# FOURTH FIVE-YEAR REVIEW REPORT FOR GALLUP'S QUARRY SUPERFUND SITE PLAINFIELD, WINDHAM COUNTY, CONNECTICUT

**Prepared by**

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9/14/17
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## LIST OF ABBREVIATIONS & ACRONYMS

| | |
|---|---|
| ARAR | Applicable or Relevant and Appropriate Requirement |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| COCs | Contaminants of Concern |
| COPCs | Contaminants of Potential Concern |
| CT DEEP | Connecticut Department of Energy and Environmental Protection |
| CTDEP | Connecticut Department of Environmental Protection |
| CVOCs | Chlorinated Volatile Organic Compound |
| CWA | Clean Water Act |
| DEHP | Bis(2-ethyl hexyl) phthalate |
| DOT | Connecticut Department of Transportation |
| EPA | United States Environmental Protection Agency |
| FPDA | Former Primary Disposal Area |
| FSB | Former Seepage Bed |
| FSDA | Former Secondary Disposal Area |
| FYR | Five-Year Review |
| ICs | Institutional Controls |
| MCLs | Federal Maximum Contaminant Levels |
| mg/kg | milligrams per kilogram |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPL | National Priorities List |
| O&M | Operation and Maintenance |
| PCBs | Polychlorinated biphenyls |
| PCE | Tetrachloroethene |
| PFAS | Poly – and perfluoroalkyl substances |
| PFOA | Perfluorooctanoic Acid |
| PFOS | Perfluorooctane Sulfonate |
| POTW | Publicly Owned Treatment Works |
| PRP | Potentially Responsible Party |
| QST | PRP contractor |
| RAO | Remedial Action Objectives |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| SDWA | Safe Drinking Water Act |
| SVOC | Semi-volatile organic compound |
| TBC | To be considered |
| TCE | Trichloroethene |
| UU/UE | Unlimited use and unrestricted exposure |
| USACE | U.S. Army Corps of Engineers |
| USGS | U.S. Geological Survey |
| VOC | Volatile Organic Compound |
| µg/L | Micrograms per liter |

# I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Gallup's Quarry Superfund Site (the "Site"). The triggering action for this statutory review was the completion of the third five-year review on September 25, 2012. The FYR has been prepared due to the fact that the selected natural attenuation remedy for Site contaminants results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The purpose of this five-year review is to determine whether the remedy for the Gallup's Quarry Superfund Site (the Site, Figure 1) is protective of human health and the environment. Specifically, the report addresses the following three questions stated in EPA's Five-Year Review Guidance Document:

Question A: Is the remedy functioning as intended by the decision documents?

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The findings and conclusions of this review are documented in this report. The report also identifies issues found during the five-year review process and offers recommendations to address such issues.

The Gallup's Quarry Superfund Site Five-Year Review was led by Leslie McVickar, EPA Remedial Project Manager with support by AECOM and CT DEEP. The review began on 3/20/2017.

**Site Background**

The Gallup's Quarry Superfund Site is located one mile southwest of Plainfield Center at 86 Tarbox Road, in the town of Plainfield, Windham County, Connecticut. It encompasses approximately 29 acres and is approximately 1,800 feet southeast of Plainfield 's sewage treatment plant at the junction of Mill Brook and Fry Brook (Figures 1 and 2). An industrial park approximately 700 feet north of the Site on the opposite side of Mill Brook includes the Intermark Fabric Corporation facility and the Safety Kleen Corporation. The Site is bounded by Mill Brook and its associated wetlands to the north, single family residences and Route 12 to the east, an active railroad (Providence and Worcester Railroad) and woodlands to the west, and single family residences and Tarbox and Mill Brook Road to the south. An alternative green energy facility resides in the south western portion of the Site between the railroad and Tarbox Road.

The area is serviced by public water. Groundwater at the Site is classified by the state of Connecticut as GA, meaning the groundwater is presumed to be suitable for direct human consumption without treatment.

Currently there are no known human receptors for Site contamination. There is a complete ecological pathway from groundwater to surface water, as evidenced by the detection of low concentrations of Site-related contaminants in the adjacent Mill Brook (less than Connecticut surface water criteria). Surface water bodies located within or near the Site include Mill Brook, Fry Brook, and Packers Pond. Mill Brook flows from east to west-southwest along the northern and western edges of the Site. Mill Brook and Fry Brook ultimately discharge to Packers Pond. The north section of Mill Brook has been classified as B/A by the State of Connecticut, indicating the water body may not be meeting Class A water-quality criteria, while the lower portion of Mill Brook has been classified as Bc, indicating that the water body meets Class B criteria and is suitable for cold water fisheries.

**Operational and Regulatory History**

In 1951, the Gallup's Quarry Superfund Site operated as a sand and gravel quarry. Records indicate that the Site was once used as a source of aggregate and was occupied by the Connecticut Department of Transportation (DOT) to operate an asphalt batching plant.

Beginning in the summer of 1977 and continuing until December 1977, drummed and bulk waste materials were illegally disposed at the Site. During that time period, disposal occurred in three locations: a buried seepage system [the Former Seepage Bed (FSB)] in the elevated central part of the Site and at two separate pits at the north end of the Site [the Former Primary Disposal Area (FPDA) and the Former Secondary Disposal Area (FSDA)] where barrels of waste chemicals and free liquid chemical wastes were dumped. The largest disposal area was the FPDA drum pit in the north-central part of the Site. Locations of disposal areas are shown in Figure 2. The FSB was destroyed during the construction of the alternative green energy facility.

In January 1978, the Connecticut Department of Environmental Protection (CTDEP, now the Connecticut Department of Energy and Environmental Protection CT DEEP)) and the Connecticut State Police initiated an investigation and concluded that the Site was used from summer 1977 until December 1977 for unlicensed waste disposal. Chemical Waste Removal, Inc. (CWR) of Bridgeport, CT, was discovered to have transported drummed and bulk liquid waste material to the Site, as concluded by the evidence collected by CTDEP. Disposal activities ceased in January 1978.

## FIVE-YEAR REVIEW SUMMARY FORM

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site Name:** Gallup's Quarry Superfund Site | | |
| **EPA ID:** CTD108960972 | | |
| **Region:** 1 | **State:** CT | **City/County:** Plainfield/Windham |
| **SITE STATUS** | | |
| **NPL Status:** Final | | |
| **Multiple OUs?** No | **Has the site achieved construction completion?** Yes | |
| **REVIEW STATUS** | | |
| **Lead agency:** EPA | | |

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|---|
| **Author name (Federal or State Project Manager):** Leslie McVickar |
| **Author affiliation:** EPA Remedial Project Manager |
| **Review period:** 3/20/2017 - 9/25/2017 |
| **Date of site inspection:** 5/10/2017 |
| **Type of review:** Statutory |
| **Review number:** 4 |
| **Triggering action date:** 9/25/2012 |
| **Due date *(five years after triggering action date)*:** 9/25/2017 |

# II. RESPONSE ACTION SUMMARY

## Basis for Taking Action

As described in the Record of Decision (ROD), actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response actions, may present an imminent and substantial endangerment to public health, welfare or the environment. In particular, the future potential ingestion of contaminated groundwater as a drinking water supply would represent an unacceptable risk to human health.

