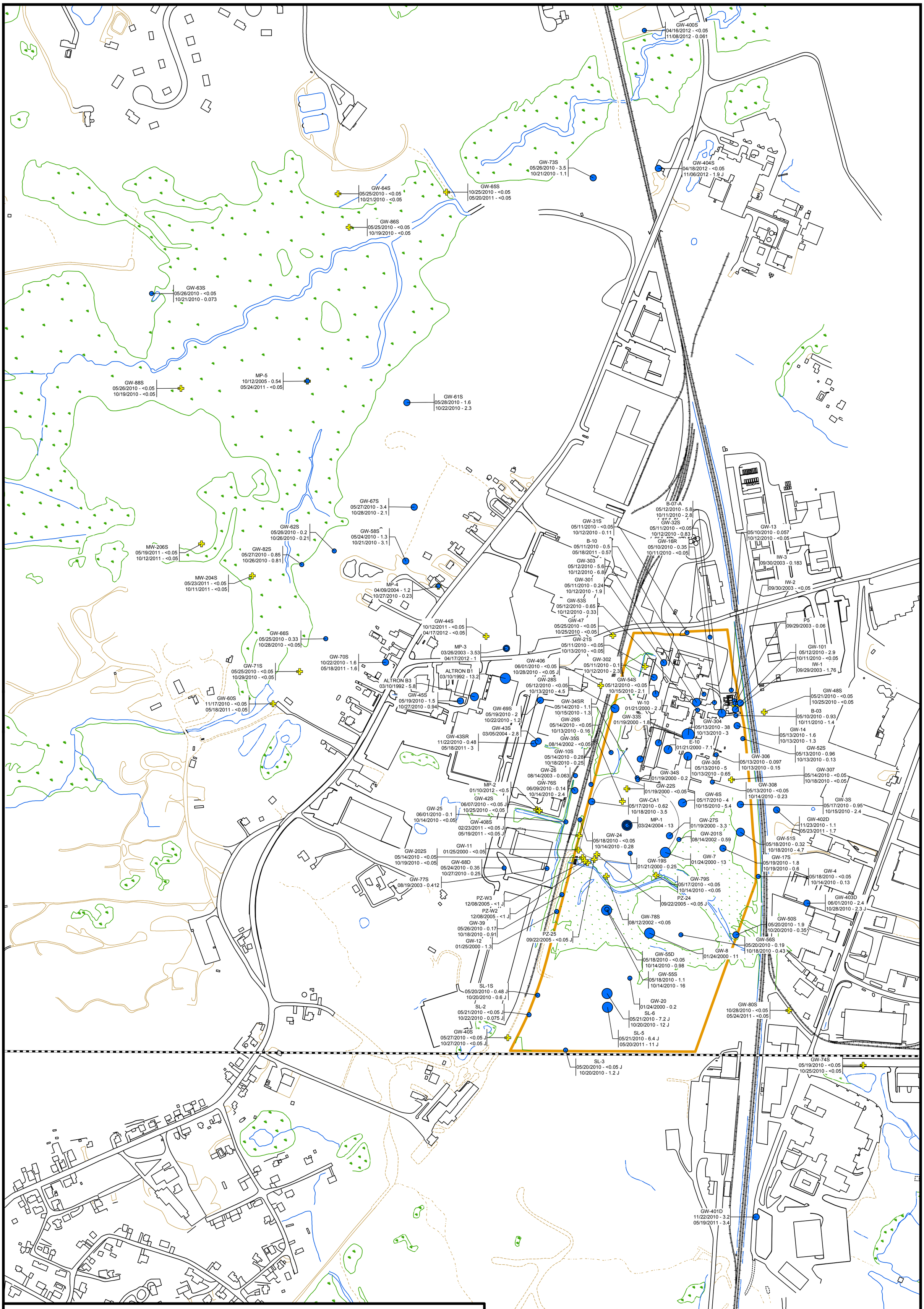

Legend

Nitrate Concentration (mg/L)

- 0.057 <= 1.4
- 1.4 <= 3.53
- 3.53 <= 7.1
- 7.1 <= 16
- 16 <= 38

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Nitrate Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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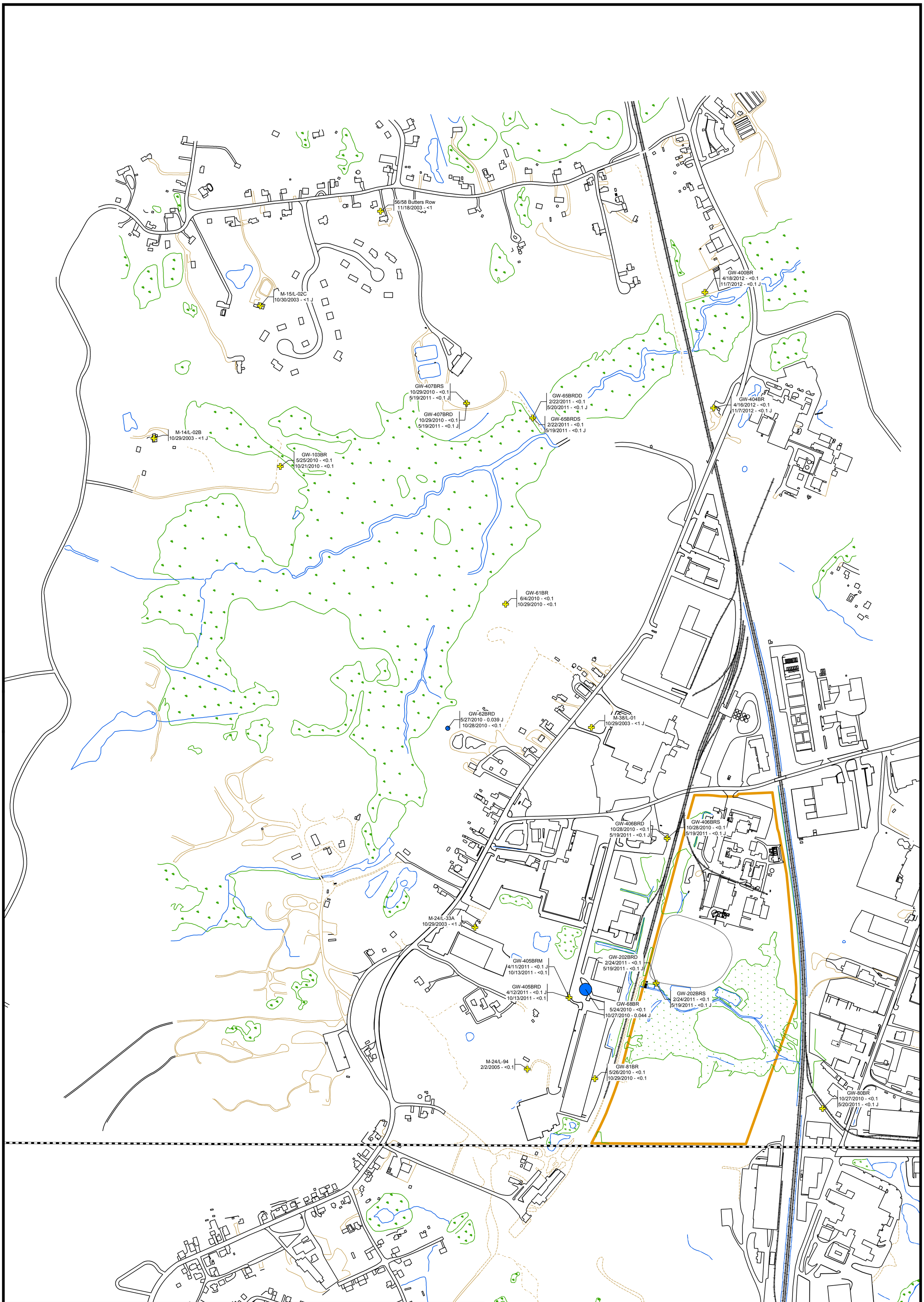

Legend

OPEX Concentration (mg/L)
- 0.039
- 0.039 <= 0.044

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

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0 300 600 Feet

Figure
OPEX Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 11/10/14 | Checked/Date: PHT 11/10/14

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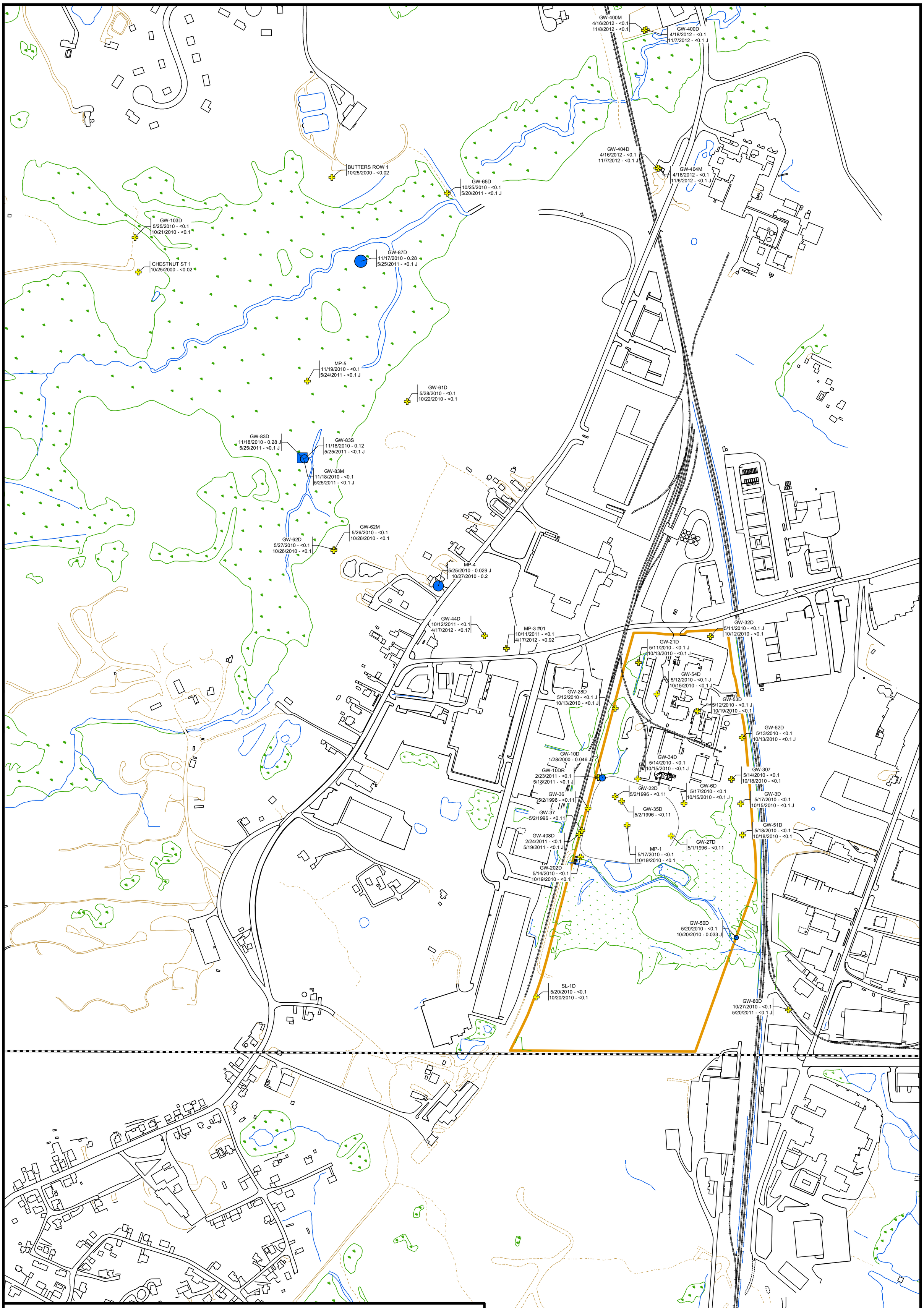

Legend

OPEX Concentration (mg/L)

- 0.033
- 0.033 <= 0.046
- 0.046 <= 0.12
- 0.12 <= 0.20
- 0.20 <= 0.28
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
OPEX Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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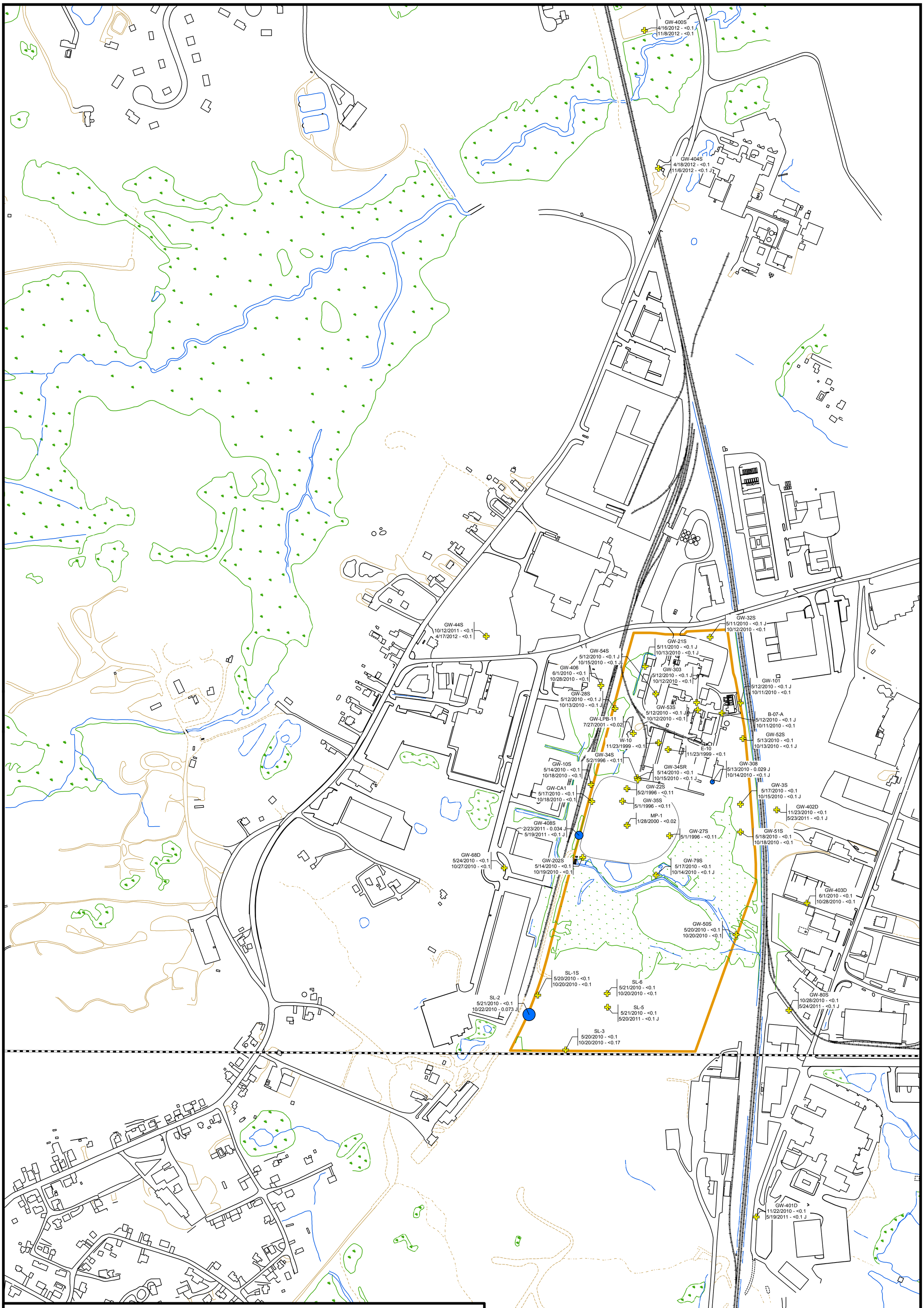

Legend

OPEX Concentration (mg/L)

- 0.029
- 0.029 <= 0.034
- 0.034 <= 0.073

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

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N

0 250 500 Feet

Figure
OPEX Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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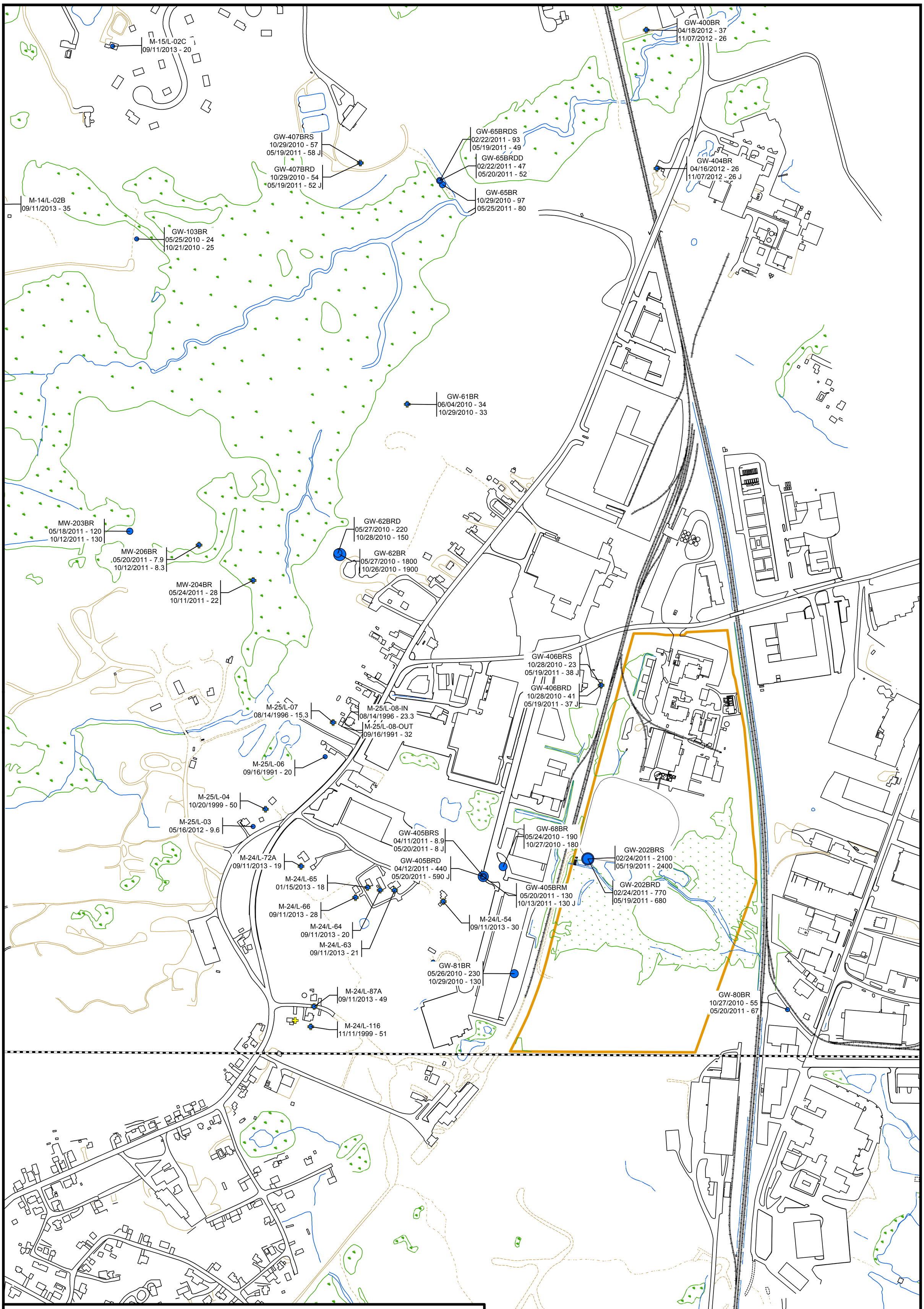

Legend

Sodium Concentration (mg/L)

- 7.4 <= 67
- 68 <= 130
- 131 <= 230
- 231 <= 770
- 771 <= 2400

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

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N

0 250 500 Feet

Figure
Sodium Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/16/14 | Checked/Date: PHT 06/16/14

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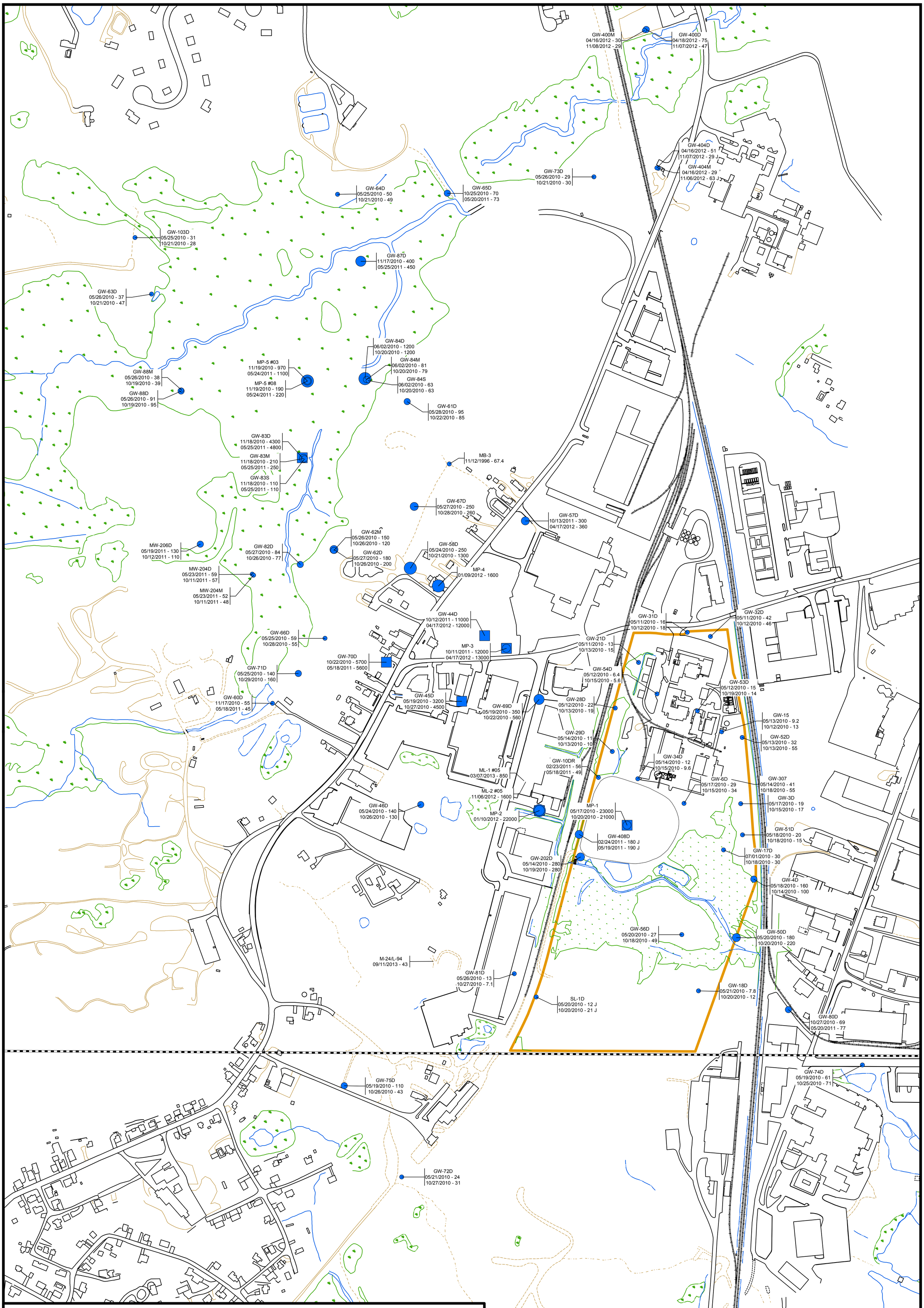

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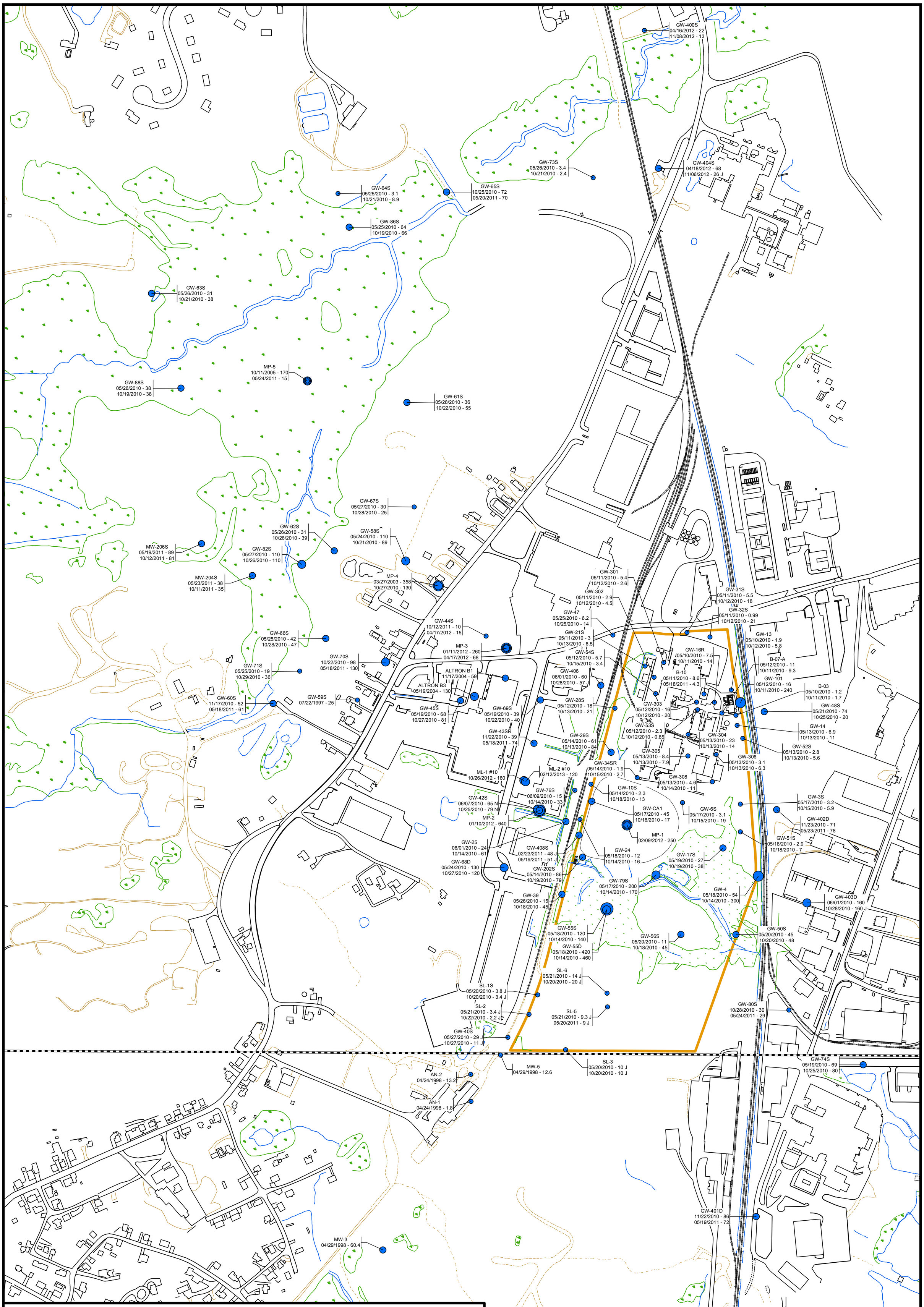

Legend

Sodium Concentration (mg/L)

- 1.7 <= 36
- 36 <= 97
- 97 <= 200
- 200 <= 364
- 364 <= 640

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

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N

0 250 500 Feet

Figure
Sodium Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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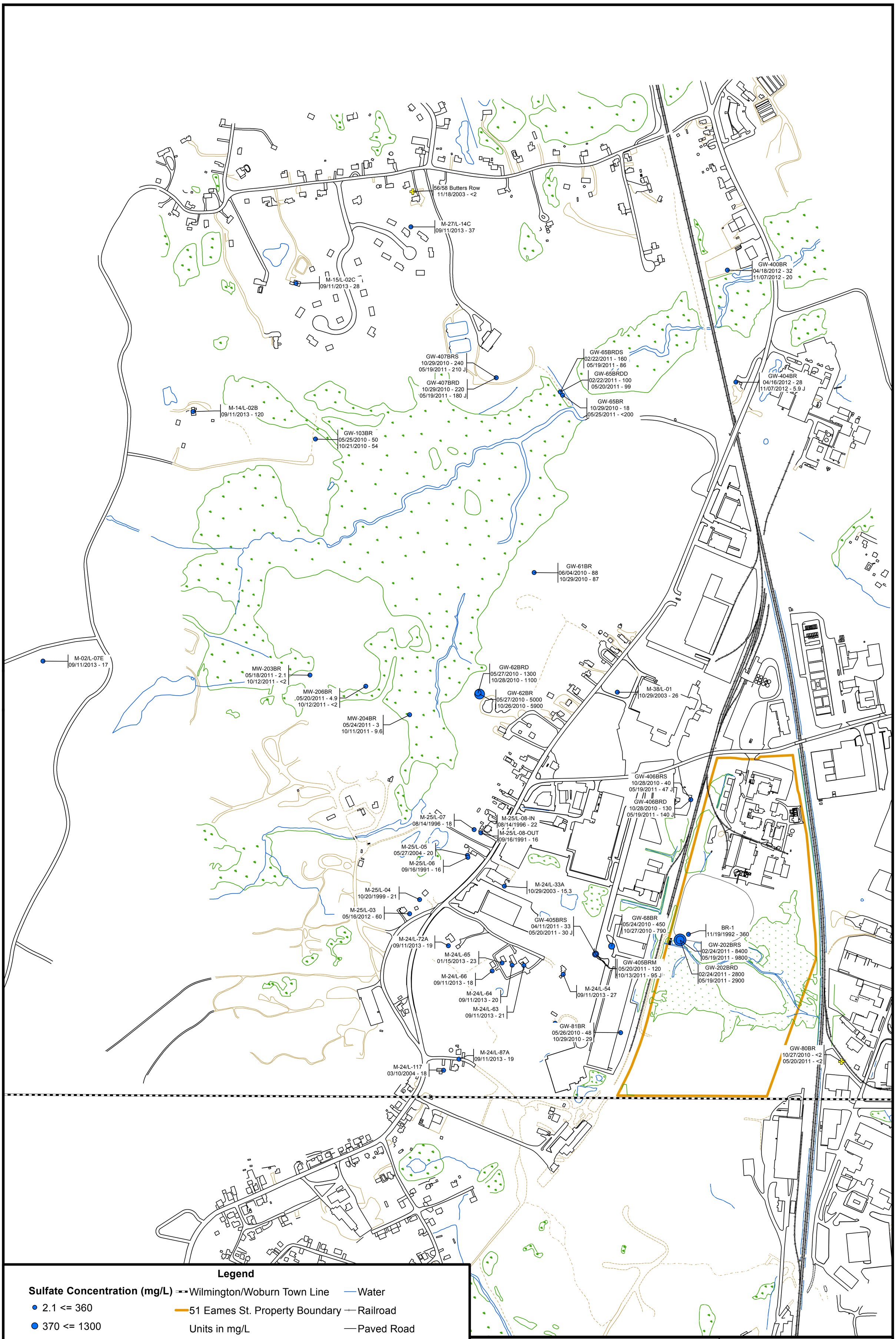

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Figure
Sulfate Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/13/14 | Checked/Date: PHT 06/13/14

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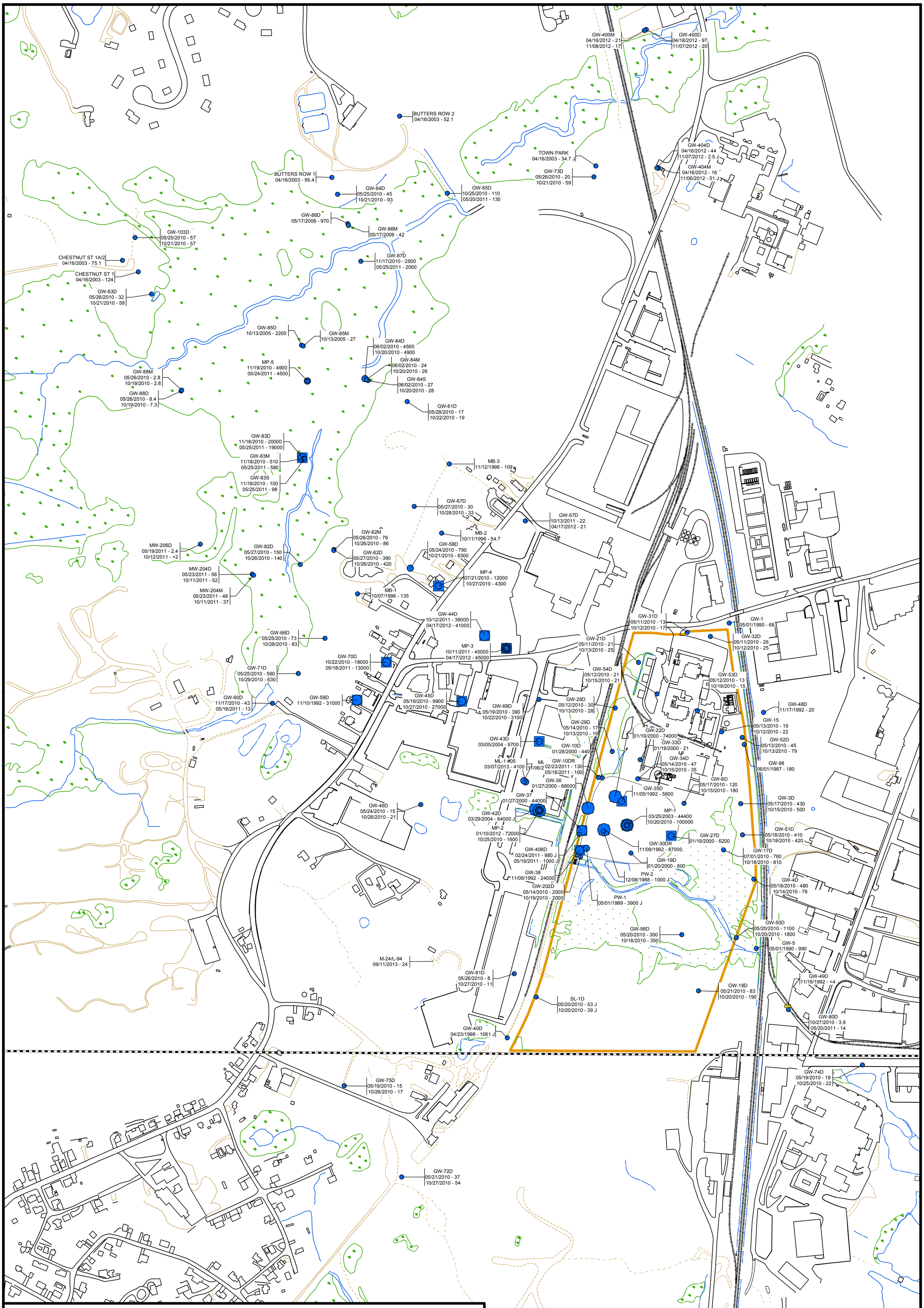

Legend

Sulfate Concentration (mg/L)

- 2.4 <= 3200
- 3200 <= 12000
- 12000 <= 27000
- 27000 <= 45000
- 45000 <= 100000
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Sulfate Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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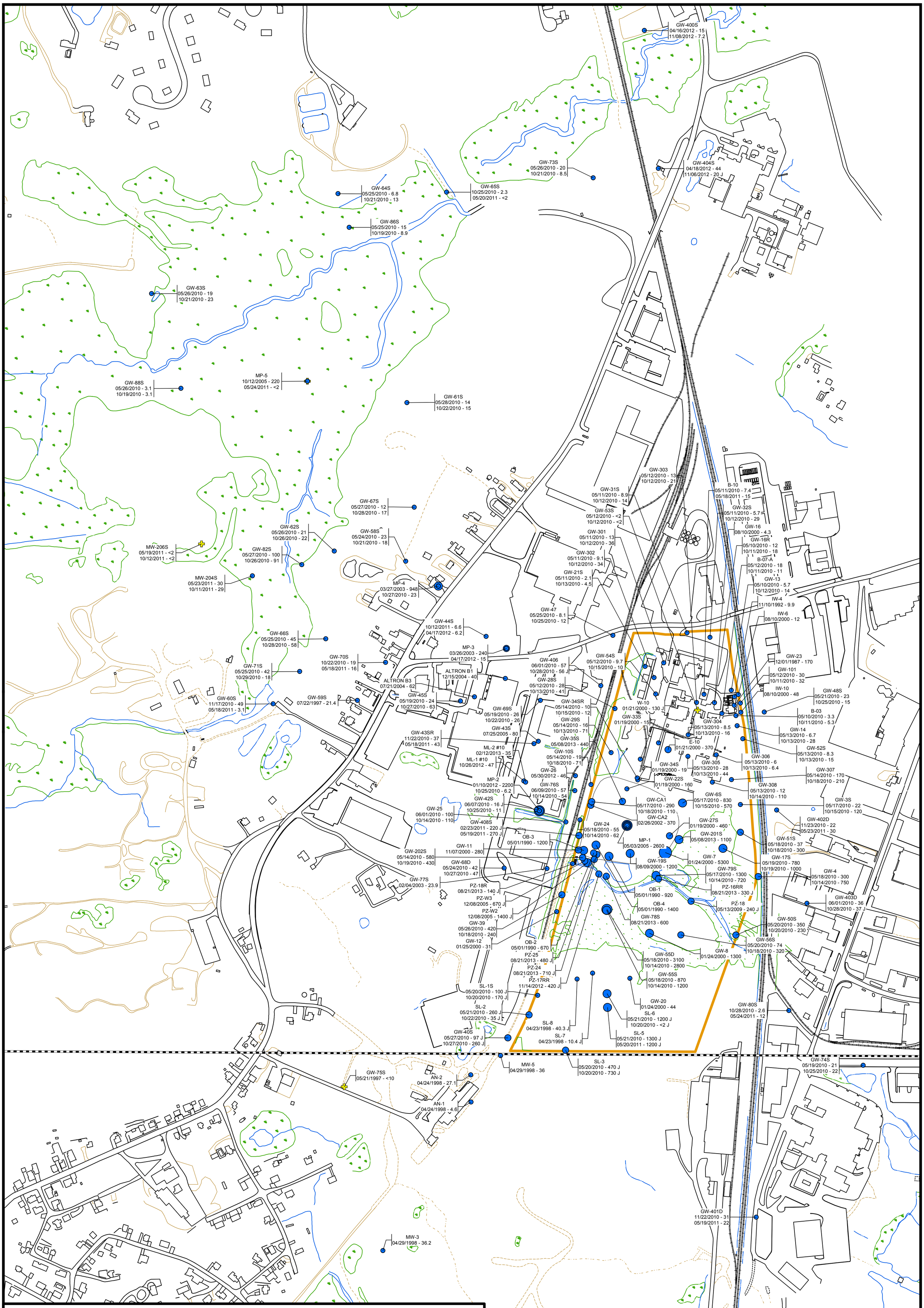

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Figure
Sulfate Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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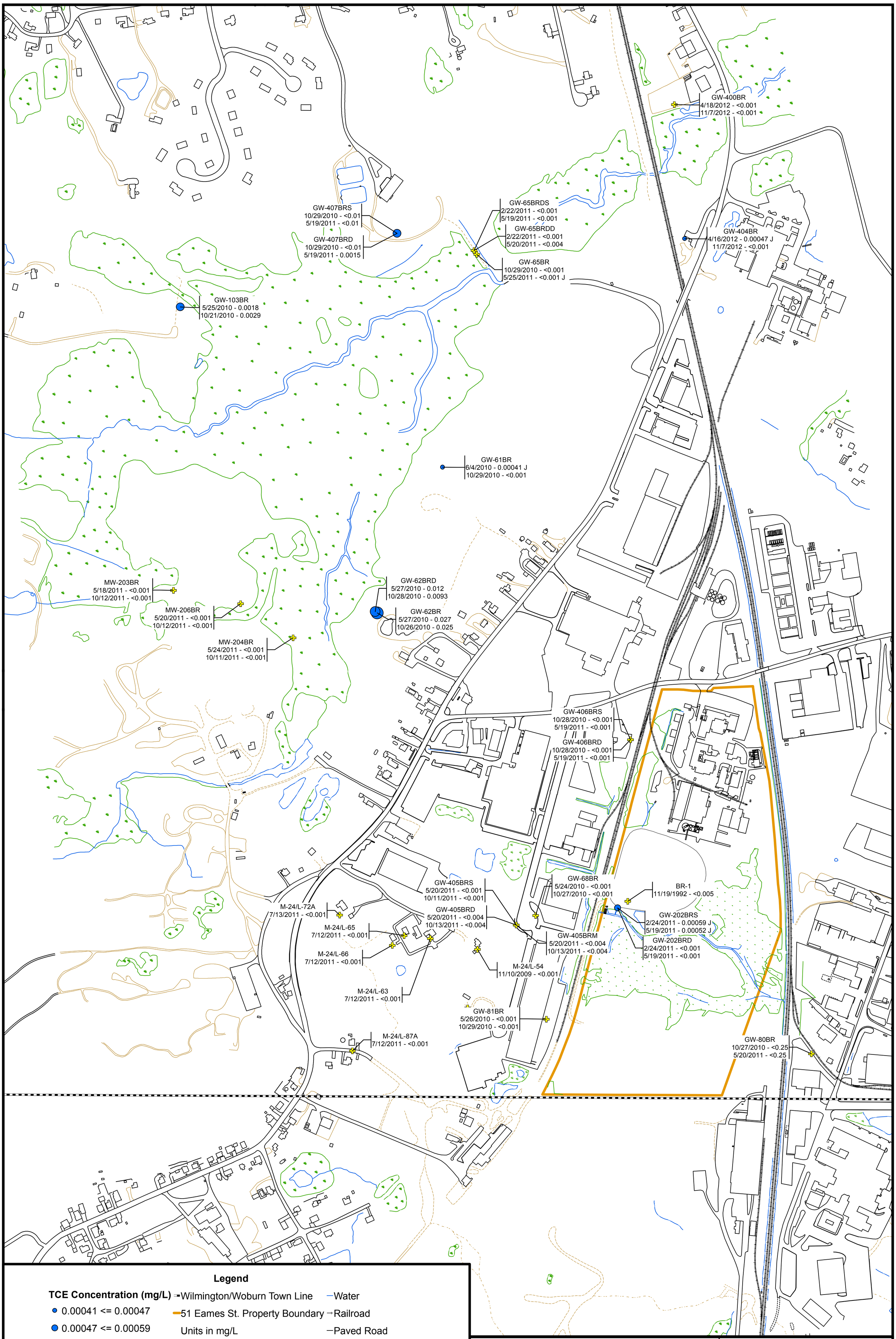

Legend

TCE Concentration (mg/L)

- 0.00041 <= 0.00047
- 0.00047 <= 0.00059
- 0.00059 <= 0.0029
- 0.0029 <= 0.012
- 0.012 <= 0.027

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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N

0 250 500 Feet

Figure
Trichloroethene Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 06/17/14 | Checked/Date: PHT 06/17/14

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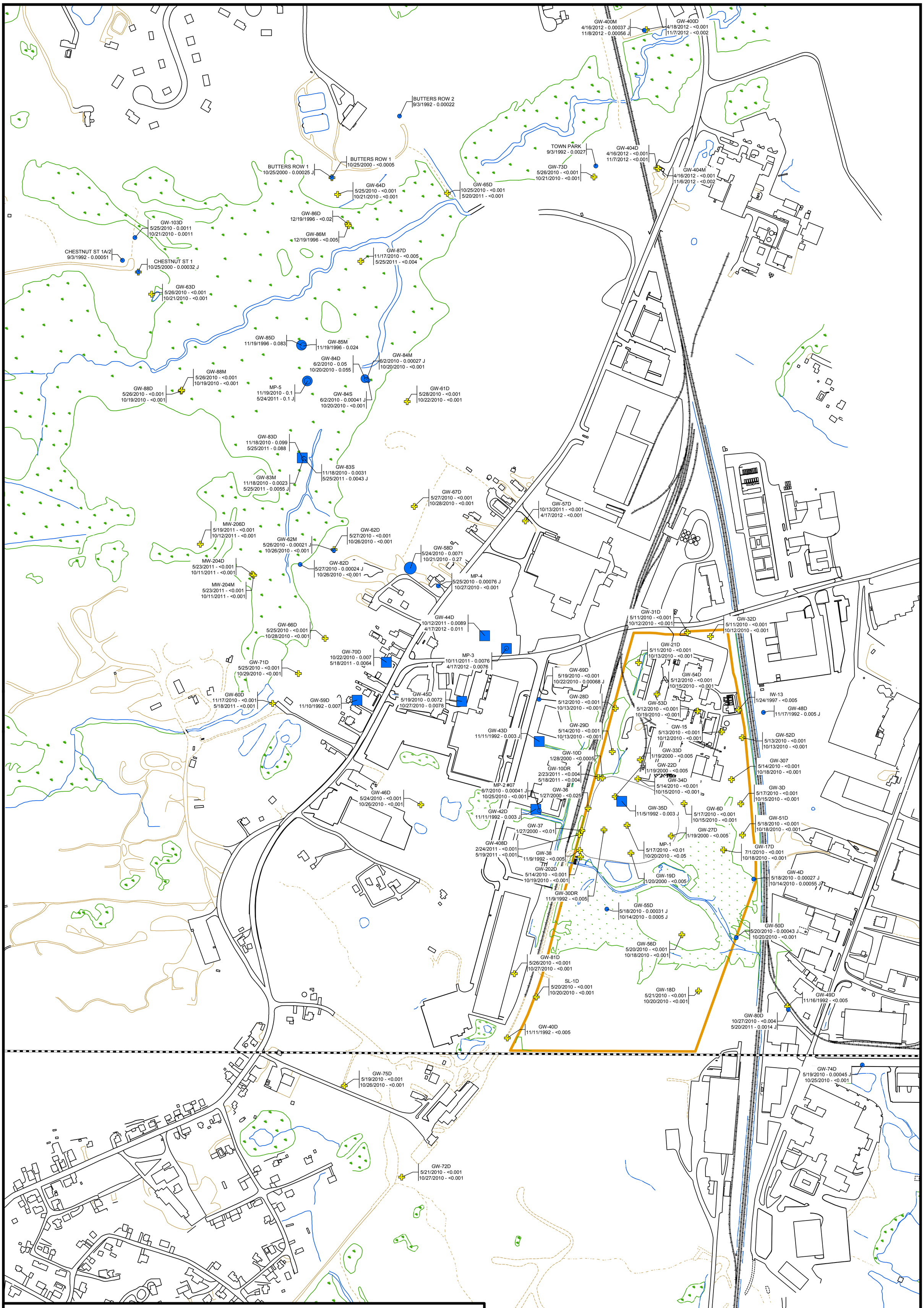

Legend

TCE Concentration (mg/L)

- 0.00021 <= 0.0055
- 0.0055 <= 0.024
- 0.024 <= 0.055
- 0.055 <= 0.10
- 0.10 <= 0.27
- Well is screened in DAPL

- Wilmington/Woburn Town Line
- 51 Eames St. Property Boundary
- Units in mg/L
- J - Estimated
- Non-Detect
- Water
- Railroad
- Paved Road
- Unpaved Road
- Wetland Boundary

Notes:
1. GW-83S and GW-84S screened intervals are deep due to thick sections of peat.
2. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
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Chelmsford, MA 01824

N

0 250 500 Feet

Figure
Trichloroethene Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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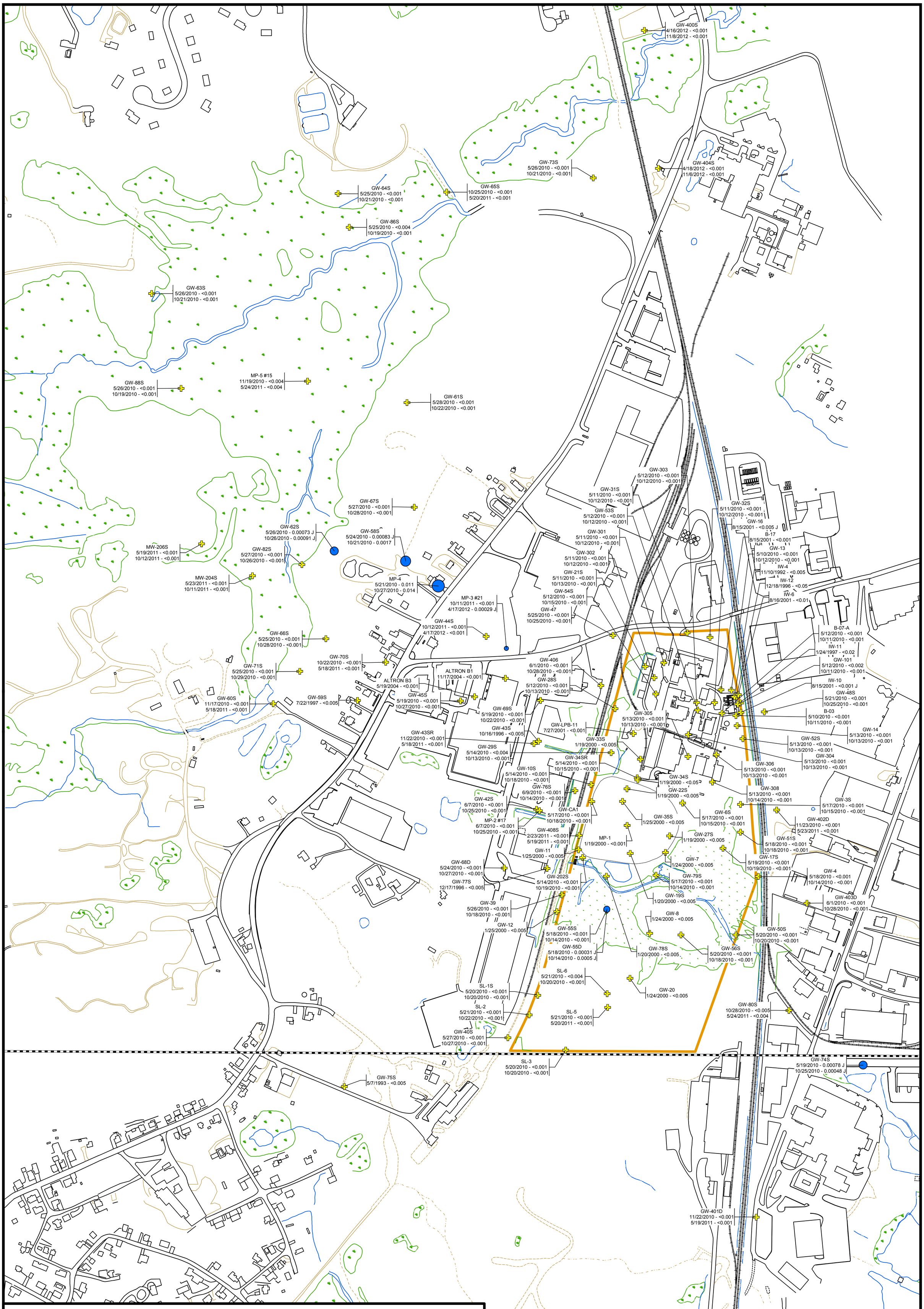

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271 Mill Road
Chelmsford, MA 01824

Figure
Trichloroethene Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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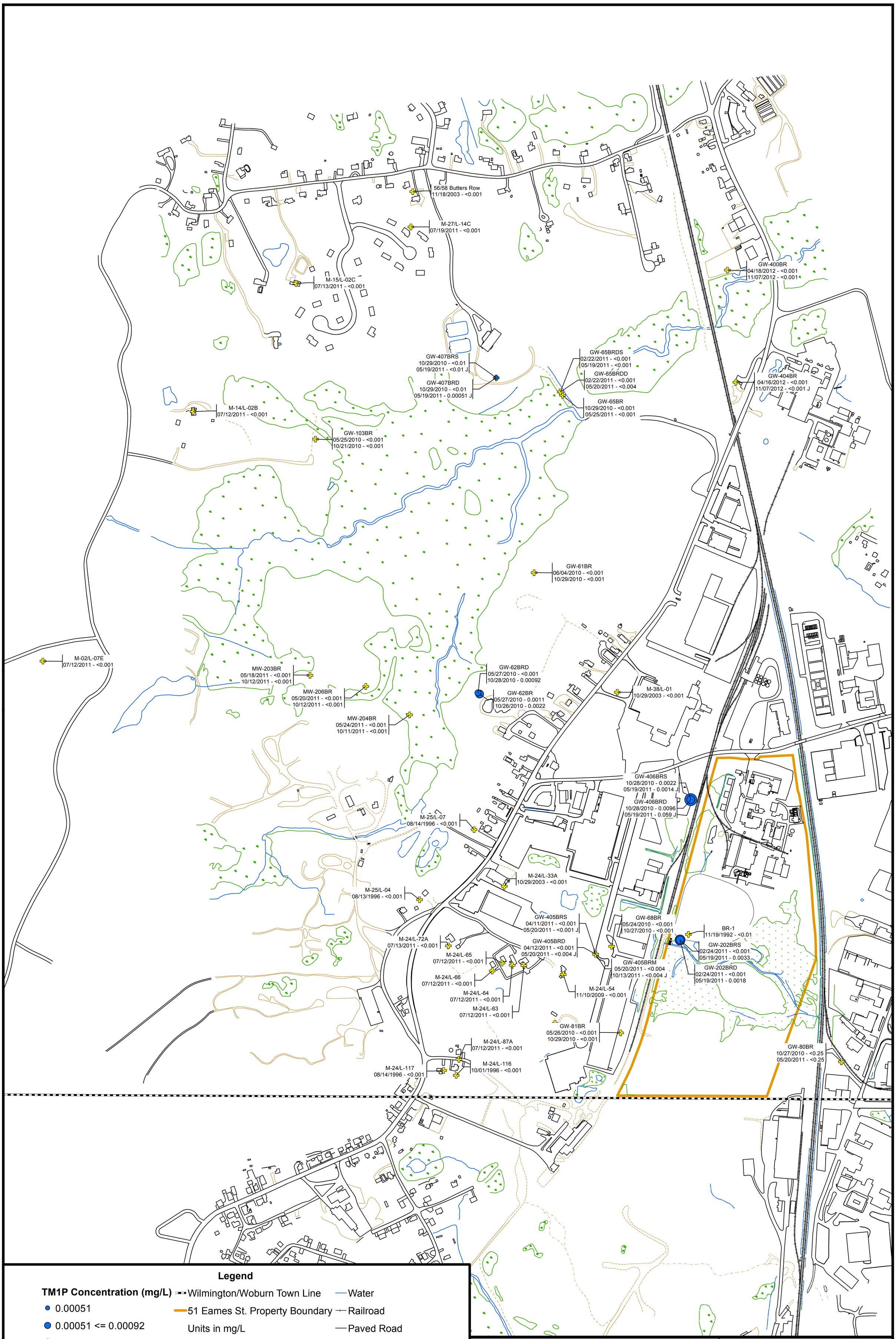

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Chelmsford, MA 01824

Figure
2,4,4-Trimethyl-1-pentene Concentrations in Bedrock Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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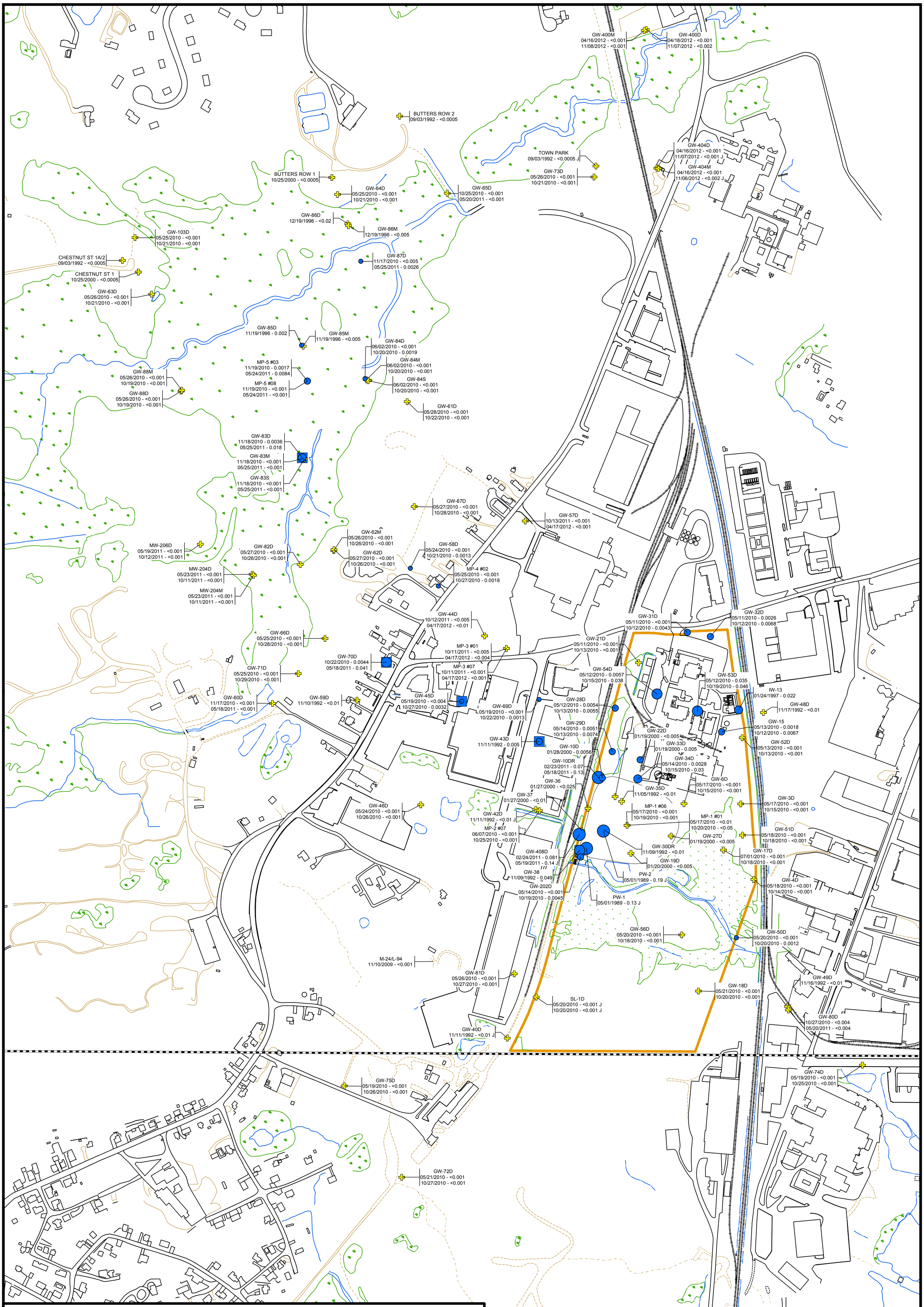

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271 Mill Road
Chelmsford, MA 01824

Figure
2,4,4-Trimethyl-1-pentene Concentrations in Deep Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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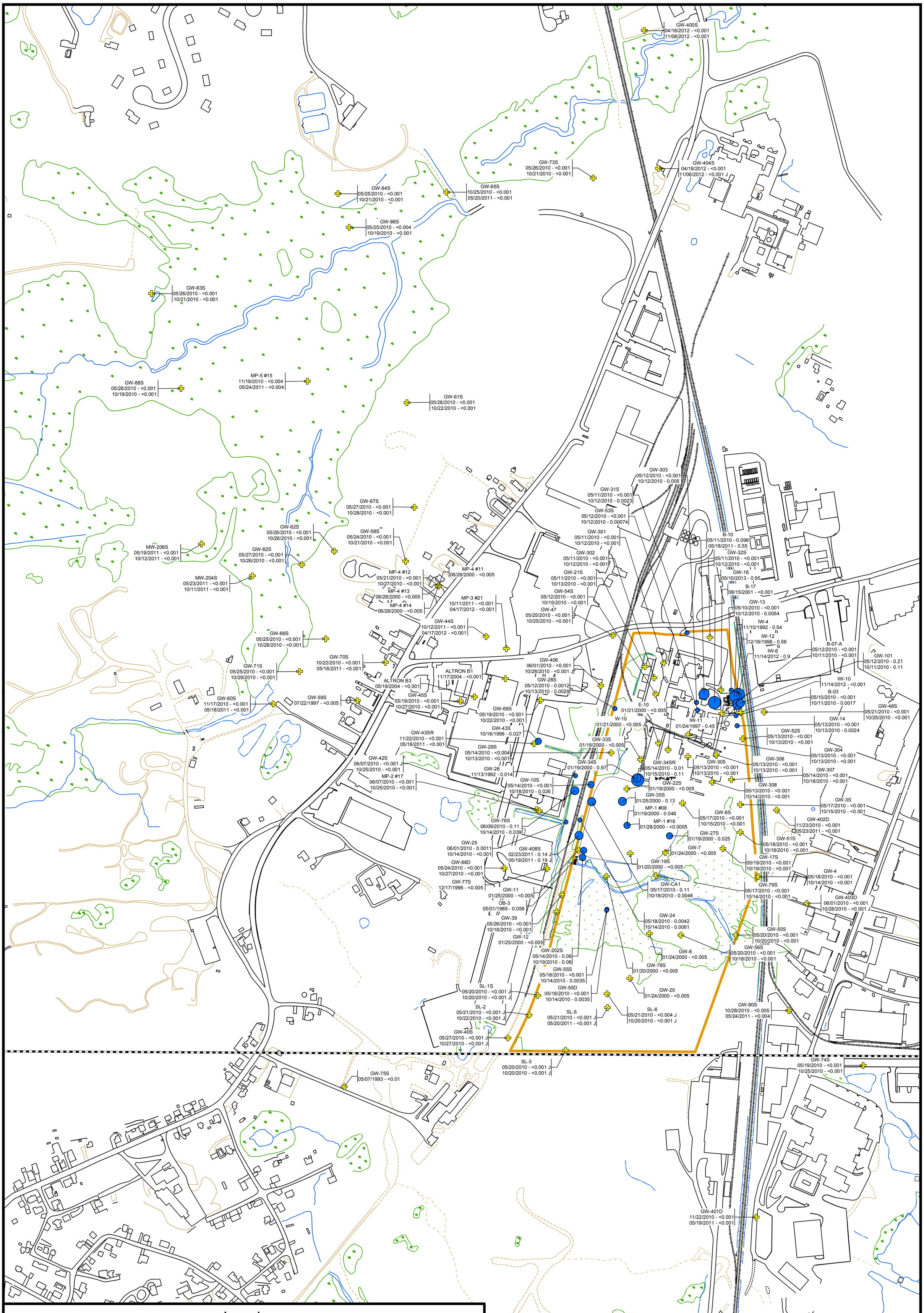

Legend

TM1P Concentration (mg/L)

- 0.00074 <= 0.014
- 0.014 <= 0.060
- 0.060 <= 0.21
- 0.21 <= 0.56
- 0.56 <= 0.97

Wilmington/Woburn Town Line
51 Eames St. Property Boundary
Units in mg/L
J - Estimated
Non-Detect
Water
Railroad
Paved Road
Unpaved Road
Wetland Boundary

Notes:
1. Symbol is based on the highest detection at location for those with multiple rounds.

AMEC Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

N

0 250 500 Feet

Figure
2,4,4-Trimethyl-1-pentene Concentrations in Shallow Overburden Groundwater

OU3 Data Gaps
Olin Chemical Superfund Site
Wilmington, Massachusetts

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APPENDIX C
SEISMIC DATA AND REPORTS

MACTEC

engineering and constructing a better tomorrow

March 10, 2011

Mr. James DiLorenzo
United States Environmental Protection Agency
5 Post Office Square. Suite 100
Mail Code 05RR07-4
Boston, MA 02109-3946

Subject: Seismic Refraction Survey Data Report
Olin Chemical Superfund Site, Wilmington, Massachusetts

Dear Mr. DiLorenzo,

MACTEC Engineering and Consulting, Inc. (MACTEC) has prepared this report on behalf of Olin Corporation to present the findings of a seismic refraction survey completed as part of the Olin Chemical Superfund Site (Site) Operable Unit 3 (OU-3) groundwater remedial investigation (RI). This report summarizes the findings of the seismic refraction survey that was undertaken in July 2010 in the Maple Meadow Brook (MMB) wetland between the Massachusetts Bay Transit Authority (MBTA) commuter rail line and Main Street in Wilmington, MA. This report also presents direct push soil boring data collected on January 11, 2011 to confirm bedrock depths in one portion of the study area and provides recommendations for locations to install two down gradient monitoring well clusters.

The Site includes, but is not limited to, the Olin property at 51 Eames Street, Wilmington, Massachusetts. The location of the Olin property is presented in Figure 1. Figure 2 is a site plan that identifies the areas, located northwest of the Olin Property, where the seismic survey was conducted.

PURPOSE

Volume IIIA, the Field Sampling Plan, of the Final Remedial Investigation/Feasibility Study (RI/FS) Work Plan (MACTEC, 2009), proposed two areas where seismic refraction surveys would be conducted to better define the depth to and profile of the bedrock surface. These areas include the northern portion of the western boundary of the Olin Property and the Western Bedrock Valley (WBV) that underlies the MMB wetland located between the MBTA commuter rail line and Main Street (Route 38). This report describes the survey results from the MMB area.

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As described in Section 3.2.2 of the Focused Remedial Investigation Report (MACTEC, 2007) the bedrock underlying the WBV consists of mylonites formed from metavolcanic and metasedimentary rocks within the Milford-Dedham Zone; also referred to in literature as the Burlington mylonites. This geologic zone is bordered on the west by the Bloody Bluff Fault (Castle, et al 1976), separating these rocks from intrusive rocks (Andover Granite and Sharpners Pond Diorite) located farther north and west. The Bloody Bluff Fault crosses the WBV in the vicinity of where Main Street crosses MMB (Castle et.al, 2005). North of Main Street the continuation of the WBV is underlain by granite and diorite and to the south by metavolcanic and metasedimentary rocks. The bedrock valley that underlies the MMB wetland contains a thick sequence of glacial outwash deposits and underlying glacial till deposits that collectively form the MMB aquifer. This sequence of sediments also contains more recent alluvial deposits and organic sediment including thick accumulations of peat (up to thirty feet thick) in places.