As presented in the ROD, the results of the Human Health Risk Assessment (HHRA) indicate that the only risks exceeding EPA's threshold for remedial action are those potentially posed to a future employee. Of the exposure pathways evaluated for a future Site employee, the future potential ingestion of groundwater represents the only pathway exceeding EPA's goals for remedial actions.

While 52 contaminants of potential concern were initially identified, interim groundwater cleanup levels were developed for the following chemicals: benzene, 1,2-dichloroethane, methylene chloride, tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, 1,1,1-trichloroethane, xylene (total), 1,2-dichloroethene, bis(2-ethyl hexyl) phthalate, lead, chromium and vanadium.

Although it was determined that soils did not pose an exposure risk, contaminants have the potential to leach from soils into groundwater at levels which may cause exceedances of groundwater remediation goals. Therefore, remedial response objectives were established for soils within the FPDA and FSB, and ARARs-based cleanup levels were established as outlined below. Unsaturated soil cleanup levels were established for ethylbenzene, PCE, TCE, chloromethane, bis(2-ethyl hexyl)phthalate, and xylene (total).

The Ecological Risk Assessment report completed in June 1997 concluded that no ecological receptors are expected to experience significant, long-term risk from Site-related contaminants present in surface water or sediment and therefore, there is no actionable ecological risk associated with the Site.

## Response Actions

**Pre-ROD Response Activities.** Investigations and removal activities at the Site directed by the CTDEP and the Connecticut State Police between January and August 1978 included sampling and analysis of soil, groundwater, and surface water/sediments from nearby Mill Brook, and the removal of buried drums and contaminated soil. Wastes disposed of at the Site in drums and as free liquid waste included VOCs and metals. Over 1,600 drums,

5,000 gallons of bulk liquid waste, and 3,500 tons of contaminated soil were removed from the ground by the CTDEP.

All drums were presumably recovered during the cleanup efforts. Soil and groundwater were monitored periodically by the CTDEP, the Connecticut Department of Health, and EPA after the 1978 clean-up operations. In May 1988, EPA initiated a limited Site Investigation to evaluate the Site with respect to conditions for additional removal actions under the National Contingency Plan (NCP). Soil samples collected by EPA confirmed the presence of VOCs, SVOCs, and metals. On June 24, 1988, the Site was proposed for placement on EPA's National Priorities List (NPL). On October 4, 1989, the Site was added to the NPL.

**Remedial Response Objectives.** The ROD identified the following Remedial Response Objectives for the Site:

Source Control (Soil)

- Prevent and/or minimize, to the extent practicable, the potential for leaching of hazardous substances, from the soil or waste into the groundwater, at concentrations that will cause groundwater concentrations greater than the cleanup levels;
- Comply with Federal and State "applicable or relevant and appropriate requirements," or ARARs.

Management of Migration (Groundwater)

- Prevent ingestion of contaminated groundwater in excess of applicable or relevant and appropriate drinking water standards or posing a potential total cancer risk greater than $10^{-4}$ to $10^{-6}$.
- Prevent ingestion of groundwater containing contaminants at concentrations in excess of applicable or relevant and appropriate drinking water standards for each non-carcinogenic compound and a total Hazard Index greater than unity (1) for non-carcinogenic compounds having the same target endpoint of toxicity.
- Comply with Federal and state ARARs.

**Selected Remedy.** The ROD sets forth a comprehensive remedy for the Gallup's Quarry Superfund Site, and describes both a source control component and a management of migration (groundwater) component within a single Operable Unit (i.e. OU1). The selected remedy consists of natural attenuation of contaminants of concern in soil and groundwater, implementation of institutional controls, long-term monitoring of groundwater and soil, and Five-Year Site reviews.

Section X of the ROD describes the remedy as follows:

- Institutional controls, including land use restrictions to limit the use and disturbance of contaminated soils and to prevent the use of impacted groundwater;
- Posting of warning signs and periodic maintenance of them;
- Periodic sampling and analysis of contaminated unsaturated soils for contaminants of concern
- Long-term sampling and analysis of groundwater and surface water to assess compliance with the groundwater cleanup levels through natural attenuation and to ensure the surface water has not been adversely impacted.

**Cleanup Levels.** The interim groundwater cleanup levels and unsaturated soil cleanup levels selected for the Site are specified in the ROD, and included in the sampling data tables (Appendix D).

## Status of Implementation

Following the issuance of the ROD, a long-term monitoring program was developed and has been implemented by the Potentially Responsible Parties (PRPs). The purpose of the program is to evaluate and document that natural attenuation is occurring, that the surface water quality is not being negatively affected, and to check that the contaminant plume is not spreading to previously uncontaminated areas or into the river at unacceptable levels. The post-ROD long-term monitoring of surface water and groundwater was initiated in November 2001. Twenty-seven monitoring wells are currently part of the groundwater monitoring program. Groundwater was sampled semi-annually, during the spring and the fall, through 2008, and has been sampled annually during the fall since 2009.

Surface water is sampled at five locations as part of an annual sampling program. Monitoring wells and surface-water sites are shown in Figure 2.

Groundwater monitoring will continue until interim cleanup levels specified in the ROD are no longer exceeded for a period of three consecutive years, at which time a risk assessment of the residual groundwater contamination shall follow EPA procedures. The ROD states that "ARARs which call into question the protectiveness of the remedy, and the protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at every point in the Site groundwater."

Soils have been sampled every five years since the ROD was implemented. Until 2006, soil samples were collected from both the FSB and the FSDA. In 2006, the FSB was destroyed during construction of a green energy facility, and therefore sampling at this location was discontinued. Approximate soil sampling locations are shown in Figure 2.

Soil cleanup levels must be attained at every point throughout the contaminated unsaturated zone in the FPDA. Although no cleanup levels were specified for the surface water, the ROD states that surface water will be sampled and analyzed for COCs until interim (groundwater) cleanup levels are attained.

All components of the Institutional Controls requirement of the ROD have been satisfied. Environmental Land Use Restrictions (ELURs) were required at six parcels. Five ELURs have been implemented. At the sixth, the Tilcon Property, an evaluation was conducted in 2015 by the USEPA that determined that an ELUR is no longer necessary on this property to protect human health and the environment. The CT DEEP concurred with EPA's evaluation.

## IC Summary Table

**Table 1: Summary of Planned and/or Implemented ICs**

| Media, engineered controls, and areas that do not support UU/UE based on current conditions | ICs Needed | ICs Called for in the Decision Documents | Impacted Parcel(s) | IC Objective | Title of IC Instrument Implemented and Date (or planned) |
|---|---|---|---|---|---|
| Groundwater | Yes | Yes | Sitewide* | To restrict residential activities (including construction of buildings) in the Former Primary Disposal Area and Former Seepage Bed, except pursuant to a plan approved by EPA for approval, and that contaminated groundwater at the Site is not utilized for drinking purposes. | Declaration of Environmental Land Use Restriction and Grant of Easement (March 19, 2001) |
| Groundwater | Yes | Yes | Sitewide* | Groundwater supply wells shall not be installed or otherwise operated in a manner that would conflict with the natural attenuation of groundwater or that would conduct contaminated groundwater away from the Site. | Declaration of Environmental Land Use Restriction and Grant of Easement (March 19, 2001) |

*In 2015, EPA and CT DEEP concurred that ICs are not required for the Tilcon Property.

# III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last five-year review as well as the recommendations from the last five-year review and the current status of those recommendations.

Protectiveness statement from the 2012 FYR:

"The remedy at the Gallup's Quarry Site currently protects human health and the environment in the short term because there is no current exposure to Site media containing contaminant concentrations exceeding applicable criteria. To ensure protectiveness in the long term, institutional controls need to be finalized, the current sampling plan must be amended to collect additional groundwater data, and current ARARs need to be further evaluated."

**Table 2: Status of Recommendations from the 2012 FYR**

| Issue | Recommendations | Current Status | Current Implementation Status Description | Completion Date (if applicable) |
|---|---|---|---|---|
| In accordance with the ROD, institutional controls were to be implemented as part of the selected remedy. To date the institutional controls for the Site have not been finalized. | Finalize Institutional Controls for the Site. | Completed | It was determined that the last parcel, lot 8 owned by Tilcon, does not require land use controls. Per memo dated June 1, 2015 by EPA, all components of the Institutional Control requirement established for the Gallup's Quarry Superfund Site, pursuant to the September 30, 1997 ROD, have been satisfied. | 6/1/2015 |
| There are new Federal/State cleanup standards identified for 1,4-dioxane and arsenic warranting additional groundwater sampling and analysis. | Add 1,4-dioxane and arsenic to the list of contaminants to be annually sampled and analyzed for in groundwater. | Completed | 1,4-dioxane and arsenic were added to the list of contaminants to be analyzed for in groundwater in the November 2013 monitoring event. Analysis of samples for 1,4-dioxane was discontinued after the 2013 event. | 9/30/2013 |
| If future data indicates that 1,4-dioxane and arsenic in the groundwater exceed the new Federal/State cleanup standards, it needs to be determined whether they are ARARs for the Site. | Based on future sampling results determine whether 1,4- dioxane and arsenic should be added to the ROD COC list as ARARs. | Ongoing | It is recommended that arsenic continue to be monitored, and in the next five year review a reevaluation of data should be conducted to determine whether arsenic should be added to the ROD COC list as an ARAR. | 9/30/2022 |

*Recommendation # 1*

Environmental Land Use Restrictions (ELURs) were required at six parcels with documented VOCs, SVOCs, and/or inorganic contamination in groundwater at concentrations exceeding safe drinking water standards. To date, ELURs have been established at all but one parcel. However, in 2015, the EPA completed an evaluation to assess the necessity for the remaining ELUR on Lot #8, the Tilcon Property. It was determined groundwater monitoring data collected over a 17-year period showed an absence of any of the VOCs that were previously detected at this location during the RI/FS. In addition, it was found that there had been no exceedance of groundwater cleanup standards for the remaining COCs. It was also noted that VOCs had not been detected in monitoring wells at any downgradient sentry locations.

Based on these results, it was determined that groundwater contaminants at the Site have been successfully reduced over time through natural attenuation processes, and that the institutional control contemplated for the Tilcon property is no longer required or necessary to protect human health and the environment.

On May 5, 2015 the CT DEEP concurred with the above decision, provided that EPA continues to evaluate all future long-term monitoring results to ensure that there are no unanticipated future conditions which might warrant implementation of additional institutional control measures at the Site. The evaluation and the CT DEEP's concurrence were documented in a memorandum to the file entitled "The Gallup's Quarry Superfund Site, Plainfield, CT Completion of Institutional Controls under the September 1997 ROD", dated June 1, 2015 (see Appendix C).

*Recommendation #2*
During the November 2013 monitoring event 1,4-dioxane was analyzed in groundwater from six wells representing a good spatial distribution across the groundwater downgradient of the Site. 1,4 - dioxane was detected in only one of those six wells (MW-105TT at 3.5 ug/L) above the detection limit (0.61 ug/L). Based on the lack of significant detections of 1,4-dioxane in the groundwater downgradient of the Site, it was recommended in the *November 2013 Groundwater Monitoring Report* (Hall & Wilson LLC, 2014) that future groundwater sampling not include 1,4–dioxane thus sampling for 1,4–dioxane was discontinued.

Starting in the November 2013 sampling event, at the request of USEPA, arsenic was also added to the list of metals. Arsenic was detected at all sampled locations during the November 2013 event, and sampling for arsenic in groundwater has continued in subsequent monitoring events.

*Recommendation #3*
Sampling for 1,4-dioxane was discontinued after the November 2013 sampling event due to lack of significant detections. 1,4 -dioxane was detected above laboratory reporting limit in only one of the six wells sampled (MW-105TT at 3.5 ug/L). While it is recommended that this chemical not be added to the ROD COC list as an ARAR, 1,4-dioxane will be included for sampling and analysis and future risk evaluation to be performed prior to Site deletion.

Arsenic exceeded the MCL of 10 ug/L in two of the three wells sampled during the November 2013 event. Arsenic sampling continued in the 2014-2016 events. Detections above the MCL of 10 ug/L were observed in the same two wells during the 2014 event, only one well in the 2015 event, and in the 2016 sampling event no wells showed detections for arsenic above the MCL. Due to the consistently decreasing concentrations observed for arsenic in groundwater, it is not recommended that this chemical be added to the ROD COC list at this time. It is recommended that arsenic continue to be monitored, and in the next five year review a reevaluation of data should be conducted to determine whether arsenic should be added to the ROD COC list as an ARAR.

# IV. FIVE-YEAR REVIEW PROCESS

## Community Notification, Involvement & Site Interviews

A press release was issued by EPA Region 1 on February 9, 2017, announcing the start of the FYR for this Site, as well as multiple other sites in the region. The public was invited to submit any comments to EPA.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that have been implemented to date. The general impression of the Site and effectiveness of the remedy was positive. No new issues were raised, and no changes to the remedy or O&M were noted. See Appendix E for the interview records.

## Data Review

The Remedial Investigation determined that contaminants associated with the Site were present in soil (mainly within the FPDA), surface water, and groundwater. A long-term monitoring program has been implemented to monitor the natural attenuation of Site-related contamination. Data collected since the last five-year review for each of the three media are summarized below.