The RI/FS Work Plan proposed installation of up to two well clusters within this portion of the MMB aquifer to collect groundwater samples for chemical analysis and measure groundwater elevations. The monitoring wells proposed in the Work Plan included a bedrock and a shallow, medium, and deep overburden groundwater well quadruplet (GW-400S, GW-400M, GW-400D, and GW-400BR) and a shallow, medium, and deep overburden triplet as a contingency well (GW-404S/M/D). The GW-400S/M/D/BR cluster was to be installed in the low point of the bedrock valley between Main Street and the MBTA commuter rail line. The GW-404S/M/D cluster was proposed as a down gradient contingency location in the event groundwater samples from the first well cluster installed contained Site-related constituents. The purpose of the seismic survey was to define the bedrock valley to best locate GW-400S/M/D/BR. The seismic refraction survey augments seismic reflection data collected previously by RAYPATH in 1996 and included as Appendix D and Plate 2-1 in the Phase II Supplemental Report (Smith, 1997). The locations of the recent and older seismic survey lines in this portion of the MMB area are presented in Figure 3.

FIELD ACTIVITIES

Seismic survey field activities were completed from July 20 to July 21, 2010 by Northeast Geophysical Services, Inc. (NGS) pursuant to an access agreement between Olin and the Town of Wilmington. NGS completed two survey lines (Line 1 and Line 2) each consisting of two line segments. Both lines originate near the sewage transfer facility located on town property which is

bordered by Main Street (Route 38) to the east, MBTA railroad tracks to the west, and MMB and a U-Haul facility to the north (see Figure 3).

Line 1 started near the southern end of the town property and ran north parallel to Main Street for approximately 770 feet, terminating at MMB. This line segment was positioned 30 to 50 feet from the road shoulder to remain on undisturbed native soil.

Line 2 also started near the southern end of the town property and paralleled the MBTA railroad tracks for approximately 690 feet crossing MMB and terminating on the town property adjacent to the back corner of the U-Haul property. Details of the seismic survey methods, equipment, and findings are presented in NGS's report in Attachment A.

The geophone locations were surveyed by NGS for relative distance and elevation along each line. The starting points were at locations with prior survey information. This data was used to estimate initial ground surface elevations at the beginning of each survey line. The survey lines were brushed out by MACTEC at the direction of NGS. A police detail from the Town of Wilmington was hired to temporarily halt traffic during implementation of the survey shots and seismograph measurements to reduce background seismic noise.

SURVEY RESULTS

The modeled profiles of Lines 1 and 2 are presented in Figures 4 and 5 respectively and are described in the following paragraphs. Both lines are in good agreement with starting elevations to the south near the municipal sewage transfer facility. These initial depths are also consistent with the RAYPATH southern seismic line and the depth of bedrock at GW-73D located near Town Park. As each line progressed northward, they diverged in elevation, with the north easternmost line (Line 1) showing a gradual rise in bedrock elevation and the south westernmost line (Line 2) showing a rise followed by a decline in bedrock elevation to the north.

Line 1

The interpretation of the seismic data indicates that the bedrock surface at the south end of Line 1 is at approximately 26 feet mean sea level (msl). Bedrock rises gently in an undulating manner to the

north reaching highs of 64 feet msl at a distance of approximately 525 feet and 56 feet msl near the end of the line at a distance of approximately740 feet.

The bedrock elevation along the interpreted seismic refraction Line 1 as it nears MMB is generally consistent with the previous RAYPATH seismic reflection data in that it shows bedrock is shallowest in vicinity of MMB where it crosses under Main Street. The RAYPATH northern line shows the bedrock surface dropping to 19 feet msl before rising again west of the U-Haul Property (see Figure 3). As noted in the Work Plan, the propagation of seismic energy may be affected by the subsurface presence of lower density (hence lower velocity) materials such as organic sediments and peat, or the presence of soil gas which are present within portions of the MMB wetland. The interpreted seismic depths from the NGS and RAYPATH surveys are consistent with physical confirmation depths obtained from nearby borings and indicate good seismic data quality.

Line 2

The south end of the seismic Line 2 indicates the bedrock surface is at approximately 25 feet msl. The bedrock surface then rises slowly to an elevation of about 47 feet msl at a distance of 225 feet along the survey line. The bedrock surface then gradually drops off to a low of approximately 14 feet msl after a distance of 530 feet and remains between 15 and 21 feet msl over the remainder of the survey line.

The southernmost RAYPATH seismic reflection line provides definition of the bedrock valley as it approaches the MBTA commuter rail line. Both lines show the presence of a bedrock low under the MMB wetland.

CONFIRMATION DIRECT PUSH BORINGS

The difference in elevations on the north western ends of Line 1 and Line 2 was not expected and preliminary interpretation of the seismic data identified that additional subsurface information was needed to confirm the depth to bedrock under the back portion of the U-Haul Property. Therefore a property access agreement was negotiated with U-Haul to install three direct push borings to refusal. Three direct push borings were installed at the U-Haul property on January 11, 2011 at the

locations shown in Figure 6. The direct push refusal depths are generally equivalent to the bedrock surface.

Results obtained from the direct push borings indicate refusal occurred at depths of between 73 feet to 76 feet below ground surface (bgs). A topographic survey is not currently available for the U-Haul property and the interpreted elevation are based on an assumed ground surface elevation of 85 feet MSL. The resulting bedrock elevations are between 9 and 13 feet MSL. These elevations are similar to the results obtained from the northern end of NGS Line 2 in which the top of the interpreted bedrock surface is shown to occupy a general low as shown in Figure 7. Interpreted seismic elevations are typically within 10% of the actual surface, and these values are in good agreement with the direct push refusal depths. The direct push data indicates that a bedrock low is present under the U-Haul property.

BEDROCK SURFACE INTERPRETATION

Interpreted Bedrock Surface

Figure 7 presents the interpreted bedrock contours based on the combined results from the RAYPATH seismic reflection survey data, the NGS seismic refraction survey data, the direct push data, bedrock elevation data at GW-73D, and outcrops located along the bedrock high next to the Town Park.

The seismic data provided by NGS in July 2010 and RAYPATH in 1996 both show the presence a bedrock high in the vicinity of Main Street and MMB. This bedrock high was detected by both the northernmost seismic line completed by RAYPATH on the east side of Main Street and by Line 1 completed by NGS on the west side of Main Street. Bedrock lows are present on both sides of this bedrock high (e.g., on the western and southeastern sides). The western most bedrock low generally follows the course of Maple Meadow Brook as it approaches and passes under the MBTA commuter rail line then turns under the U-Haul property. This western most bedrock low is defined by lows along RAYPATH's southernmost seismic line, by NGS's Line 2, the direct push data, and the western portion of RAYPATH's northern seismic line. The southeastern bedrock low is defined by the lows in the NGS seismic Lines 1 and 2 near the municipal sewage transfer station,

and the bedrock depth at GW-73D. Farther to the southeast, a bedrock high is present near Town Park.

SUMMARY

The seismic refraction survey shows the bedrock surface contains a topographic high within the Western Bedrock Valley between the MBTA commuter line and Main Street. Topographic lows are located on both sides of this high. One bedrock low extends under the U-Haul property and the other occurs in vicinity of the municipal sewer transfer station.

RECOMMENDATIONS

As stated earlier in this report, the purpose of the seismic survey was to define the bedrock valley to locate a monitoring well cluster in this portion of the Site. Since the seismic data shows the apparent presence of two bedrock lows in this portion of the WBV both well clusters are proposed to be installed as shown on Figure 7. Both locations would be subject to modification pursuant to access agreement negotiations.

If you have any questions concerning this letter report, please feel free to contact Steve Morrow at (423) 336-4511.

Sincerely,
MACTEC Engineering and Consulting, Inc.

Peter H. Thompson
Project Manager

(for MJM w/permission)
Michael J. Murphy
Project Principal

cc: Joe Coyne, MADEP
Steve Morrow, Olin

References

Castle, R., Dixon, H., Grew, E., Griscon, A., Zietz, I., 1976. *Structural Dislocations in Eastern Massachusetts.* United States Geological Survey Bulletin 1410

Castle, R., Hepburn, C., Kopera, J., 2005. *Bedrock Geologic Map of the Wilmington Quadrangle, Massachusetts. V1.0,* Massachusetts Geologic Survey (4th) (In review, April 2005)

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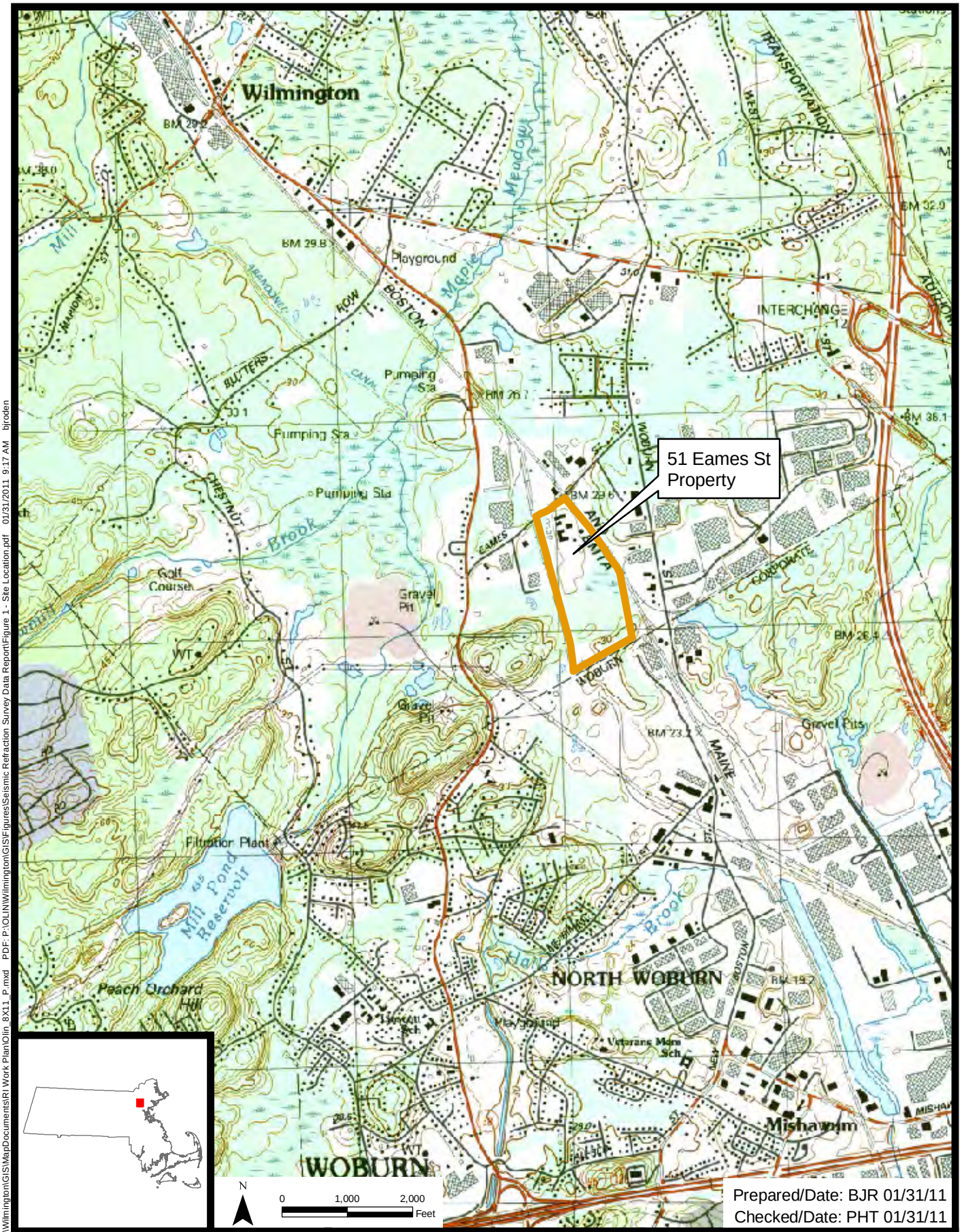
Smith, June, 1997. *Supplemental Phase II Report*; Wilmington Massachusetts, Olin Corporation. MassDEP RTN: 3-0471. Smith Technology Corporation, PTI Environmental Services; ABB Environmental Serviced, Inc. Geomega.

FIGURES



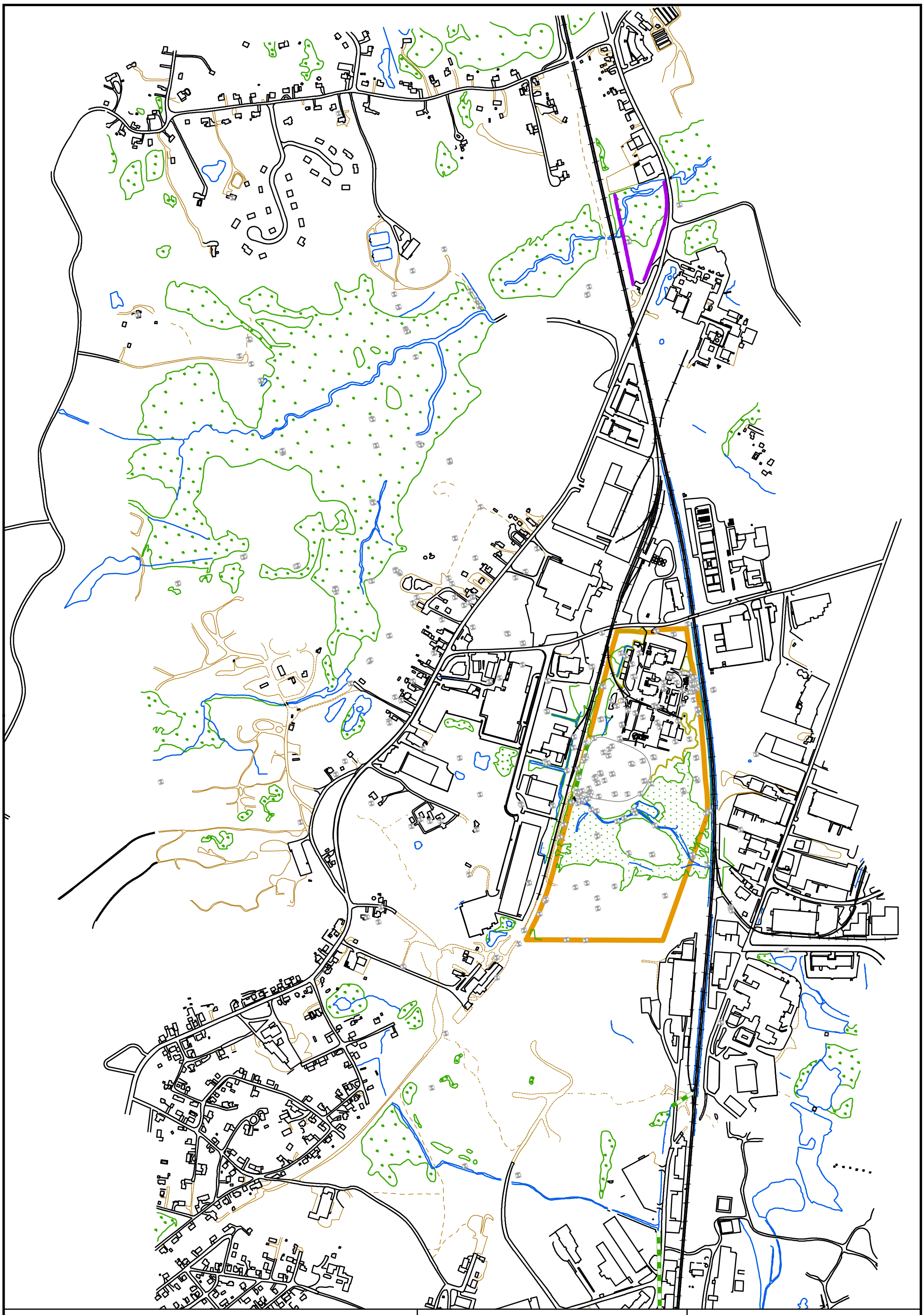
Prepared/Date: BJR 01/31/11
Checked/Date: PHT 01/31/11

Olin Chemical Superfund Site
Wilmington, Massachusetts

MACTEC

Figure 1
Site Location
Seismic Refraction Survey Data Report

Document: P:\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_8X11_P.mxd PDF: P:\OLIN\Wilmington\GIS\Figures\Seismic Refraction Survey Data Report\Figure 1 - Site Location.pdf 01/31/2011 9:17 AM bjroden



Legend

- Seismic Refraction Survey Line
- Historical Monitoring Well Location
- 51 Eames St. Property Boundary
- Paved Road
- Unpaved Road
- Railroad
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary
- Wooded Areas
- Culvert

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N

0 340 680 1,360 Feet

Figure 2
Location of Seismic Refraction Survey Lines

Seismic Refraction Survey Data Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

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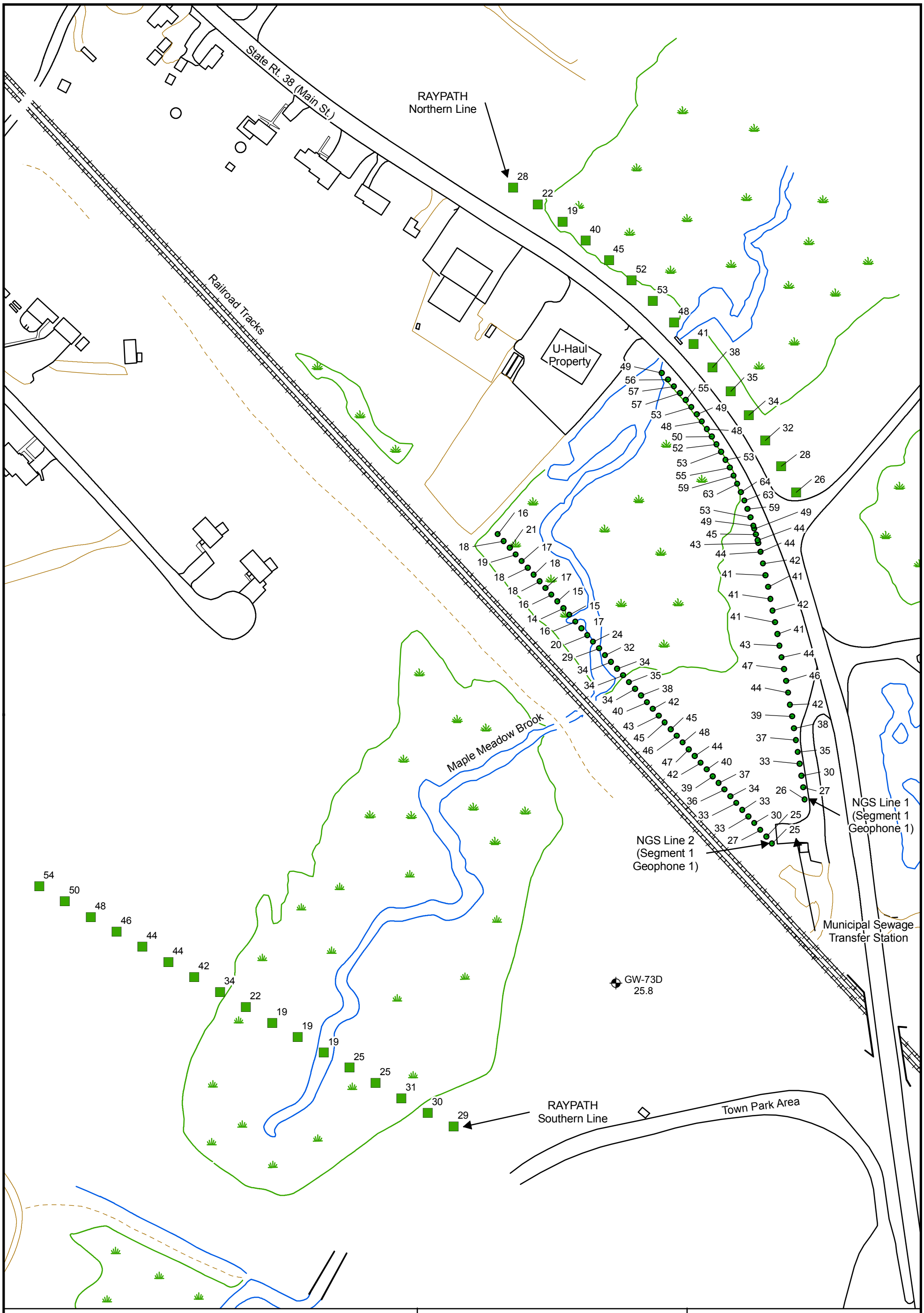

Legend

- NGS Seismic Point
- Smith Seismic Point
- 25 - Bedrock Elevation ft msl
- Railroad
- Paved Road
- Unpaved Road
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary

Note: Number at seismic and direct push points represent interpreted bedrock elevations (ft msl) at those locations.

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N

0 75 150 300 Feet

Figure 3
Location of Seismic Profile Lines

Seismic Refraction Survey Data Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

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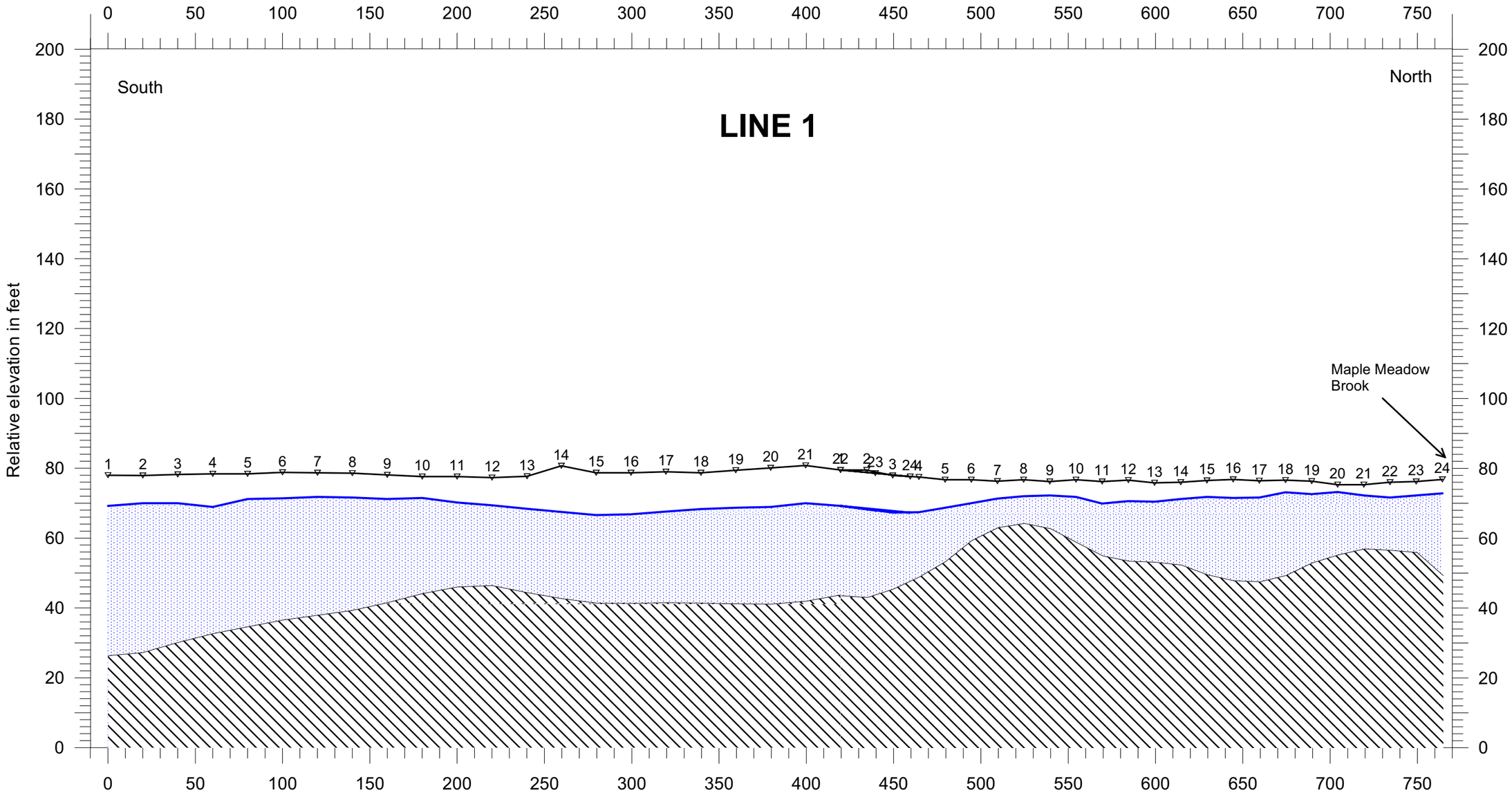
Document: P:\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_11X17_P.mxd PDF: P:\OLIN\Wilmington\GIS\Figures\Seismic Refraction Survey Data Report\Figure 3 - Location of Seismic Profile Lines.pdf 02/21/2011 1:18 PM bjroden



Explanation

= dry or partly saturated soil

= saturated soil

= bedrock

3 = geophone station number (per line segment)

Line 1 roughly parallels the west side of Route 38

FIGURE 4

MACTEC

Line 1 Interpreted Bedrock Profile

Olin Chemical Superfund Site

Location: Wilmington, MA	July, 2010 July, 2010
Client: MACTEC	Scale: 1 in = 60 ft horizontal 1 in = 30 ft vertical

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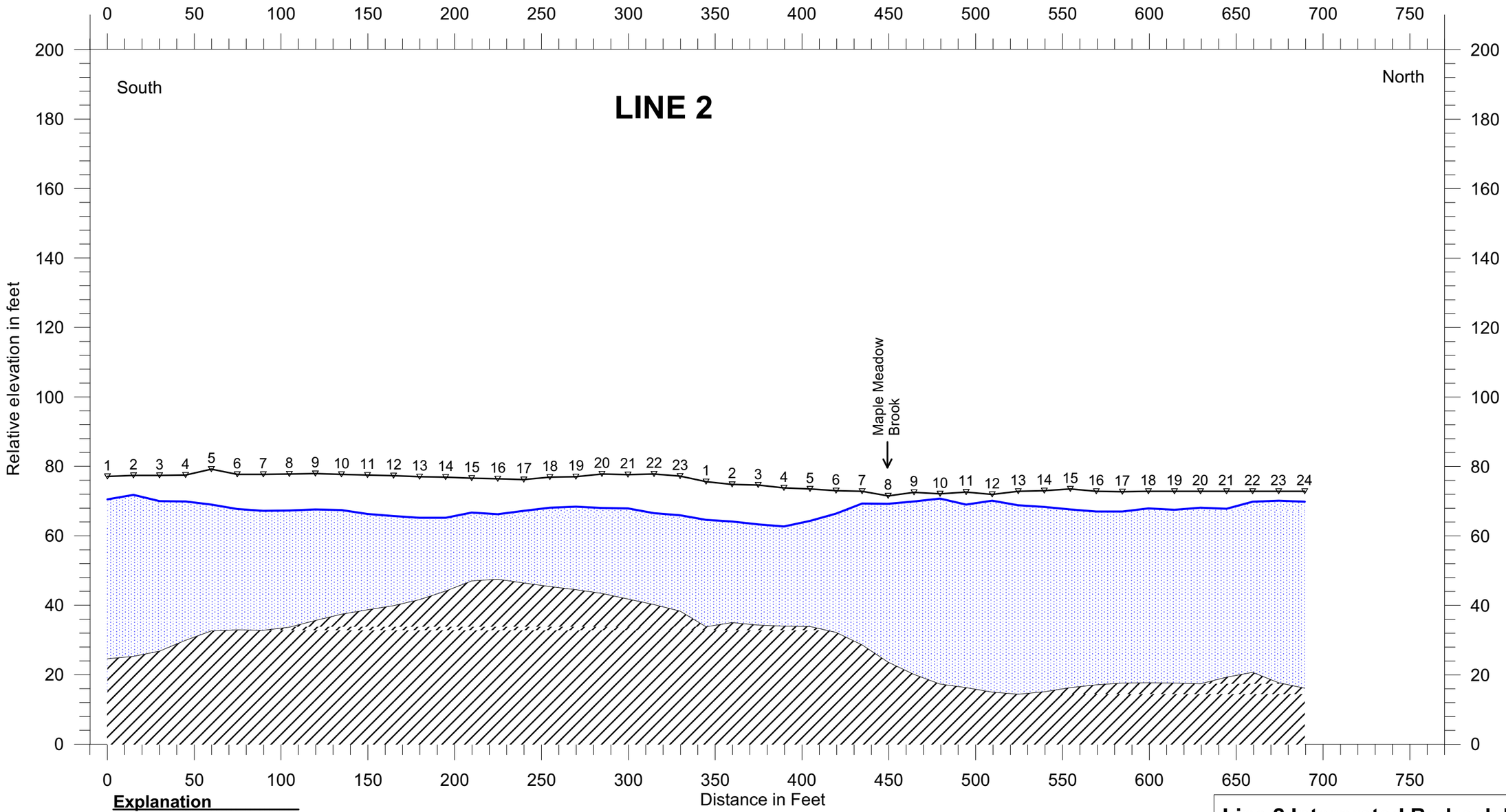
Bangor, Maine



Explanation

= dry or partly saturated soil

= saturated soil

= bedrock

3 = geophone station number (per line segment)

Line 2 parallels the east side of the railroad tracks

FIGURE 5

MACTEC

Line 2 Interpreted Bedrock Profile

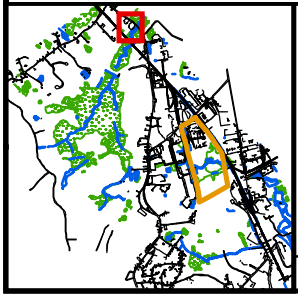
Olin Chemical Superfund Site

Location: Wilmington, MA	July, 2010 July, 2010
Client: MACTEC	Scale: 1 in = 60 ft horizontal 1 in = 30 ft vertical

Northeast Geophysical Services

Bangor, Maine

Notes:
1. 2008 Orthophoto obtained from: Office of Geographic Information (MassGIS), Commonwealth of Massachusetts Information Technology Division.
2. Wilmington Property Map obtained from: Town of Wilmington Assessors Office.



Legend

Approximate Direct Push Location

Approximate Property Boundary

25-2 Map-Lot Number

51 Eames St. Property Boundary

N

0 50 100 Feet

Prepared by BJR | Checked by PHT

Figure 6
Approximate Direct Push Soil Boring Locations
Seismic Refraction Survey Data Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

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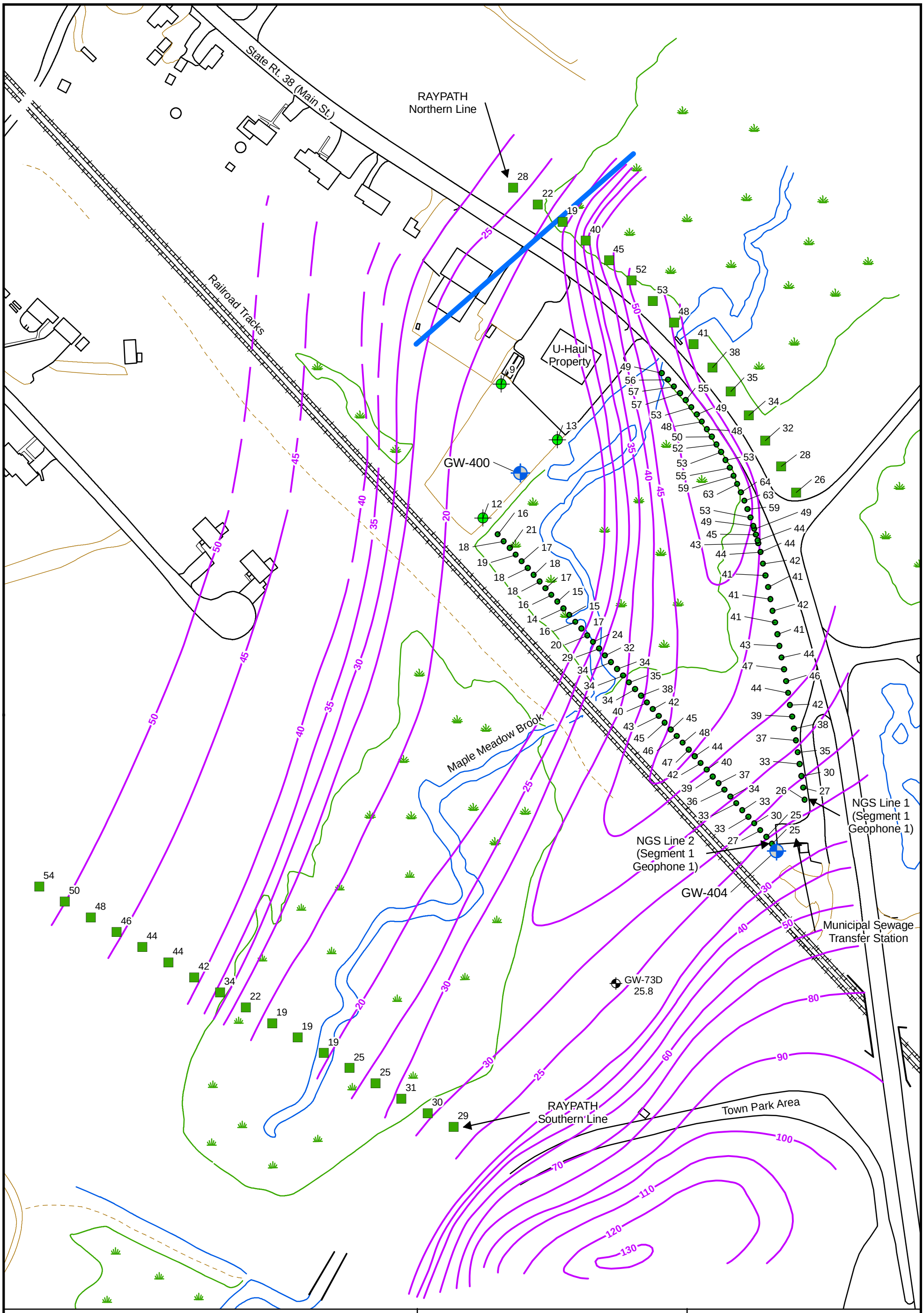

Legend

- Proposed Well Cluster
- Interpretive Bedrock Elevation Contours
- Bloody Bluff Fault Trace
- Direct Push Location
- NGS Seismic Point
- Smith Seismic Point
- 25 - Bedrock Elevation ft msl
- Railroad
- Paved Road
- Unpaved Road
- Sidewalks
- Structures
- Surface Water
- Trails
- Wetland Boundary

Note: Number at seismic and direct push points represent interpreted bedrock elevations (ft msl) at those locations.

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N

0 75 150 300 Feet

Figure 7
Interpreted Bedrock Elevation Contours and Proposed Well Loctions

Seismic Refraction Survey Data Report
Olin Chemical Superfund Site
Wilmington, Massachusetts

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Document: P:\OLIN\Wilmington\GIS\MapDocuments\RI Work Plan\Olin_11X17_P.mxd PDF: P:\OLIN\Wilmington\GIS\Figures\Seismic Refraction Survey Data Report\Figure 7 - Interpreted Bedrock Elevation Contours and Proposed Well Locations.pdf 02/28/2011 10:05 AM bjroden

ATTACHMENT A

GEOPHYSICAL REPORT

SEISMIC REFRACTION SURVEY
FOR THE
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

September, 2010

Northeast Geophysical Services
Division of NGS, Inc.
4 Union Street, Suite 3
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SEISMIC REFRACTION SURVEY
FOR THE
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

INTRODUCTION

At the request of MACTEC Engineering and Consulting, Inc. a seismic refraction survey was completed for the Olin Chemical Superfund Site in Wilmington, Massachusetts. The objective of this survey was to determine the configuration of the bedrock beneath the survey area. The field survey was undertaken on July 20 and 21, 2010.

This report describes the equipment and methods used and the results of the survey, and includes tabulated data, profiles and a line location map. For each of the two seismic lines surveyed a profile is presented at a scale of 1 inch equals 60 feet on the horizontal scale and 1 inch equals 120 feet on the vertical scale.

LOCATION AND SITE CONDITIONS

The survey area is located in the area between Main Street (Route 38) on the east and a railroad line on the west in the City of Wilmington. The survey lines are bordered to the north by the U-Haul property and to the south by the Town of Wilmington septic pump station. The locations of the survey lines are shown on the Seismic Line Location Map (following page). The survey was conducted in wooded lowlands. Over half of the survey was in the Maple Meadow Brook wetland with water depths that varied between knee and chest deep. Traffic noise from Route 38 was mitigated by using a traffic detail from the local police department that held traffic during data collection.

SUMMARY OF RESULTS

Two lines totaling 1,455 lineal feet were surveyed. The seismic refraction survey results are presented in the appendix as profiles of each line and as tabulated data. The seismically calculated bedrock depths over the two lines range from 13 to 58 feet. Highest seismically calculated bedrock elevation of 64 feet above mean sea level (msl) was along the middle of Line 1. The lowest seismically calculated bedrock elevation of 14 feet above msl was near the north end of Line 2.

SEISMIC METHODS AND INSTRUMENTATION

The seismic refraction method relies on travel times of sound waves, measured in milliseconds, traveling through and refracting from subsurface layers with contrasting densities. The seismic refraction lines were surveyed using a Geometrics Geode, 24-channel seismograph.

Each line consisted of two segments. Each segment consisted of 24 marsh geophones. Geophones were nominally spaced 15 to 20 feet apart. In the marshlands the geophones were implanted 1.5 to 2.5 feet into the muck. Each segment was tested with 5 to 7 shots. The general shot configuration consisted of one shot at either end of the segment, one off each end about 150

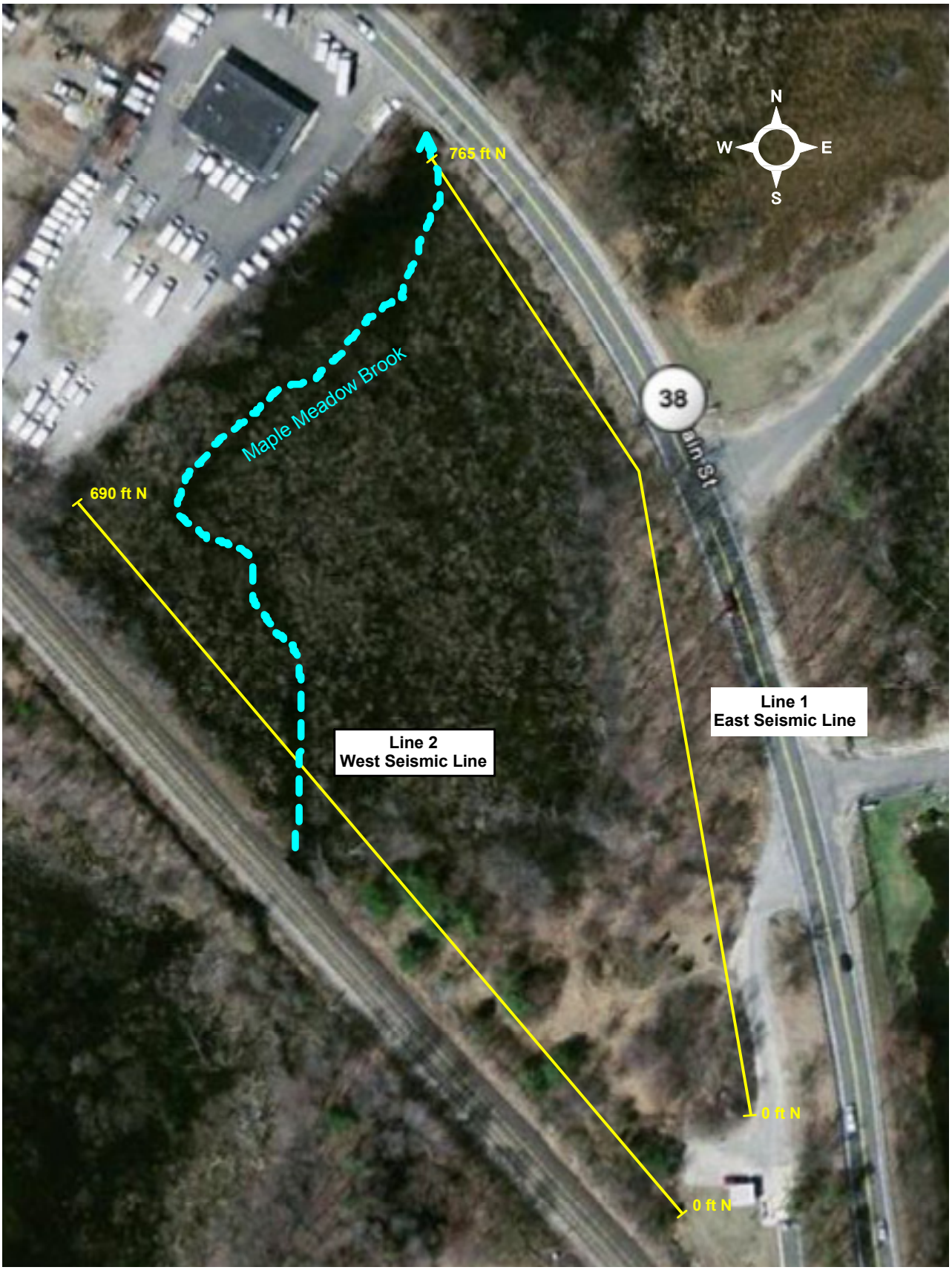


FIGURE 1
Approximate Seismic Line Locations

feet, and one or two shots within the segment. The energy source consisted of a small explosive charge buried about 3 to 4 feet deep.

The surface elevations were estimated from a topographic map of the area.

The seismic data were processed and interpreted using the RIMRock Geophysics SIPT-2 (formerly U.S.G.S. SIPT-2) seismic interpretation program. This program calculates seismic velocities by regression and by the Hobson-Overton method, and solves for layer thicknesses using the delay-time method and iterative ray tracing modeling.

SEISMIC SURVEY RESULTS

The seismic refraction results are presented in the appendix as profiles of each line showing the seismically interpreted bedrock depths and configurations. Tabulated results for each line are also shown in the appendix. The time distance plots of the data show three velocity layers. The first layer, Layer 1, had velocities of approximately 1,023 to 1,396 fps. Layer 1 was interpreted to represent dry soil, peat (organic sediments) or partly saturated soil. Layer 2 had velocities of approximately 4,425 to 5,180 fps. Layer 2 was interpreted to represent saturated mineral soil or till. Layer 3 had velocities of approximately 12,070 to 14,724 fps.

Profile of Line 1 (765 lineal feet) Line 1 consists of 2 segments and trends from south to north roughly paralleling the west side of Route 38. The south end of the line traverses wooded lowland. The north end of the line from about 450 feet to the end of the line at 765 feet, was in marshland with standing water 1 foot to 2 feet deep.

The seismically calculated bedrock depths along Line 1 range from 13 to 52 feet deep. The greatest bedrock depth is at the south end of the line. The shallowest bedrock depth was at about 520 feet north along the line.

Profile of Line 2 (690 lineal feet) Line 2 consists of two segments that trend from southeast to northwest paralleling the east side of the railroad tracks. The south end of the line traverses wooded lowland. The north end of the line from about 350 feet to the end of the line at 690 feet, was in marshland with standing water 1 foot to 3 feet deep.

The seismically calculated bedrock depths along Line 2 range from about 29 to about 58 feet deep. Bedrock depth at the southeast end of the line is about 53 feet. The bedrock surface slopes upward going to the northwest until about 225 feet north where bedrock depth was estimated at 29 feet. From 225 feet going north the bedrock slopes downward to about 55 feet deep near the north end of the line.

DISCUSSION OF SEISMIC RESULTS

In order for the seismic refraction method to accurately estimate velocity layer depths, certain natural conditions should exist:

a.) Layers should increase in velocity and in thickness with depth. A typical example would be ten feet of unsaturated soil at 1,500 fps overlying 50 feet of saturated soil at 5,000 fps that overlies bedrock at 16,000 fps.

b.) There should be a sufficient velocity contrast between different layers. Ideally, each velocity layer would be 2 to 3 times faster than the overlying layer.

c.) The velocity within a layer should be relatively constant throughout that layer (lateral homogeneity).

In addition to these conditions, it is also important that there be a low level of background noise at the site. It is also very helpful if there is some ground truth data, such as borehole data, to compare and calibrate the seismic information. At the time of the seismic interpretation there were no known bedrock depths situated near the lines.

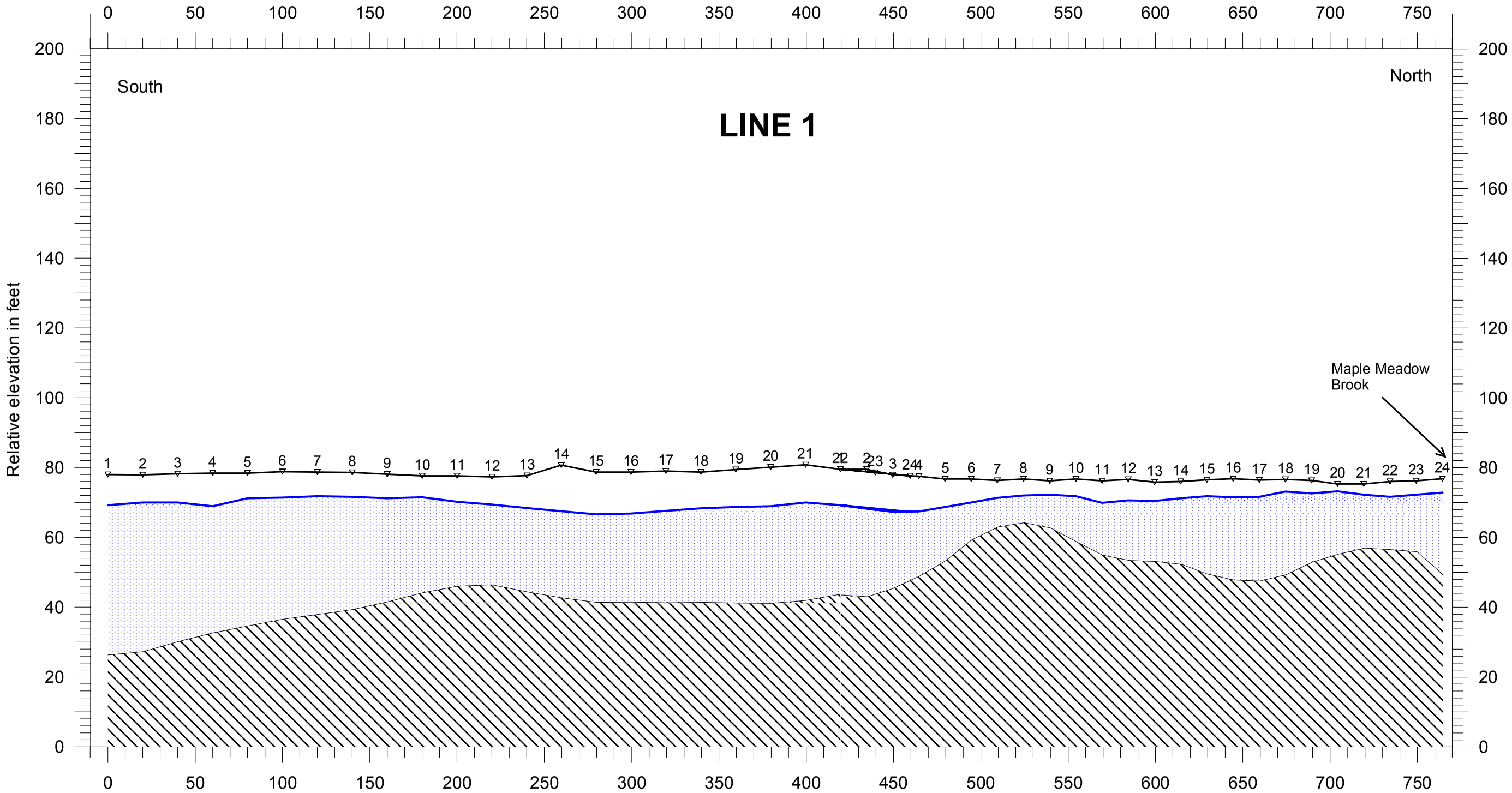
Under favorable conditions seismic refraction results can be fairly precise, within +/- 10 percent. The data quality for this survey was generally good. There are conditions that may exist that can affect the accuracy of the survey. The first condition is when the velocity within a layer varies laterally along the line. The seismic interpretation program assumes that the velocity within each layer is constant across the segment. If this is not the case, and the velocity changes, the depth interpretations can be in error. An example would be if a seismic line traversed over a short zone of material that had a layer 1 velocity of 1,000 fps while the rest of the line had a velocity of 1,500 fps. The effect on the interpretation would be that the bedrock depth would be overestimated in the area of the slow (1,000 fps) material.

Another possibility is that a higher velocity layer may overlie a low velocity layer (a velocity inversion). If this is the case, the low velocity layer would be hidden to the refraction method. The effect on the seismic interpretation would be that that depth to bedrock would be overestimated.

CONCLUSION

Two lines totaling 1,455 lineal feet were surveyed using the seismic refraction method for the Olin Chemical Superfund Site. The seismic survey provides a relative perspective of the bedrock configuration at this site. Normally it is expected that a refraction survey can provide bedrock depths that are within 10% of the actual depths. The data quality for this survey was generally good and based on the available information it appears that the survey fairly accurately estimates the bedrock surface. If there are future boreholes drilled in the area the seismic model can be refined and the confidence in the accuracy of the model improved.

APPENDIX
SEISMIC REFRACTION PROFILES
AND TABULATED RESULTS



Explanation

= dry or partly saturated soil

= saturated soil

= bedrock

3 = geophone station number (per line segment)

Line 1 roughly parallels the west side of Route 38

Line 1 Interpreted Bedrock Profile

Olin Chemical Superfund Site

Location: Wilmington, MA	July, 2010 July, 2010
Client: MACTEC	Scale: 1 in = 60 ft horizontal 1 in = 30 ft vertical

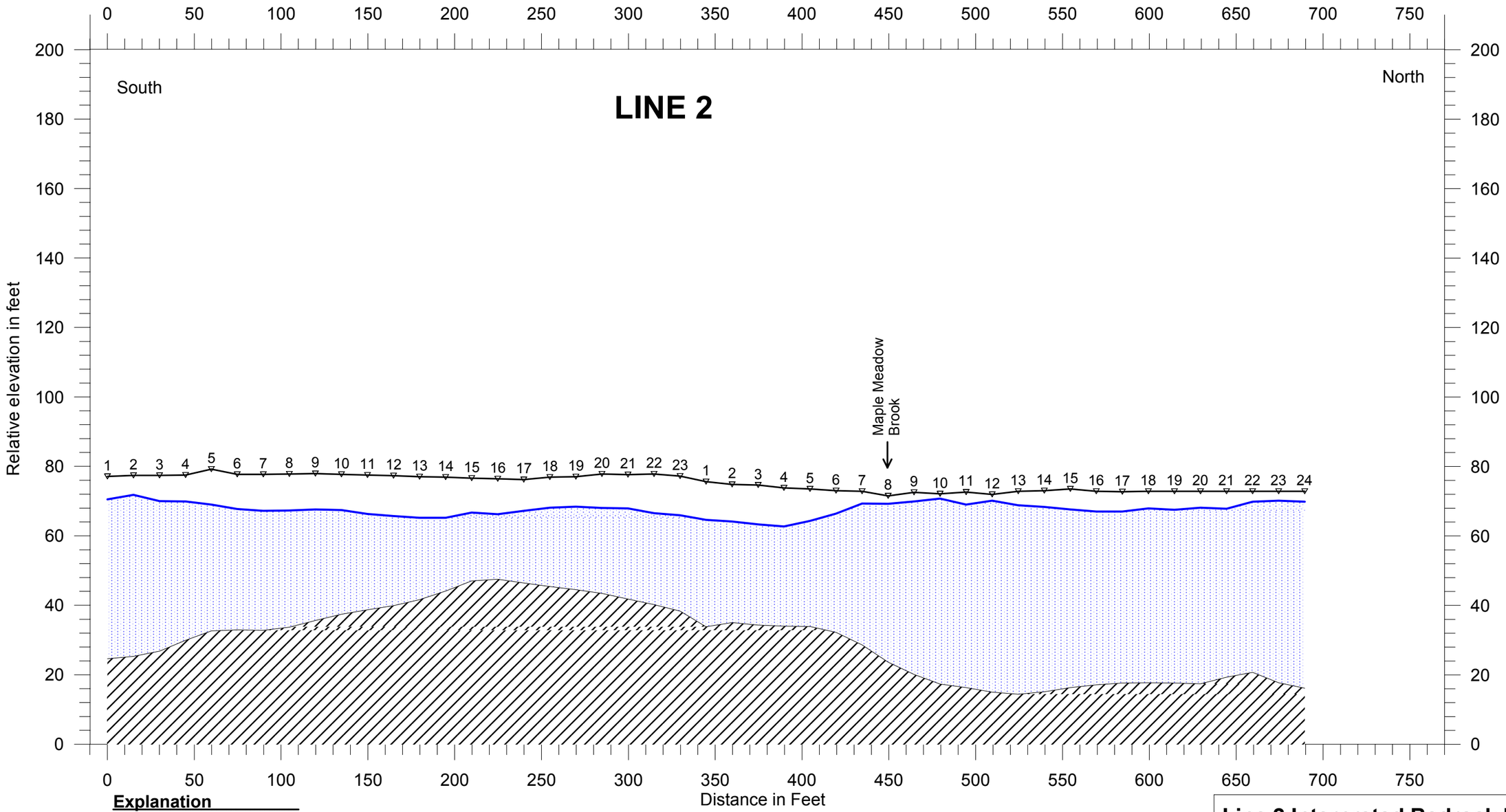
Northeast Geophysical Services

Bangor, Maine

Seismic Line 1 Olin Site - Wilminton, MA estimated depths & elevations

Geo	X dist	Surface	L2 depth	L2 elev	L3 depth	L3 elev
1	0	78	9	69	52	26
2	20	77.9	8	70	51	27
3	40	78.2	8	70	48	30
4	60	78.4	10	69	46	33
5	80	78.4	7	71	44	35
6	100	78.8	7	71	42	37
7	120	78.7	7	72	41	38
8	140	78.6	7	72	39	39
9	160	78.1	7	71	37	42
10	180	77.6	6	72	34	44
11	200	77.6	7	70	32	46
12	220	77.3	8	69	31	46
13	240	77.7	9	68	33	44
14	259.7	80.7	13	68	38	43
15	279.6	78.7	12	67	37	41
16	299.6	78.7	12	67	37	41
17	319.6	79	11	68	38	42
18	339.6	78.7	10	68	37	41
19	359.6	79.4	11	69	38	41
20	379.6	80.1	11	69	39	41
21	399.6	80.8	11	70	39	42
22	419.6	79.5	10	69	36	44
23	439.5	78.6	11	68	35	44
24	459.5	77.6	10	67	29	49
1	419.6	79.5	10	69	36	44
2	434.6	79.5	11	68	37	43
3	449.5	77.9	11	67	33	45
4	464.5	77.5	10	67	29	49
5	479.5	76.7	8	69	23	53
6	494.5	76.7	7	70	17	59
7	509.4	76.3	5	71	13	63
8	524.4	76.7	5	72	13	64
9	539.4	76.2	4	72	14	63
10	554.4	76.7	5	72	18	59
11	569.4	76.2	6	70	21	55
12	584.4	76.6	6	71	23	53
13	599.4	75.8	5	70	23	53
14	614.4	76	5	71	24	52
15	629.4	76.5	5	72	27	50
16	644.4	76.8	5	72	29	48
17	659.4	76.4	5	72	29	48
18	674.4	76.6	4	73	27	49

Seismic Line 1	Olin Site - Wilminton, MA			estimated depths & elevations		
Geo	X dist	Surface	L2 depth	L2 elev	L3 depth	L3 elev
19	689.4	76.3	4	73	23	53
20	704.3	75.3	2	73	20	55
21	719.3	75.3	3	72	18	57
22	734.3	76	4	72	20	57
23	749.3	76.2	4	72	20	56
24	764.3	76.8	4	73	28	49



Explanation

= dry or partly saturated soil

= saturated soil

= bedrock

3 = geophone station number (per line segment)

vertical exaggeration = 2X

Line 2 parallels the east side of the railroad tracks

Line 2 Interpreted Bedrock Profile

Olin Chemical Superfund Site

Location: Wilmington, MA	July, 2010 July, 2010
Client: MACTEC	Scale: 1 in = 60 ft horizontal 1 in = 30 ft vertical

Northeast Geophysical Services

Bangor, Maine

Seismic Line 2 Olin Site - Wilmington, MA estimated depths & elevations

Geo	X dist	Surface	L2 depth	L2 elev	L3 depth	L3 elev
1	0	77.1	7	71	53	25
2	15	77.4	6	72	52	25
3	30	77.4	7	70	51	27
4	45	77.5	8	70	48	30
5	59.9	79.2	10	69	47	33
6	74.8	77.7	10	68	45	33
7	89.8	77.7	11	67	45	33
8	104.8	77.8	11	67	44	34
9	119.8	77.9	10	68	42	36
10	134.8	77.7	10	67	40	37
11	149.8	77.5	11	66	39	39
12	164.8	77.3	12	66	37	40
13	179.8	77	12	65	35	42
14	194.8	76.9	12	65	33	44
15	209.8	76.6	10	67	30	47
16	224.8	76.4	10	66	29	48
17	239.8	76.2	9	67	30	46
18	254.8	76.9	9	68	32	45
19	269.8	77	9	68	33	45
20	284.8	77.8	10	68	34	43
21	299.8	77.6	10	68	36	42
22	314.8	77.8	11	67	38	40
23	329.8	77.2	11	66	39	38
1	344.7	75.6	11	65	42	34
2	359.7	74.8	11	64	40	35
3	374.7	74.6	11	63	40	34
4	389.6	73.8	11	63	40	34
5	404.6	73.5	9	64	40	34
6	419.6	73	7	66	41	32
7	434.6	72.8	4	69	44	29
8	449.6	71.5	2	69	48	24
9	464.5	72.5	3	70	52	20
10	479.5	72.1	1	71	55	17
11	494.5	72.6	4	69	56	16
12	509.5	71.9	2	70	57	15
13	524.5	72.8	4	69	58	14
14	539.5	73	5	68	58	15
15	554.5	73.5	6	68	57	16
16	569.4	72.8	6	67	56	17
17	584.4	72.7	6	67	55	18
18	599.4	72.8	5	68	55	18
19	614.4	72.8	5	68	55	18

Seismic Line 2	Olin Site - Wilmington, MA			estimated depths & elevations		
Geo	X dist	Surface	L2 depth	L2 elev	L3 depth	L3 elev
20	629.4	72.8	5	68	55	17
21	644.4	72.8	5	68	54	19
22	659.4	72.8	3	70	52	21
23	674.4	72.8	3	70	55	18
24	689.4	72.8	3	70	57	16

SEISMIC REFRACTION SURVEY
OF LINE 3 AT THE
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

For
MACTEC Engineering and Consulting, Inc.

June 2011

Northeast Geophysical Services
Division of NGS, Inc.
4 Union Street, Suite 3
Bangor, Maine

SEISMIC REFRACTION SURVEY
OF LINE 3 AT THE
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

INTRODUCTION

At the request of MACTEC Engineering and Consulting, Inc., a seismic refraction survey (Seismic Line 3) was completed at the Olin Chemical Superfund Site in Wilmington, Massachusetts. This survey is an addendum to an earlier survey by Northeast Geophysical Services that was completed in July 2010 for MACTEC entitled: "Seismic Refraction Survey for the Olin Chemical Superfund Site". Line 3 was surveyed at a later date because of nearby active construction that was occurring during the earlier survey. The objective of this survey was to determine the configuration of the bedrock beneath the survey area. The field survey was undertaken on December 14, 2010. Preliminary results were sent in February, 2011.

This report describes the equipment and methods used and the results of the survey, and includes tabulated data, profiles and a line location map. A profile of Line 3 is presented at a scale of 1 inch equals 60 feet on the horizontal scale and 1 inch equals 30 feet on the vertical scale.

LOCATION AND SITE CONDITIONS

Seismic Line 3 is located along the west boundary of the Olin property just east and parallel to a railroad line in the City of Wilmington. The north end of the line is about 50 feet south of Eames Street. The location of the survey line is shown on the Seismic Line Location Map (following page). The geophone locations were marked in the field with pin flags. The south end of the line was wet with water table at or near the surface. Bedrock is exposed in places at the north end of the line.

SUMMARY OF RESULTS

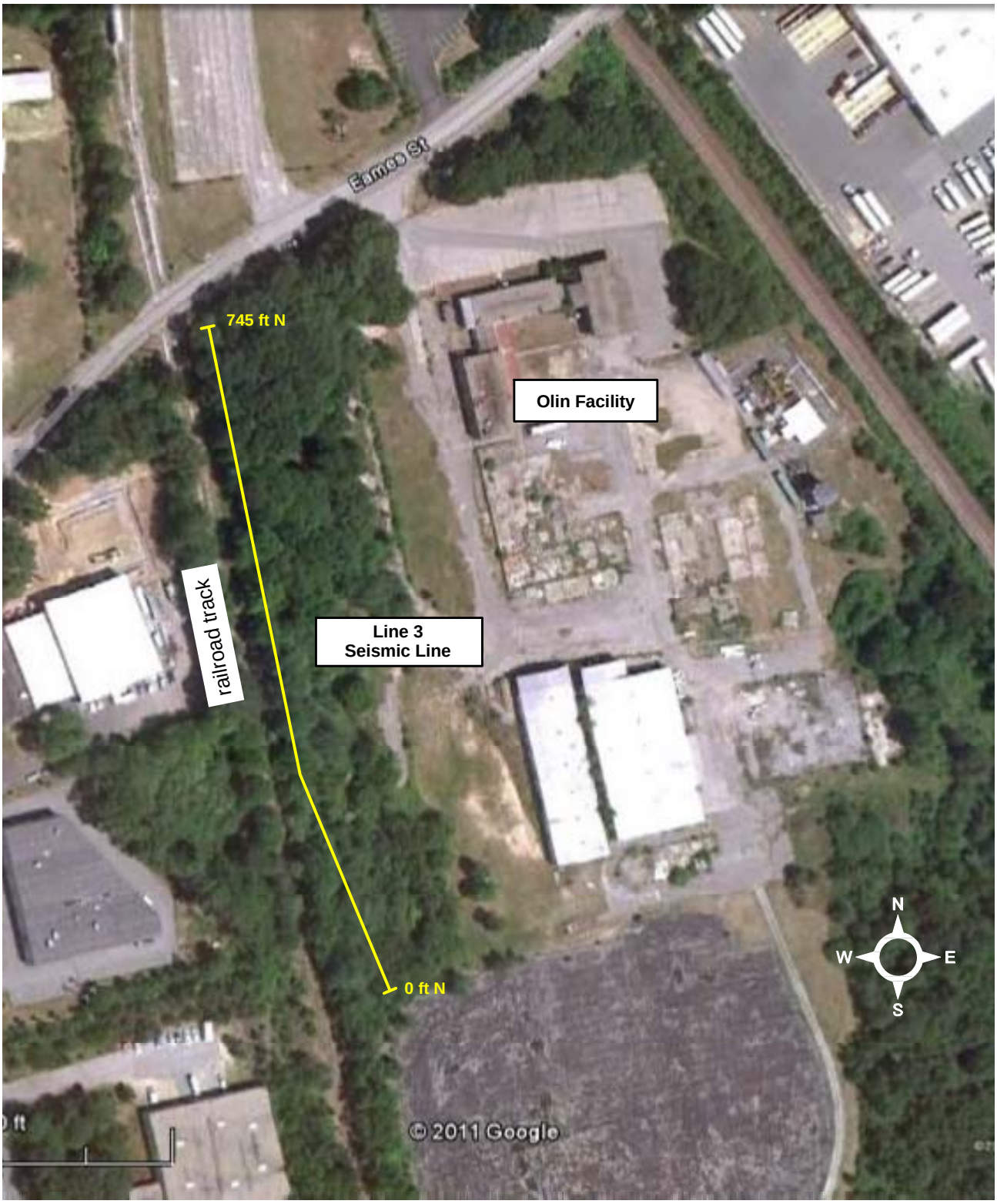
Line 3 totaled 745 lineal feet. The seismic refraction survey results are presented in the appendix as a profile of the line and as tabulated data. The seismically calculated bedrock depths along the line range from 2 to 39 feet. Highest seismically calculated bedrock elevation of 94 feet above mean sea level (msl) was near the north end of the line. The lowest seismically calculated bedrock elevation of 44 feet above msl was at the south end of the line. The bedrock surface generally slopes from north to south.

SEISMIC METHODS AND INSTRUMENTATION

The seismic refraction method relies on travel times of sound waves, measured in milliseconds, traveling through and refracting from subsurface layers with contrasting densities. The seismic refraction lines were surveyed using a Geometrics Geode, 24-channel seismograph.

The line consisted of two segments. Each segment consisted of 24 marsh geophones. Geophones were nominally spaced 15 to 20 feet apart. Segment 1 was tested with six shots and

FIGURE 1
Line 3 Approximate Seismic Line Location



Segment 2 with seven shots. The general shot configuration consisted of one shot at either end of the segment, one off each end about 150 feet, and one or two shots within the segment. The energy source consisted of a small explosive charge buried about 3 to 4 feet deep.