### Soils

Periodic sampling and analysis of soils was included in the selected remedy because concentrations of contaminants in unsaturated soils exceeded applicable criteria specified by the State for a leaching threat to groundwater. The ROD identified unsaturated soil cleanup levels for ethyl benzene, PCE, TCE, chloromethane, bis(2-ethyl hexyl) phthalate (DEHP), and total xylenes. In accordance with the Remedial Action Work Plan, soil sampling is to be performed once every five years to determine if concentrations of contaminants are declining. Since the completion of the RI in 1997, four rounds of soil sampling and analysis have been completed (November 2001, June 2006, November 2011, and November 2016). Soils were sampled in the depth interval of 4-6 feet. See Table D-3 in Appendix D for the soils data summary table.

Soil samples collected as part of the long-term monitoring program over the last five-year review were obtained from seven locations within the footprint of the FPDA, and submitted to a laboratory for analysis. The Former Seepage Bed was destroyed during the construction of the alternative energy facility and is no longer being sampled. Sample locations are shown in Figure 2. The soil samples from six of the locations (SB108, SB109, SB110, SB114, SB115, and SB125) were analyzed for COC VOCs (ethyl benzene, tetrachloroethene, trichloroethene, chloromethane, and total xylenes) and soil samples from three locations (SB107, SB109, and SB110) were also analyzed for bis(2-ethyl hexyl)phthalate (DEHP). Analytical data was validated using EPA Region I data validation guidelines, Tier II (EPA, 1996b).

Table D-3 in Appendix D shows the analytical results for the soil samples collected in 1994, 1995, 2001, 2006, 2011 and 2016.

In 2016, locations SB109, SB110, and SB125 were sampled. Only trace VOCs were detected at locations SB110 and SB125. The only positive result for DEHP was a trace amount detected at location SB109. All concentrations were well below the COC Soil Cleanup Levels.

### Surface Water

In accordance with the ROD, surface-water sampling and analysis is included in the long-term monitoring program. As specified in the Remedial Action Work Plan, surface water samples were collected and analyzed during the first groundwater monitoring event and annually thereafter. See Table D-4 in Appendix D for the surface water data summary table.

Surface water sample locations include the following (see Figures 1 and 2 for locations):

- Mill Brook upgradient of site (UB-4);
- Mill Brook near MW-101 (UB-10);
- Mill Brook downgradient of Fry Brook (LB-1)
- Mill Brook downstream of Fry Brook near MW121 (LB-2);

- Fry Brook, northwest of the confluence with Mill Brook (FB);
- Packers Pond at the mouth of Mill Brook (PP)

The analytical results presented in the annual monitoring reports (Hall & Wilson, 2014, 2015, 2016, and 2017) show that a trace amount of 1,2-DCE was detected in surface water at the Packers Pond (PP) location in 2013; however, this location could not be accessed during the 2014, 2015, and 2016 monitoring events. Trace amounts of 1,2-DCE and PCE were detected in Mill Brook downgradient of Fry Brook at LB-1 in every sampling event since 2013. These compounds were also detected at location LB2 in 2015; however, this location could not be accessed during the 2013 and 2016 monitoring events. Locations for the Mill Brook and Fry Brook sampling sites are shown on Figure 2, and for the Packers Pond site on Figure 1. No VOCs detected in UB-4 or UB-10 during the last five sampling events. Both locations are located in Mill Brook, upgradient of its confluence with Fry Brook. At LB-1, which is located in Mill Brook just downgradient of the confluence with Fry Brook, trace concentrations of PCE and 1,2-DCE were detected during each of the past five sampling events. TCE was detected at this location at trace amounts during the 2014 and 2015 events only. None of these compounds were detected at concentrations above the applicable Connecticut Surface Water Protection Criteria. No VOCs were detected in the sample from Fry Brook in 2016. However, due to access issues, Fry Brook was sampled further upstream of Mill Brook than in previous years. Historical data has indicated that there is another non-Site related source of VOCs north of Mill Brook. The sampling location used may have been upgradient of where that source impacts Fry Brook. As stated in the November 2016 annual monitoring report, limited detections in Mill Brook near the discharge point for the plume (sample location UB-10) indicate that VOCs in Mill Brook are largely from Fry Brook and likely unrelated to the Site. This possibility was discussed in the RI/FS reports, the ROD, and the last Five Year Review. The limited detections of VOCs in Mill Brook may reflect low rates of contaminant discharge relative to stream flow and possibly enhanced biodegradation in organic-rich stream and wetland sediments.

Although the source for contaminants in surface water is not defined, all detections were found to be below applicable surface-water criteria. The low concentrations observed in surface water continue to support the remedy-protectiveness statement.

**Groundwater**

Periodic monitoring of groundwater quality at the Site was initiated during the RI in January 1995 and continued through May 1997. No groundwater sampling was conducted between June 1997 and October 2001 while the Remedial Action Work Plan was being developed. See Table D-1 and D-2 in Appendix D for data summary tables.

The long-term groundwater monitoring program was initiated in November 2001 in accordance with the Remedial Action Work Plan. Samples were collected quarterly from November 2001 to November 2003 and semi-annually (spring and fall) from 2004 until 2009. Since then, sampling has occurred annually in the fall. The groundwater monitoring network currently consists of 27 wells. Results of groundwater monitoring have been documented in reports submitted to EPA by contractors of the Gallup's Quarry Superfund Site PRP Committee. The current contractor is Hall & Wilson.

Each monitoring well is screened in one of three distinct zones within the overburden materials. Shallow monitoring wells with screened intervals intercepting the groundwater table have the suffix "S" after their location designation. Monitoring wells with screened intervals at the top of the till layer and within the till layer have the suffix "TT" and "T" respectively. Well MW-102B is completed in bedrock.

Five rounds of groundwater sampling have been conducted since the last five-year review. Twenty-seven wells were sampled annually for VOCs and select metals (chromium, lead, vanadium, and arsenic) and DEHP. Of the 27 monitoring wells sampled, five have been found to contain contaminant concentrations exceeding ROD-

specified cleanup levels during this five-year review period. These wells include MW-102S, MW-102TT, MW-105TT, MW-105T, and MW-107TT (discussed below).

Vinyl chloride exceeded the cleanup level of 2 µg/L at wells MW-102TT, MW-105TT, and MW-107TT during one or more of the last five sampling rounds. During the last three rounds, the cleanup level was exceeded at just two wells (MW-102TT and MW-107TT). Overall, vinyl chloride was detected infrequently in groundwater and the frequency of detections has decreased since 1997. Based on a Mann Kendall trend test conducted on vinyl chloride concentrations for MW-102TT and MW-107TT, concentrations are decreasing over time (Appendix G).

TCE exceeded the cleanup level of 5 µg/L at one well, MW-104S, during the previous five-year review period (i.e., 2007 - 2011) and was detected below cleanup levels at all other monitoring wells. In the 2012 - 2016 five-year period, TCE was not detected above the cleanup level of 5 µg/L in any well.

PCE exceeded the cleanup level of 5 µg/L at least once in the last five sampling rounds in groundwater from five monitoring wells, including MW-102S, MW-102TT, MW-105TT, MW-105T, and MW-107TT. Based on a Mann Kendall trend test (Appendix G), either no trend or decreasing trends in concentration were indicated at the five wells with cleanup level exceedances. Overall, PCE was detected in approximately one quarter to one third of sampled wells during three most recent sampling rounds.