The surface elevations were estimated from nearby monitoring well (GW-29S and GW-28S) elevations.

The seismic data were processed and interpreted using the RIMRock Geophysics SIPT-2 (formerly U.S.G.S. SIPT-2) seismic interpretation program. This program calculates seismic velocities by regression and by the Hobson-Overton method, and solves for layer thicknesses using the delay-time method and iterative ray tracing modeling.

SEISMIC SURVEY RESULTS

The seismic refraction results for Line 3 are presented in the appendix as a profile of the line showing the seismically interpreted bedrock depths and configurations. Tabulated results for the line are also shown in the appendix.

Line 3 (745 lineal feet) consists of 2 segments and trends from south to north roughly paralleling the east side of a railroad track along the west side of the Olin property. The north end of the line ends about 50 feet south of Eames Street.

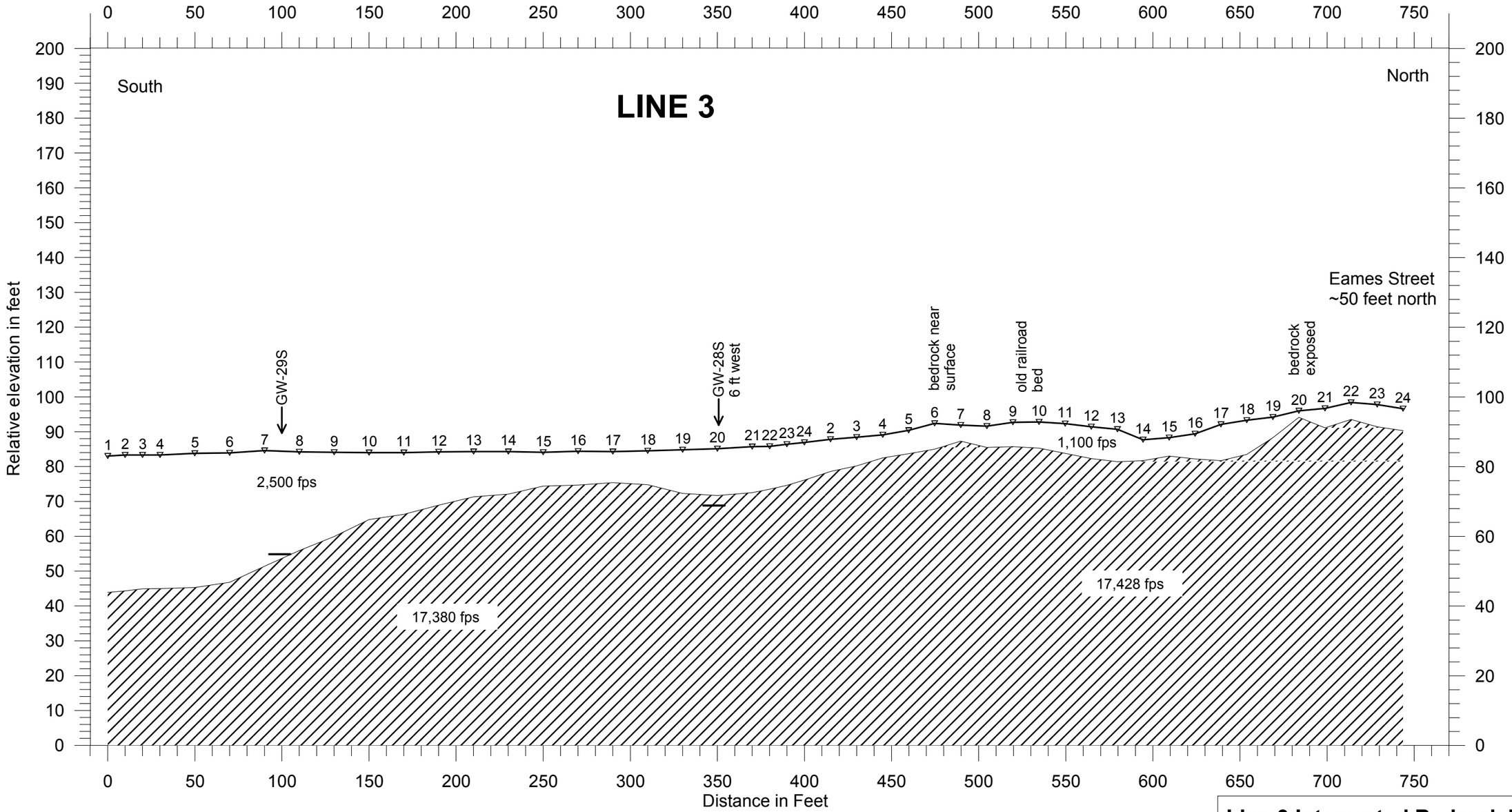
For Line 3 the time distance plots of the data show two velocity layers. The first layer, Layer 1, had velocities ranging from approximately 1,098 to 3,654 fps. Layer 1 was interpreted to represent dry soil at the north end of the line and saturated to partly saturated soil at the south end. Layer 2 had velocities of approximately 17,052 to 17,428 fps. Layer 2 was interpreted to represent bedrock.

The seismically calculated bedrock depths over Line 3 range from 2 to 39 feet. Highest seismically calculated bedrock elevation of 94 feet above mean sea level (msl) was near the north end of the line. The lowest seismically calculated bedrock elevation of 44 feet above msl was at the south end of the line. The bedrock surface generally slopes from north to south.

CONCLUSION

Seismic Line 3 totaling 745 lineal feet was surveyed using the seismic refraction method at the Olin Chemical Superfund Site. The seismic survey provides a relative perspective of the bedrock configuration along this line. Normally it is expected that a refraction survey can provide bedrock depths that are within 10% of the actual depths. There were two boreholes, GW-29S located at about 100 feet north along the line and GW-28S located at about 350 feet north along the line that had known bedrock depths. These lines were used to help calibrate the seismic models. If there are future boreholes drilled in the area the seismic model can be refined and the confidence in the accuracy of the model improved.

APPENDIX
SEISMIC REFRACTION LINE 3
PROFILE AND TABULATED RESULTS



vertical exaggeration = 2X

Line 3 parallels the east side of the railroad tracks

Line 3 Interpreted Bedrock Profile

Olin Chemical Superfund Site

Location: Wilmington, MA	Survey Date: December, 2010
Client: MACTEC Engineering & Consulting	Scale: 1 in = 60 ft horizontal, 1 in = 30 ft vertical

Northeast Geophysical Services

Bangor, Maine

Seismic Line 3 Olin Site - Wilmington, MA estimated depths & elevations				
Geophone	X dist	Surface elevation (ft)	Bedrock depth (ft)	Bedrock elevation (ft)
1	0	83	39	44
2	10	83.3	39	44
3	20	83.3	38	45
4	30	83.3	38	45
5	50	83.8	39	45
6	70	83.9	37	47
7	90	84.6	33	51
8	110	84.2	28	56
9	130	84.1	24	60
10	150	84	19	65
11	170	84	18	66
12	190	84.2	15	69
13	210	84.3	13	71
14	230	84.3	12	72
15	250	84.1	10	74
16	270	84.4	10	75
17	290	84.3	9	75
18	310	84.5	10	75
19	330	84.8	13	72
20	350	85.1	13	72
21	370	85.7	13	73
22	380	85.8	12	74
23	389.9	86.4	12	75
24	399.9	86.9	11	76
2	414.9	87.8	9	79
3	429.9	88.4	8	80
4	444.9	89.1	7	83
5	459.8	90.4	7	84
6	474.7	92.4	7	85
7	489.7	91.9	5	87
8	504.7	91.6	6	86
9	519.6	92.7	7	86
10	534.6	92.8	8	85
11	549.6	92.3	9	84
12	564.6	91.4	9	82
13	579.6	90.7	9	81
14	594.3	87.7	6	82
15	609.3	88.3	5	83
16	624.2	89.4	7	82
17	639	92.1	10	82
18	653.9	93.3	10	84
19	668.9	94.2	6	88
20	683.8	96	2	94
21	698.8	96.7	6	91
22	713.7	98.4	5	94
23	728.7	97.8	6	91
24	743.6	96.6	6	90

APPENDIX D
BOREHOLE GEOPHYSICAL DATA

BOREHOLE GEOPHYSICAL LOGGING OF FIVE BEDROCK BOREHOLES AT THE OLIN SITE WILMINGTON, MASSACHUSETTS

Northeast Geophysical Services
4 Union Street, Suite 3
Bangor, Maine 04401
January, 2011

BOREHOLE GEOPHYSICAL LOGGING
OF FIVE BEDROCK BOREHOLES
AT THE OLIN SITE
WILMINGTON, MASSACHUSETTS

Introduction

At the request of MACTEC, five bedrock boreholes located at the Olin Site in Wilmington, Massachusetts were geophysically logged by Rudy Rawcliffe of Northeast Geophysical Services (NGS). The boreholes are designated as 65 BRD, 202 BR, 405 BR, 406 BR and 407 BR. Borehole 406 BR was logged on May 17, 2010 and 407 BR was logged on May 28, 2010. Boreholes 65 BRD, 202 BR and 405 BR were logged between December 8 and 10, 2010 and a repeat log of 65 BRD was done on December 13, 2010.

The purpose of the geophysical logging was to identify water-bearing fractures for subsequent packer testing. Caliper, temperature, fluid resistivity, single-point resistance (SPR), spontaneous potential (SP) and heat-pulse flowmeter measurements were collected from each of the boreholes. In addition, acoustic televiewer (ATV) and optical televiewer (OTV) images were generated for each borehole.

Summary of Results

Five boreholes totaling about 982 lineal feet of geophysical logging were completed. Geophysical logs of the five boreholes are attached to this report (Attachments A-E respectively). For each borehole the data are presented in a series of logs (Plates 1-4) that show the results of the geophysical measurements. Tables that provide the depth and calculated strike and dip of each identified feature and rose and polar plots of planar features for each borehole are also presented in the attachments.

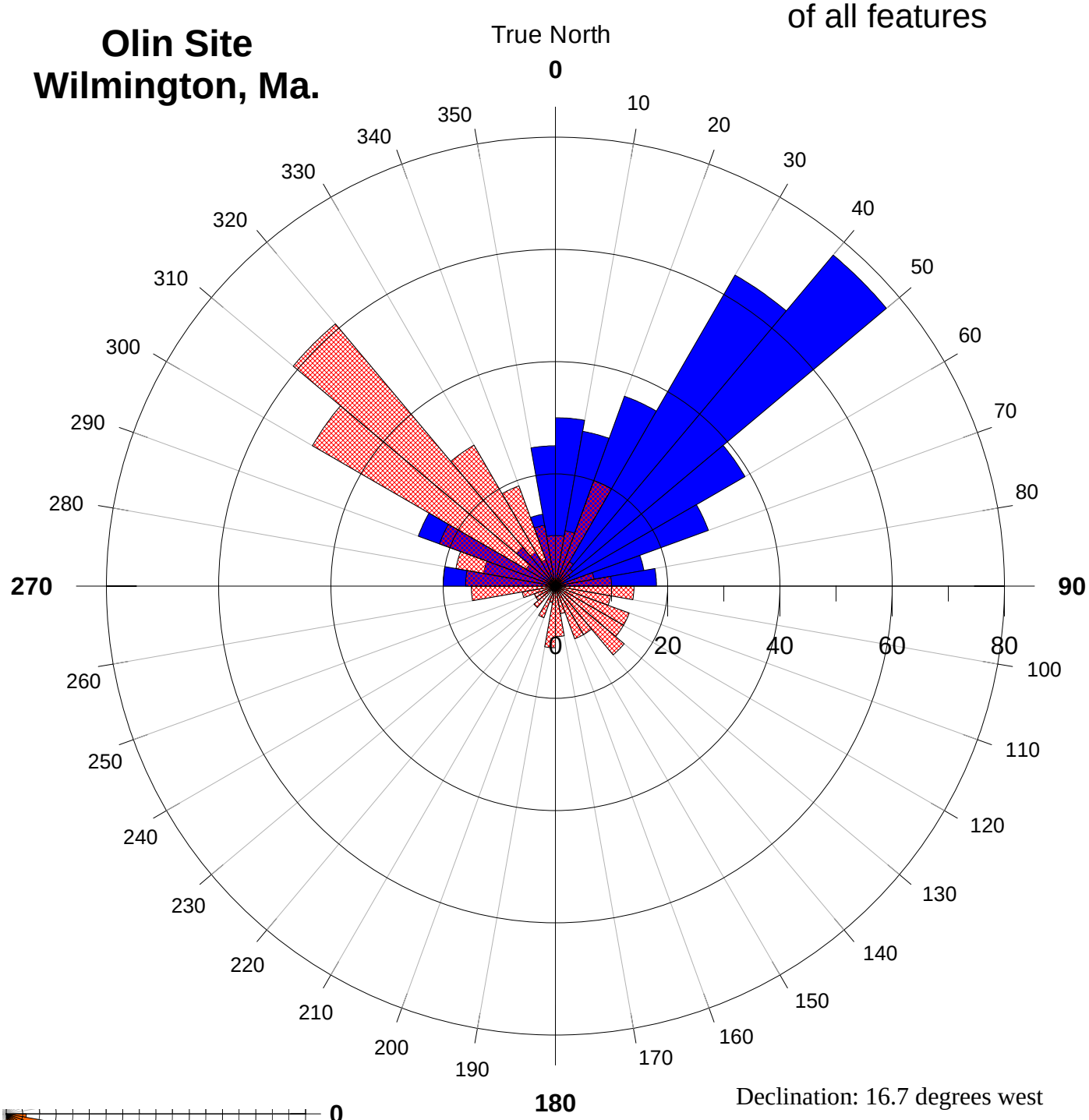
The main objective of the geophysical logging was to identify transmissive fractures in the boreholes. Plate 1 in each attachment (A-K) is a composite geophysical log containing caliper, flowmeter, temperature, fluid resistivity, SPR and SP data and a tadpole plot derived from the televiewer data. Plate 1 shows the locations of potential fractures in each of the boreholes. The flowmeter results, temperature and fluid resistivity results provide indications of which of these potential fractures carry notable groundwater flow (i.e. are transmissive).

The fractures interpreted to be transmissive are shown on Plate 1 by dashed circles adjacent to the caliper log. Dark black circles indicate likely transmissive fractures. Lighter, gray circles indicate possible transmissive fractures. The tadpole plot (far right column) on Plate 1 also shows possible and likely transmissive fractures. The blue colored tadpoles represent possible (light blue) and likely (dark blue) transmissive fractures. It is possible that there are other transmissive fractures in the boreholes but these are the ones that are most apparent based on the geophysical measurements.

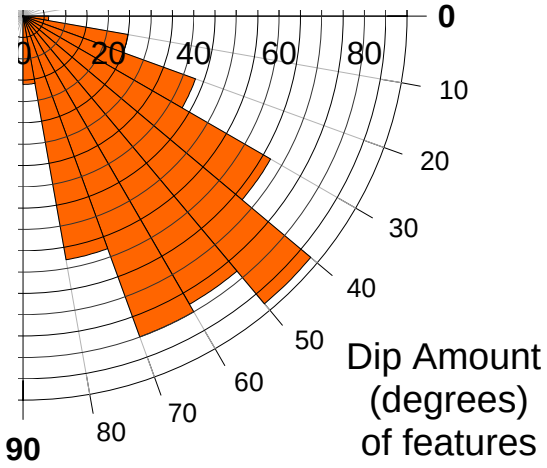
Figure 1 (page 2) is a rose plot of the strike and dip angle of all 461 interpreted features measured in the five boreholes logged by NGS. This plot shows that the median strike of these features in all of the boreholes is to the northeast at 49º and the features generally dip 50º (median) to the

FIGURE 1
Strike and Dip Direction of all features

Olin Site
Wilmington, Ma.



Declination: 16.7 degrees west



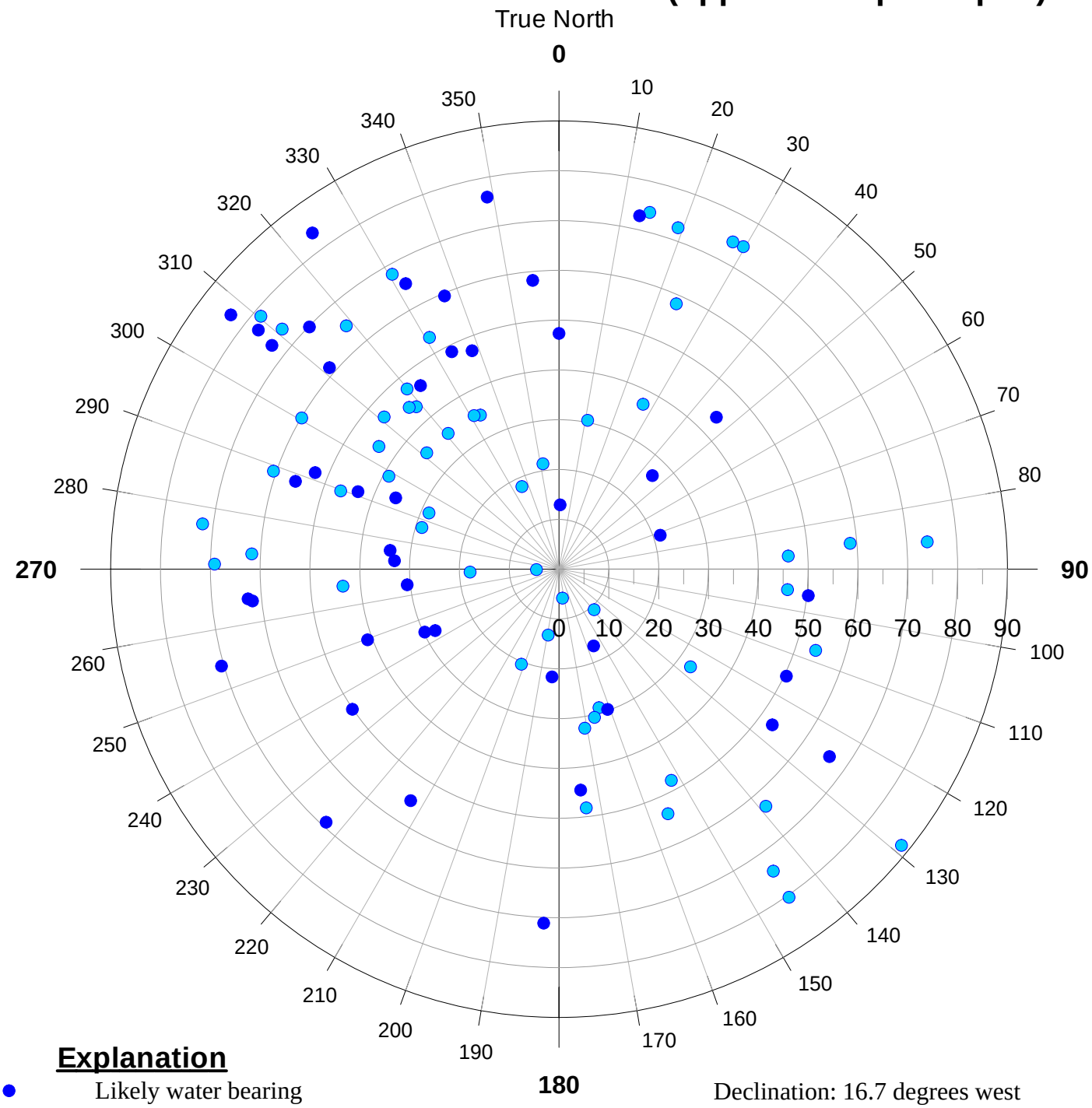
Explanation

- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 461 measurements in five boreholes, (BRD 65, BR 202, 405, 406 and 407)

Olin Site
Wilmington, Ma.

FIGURE 2
Dip Amount and Dip Azimuth of Likely and Possibly transmissive fractures (upper hemisphere plot)



Explanation

- Likely water bearing
- Possibly water bearing

Declination: 16.7 degrees west

Based on 99 measurements in five boreholes, (BRD 65, BR 202, 405, 406 and 407)

northwest. This probably represents foliation of the bedding planes or fractures that parallel the foliation.

Of the 461 measured features, 99 were interpreted to be likely or possibly transmissive. Figure 2 (page 3) is an upper hemisphere polar plot showing the dip amount and dip direction of the planar features in the five boreholes that are interpreted to be likely or possibly transmissive. This graph shows that about 44% of the interpreted transmissive features dip towards the northwest (median 311º) at an angle of about 49º. This coincides with the dip direction of the bedrock foliation or bedding. However, the dip directions of other 56% of the interpreted transmissive fractures are varied and some have steep dips (over 70º) and others are nearly horizontal fractures (dipping less than 20º).

Geophysical Methods and Instrumentation

The boreholes were logged with a Mount Sopris Matrix digital logger. The boreholes were logged with a caliper tool, fluid temperature/fluid resistivity tool, a SPR/SP tool and the OTV and ATV tools. The final log on each borehole was the flowmeter measurements. Prior to entering the borehole each tool was decontaminated using soap (alconox) and deionized water rinse. Following is a brief description of each parameter that was measured and how that information is used to locate possible bedrock fractures.

Temperature (in degrees Centigrade [ºC]) is measured with the probe going down each hole. Generally, temperature rises smoothly with depth at a rate of about 1.0º C per 100 feet due to the local geothermal gradient. Areas where water may be entering or exiting the borehole are sometimes revealed on the temperature log as abrupt temperature changes or sometimes as temperature gradient changes. Other factors that can affect the temperature log besides transmissive fractures include variations in the thermal resistivity of the rock with depth along the borehole, surface climatic changes, thermal effects of drilling activity, and localized heat sources such as radionuclides in the rock or cement setting outside the casing.

Single-point-resistance (SPR) measures the electrical resistance (in ohms) between the probe and a surface electrode. Water-filled fractures will often appear as abrupt spikes of relatively low resistance on this log.

Spontaneous potential (SP) measures the natural electrical currents (in milli-volts) in the subsurface. Causes of SP can be due to electrochemical changes or oxidation-reduction potentials that may exist between different layers. Another cause for SP can be streaming potentials caused by fluid movement into or out of a bedrock fracture. Typically SP anomalies appear as spikes towards the left (lower voltage) on the log.

Fluid resistivity measures the resistivity (in ohm-meters) of the water in the borehole. Fluid resistivity can be useful in identifying transmissive fractures because water entering the borehole through fractures sometimes has a different resistivity than the water that is already in the borehole.

Caliper measures the borehole diameter. Fractures are often revealed on the caliper log as abrupt widenings of the borehole.

The optical televiewer (OTV) log provides a digital optical image of the borehole walls. The OTV can identify planar features such as fractures, bedding surfaces, and joints and the strike, dip direction and dip angle.

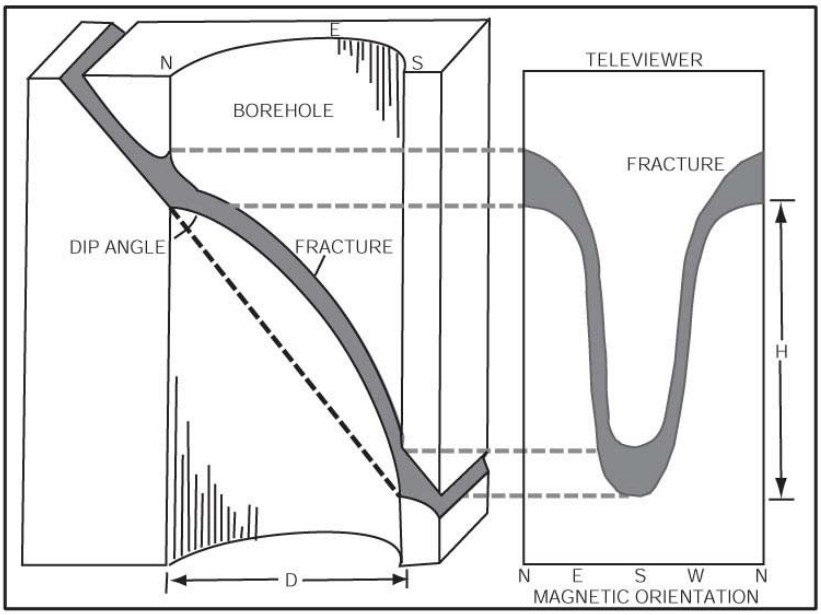
The acoustical televiewer (ATV) log provides an acoustical image of the borehole walls. The ATV works by scanning the borehole wall with an acoustic beam that is produced by a rapidly

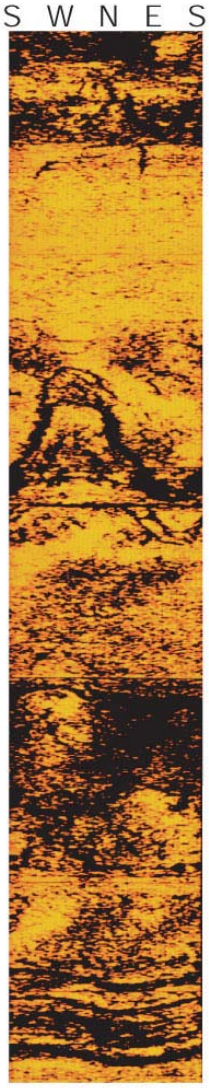
rotating piezoelectric source. Similar to the optical televiewer, planar features such as fractures, bedding surfaces and joints can be identified with the ATV tool and the strike, dip direction and dip angle of these features can often be determined.

The optical (OTV) and acoustical (ATV) televiewer logs are somewhat duplicative in that they both can provide similar information. However, there are advantages and disadvantages to both tools. The ATV requires the borehole to be water filled and will not provide information above the water level. The OTV can work in air or water but is not effective in cloudy, turbid water whereas the ATV will work fine in cloudy water. The ATV can be better at discerning voids, cracks and fractures whereas the OTV can be better at discerning lithology. Also, sometimes water-bearing fractures are rust stained, which can be seen by the OTV.

The ATV (and OTV) data are presented as "unwrapped" images of the borehole wall that are oriented to magnetic north. The dip angle and dip direction of any planar feature that intersects the borehole can be measured from this image. The figure below illustrates this.

Borehole Televiewer Data





Each identified feature was digitized using WellCad software which then calculates the dip and dip direction of the features taking into account the borehole tilt and orientation.

The temperature, caliper, SPR, fluid resistivity, ATV and OTV logs were examined and possible bedrock fractures were identified. This information was used to select measurement locations for the flowmeter instrument. Generally, flowmeter measurements were taken in the zone above and below locations where potential fractures might exist in the boreholes.

Flowmeter Measurements

Flowmeter measurements of the vertical water flow were made in the boreholes using a Mount Sopris Heat Pulse Flowmeter. This instrument is capable of measuring flow direction in a borehole (up or down) and has a calibrated measurement range of 1.0 to 0.03 gallons per minute (gpm).

Vertical flow in a borehole is caused when two or more transmissive fractures in the borehole are at hydraulic disequilibrium with one another. When this occurs there is a hydraulic gradient developed and water will flow toward the fracture with the lower hydraulic head. When no vertical flow is measured it can mean that there are less than two transmissive fractures in the borehole or that all the fractures in the borehole are at equilibrium with each other.

Flowmeter measurements are made under ambient (unstressed) conditions and then repeated while stressing the borehole by pumping using a small pump situated near the top of the borehole. The effect of pumping is to cause inflow into the borehole from any transmissive fractures which can be identified by the flowmeter measurements.

Borehole Geophysical Results

Composite geophysical logs of the boreholes are attached to this report (Attachments A-E). The geophysical data for each borehole are presented on a series of plots entitled Plates 1-4. The caliper log is plotted on plates 1 and 4 for reference. Attachment A contains data from 65 BRD, Attachment B contains data from 202 BR, and Attachment C contains data from 205 BR and so on.

The first plot for each borehole, Plate 1, is a composite log plot containing the caliper log, heat pulse flowmeter, fluid resistivity, temperature, SPR, SP logs and a tadpole plot of the dip and dip direction of the interpreted planar features interpreted from the televiewer logs. The blue colored tadpoles represent possible (light blue) and likely (dark blue) transmissive fractures. The number adjacent to each blue tadpole reference tabulated data for the borehole that provide the strike, dip direction and dip amount of each identified planar feature in the borehole.

One or a combination of anomalous geophysical responses identified physical discontinuities that may represent possible transmissive fractures. These included abrupt widenings in the caliper log, changes in the fluid resistivity log, deflections or gradient changes in the temperature log and the heat pulse flowmeter measurements. The flowmeter log and the temperature and fluid resistivity logs were mainly used to identify transmissive fractures.

Plate 2 is a rose plot of the strike and dip angle of all the interpreted planar features in each borehole.

Plate 3 is an upper hemisphere polar plot of the dip direction and dip amount of planar features in each borehole.

Plate 4 is the televiewer image log plots, caliper log and interpreted structure for each borehole.

Table 1 (A-E) provides the depth and calculated strike and dip of the planar features in each borehole that have been interpreted from the televiewer logs. These planar features may be

fractures or may represent cleavage, joints or bedding planes. The results in Table 1 have been categorized and also have been color-coded on the logs to provide an interpretative range of the likelihood that the associated feature signifies a transmissive fracture as follows:

- Dark blue symbol (category 107) - multiple distinct borehole geophysical logging responses indicating borehole enlargement (caliper, SPR, acoustic signal), or evident change in the borehole fluid characteristic (temperature, fluid resistivity, discoloration on the optical log or quantified vertical flow) that provides the strongest data that the indicated bedrock feature represents a likely transmissive water-bearing fracture.
- Light blue symbol (category 108) - less amount of corroborating geophysical data to support that the indicated feature will transmit groundwater compared to the dark blue symbol. However, the televiewer logs show a fairly distinct acoustic signal or optical image that perhaps under a higher stress condition (e.g. pumping rate), vertical flow could be induced in the borehole. Less degree of confidence that the feature represents a transmissive feature.
- Black symbol (category 100) - bedrock feature not interpreted to transmit water; more likely to represent planes of foliation, bedding planes, healed or filled fractures, or mechanical breaks in the rock matrix due to drilling advancement.

It is possible that there are other transmissive fractures in the boreholes but the ones indicated on the logs and tables are considered the most likely based on the geophysical measurements.

ATTACHMENT A

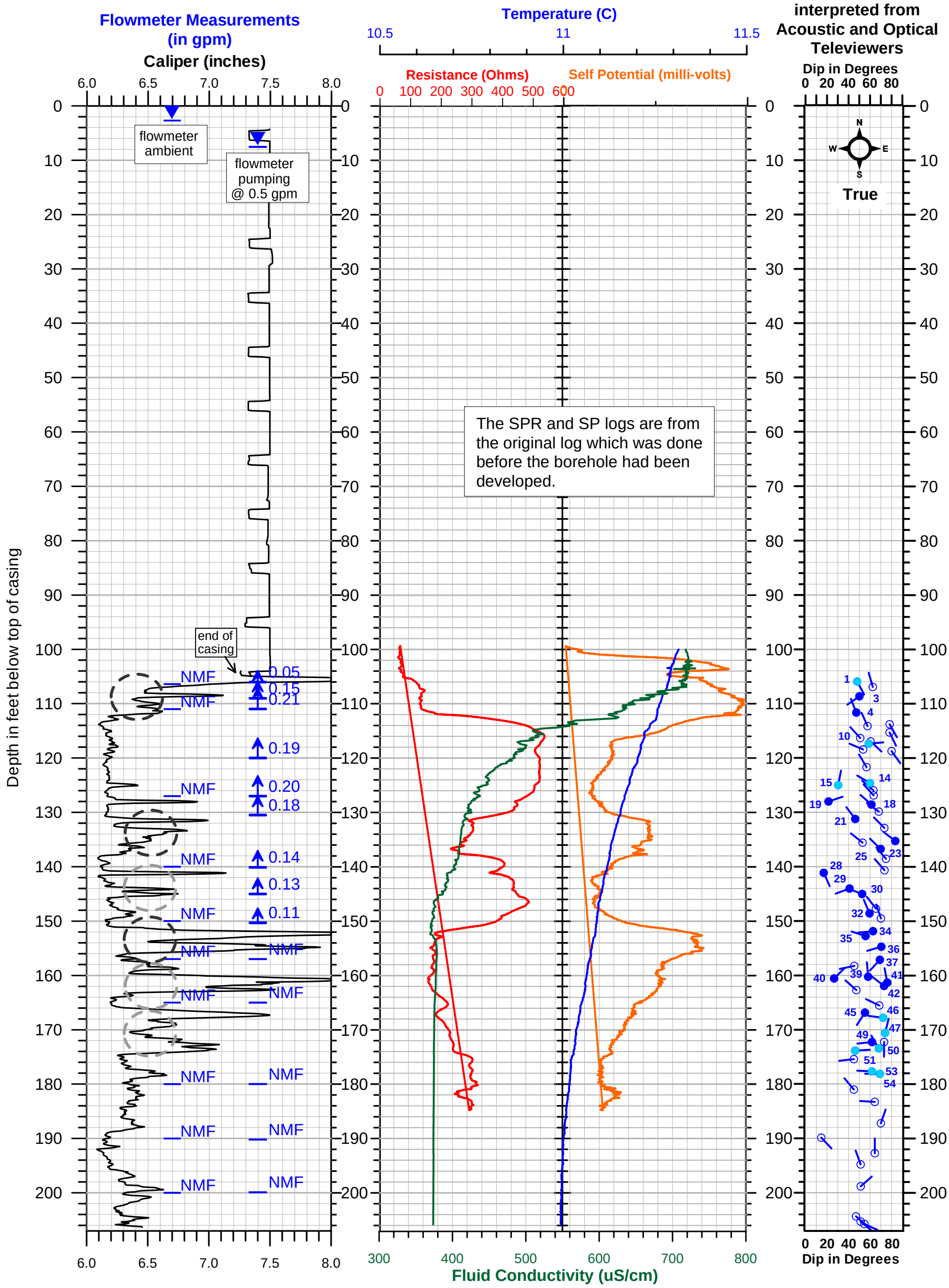
BOREHOLE 65 BRD

BOREHOLE GEOPHYSICAL LOGS

Northeast Geophysical Services

PLATE A-1
Borehole Geophysical Log
65 BRD - Olin Site
Wilmington, MA

Date logged: 12/13/10



= Likely transmissive zone

= Possible transmissive zone

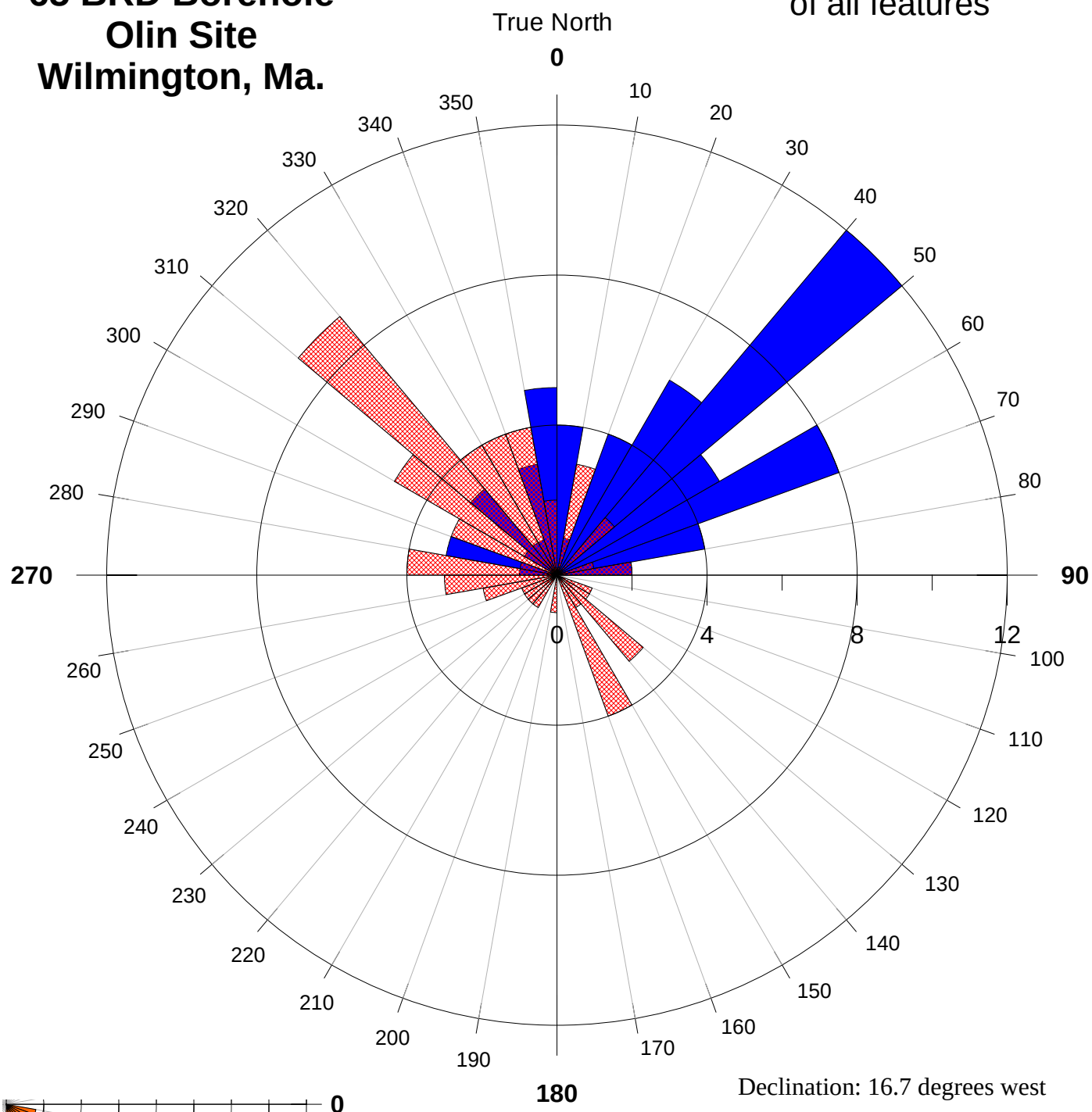
PLATE A-1
Borehole Geophysical Log
65 BRD Repeat - Olin Site
Wilmington, MA

Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

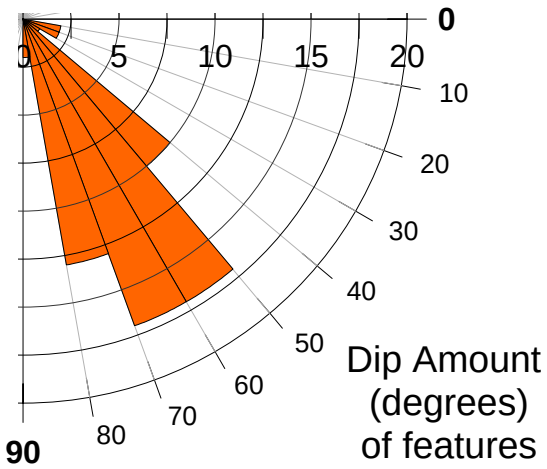
Northeast Geophysical Services

65 BRD Borehole
Olin Site
Wilmington, Ma.

PLATE A-2
Strike and Dip Direction of all features



Declination: 16.7 degrees west



Explanation

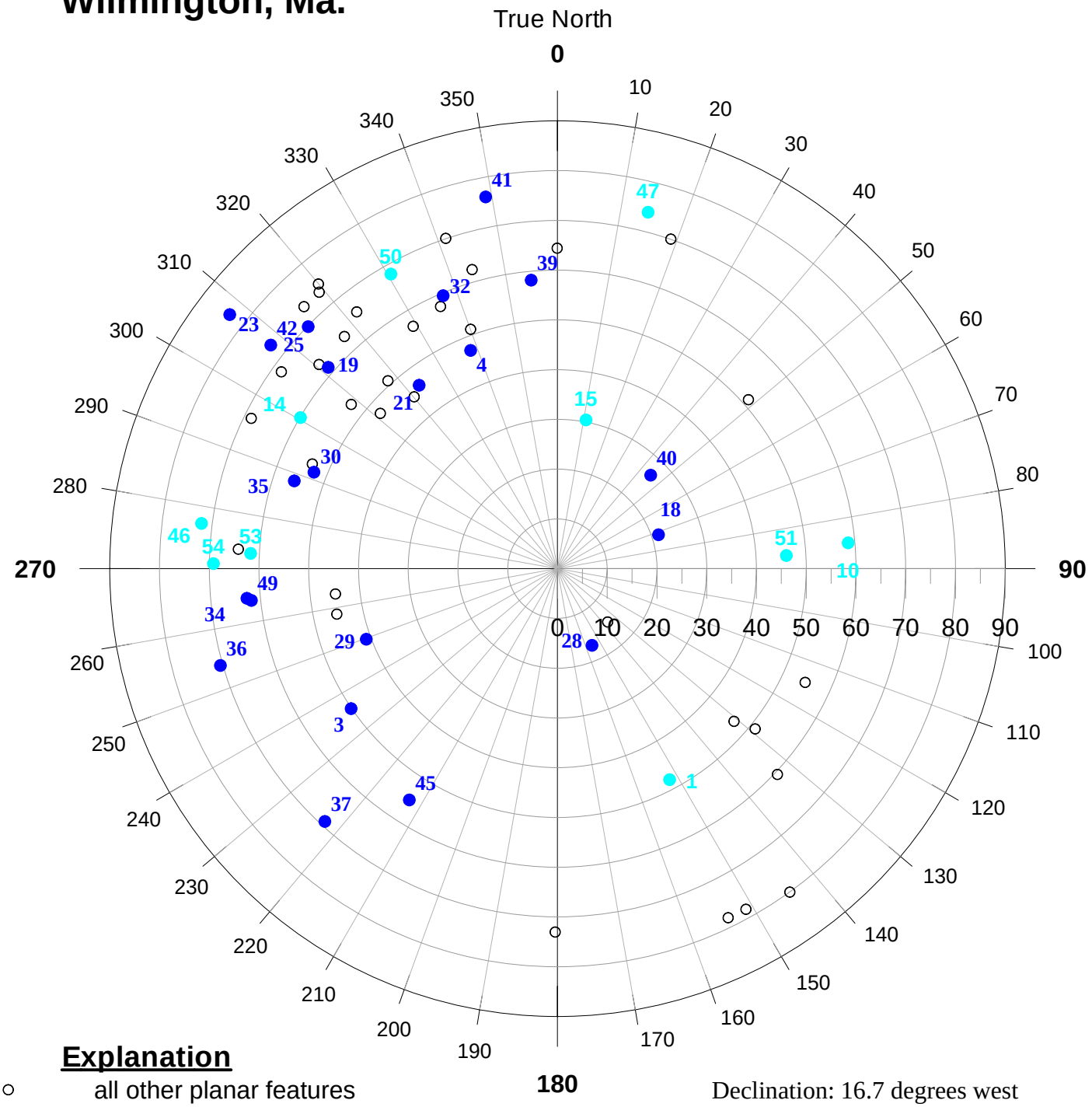
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 64 measurements

Northeast Geophysical Services

65 BRD Borehole
Olin Site
Wilmington, Ma.

PLATE A-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- ○ all other planar features
- ● Likely water bearing
- ● Possibly water bearing

Declination: 16.7 degrees west

Based on 64 measurements

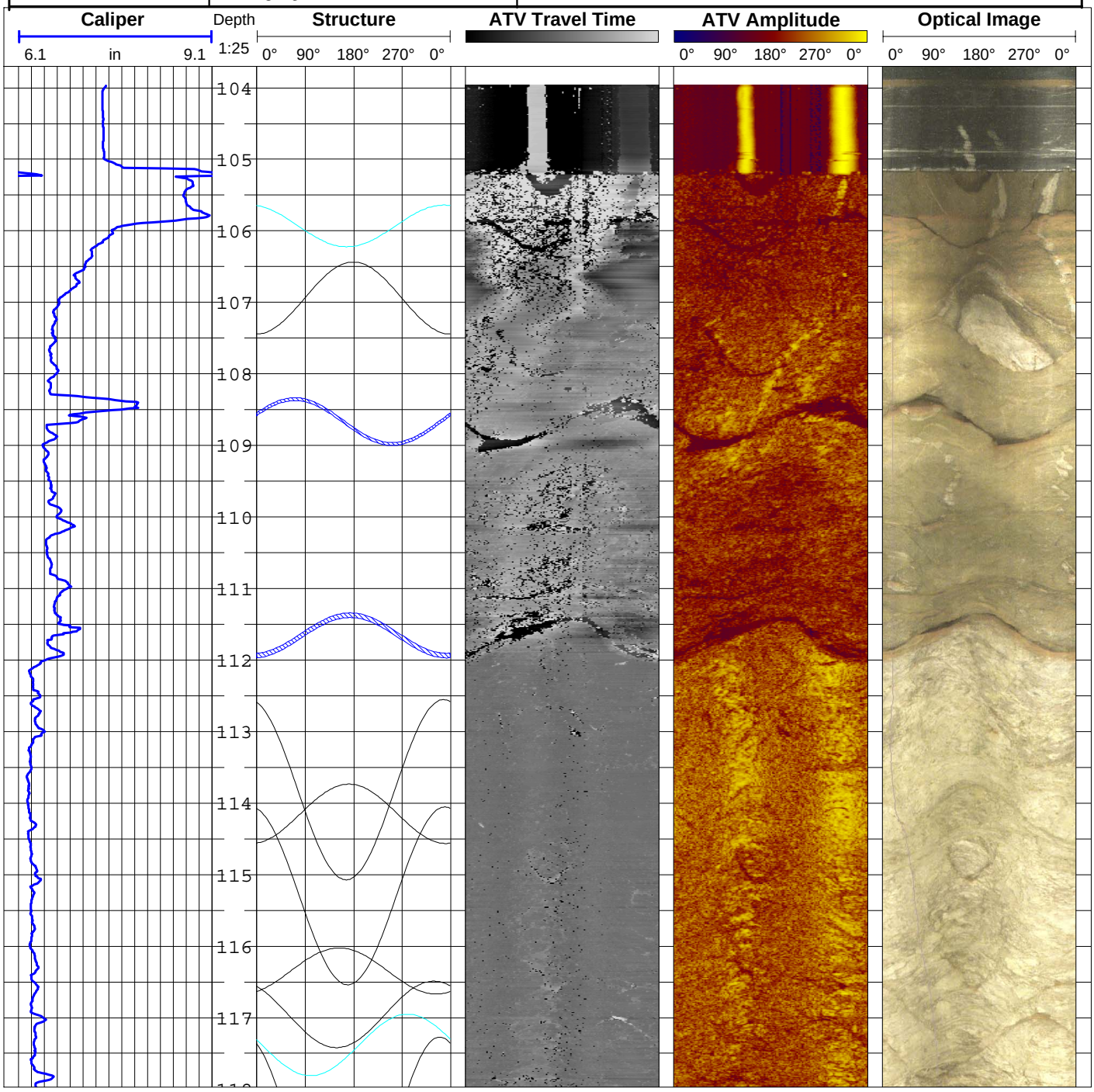
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

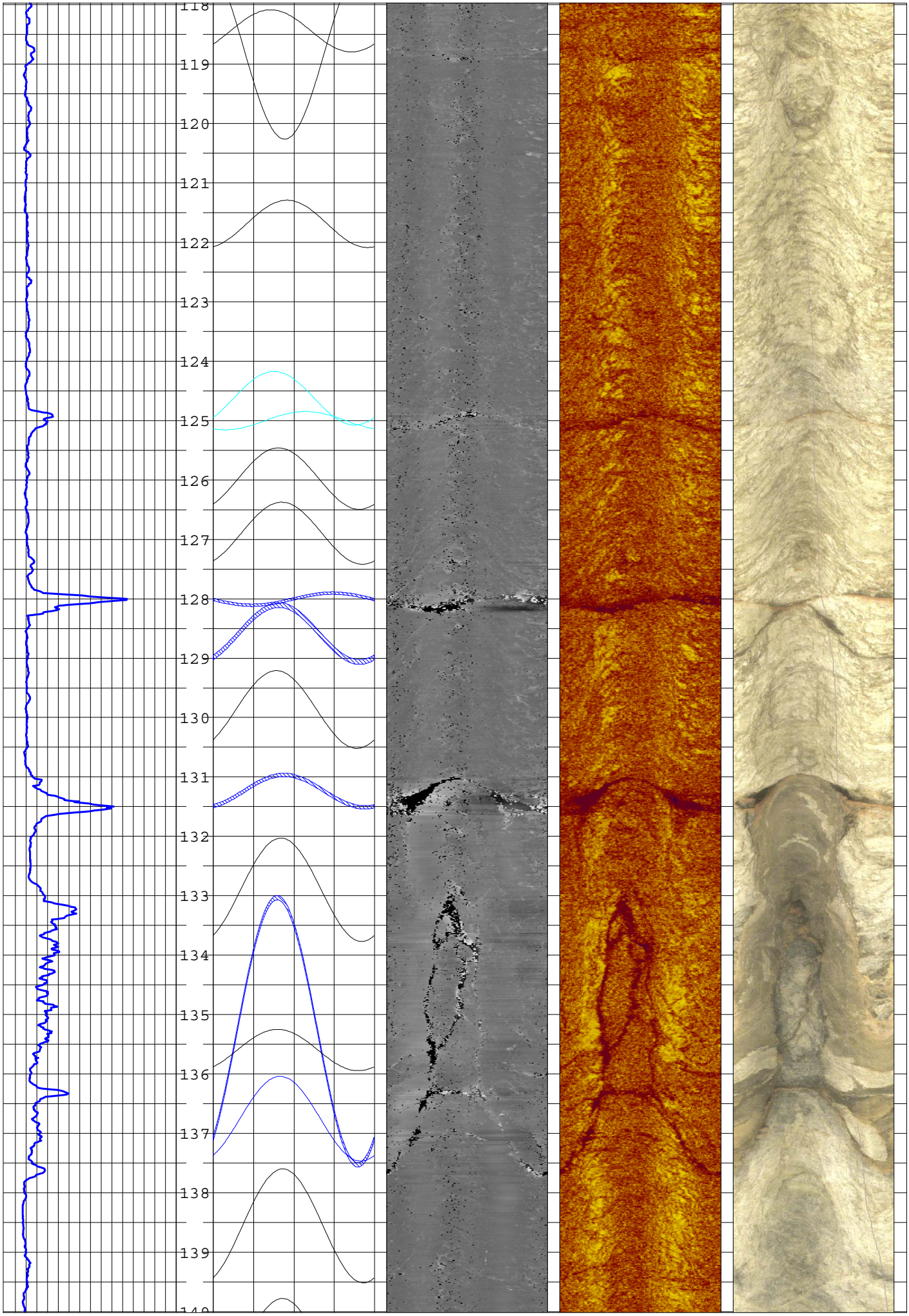
Log: Plate A-4 Televiewer & Caliper Logs

Well: BRD 65

Site: Olin

Date:	12/13/10	Location: Wilmington, Ma.	
Casing Depth:	105 ft.	For:	MACTEC
Casing Type:	6 in steel	Logged by:	R Rawcliffe
Boring Depth:	206.4 ft	Orientation:	magnetic north
Meas. From:	top of casing	Structure Plots:	
Stickup:	0.2 ft	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture	
Water Level:	2.70 ft		

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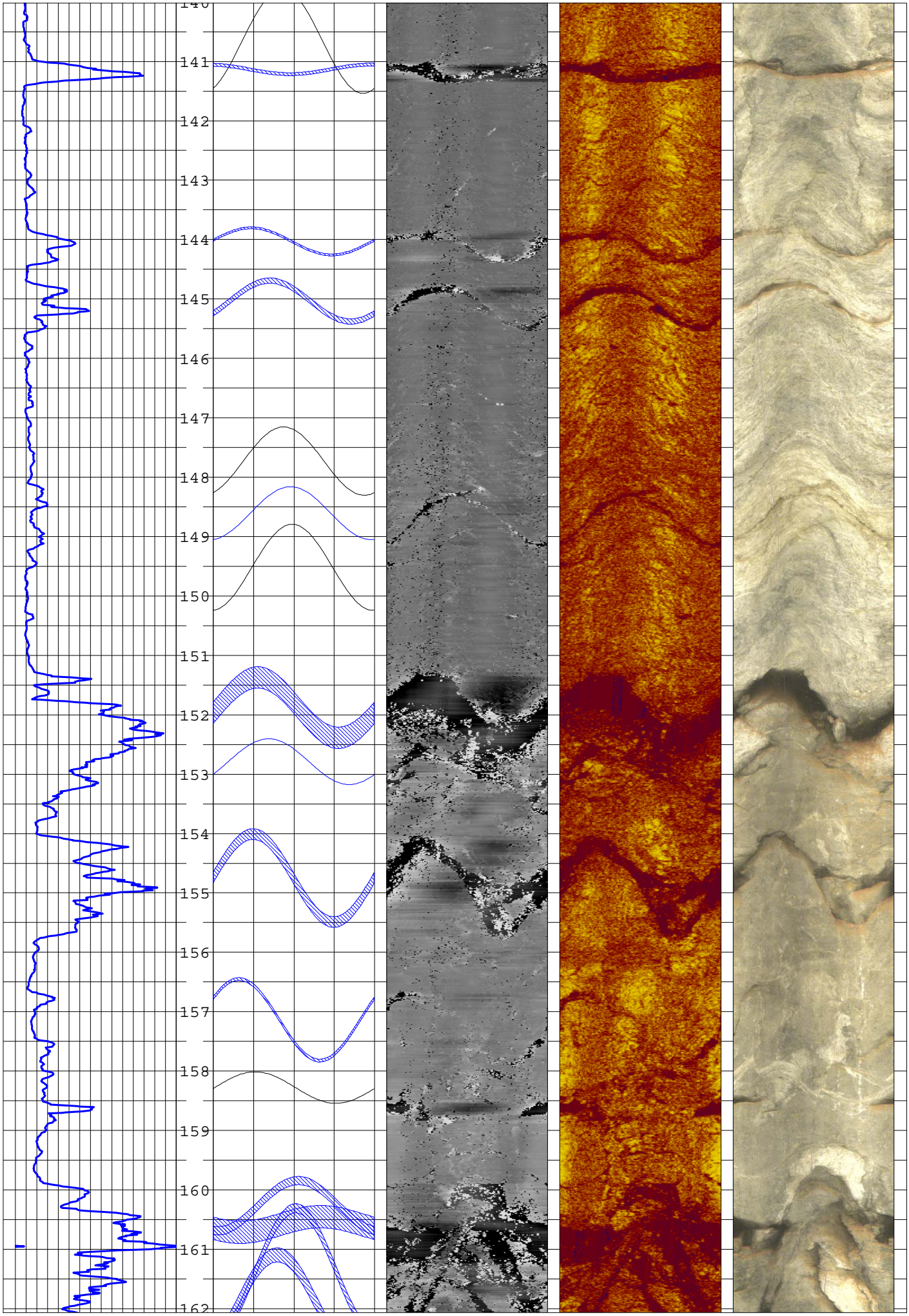
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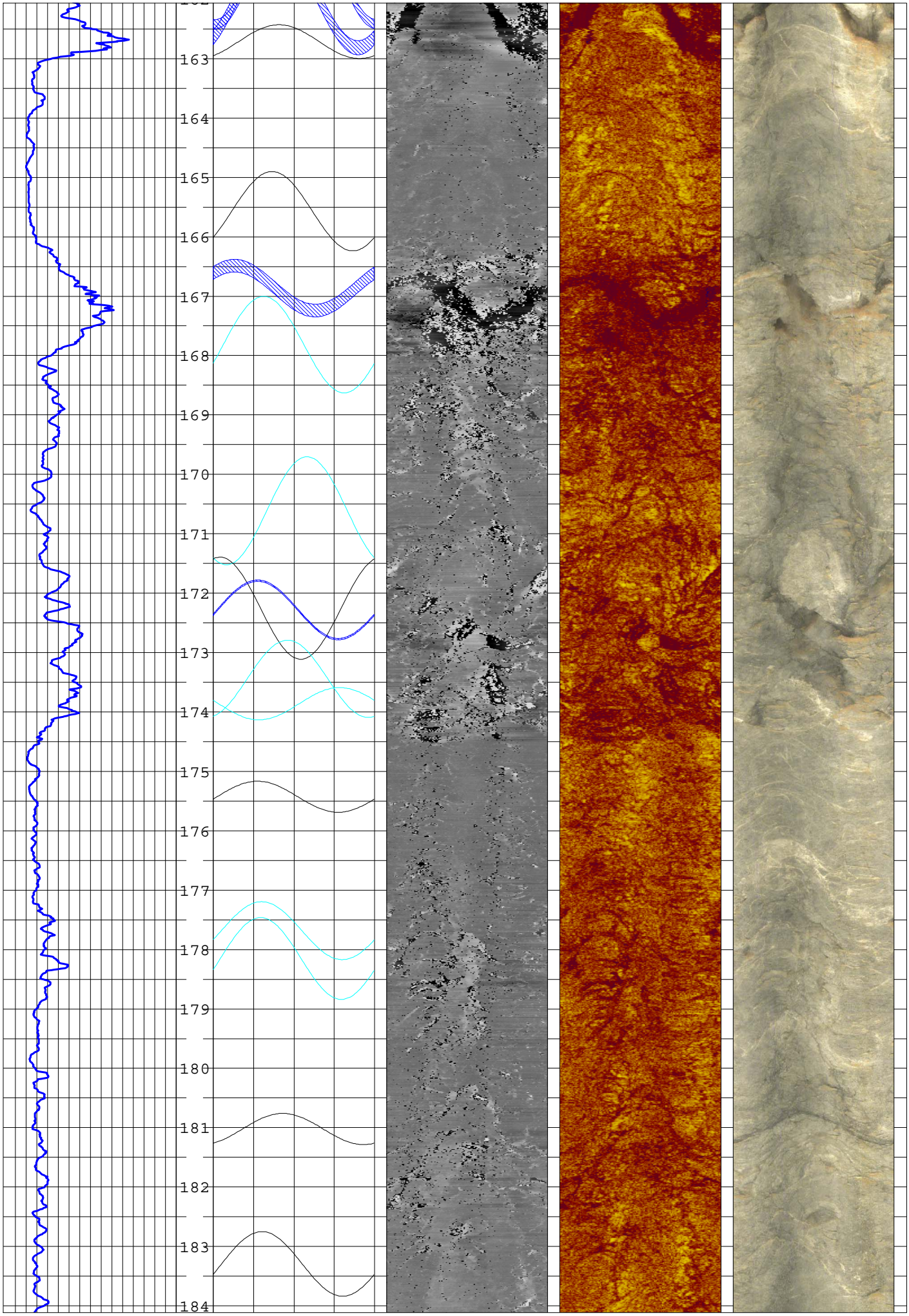
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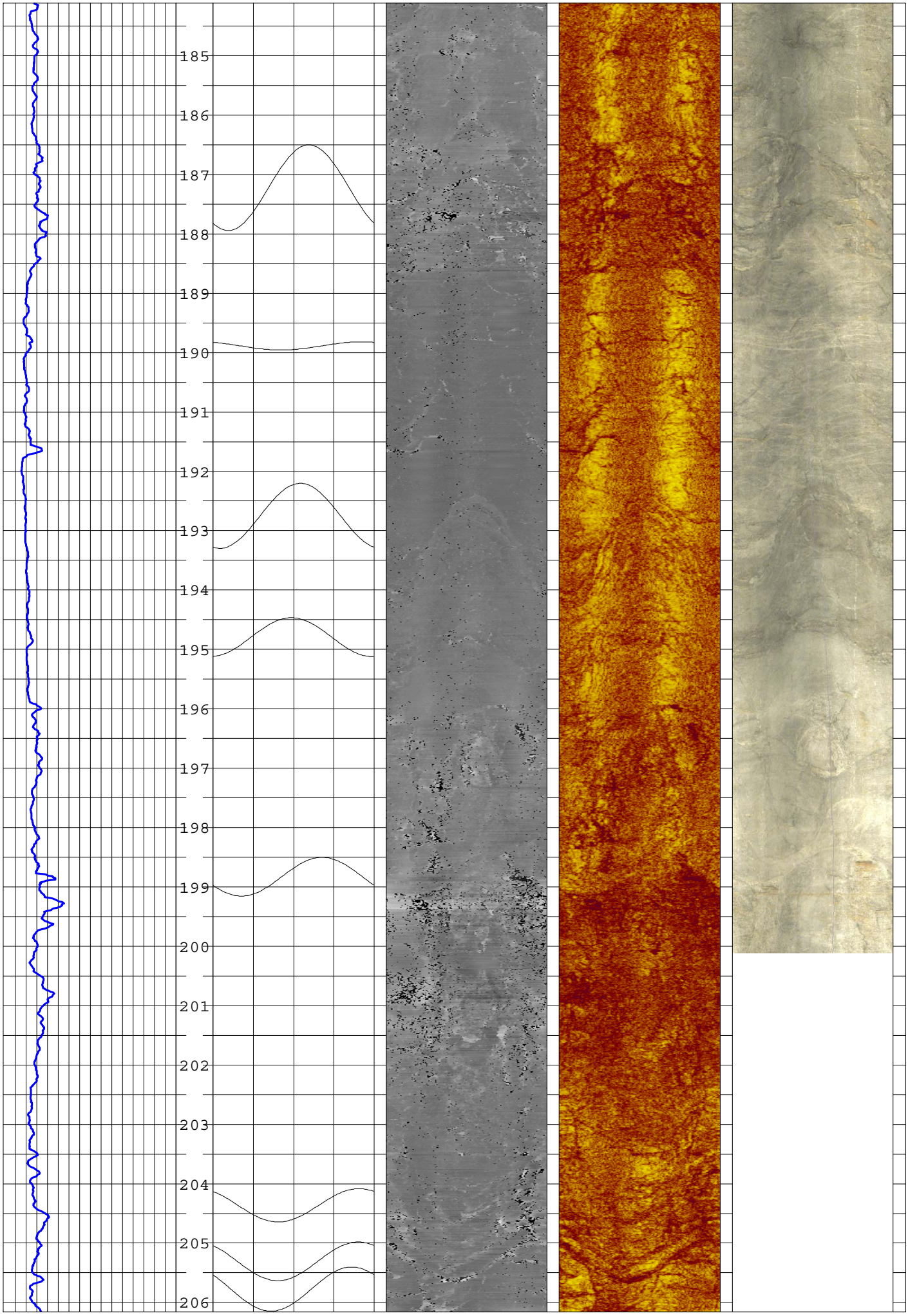
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TABLE A-1 Planar features interpreted from acoustical and optical televiewers
65 BRD Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
65 BRD	1	105.9	48	167	77	152	62	0	108
65 BRD	2	106.9	63	359	89	344	74	0	100
65 BRD	3	108.7	50	251	341	236	326	9	107
65 BRD	4	111.7	47	353	83	338	68	13	107
65 BRD	5	113.8	78	166	76	151	61	0	100
65 BRD	6	114.2	58	351	81	336	66	0	100
65 BRD	7	115.3	78	169	79	154	64	0	100
65 BRD	8	116.4	51	333	63	318	48	0	100
65 BRD	9	117.0	61	148	58	133	43	0	100
65 BRD	10	117.4	59	100	10	85	355	0	108
65 BRD	11	118.4	54	308	38	293	23	0	100
65 BRD	12	118.8	80	159	69	144	54	0	100
65 BRD	13	121.7	57	344	74	329	59	0	100
65 BRD	14	124.6	60	316	46	300	30	0	108
65 BRD	15	125.0	30	26	296	11	281	0	108
65 BRD	16	126.0	63	326	56	311	41	0	100
65 BRD	17	126.9	63	333	63	317	47	0	100
65 BRD	18	128.0	21	87	357	71	341	11	107
65 BRD	19	128.6	61	326	56	311	41	12	107
65 BRD	20	129.9	68	321	51	305	35	0	100
65 BRD	21	131.2	46	338	68	323	53	13	107
65 BRD	22	132.9	73	331	61	316	46	0	100
65 BRD	23	135.3	83	323	53	308	38	2	107
65 BRD	24	135.6	53	324	54	309	39	0	100
65 BRD	25	136.8	70	329	59	314	44	0	107
65 BRD	26	138.6	75	335	65	320	50	0	100
65 BRD	27	140.7	73	334	64	319	49	0	100
65 BRD	28	141.1	17	171	81	156	66	16	107
65 BRD	29	144.0	41	265	355	250	340	8	107
65 BRD	30	145.0	53	307	37	292	22	17	107
65 BRD	31	147.7	65	337	67	322	52	0	100
65 BRD	32	148.6	59	352	82	337	67	0	107
65 BRD	33	149.5	70	356	86	341	71	0	100
65 BRD	34	151.9	63	280	10	265	355	51	107
65 BRD	35	152.8	56	304	34	288	18	0	107
65 BRD	36	154.8	71	269	359	254	344	18	107
65 BRD	37	157.1	69	238	328	223	313	5	107
65 BRD	38	158.3	45	273	3	258	348	0	100
65 BRD	39	160.3	58	10	280	355	85	22	107
65 BRD	40	160.6	27	60	330	45	315	104	107
65 BRD	41	161.4	76	4	274	349	79	11	107
65 BRD	42	162.0	73	323	53	308	38	21	107
65 BRD	43	162.7	47	326	56	311	41	0	100
65 BRD	44	165.6	69	311	41	296	26	0	100
65 BRD	45	166.9	55	228	318	213	303	37	107
65 BRD	46	167.8	72	292	22	277	7	0	108
65 BRD	47	170.6	74	29	299	14	284	0	108
65 BRD	48	172.3	73	195	285	180	270	0	100
65 BRD	49	172.3	62	279	9	264	354	4	107
65 BRD	50	173.4	68	346	76	331	61	0	108
65 BRD	51	173.9	46	102	12	87	357	0	108
65 BRD	52	175.4	45	279	9	263	353	0	100
65 BRD	53	177.7	62	288	18	273	3	0	108
65 BRD	54	178.2	69	286	16	271	1	0	108
65 BRD	55	181.0	45	335	65	320	50	0	100
65 BRD	56	183.3	64	289	19	273	3	0	100
65 BRD	57	187.2	70	34	304	19	289	0	100
65 BRD	58	189.9	15	152	62	137	47	0	100
65 BRD	59	192.8	64	15	285	360	90	0	100