During the first five-year period, total xylenes exceeded the cleanup level of 530 µg/L on three occasions, in MW-102TT, MW-105TT and MW-107TT. During the past three five-year review periods, there have been no detections above the cleanup level.

The most recent exceedance of the cleanup level for DEHP (2 µg/L) was detected in well MW-102TT (November 2013 at 2.1 µg/L). This was the only detection of DEHP observed over the cleanup level or laboratory reporting limits in the past five years.

With respect to metals, while there have been detections of chromium, lead, and vanadium between 1997 and November 2011, none of these detections exceeded their respective cleanup levels in groundwater. During the November 2016 event, these metals were only detected in well MW-102TT. Chromium was observed at 1.2 µg/L and lead at 3.4 µg/L (both are below the clean-up level).

Arsenic was added to the sampling list in November 2013. It was detected in all three sampled wells (MW-102TT, MW-105TT, and MW-107TT) from November 2013 – November 2016. The groundwater sample for arsenic at MW-107TT during the fall 2016 event was not analyzed; therefore, there is no arsenic data for this well from this event. Arsenic has no cleanup level in the ROD-specified CUG because it has not been added as a COC. Arsenic exceeded the MCL of 10 ug/L in groundwater from two of the three wells sampled during the November 2013 and November 2014 events. Arsenic in groundwater from only one well exceeded the MCL during the 2015 event, and in the 2016 sampling event there were no arsenic detections above the MCL of 10 ug/L. It is difficult to draw conclusions regarding trends due to the limited available data.

The historical groundwater quality data indicate that the plume is stable, and the discharge area to Mill Brook has a limited lateral extent. As stated in the previous Five-Year Review, the absence of contaminants at well clusters MW-120 to MW-123S indicates that a groundwater flow path along Mill Brook, that was shown on Figure 1-5 of the FS, is no longer present.

**Site Inspection**

A site inspection was conducted on 5/10/2017. In attendance were Rachel MacPhee (AECOM project scientist), and Gary Wilson (Hall & Wilson LLC, PRP Project Manager). The purpose of the inspection was to assess the protectiveness of the remedy.

The current conditions of the former source areas, monitoring wells, and surface-water stations were observed during the Site Inspection.

Overall, the Site appears in good condition. The former disposal areas were observed to be barren of vegetation and covered by sand. The alternative energy facility construction is complete and the plant is in operation with no outstanding issues. All monitoring wells were found to be locked and in good condition.

Due to the sprawling nature of the Site, and its remote location a perimeter fence is not in place. Access to the Site is restricted by the alternative energy facility to the southwest, and surrounding wetlands. During the site visit, it was observed that the main gate providing access to the southern portion of the site off of Tarbox Road was unlocked. Per discussion with Mr. Wilson this gate is routinely left open by Tilcon staff.

A squatter was observed camping on town land near well cluster MW-106. Mr. Wilson states that this person was also observed camping on the site during the November 2016 sampling event. The Plainfield Police Department was informed during the November 2016 sampling event. The squatter is not causing any damage to the Site.

## V. TECHNICAL ASSESSMENT

**QUESTION A:** Is the remedy functioning as intended by the decision documents?

Yes. Overall the remedy appears to be functioning as intended by the ROD. Significant reductions in contaminant concentrations in groundwater were noted at most groundwater monitoring wells as compared to concentrations detected in 1997. With the exception of PCE, concentrations of VOCs have continued to steadily decline since 1997. While arsenic has been detected in Site groundwater above the MCL, the detections have been inconsistent. Because groundwater at the Site is not being used as a potable water supply, the persistence of both VOCs and arsenic above cleanup levels does not compromise the protectiveness of the remedy at this time.

Concentrations of VOCs detected in surface water do not pose a threat. Also the VOCs appear to be attributable to another source in the Fry Brook drainage apart from the Site, as stated in the ROD.

In on-site soils, the November 2016 data indicate that there are trace VOC concentrations detected at location SB110 and SB125. Otherwise, no VOCs were detected in the other soil samples collected. Very low level (0.18 mg/kg) DEHP was detected in SB101. Exposure to the low levels of VOCs is not considered a health risk, as stated in the ROD (section X.B). However, the potential for leaching to groundwater persists.

Institutional controls, including land use restrictions to limit the use and disturbance of contaminated soils at the Site and to prevent the use of impacted groundwater, have been fully implemented. Per the ROD, ELURs were required at six parcels. Five ELURs have been implemented. At the sixth, the Tilcon Property, an evaluation was conducted in 2015 by the EPA that determined that an ELUR is no longer necessary on this property to protect human health and the environment. The CT DEEP concurred with EPA's evaluation.

Because the selected remedy for the Site is natural attenuation, no remedial systems require operation and maintenance. The only operation and maintenance activities required at the Site are associated with repairing any damage caused by vandals or natural causes. Access controls at the Site include fencing in as much of the site as feasible, which is provided in the vicinity of the former disposal areas by the new alternative energy facility. Warning signs should also be present in the vicinity of the former disposal areas. Currently, no warning signs are in place at the Site; however, the area of concern is now entirely fenced in by the alternative energy facility. While the Site was frequently utilized by users of recreational vehicles, as a result of the additional restrictions

and activities related to the alternative energy facility, there has been limited trespassing at the Site. Although exposure of trespassers to chemicals is not considered a threat, there is the potential for vandalism of Site wells via access along the railroad line.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the Site.

The data that have been collected since initiation of the long-term monitoring program provide a basis for optimizing data-collection activities and refining estimates of cleanup times. Some suggestions are offered for surface water and groundwater below.

**Surface water**

The purpose of surface water sampling stated in the ROD is to "ensure the surface water has not been adversely impacted (section X.C.ii). No water-quality criteria for surface water are given in the ROD. Sampling of surface water during the monitoring period has confirmed the statement in the ROD that most VOCs in surface water can be attributed to an upstream source in the Fry Brook drainage. Concentrations in Mill Brook downstream of the Site and groundwater plume are typically below detection levels. With the generally low concentrations of VOCs in groundwater, it is unlikely that future discharge from the plume to surface water will cause adverse effects.

Due to these consistently low detections it is recommended that a reduction in the frequency of surface water from annually to once every five years be considered.

**Groundwater**

Sampling has demonstrated that the groundwater plume has remained in a declining or stable position for at least 20 years. The downstream component of groundwater flow shown in Figure 1-5 of the FS is not supported by available water-quality data and appears to be unlikely because of the low hydraulic gradient along the stream. Conceptually, Mill Brook and associated wetlands near the plume are the main discharge areas for groundwater and lateral downstream flow is minimal or absent. Although contaminants have not been detected in wells MW-104S and MW-104TT, these will continue to serve as useful sentinel wells in case hydrologic conditions change and cause changes in groundwater flow patterns.

The ROD states that cleanup will be accomplished within a 27-year period based on results from numerical transport modeling. The model predictions have been reasonably accurate, but the concentrations of VOCs detected in groundwater over time have been variable. The water quality data that have been collected during long-term monitoring should be useful for reassessing the cleanup time frame over time. Consideration should be given to re-calibrating the original model using the LTMP monitoring data to assess the viability of the 27-year cleanup period.

It is recommended that Poly- and perfluoroalkyl substances (PFAS) compounds be included for groundwater sampling at the Site. This emerging contaminant has not yet been investigated at this Site, but may have the potential to be present due to the unknown sources of the waste disposed in Gallup's Quarry.

**QUESTION B:** Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

No. Since the 1997 ROD, there have been changes in exposure assumptions and toxicity data; however, these changes do not impact the protectiveness of the remedy. The ARARs, RAOs, and cleanup levels used at the time of remedy selection are still valid for the site.

**Question B Summary:**

In order to answer Question B in EPA's Comprehensive Five-Year Review Guidance (June 2001), EPA reviewed the 1997 ROD ARARs and revisited the site-specific risk assessments to evaluate the impact of any changes in standards, toxicity factors, exposure assumptions, or site conditions on remedy protectiveness.

**Review of Risk Assessments Serving as the Basis for the Remedies.** An evaluation of changes in toxicity values and other contaminant characteristics, changes to the risk assessment methodology, and changes to exposure assumptions used in the human health and ecological risk assessments for the site was performed. The overall conclusion of this evaluation is that the remedy, as implemented, is protective of human health and the environment.

As summarized in the 1997 ROD, the baseline human health risk assessment (BHHRA) performed in 1997 (QST, 1997) concluded that the following exposure pathway exceeded EPA risk management guidelines:

- Future hypothetical Site worker exposure to groundwater (via ingestion)

It was noted in the 1997 ROD that, although soils do not pose an exposure risk, contaminants may have the potential to leach from soils into groundwater at levels which may cause exceedances of groundwater remediation goals. Therefore, RAOs and cleanup levels were developed for soil within the Former Primary Disposal Area (FPDA) and within the Seepage Bed, based on exceedances of CT Remediation Standard Regulations (RSRs).

**Changes in Risk Assessment Methods**
Since the 2012 FYR, changes have been adopted to the equations used to calculate risks from exposures to soil and groundwater.

In 2014, EPA finalized the Directive to Determine Groundwater Exposure Point Concentrations (EPCs). https://web.archive.org/web/20150912180339/http:/www.epa.gov/oswer/riskassessment/pdf/superfund-hh-exposure/OSWER-Directive-9283-1-42-GWEPC-2014.pdf. This Directive provides recommendations to develop groundwater EPCs. The recommendations in this directive are to calculate the 95% upper confidence limit (95% UCL) of the arithmetic mean concentration for each contaminant from wells within the core/center of the plume, using the statistical software ProUCL. Developing EPCs this way could result in lower groundwater EPCs than the maximum concentrations routinely used for EPCs as past practice in risk assessment, leading to changes in groundwater risk screening and evaluation. In general, this approach could result in slightly lower risk or higher screening levels.

Also in 2014, EPA finalized the Directive on the Update of Standard Default Exposure Factors. https://www.epa.gov/risk/update-standard-default-exposure-factors. Many of these exposure factors differ from those used in the risk assessment supporting the 1997 ROD. These changes in general would result in a slight decrease of the risk estimates for most chemicals.

2015 Vapor Intrusion Technical Guide
In June 2015, EPA finalized the Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air and updated the vapor intrusion screening levels (VISLs) electronic calculator to develop media-specific risk-based VISLs for groundwater, soil gas, and indoor air. These VISLs can be found at the EPA vapor intrusion web page (http://www.epa.gov/vaporintrusion).

Most current Regional Screening Levels (RSLs) tables
These tables are updated twice a year and the most current ones are available at the EPA Regional Screening Levels web page (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/).

Although calculated risks from potential exposure pathways at the Site may differ from those previously estimated, slightly higher for some contaminants and slightly lower for others, the revised methodologies themselves are not expected to affect the protectiveness of the remedy. A review of Site information identifies that these updates do not call into question the protectiveness of the remedy.

While there have been changes in risk assessment methodology, chemical toxicity, and default exposure parameter assumptions since the 1997 ROD, these changes are not anticipated to impact the protectiveness of the remedy. Site groundwater is not being used and there will be a revised risk assessment performed using the most current guidance/methods upon achieving interim cleanup goals for three consecutive years. For soil, the ROD presented risk results for the receptors evaluated in the risk assessment (current future youth trespasser, future site employee, and future excavation worker). Of the results presented, the future ingestion and dermal contact by a Site employee showed the highest risk results for reasonable maximum exposure (RME) calculations (Hazard Index [HI] of 1 and carcinogenic risk of $7.0 \times 10^{-5}$). As there has been remedial action performed at the Site and soil monitoring which has shown reduction in concentrations over time (see Section IV and Appendix D for soil monitoring results), recalculating the baseline risk would not be appropriate. However, comparing the most current soil results to current RSLs which utilize the most current methodologies, exposure assumptions, and chemical toxicity, provides insight into determining if there are any changes in remedy protectiveness as it relates to direct contact of soil.

Of the six (6) indicator analytes monitored (ethylbenzene, tetrachloroethene, trichloroethene, chloromethane, xylenes, and DEHP), only tetrachloroethene (0.048 mg/kg) and trichloroethene (0.02 mg/kg) were detected in one subsurface soil location (SB110 [4-6 ft]) in the most recent monitoring event (November 2016). Trichloroethene (0.001 mg/kg) was also detected in one other location (SB125 - 4-6 ft). No other detections were observed during this monitoring event. Although an exposure point concentration (EPC) would typically involve combining sampling results, this protectiveness evaluation will look at the two maximum detections on their own.

| | 2016 detection (mg/kg) | Residential Soil RSL (mg/kg)[1] | Industrial Soil RSL (mg/kg)[1] |
|---|---|---|---|
| Tetrachloroethene | 0.048 | 8.1 | 39 |
| Trichloroethene | 0.02 | 0.41 | 1.9 |

[1] June 2017 Regional Screening Levels, with non-carcinogen adjustment to a hazard quotient of 0.1

With the maximum detections being below the RSLs, this shows that, based on current monitoring results, no changes to the soil remedy are necessary and protectiveness is maintained. Furthermore, there are no changes to site use assumptions made at the time of the 1997 ROD.

Maximum Contaminant Levels (MCLs) and Connecticut Groundwater Protection Criteria (CT GWPC) for drinking water were selected as groundwater interim cleanup levels for numerous analytes. Refer to the ARARs review section for versions used/selected and determination if changes have occurred in these values.