TABLE A-1 Planar features interpreted from acoustical and optical televiewers
65 BRD Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
65 BRD	60	194.8	51	355	85	340	70	0	100
65 BRD	61	198.8	51	64	334	49	319	0	100
65 BRD	62	204.4	47	146	56	131	41	0	100
65 BRD	63	205.3	51	144	54	129	39	0	100
65 BRD	64	205.8	55	130	40	115	25	0	100

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

ATTACHMENT B

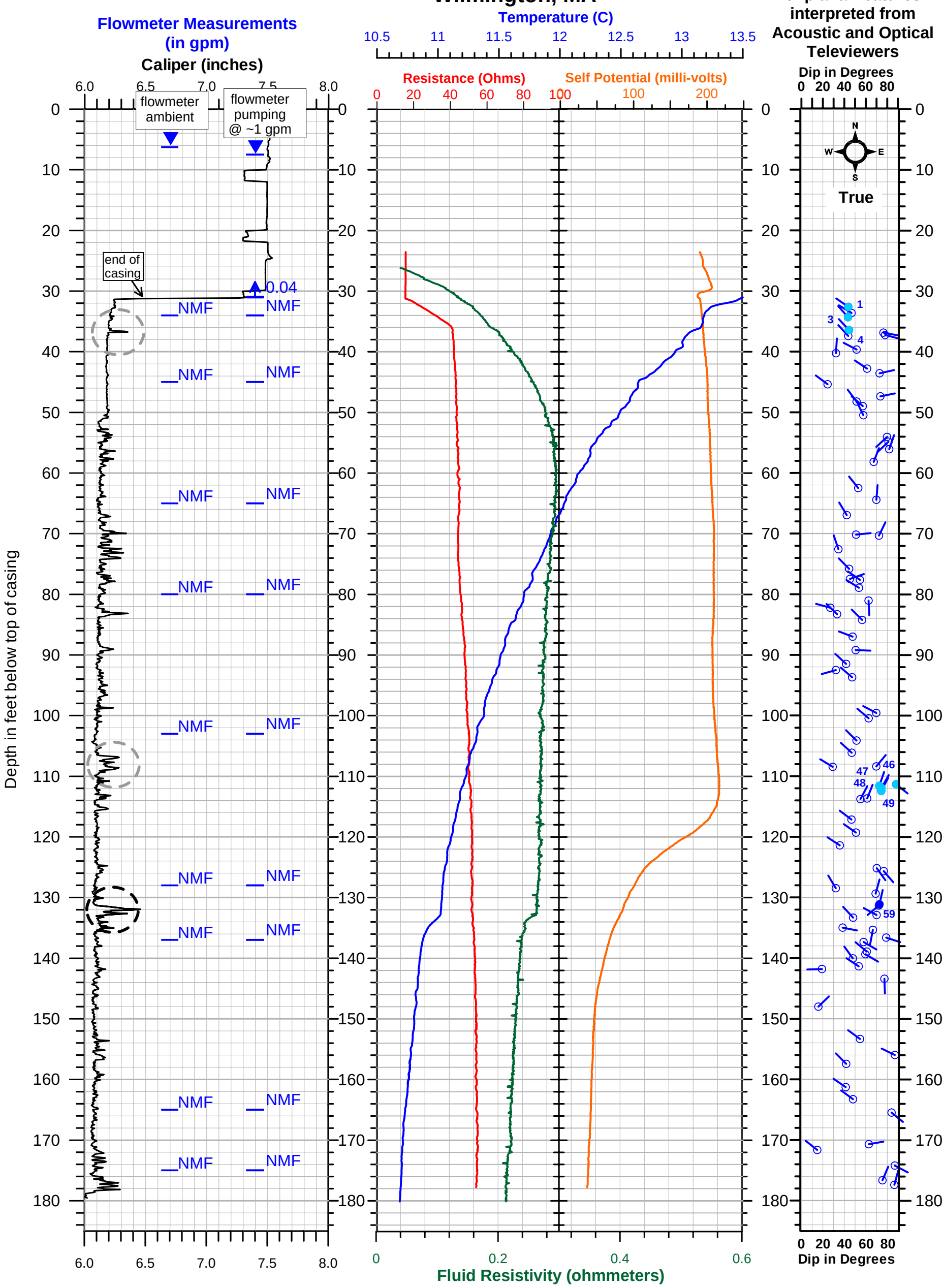
BOREHOLE 202 BR

BOREHOLE GEOPHYSICAL LOGS

Northeast Geophysical Services

PLATE B-1
Borehole Geophysical Log
202 BR - Olin Site
Wilmington, MA

Date logged: 12/10/10



= Likely transmissive zone

= Possible transmissive zone

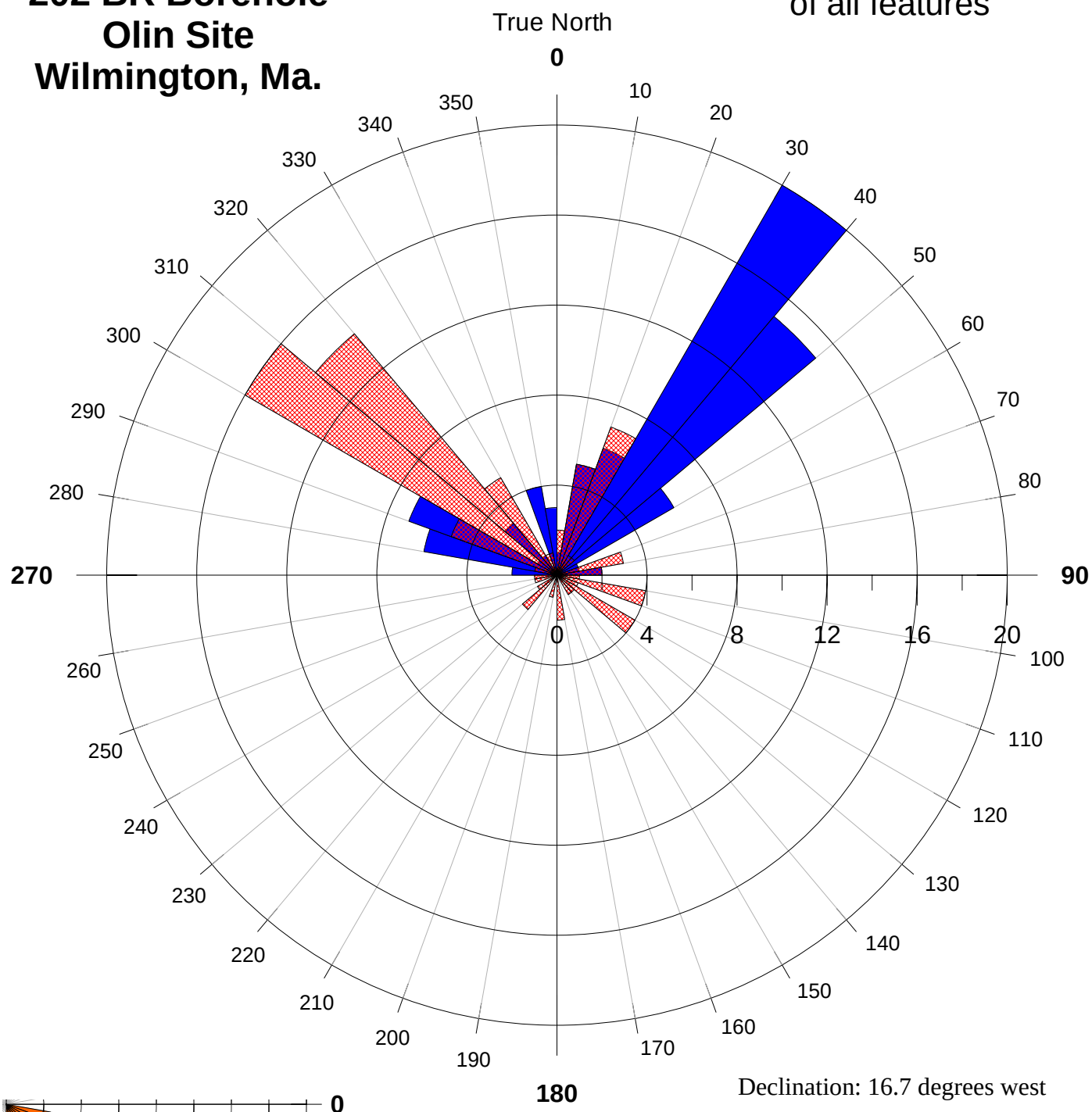
PLATE B-1
Borehole Geophysical Log
202 BR - Olin Site
Wilmington, MA

Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

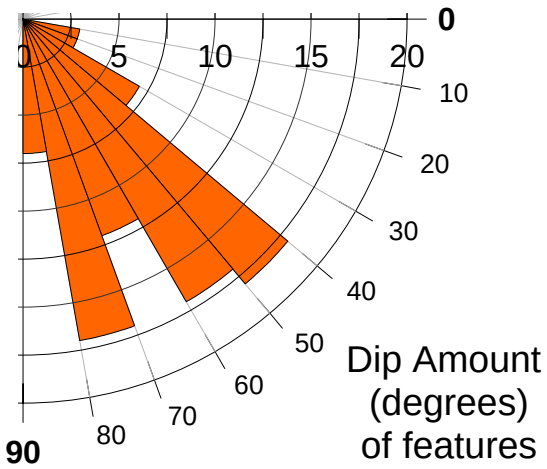
Northeast Geophysical Services

202 BR Borehole
Olin Site
Wilmington, Ma.

PLATE B-2
Strike and Dip Direction
of all features



Declination: 16.7 degrees west



Explanation

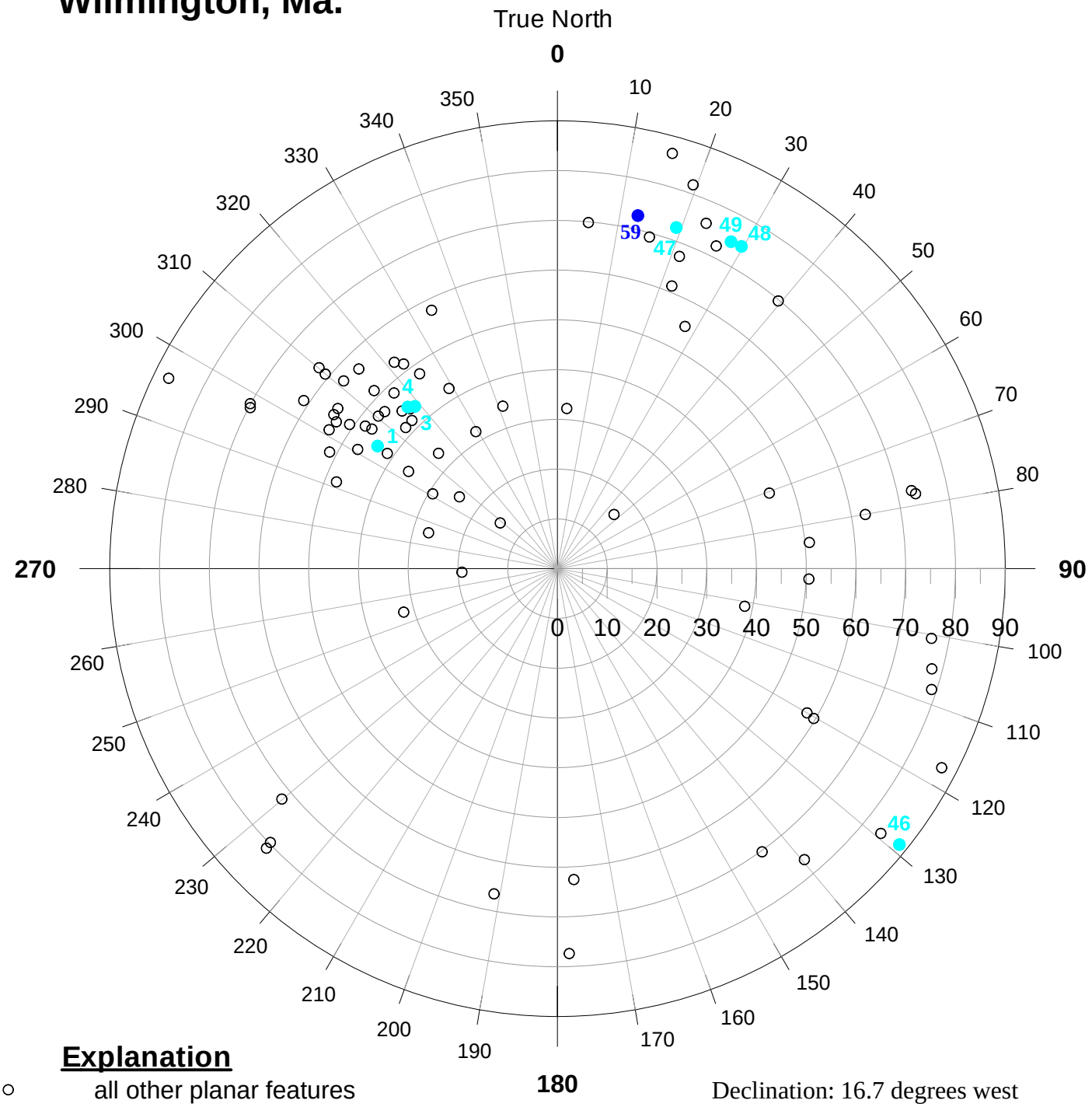
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 84 measurements

Northeast Geophysical Services

202 BR Borehole
Olin Site
Wilmington, Ma.

PLATE B-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- ○ all other planar features
- ● Likely water bearing
- ● Possibly water bearing

Declination: 16.7 degrees west

Based on 84 measurements

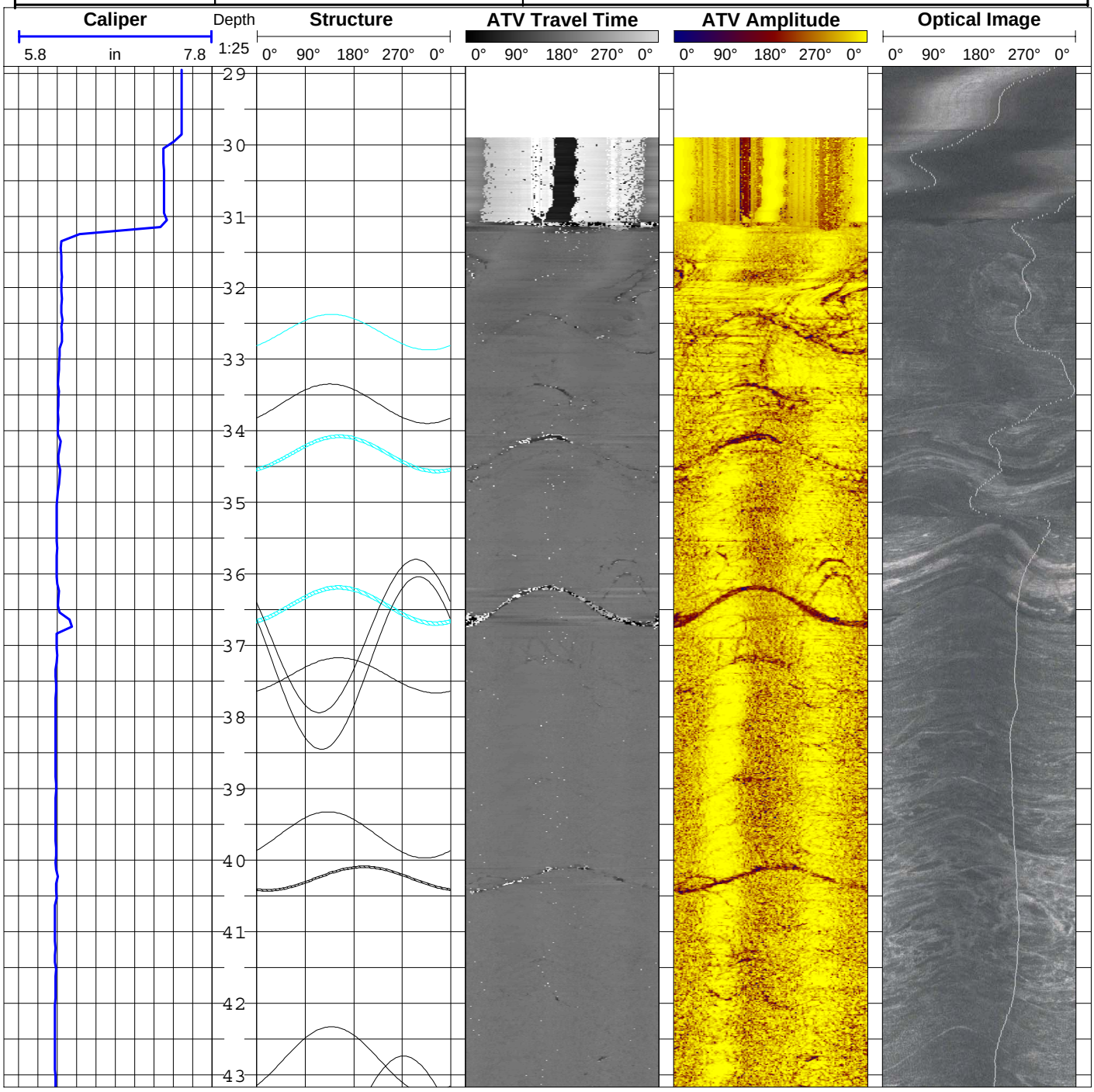
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

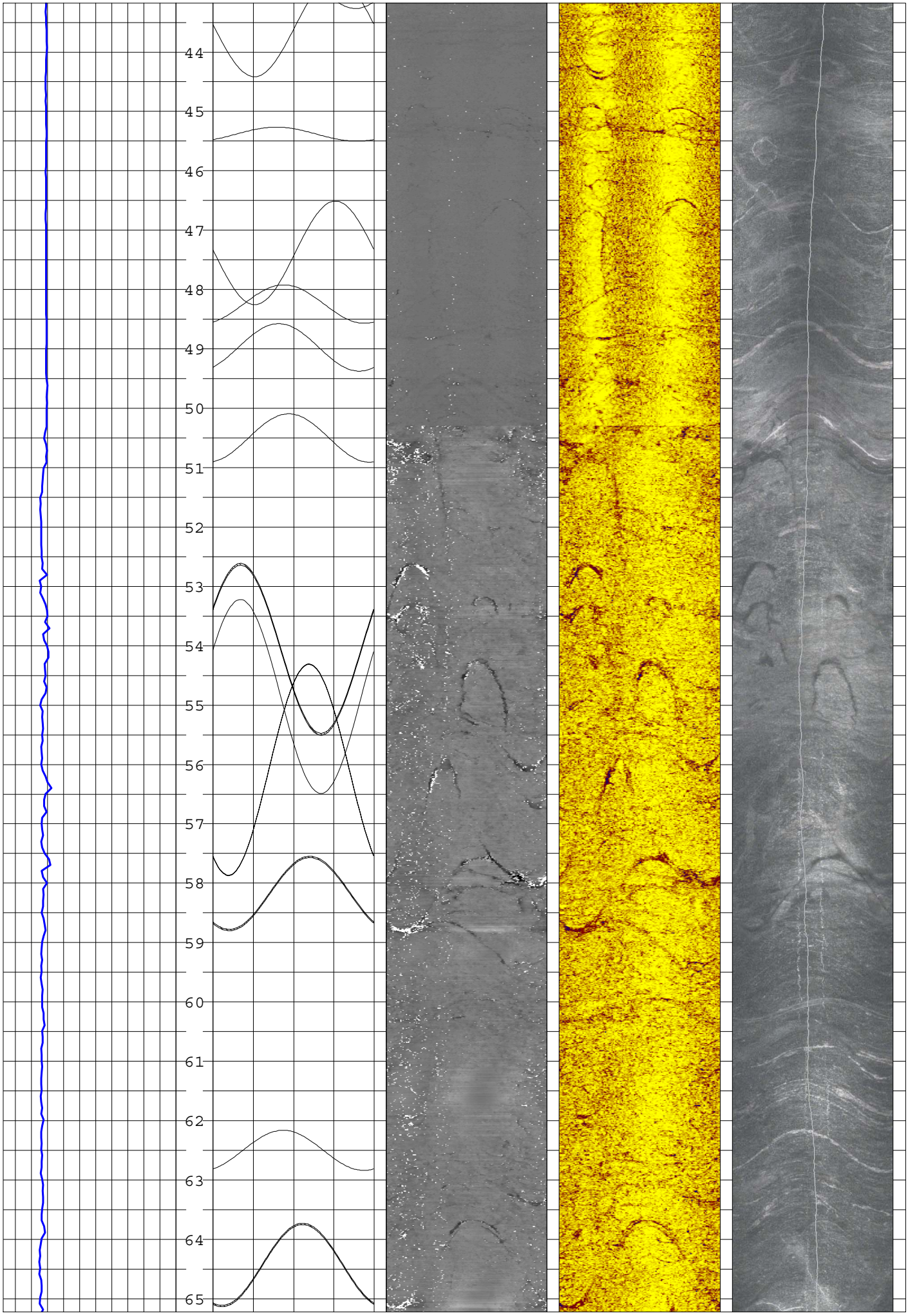
Log: Plate B-4 Televiewer & Caliper Logs

Well: 202 BR

Site: Olin

Date:	12/10/10	Location:	Wilmington, MA
Casing Depth:	31 ft	For:	MACTEC
Casing Type:	steel	Logged by:	R Rawcliffe
Boring Depth:	180.6 ft	Orientation:	magnetic
Meas. From:	top of casing	Structure Plots:	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	0.6 ft		
Water Level:	6.25 ft		

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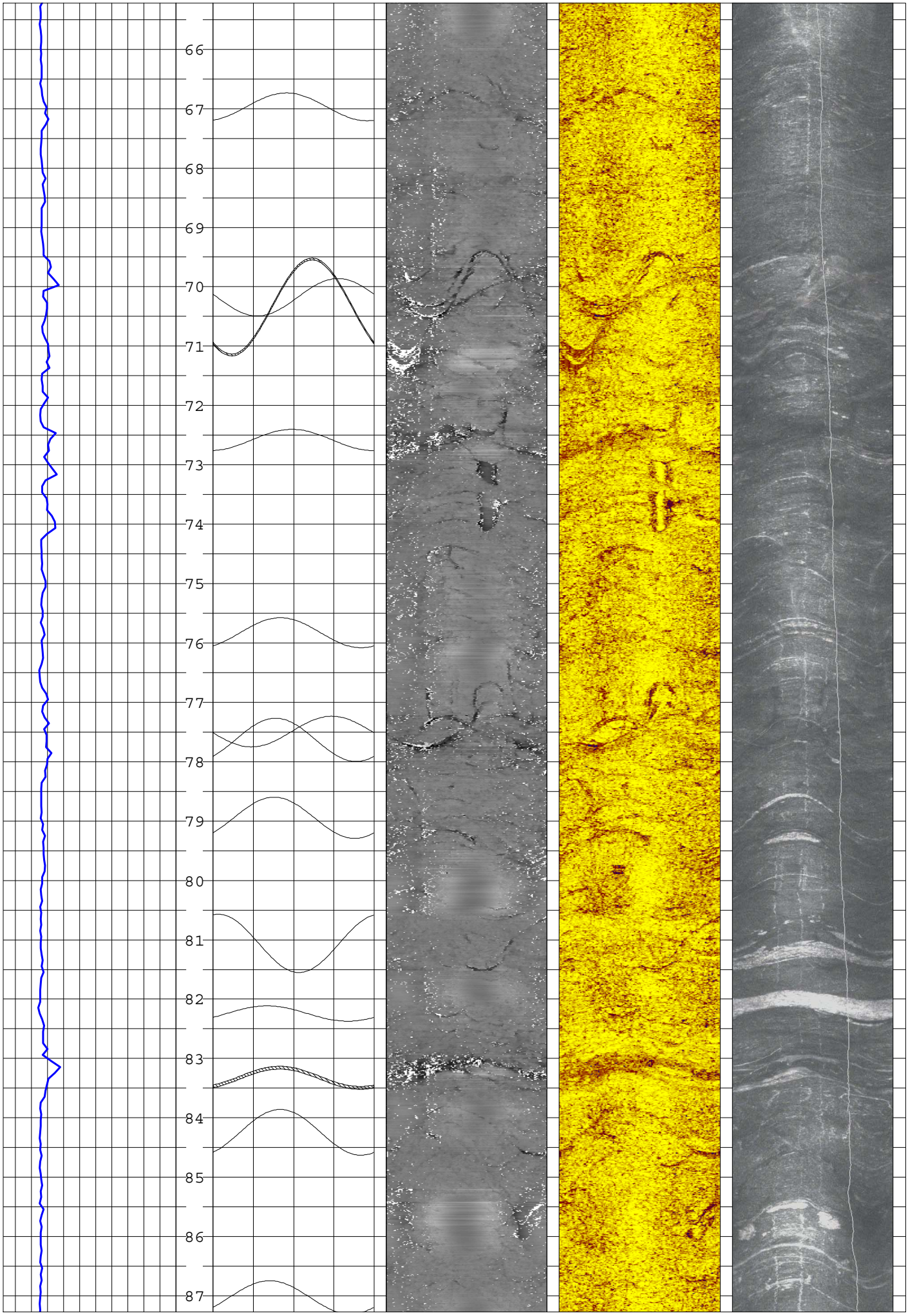
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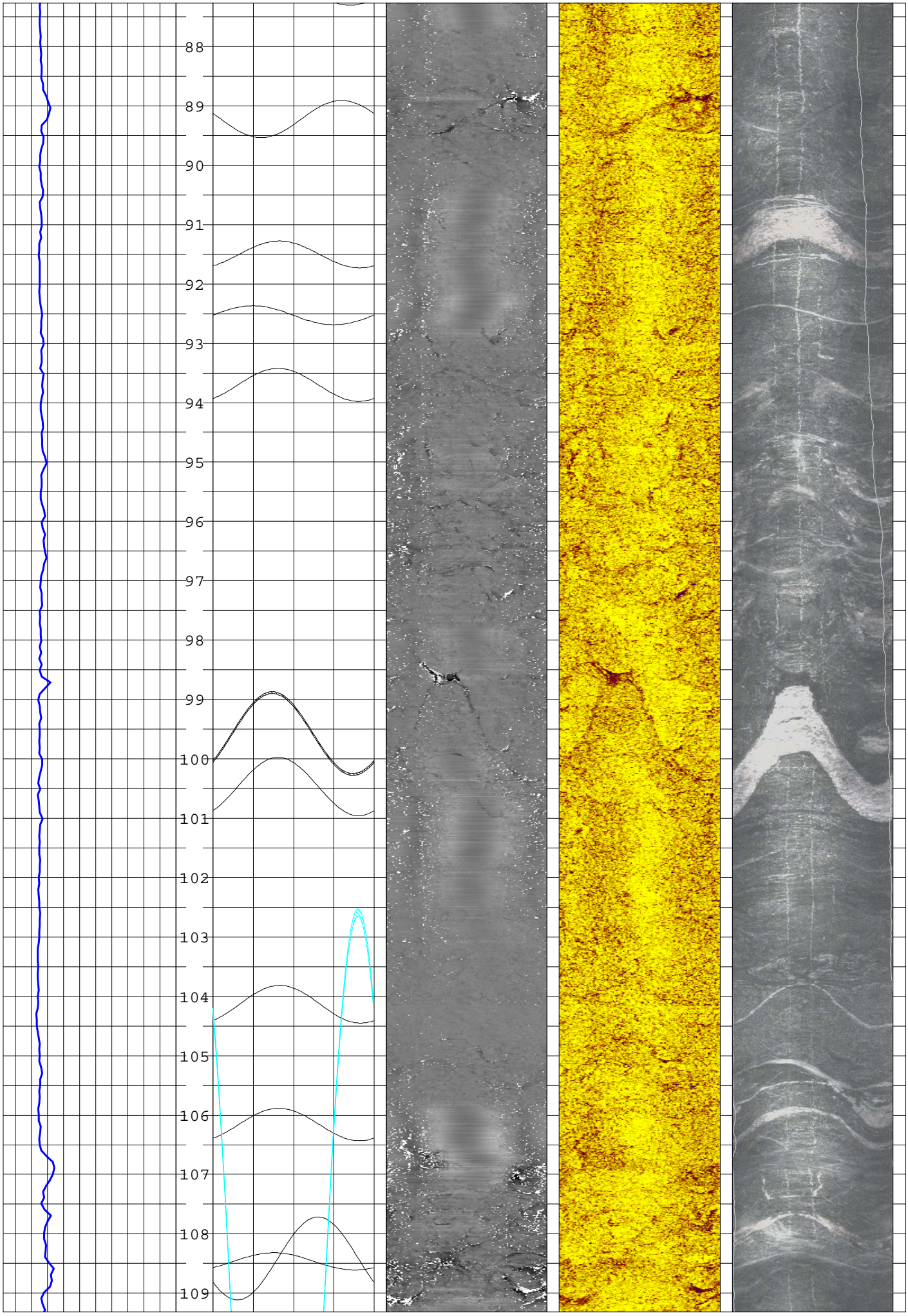
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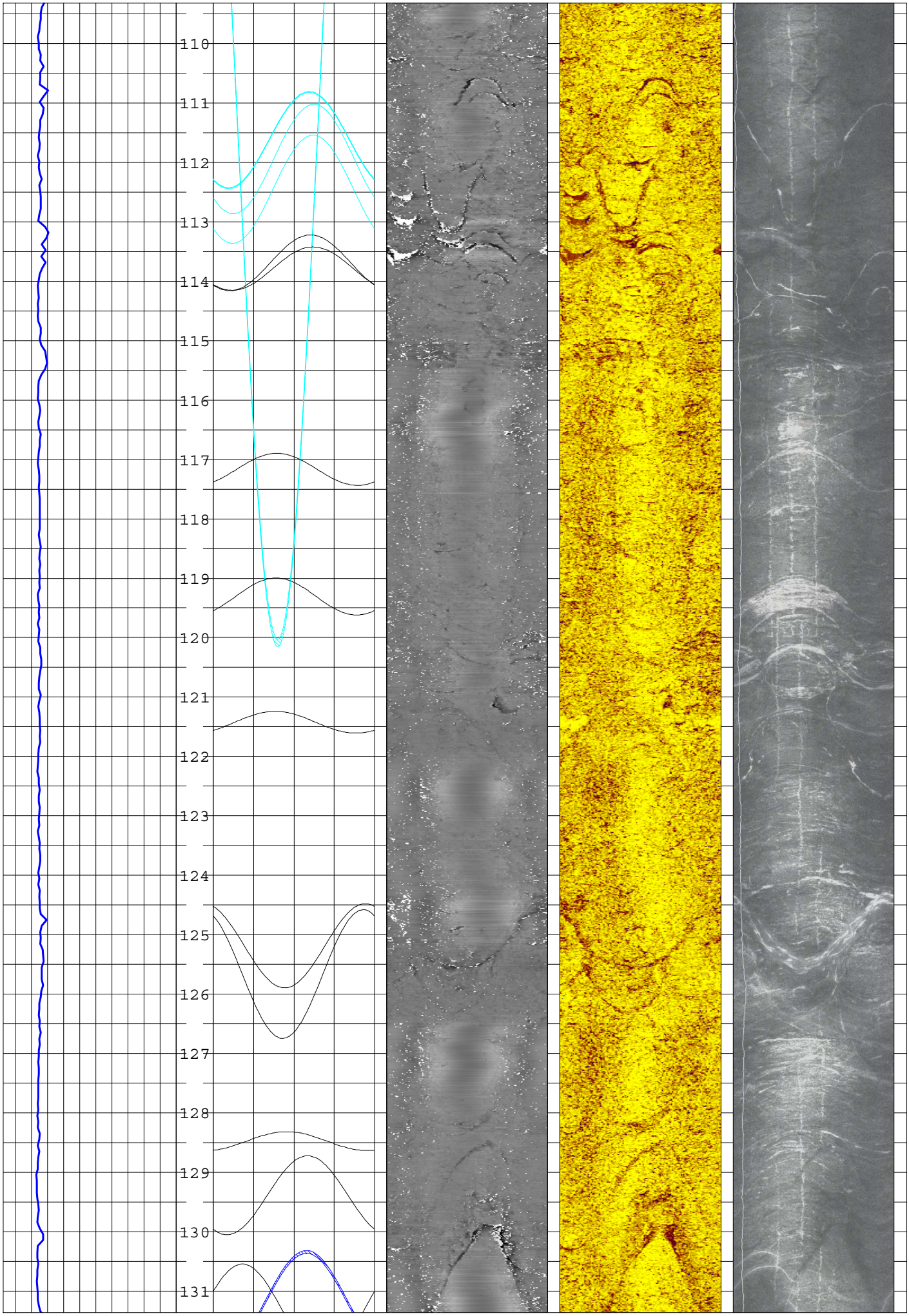
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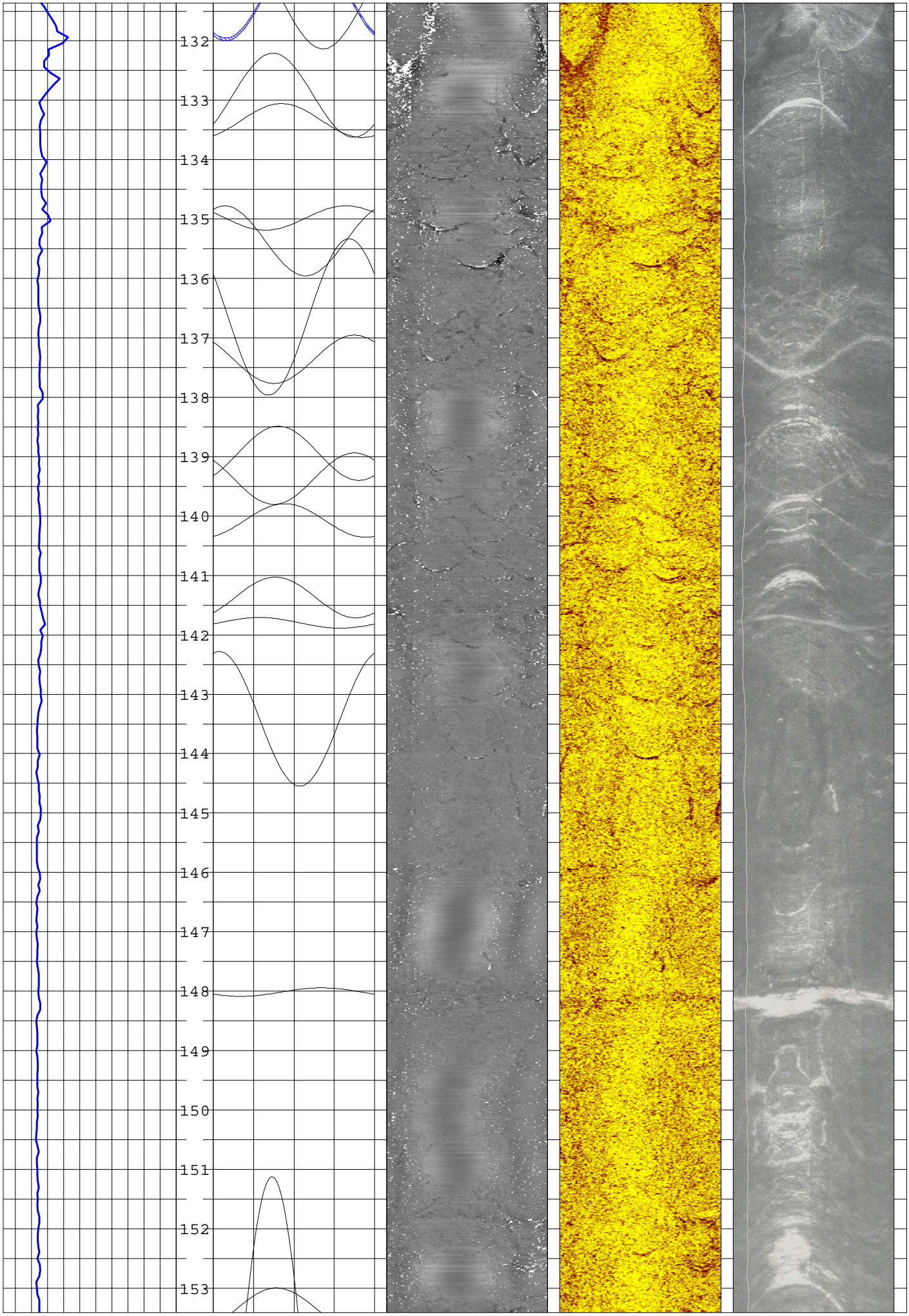
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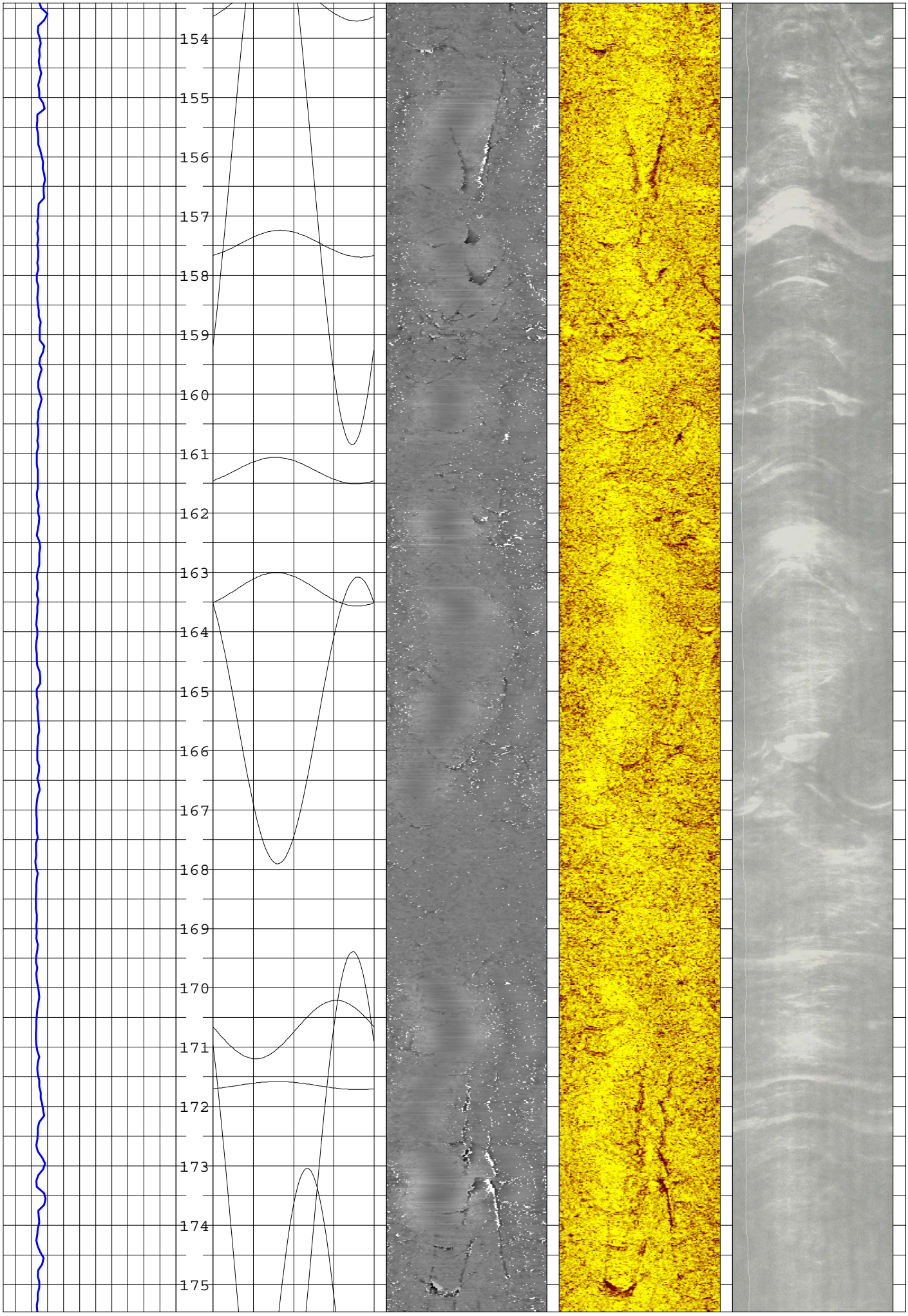
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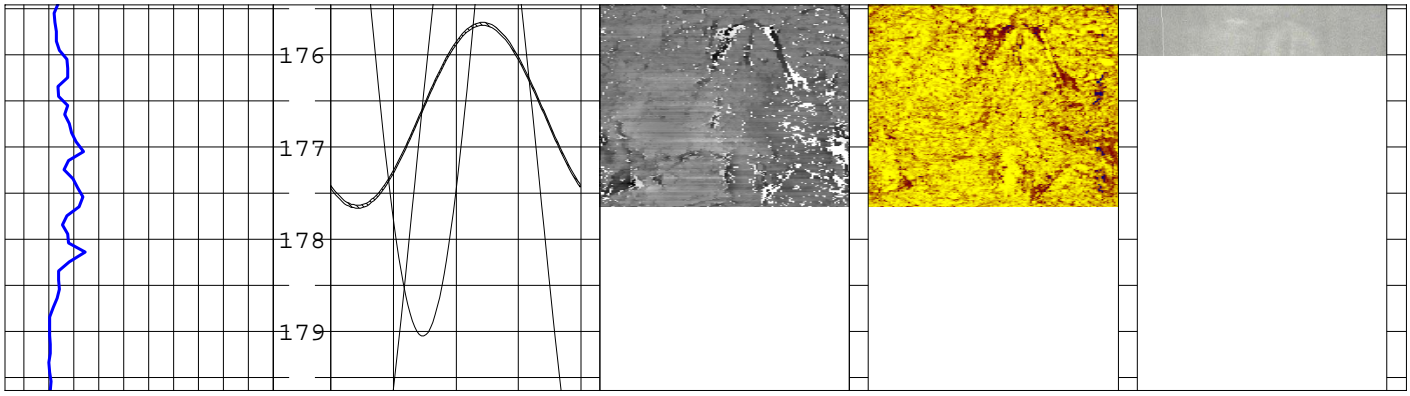
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TABLE B-1 Planar features interpreted from acoustical and optical televiewers
202 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
202 BR	1	32.6	44	319	49	304	34	0	108
202 BR	2	33.6	47	316	46	301	31	0	100
202 BR	3	34.3	43	334	64	319	49	9	108
202 BR	4	36.4	44	332	62	317	47	11	108
202 BR	5	36.9	76	116	26	101	11	0	100
202 BR	6	37.3	78	120	30	105	15	0	100
202 BR	7	37.4	44	332	62	317	47	0	100
202 BR	8	39.7	51	312	42	297	27	0	100
202 BR	9	40.3	32	18	288	3	273	7	100
202 BR	10	42.8	61	319	49	304	34	0	100
202 BR	11	43.6	73	93	3	78	348	0	100
202 BR	12	45.4	24	321	51	306	36	0	100
202 BR	13	47.4	74	93	3	78	348	0	100
202 BR	14	48.2	51	338	68	323	53	0	100
202 BR	15	49.0	57	326	56	311	41	0	100
202 BR	16	50.5	58	349	79	334	64	0	100
202 BR	17	54.1	80	241	331	226	316	2	100
202 BR	18	54.9	81	241	331	226	316	0	100
202 BR	19	56.1	82	35	305	19	289	1	100
202 BR	20	58.2	67	36	306	21	291	2	100
202 BR	21	62.5	53	337	67	322	52	0	100
202 BR	22	64.4	70	20	290	5	275	3	100
202 BR	23	67.0	42	344	74	329	59	0	100
202 BR	24	70.2	51	99	9	84	354	0	100
202 BR	25	70.3	72	41	311	26	296	3	100
202 BR	26	72.6	34	357	87	341	71	0	100
202 BR	27	75.8	44	330	60	315	45	0	100
202 BR	28	77.5	45	85	355	70	340	0	100
202 BR	29	77.6	55	320	50	305	35	0	100
202 BR	30	79.0	54	316	46	301	31	0	100
202 BR	31	81.1	63	192	282	177	87	0	100
202 BR	32	82.2	27	301	31	286	16	0	100
202 BR	33	83.3	33	329	59	314	44	11	100
202 BR	34	84.3	57	330	60	315	45	0	100
202 BR	35	87.0	48	307	37	291	21	0	100
202 BR	36	89.2	51	107	17	92	2	0	100
202 BR	37	91.5	42	328	58	313	43	0	100
202 BR	38	92.5	32	269	359	254	344	0	100
202 BR	39	93.7	47	326	56	310	40	0	100
202 BR	40	99.6	70	313	43	298	28	4	100
202 BR	41	100.5	63	325	55	310	40	0	100
202 BR	42	104.1	51	329	59	314	44	0	100
202 BR	43	106.2	47	327	57	312	42	0	100
202 BR	44	108.4	70	55	325	40	310	0	100
202 BR	45	108.5	29	316	46	301	31	0	100
202 BR	46	111.3	88	144	54	129	39	1	108
202 BR	47	111.6	73	34	304	19	289	2	108
202 BR	48	112.0	75	45	315	30	300	0	108
202 BR	49	112.5	74	43	313	28	298	0	108
202 BR	50	113.7	61	37	307	22	292	0	100
202 BR	51	113.8	55	43	313	28	298	0	100
202 BR	52	117.2	47	322	52	307	37	0	100
202 BR	53	119.3	51	320	50	305	35	0	100
202 BR	54	121.4	36	318	48	303	33	0	100
202 BR	55	125.2	70	159	69	144	54	0	100
202 BR	56	125.7	77	155	65	140	50	0	100
202 BR	57	128.5	32	344	74	329	59	0	100
202 BR	58	129.4	69	31	301	16	286	0	100
202 BR	59	131.2	73	28	298	13	283	4	107

TABLE B-1 Planar features interpreted from acoustical and optical televiewers
202 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
202 BR	60	131.3	72	245	335	230	320	0	100
202 BR	61	132.9	70	313	43	298	28	0	100
202 BR	62	133.3	48	332	62	317	47	0	100
202 BR	63	135.0	38	116	26	101	11	0	100
202 BR	64	135.4	67	206	296	191	281	0	100
202 BR	65	136.6	79	123	33	108	18	0	100
202 BR	66	137.4	58	135	45	120	30	0	100
202 BR	67	138.9	61	325	55	310	40	0	100
202 BR	68	139.4	60	135	45	120	30	0	100
202 BR	69	140.1	48	340	70	325	55	0	100
202 BR	70	141.4	53	319	49	304	34	0	100
202 BR	71	141.8	19	283	13	268	358	0	100
202 BR	72	143.4	77	193	283	178	88	0	100
202 BR	73	148.0	16	61	331	46	316	0	100
202 BR	74	153.4	55	321	51	306	36	0	100
202 BR	75	156.0	87	311	41	296	26	0	100
202 BR	76	157.5	42	331	61	316	46	0	100
202 BR	77	161.3	41	319	49	304	34	0	100
202 BR	78	163.3	48	322	52	307	37	0	100
202 BR	79	165.5	84	144	54	129	39	0	100
202 BR	80	170.7	63	95	5	80	350	0	100
202 BR	81	171.7	15	324	54	309	39	0	100
202 BR	82	174.2	87	132	42	117	27	0	100
202 BR	83	176.7	76	38	308	23	293	2	100
202 BR	84	177.4	87	31	301	15	285	0	100

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

ATTACHMENT C

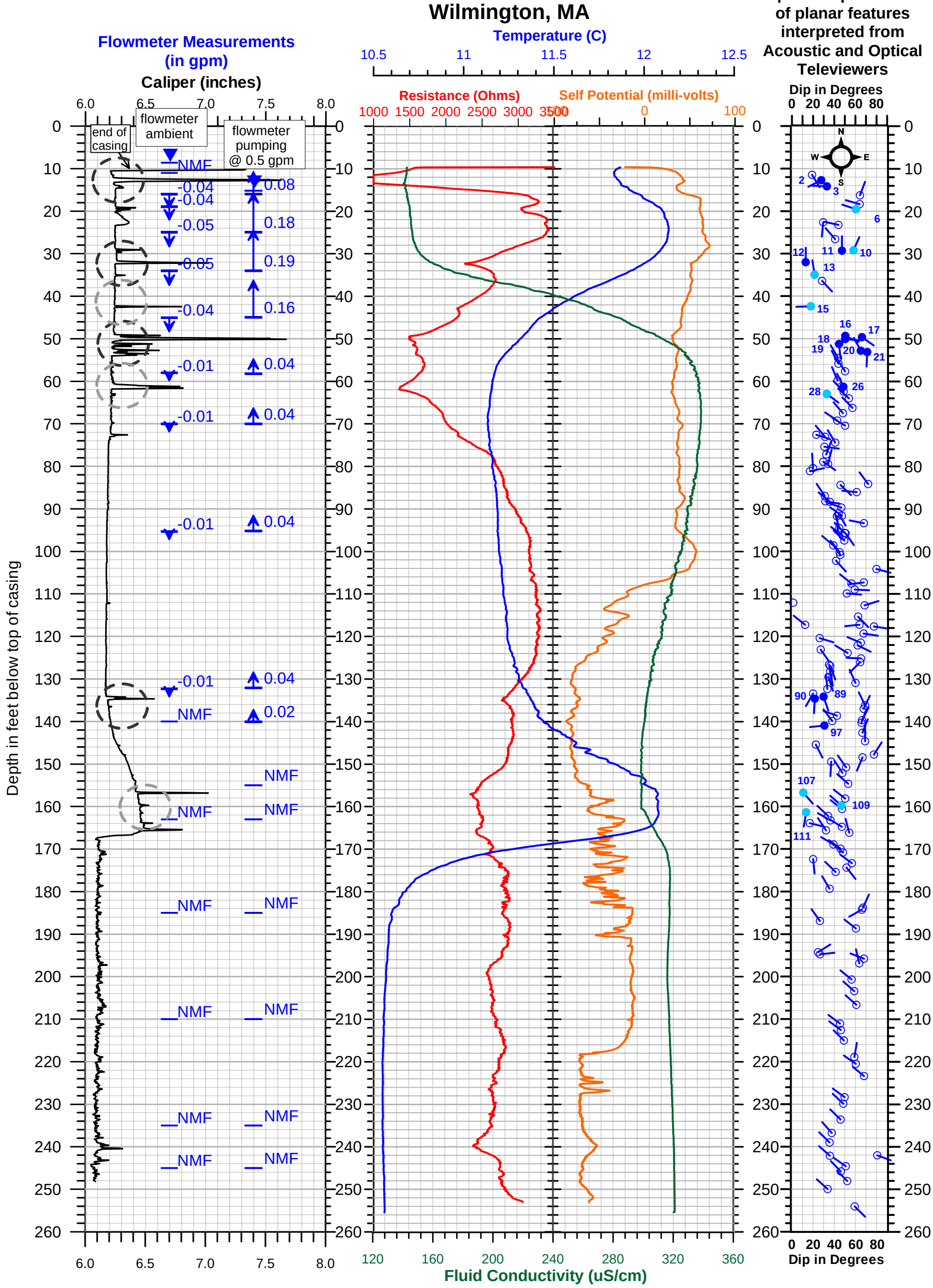
BOREHOLE 405 BR

BOREHOLE GEOPHYSICAL LOGS

Northeast Geophysical Services

PLATE C-1
Borehole Geophysical Log
405BR - Olin Site
Wilmington, MA

Date logged: 12/09/10



= Likely transmissive zone

= Possible transmissive zone

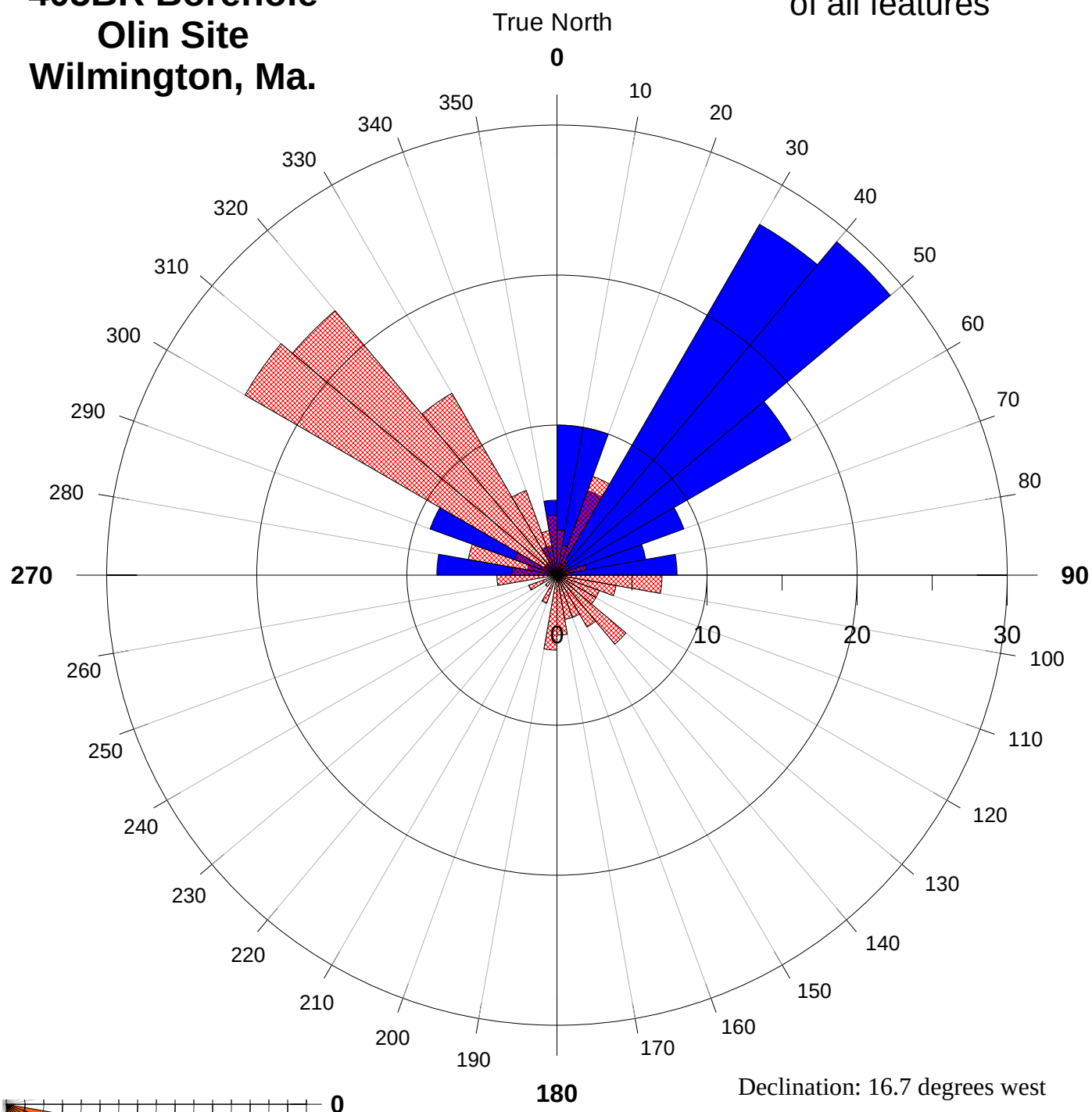
PLATE C-1
Borehole Geophysical Log
405BR - Olin Site
Wilmington, MA

Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

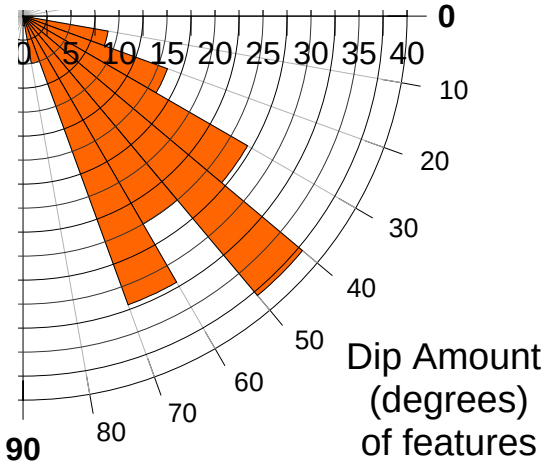
Northeast Geophysical Services

405BR Borehole
Olin Site
Wilmington, Ma.

PLATE C-2
Strike and Dip Direction of all features



Declination: 16.7 degrees west



Explanation

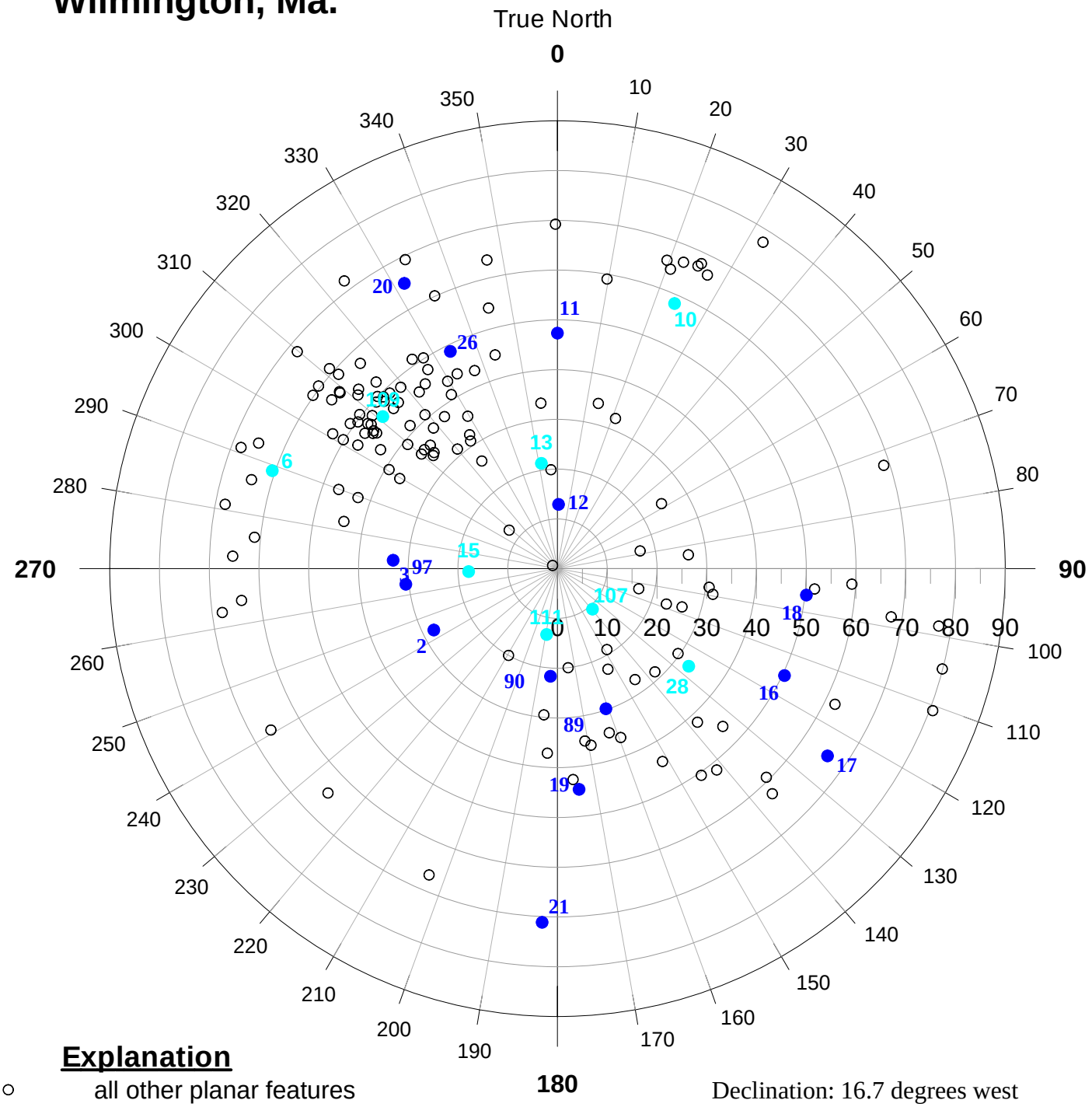
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 154 measurements

Northeast Geophysical Services

405BR Borehole
Olin Site
Wilmington, Ma.

PLATE C-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- ○ all other planar features
- ● Likely water bearing
- ● Possibly water bearing

Declination: 16.7 degrees west

Based on 154 measurements

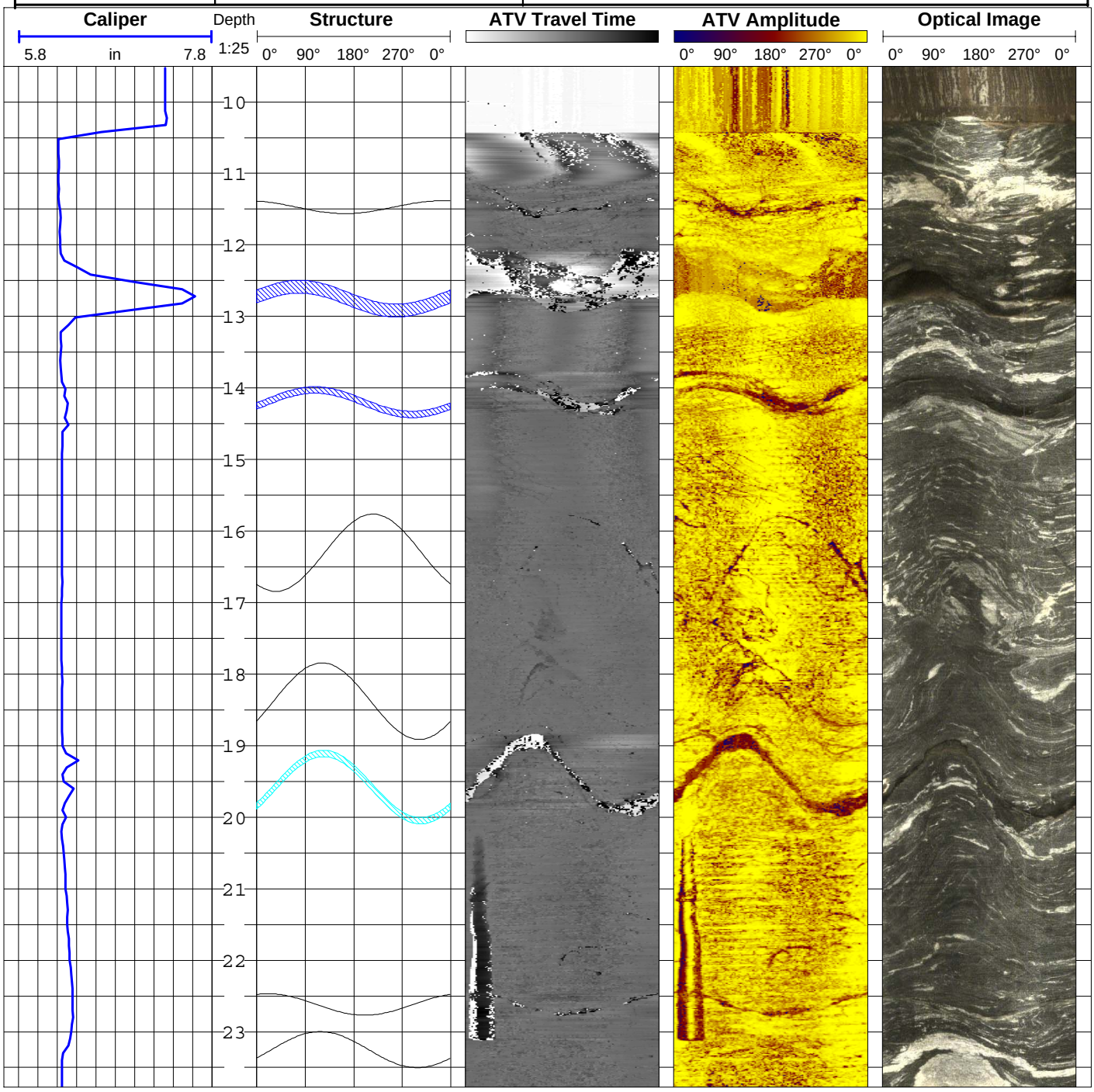
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

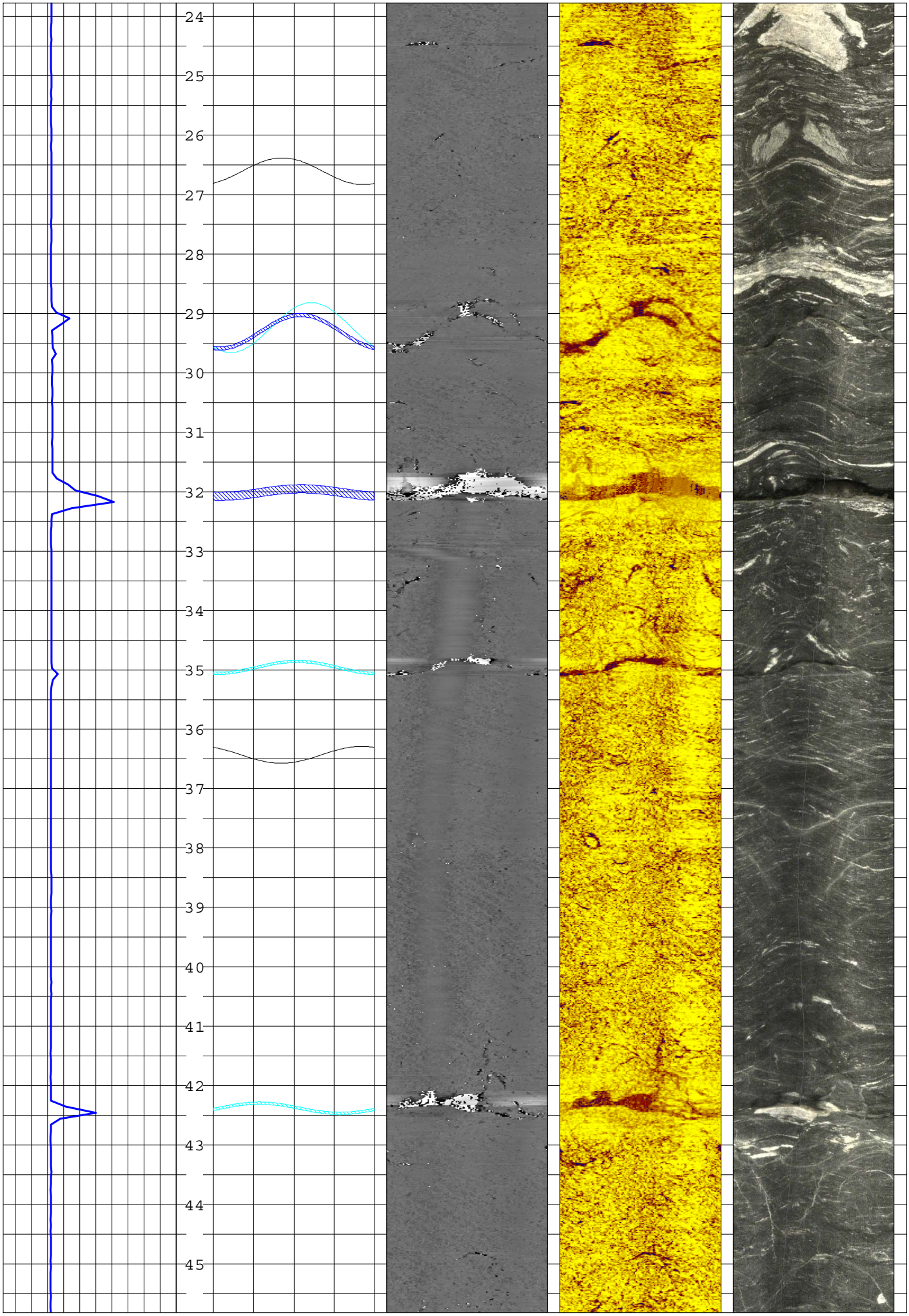
Log: Plate C-4 Televiewer & Caliper Logs

Well: 405 BR

Site: Olin

Date:	12/09/10	Location:	Wilmington, MA
Casing Depth:	10.3 ft	For:	MACTEC
Casing Type:	steel	Logged by:	R Rawcliffe
Boring Depth:	255.4 ft	Orientation:	magnetic
Meas. From:	top of casing	Structure Plots:	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	0.9 ft		
Water Level:	8.61 ft		

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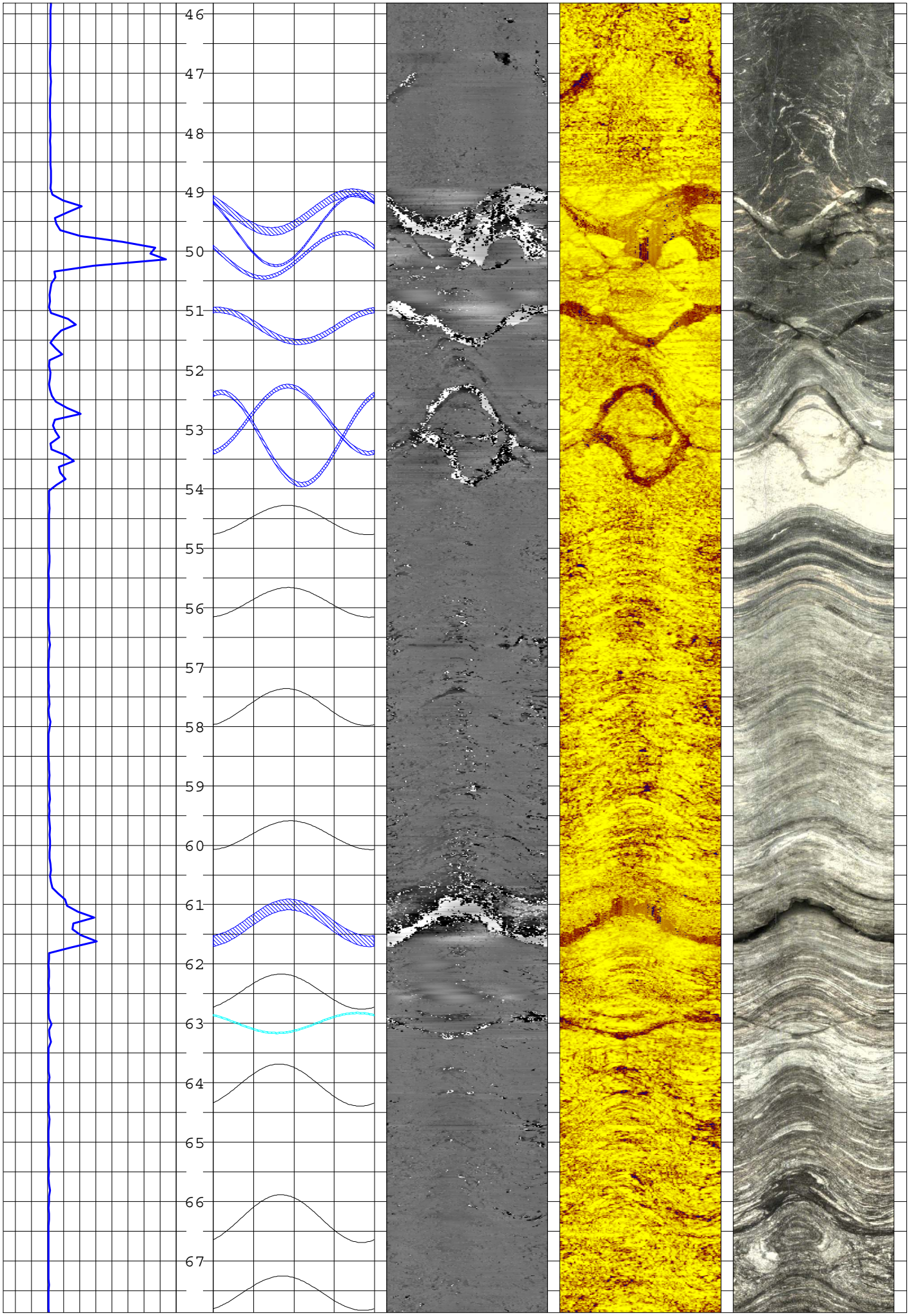
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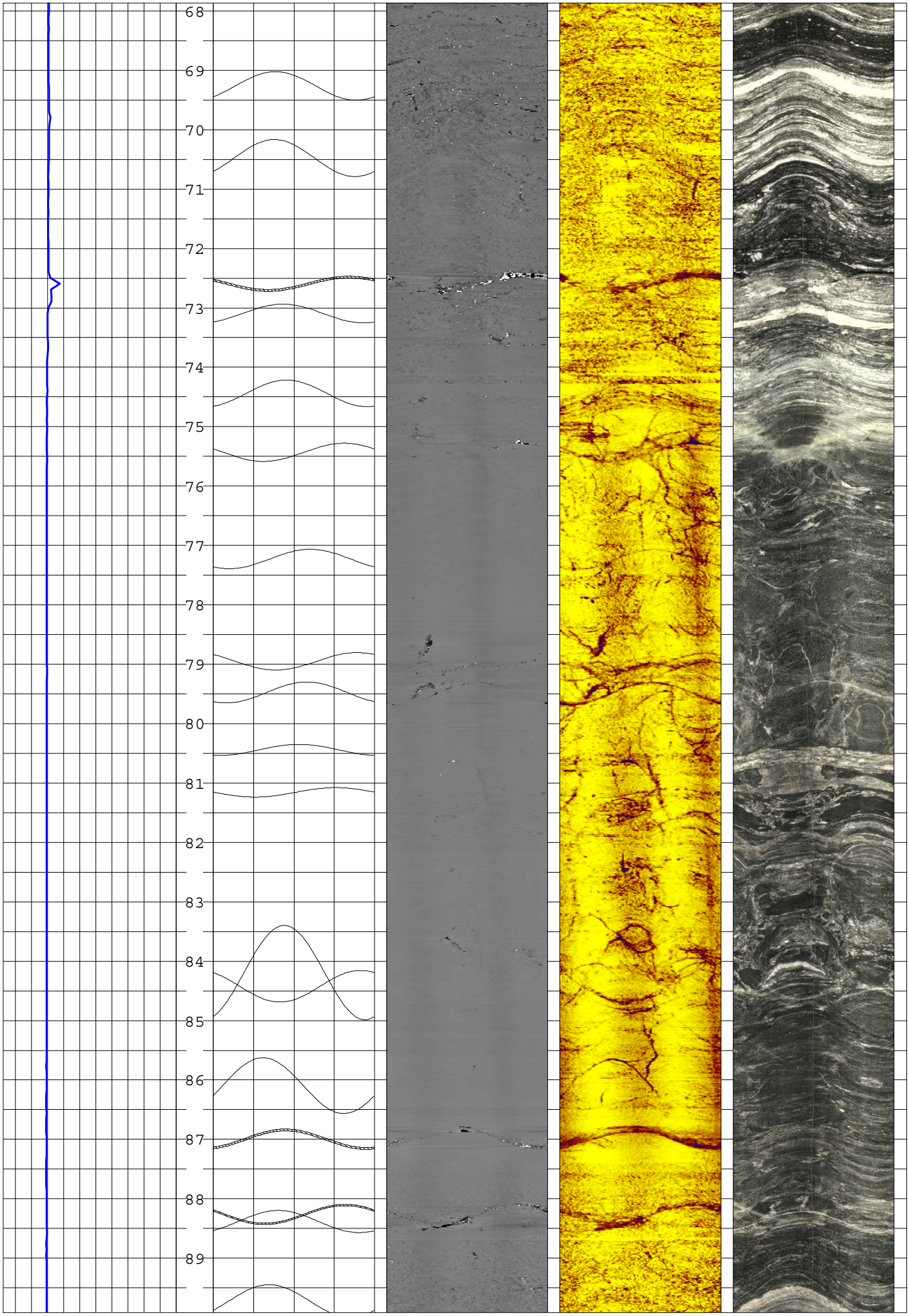
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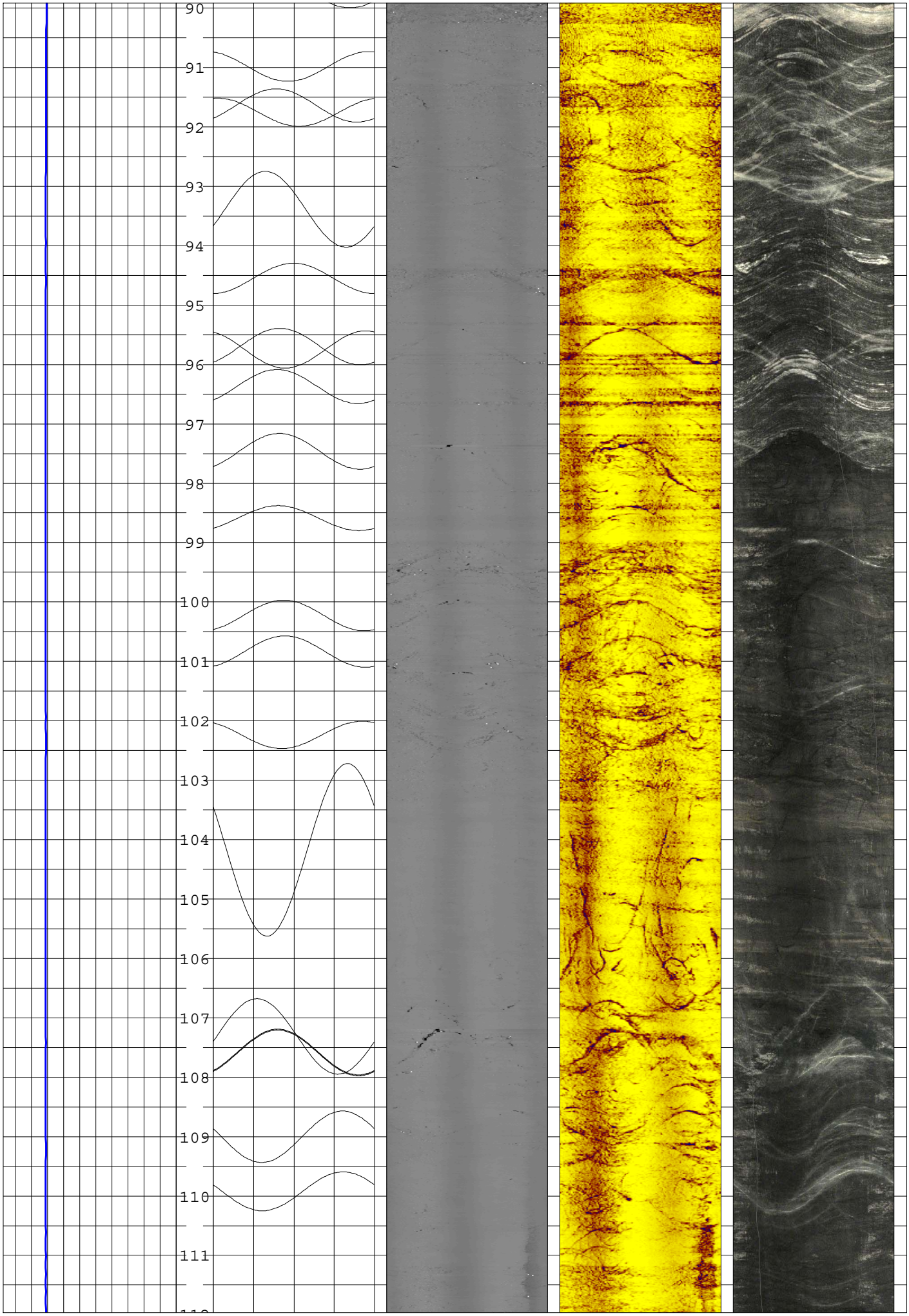
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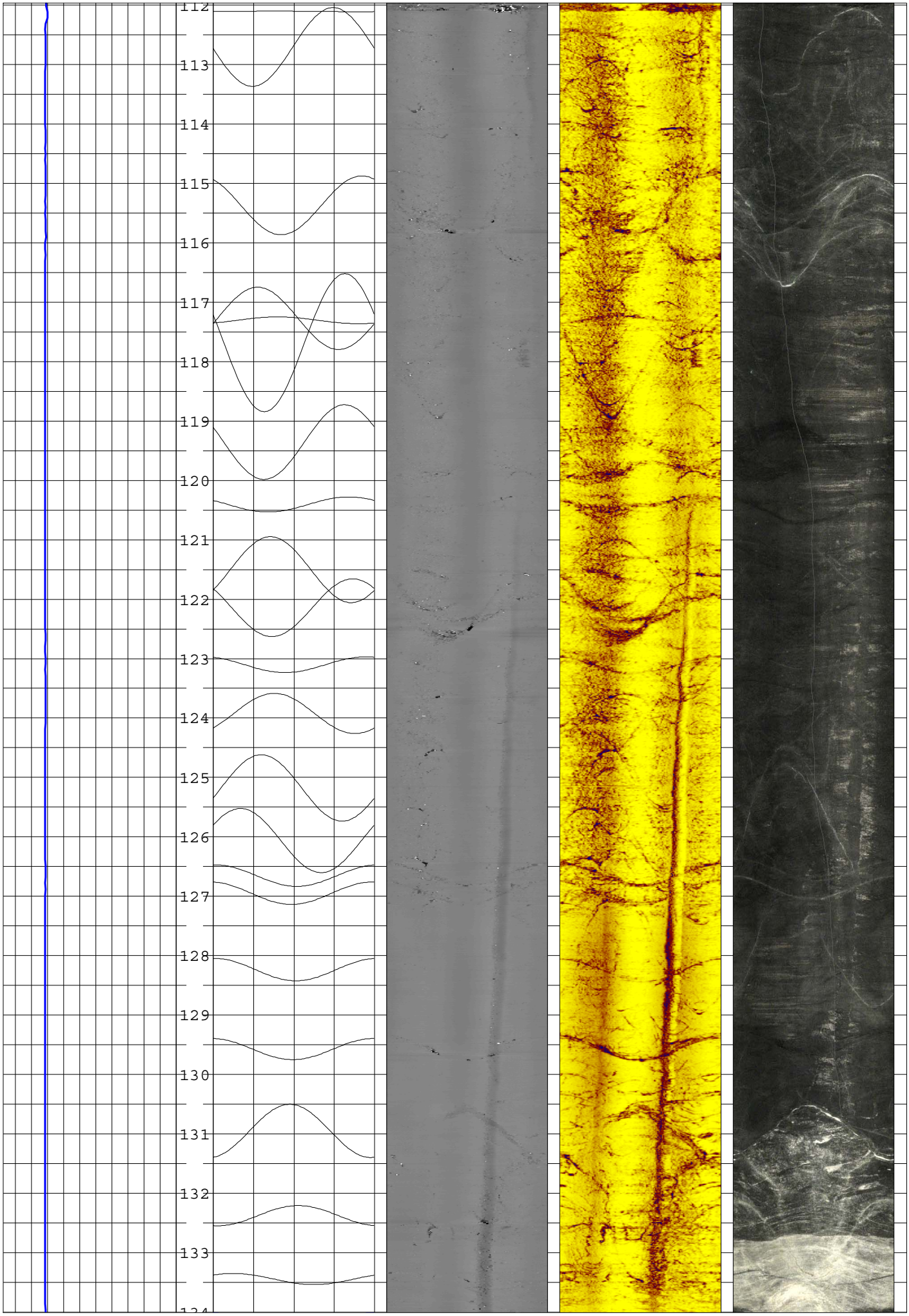
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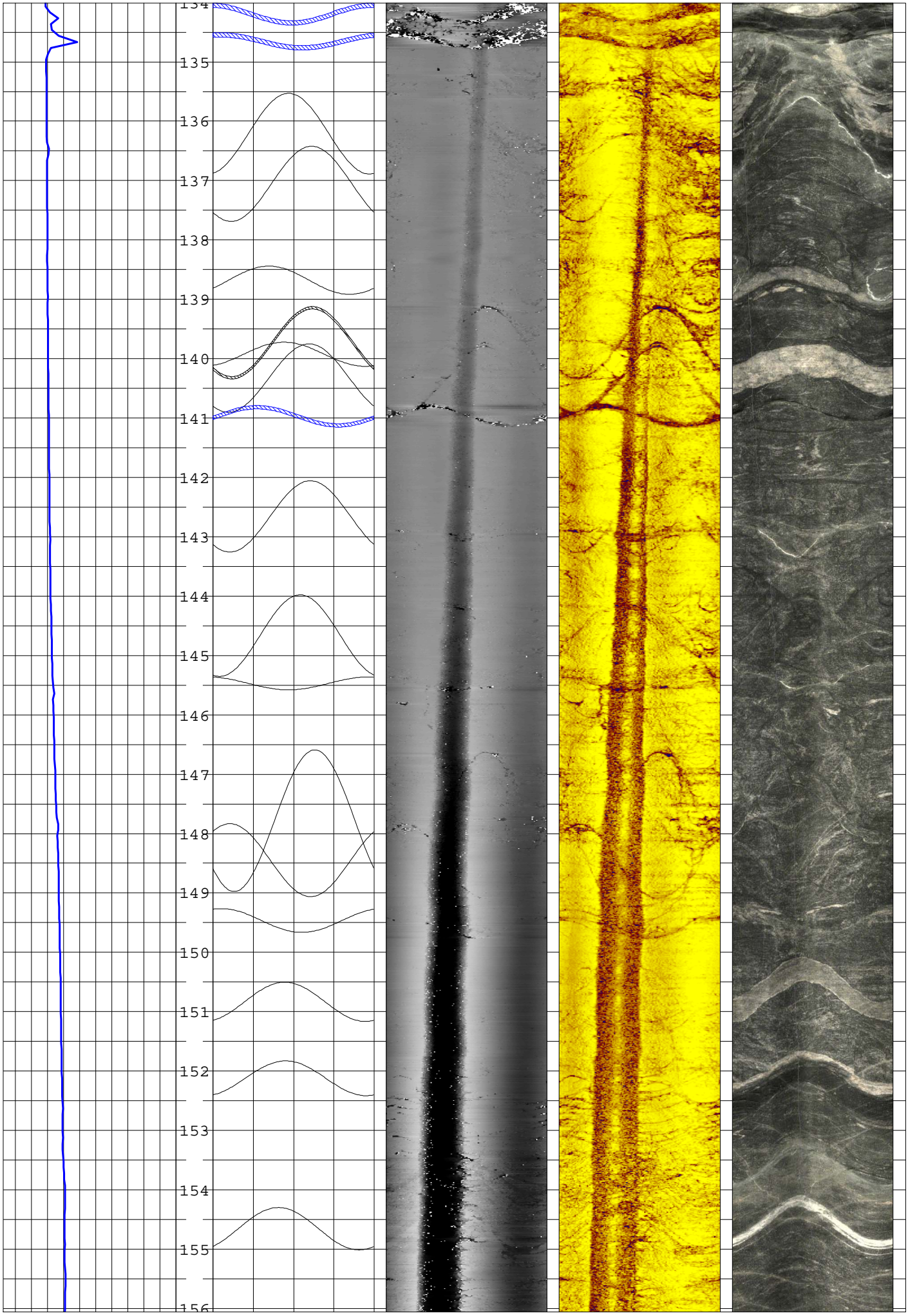
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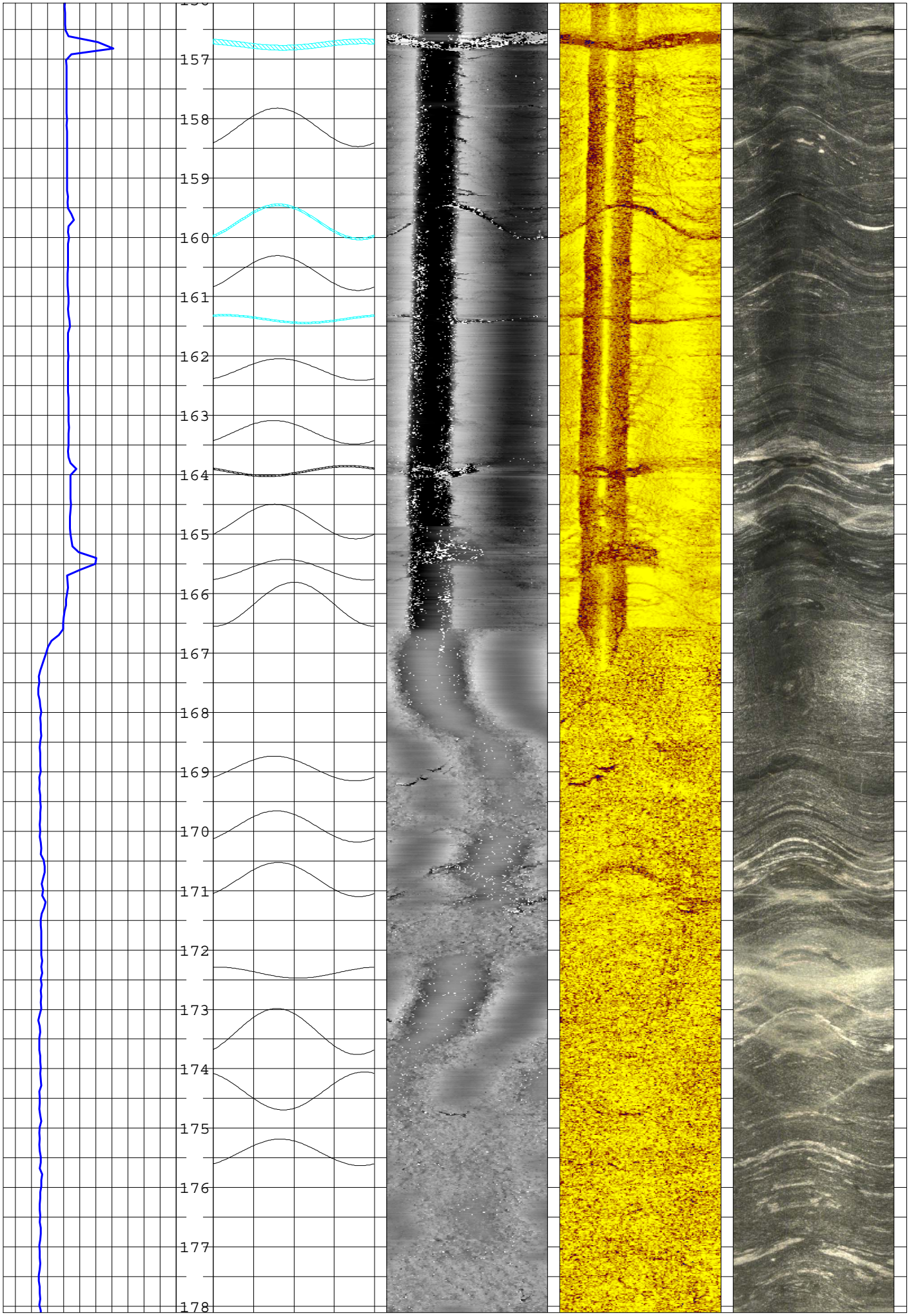
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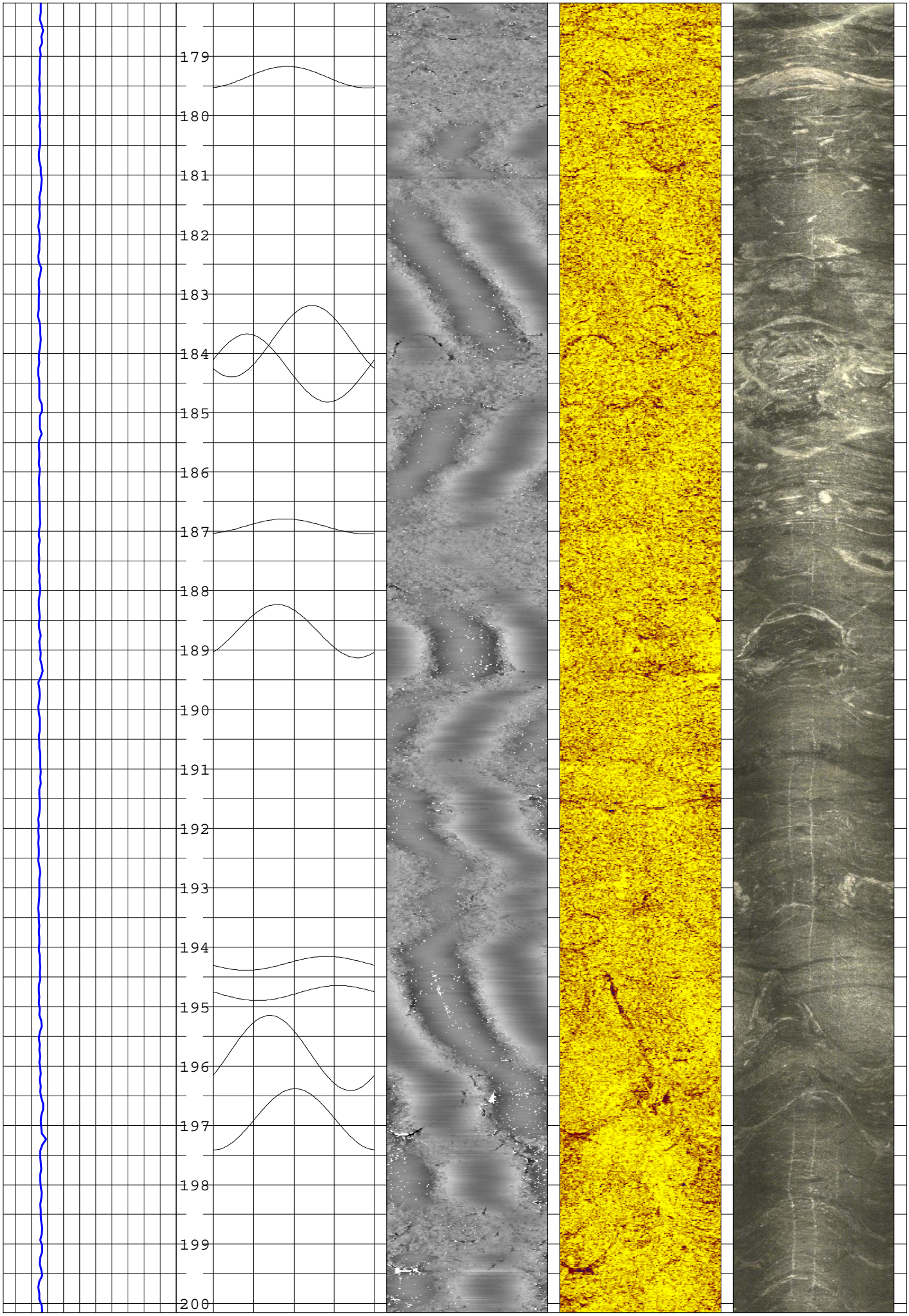
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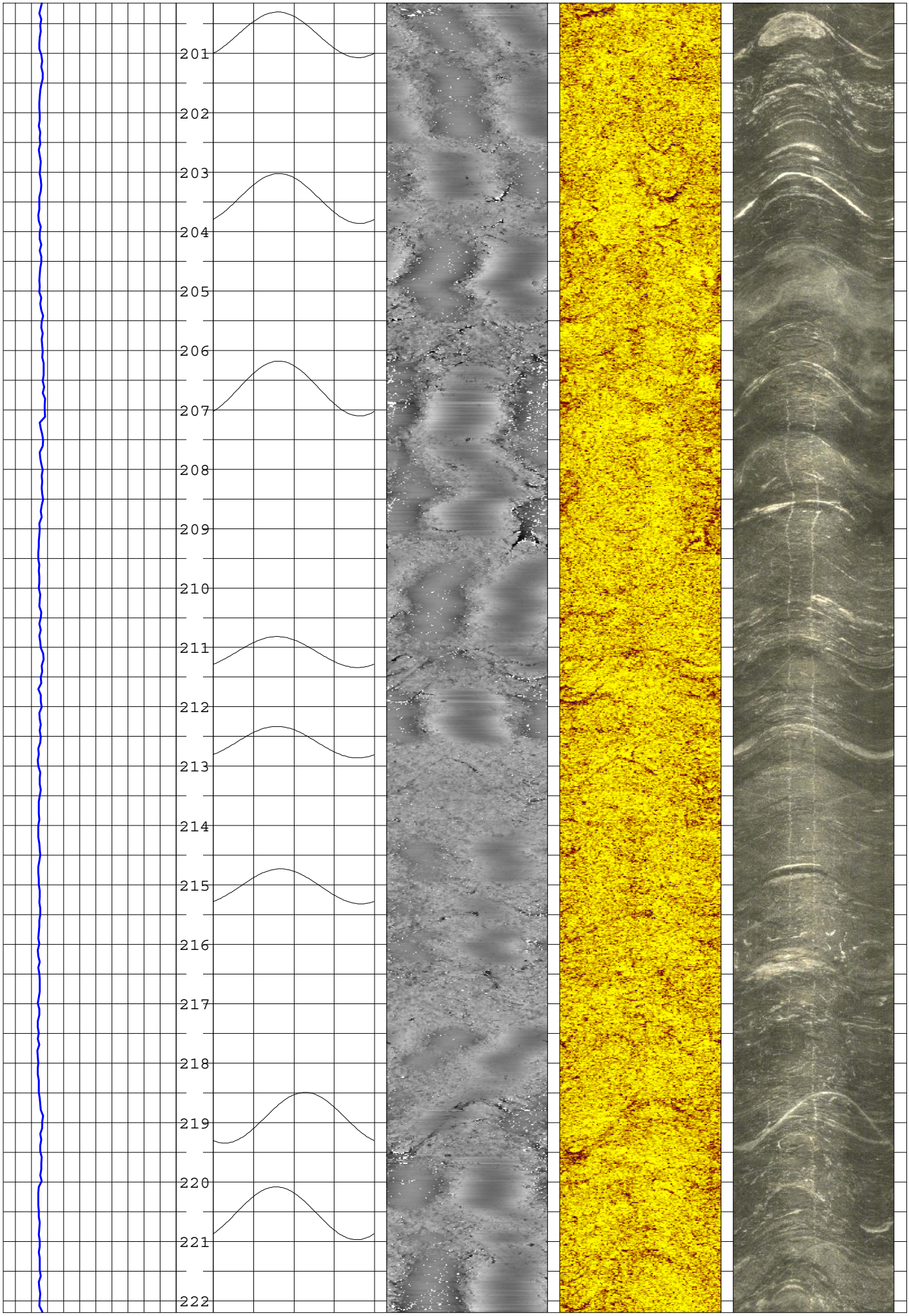
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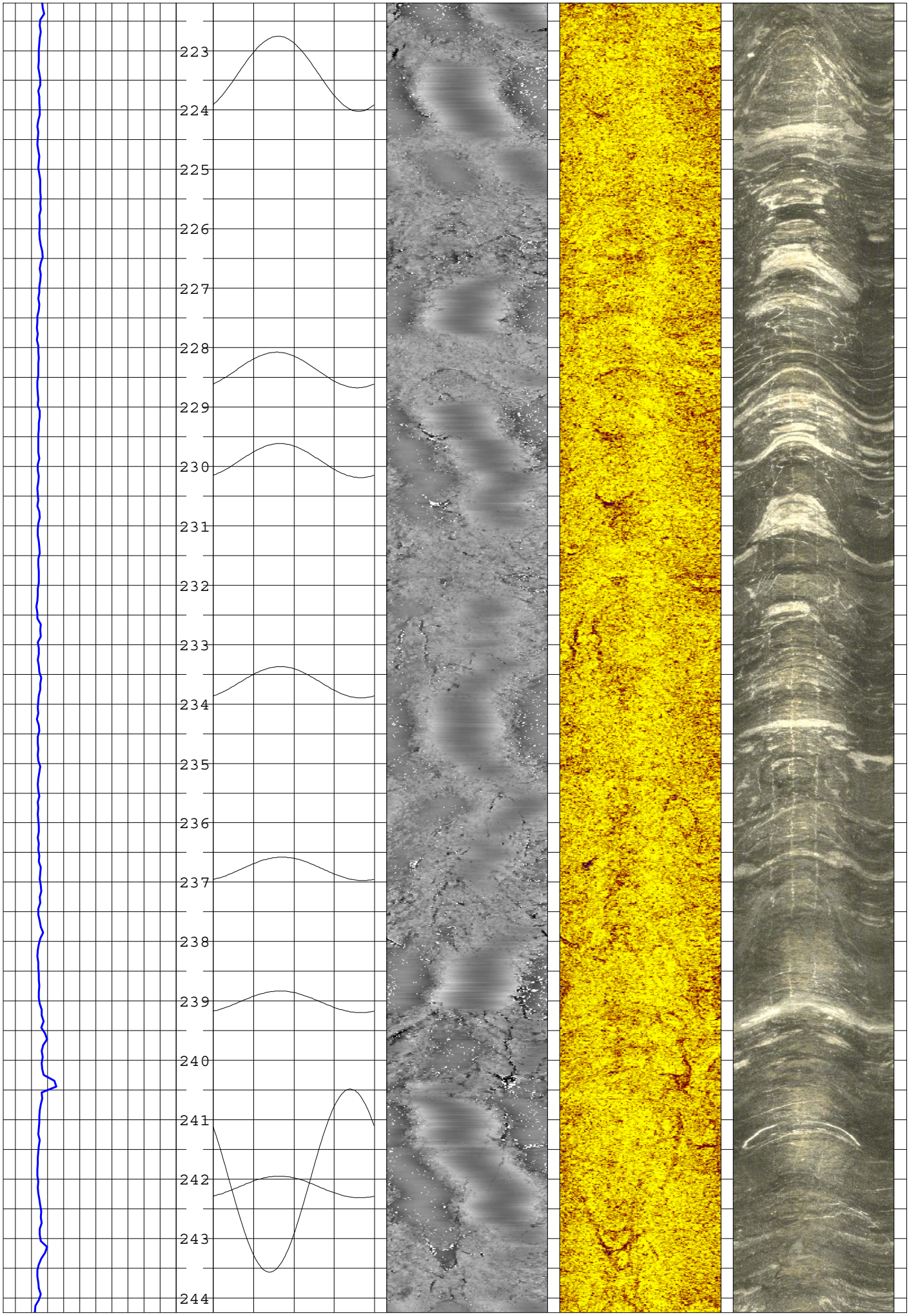
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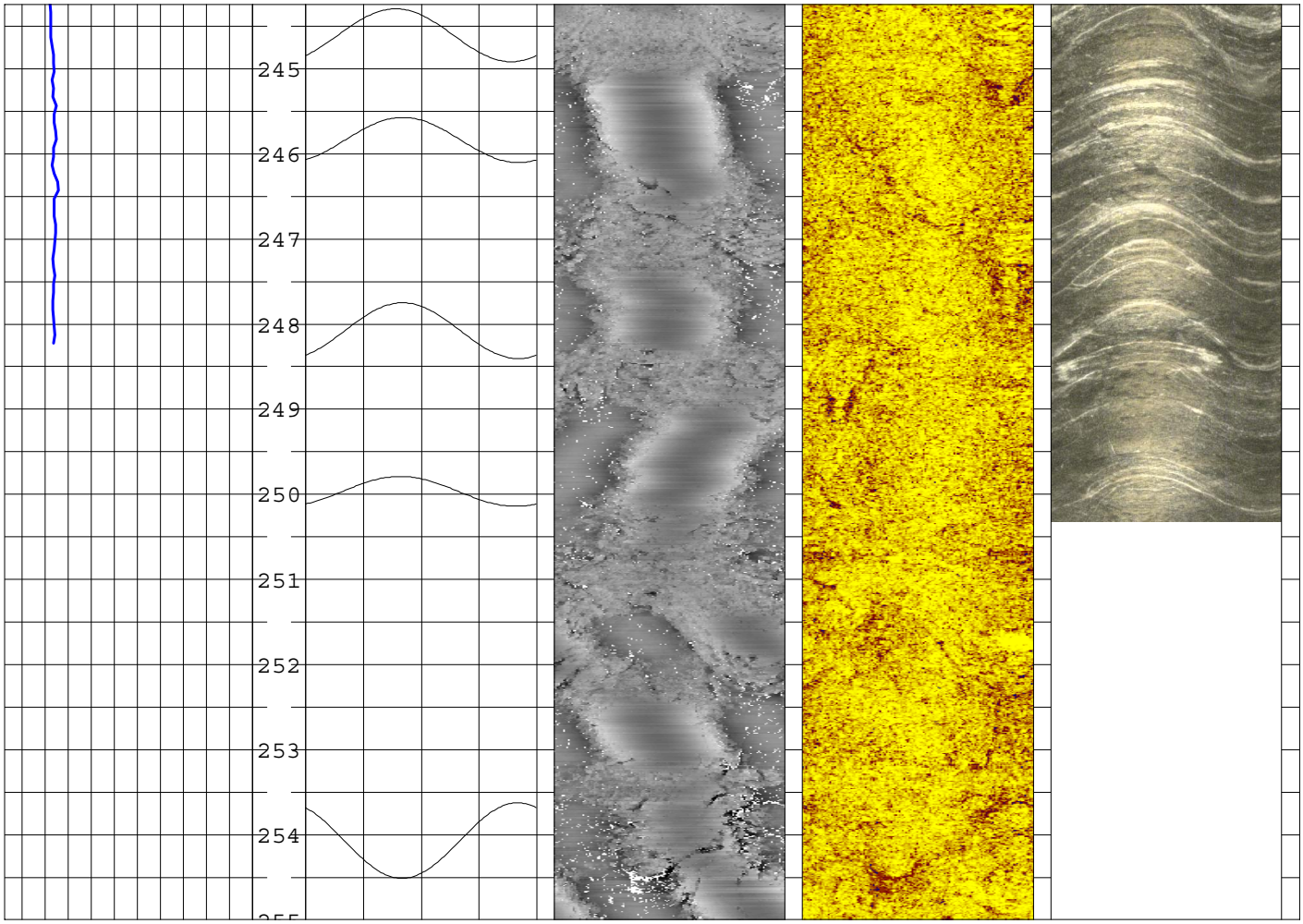
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TABLE C-1 Planar features interpreted from acoustical and optical televiewers
405 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
405 BR	1	11.5	19	164	74	149	59	0	100
405 BR	2	12.8	28	259	349	244	334	49	107
405 BR	3	14.2	33	288	18	273	3	23	107
405 BR	4	16.3	64	36	306	21	291	0	100
405 BR	5	18.4	64	301	31	286	16	0	100
405 BR	6	19.6	61	304	34	289	19	13	108
405 BR	7	22.6	30	200	290	185	275	0	100
405 BR	8	23.3	44	298	28	282	12	0	100
405 BR	9	26.6	41	334	64	319	49	0	100
405 BR	10	29.2	58	39	309	24	294	0	108
405 BR	11	29.3	47	15	285	0	270	11	107
405 BR	12	32.0	13	16	286	1	271	41	107
405 BR	13	35.0	21	6	276	351	81	11	108
405 BR	14	36.4	29	152	62	137	47	0	100
405 BR	15	42.4	18	283	13	268	358	13	108
405 BR	16	49.3	50	130	40	115	25	26	107
405 BR	17	49.7	66	140	50	125	35	4	107
405 BR	18	50.1	50	111	21	96	6	12	107
405 BR	19	51.3	45	189	279	174	84	19	107
405 BR	20	52.8	65	347	77	332	62	9	107
405 BR	21	53.2	71	198	288	182	272	8	107
405 BR	22	54.5	44	345	75	330	60	0	100
405 BR	23	55.9	44	348	78	333	63	0	100
405 BR	24	57.7	50	343	73	328	58	0	100
405 BR	25	59.8	43	352	82	337	67	0	100
405 BR	26	61.3	49	349	79	334	64	36	107
405 BR	27	62.5	49	331	61	316	46	0	100
405 BR	28	63.0	33	142	52	127	37	6	108
405 BR	29	64.0	54	327	57	312	42	0	100
405 BR	30	66.3	57	331	61	316	46	0	100
405 BR	31	67.5	48	334	64	319	49	0	100
405 BR	32	69.3	43	319	49	304	34	0	100
405 BR	33	70.5	50	316	46	301	31	0	100
405 BR	34	72.6	23	123	33	108	18	8	100
405 BR	35	73.1	31	335	65	320	50	0	100
405 BR	36	74.4	41	344	74	329	59	0	100
405 BR	37	75.4	31	112	22	97	7	0	100
405 BR	38	77.2	32	36	306	21	291	0	100
405 BR	39	79.0	30	140	50	125	35	0	100
405 BR	40	79.5	34	29	299	14	284	0	100
405 BR	41	80.4	20	11	281	356	86	0	100
405 BR	42	81.2	17	93	3	78	348	0	100
405 BR	43	84.2	72	339	69	323	53	0	100
405 BR	44	84.4	46	149	59	134	44	0	100
405 BR	45	86.1	61	291	21	276	6	0	100
405 BR	46	87.0	31	341	71	326	56	8	100
405 BR	47	88.3	32	115	25	99	9	6	100
405 BR	48	88.4	36	325	55	310	40	0	100
405 BR	49	89.7	47	305	35	290	20	0	100
405 BR	50	91.0	44	167	77	151	61	0	100
405 BR	51	91.6	47	320	50	305	35	0	100
405 BR	52	91.8	43	191	281	176	86	0	100
405 BR	53	93.4	68	296	26	281	11	0	100
405 BR	54	94.6	45	359	89	344	74	0	100
405 BR	55	95.7	50	329	59	314	44	0	100
405 BR	56	95.8	51	160	70	145	55	0	100
405 BR	57	96.4	48	322	52	307	37	0	100
405 BR	58	97.5	49	328	58	313	43	0	100
405 BR	59	98.6	39	325	55	310	40	0	100

TABLE C-1 Planar features interpreted from acoustical and optical televiewers
405 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
405 BR	60	100.2	45	337	67	322	52	0	100
405 BR	61	100.8	46	340	70	324	54	0	100
405 BR	62	102.2	42	153	63	138	48	0	100
405 BR	63	104.2	80	120	30	105	15	0	100
405 BR	64	107.3	68	278	8	263	353	0	100
405 BR	65	107.6	56	324	54	309	39	3	100
405 BR	66	109.0	59	108	18	93	3	0	100
405 BR	67	109.9	52	110	20	95	4	0	100
405 BR	68	112.1	1	317	47	302	32	0	100
405 BR	69	112.7	69	88	358	72	342	0	100
405 BR	70	115.4	63	151	61	136	46	0	100
405 BR	71	117.3	64	279	9	264	354	0	100
405 BR	72	117.3	12	324	54	309	39	0	100
405 BR	73	117.7	78	114	24	99	9	0	100
405 BR	74	119.4	68	113	23	98	8	0	100
405 BR	75	120.4	26	122	32	107	17	0	100
405 BR	76	121.5	65	308	38	293	23	0	100
405 BR	77	122.1	62	131	41	116	26	0	100
405 BR	78	123.1	27	160	70	145	55	0	100
405 BR	79	123.9	53	316	46	301	31	0	100
405 BR	80	125.2	65	287	17	272	2	0	100
405 BR	81	126.1	65	241	331	226	316	0	100
405 BR	82	126.7	35	186	276	171	81	0	100
405 BR	83	127.0	36	175	85	159	69	0	100
405 BR	84	128.2	36	184	274	169	79	0	100
405 BR	85	129.6	35	178	88	162	72	0	100
405 BR	86	131.0	60	351	81	336	66	0	100
405 BR	87	132.4	33	9	279	354	84	0	100
405 BR	88	133.5	20	225	315	209	299	0	100
405 BR	89	134.2	30	176	86	161	71	20	107
405 BR	90	134.7	22	199	289	184	274	21	107
405 BR	91	136.2	69	349	79	334	64	0	100
405 BR	92	137.1	68	40	310	25	295	0	100
405 BR	93	138.7	43	305	35	290	20	0	100
405 BR	94	139.7	66	42	312	27	297	4	100
405 BR	95	139.9	38	339	69	323	53	0	100
405 BR	96	140.3	66	35	305	20	290	0	100
405 BR	97	141.0	31	279	9	264	354	14	107
405 BR	98	142.7	67	37	307	22	292	0	100
405 BR	99	144.7	69	15	285	360	90	0	100
405 BR	100	145.5	23	168	78	153	63	0	100
405 BR	101	147.8	78	47	317	32	302	0	100
405 BR	102	148.5	67	218	308	203	293	0	100
405 BR	103	149.5	37	198	288	183	273	0	100
405 BR	104	150.8	51	340	70	325	55	0	100
405 BR	105	152.1	48	342	72	327	57	0	100
405 BR	106	154.7	53	326	56	311	41	0	100
405 BR	107	156.8	11	154	64	139	49	26	108
405 BR	108	158.2	50	323	53	308	38	0	100
405 BR	109	159.7	47	326	56	311	41	6	108
405 BR	110	160.6	47	323	53	308	38	0	100
405 BR	111	161.4	13	205	295	189	279	6	108
405 BR	112	162.2	34	328	58	313	43	0	100
405 BR	113	163.3	37	315	45	300	30	0	100
405 BR	114	163.9	17	119	29	104	14	8	100
405 BR	115	164.8	47	317	47	302	32	0	100
405 BR	116	165.6	32	342	72	327	57	0	100
405 BR	117	166.2	54	0	270	345	75	0	100
405 BR	118	168.9	39	316	46	300	30	0	100

TABLE C-1 Planar features interpreted from acoustical and optical televiewers
405 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: December, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
405 BR	119	169.9	46	321	51	306	36	0	100
405 BR	120	170.8	48	325	55	310	40	0	100
405 BR	121	172.4	20	189	279	174	84	0	100
405 BR	122	173.4	57	322	52	307	37	0	100
405 BR	123	174.4	52	157	67	142	52	0	100
405 BR	124	175.4	41	329	59	314	44	0	100
405 BR	125	179.4	36	345	75	330	60	0	100
405 BR	126	183.8	67	40	310	25	295	0	100
405 BR	127	184.3	66	256	346	241	331	0	100
405 BR	128	186.9	26	340	70	325	55	0	100
405 BR	129	188.7	60	323	53	307	37	0	100
405 BR	130	194.3	25	73	343	58	328	0	100
405 BR	131	194.8	26	99	9	84	354	0	100
405 BR	132	195.8	68	306	36	291	21	0	100
405 BR	133	196.9	64	2	272	347	77	0	100
405 BR	134	200.7	56	324	54	309	39	0	100
405 BR	135	203.4	59	327	57	312	42	0	100
405 BR	136	206.6	61	326	56	311	41	0	100
405 BR	137	211.1	45	322	52	307	37	0	100
405 BR	138	212.6	46	322	52	307	37	0	100
405 BR	139	215.0	49	330	60	315	45	0	100
405 BR	140	218.9	59	25	295	10	280	0	100
405 BR	141	220.5	60	320	50	305	35	0	100
405 BR	142	223.4	68	325	55	310	40	0	100
405 BR	143	228.4	50	321	51	306	36	0	100
405 BR	144	229.9	48	329	59	314	44	0	100
405 BR	145	233.6	46	329	59	314	44	0	100
405 BR	146	236.8	38	334	64	319	49	0	100
405 BR	147	239.0	36	329	59	314	44	0	100
405 BR	148	242.0	81	126	36	111	21	0	100
405 BR	149	242.1	36	327	57	312	42	0	100
405 BR	150	244.6	51	320	50	305	35	0	100
405 BR	151	245.8	46	331	61	316	46	0	100
405 BR	152	248.1	52	331	61	316	46	0	100
405 BR	153	250.0	34	327	57	312	42	0	100
405 BR	154	254.1	59	150	60	135	45	0	100

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

ATTACHMENT D

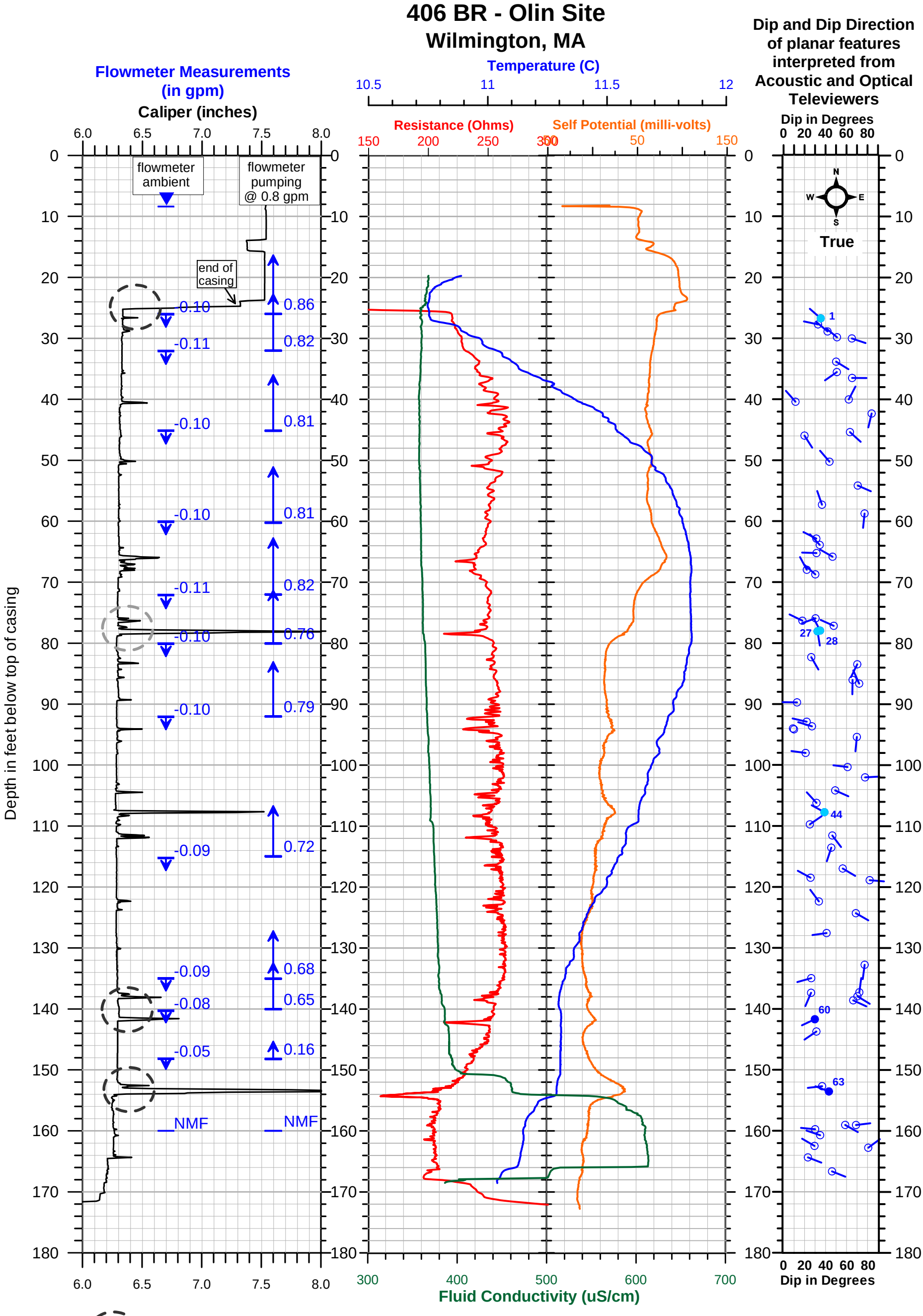
BOREHOLE 406 BR

BOREHOLE GEOPHYSICAL LOGS

Northeast Geophysical Services

PLATE D-1
Borehole Geophysical Log
406 BR - Olin Site
Wilmington, MA

Date logged: 5/17/10



= Likely transmissive zone

= Possible transmissive zone

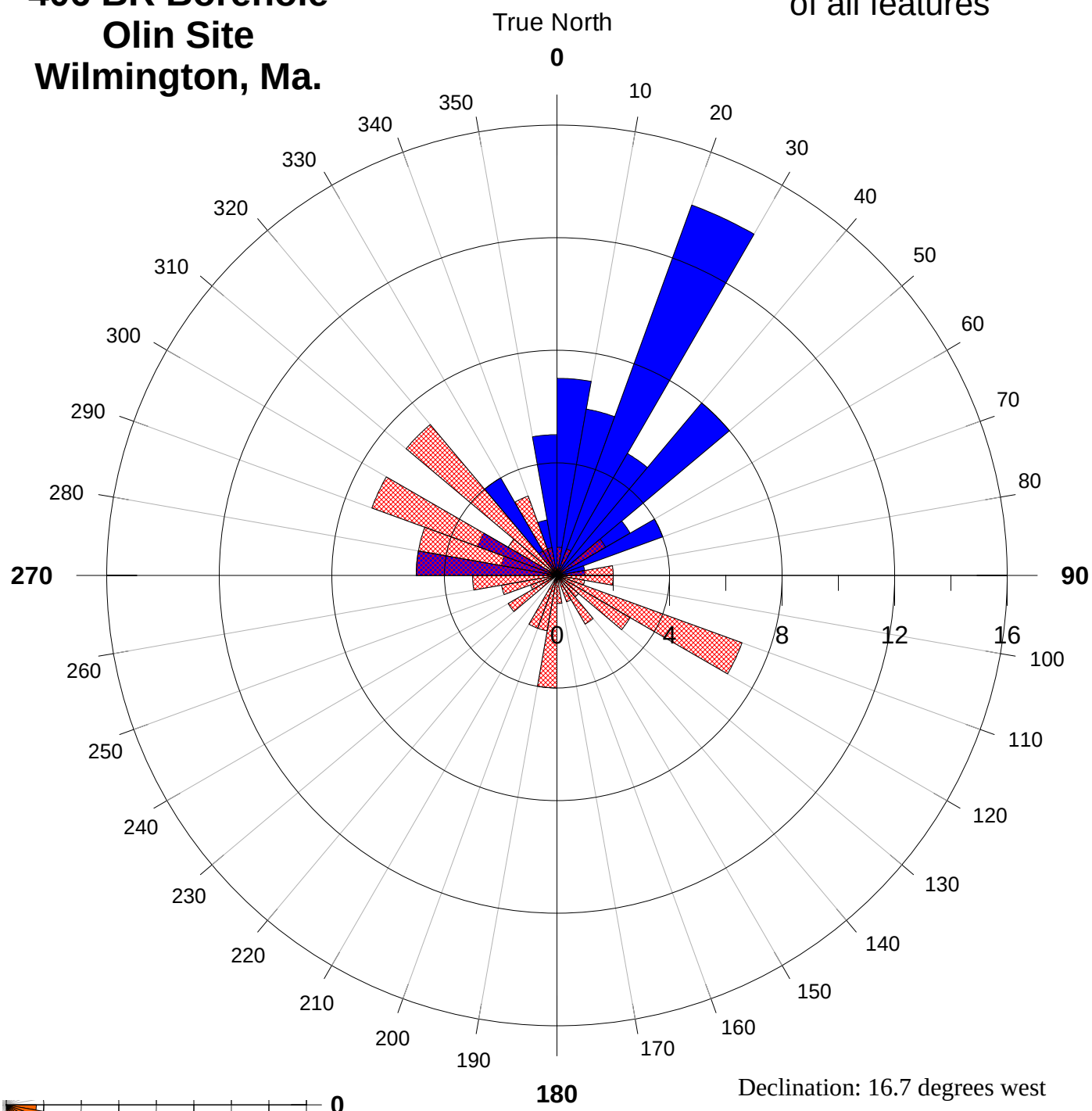
PLATE D-1
Borehole Geophysical Log
406 BR - Olin Site
Wilmington, MA

Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

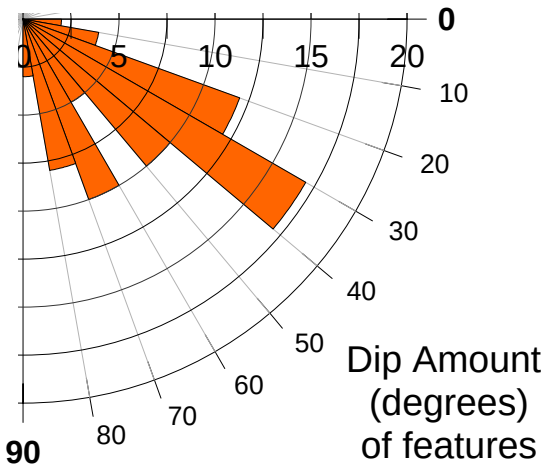
Northeast Geophysical Services

406 BR Borehole
Olin Site
Wilmington, Ma.

PLATE D-2
Strike and Dip Direction
of all features



Declination: 16.7 degrees west



Explanation

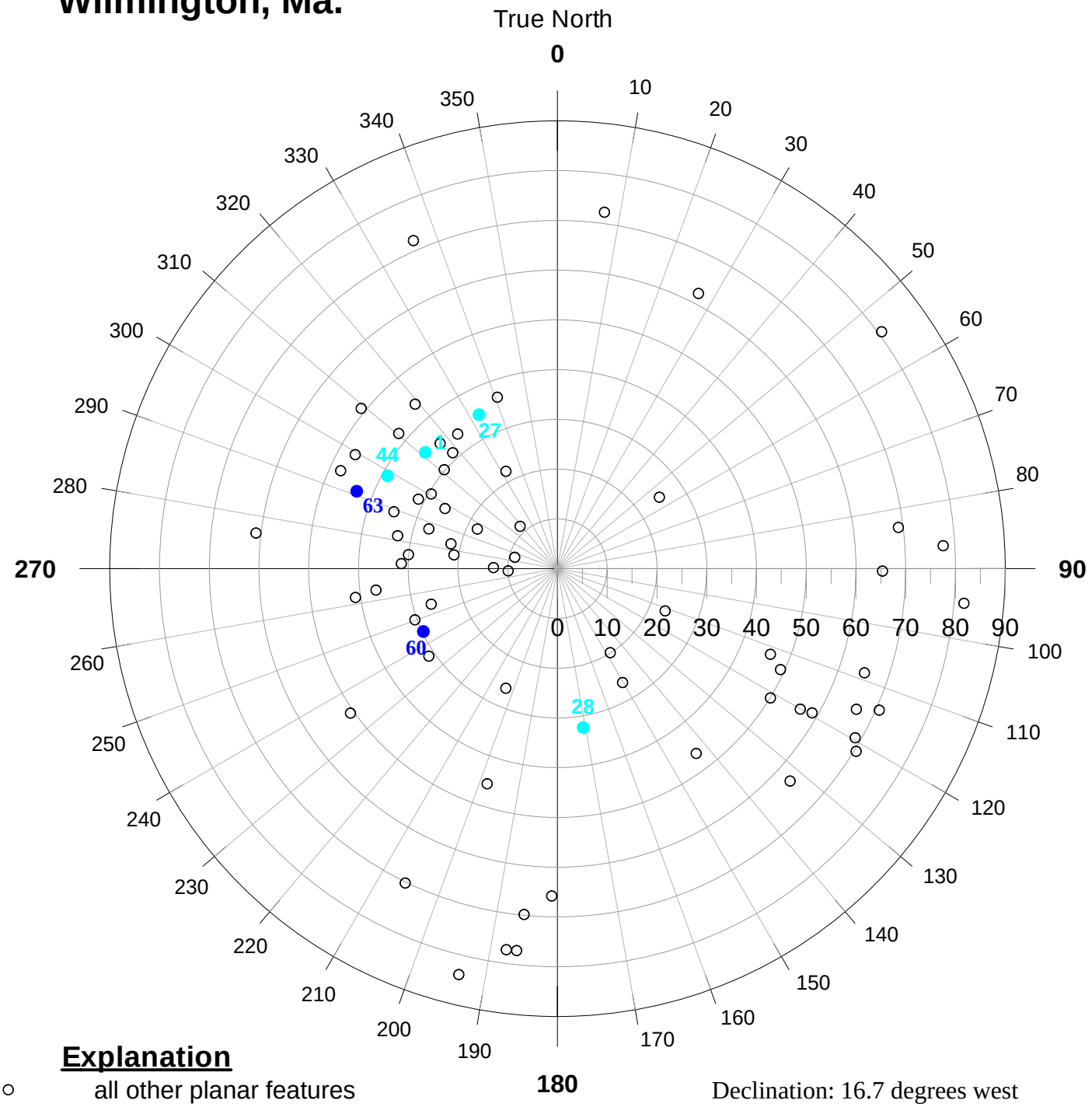
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 71 measurements

Northeast Geophysical Services

406 BR Borehole
Olin Site
Wilmington, Ma.

PLATE D-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- ○ all other planar features
- ● Likely water bearing
- ● Possibly water bearing

Declination: 16.7 degrees west

Based on 71 measurements

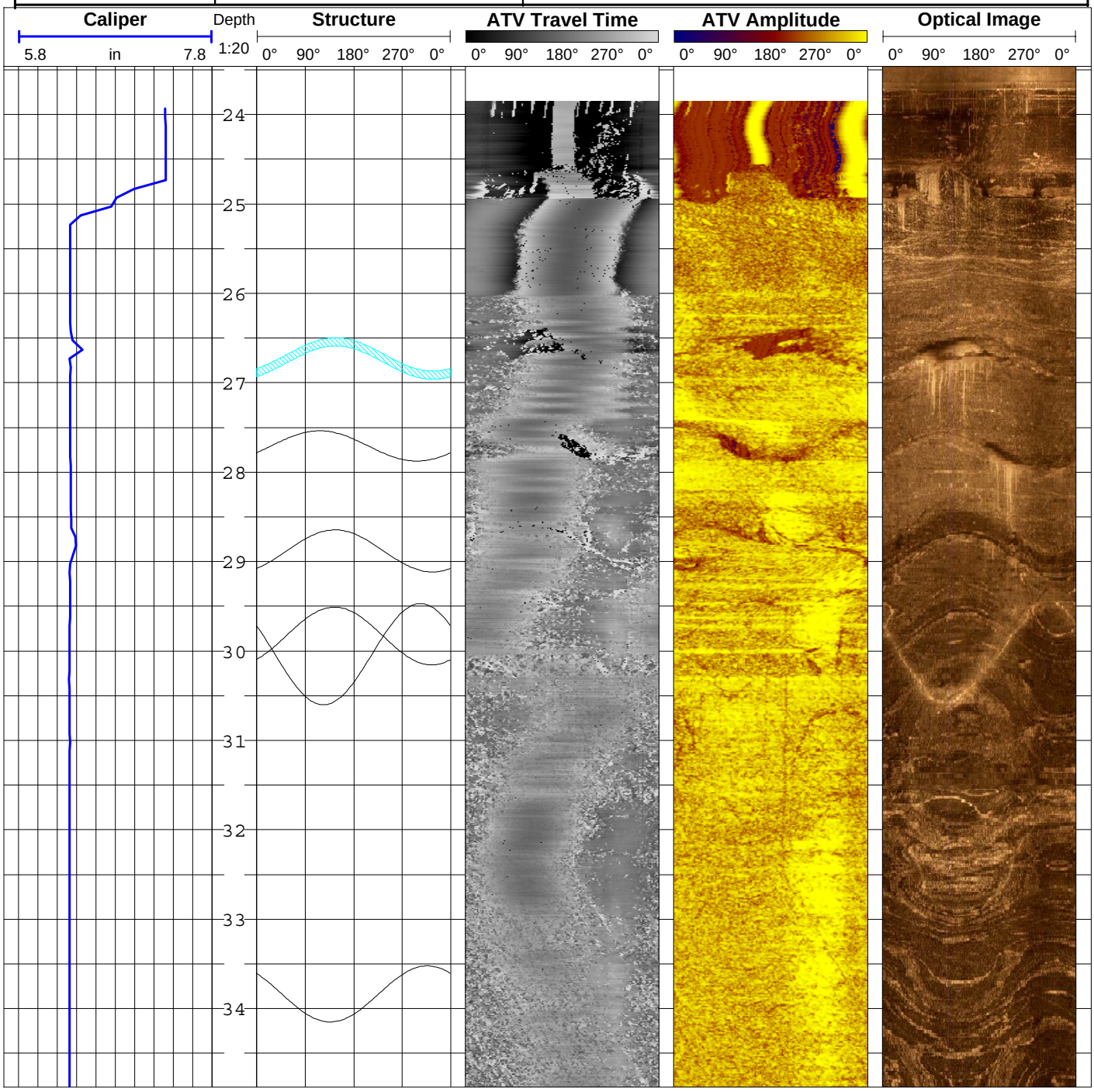
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