With respect to vapor intrusion, the previous FYR noted that the highest detections of VOCs were well downgradient of any structures being constructed for an alternative energy facility or other use. Groundwater monitoring results from the past five years (2012 to 2016) were compared to vapor intrusion screening levels (VISLs) developed using the most current version of EPA's VISL calculator (v3.5.1, using May 2016 RSLs; see Section IV and Appendix D for tabulated groundwater monitoring results versus VISLs). There were three wells which showed exceedances of the TCE screening value associated with a cancer risk of $1 \times 10^{-6}$ (1.2 ug/L). All three exceedances were in 2013 and monitoring since that time has shown concentrations below the screening value. Vinyl chloride has been detected in four wells in the past five years, with all detections above the screening value associated with a cancer risk of $1 \times 10^{-6}$ (0.15 ug/L). All detections were in deeper wells, with the shallowest screen being at 23 feet bgs and the shallower wells in the cluster not showing detections. Furthermore,

only one well (MW-107TT) showed a detection in 2016 (4.6 ug/L) which was above the screening level associated with a cancer risk of 1 x $10^{-5}$ (1.5 ug/L). Similar to the previous FYR, the remedy appears to remain protective regarding the vapor intrusion exposure pathway. Groundwater will continue to be monitored and results evaluated in future FYRs until cleanup levels are met, at which time the risk assessment will be updated. Additionally, if land use or conditions were to change, further evaluation of the VI pathway may be required.

The 1997 Baseline Environmental Risk Assessment (BERA) concluded no unacceptable risk to ecological receptors due to site-related contamination. Long-term surface water monitoring is being performed to evaluate groundwater impacts (if any) to surface water. There have been no exceedances of monitoring standards (see Section IV and Appendix D). Therefore, the remedy remains protective.

**Changes in Toxicity and Other Contaminant Characteristics**
While there have been revisions to recommended toxicity values (see table below) and exposure parameters based on EPA guidance since the 1997 ROD, they do not impact the protectiveness of the remedy, based on a comparison of recent monitoring results to current risk-based screening values.

Lead
In the December 22, 2016 OLEM memorandum entitled "Updated Scientific Considerations for Lead in Soil Cleanups" (OLEM Directive 9200.2-167), EPA recognizes that there is sufficient evidence to support an association between adverse health effects and blood lead levels (BLLs) less than 10 µg/dL. The memo mentioned that several studies have observed "clear evidence of cognitive function decrements in young children with mean or group BLLs between 2 and 8 µg/dL." Lead was identified as a COC for groundwater, with an Interim Cleanup Level of 15 µg/L, however, groundwater is not used as a drinking water source and groundwater use restrictions are in place. Therefore, this change would not be expected to impact the protectiveness of the remedy.

2011 Methylene Chloride cancer and non-cancer toxicity values
On November 18, 2011, EPA finalized the toxicity assessment for methylene chloride. The new values indicate that methylene chloride is more toxic from non-cancer health effects but less toxic from cancer health effects. These toxicity changes would result in an increased non-cancer hazard and a decreased cancer risk from exposure to methylene chloride.

2012 PCE cancer and non-cancer toxicity values
On February 10, 2012, EPA finalized the cancer and non-cancer toxicity values for PCE. The new values indicate that PCE is less toxic from cancer health effects, but more toxic from non-cancer health effects. These toxicity changes would result in a decreased cancer risk and an increased non-cancer risk from exposure to PCE.

2011 TCE cancer and non-cancer toxicity values
On September 28, 2011, EPA finalized the December 2009 revised toxicity values for TCE. The new values indicate that TCE is more toxic from both cancer and non-cancer health effects. These toxicity changes would result in increased non-cancer hazard and cancer risk from exposure to TCE.

Vanadium and Compounds non-cancer toxicity values
In 2013, the inhalation reference concentration (RfC) for vanadium and compounds was updated to 1.0E-04 $mg/m^3$ based on an ATSDR update. Previously, there was no RfC value for vanadium and compounds. This change would not be expected to affect the protectiveness of the remedy because there is no exposure to vanadium via an inhalation pathway.

2016 Perfluorooctanoic Acid (PFOA)/Perfluorooctane Sulfonate (PFOS) non-cancer toxicity value
On May 19, 2016, EPA issued final lifetime drinking water health advisories for PFOA and PFOS, which identified chronic oral reference dose (RfD) values of 2E-05 mg/kg-day (USEPA, 2016a and USEPA, 2016b).

These RfD values should be used when evaluating potential risks from ingestion of contaminated groundwater at Superfund sites where PFOA and PFOS might be present based on site history. Potential estimated health risks from PFOA and PFOS, if identified, would likely increase total site risks due to groundwater exposure. However, groundwater is not being used at the Site as drinking water and there is no known current exposure to PFOA and PFOS in groundwater. This does not affect the protectiveness of the remedy issued in the ROD.

2014 Perfluorobutanesulfonic Acid (PFBS) non-cancer toxicity value

PFBS has a chronic oral RfD of 2E-02 mg/kg-day based on an EPA Provisional Peer Reviewed Toxicity Value (PPRTV) (USEPA, 2014). This RfD value should be used when evaluating potential risks from ingestion of contaminated groundwater at Superfund sites where PFBS might be present based on site history. Potential estimated health risks from PFBS, if identified, would likely increase total site risks due to groundwater exposure. However, groundwater is not being used at the Site as drinking water and there is no known current exposure to PFBS in groundwater. This does not affect the protectiveness of the remedy issued in the ROD.

**Changes in Toxicity values**

| **Chemical** | **Original Toxicity Value in ROD** | **Current Toxicity Value** | **Risk Higher or Lower?** |
|---|---|---|---|
| Arsenic | Cancer Slope Factor (CSF) = 2.0E+00 per mg/kg-day<br><br>RfD = 3.0E-04 mg/kg-day | CSF = 1.5E+00 per mg/kg-day<br><br>RfD = 3.0E-04 mg/kg-day | Cancer risk lower<br><br>No change in non-cancer risk |
| Benzene | CSF = 2.9E-02 per mg/kg-day | CSF = 5.5E-02 mg/kg-day | Cancer risk higher |
| 1,1-Dichloroethene | CSF = 6.0E-01 per mg/kg-day<br><br>RfD = 9.0E-03 per mg/kg-day | CSF = No value<br><br>RfD = 5.0E-02 mg/kg-day | Cannot assess cancer risk<br><br>Non-cancer risk lower |
| 1,2-Dichloroethane | CSF = 9.1E-02 per mg/kg-day | CSF = 9.1E-02 per mg/kg-day | No change in cancer risk |
| Cis-1,2-Dichloroethylene | CSF = no value<br><br>RfD = 9.0E-03 mg/kg-day | CSF = no value<br><br>RfD = 2.0E-03 mg/kg-day | No change in cancer risk<br><br>Non-cancer risk higher |
| Methylene Chloride | CSF = 7.5E-03 per mg/kg-day<br><br>RfD = 6.0E-02 mg/kg-day | CSF = 2.0E-03 per mg/kg-day<br><br>RfD = 6.0E-03 mg/kg-day | Cancer risk lower<br><br>Non-cancer risk higher |
| PCE | CSF = 5.2E-02 per mg/kg-day<br><br>RfD = 1.0E-02 mg/kg-day | CSF = 2.1E-03 per mg/kg-day<br><br>RfD = 6.0E-03 mg/kg-day | Cancer risk lower<br><br>Non-cancer risk higher |
| TCE | CSF = 1.1E-02 per mg/kg-day<br><br>RfD = 6.0 mg/kg-day E-03 | CSF = 4.6E-02 per mg/kg-day<br><br>RfD = 5.0E-04 mg/kg-day | Cancer risk higher<br><br>Non-cancer risk higher |