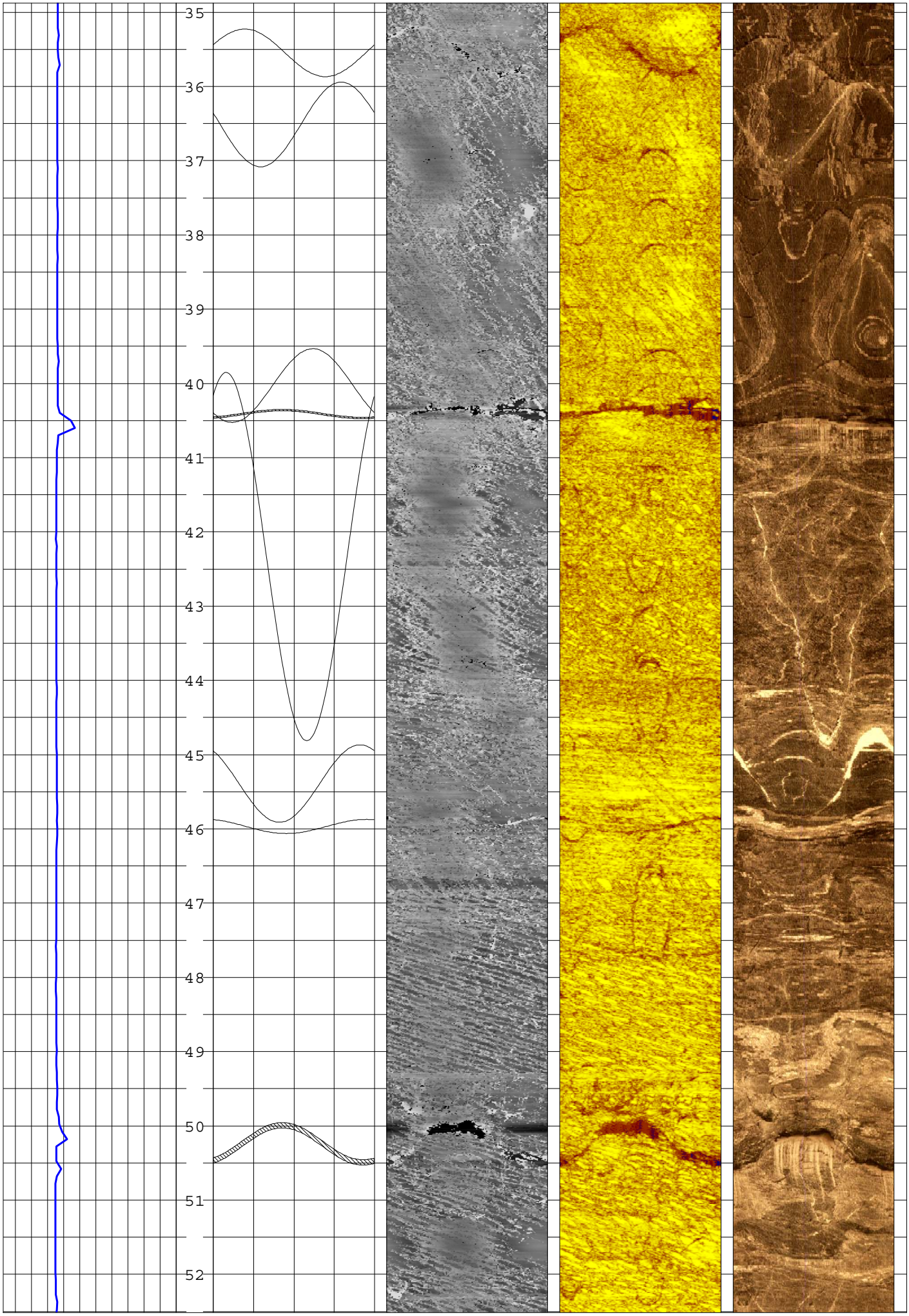
Log: Plate D-4 Televiewer & Caliper Logs

Well: 406 BR

Site: Olin

Date:	5/17/10	Location:	Wilmington, MA
Casing Depth:	25 ft	For:	MACTEC
Casing Type:	8 in	Logged by:	R. Rawcliffe
Boring Depth:	176.8 ft	Orientation:	magnetic
Meas. From:	top of casing	Structure Plots:	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture
Stickup:	2.9 ft		
Water Level:	8.22 ft		

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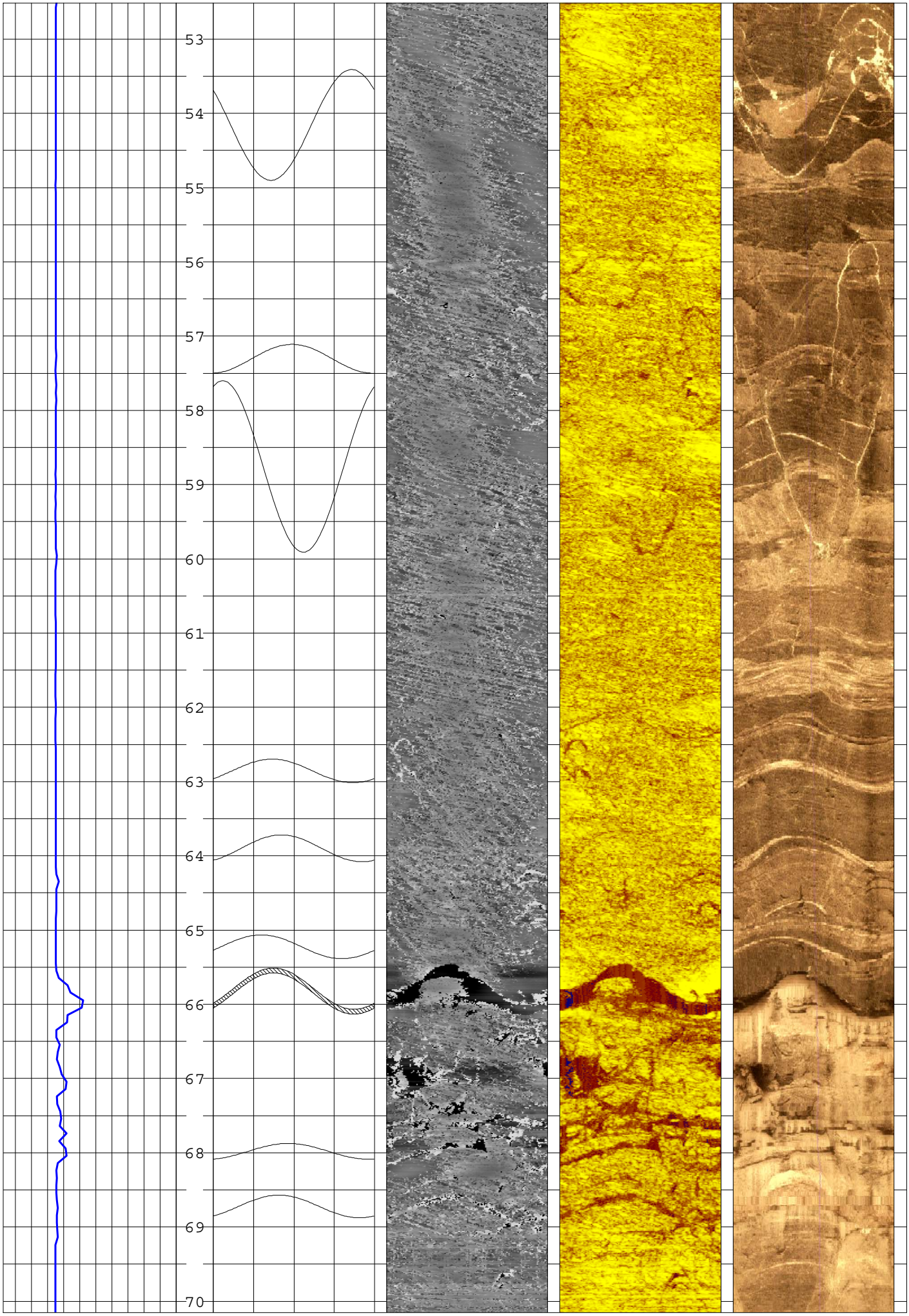
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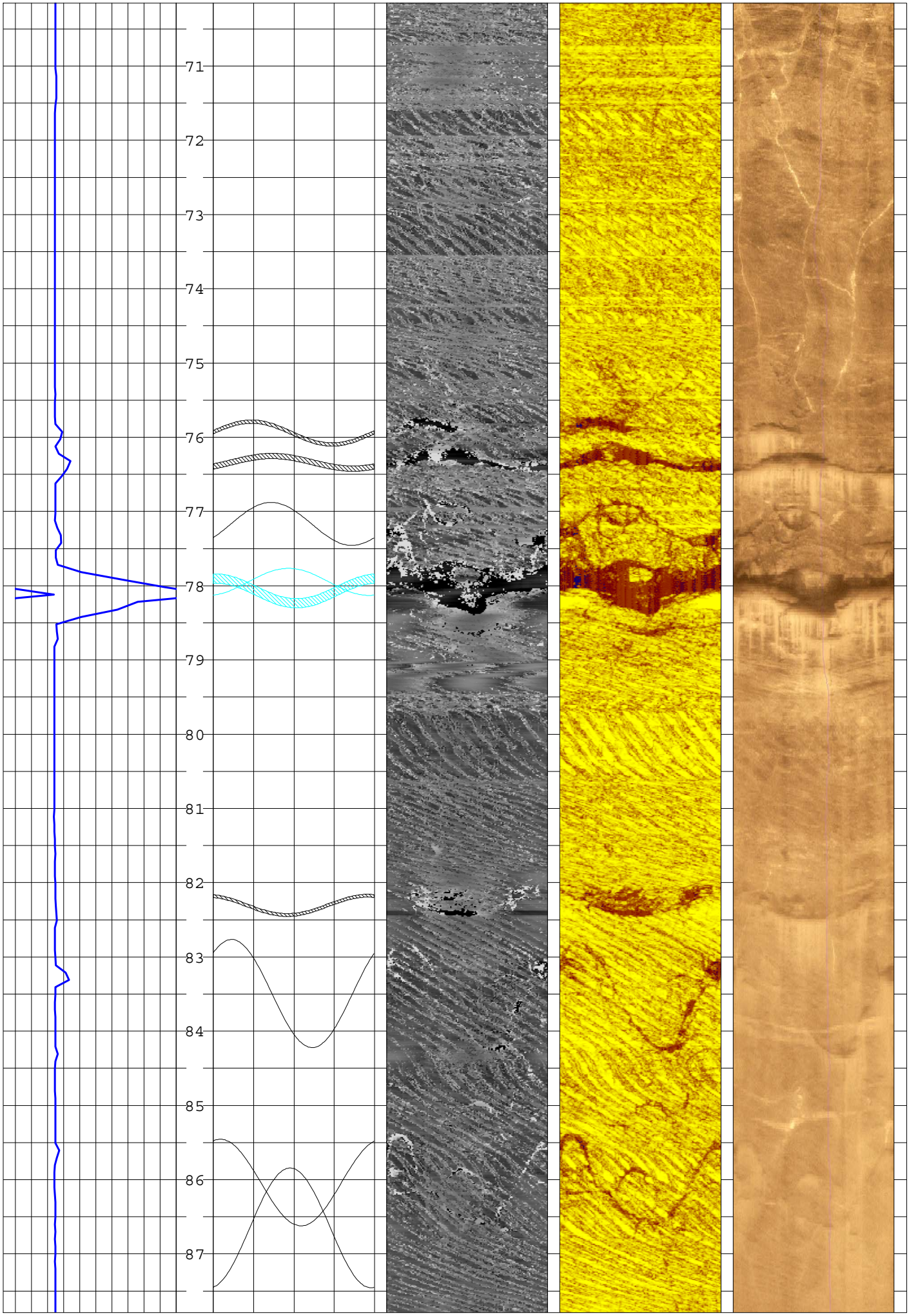
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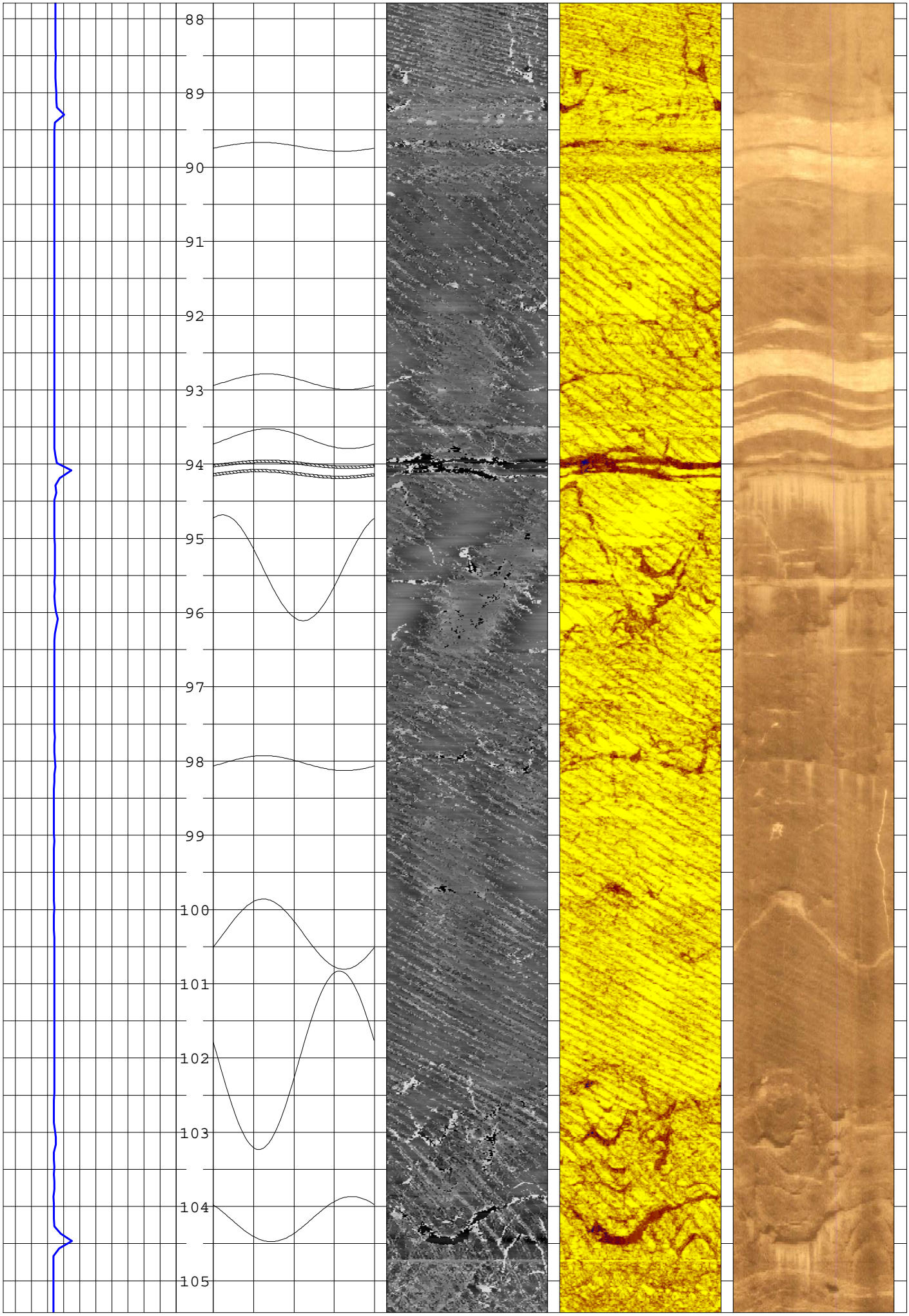
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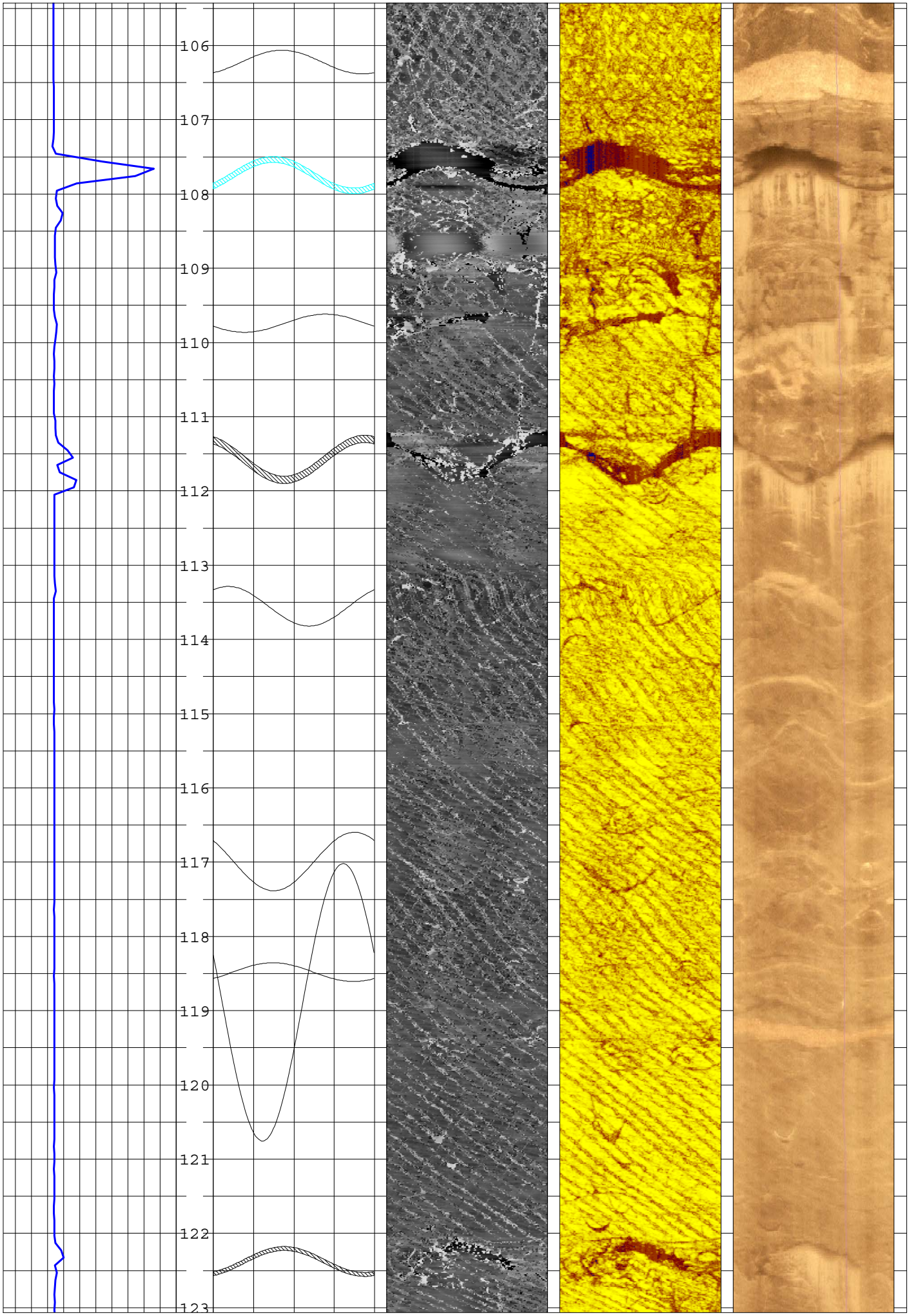
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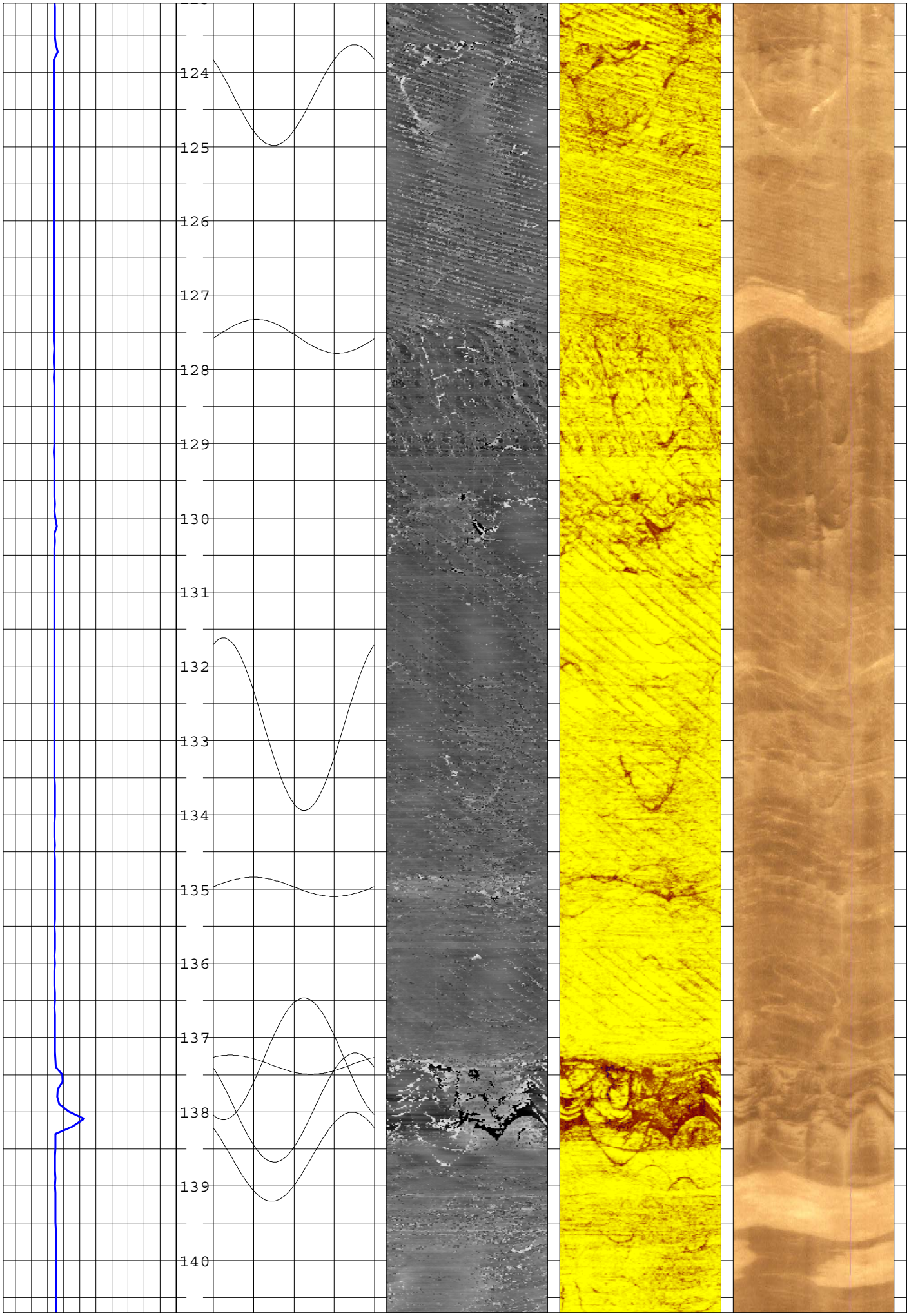
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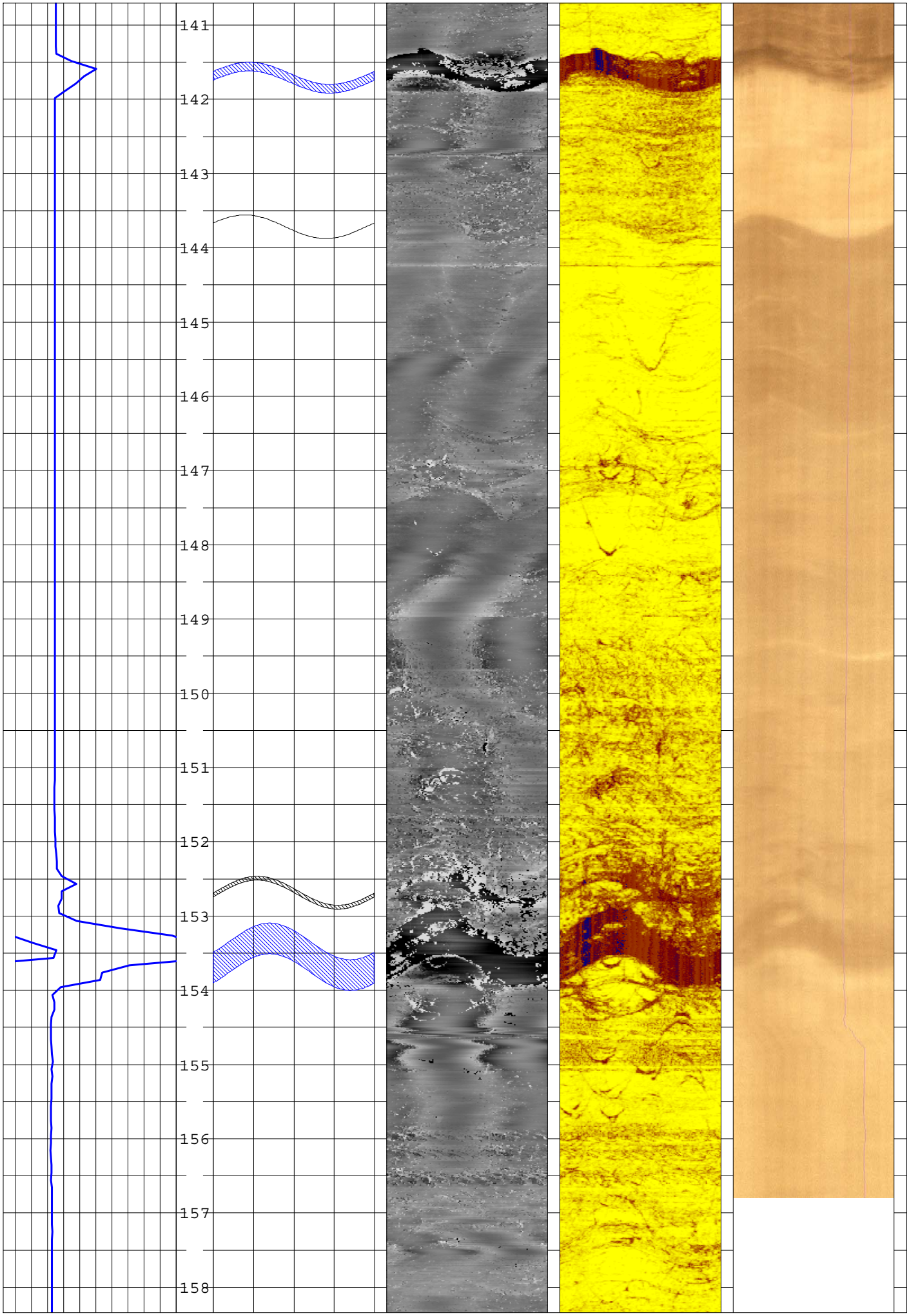
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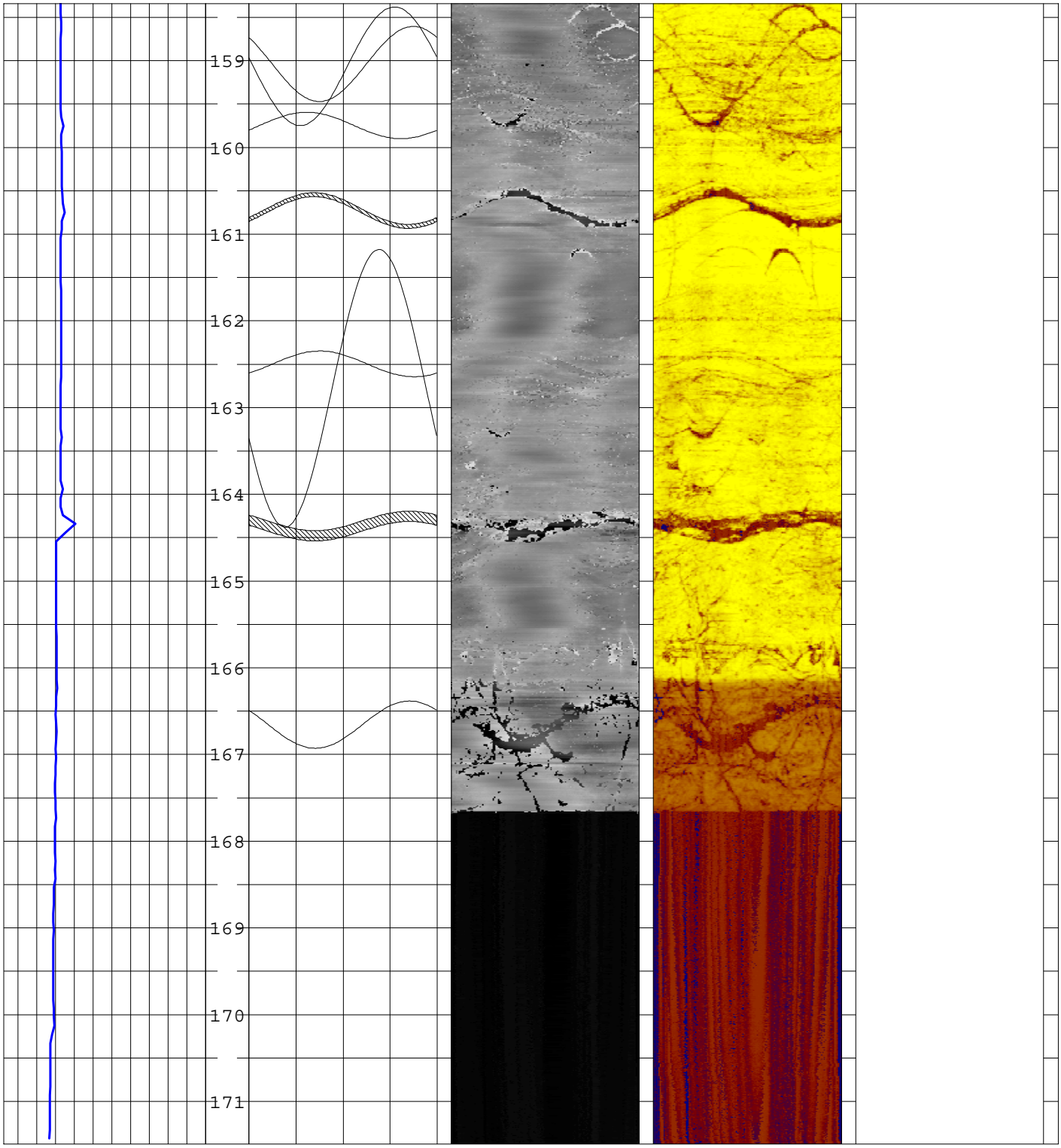
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TABLE D-1 Planar features interpreted from acoustical and optical televiewers
406 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: May, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
406 BR	1	26.7	35	326	56	311	41	23	108
406 BR	2	27.7	33	297	27	282	12	0	100
406 BR	3	28.9	42	325	55	310	40	0	100
406 BR	4	29.8	51	324	54	309	39	0	100
406 BR	5	30.0	65	124	34	109	19	0	100
406 BR	6	33.8	50	136	46	121	31	0	100
406 BR	7	35.6	51	250	340	235	325	0	100
406 BR	8	36.5	65	106	16	90	0	0	100
406 BR	9	40.0	62	42	312	27	297	0	100
406 BR	10	40.4	11	334	64	319	49	6	100
406 BR	11	42.3	84	209	299	194	284	0	100
406 BR	12	45.4	63	147	57	132	42	0	100
406 BR	13	46.0	20	163	73	148	58	0	100
406 BR	14	50.2	44	334	64	319	49	16	100
406 BR	15	54.2	71	129	39	114	24	0	100
406 BR	16	57.3	37	356	86	341	71	0	100
406 BR	17	58.8	77	201	291	186	276	0	100
406 BR	18	62.9	31	312	42	297	27	0	100
406 BR	19	63.9	35	332	62	317	47	0	100
406 BR	20	65.2	31	287	17	272	2	0	100
406 BR	21	65.8	47	315	45	299	29	14	100
406 BR	22	68.0	22	347	77	332	62	0	100
406 BR	23	68.7	30	326	56	311	41	0	100
406 BR	24	76.0	30	265	355	250	340	12	100
406 BR	25	76.3	18	311	41	296	26	20	100
406 BR	26	77.2	48	309	39	294	24	0	100
406 BR	27	78.0	35	348	78	333	63	0	108
406 BR	28	78.1	32	186	276	171	81	31	108
406 BR	29	82.3	26	165	75	150	60	10	100
406 BR	30	83.5	70	221	311	206	296	0	100
406 BR	31	86.0	66	196	286	181	271	0	100
406 BR	32	86.7	72	351	81	336	66	0	100
406 BR	33	89.7	13	286	16	271	1	0	100
406 BR	34	92.9	22	298	28	283	13	0	100
406 BR	35	93.7	27	302	32	287	17	0	100
406 BR	36	94.0	9	300	30	285	15	10	100
406 BR	37	94.1	10	283	13	267	357	10	100
406 BR	38	95.4	70	201	291	186	276	0	100
406 BR	39	98.0	21	293	23	278	8	0	100
406 BR	40	100.3	61	292	22	277	7	0	100
406 BR	41	102.0	78	102	12	87	357	0	100
406 BR	42	104.2	49	129	39	114	24	0	100
406 BR	43	106.2	31	333	63	318	48	0	100
406 BR	44	107.8	39	314	44	299	29	18	108
406 BR	45	109.7	25	70	340	55	325	0	100
406 BR	46	111.6	46	158	68	143	53	21	100
406 BR	47	113.6	45	213	303	198	288	0	100
406 BR	48	117.0	56	135	45	120	30	0	100
406 BR	49	118.5	26	313	43	298	28	0	100
406 BR	50	118.9	82	110	20	95	5	0	100
406 BR	51	122.4	34	339	69	323	53	14	100
406 BR	52	124.3	69	135	45	120	30	0	100
406 BR	53	127.6	41	277	7	262	352	0	100
406 BR	54	132.8	77	203	293	188	278	0	100
406 BR	55	135.0	26	269	359	254	344	0	100
406 BR	56	137.3	72	23	293	8	278	0	100
406 BR	57	137.4	26	218	308	203	293	0	100
406 BR	58	137.9	70	137	47	121	31	0	100
406 BR	59	138.6	66	130	40	115	25	0	100

TABLE D-1 Planar features interpreted from acoustical and optical televiewers
406 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: May, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
406 BR	60	141.7	30	260	350	245	335	30	107
406 BR	61	143.7	31	251	341	236	326	0	100
406 BR	62	152.7	37	278	8	263	353	12	100
406 BR	63	153.6	43	306	36	291	21	92	107
406 BR	64	159.0	59	135	45	120	30	0	100
406 BR	65	159.1	69	98	8	83	353	0	100
406 BR	66	159.8	30	290	20	275	5	0	100
406 BR	67	160.7	35	304	34	289	19	11	100
406 BR	68	162.5	29	316	46	301	31	0	100
406 BR	69	162.8	81	69	339	54	324	0	100
406 BR	70	164.4	23	127	37	111	21	34	100
406 BR	71	166.7	46	127	37	112	22	0	100

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

ATTACHMENT E

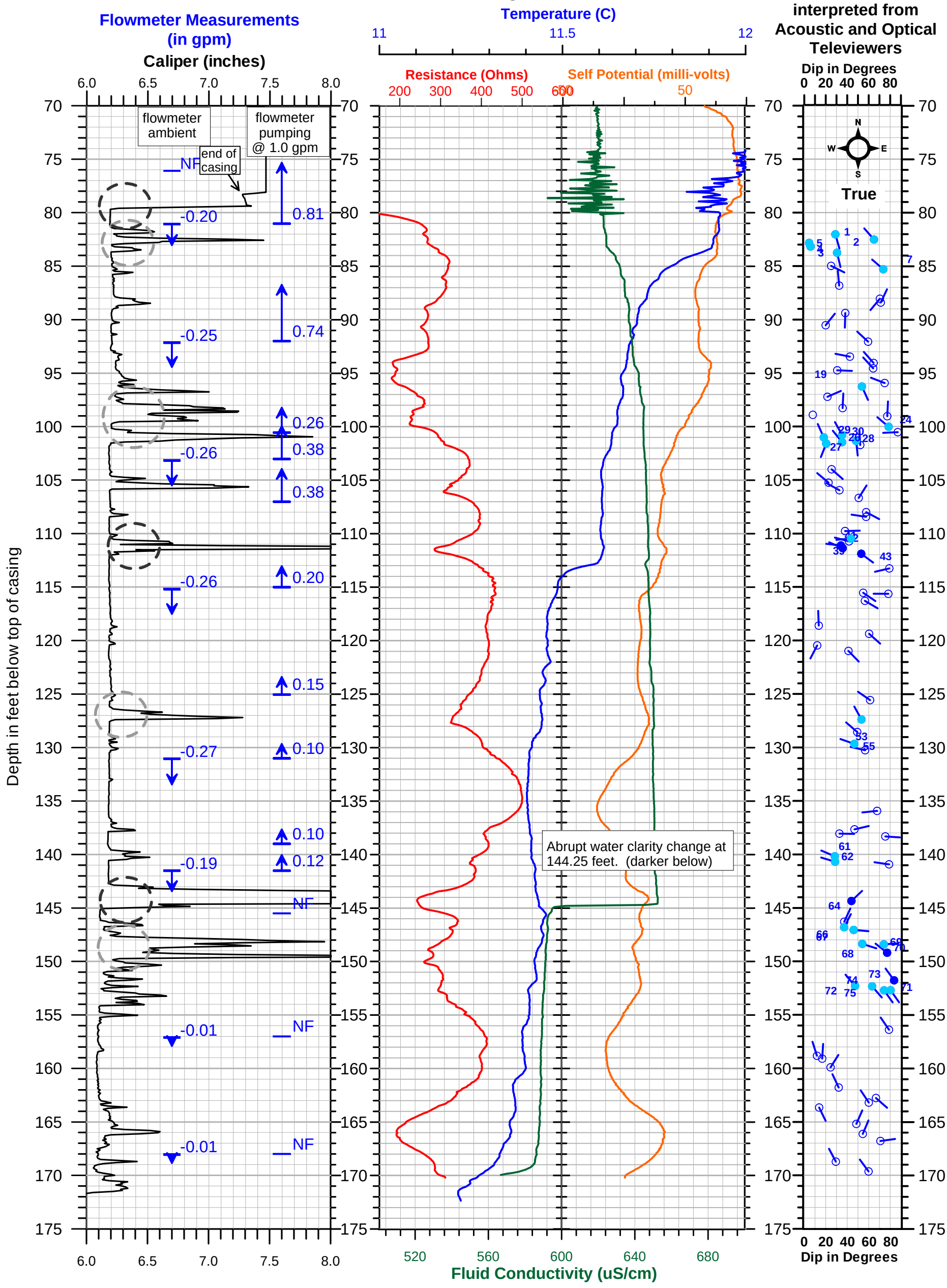
BOREHOLE 407 BR

BOREHOLE GEOPHYSICAL LOGS

Northeast Geophysical Services

PLATE E-1
Borehole Geophysical Log
407 BR - Olin Site
Wilmington, MA

Date logged: 5/28/10



= Likely transmissive zone

= Possible transmissive zone

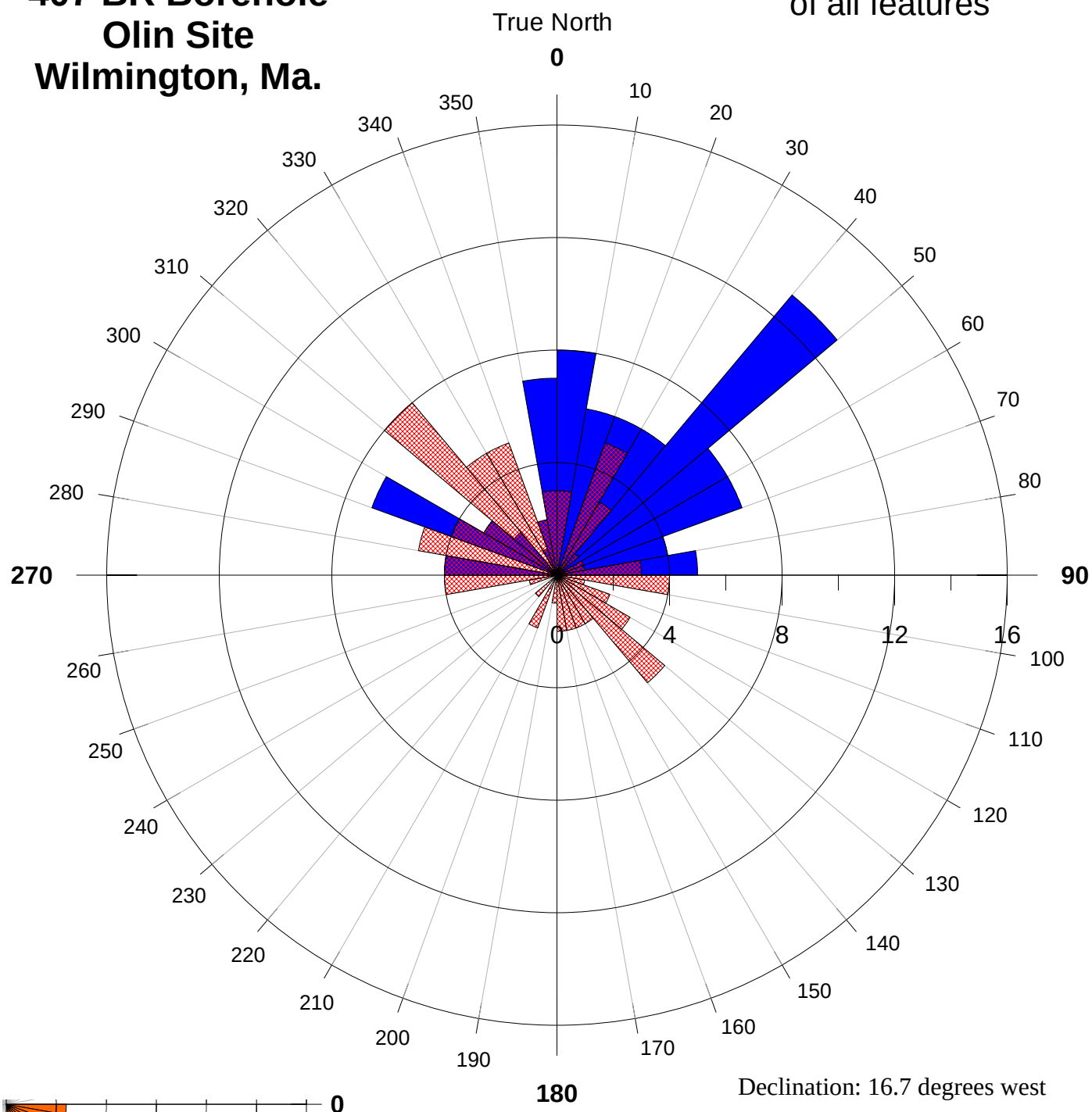
PLATE E-1
Borehole Geophysical Log
407 BR - Olin Site
Wilmington, MA

Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

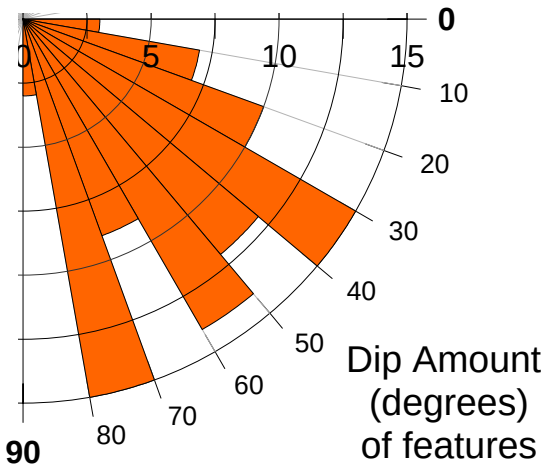
Northeast Geophysical Services

407 BR Borehole
Olin Site
Wilmington, Ma.

PLATE E-2
Strike and Dip Direction
of all features



Declination: 16.7 degrees west



Explanation

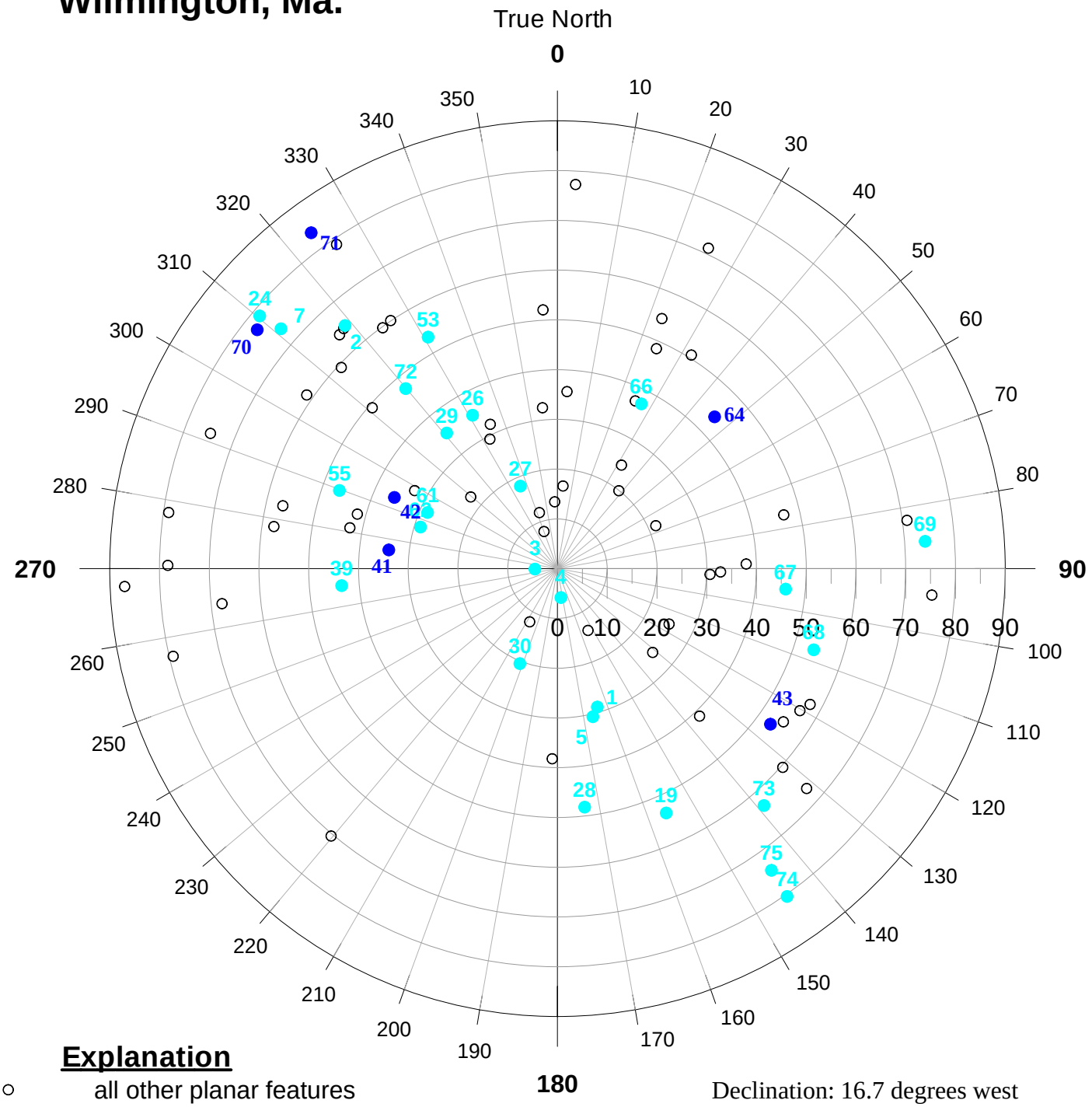
- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

Based on 88 measurements

Northeast Geophysical Services

407 BR Borehole
Olin Site
Wilmington, Ma.

PLATE E-3
Dip Amount and Dip Azimuth of planar features (upper hemisphere plot)



Explanation

- ○ all other planar features
- ● Likely water bearing
- ● Possibly water bearing

Declination: 16.7 degrees west

Based on 88 measurements

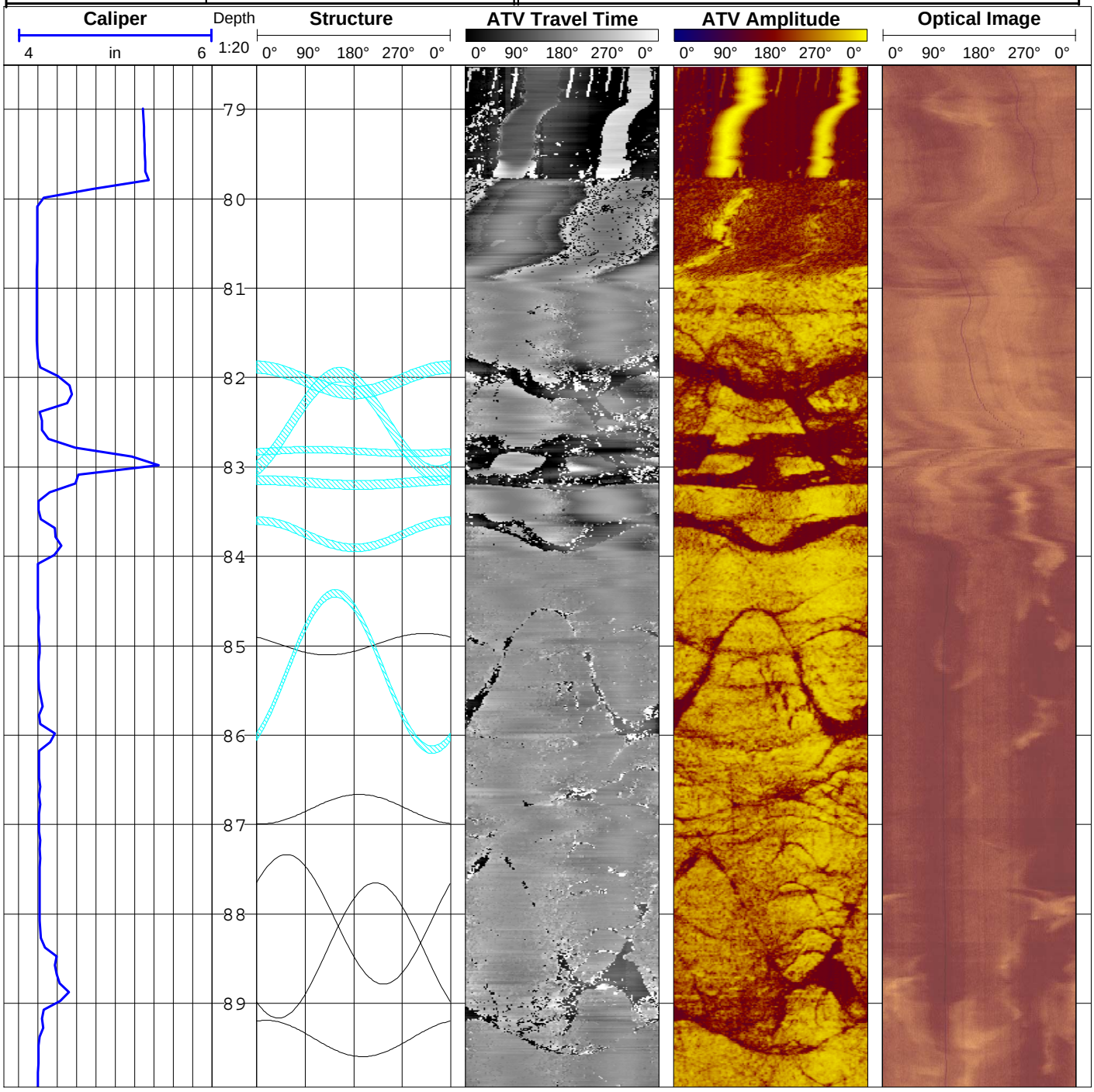
Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

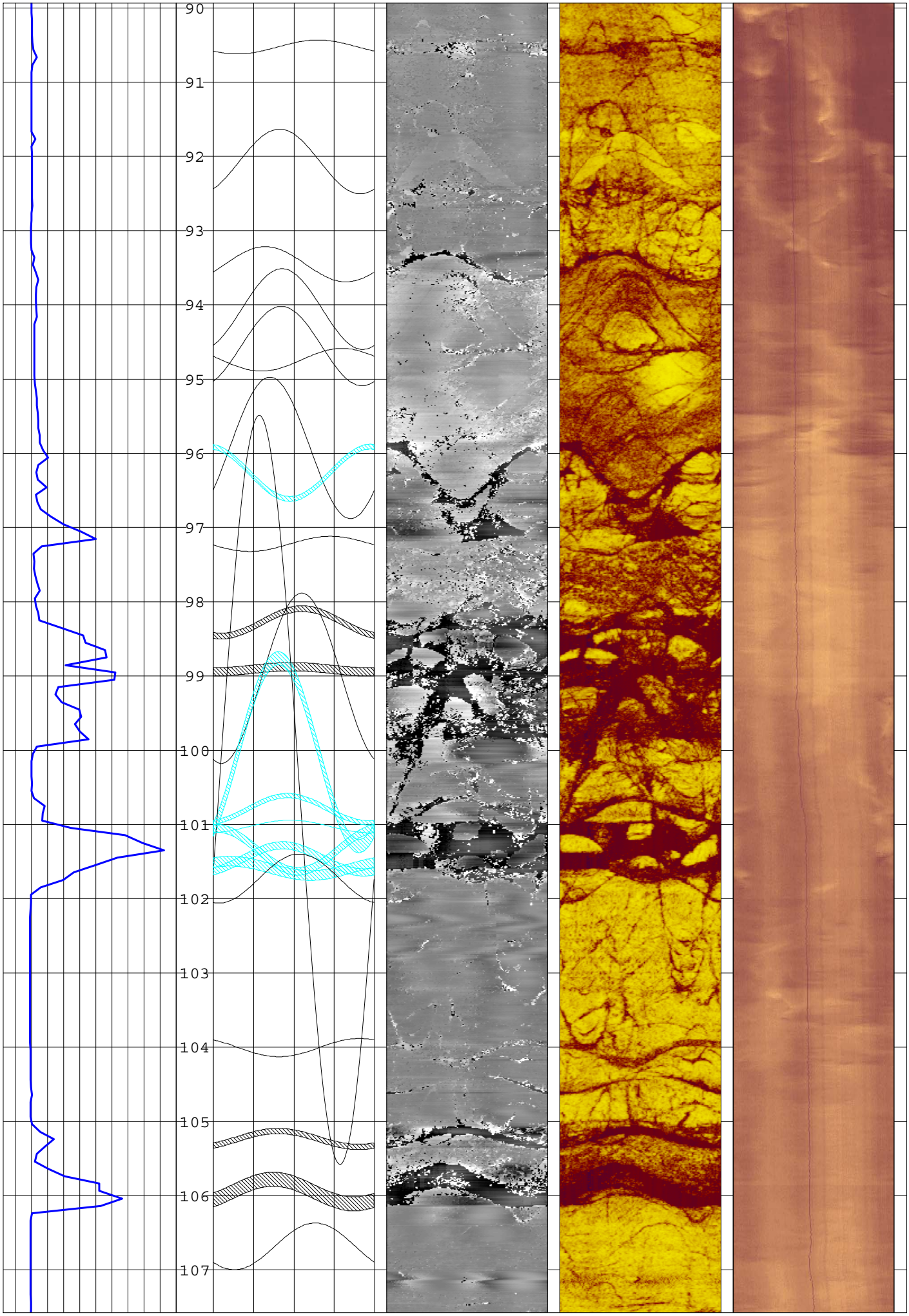
Log: Plate E-4 Televiewer & Caliper Logs

Well: 407 BR

Site: Olin

Date:	5/28/2010	Location: Wilmington, MA	
Casing Depth:	79.5 ft	For:	MACTEC
Casing Type:	8 in steel	Logged by:	
Boring Depth:	179.6 ft	Orientation:	
Meas. From:	top of casing	Structure Plots:	
Stickup:	2.45 ft	black = planar features (faults, foliation, bedding, joints, etc) light blue = possibly transmissive fracture dark blue = likely transmissive fracture	
Water Level:	8.42 ft		

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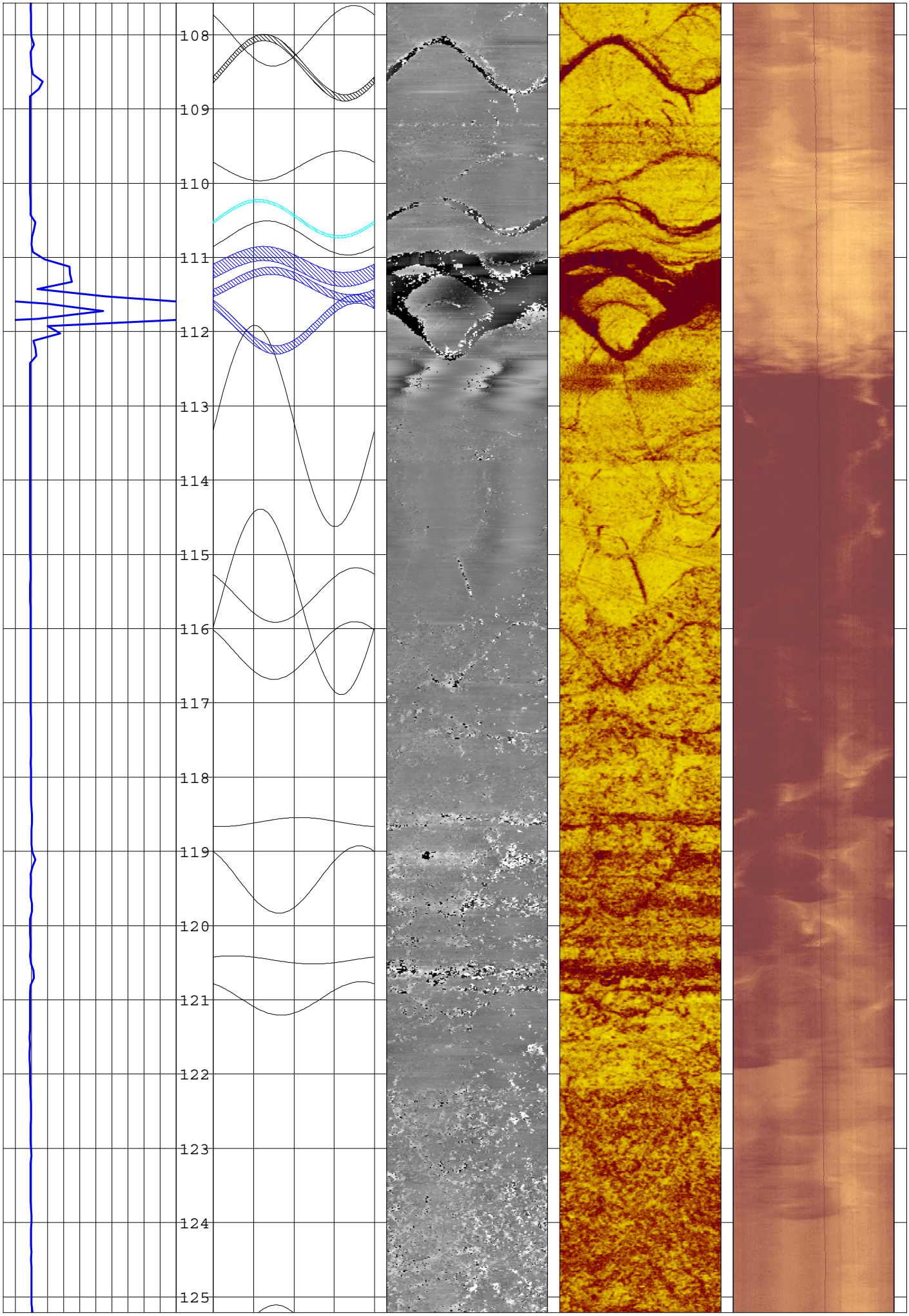
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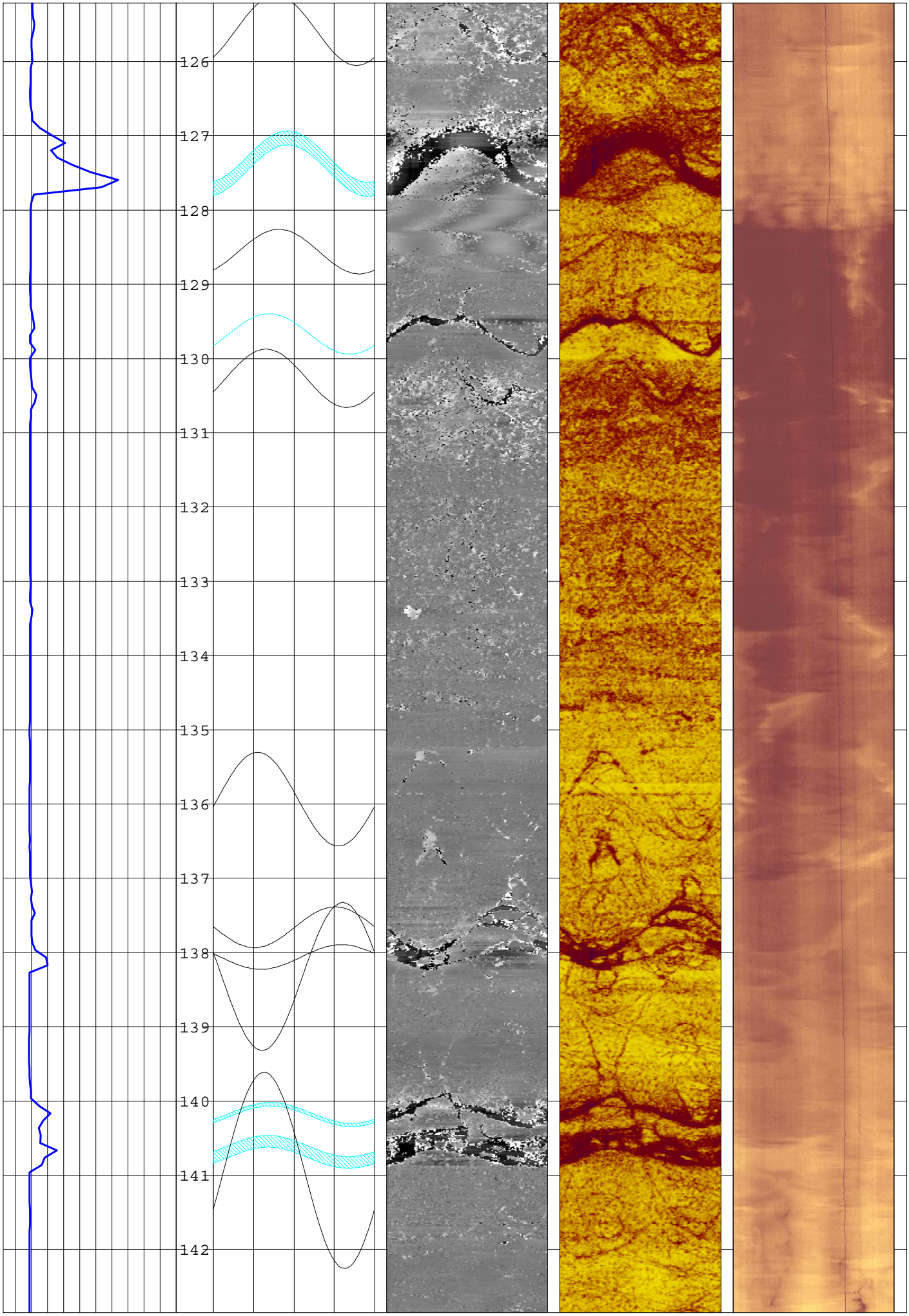
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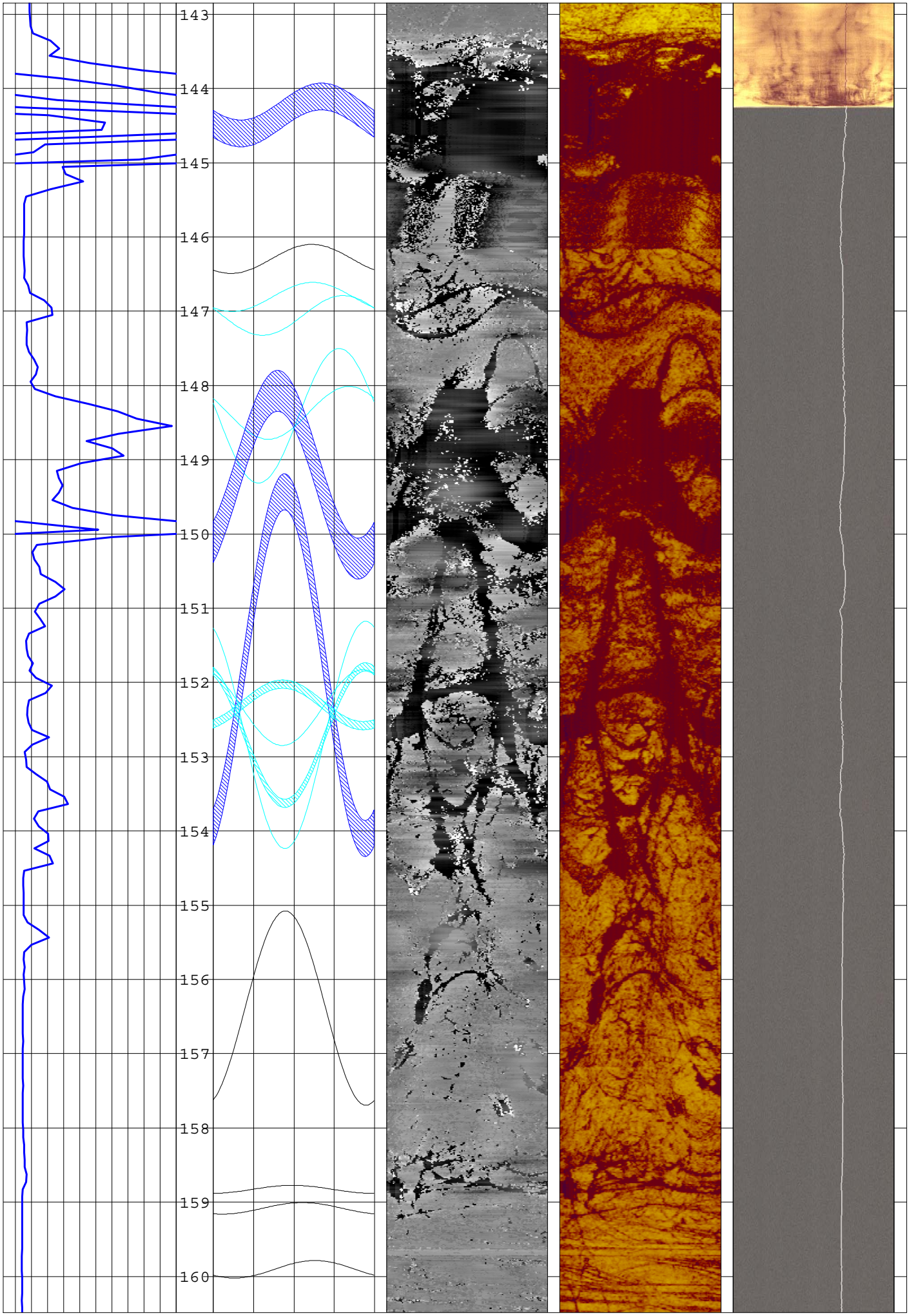
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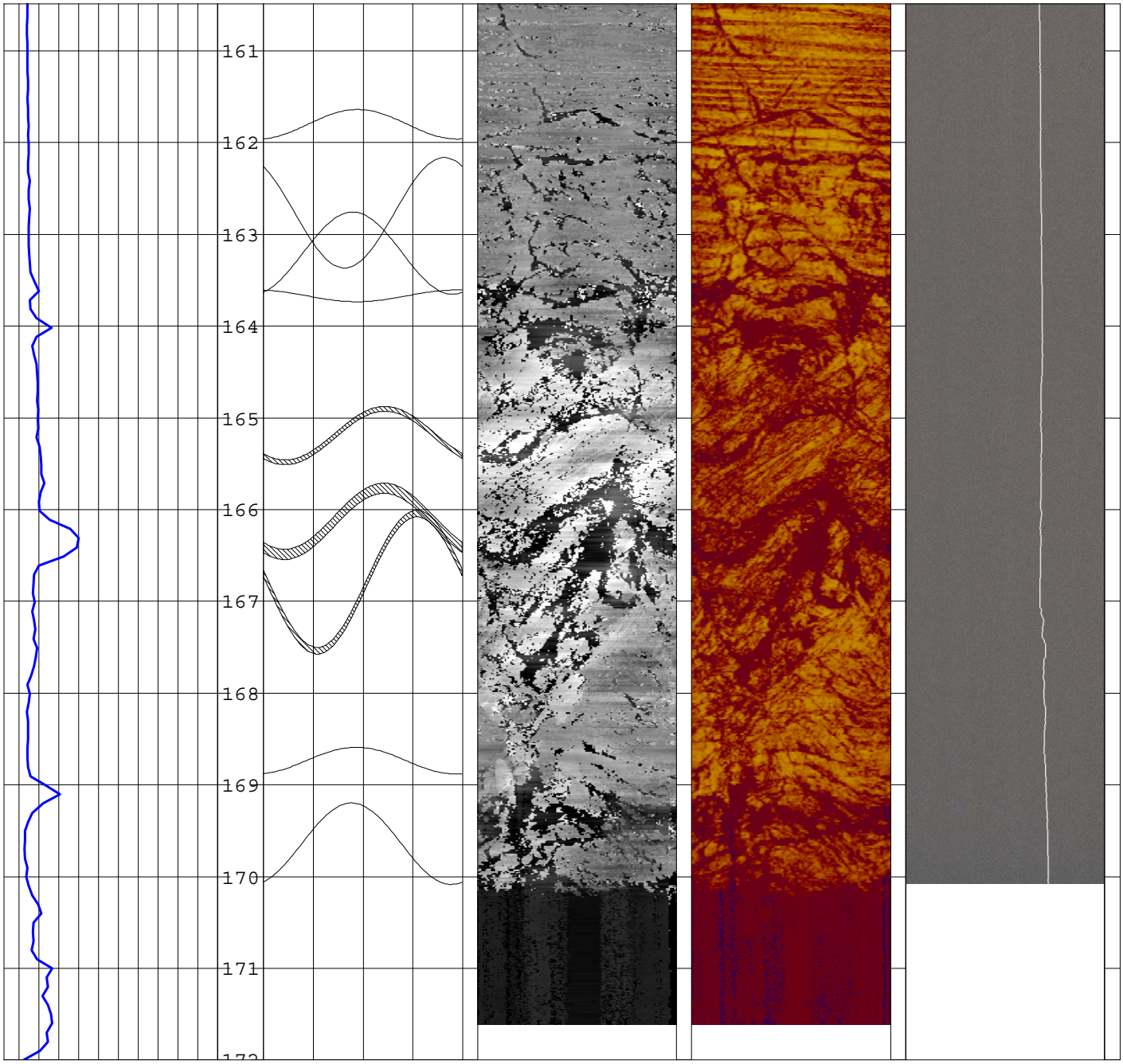
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TABLE E-1 Planar features interpreted from acoustical and optical televiewers
407 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: May, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
407B	1	82.0	29	179	89	164	74	37	108
407B	2	82.5	65	334	64	319	49	21	108
407B	3	82.8	5	284	14	269	359	22	108
407B	4	83.2	6	188	278	173	83	30	108
407B	5	83.8	31	182	272	167	77	22	108
407B	6	85.0	25	132	42	116	26	0	100
407B	7	85.3	74	326	56	311	41	8	108
407B	8	86.8	32	10	280	355	85	0	100
407B	9	88.1	70	235	325	220	310	0	100
407B	10	88.4	71	40	310	25	295	0	100
407B	11	89.4	38	197	287	182	272	0	100
407B	12	90.5	20	53	323	38	308	0	100
407B	13	92.1	59	328	58	313	43	0	100
407B	14	93.5	43	296	26	281	11	0	100
407B	15	94.1	65	333	63	318	48	0	100
407B	16	94.6	64	332	62	317	47	0	100
407B	17	94.7	31	107	17	92	2	0	100
407B	18	95.9	75	306	36	291	21	0	100
407B	19	96.3	54	171	81	156	66	12	108
407B	20	97.2	22	82	352	66	336	0	100
407B	21	98.3	36	18	288	3	273	19	100
407B	22	98.9	8	355	85	340	70	34	100
407B	23	99.0	77	18	288	3	273	0	100
407B	24	100.0	78	325	55	310	40	11	108
407B	25	100.5	87	283	13	268	358	0	100
407B	26	100.8	35	346	76	331	61	15	108
407B	27	101.0	18	351	81	336	66	0	108
407B	28	101.3	48	189	279	174	84	21	108
407B	29	101.5	35	336	66	321	51	25	108
407B	30	101.6	21	217	307	202	292	37	108
407B	31	101.7	52	12	282	357	87	0	100
407B	32	104.0	26	146	56	131	41	0	100
407B	33	105.2	23	325	55	310	40	22	100
407B	34	106.0	33	314	44	299	29	48	100
407B	35	106.7	51	47	317	32	302	0	100
407B	36	108.0	58	133	43	118	28	0	100
407B	37	108.4	58	294	24	278	8	14	100
407B	38	109.8	38	104	14	89	359	0	100
407B	39	110.5	44	281	11	266	356	8	108
407B	40	110.7	42	300	30	285	15	0	100
407B	41	111.1	34	291	21	276	6	47	107
407B	42	111.4	36	309	39	294	24	24	107
407B	43	111.9	53	141	51	126	36	21	107
407B	44	113.3	79	272	2	257	347	0	100
407B	45	115.5	55	139	49	124	34	0	100
407B	46	115.6	78	286	16	270	0	0	100
407B	47	116.3	56	135	45	120	30	0	100
407B	48	118.6	13	13	283	358	88	0	100
407B	49	119.4	60	146	56	131	41	0	100
407B	50	120.5	12	223	313	208	298	0	100
407B	51	121.0	41	151	61	136	46	0	100
407B	52	125.6	61	320	50	305	35	0	100
407B	53	127.4	53	346	76	331	61	35	108
407B	54	128.6	49	326	56	311	41	0	100
407B	55	129.7	47	305	35	290	20	0	108
407B	56	130.3	57	298	28	283	13	0	100
407B	57	135.9	68	279	9	264	354	0	100
407B	58	137.7	47	92	2	77	347	0	100
407B	59	138.1	33	106	16	91	1	0	100

TABLE E-1 Planar features interpreted from acoustical and optical televiewers
407 BR Borehole - Olin Site - Wilmington, Massachusetts **Logged: May, 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
407B	60	138.3	75	109	19	94	4	0	100
407B	61	140.2	28	308	38	293	23	12	108
407B	62	140.7	29	302	32	287	17	42	108
407B	63	140.9	79	293	23	278	8	0	100
407B	64	144.4	44	61	331	46	316	80	107
407B	65	146.3	37	40	310	25	295	0	100
407B	66	146.8	37	42	312	27	297	0	108
407B	67	147.1	46	110	20	95	5	0	108
407B	68	148.4	54	123	33	108	18	0	108
407B	69	148.4	74	101	11	86	356	0	108
407B	70	149.2	77	324	54	309	39	38	107
407B	71	151.8	84	339	69	324	54	16	107
407B	72	152.3	47	335	65	320	50	23	108
407B	73	152.3	63	154	64	139	49	0	108
407B	74	152.7	80	160	70	145	55	0	108
407B	75	152.7	74	160	70	145	55	9	108
407B	76	156.4	79	341	71	326	56	0	100
407B	77	158.8	12	357	87	342	72	0	100
407B	78	159.1	17	19	289	4	274	0	100
407B	79	159.9	24	47	317	32	302	0	100
407B	80	161.8	32	350	80	335	65	0	100
407B	81	162.8	67	147	57	131	41	0	100
407B	82	163.2	60	341	71	326	56	0	100
407B	83	163.7	14	169	79	154	64	0	100
407B	84	165.2	48	39	309	24	294	11	100
407B	85	166.1	54	38	308	23	293	20	100
407B	86	166.8	71	97	7	82	352	7	100
407B	87	168.7	29	348	78	332	62	0	100
407B	88	169.6	60	339	69	324	54	0	100

Explanation:

Category 100 = planar feature (possible fracture, joint, foliation, bedding, etc.)
Category 107 = Likely water bearing feature
Category 108 = Possible water bearing fracture

Planar features interpreted from acoustical and optical televiewers
Boreholes 65 BRD and 202, 405, 406 and 407 BR - Olin Site - Wilmington, Massachusetts **Logged: 2010**

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
65 BRD	1	105.9	48	167	77	152	62	0	108
65 BRD	2	106.9	63	359	89	344	74	0	100
65 BRD	3	108.7	50	251	341	236	326	9	107
65 BRD	4	111.7	47	353	83	338	68	13	107
65 BRD	5	113.8	78	166	76	151	61	0	100
65 BRD	6	114.2	58	351	81	336	66	0	100
65 BRD	7	115.3	78	169	79	154	64	0	100
65 BRD	8	116.4	51	333	63	318	48	0	100
65 BRD	9	117.0	61	148	58	133	43	0	100
65 BRD	10	117.4	59	100	10	85	355	0	108
65 BRD	11	118.4	54	308	38	293	23	0	100
65 BRD	12	118.8	80	159	69	144	54	0	100
65 BRD	13	121.7	57	344	74	329	59	0	100
65 BRD	14	124.6	60	316	46	300	30	0	108
65 BRD	15	125.0	30	26	296	11	281	0	108
65 BRD	16	126.0	63	326	56	311	41	0	100
65 BRD	17	126.9	63	333	63	317	47	0	100
65 BRD	18	128.0	21	87	357	71	341	11	107
65 BRD	19	128.6	61	326	56	311	41	12	107
65 BRD	20	129.9	68	321	51	305	35	0	100
65 BRD	21	131.2	46	338	68	323	53	13	107
65 BRD	22	132.9	73	331	61	316	46	0	100
65 BRD	23	135.3	83	323	53	308	38	2	107
65 BRD	24	135.6	53	324	54	309	39	0	100
65 BRD	25	136.8	70	329	59	314	44	0	107
65 BRD	26	138.6	75	335	65	320	50	0	100
65 BRD	27	140.7	73	334	64	319	49	0	100
65 BRD	28	141.1	17	171	81	156	66	16	107
65 BRD	29	144.0	41	265	355	250	340	8	107
65 BRD	30	145.0	53	307	37	292	22	17	107
65 BRD	31	147.7	65	337	67	322	52	0	100
65 BRD	32	148.6	59	352	82	337	67	0	107
65 BRD	33	149.5	70	356	86	341	71	0	100
65 BRD	34	151.9	63	280	10	265	355	51	107
65 BRD	35	152.8	56	304	34	288	18	0	107
65 BRD	36	154.8	71	269	359	254	344	18	107
65 BRD	37	157.1	69	238	328	223	313	5	107
65 BRD	38	158.3	45	273	3	258	348	0	100
65 BRD	39	160.3	58	10	280	355	85	22	107
65 BRD	40	160.6	27	60	330	45	315	104	107
65 BRD	41	161.4	76	4	274	349	79	11	107
65 BRD	42	162.0	73	323	53	308	38	21	107
65 BRD	43	162.7	47	326	56	311	41	0	100
65 BRD	44	165.6	69	311	41	296	26	0	100
65 BRD	45	166.9	55	228	318	213	303	37	107
65 BRD	46	167.8	72	292	22	277	7	0	108
65 BRD	47	170.6	74	29	299	14	284	0	108
65 BRD	48	172.3	73	195	285	180	270	0	100
65 BRD	49	172.3	62	279	9	264	354	4	107
65 BRD	50	173.4	68	346	76	331	61	0	108
65 BRD	51	173.9	46	102	12	87	357	0	108
65 BRD	52	175.4	45	279	9	263	353	0	100
65 BRD	53	177.7	62	288	18	273	3	0	108
65 BRD	54	178.2	69	286	16	271	1	0	108
65 BRD	55	181.0	45	335	65	320	50	0	100
65 BRD	56	183.3	64	289	19	273	3	0	100
65 BRD	57	187.2	70	34	304	19	289	0	100
65 BRD	58	189.9	15	152	62	137	47	0	100
65 BRD	59	192.8	64	15	285	360	90	0	100

Planar features interpreted from acoustical and optical televiewers
Boreholes 65 BRD and 202, 405, 406 and 407 BR - Olin Site - Wilmington, Massachusetts **Logged: 2010**

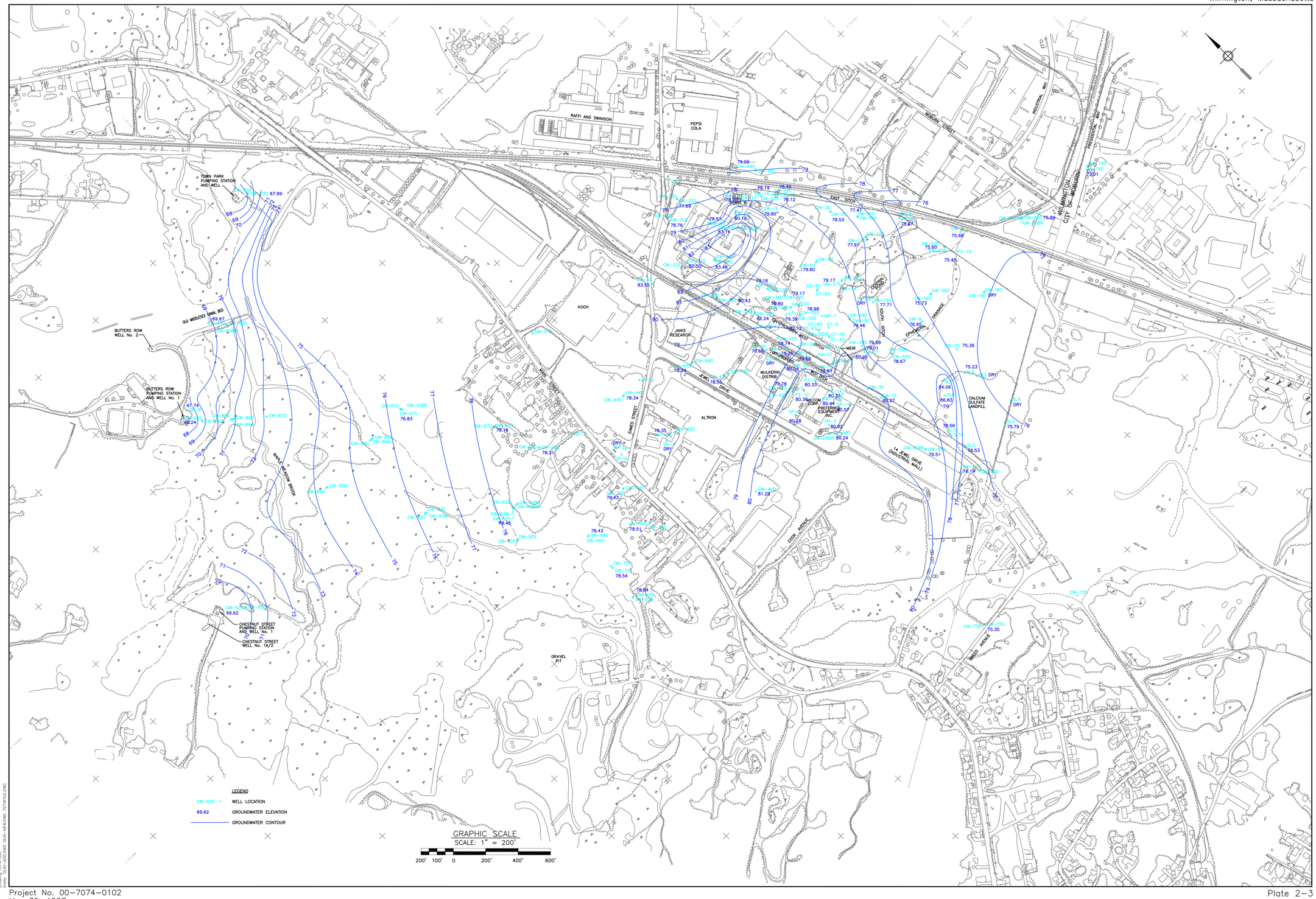
Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture millimeters	Category Type
65 BRD	60	194.8	51	355	85	340	70	0	100
65 BRD	61	198.8	51	64	334	49	319	0	100
65 BRD	62	204.4	47	146	56	131	41	0	100
65 BRD	63	205.3	51	144	54	129	39	0	100
65 BRD	64	205.8	55	130	40	115	25	0	100
202 BR	1	32.6	44	319	49	304	34	0	108
202 BR	2	33.6	47	316	46	301	31	0	100
202 BR	3	34.3	43	334	64	319	49	9	108

APPENDIX E
SMITH PHASE II SUPPLEMENTAL INVESTIGATION REPORT GROUNDWATER CONTOUR PLATES

XREF 'OLIN-NEW.dwg' & 'OLIN-ADD.dwg' INSERT 0,0 ROTATE 0°

SMITH TECHNOLOGY CORPORATION

Olin Corporation
Wilmington, Massachusetts



Drawing: 7074-007
Xrefs: OLIN-ADD.DWG OLIN-NEW.DWG 7074FIGA.DWG

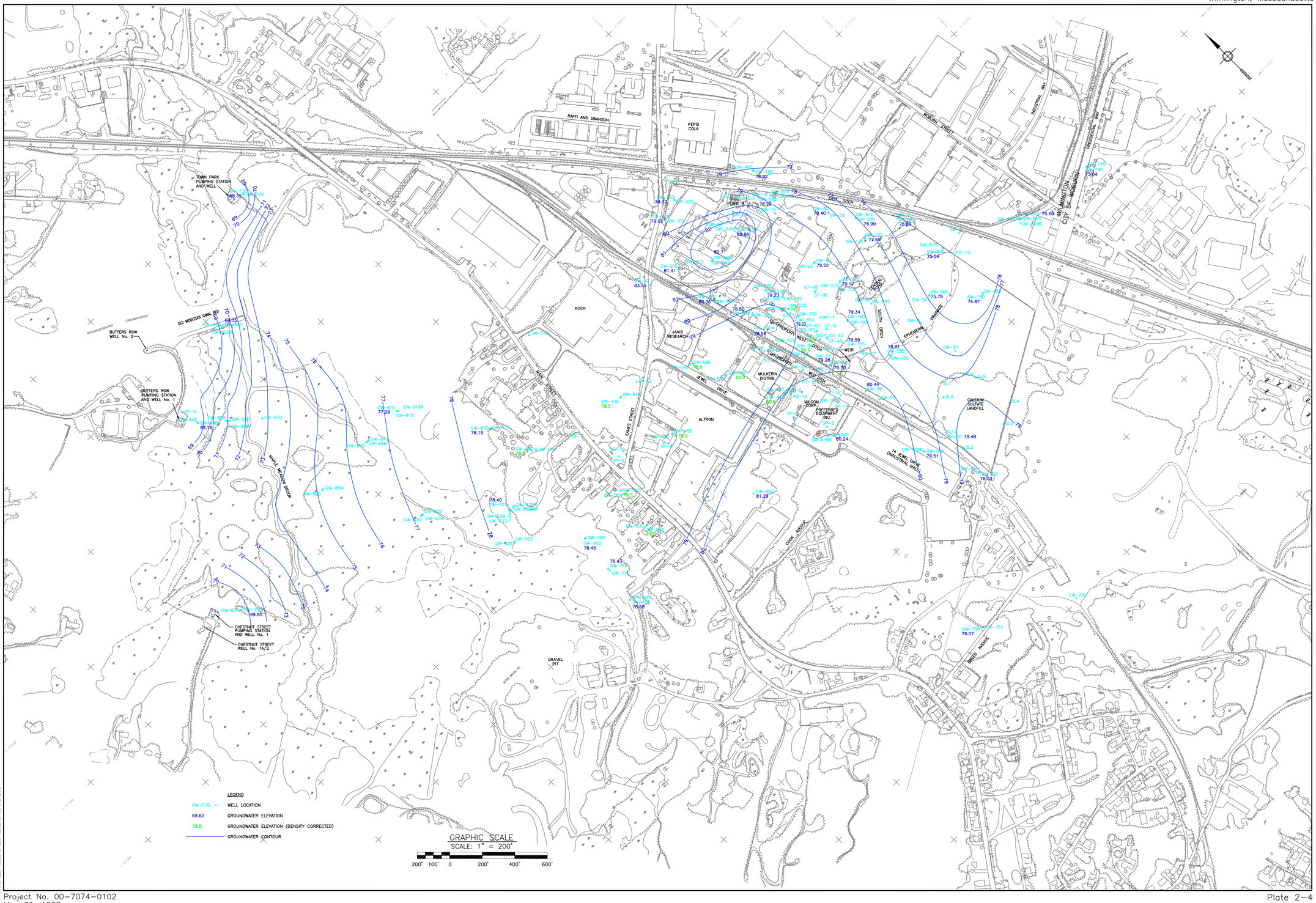
Project No. 00-7074-0102
May 30, 1997

Plate 2-3
Groundwater Contour Map, Water Table, October 1995

XREF 'OLIN-NEW.dwg' & 'OLIN-ADD.dwg' INSERT 0,0 ROTATE 0°

SMITH TECHNOLOGY CORPORATION

Olin Corporation
Wilmington, Massachusetts



Project No. 00-7074-0102
May 30, 1997

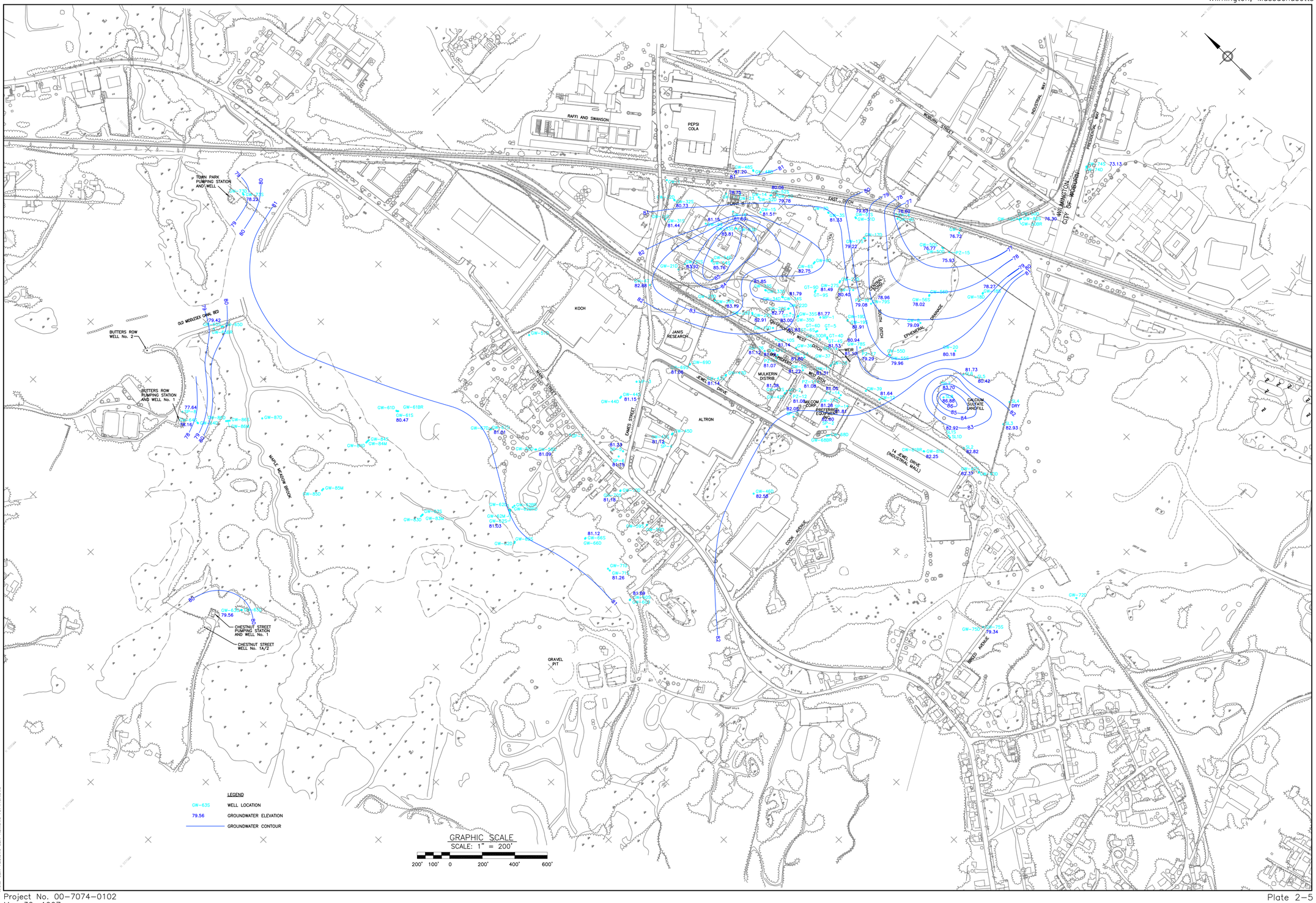
Plate 2-4
Hydraulic Heads in Deep Wells, October 1995

Drawing: 7074-007
Date: OLIN-ADD.DWG, OLIN-NEW.DWG, 7074FIG4.DWG

XREF 'OLIN-NEW.dwg' & 'OLIN-ADD.dwg' INSERT 0,0 ROTATE 0°

SMITH TECHNOLOGY CORPORATION

Olin Corporation
Wilmington, Massachusetts



Drawing: 7074-007
Date: OLIN-ADD.DWG, OLIN-NEW.DWG, 7074FIG4.DWG

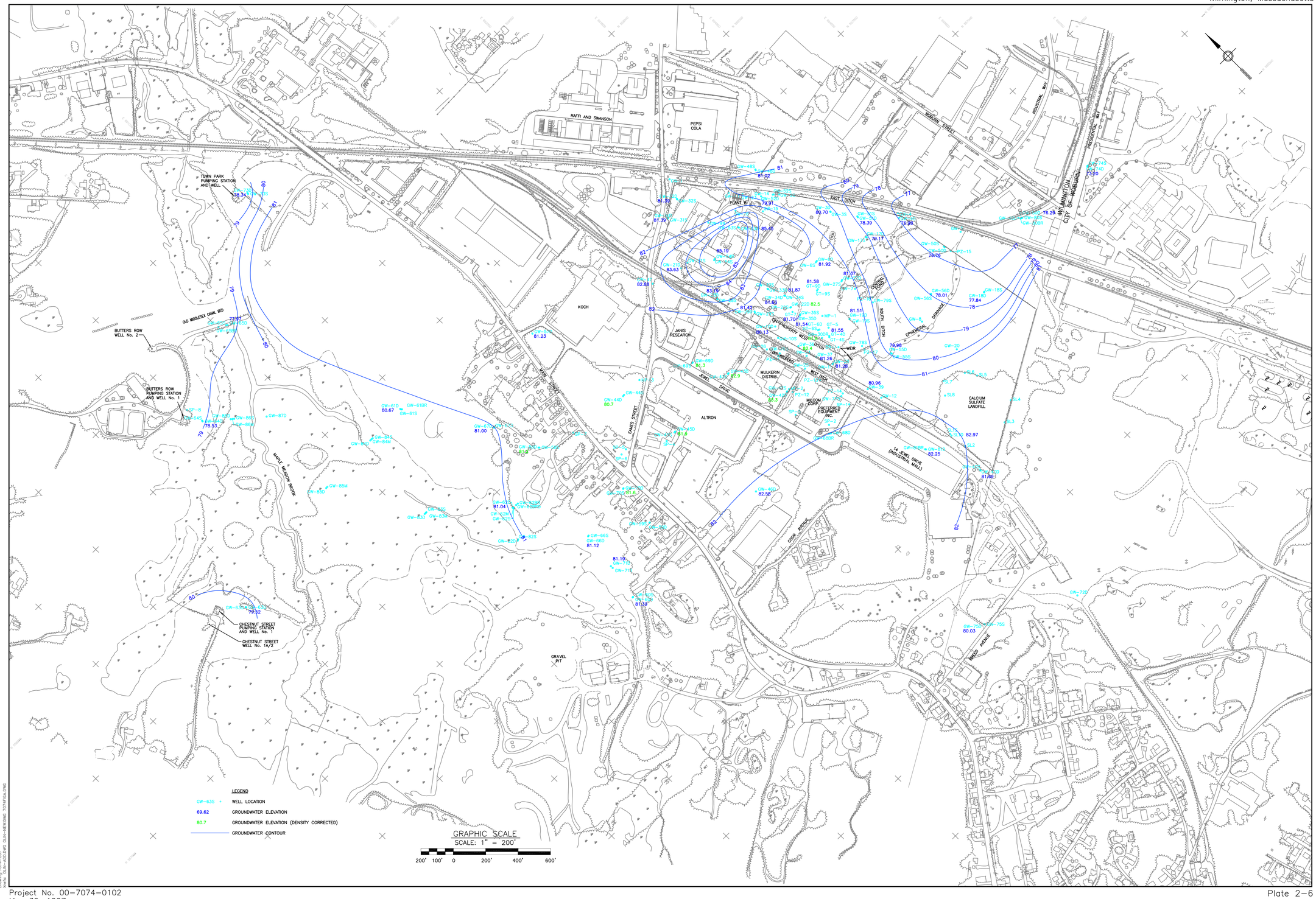
Project No. 00-7074-0102
May 30, 1997

Plate 2-5
Groundwater Contour Map, Water Table, April/May 1996

XREF 'OLIN-NEW.dwg' & 'OLIN-ADD.dwg' INSERT 0,0 ROTATE 0°

SMITH TECHNOLOGY CORPORATION

Olin Corporation
Wilmington, Massachusetts

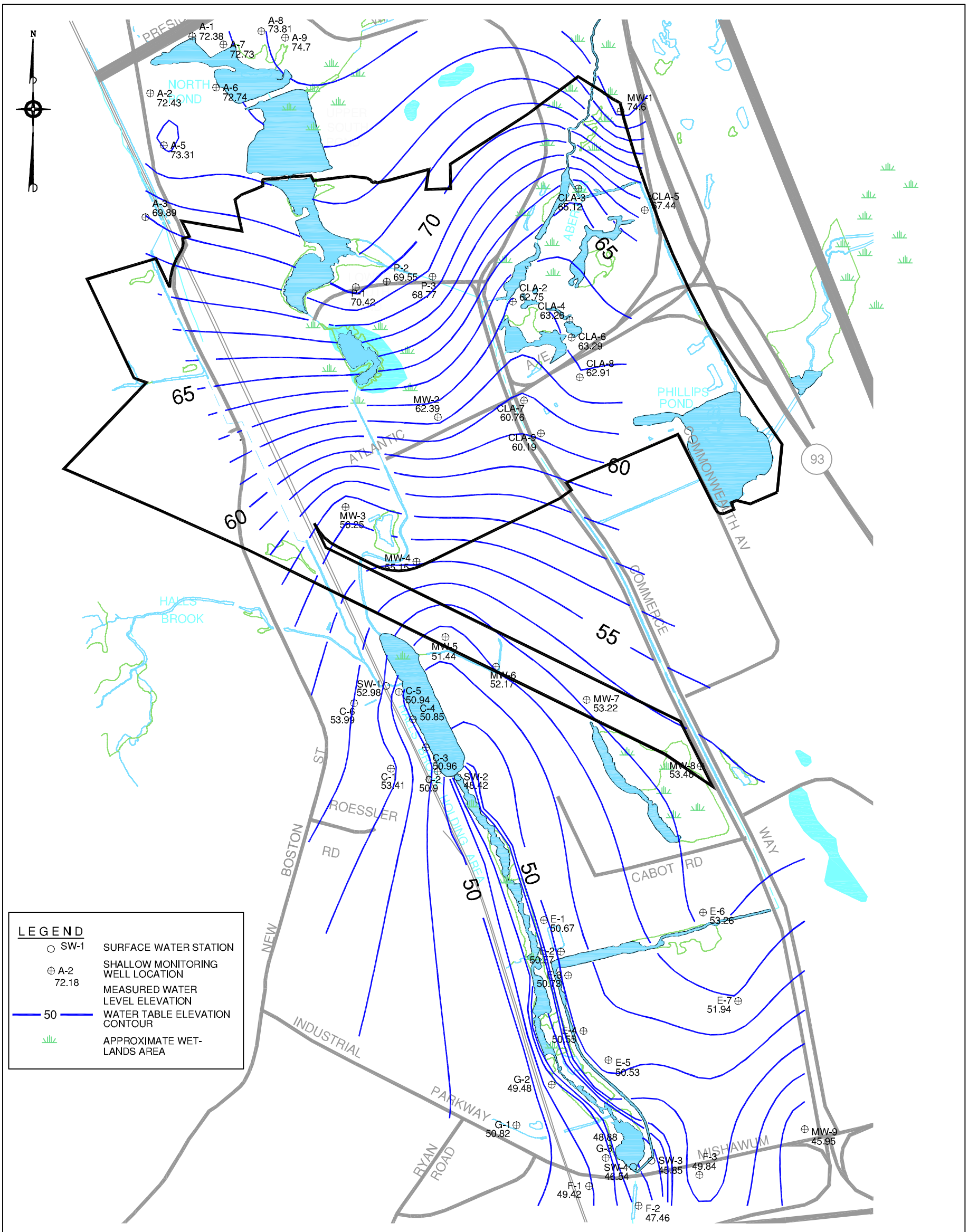


Drawing: 7074-007
Xrefs: OLIN-ADD.DWG OLIN-NEW.DWG 7074FIGA.DWG

Project No. 00-7074-0102
May 30, 1997

Plate 2-6
Hydraulic Heads in Deep Wells, April/May 1996

APPENDIX F
INDUSTRI-PLEX FIGURES



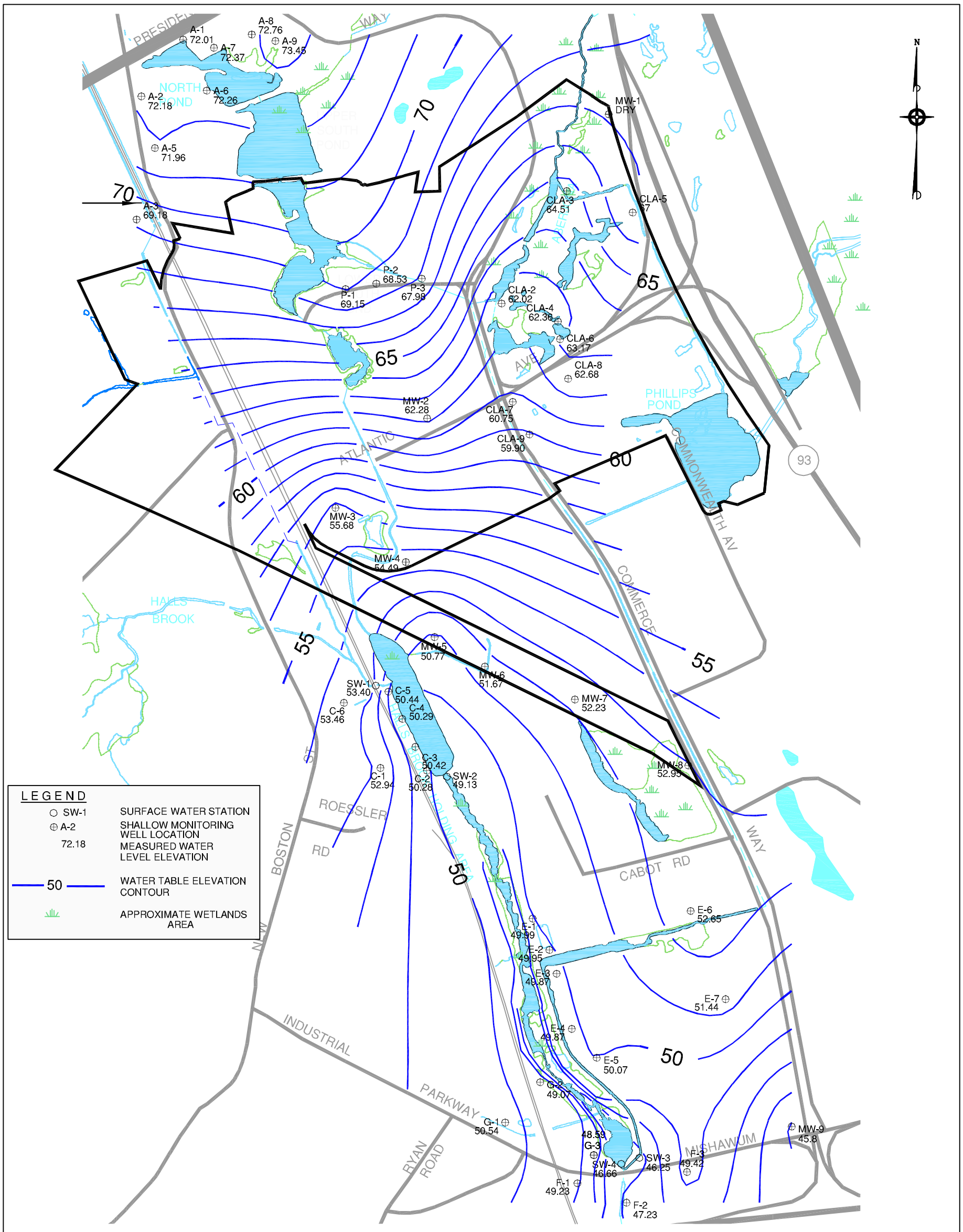
NOTES:

1. LOCATIONS OF MAJOR ROADS, STREETS AND WATER COURSES FROM MASSACHUSETTS GIS AND MAPPING PROVIDED BY THE CITY OF WOBURN ENGINEERING DEPT.
2. ORIGINAL PLAN DATUM FROM SOURCES CONVERTED TO NAD 83 FEET USING THE GEOGRAPHIC CALCULATOR BY BLUE MARBLE GEOGRAPHICS, VERSION 4.2; VERTICAL DATUM: NAVD 1988.
3. GROUNDWATER LEVELS WERE MEASURED ON APRIL 18, 2002 FROM A DESIGNATED MEASURING POINT (TOP OF PVC) AT EACH TEMPORARY SHALLOW OVERBURDEN MONITORING WELL. THE GROUNDWATER LEVELS WERE CONVERTED TO AN ELEVATION BASED ON THE TOP OF PVC ELEVATION.
4. TEMPORARY MONITORING WELLS SURVEYED BY LOUIS FEDERICI & ASSOCIATES. VERTICAL DATUM IN NAVD 1988.
5. SURFACE WATER LEVELS WERE MEASURED ON 4/18/02 BY A DEPTH AND VELOCITY TRANDSDUCER LOCATED IN THE CENTER OF THE RIVER CHANNEL AT EACH STATION. THE SURFACE WATER LEVELS WERE CONVERTED TO ELEVATIONS BASED ON TRANSDUCER ELEVATIONS SURVEYED IN THE FIELD BY TTNUS AND CORRECTED TO NAVD 88 ACCORDING TO THE SURFACE WATER STATION PAD ELEVATION (SURVEY BY LOUIS FEDERICI & ASSOCIATES).
6. WATER TABLE CONTOURS GENERATED BY USE OF SURFER VERSION 8.0 AND MODIFIED TO CONFORM WITH PRESENT WATER BODIES AND OTHER PHYSICAL FEATURES.

GRAPHIC SCALE

0′ 700′ 1400′

WATER TABLE ELEVATION CONTOURS – 04/18/02	FIGURE 3–5
MSGRP REMEDIAL INVESTIGATION REPORT	
INDUSTRI–PLEX SITE, WOBURN, MASSACHUSETTS	
DRAWN BY: D.W.M. / R.G.D. — REV.: 0	TETRA TECH NUS, INC.
CHECKED BY: J. DANIELI / P. CALL — DATE: JANUARY 05, 2005	55 Jonspin Road Wilmington, MA 01887 (978)658–7899
SCALE: AS NOTED — FILE NO.: DWG\4123\0910\041802_1.DWG	



NOTES:

1. LOCATIONS OF MAJOR ROADS, STREETS AND WATER COURSES FROM MASSACHUSETTS GIS AND MAPPING PROVIDED BY THE CITY OF WOBURN ENGINEERING DEPT.

2. ORIGINAL PLAN DATUM FROM SOURCES CONVERTED TO NAD 83 FEET USING THE GEOGRAPHIC CALCULATOR BY BLUE MARBLE GEOGRAPHICS, VERSION 4.2; VERTICAL DATUM: NAVD 1988.

3. GROUNDWATER LEVELS WERE MEASURED ON JULY 30, 2002 FROM A DESIGNATED MEASURING POINT (TOP OF PVC) AT EACH TEMPORARY SHALLOW OVERBURDEN MONITORING WELL. THE GROUNDWATER LEVELS WERE CONVERTED TO AN ELEVATION BASED ON THE TOP OF PVC ELEVATION.

4. TEMPORARY MONITORING WELLS SURVEYED BY LOUIS FEDERICI & ASSOCIATES. VERTICAL DATUM IN NAVD 1988.

5. SURFACE WATER LEVELS WERE MEASURED ON 7/30/02 BY A DEPTH AND VELOCITY TRANDSDUCER LOCATED IN THE CENTER OF THE RIVER CHANNEL AT EACH STATION. THE SURFACE WATER LEVELS WERE CONVERTED TO ELEVATIONS BASED ON TRANSDUCER ELEVATIONS SURVEYED IN THE FIELD BY TTNUS AND CORRECTED TO NAVD 88 ACCORDING TO THE SURFACE WATER STATION PAD ELEVATION (SURVEY BY LOUIS FEDERICI & ASSOCIATES).

6. WATER TABLE CONTOURS GENERATED BY USE OF SURFER VERSION 8.0 AND MODIFIED TO CONFORM WITH PRESENT WATER BODIES AND OTHER PHYSICAL FEATURES.

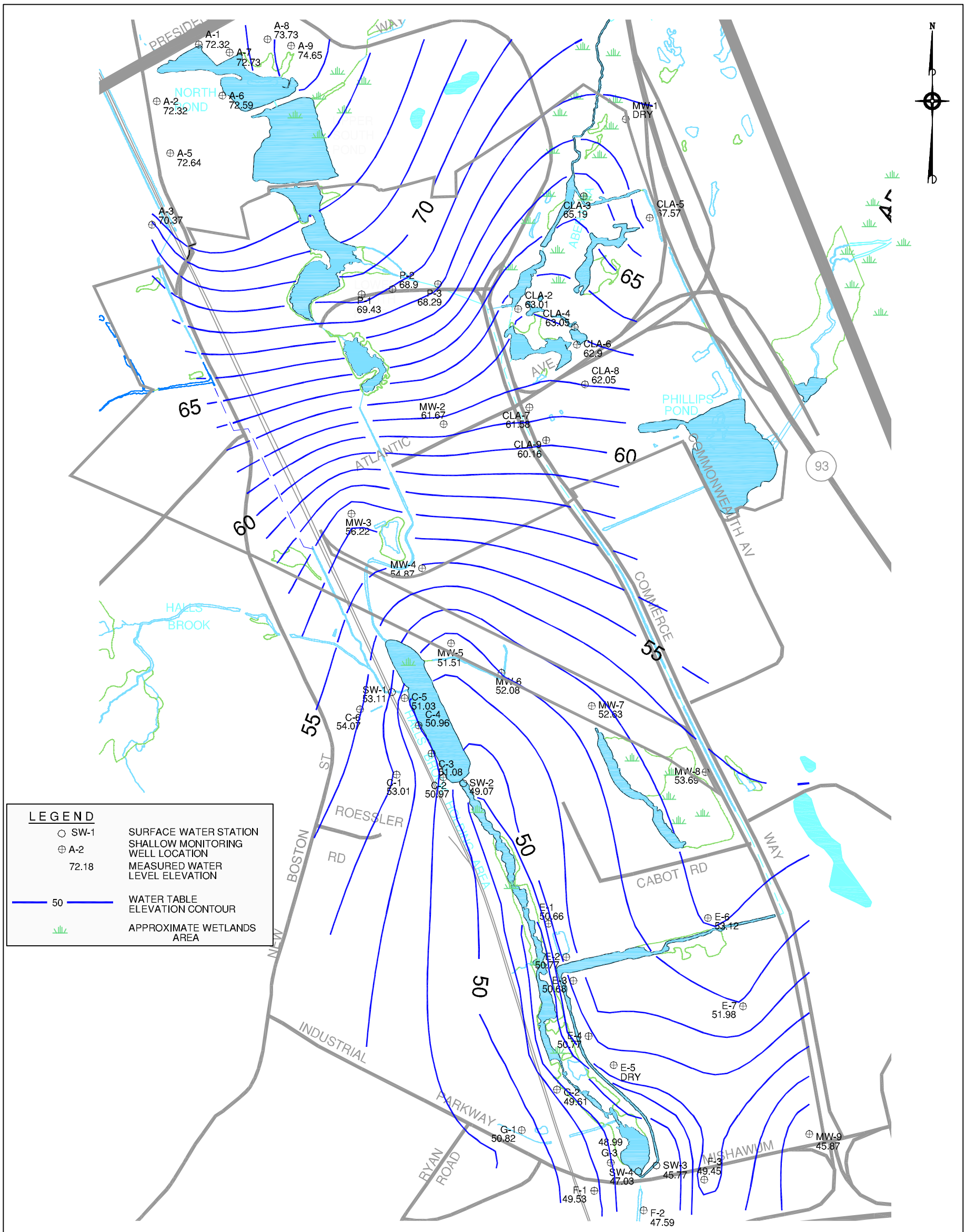
GRAPHIC SCALE

0′ 700′ 1400′

WATER TABLE ELEVATION CONTOURS – 07/30/02		FIGURE 3–6	
MSGRP REMEDIAL INVESTIGATION REPORT			
INDUSTRI–PLEX SITE, WOBURN, MASSACHUSETTS			
DRAWN BY:	D.W.M. / R.G.D.	REV.:	0
CHECKED BY:	J. DANIELI / P. CALL	DATE:	JANUARY 06, 2005
SCALE:	AS NOTED	FILE NO.:	DWG\4123\0910\073002_1.DWG

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658–7899



NOTES:

1. LOCATIONS OF MAJOR ROADS, STREETS AND WATER COURSES FROM MASSACHUSETTS GIS AND MAPPING PROVIDED BY THE CITY OF WOBURN ENGINEERING DEPT.

2. ORIGINAL PLAN DATUM FROM SOURCES CONVERTED TO NAD 83 FEET USING THE GEOGRAPHIC CALCULATOR BY BLUE MARBLE GEOGRAPHICS, VERSION 4.2; VERTICAL DATUM: NAVD 1988.

3. GROUNDWATER LEVELS WERE MEASURED ON OCTOBER 28, 2002 FROM A DESIGNATED MEASURING POINT (TOP OF PVC) AT EACH TEMPORARY SHALLOW OVERBURDEN MONITORING WELL. THE GROUNDWATER LEVELS WERE CONVERTED TO AN ELEVATION BASED ON THE TOP OF PVC ELEVATION.

4. TEMPORARY MONITORING WELLS SURVEYED BY LOUIS FEDERICI & ASSOCIATES. VERTICAL DATUM IN NAVD 1988.

5. SURFACE WATER LEVELS WERE MEASURED ON 10/28/02 BY A DEPTH AND VELOCITY TRANDSDUCER LOCATED IN THE CENTER OF THE RIVER CHANNEL AT EACH STATION. THE SURFACE WATER LEVELS WERE CONVERTED TO ELEVATIONS BASED ON TRANSDUCER ELEVATIONS SURVEYED IN THE FIELD BY TTNUS AND CORRECTED TO NAVD 88 ACCORDING TO THE SURFACE WATER STATION PAD ELEVATION (SURVEY BY LOUIS FEDERICI & ASSOCIATES).

6. WATER TABLE CONTOURS GENERATED BY USE OF SURFER VERSION 8.0 AND MODIFIED TO CONFORM WITH PRESENT WATER BODIES AND OTHER PHYSICAL FEATURES.

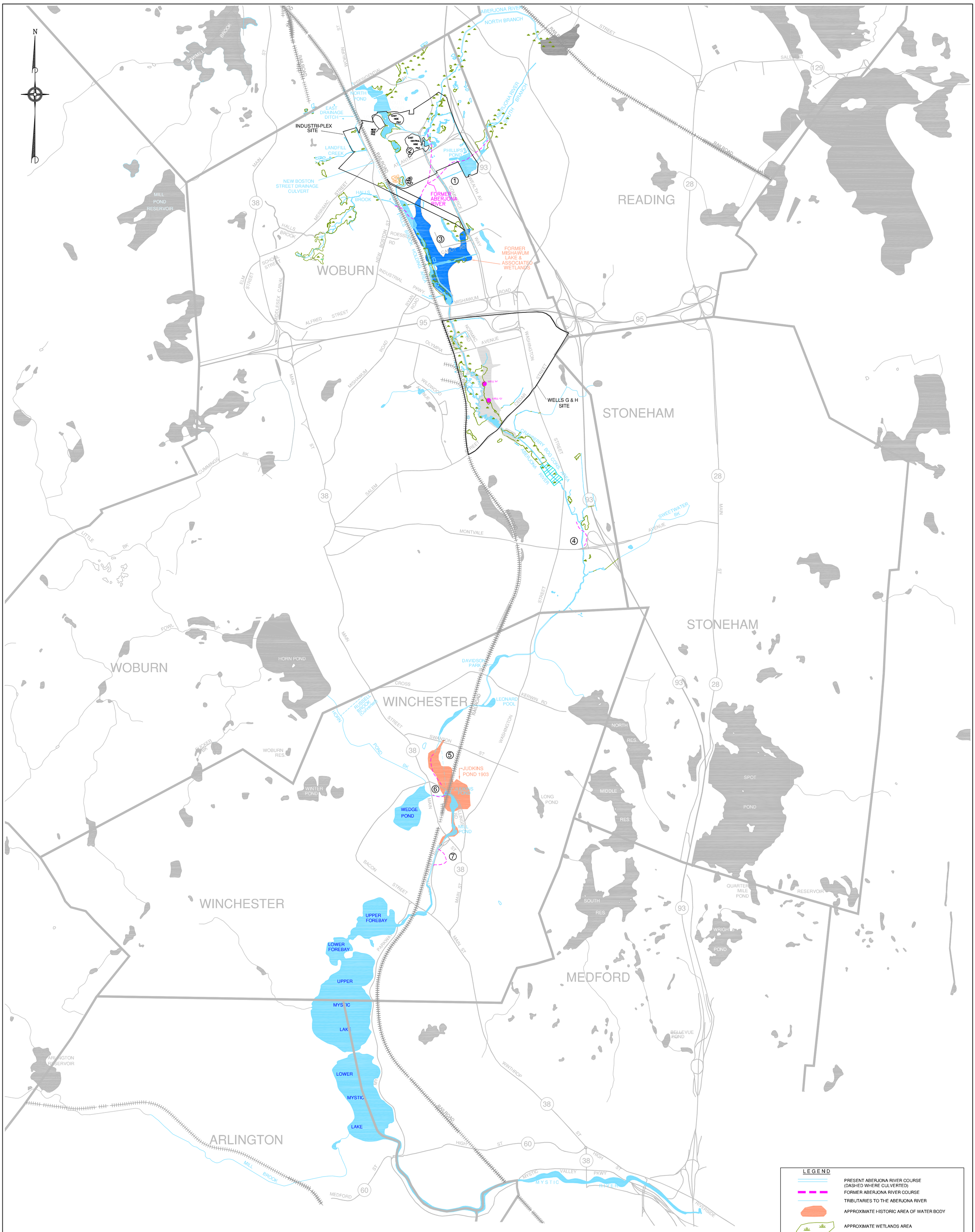
GRAPHIC SCALE

0′ 700′ 1400′

WATER TABLE ELEVATION CONTOURS – 10/28/02		FIGURE 3–7	
MSGRP REMEDIAL INVESTIGATION REPORT			
INDUSTRI–PLEX SITE, WOBURN, MASSACHUSETTS			
DRAWN BY:	D.W.M. / R.G.D.	REV.:	0
CHECKED BY:	J. DANIELI / P. CALL	DATE:	JANUARY 17, 2005
SCALE:	AS NOTED	FILE NO.:	DWG\4123\0910\102802_1.DWG

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658–7899



NOTES:

1. LOCATIONS OF TOWN BOUNDARIES, MAJOR ROADS, STREETS, WATER BODIES, AND WATER COURSES FROM PLANS BY THE MASSACHUSETTS GIS AND CITY OF WOBURN ENGINEERING DEPT. (2003) EXCEPT AS NOTED BELOW.
2. JUDKINS POND 1903 LOCATION DIGITIZED FROM USGS MAP: BOSTON, MA QUADRANGLE, EDITION OF JULY, 1903, REPRINTED 1942, OBTAINED FROM HTTP://DOCS.UNH.EDU.
3. LOCATIONS OF HISTORIC MISHAWUM LAKE, AND HISTORIC ABERJONA RIVER NORTH BRANCH FROM A PLAN ENTITLED "PLANS OF ABERJONA RIVER, HALL'S BROOK AND MISHAWUM LAKE FLOOD CONTROL AND DRAINAGE STRUCTURES TO REPLACE EXISTING WATERWAY, WOBURN, MA, FOR PETITION OF MARK PHILLIP TRUST", WESTON & SAMPSON ENGINEERS, DATED: NOV. 1974.
4. PARTS OF THE ABERJONA RIVER SOUTH BRANCH SHOWN FROM A PLAN BY HALLIBURTON NUS, INC., PLAN DATED: AUGUST 25, 1997, ENTITLED: "HISTORICAL AND CURRENT SURFACE WATER CONDITIONS, PRELIMINARY MSGRP STUDY, INDUSTRI-PLEX, WOBURN, MA".
5. SURFACE WATER FEATURES ADAPTED FROM FIGURE 39 (ABERJONA RIVER STUDY AREA, WETLANDS STATUS & RIVER COURSES,1995) FROM A REPORT ENTITLED: AERIAL PHOTOGRAPHIC ANALYSIS OF THE ABERJONA RIVER STUDY AREA MIDDLESEX COUNTY, MASSACHUSETTS", OCTOBER, 2002, BY U.S. E.P.A. AND ONE METER AERIAL PHOTOGRAPHS OBTAINED FROM THE MASSACHUSETTS GIS.
6. ROADS AND WATER COURSES UNAVAILABLE FROM ABOVE SOURCES ADDED FROM AVAILABLE PLANS AND/OR FIELD OBSERVATIONS.
7. PLAN DATUM IN NAD 83 FEET; ORIGINAL DATUM FROM OTHER PLANS CONVERTED TO NAD 83 FEET USING THE GEOGRAPHIC CALCULATOR BY BLUE MARBLE GEOGRAPHICS, VERSION 4.2.
8. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
9. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

1500' 0' 1500' 3000'

DRAWN BY:	R.G. DEWSNAP
PREPARED BY:	P. CALL
CHECKED BY:	D. BAXTER
PROJECT MANAGER:	G. BULLARD
PROGRAM MANAGER:	G. GARDNER

TITLE: CURRENT AND HISTORIC SURFACE WATER FEATURES
MSGRP REMEDIAL INVESTIGATION REPORT
INDUSTRI-PLEX SITE, WOBURN, MASSACHUSETTS

SOURCE: MASSACHUSETTS GIS AND OTHER SOURCES (SEE NOTES)

SCALE:	DATE:	PROJ. NO:
AS SHOWN	DECEMBER 15, 2004	4123
DRAWING NO: FIGURE 3-8	ACFILE NAME: DWG\4123\0910\CURRENT-HISTORIC_SW_FEATUES.DWG	REV: 0

TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899

APPENDIX G
RESPONSE TO COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
5 Post Office Square, Suite 100
Mail Code OSRR07-4
Boston, MA 02109-3912

May 13, 2015

James Cashwell
Olin Corporation
3855 North Ocoee Street
Suite 200
Cleveland, TN 37312

Subject: Conditional Approval
Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site, Wilmington, Massachusetts

Dear Mr. Cashwell:

In accordance with Paragraph 40 of the Administrative Settlement Agreement and Order on Consent ("AOC"), Region I of the United States Environmental Protection Agency ("EPA") has completed a review of the revised OU3 Data Gap Analysis and Additional Field Studies Work Plan ("Work Plan") prepared by AMEC and dated December 16, 2014.

AMEC originally submitted an OU3 Data Gap Analysis and Additional Field Studies Work Plan dated September 5, 2014. Upon review, it was the opinion of EPA and the stakeholders that the analysis of data gaps in the Work Plan lacked the required rigor and depth for decision making, and did not provide sufficient information to determine if the RI objectives had been met. On September 30, EPA provided Olin with a draft "working list" of information that, in EPA's opinion, was missing from the OU3 data gaps analysis. Discussions followed and on November 13, 2014, EPA submitted a formal comment letter which requested that the Work Plan be resubmitted.

Pursuant to Section 1.III.D of the Remedial Investigation/Feasibility Study Statement of Work ("RI/FS SOW"), EPA solicited comments from external stakeholders. EPA has consolidated certain written comments received within the context of this letter. Original comment letters received by EPA are enclosed.

Conditions of this approval follow below. Comments are organized as follows; (1) Data Gap Comments, (2) Nature and Extent General Comments, and (3) Nature and Extent Specific Comments. The Data Gap comments require additional field work and should be addressed first now that the field season is underway. The Nature and Extent comments have been limited by EPA to issues which, in EPA's opinion, are required to make informed decisions regarding data gaps. Comments which are more consistent with the complete Nature and

Extent evaluation for groundwater have been deferred in anticipation of the receipt of a thorough evaluation in the pending OU3 Remedial Investigation Report.

Conditions

1. Olin shall submit a written response to the Data Gap comments by May 29th. Written responses to the Nature and Extent comments and Condition No.2, and the revised Final Work Plan are due by June 12th.

2. EPA's November 13, 2014 comment letter identified the lack of representative data from the former municipal and Samina operating wells as a data gap (Comment No. 4). EPA strongly believes that recent data from these wells is necessary to assess existing conditions and determine the need and efficacy for remediation. Note that remedial alternatives developed in the pending feasibility study will be required to satisfy the threshold criteria: (1) overall protection of human health and the environment and (2) compliance with applicable or relevant and appropriate requirements (ARARs); which cannot be assessed without representative data. While these wells are not currently in use, representative data is also necessary to determine the need to establish administrative restrictions (commonly referred to as institutional controls) to prevent unsafe use of these wells if existing conditions do not allow for unrestricted use. Representative data would also further the understanding of nature and extent of contamination in these areas and specific chemical changes in these wells since the cessation of pumping more than a decade ago. Olin's response on p.3-3 of the Work Plan indicates that a Technical Memorandum would be prepared to support Olin's rationale for why this data is not necessary. EPA requests that this memorandum be submitted in response to this comment for further consideration by EPA and the stakeholders. This technical memorandum should also include any information in Olin's files regarding the design and configuration of these wells.

3. EPA reserves the right to identify additional gaps in data pending the review of additional groundwater data and complete responses to the comments in this letter.

Data Gaps

1. Additional Well Cluster. EPA's November 13, 2014 comment letter identified the area generally North of Eames Street as a potential data gap for groundwater (Comment No. 3). Olin's response on p.3-3 of the Work Plan indicates that Olin is considering this comment. More recent discussions indicate that Olin is willing to install a well in this location. EPA requests that Olin propose a location for at least one downgradient well cluster (shallow, deep overburden and shallow bedrock), based on the known geo-hydro conditions in that area to address this gap. A sample should be collected from each well screen and analyzed for the full analytical list, including specialty compounds. Installation, drilling and analytical methods should be consistent with the existing work plan. EPA also requests that the Olin-proposed well cluster downgradient of GW-80 be analyzed for the full analytical list, including specialty compounds.

2. Synoptic Water Levels. Given the importance of understanding the hydraulic system with regard to the groundwater divide and interaction with regional surface water bodies, and the anticipated development of remedial alternatives for groundwater, EPA requests that a minimum of 2 additional synoptic water level rounds separated by seasonality be performed.

3. GW-40S. Opex was detected at a relatively high concentration in SL-2. EPA requests that nearby well GW-40S be sampled for Opex to determine the downgradient extent of the detection at SL-2.

4. GW-70D. Opex was detected at a relatively high concentration in MP-4 and GW-83S/D. EPA requests that nearby well GW-70D be sampled for OPEX to determine if it is migrating with DAPL/diffuse groundwater.

5. GW-57D. GW-57D should be sampled for hydrazine, given that this compound was detected in both samples in GW-44D and one sample in MP-3 (both are upgradient).

6. GW-75D. EPA agrees that the current dataset for this well is sufficient and does not constitute a data gap. This well should be retained as a likely sentinel monitoring location. Note that the reference to Table 3-1 is incorrect. The correct reference is Table 3-2.

7. GW-80BR. EPA recommends that a full suite of geophysical logs be performed in GW-80BR prior to the installation of the new downgradient well cluster. Minimal bedrock information exists in this portion of the study area and logging GW-80BR should provide useful information regarding bedrock lithology and can be used to help assess the appropriate depth for the new bedrock screen.

8. GW-103BR. EPA recommends that a full suite of geophysical logs be performed in GW-103BR (to the extent it is physically accessible). This well is located on the western edge of MMB and should provide useful information regarding bedrock lithology and NDMA migration, which has been detected in downgradient private rock wells. Also, NDMA was detected at an elevated concentration in GW-103BR.

9. GW-85, GW-86D, GW-59D. MMB wetland monitoring wells GW-85, GW-86D, and GW-59D, had elevated concentrations of some Site-related compounds ten years ago. It does not appear that a full analytical suite has ever been performed. Given the importance of the MMB area to the overall understanding of contaminant flow, EPA requests a current sampling round for the full analytical suite of chemicals (including specialty compounds) in these wells.

10. Geophysical Logging. EPA requests that a full suite of geophysical logs be performed on the new bedrock wells to be installed to the southeast (as proposed by Olin) and to the north (as proposed by EPA).

11. Specific Conductivity. To the extent that specific conductivity has not been measured in existing bedrock wells, such measurements should be collected from bedrock wells GW-62BR, GW-62BRD, GW-406BRS, GW-406BRD, GW-202BRS, GW-202BRD, and BR-1 to determine the presence of DAPL or diffuse material. Elevated concentrations of NDMA have been detected in these wells.