| Chemical | Original Toxicity Value in ROD | Current Toxicity Value | Risk Higher or Lower? |
|---|---|---|---|
| Vinyl Chloride | CSF = 1.9E+00 per mg/kg-day<br><br>RfD = no value | CSF = 7.2E-01 per mg/kg-day<br><br>RfD = 3.0E-03 mg/kg-day | Cancer risk lower<br><br>NA |
| Bis(2-ethylhexyl)phthalate | CSF = 1.4E-02 per mg/kg-day<br><br>RfD = 2.0E-02 mg/kg-day | CSF = 1.4E-02 per mg/kg-day<br><br>RfD = 2.0E-02 mg/kg-day | No change in cancer risk<br><br>No change in non-cancer risk |
| Lead | NA | NA | NA |
| 1,1,1-trichloroethane | CSF = no value<br><br>RfD = no value | CSF = no value<br><br>RfD = 2.0E+00 | NA<br><br>NA |
| xylene (total) | CSF = no value<br><br>RfD = 2.0E+00 | CSF = no value<br><br>RfD = 2.0E-01 | NA<br><br>Non-cancer risk higher |
| Chromium VI | CSF = no value<br><br>RfD = 5.0E-03 mg/kg-day | CSF = no value<br><br>RfD = 3.0E-03 mg/kg-day | NA<br><br>Non-cancer risk higher |
| Vanadium | CSF = no value<br><br>RfD = no value | CSF = no value<br><br>RfD = 5.0E-03 mg/kg-day | NA<br><br>NA |

**ARARs and TBCs Review.** A review of Applicable or Relevant and Appropriate Requirements (ARARs) was performed to check the impact on the remedy protectiveness due to any changes in standards that were identified as ARARs in the 1997 ROD, newly promulgated standards, and/or changes in TBCs (to be considered). No changes have been identified that impact the current protectiveness of the remedy. A discussion of the review is summarized below.

The ARARs and TBCs identified for the selected remedy include:

Chemical-Specific:

- Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs)
- Connecticut Groundwater Quality Standards
- Connecticut Standards for Public Drinking Water Quality
- Connecticut Remediation Standards Regulations (CT RSRs) – Groundwater and Surface Water Protection Criteria (GWPC and SWPC) and Groundwater Volatilization Criteria (VC)
- CT RSRs – Soil Direct Exposure Criteria (DEC) and Pollutant Mobility Criteria (PMC)

Action-Specific:

- Resource Conservation and Recovery Act (RCRA) Closure/Post-Closure Requirements for Hazardous Waste Landfills and Groundwater Limits for Hazardous Constituents
- Connecticut Hazardous Waste Management Requirements
- Connecticut Control of Noise Regulations
- Connecticut Regulations for the Well Drilling Industry

Location-Specific:

- Federal Clean Water Regulations governing activities in Wetlands
- Federal Executive Order 11990 (Protection of Wetlands)
- Federal Executive Order 11988 (Floodplains Protection)
- Connecticut Aquifer Protection Areas
- Connecticut Public Health Code
- Connecticut Surface Water and Wetlands – Inland Wetlands and Watercourses Regulations
- Connecticut Environmental Land Use Restriction Regulations

Additional policies, criteria, and guidance were identified in the ROD as TBC, including:

- Federal Drinking Water Health Advisories
- Federal Water Quality Criteria
- Federal Groundwater Protection Strategy
- Federal Groundwater Use and Value Determination

The following table lists the Interim Groundwater Cleanup Levels from the 1997 ROD and confirms that the cleanup levels identified in the ROD are still valid. While the CT RSRs were amended effective June 27, 2013, no changes were identified for the groundwater COCs with cleanup levels. Similarly, no changes were identified in EPA or Connecticut MCLs and MCLGs and Connecticut Groundwater Quality Standards that would impact Interim Groundwater Cleanup Levels.

**Table 3: Review of Interim Groundwater Cleanup Levels and Changes to ARARs**

| Contaminants of Concern | Interim Groundwater Cleanup Level from ROD (ug/L) | Basis for Interim Groundwater Cleanup Level | Current CT Regulation (ug/L) | Additional or Alternative CT Criteria* | Implication for ARAR |
|---|---|---|---|---|---|
| Benzene | 1 | CT GWPC | 1 | | No change to ARAR |
| Bis(2-ethylhexyl) phthalate | 2 | CT GWPC | 2 | | No change to ARAR |
| Chromium | 50 | CT GWPC | 50 | | No change to ARAR |
| 1,1-Dichloroethene | 6 | CT Vol. Criteria (Industrial/ Commercial) | 6 | Previous FYR noted a revised Res GWVC of 190; this value was not adopted with the 2013 amended CT RSRs; current Res GWVC is unchanged from 1996 value of 1 ppb | No change to ARAR |
| 1,2-Dichloroethane | 1 | CT GWPC | 1 | Previous FYR noted a revised Res GWVC of 6.5; this value was not adopted with the 2013 amended CT RSRs; current Res GWVC is unchanged from 1996 value of 21 ppb | No change to ARAR |

| Contaminants of Concern | Interim Groundwater Cleanup Level from ROD (ug/L) | Basis for Interim Groundwater Cleanup Level | Current CT Regulation (ug/L) | Additional or Alternative CT Criteria* | Implication for ARAR |
|---|---|---|---|---|---|
| 1,2-Dichloroethene (DCE) | 70 | CT GWPC (ROD Table 5 notes that specific cleanup levels are 70 ppb for cis-1,2-DCE and 100 ppb for trans-1,2-DCE) | 70 | Previous FYR noted additional Res and I/C GWVC for cis-1,2-DCE and trans-1,2-DCE; these values were not adopted with the 2013 amended CT RSRs; there are no current GWVC | No change to ARAR |
| Lead | 15 | CT GWPC/ EPA Action Level | 15 | | No change to ARAR |
| Methylene chloride | 5 | CT GWPC & EPA MCL | 5 | | No change to ARAR |
| Tetrachloroethene (PCE) | 5 | CT GWPC & EPA MCL | 5 | | No change to ARAR |
| 1,1,1-Trichloroethane | 200 | CT GWPC & EPA MCL | 200 | | No change to ARAR |
| Trichloroethene | 5 | CT GWPC & EPA MCL | 5 | | No change to ARAR |
| Vanadium | 50 | CT GWPC | 50 | | No change to ARAR |
| Vinyl chloride | 2 | CT GWPC & EPA MCL | 2 | Previous FYR noted a revised Res GWVC of 1.6; this value was not adopted with the 2013 amended CT RSRs; current Res