Nature and Extent General Comments

1. Nature and Extent in Bedrock. This issue generated numerous comments and concerns with respect to nature and extent. Low concentrations of NDMA and other Site-related compounds have been detected in several private rock supply wells, typically at depths of 300 feet or more below ground surface. NDMA was also detected in several bedrock monitoring wells located throughout the study area, including MMB. Concentrations of NDMA in some bedrock wells are elevated (i.e., GW-62BR at 16,000 ng/l) consistent with NDMA concentrations typically observed in known DAPL pools, yet not all of the bedrock wells where NDMA was detected at elevated concentrations are located consistent with the known DAPL pool areas. This suggests that DAPL has seeped into bedrock fractures, not only beneath the DAPL pools, but also along DAPL migration pathways. The Conceptual Site Model (Figure 2.1-9) completely ignores the transport of particulate or dissolve-phased compounds into bedrock fractures. For example, it seems plausible or even likely that some DAPL has seeped into larger fractures over the past several decades. Diffusion into saturated fractures seems likely. Absorption into the rock matrix also seems possible. In order to fully understand the nature and extent of contamination for OU3, the analysis of data gaps should include an evaluation of the relationship between deep overburden and shallow bedrock groundwater, including DAPL and diffuse layers, and discuss transport mechanisms. To be clear, EPA does not believe it is necessary or prudent to map relatively low concentration compounds deep into bedrock fractures. However, EPA believes it is necessary to understand the physical and chemical nature of Site-related compounds in the shallow bedrock environment and the processes which control migration into and perhaps out of shallow bedrock. Significant and meaningful analytical and geophysical information exists, and should be presented to complete the conceptual site model for groundwater in bedrock. Additionally, to the extent that monitoring well BR-1 still exists within the containment area, EPA requests that it be sampled for NDMA and other contaminants of concern in groundwater. Note that Figure 2.3-2 shows a May 1990 sample result for NDMA in BR-1 as 0.001 ng/l, however the scale of the circle indicates a much higher concentration. Either the circle is scaled incorrectly or the numeric value shown is in mg/l. Please verify and correct.

2. Concentration Contour Maps. The Work Plan does not include any concentration contour maps (aka, isocontour maps or plume maps). Instead, a series of figures are provided in Appendix B which display concentration results for certain Site-related compounds as scaled-circles or squares. While EPA agreed to this approach for this Work Plan, the use of plume maps is considered by many to be the most effective method to portray concentration results and is the standard convention in Region 1 RI reports. EPA requests that such figures be provided in the pending OU3 RI report.

3. OU3 Study Area. In the AOC, the definition of "Site" includes contaminated groundwater that extends from the Olin Property to other areas. However, the only figure that displays the entire Site study area is Figure 2.3-2, and even that figure lacks detail in the area west of Maple Meadow Brook. Site-related compounds have been found in private wells located west of Maple Meadow Brook. OU3 figures, including those which display chemical data and hydro-geologic information should display the entire Site study area as defined by the extent of contamination. Please provide complete figures in the pending RI Report.

4. Elevated Concentrations in DAPL. The Work Plan does not explain the nature of the physical and chemical conditions which support the elevated concentrations of NDMA and other Site-related compounds detected in DAPL (which are not 'components' of DAPL). Are the concentrations homogeneous or do concentrations increase with depth? Is the relationship density-driven, dependent on pH, both, or other physical conditions/parameters? This relationship should be explained and included in the conceptual Site model.

5. Calcium Sulfate Landfill. Section 2.1.2.5 provides a general description of the landfill monitoring program, and results. However, as identified in EPA's November 13, 2014 comment letter (Missing Information Comment No. 1.b), EPA considers the landfill to be a potential ongoing source to area/local groundwater and the Work Plan should provide a detailed discussion of the nature and extent of Site-related compounds deducted in proximity wells, including trends, and present this data in tabular and perhaps graphical form. The Work Plan should also discuss any potential impacts to area surface water bodies including the South Ditch, East Ditch and Landfill Brook. In the context of data-gaps analysis, this information is important to understanding if the existing monitoring well network is sufficient to assess the Calcium Sulfate Landfill as an ongoing source.

6. Nature and Extent of DAPL in MMB. The dimensions of the small DAPL pool shown on the figure within the MMB wetland are unknown. This pool is currently defined as a small circle at the GW-83 cluster. Given that the bedrock topographic low in this area appears to extend to the northwest (southwest of MP-5 and east of the GW-88 cluster), what evidence is there that DAPL would not extend throughout this bedrock low? Olin/AMEC may elect to investigate bedrock depths and/or add additional well control to determine this. Although Olin/AMEC have defined this DAPL pool as a relatively small area, it appears to be a significant source of contamination to the MMBW and downgradient residential wells, as shown by the diffuse layer delineation (Figure 2.1-8). EPA and the stakeholders remain concerned that this DAPL pool (around 83D) is likely much larger than currently delineated or there are other DAPL sources in the MMB wetland given the large area of diffuse groundwater in this area.

7. Groundwater Divide. The Conceptual Site Model (Figure 2.1-9) portrays existing conditions only and does not take into account the transport of Site-related compounds during the pumping of the five municipal wells. These wells were consistently pumped at an estimated rate of 2.1 million gallons per day during the complete operational period

of the former Olin facility, and was likely significant enough to induce the migration of Site-related compounds across the otherwise naturally-occurring groundwater divide. This information is not only important to understanding the nature and extent of contamination, but may also be important to assessing anticipated remedial alternatives in the FS. Consequently, EPA does not currently concur with the depiction of the GW-1 area as shown in an Appendix B figure. Please modify the existing, or submit a separate Conceptual Site Model which demonstrates likely migration pathways during the active pumping period (pre-2003).

8. Synoptic Water Levels. Two synoptic water level rounds were completed in May and October 2011. Actual data is not provided, however water level elevation contours for deep overburden and bedrock conditions are shown in Figures 2.1-1 to 2.1-4; and for shallow groundwater in Figures 3.3-2 and 3.3-3. It appears the contours on these figures were not developed using all the available monitoring wells (Some wells are missing. For example, the GW-400 and 404 series wells to the north)? Surface water elevations should be used to the extent available to further the shallow contours. Contours should be shown or estimated to the north of Eames Street, and to the south and east of East Ditch. Also, groundwater elevations within the containment area should be shown. Please update these figures accordingly.

Nature and Extent Specific Comments

1. Vapor Intrusion. P. 2-17. The last paragraph in the VOC section states that, 'the vapor intrusion pathway (with the possible exception of TMPs) is not a concern based on a comparison of maximum shallow groundwater VOC concentrations to values obtained from EPA's VI screening level calculator.' The Work Plan should provide the screening results in tabular form, and expand on the discussion of TMPs with regard to VI (i.e, Is this concern limited to the Plant B area?).

2. Table 2.1-2. According to the summary data in this table, chromium was detected at a maximum concentration of 1,800 mg/l, which is well above the federal MCL of 0.1 mg/l, and should be shaded.

3. Figure 2.1-5. What is the source for the bedrock contours provided on this figure?

4. Figure 2.1-7. Please label the DAPL pools shown on this figure and superimpose the monitoring well locations to provide context.

5. Figure 2.3-1. Please include monitoring wells SL-2 and SL-3 on this figure.

6. Figure 2.3-2. The 'extent of impacts in bedrock groundwater' as shown in this figure should be expanded to include private wells where NDMA has been detected.

7. Figures 6.2-26 and 6.2-31 (NDMA, Sulfate & Ammonia Cross Sections). It appears that data from wells GW-85M, 85D, 86D and Chestnut #1 were not used in the development of the concentration profiles A-A' and B-B'. Although data from these wells is older (est.

2004), it is considered to be representative and is expected to be used in the pending OU3 remedial investigation report. A handwritten mark-up of the 2 NDMA figures using this data was provided by WERC (See March 17, 2015 memo attached). Please revise these figures to include these results. For the RI Report, EPA requests that similar cross-sections be provided for other contaminants of concern.

8. Appendix B, GW-1 Figure. EPA does not agree with the GW-1 delineation shown on this figure. While this Figure appears to depict GW-1 based on recent water level studies, the hydraulic conditions which were present during active pumping of the 5 municipal wells (pre-2003) have not been presented. Site-related compounds were present in 4 of the 5 municipal wells in 2003, and earlier samples. Site-related compounds were also detected in several private drinking water wells previously located on Main Street (which were subsequently subsequently abandoned and homes connected to the public drinking water system). All of these wells are shown to be within the GW-1 boundary as depicted on this Figure. The primary known source areas (i.e., the former lagoons and Lake Poly) were all located outside of the GW-1 boundary as depicted in this Figure. The transport mechanisms for these compounds from the former facility to the municipal wells has not been discussed. Absent that discussion, it seems plausible that the primary known source areas at the former facility were within the zone of contribution to the municipal and former private wells. By definition, this means that the primary former source areas on the property are within the GW-1 boundary and should be depicted as such. EPA expects the GW-1 delineation issue to be resolved for the OU3 RI Report. For now, EPA requests a written response to this comment and that this Figure (and the Section 2.3 reference to this Figure) be removed from the final Work Plan.

Please call me if you have any questions. Please provide EPA with a minimum of 3 days notice prior to performing any OU3 field work.

Sincerely,

James M. DiLorenzo
Remedial Project Manager
USEPA Region 1 - New England

Attachments: Nobis Comment Letter
GeoInsight Comment Letter
WERC Comment Letter

Cc: Heather Ford, Nobis
Joe Coyne, MassDEP
Jeff Hull, Town of Wilmington
Michael Webster, GeoInsight
Martha Stevenson, WERC

6107150016

May 29, 2015

Mr. James M. DiLorenzo
Remedial Project Manager
USEPA Region 1 - New England
5 Post Office Square
Mail Code: OSRR07-4
Boston, MA 02109-3912

Subject: Response to USEPA Comments & Conditional Approval Dated May 13, 2015
Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site, Wilmington, Massachusetts

On behalf of Olin Corporation, Amec Foster Wheeler Environment and Infrastructure, Inc. (Amec Foster Wheeler) respectfully submits the following responses to the United States Environmental Protection Agency's (USEPA's) Data Gap Comments in the May 13, 2015 Comments and Conditional Approval Letter for the Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan.

Below please find the USEPA comments followed by Olin's response.

COMMENTS

Comment No. 1: Additional Well Cluster. EPA's November 13, 2014 comment letter identified the area generally North of Eames Street as a potential data gap for groundwater (Comment No.3). Olin's response on p.3-3 of the Work Plan indicates that Olin is considering this comment. More recent discussions indicate that Olin is willing to install a well in this location. EPA requests that Olin propose a location for at least one downgradient well cluster (shallow, deep overburden and shallow bedrock), based on the known geo-hydro conditions in that area to address this gap. A sample should be collected from each well screen and analyzed for the full analytical list, including specialty compounds. Installation, drilling and analytical methods should be consistent with the existing work plan. EPA also requests that the Olin-proposed well cluster downgradient of GW-80 be analyzed for the full analytical list, including specialty compounds.

> ***Response No. 1:*** A proposed well cluster location is provided in Figure 1. The available groundwater data north of Eames Street and west of the MBTA indicates groundwater flow toward the East Ditch (see Attachment A). Therefore groundwater migrating from the Northeast corner of the Property is expected to migrate toward East Ditch. Therefore a location located toward East Ditch has been selected based on potential location(s) suitable for the size of required drilling equipment that will not interfere with intervening commercial property structures (mature landscaping and plantings, leach fields and septic tanks, gas utilities, and active areas of parking lots).

Comment No. 2: Synoptic Water Levels. Given the importance of understanding the hydraulic system with regard to the groundwater divide and interaction with regional surface water bodies, and

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511 Congress Street, Ste. 200
Portland, Maine 04101 USA
Tel 207-775-5401 | Fax 207-772-4762 www.amecfw.com

the anticipated development of remedial alternatives for groundwater, EPA requests that a minimum of 2 additional synoptic water level rounds separated by seasonality be performed.

Response No. 2: Additional rounds of synoptic water levels will be conducted as requested.

Comment No. 3: GW-40S. Opex was detected at a relatively high concentration in SL-2. EPA requests that nearby well GW-40S be sampled for Opex to determine the downgradient extent of the detection at SL-2.

Response No. 3: The detected concentration (once from two samples) of Opex at SL-2 was 0.073J mg/L. The drinking water concentration of Opex (Dinitrosopentam-ethylenetetramine) associated with a Hazard Quotient of 1 is 0.60 milligrams per liter (mg/L). This is based on a toxicity value (Oral Reference Dose) derived by Amec Foster Wheeler and presented in the 1997 Supplemental Phase II Report submitted to the MassDEP. As evidenced by this data, the estimated concentration of Opex in SL-2 is an order of magnitude less than the concentration cited above and does not represent a "high" concentration with respect to human health exposure for ingestion of groundwater. Furthermore, the laboratory that developed the method for Opex/Kempore has confirmed they no longer support that method and have indicated they will not run that method if requested. Olin therefore concludes, additional analysis for Opex is not required, needed or possible.

Comment No. 4: GW-70D. Opex was detected at a relatively high concentration in MP-4 and GW-83S/D. EPA requests that nearby well GW-70D be sampled for OPEX to determine if it is migrating with DAPL/diffuse groundwater.

Response No. 4: Please see response to Comment 3. The maximum detected concentration of Opex at MP-4 was 0.02 mg/L, and at GW-83 S/D was 0.28J mg/L both below a concentration that would be considered to pose an unacceptable risk if the water were to be used for potable purposes. The data indicates that additional sampling is not required even if the analysis were to be available commercially since these concentrations do not present an unacceptable risk.

Comment No. 5: GW-57D. GW-57D should be sampled for hydrazine, given that this compound was detected in both samples in GW-44D and one sample in MP-3 (both are upgradient).

Response No. 5: GW-57D is not directly downgradient of GW-44D or MP-3, however GW-57D will be sampled and analyzed for hydrazine to determine presence of absence at this location and provide additional bounding of hydrazine in groundwater.

Comment No. 6: GW-75D. EPA agrees that the current dataset for this well is sufficient and does not constitute a data gap. This well should be retained as a likely sentinel monitoring location. Note that the reference to Table 3-1 is incorrect. The correct reference is Table 3-2.

Response No. 6: The reference will be checked and corrected.

Comment No. 7: GW-80BR. EPA recommends that a full suite of geophysical logs be performed in GW -80BR prior to the installation of the new downgradient well cluster. Minimal bedrock information exists in this portion of the study area and logging GW-80BR should provide useful information

regarding bedrock lithology and can be used to help assess the appropriate depth for the new bedrock screen.

Response No. 7: GW-80BR is an open 6-inch diameter borehole from a depth of 30 feet to 70 feet below ground surface. The borehole could be logged over this short interval, however the depth of water bearing fractures in the borehole would not provide useful information concerning the depth of water bearing fractures in the new proposed bedrock well. The new proposed bedrock well is intended to be completed in the first water bearing fracture zone and would not be geophysically logged. Therefore, Olin recommends not logging GW-80BR.

Comment No. 8: GW-103BR. EPA recommends that a full suite of geophysical logs be performed in GW- 103BR (to the extent it is physically accessible). This well is located on the western edge of MMB and should provide useful information regarding bedrock lithology and NDMA migration, which has been detected in downgradient private rock wells. Also, NDMA was detected at an elevated concentration in GW-103BR.

Response No. 8: GW-103BR was drilled by sonic methods to 81.5 feet and then HQ diamond coring to a depth of106 feet below ground surface. Granite was encountered at 59 feet and sonic drilling continued to 81.5 feet. A four inch casing was permanently installed to 81.5 feet and the remainder of the borehole (from 81.5-106 feet) was cored with an HQ diamond bit. It is an open borehole below 81.5 feet. The core log shows a likely water bearing fractures at 91 feet (iron stained) with shallow dip (20 degrees to the core) and a horizontal and a steeply dipping (70 degrees) fracture at 99.0 and 99.1 feet respectively. No other water bearing fractures are indicated.

Since there is only 26 feet of open borehole to log, it is unlikely that geophysical logging will provide useful information beyond what is known from the core log of this boring and Olin recommends not logging this borehole.

Comment No. 9: GW-85, GW-86D, GW-59D. MMB wetland monitoring wells GW-85, GW-86D, and GW-59D, had elevated concentrations of some Site-related compounds ten years ago. It does not appear that a full analytical suite has ever been performed. Given the importance of the MMB area to the overall understanding of contaminant flow, EPA requests a current sampling round for the full analytical suite of chemicals (including specialty compounds) in these wells.

Response No. 9: It was not the intention of the OU3 RI sampling program to re-sample all wells, but to provide a representative suite of samples that was comprehensive in extent and spatial coverage. Olin will agree to resample these wells at USEPA request to confirm current concentrations. The full analytical suite will be performed less Opex/Kempore which is no longer available.

Comment No. 10: Geophysical Logging. EPA requests that a full suite of geophysical logs be performed on the new bedrock wells to be installed to the southeast (as proposed by Olin) and to the north (as proposed by EPA).

Response No. 10: These new proposed wells will be completed to the first water bearing fracture and geophysical logging of these shallow bedrock borings is not warranted nor is it part of the Olin RI/FS Work Plan protocol for shallow bedrock wells (first water bearing fracture). The use

of physical observations rather than borehole geophysics to locate screen intervals for shallow bedrock wells is discussed in Section 3.3, on page 3-4 of Addendum IV of the RI/FS Work Plan. Borehole logging is intended for deep bedrock borings where it is difficult to ascertain the depth and water bearing characteristics of individual fractures and the logging provides a means to test the individual fractures to select permanent well screen depths. In shallow wells, core is observed for fractures, the well yield is tested based on borehole water recovery and drilling return water flows to determine the depth interval where sufficient water is available to sample the well. The first water bearing zone is typically encountered in shallow weathered bedrock. Olin recommends not logging these shallow bedrock borings as little valuable information will be obtained.

Comment No. 11: Specific Conductivity. To the extent that specific conductivity has not been measured in existing bedrock wells, such measurements should be collected from bedrock wells GW-62BR, GW-62BRD, GW-406BRS, GW-406BRD, GW-202BRS, GW-202BRD, and BR-1 to determine the presence of DAPL or diffuse material. Elevated concentrations of NDMA have been detected in these wells.

Response No. 11: Specific conductivity measurements are collected as field parameters in accordance with the current low flow and prior sampling procedures and has been measured in all the wells requested. Most recent specific conductivity for these wells is provided in the table below.

Well Location	Date	Specific Conductance (µSiemens/cm)	Classification Based on Specific Conductance
BR-1	11/19/1992	8590	Diffuse Material
GW-62BR	8/13/1992	6800	Diffuse Material
GW-62BR	11/19/1992	2940	Groundwater
GW-62BR	1/16/1995	13200	Diffuse Material
GW-62BR	10/16/1995	12200	Diffuse Material
GW-62BR	5/27/2010	10334	Diffuse Material
GW-62BR	10/26/2010	11381	Diffuse Material
GW-62BRD	5/27/2010	3768	Diffuse Material
GW-62BRD	10/28/2010	3378	Diffuse Material
GW-202BRD	2/24/2011	7900	Diffuse Material
GW-202BRD	5/19/2011	7487	Diffuse Material
GW-202BRS	2/24/2011	12441	Diffuse Material
GW-202BRS	5/19/2011	15320	Diffuse Material
GW-406BRD	10/28/2010	1060	Groundwater
GW-406BRD	5/19/2011	1247	Groundwater
GW-406BRS	10/28/2010	399	Groundwater
GW-406BRS	5/19/2011	501	Groundwater

If you have any questions concerning this letter, please feel free to contact James Cashwell at (423) 336-4012.

Sincerely,

AMEC Environment & Infrastructure, Inc.

Peter H. Thompson
Project Manager

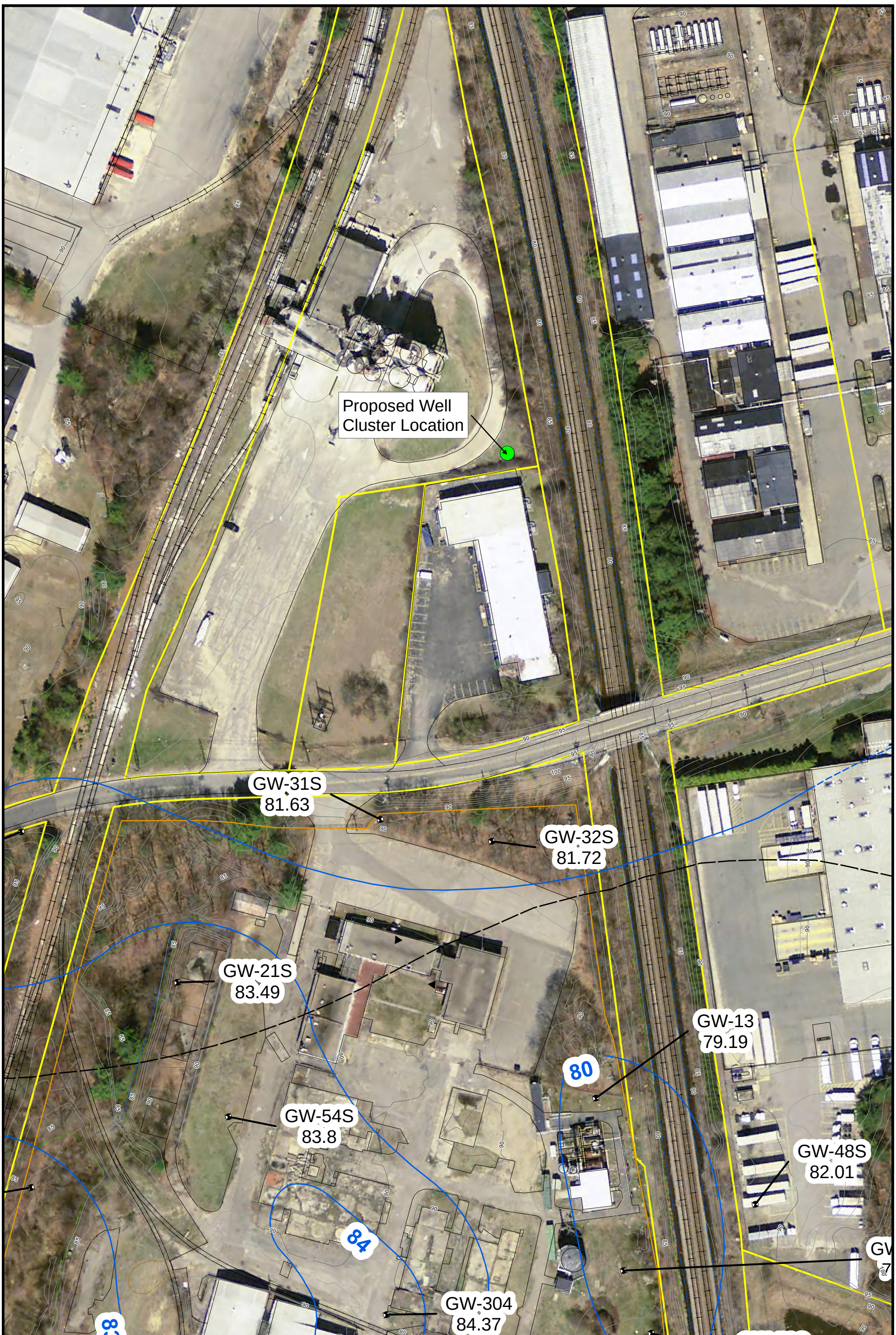
Michael J. Murphy
Project Principal

cc: James Cashwell, Olin
Joe Coyne, MassDEP
AMEC Project File

Figure 1

and

Attachment A



amec foster wheeler

Amec Foster Wheeler
Environment & Infrastructure
271 Mill Road
Chelmsford, MA 01824

Figure 1
Proposed Well Location and Groundwater Elevations in Shallow Monitoring Wells - May 2011
Olin Chemical Superfund Site
Wilmington, Massachusetts

Prepared/Date: BJR 05/28/15 | Checked/Date: PHT 05/28/15

Document: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\MapDocuments\OU3 Data Gaps\Olin_22x34P_Proposed Well Location.mxd PDF: P:\old_Wakefield_Data\projects\OLIN\Wilmington\GIS\Figures\OU3 Data Gaps\Proposed Well Location.pdf 5/28/2015 8:17 AM brian.roden

RAFFI & SWANSON, INC.

1,1-DCA	43 ppb
PCE	17 ppb
1,1,1-TCA	240 ppb
TCE	2.7 ppb

BOSTON AND MAINE RAILROAD

TCE	3.6 ppb

90.75'

MW-3 [90.76']

90.50'

[90.48']
MW-2

LEACHING AREA

TRANSFORMERS

LANDSCAPED GRASSY AREA

GAS LINE

EAMES STREET

FLOOR DRAIN

DEBURRING ROOM

MACHINING AREA

OFFICES

1,000 SQ. FT.

90.75' (M)

LEACHING AREA

1,000 GALLON SEPTIC TANK

91.00'

INDEPENENT CEMENT COMPANY

STAMPING AREA

STORAGE

GRINDING ROOM

OLIN CORPORATION

GRASSY LANDSCAPED AREA

91.00'

VENT PIPE

FUEL OIL UST

B-3

B-1

B-1-S

91.25'

MW-1 [91.05']

1,4-DCB	16 ppb

B-2

APPROXIMATE LOCATION OF CATCH BASIN

[91.30']
MW-4

SCRAP METAL STORAGE

91.25'

SOLID WASTE DUMPSTER

SCRAP METAL DUMPSTER

ND

ASPHALT PAVED PARKING AREA

INDEPENENT CEMENT COMPANY

0 30' 60'

SCALE IN FEET
1" = 30'

LEGEND

MW-3 MONITORING WELL INSTALLED JULY 9, 1997

B-2 SOIL BORING INSTALLED JULY 9, 1997

APPROXIMATE LOCATION OF SOIL GAS SURVEY POINTS INSTALLED BY THE MASSACHUSETTS DEP, SEPTEMBER 1991

APPROXIMATE LOCATION OF MANHOLES USED TO ACCESS GEOTHERMAL SYSTEM

(M) MANHOLE USED TO ACCESS SEPTIC SYSTEM

[90.76'] GROUND WATER ELEVATION (FT.)

90.0' GROUND WATER ELEVATION CONTOUR (FT.)

GROUND WATER FLOW DIRECTION

PARAMETER	CONCENTRATION

CHEMICAL DATA

Marin Environmental, Inc.
7 Island Dock Road, Haddam, CT 06438
(860) 345-4578

GROUND WATER ELEVATION AND GROUND WATER QUALITY DATA
JULY 15, 1997

98 EAMES STREET
WILMINGTON, MASSACHUSETTS

DRAWN BY: SFS	DATE: JULY 1997	SCALE: 1"=30'
APPROVED BY: GM	FILE No.: M9703302	

RAFFI & SWANSON

DW3E ▲ DRAINAGE SWALE DW2E ▲ DW1E ▲

BOSTON & MAINE RAILROAD

DW3W ▲ MW-3 92.44 MW-3D 92.57 DRAINAGE SWALE DW2W ▲ MW-2D 92.27 MW-2 92.24 B101-MW 92.37 TRANSFORMERS DW1W ▲

FORMER DRYWELL

◎ #6 ◎ #5 ◎ #4 ◎ #3 #2 ◎ ◎ #1

92.50'

FLOOR DRAIN

DEBURRING ROOM

OFFICES

MACHINING AREA

STAMPING AREA

STORAGE

GRINDING ROOM

LEACH FIELD

93.00'

FORMER FUEL OIL UST

B102-MW 93.19

MW-1 92.90

MW-1D 93.24

SCRAP STORAGE

CATCH BASIN

ASPHALT PARKING AND DRIVEWAY

SCRAP METAL DUMPSTER

B103-MW 93.39

MW-4 93.38

INDEPENDENT CEMENT COMPANY

EAMES STREET

OLIN CHEMICAL

LEGEND

DW1W ▲	SURFACE WATER SAMPLING POINT
◎	GEOTHERMAL WELLS
⌖	
MW-2 / 93.38	MONITORING WELL WATER TABLE ELEVATION
✦	MA DEP SOIL LOCATIONS 9/91
— - - —	NATURAL GAS UTILITY
— · —	PROPERTY BOUNDARY

NOTES:
1. PROPERTY BOUNDARIES BASED ON MARIN ENVIRONMENTAL REPORT JULY 1997.
2. GROUNDWATER FLOW DIRECTION BASED ON GAUGING EVENT JULY 2000.
3. SITE PLAN DOES NOT SHOW UTILITY FEATURES IN RAILROAD OR EAMES STREET.

SCALE 1"=30'

FIGURE 4

PEASE, SNOW, & ASSOCIATES, INC.
Licensed Site Professional/Environmental Consultant
23 Hitchinpost Road, Chelmsford, MA

PHASE II SITE INVESTIGATION
UNITED TOOL & DIE
SITE PLAN WITH
GROUNDWATER FLOW DIRECTION
SHALLOW AQUIFER JULY 2000
98 EAMES STREET, WILMINGTON, MASSACHUSETTS

DATE: JULY 2000 BPE017.01

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
5 Post Office Square, Suite 100
Mail Code OSRR07-4
Boston, MA 02109-3912

June 18, 2015

James Cashwell
Olin Corporation
3855 North Ocoee Street
Suite 200
Cleveland, TN 37312

Subject: EPA Review and Conditional Approval of Data Gaps
AMEC May 29, 2015, Response to USEPA Comments & Conditional Approval Letter - Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan
Olin Chemical Superfund Site, Wilmington, Massachusetts

Dear Mr. Cashwell:

In accordance with Paragraph 40 of the Administrative Settlement Agreement and Order on Consent ("AOC"), Region I of the United States Environmental Protection Agency ("EPA") has completed a review of the above referenced RTC letter prepared by AMEC.

On December 16, 2014, AMEC submitted a Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan which was conditionally approved by EPA in a letter dated May 13, 2015. EPA's letter required this initial RTC from Olin specific to data gaps requiring additional field work. A full response to comments letter and Final Work Plan are pending.

Pursuant to Section 1.III.D of the Remedial Investigation/Feasibility Study Statement of Work ("RI/FS SOW"), EPA solicited comments from external stakeholders. EPA has consolidated certain written comments received within the context of this letter. Original comment letters received by EPA are enclosed.

Conditions of this approval follow below.

Conditions

1. Olin shall submit a written response to these conditions and comments, and to the remaining conditions and comments contained in EPA's May 13th letter, and submit a Final Work Plan with a schedule to complete OU3 field work, by July 3rd.

2. To the extent access is required to install the new well clusters, efforts to secure access should begin immediately (if they haven't already.)

3. The two new well clusters shall be analyzed for the full analytical list, including specialty compounds. This is necessary since the intent of each of these well clusters is to delineate the full nature and extent of contamination in each of these downgradient areas.

4. EPA reserves the right to identify additional gaps in data pending the review of additional groundwater data and pending information.

RTC Responses (Only those RTCs which require further response are included below.)

1. RTC No.1: Additional Well Cluster. EPA concurs with the proposed location of the new well cluster as shown in Figure 1. The final work plan should provide construction details for both well clusters.

2. RTC Nos.3 and 4: Opex. EPA's comment was with regard to delineation of the nature and extent of Opex in the area of wells GW-40S and GW-70D. The RTC discussion of potential human health risks is not relevant. However, more concerning is the statement that the laboratory no longer supports the Opex method. EPA reached out to the subject laboratory, Eurofins (formerly Landcaster labs). Eurofins stated that "Opex was a client supported standard, which they no longer have." This suggests that Eurofins developed the Opex method for Olin Corp. and that Olin Corp., as the client, could again request the standard. EPA requests (1) a response to EPA's original comments no.3 and no.4 with regard to nature and extent of contamination, and (2) further clarification on recent efforts made by Olin Corp. to identify a laboratory which will support the Opex method.

3. RTC No.7: Borehole Geophysics in GW-80BR. EPA respectfully disagrees with Olin's conclusion that logging shallow bedrock from 30 to 70 feet would not provide usefull information. Geophysical logging is a useful tool to supplement existing information on bedrock features at the site, and is not unduly cumbersome or expensive to perform. Minimal information is available for shallow bedrock in this part of the study area. Well GW-80BR is readily accessible and completing a full suite of borehole logs should further the understanding of contaminant migration into shallow bedrock in this area. Therefore, EPA continues its request that GW-80BR be logged.

4. RTC No.11: Specific Conductivity. EPA appreciates the summary table compiled by Olin of available specific conductivity results for the wells in question. EPA is satisfied with the results for all but 1 well location. The specific conductivity results from BR-1 are from 1992. BR-1 was installed in 1987 and is a shallow bedrock well with an open borehole which extends from 21 to 50 feet and is located with the containment area. Since that time, the slurry wall was constructed around BR-1 and recent analytical results from BR-1 show elevated concentrations of some site-related compounds. In 1992, specific conductivity results indicated that BR-1 was screened in diffuse material. These results may no longer be representative and should be updated. EPA requests that two rounds of specific conductivity measurements be collected from BR-1.

Please call me if you have any questions. Please provide EPA with a minimum of 3 days notice prior to performing any OU3 field work.

Sincerely,

James M. DiLorenzo
Remedial Project Manager
USEPA Region 1 - New England

Attachments: Nobis Comment Letter
GeoInsight Comment Letter
WERC Comment Letter

Cc: Heather Ford, Nobis
Joe Coyne, MassDEP
Jeff Hull, Town of Wilmington
Michael Webster, GeoInsight
Martha Stevenson, WERC

July 3, 2015

Mr. James M. DiLorenzo
Remedial Project Manager
USEPA Region 1 - New England
5 Post Office Square
Mail Code: OSRR07-4
Boston, MA 02109-3912

Subject: Response to USEPA Review and Conditional Approval of Data Gaps Dated June 18, 2015, and USEPA Comments & Conditional Approval Dated May 13, 2015 Revised OU3 Data Gap Analysis and Additional Field Studies Work Plan Olin Chemical Superfund Site, Wilmington, Massachusetts

On behalf of Olin Corporation, Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) respectfully submits the following responses to conditions and comments that have been provided by the United States Environmental Protection Agency (USEPA) in two letters:

1. The June 18, 2015 EPA Review and Conditional Approval of Data Gaps, Amec Foster Wheeler May 29, 2015 Response to USEPA Comments & Conditional Approval Letter
2. The May 13, 2015 Conditional Approval of the Revised OU3 Data Gap Analyses and Additional Field Studies Work Plan (dated December 16, 2014).

The May 13, 2015 conditional approval letter from USEPA regarding the December 16, 2014 Work Plan only required Olin to initially respond to specific data gap comments, for which Olin provided responses on May 29, 2015. The May 13th letter also requested that responses to the Nature and Extent Comments and a revised Final OU3 Data Gaps Work Plan be submitted by June 12, 2015. Our understanding was that we would receive final comments from USEPA prior to June 12th so that we could provide a final work plan by the requested date. Given the timing of USEPA's final comments, this letter also addresses the Nature and Extent Comments from the May 13th letter, to the extent a response was required. In its June 18, 2015 letter, USEPA accepted a number of Olin's responses concerning data gaps that Olin believed were resolved, and re-iterated comments on certain other data gaps it believed required additional investigation activities. This letter seeks to resolve remaining comments and conditions. This letter also lists the original May 13, 2015 Data Gap comments that USEPA stated were not resolved by the Olin's June 18 response, and indicates how those are to be resolved. The additional agreed upon data gaps and field studies will be incorporated into the Final OU3 Data Gap Analysis and Additional Field Studies Work Plan.

Below please find the USEPA conditions and comments followed by Olin's response.

JUNE 18, 2015 CONDITIONS

Condition No. 1: Olin shall submit a written response to these conditions and comments, and to the remaining conditions and comments contained in EPA's May 13th letter, and submit a Final Work Plan with a schedule to complete OU3 field work, by July 3rd.

***Response to Condition No. 1**:* This letter provides Olin's written response to conditions and comments provided in June 18 and May 13 and letters. Olin will submit a Final Work Plan under separate cover.

Condition No. 2: To the extent access is required to install the new well clusters, efforts to secure access should begin immediately (if they haven't already.)

***Response to Condition No. 2**:* Olin has initiated drafting access agreements.

Condition No. 3: The two new well clusters shall be analyzed for the full analytical list, including specialty compounds. This is necessary since the intent of each of these well clusters is to delineate the full nature and extent of contamination in each of these downgradient areas.

Response to Condition No. 3: Based on discussions with USEPA, Olin will analyze groundwater samples from the new well clusters for the full analytical list. Please see Olin's response to previous responses to comments (RTCs) Nos. 3 and 4 below relative to analysis of OPEX.

Condition No. 4. EPA reserves the right to identify additional gaps in data pending the review of additional groundwater data and pending information.

Response to Condition No. 4: No response is necessary.

JUNE 18, 2015 RTC RESPONSES

(Only those RTCs which require further response are included below.)

USEPA RTC No.1: Additional Well Cluster. EPA concurs with the proposed location of the new well cluster as shown in Figure 1. The final work plan should provide construction details for both well clusters.

Response to RTC No. 1: Olin will include the referenced Figure 1 along with anticipated well construction details for the well cluster north of Eames Street and the well cluster east of the East Ditch in the Final Work Plan. Olin will plan to install a shallow and deep overburden couplet with a bedrock well in the first water bearing fracture zone. If the thickness of saturated overburden is inadequate for a paired well, a single overburden screen will be installed above the top of bedrock.

USEPA RTC Nos.3 and 4: Opex. EPA's comment was with regard to delineation of the nature and extent of Opex in the area of wells GW-40S and GW-70D. The RTC discussion of potential human health risks is not relevant. However, more concerning is the statement that the laboratory no longer supports the Opex method. EPA reached out to the subject laboratory, Eurofins (formerly Lancaster

labs). Eurofins stated that "Opex was a client supported standard, which they no longer have." This suggests that Eurofins developed the Opex method for Olin Corp. and that Olin Corp., as the client, could again request the standard. EPA requests (1) a response to EPA's original comments no.3 and no.4 with regard to nature and extent of contamination, and (2) further clarification on recent efforts made by Olin Corp. to identify a laboratory which will support the Opex method.

Response to RTC Nos. 3 and 4: There are two responses that are relevant to this comment. First, the laboratory that developed the Method for OPEX has ceased maintaining this method due to the lack of customer demand for this analysis and it does not have any physical samples of OPEX remaining to conduct further method development or to calibrate equipment if the method was available. We do not have any OPEX standards internally, we have been unable to locate a reliable and available standard that the lab can use, and we are unaware of any reasonable surrogates. Second, OPEX has not been detected at the Site at concentrations even approaching the calculated groundwater protection standard for OPEX (0.6 mg/L). Therefore, OPEX is not presenting any unacceptable risk at the Site. Given these facts, we believe that assessing the risk associated with OPEX at the Site in determining the need for additional sampling is fully relevant to the point at hand.

Based on discussions held between Olin and USEPA following receipt of USEPA's final comments, OPEX should not be analyzed further based on the following:

- The detection of OPEX in SL-2 at the calcium sulfate landfill (CSL) occurred in only one of five wells, in one of two sampling events at a low estimated concentration that was an order of magnitude below the calculated Hazard Quotient of 1 (0.6 mg/L). Olin contends the discussion of potential for health risks is relevant especially since groundwater is being evaluated to quantify potential health risks.
- The preponderance of groundwater data shows that OPEX is not a constituent that is consistently detected or generally shown to be present at the CSL. It was detected once out of 10 samples at a low estimated concentration of 0.073J mg/L. This singular detection does not warrant additional evaluation.
- The detections of OPEX in deep overburden groundwater underlying Maple Meadow Brook are also inconsistent, being detected in only one of two sampling events in three wells, (i.e. 3 of 34 samples analyzed) and at concentrations much less than the HQ value of 1.
- The extent of OPEX in deep overburden groundwater is bounded both laterally and downgradient by non-detect samples. While the detections of OPEX appear to be more frequently associated with DAPL or Diffuse Material, they occur within the area of other groundwater impacts and further evaluation of OPEX is not necessary to complete an assessment of nature extent and a quantitative assessment of risk. The extent is bounded and sufficient data is available to calculate risk.
- Lancaster labs (now Eurofins), informed Amec Foster Wheeler that it did not have any OPEX material remaining for standards and stated that they no longer offer the OPEX method. .
- A reagent grade source of OPEX that is reliable and of known composition to prepare working standards for method development would need to be identified and acquired to re-instate a laboratory method.
- There are no readily available commercial laboratories with methods to analyze OPEX.

- It would be necessary to find a commercial laboratory that is willing to dedicate an HPLC/UV instrument and bring up the previously developed method in their laboratory. Since the number of samples to be analyzed is extremely small, there is little economic incentive for a laboratory to do this level of method development and all development costs would need to be reflected in the analytical sample price.
- Method development requires analysis of multiple standards to develop precision and accuracy and studies to determine the sensitivity of the procedures and establish method detection limits and quantitation limits. There is uncertainty regarding the level of performance that would be obtained from a new laboratory, in addition to the adequacy of OPEX material that may be acquired for standard development.

In summary, Olin's position is that nature and extent of OPEX in groundwater is sufficiently defined to allow quantitative assessment of risk and that the extensive effort that would be required to re-instate the OPEX analysis at a commercial laboratory, if an adequate source of OPEX can be acquired, is simply not justified by the data.

RTC No.7: Borehole Geophysics in GW-80BR. EPA respectfully disagrees with Olin's conclusion that logging shallow bedrock from 30 to 70 feet would not provide useful information. Geophysical logging is a useful tool to supplement existing information on bedrock features at the site, and is not unduly cumbersome or expensive to perform. Minimal information is available for shallow bedrock in this part of the study area. Well GW-80BR is readily accessible and completing a full suite of borehole logs should further the understanding of contaminant migration into shallow bedrock in this area. Therefore, EPA continues its request that GW-80BR be logged.

Response to RTC No. 7: Olin will include borehole logging of well GW-80BR including the standard suite of parameters in the RI/FS Work Plan (Optical/Acoustic televiewer, caliper, temperature, single point resistance, fluid conductivity and heat pulse flow meter logging).

RTC No.11: Specific Conductivity. EPA appreciates the summary table compiled by Olin of available specific conductivity results for the wells in question. EPA is satisfied with the results for all but 1 well location. The specific conductivity results from BR-1 are from 1992. BR-1 was installed in 1987 and is a shallow bedrock well with an open borehole which extends from 21 to 50 feet and is located with the containment area. Since that time, the slurry wall was constructed around BR-1 and recent analytical results from BR-1 show elevated concentrations of some site-related compounds. In 1992, specific conductivity results indicated that BR-1 was screened in diffuse material. These results may no longer be representative and should be updated. EPA requests that two rounds of specific conductivity measurements be collected from BR-1.

Response to RTC No. 11: Olin will collect two rounds of specific conductivity measurements from BR-1 using low flow purging methods. If the transmissivity of BR-1 cannot support low flow sampling, (as is anticipated), the well will be purged down and sampled upon recovery.

OUTSTANDING MAY 13, 2015 CONDITIONS AND DATA GAPS

CONDITIONS

Condition No. 1 Olin shall submit a written response to the Data Gap comments by May 29th. Written responses to the Nature and Extent comments and Condition No.2, and the revised Final Work Plan are due by June 12th.

> ***Response to Condition 1:*** Olin provided a written response to EPA comments regarding data gaps on May 29, 2015. Given the timing of the USEPA response on June 18, Olin and USEPA agreed the revised Final Work Plan would be submitted on July 3, 2015.

Condition No. 2: EPA's November 13, 2014 comment letter identified the lack of representative data from the former municipal and Samina operating wells as a data gap (Comment No. 4). EPA strongly believes that recent data from these wells is necessary to assess existing conditions and determine the need and efficacy for remediation. Note that remedial alternatives developed in the pending feasibility study will be required to satisfy the threshold criteria: (1) overall protection of human health and the environment and (2) compliance with applicable or relevant and appropriate requirements (ARARs); which cannot be assessed without representative data. While these wells are not currently in use, representative data is also necessary to determine the need to establish administrative restrictions (commonly referred to as institutional controls) to prevent unsafe use of these wells if existing conditions do not allow for unrestricted use. Representative data would also further the understanding of nature and extent of contamination in these areas and specific chemical changes in these wells since the cessation of pumping more than a decade ago. Olin's response on p.3-3 of the Work Plan indicates that a Technical Memorandum would be prepared to support Olin's rationale for why this data is not necessary. EPA requests that this memorandum be submitted in response to this comment for further consideration by EPA and the stakeholders. This technical memorandum should also include any information in Olin's files regarding the design and configuration of these wells.

> ***Response to Condition 2:*** Olin will provide a technical memorandum relative to the former operation of the Sanmina and municipal wells under separate cover by August 31, 2015.

DATA GAPS

Comment No. 1: Additional Well Cluster. EPA's November 13, 2014 comment letter identified the area generally North of Eames Street as a potential data gap for groundwater (Comment No.3). Olin's response on p.3-3 of the Work Plan indicates that Olin is considering this comment. More recent discussions indicate that Olin is willing to install a well in this location. EPA requests that Olin propose a location for at least one downgradient well cluster (shallow, deep overburden and shallow bedrock), based on the known geo-hydro conditions in that area to address this gap. A sample should be collected from each well screen and analyzed for the full analytical list, including specialty compounds. Installation, drilling and analytical methods should be consistent with the existing work plan. EPA also requests that the Olin-proposed well cluster downgradient of GW-80 be analyzed for the full analytical list, including specialty compounds.

Response No. 1: See above response to the June 18 Condition 3 and RTC No. 1: Additional Well Cluster. Olin has agreed to install an additional well, pending obtaining an access agreement, and USEPA has agreed to the proposed location.

Comment No. 2: Synoptic Water Levels. Given the importance of understanding the hydraulic system with regard to the groundwater divide and interaction with regional surface water bodies, and the anticipated development of remedial alternatives for groundwater, EPA requests that a minimum of 2 additional synoptic water level rounds separated by seasonality be performed.

Response No. 2: Two additional seasonal rounds of synoptic water levels will be collected as requested.

Comment No. 3: GW-40S. Opex was detected at a relatively high concentration in SL-2. EPA requests that nearby well GW-40S be sampled for Opex to determine the downgradient extent of the detection at SL-2.

Response No. 3: See above response the June 18 RTC Nos. 3 and 4. The detected concentration (once from two samples) of OPEX at SL-2 was 0.073J mg/L. The drinking water concentration of OPEX (Dinitrosopentam-ethylenetetramine) associated with a Hazard Quotient of 1 is 0.60 milligrams per liter (mg/L). This is based on a toxicity value (Oral Reference Dose) derived by Amec Foster Wheeler and presented in the 1997 Supplemental Phase II Report submitted to the MassDEP. As evidenced by this data, the estimated concentration of Opex in SL-2 is an order of magnitude less than the concentration cited above and does not represent a “high” concentration with respect to human health exposure for ingestion of groundwater. Furthermore, the laboratory that developed the method for OPEX has confirmed they no longer support that method and have indicated they will not run that method if requested. Olin therefore concludes, additional analysis for Opex is not required, needed or possible.

Comment No. 4: GW-70D. Opex was detected at a relatively high concentration in MP-4 and GW-83S/D. EPA requests that nearby well GW-70D be sampled for OPEX to determine if it is migrating with DAPL/diffuse groundwater.

Response No. 4: Please see above response to Comment 3. The nature and extent of OPEX has been adequately defined by non-detect analyses downgradient and data is sufficient to quantify risk.

Comment No. 7: GW-80BR. EPA recommends that a full suite of geophysical logs be performed in GW -80BR prior to the installation of the new downgradient well cluster. Minimal bedrock information exists in this portion of the study area and logging GW-80BR should provide useful information regarding bedrock lithology and can be used to help assess the appropriate depth for the new bedrock screen.

Response No. 7: See revised response above to June 18 RTC No. 7. Olin will include borehole logging of well GW-80BR in the Work Plan including the standard suite of parameters (caliper, temperature, single point resistance, conductivity and heat pulse flow meter logging).

Comment No. 8: GW-103BR. EPA recommends that a full suite of geophysical logs be performed in GW- 103BR (to the extent it is physically accessible). This well is located on the western edge of MMB and should provide useful information regarding bedrock lithology and NDMA migration, which has been detected in downgradient private rock wells. Also, NDMA was detected at an elevated concentration in GW-103BR.

Response No. 8: See revised response above to June 18 RTC No. 7. Olin will include borehole logging of well GW-103BR in the Work Plan including the standard suite of parameters (caliper, temperature, single point resistance, conductivity and heat pulse flow meter logging).

Comment No. 9: GW-85, GW-86D, GW-59D. MMB wetland monitoring wells GW-85, GW-86D, and GW-59D, had elevated concentrations of some Site-related compounds ten years ago. It does not appear that a full analytical suite has ever been performed. Given the importance of the MMB area to the overall understanding of contaminant flow, EPA requests a current sampling round for the full analytical suite of chemicals (including specialty compounds) in these wells.

Response No. 9: Olin has agreed to resample these wells at USEPA request to confirm current concentrations. The full analytical suite will be performed less OPEX and Kempore which is also analyzed by the same instrumentation and which is also no longer available.

Comment No. 10: Geophysical Logging. EPA requests that a full suite of geophysical logs be performed on the new bedrock wells to be installed to the southeast (as proposed by Olin) and to the north (as proposed by EPA).

Response No. 10: Olin will include borehole logging of new bedrock wells to be installed in the Work Plan including the standard suite of parameters (caliper, temperature, single point resistance, fluid conductivity and heat pulse flow meter logging).

Comment No. 11: Specific Conductivity. To the extent that specific conductivity has not been measured in existing bedrock wells, such measurements should be collected from bedrock wells GW-62BR, GW-62BRD, GW-406BRS, GW-406BRD, GW-202BRS, GW-202BRD, and BR-1 to determine the presence of DAPL or diffuse material. Elevated concentrations of NDMA have been detected in these wells.

Response No. 11: See above response to June 18 RTC No. 11. Olin will analyze specific conductance of BR-1 as requested.

MAY 13, 2015 NATURE AND EXTENT COMMENTS

NATURE AND EXTENT GENERAL COMMENTS

Comment No. 1. Nature and Extent in Bedrock. This issue generated numerous comments and concerns with respect to nature and extent. Low concentrations of NDMA and other Site-related compounds have been detected in several private rock supply wells, typically at depths of 300 feet or more below ground surface. NDMA was also detected in several bedrock monitoring wells located throughout the study area, including MMB. Concentrations of NDMA in some bedrock wells are

elevated (i.e., GW-62BR at 16,000 ng/l) consistent with NDMA concentrations typically observed in known DAPL pools, yet not all of the bedrock wells where NDMA was detected at elevated concentrations are located consistent with the known DAPL pool areas. This suggests that DAPL has seeped into bedrock fractures, not only beneath the DAPL pools, but also along DAPL migration pathways. The Conceptual Site Model (Figure 2.1-9) completely ignores the transport of particulate or dissolve-phased compounds into bedrock fractures. For example, it seems plausible or even likely that some DAPL has seeped into larger fractures over the past several decades. Diffusion into saturated fractures seems likely. Absorption into the rock matrix also seems possible. In order to fully understand the nature and extent of contamination for OU3, the analysis of data gaps should include an evaluation of the relationship between deep overburden and shallow bedrock groundwater, including DAPL and diffuse layers, and discuss transport mechanisms. To be clear, EPA does not believe it is necessary or prudent to map relatively low concentration compounds deep into bedrock fractures. However, EPA believes it is necessary to understand the physical and chemical nature of Site-related compounds in the shallow bedrock environment and the processes which control migration into and perhaps out of shallow bedrock. Significant and meaningful analytical and geophysical information exists, and should be presented to complete the conceptual site model for groundwater in bedrock. Additionally, to the extent that monitoring well BR-1 still exists within the containment area, EPA requests that it be sampled for NDMA and other contaminants of concern in groundwater. Note that Figure 2.3-2 shows a May 1990 sample result for NDMA in BR-1 as 0.001 ng/l, however the scale of the circle indicates a much higher concentration. Either the circle is scaled incorrectly or the numeric value shown is in mg/l. Please verify and correct.

Response to Comment 1: Olin added specific information to the Work Plan CSM discussion at the request of USEPA. Olin will provide additional information and discussion concerning fractured bedrock in the OU3 RI report. The result for NDMA in BR-1 in the referenced figure was mg/L and will be converted to ng/L in the Final Work Plan.

Comment No. 2. Concentration Contour Maps. The Work Plan does not include any concentration contour maps (aka, isocontour maps or plume maps). Instead, a series of figures are provided in Appendix B which display concentration results for certain Site-related compounds as scaled-circles or squares. While EPA agreed to this approach for this Work Plan, the use of plume maps is considered by many to be the most effective method to portray concentration results and is the standard convention in Region 1 RI reports. EPA requests that such figures be provided in the pending OU3 RI report.

Response to Comment 2: Isocontour maps will be provided in the OU3 RI Report.

Comment No. 3. OU3 Study Area. In the AOC, the definition of “Site” includes contaminated groundwater that extends from the Olin Property to other areas. However, the only figure that displays the entire Site study area is Figure 2.3-2, and even that figure lacks detail in the area west of Maple Meadow Brook. Site-related compounds have been found in private wells located west of Maple Meadow Brook. OU3 figures, including those which display chemical data and hydro-geologic information should display the entire Site study area as defined by the extent of contamination. Please provide complete figures in the pending RI Report.

Response to Comment 3: The legend of the map will be revised to indicate the extent of contamination represented by the dashed line is specific to monitoring wells. The detection of NDMA in bedrock groundwater in residential wells is indicated on the figure by the maximum detected concentration and the date at each residential location. Therefore the scale of the entire Site based on the known extent of impact is displayed. The figure is not incomplete.

Comment No. 4. Elevated Concentrations in DAPL. The Work Plan does not explain the nature of the physical and chemical conditions which support the elevated concentrations of NDMA and other Site-related compounds detected in DAPL (which are not 'components' of DAPL). Are the concentrations homogeneous or do concentrations increase with depth? Is the relationship density-driven, dependent on pH, both, or other physical conditions/parameters? This relationship should be explained and included in the conceptual Site model.

Response to Comment 4: The OU3 RI report will provide a detailed discussion of the associated stratification of constituents in the DAPL Pools. The major "components" of DAPL are those constituents which determine its density. Further discussion is not required for the purposes of the Work Plan.

Comment No. 5. Calcium Sulfate Landfill. Section 2.1.2.5 provides a general description of the landfill monitoring program, and results. However, as identified in EPA's November 13, 2014 comment letter (Missing Information Comment No. 1.b), EPA considers the landfill to be a potential ongoing source to area/local groundwater and the Work Plan should provide a detailed discussion of the nature and extent of Site-related compounds deducted in proximity wells, including trends, and present this data in tabular and perhaps graphical form. The Work Plan should also discuss any potential impacts to area surface water bodies including the South Ditch, East Ditch and Landfill Brook. In the context of data- gaps analysis, this information is important to understanding if the existing monitoring well network is sufficient to assess the Calcium Sulfate Landfill as an ongoing source.

Response to Comment 5: The Calcium Sulfate Landfill was identified as an OU1/OU2 Site feature. As such, significant discussion was provided in the OU1/OU2 RI report relating to the CSL as a potential source of impacts to East Ditch and Landfill Brook. The CSL is hydrogeologically upgradient of the South Ditch and samples collected from within and around South Ditch do not suggest there is any impact from the CSL. Given the current status of the OU1/OU2 RI report, USEPA has not raised the CSL as a continuing issue of concern. Therefore, we respectfully request that USEPA consider the significant effort that was expended in the OU1/OU2 RI report to satisfy this comment. If USEPA has further concerns, then we are certainly willing to have further discussion of this topic. However, given this information, we do not believe the OU3 data gaps work plan needs to be revised to contain this information.

Comment No. 6. Nature and Extent of DAPL in MMB. The dimensions of the small DAPL pool shown on the figure within the MMB wetland are unknown. This pool is currently defined as a small circle at the GW-83 cluster. Given that the bedrock topographic low in this area appears to extend to the northwest (southwest of MP-5 and east of the GW-88 cluster), what evidence is there that DAPL would not extend throughout this bedrock low? Olin/AMEC may elect to investigate bedrock depths and/or add additional well control to determine this. Although Olin/AMEC have defined this DAPL pool as a

relatively small area, it appears to be a significant source of contamination to the MMBW and downgradient residential wells, as shown by the diffuse layer delineation (Figure 2.1-8). EPA and the stakeholders remain concerned that this DAPL pool (around 83D) is likely much larger than currently delineated or there are other DAPL sources in the MMB wetland given the large area of diffuse groundwater in this area.

Response to Comment 6: The nature of DAPL identified in MMB will be discussed in the OU3 RI report and no additional field work is necessary to complete the OU3 investigation with regard to this question.

Comment No. 7. Groundwater Divide. The Conceptual Site Model (Figure 2.1-9) portrays existing conditions only and does not take into account the transport of Site-related compounds during the pumping of the five municipal wells. These wells were consistently pumped at an estimated rate of 2.1 million gallons per day during the complete operational period of the former Olin facility, and was likely significant enough to induce the migration of Site-related compounds across the otherwise naturally-occurring groundwater divide. This information is not only important to understanding the nature and extent of contamination, but may also be important to assessing anticipated remedial alternatives in the FS. Consequently, EPA does not currently concur with the depiction of the GW-1 area as shown in an Appendix B figure. Please modify the existing, or submit a separate Conceptual Site Model which demonstrates likely migration pathways during the active pumping period (pre-2003).

Response to Comment 7: It is Olin's position that the GW-1 area as depicted is correct. The figure will be removed from Appendix B for the purposes of the Work Plan.

Comment No. 8. Synoptic Water Levels. Two synoptic water level rounds were completed in May and October 2011. Actual data is not provided, however water level elevation contours for deep overburden and bedrock conditions are shown in Figures 2.1-1 to 2.1-4; and for shallow groundwater in Figures 3.3-2 and 3.3-3. It appears the contours on these figures were not developed using all the available monitoring wells (Some wells are missing. For example, the GW-400 and 404 series wells to the north)? Surface water elevations should be used to the extent available to further the shallow contours. Contours should be shown or estimated to the north of Eames Street, and to the south and east of East Ditch. Also, groundwater elevations within the containment area should be shown. Please update these figures accordingly.

Response to Comment 8: The figures are adequate for the purpose of the Work Plan. The figures were developed for the OU1/OU2 RI and all the data was presented in that report. GW-400 and GW-404 were installed after the synoptic water level rounds. Potentiometric surface figures will be revised in the OU3 RI report as Olin has agreed to collect additional synoptic water level rounds.

NATURE AND EXTENT SPECIFIC COMMENTS

Comment No. 1. Vapor Intrusion. P. 2-17. The last paragraph in the VOC section states that, 'the vapor intrusion pathway (with the possible exception of TMPs) is not a concern based on a comparison of maximum shallow groundwater VOC concentrations to values obtained from EPA's VI screening level calculator.' The Work Plan should provide the screening results in tabular form, and expand on the discussion of TMPs with regard to VI (i.e., Is this concern limited to the Plant B area?).

Response to Comment 1: The TMP VI issue is specific to EA7 and was discussed in the OU1/OU2 RI. Additional discussion of VI will be deferred to the OU3 RI Report.

Comment No. 2. Table 2.1-2. According to the summary data in this table, chromium was detected at a maximum concentration of 1,800 mg/l, which is well above the federal MCL of 0.1 mg/l, and should be shaded.

Response to Comment 2: Chromium will be shaded in Table 2.1-2.

Comment No. 3. Figure 2.1-5. What is the source for the bedrock contours provided on this figure?

Response to Comment 3: The bedrock contours have been developed throughout the entire history of investigation at the Site and have been modified and refined over the years as new data is collected. The current contours represent all seismic data, outcrop data, and depth to bedrock data from drilling.

Comment No. 4. Figure 2.1-7. Please label the DAPL pools shown on this figure and superimpose the monitoring well locations to provide context.

Response to Comment 4: Labels for DAPL pools will be added to the figure. The extent of the DAPL pools is defined by the elevation of the DAPL surface and the interpreted bedrock surface. Monitoring wells with DAPL are depicted as separate symbols in the groundwater distribution figures. Additional changes to this figure are not necessary for the purposes of the Work Plan.

Comment No. 5. Figure 2.3-1. Please include monitoring wells SL-2 and SL-3 on this figure.

Response to Comment 5: The wells requested will be included.

Comment No. 6. Figure 2.3-2. The 'extent of impacts in bedrock groundwater' as shown in this figure should be expanded to include private wells where NDMA has been detected.

***Response to Comment 6*:** Please see the response to Nature and Extent General Comment Number 3.

Comment No. 7. Figures 6.2-26 and 6.2-31 (NDMA, Sulfate & Ammonia Cross Sections). It appears that data from wells GW-85M, 85D, 86D and Chestnut #1 were not used in the development of the concentration profiles A-A' and B-B'. Although data from these wells is older (est.2004), it is considered to be representative and is expected to be used in the pending OU3 remedial investigation report. A handwritten mark-up of the 2 NDMA figures using this data was provided by WERC (See March 17, 2015 memo attached). Please revise these figures to include these results. For the RI Report, EPA requests that similar cross-sections be provided for other contaminants of concern.

Response to Comment 7: The cross section figures will be updated in the OU3 RI Report. Additional changes to these figures at this time is not necessary for the purposes of the Work Plan.

Comment No. 8. Appendix B, GW-1 Figure. EPA does not agree with the GW-1 delineation shown on this figure. While this Figure appears to depict GW-1 based on recent water level studies, the hydraulic conditions which were present during active pumping of the 5 municipal wells (pre-2003) have not been presented. Site-related compounds were present in 4 of the 5 municipal wells in 2003, and earlier samples. Site-related compounds were also detected in several private drinking water wells previously located on Main Street (which were subsequently abandoned and homes connected to the public drinking water system). All of these wells are shown to be within the GW-1 boundary as depicted on this Figure. The primary known source areas (i.e., the former lagoons and Lake Poly) were all located outside of the GW-1 boundary as depicted in this Figure. The transport mechanisms for these compounds from the former facility to the municipal wells has not been discussed. Absent that discussion, it seems plausible that the primary known source areas at the former facility were within the zone of contribution to the municipal and former private wells. By definition, this means that the primary former source areas on the property are within the GW-1 boundary and should be depicted as such. EPA expects the GW-1 delineation issue to be resolved for the OU3 RI Report. For now, EPA requests a written response to this comment and that this Figure (and the Section 2.3 reference to this Figure) be removed from the final Work Plan.

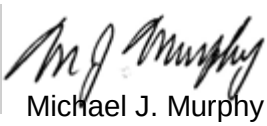
> ***Response to Comment 8:*** Olin will remove the GW-1 figure from Appendix B for the Final Work Plan. Olin will resolve the definition of the GW-1 area with USEPA under the OU3 RI.

If you have any questions concerning this letter, please feel free to contact James Cashwell at (423) 336-4012.

Sincerely,

Amec Foster Wheeler Environment & Infrastructure, Inc.

Peter H. Thompson
Project Manager

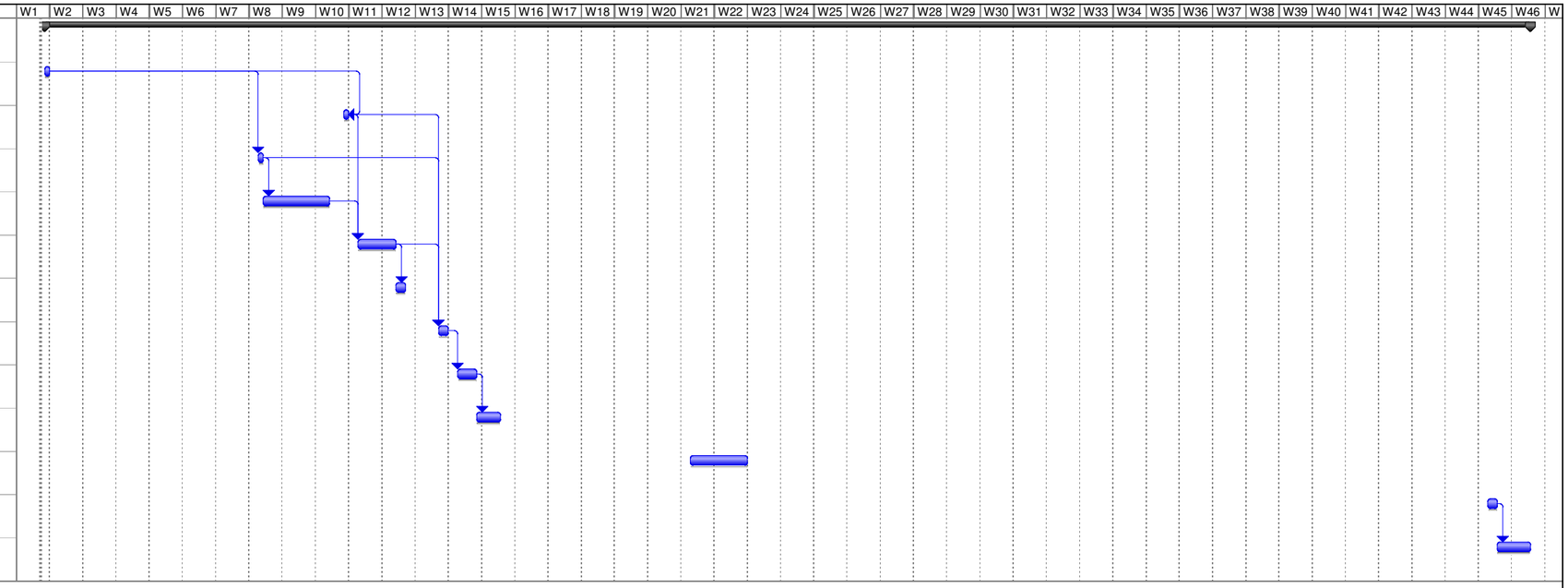


Michael J. Murphy
Project Principal

cc: James Cashwell, Olin
Joe Coyne, MassDEP
AMEC Project File

APPENDIX H
OU3 FIELD SCHEDULE

ID	Task Name
1	**OU3 Data Gap Field Work Schedule**
2	Olin Submits Final OU3 Data Gap Work plan
3	Olin Completes Negotiation of All New Access Agreements
4	Olin Completes Work Notifications for Existing Access Agreements
5	Conduct Main Street DAPL Pool Delineation
6	Install New Well Clusters
7	Develop New Wells
8	Conduct Fall Synoptic Water Level Round
9	Conduct 1st Groundwater Sampling (Existing Wells)
10	Conduct 1st Groundwater Sampling New Wells
11	Conduct Final HPIT
12	Conduct Spring Synoptic Water Level Round
13	Conduct 2nd Groundwater Sampling Event



Project: OU3 DGWP Field Schedule
Date: Thu 7/2/15

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone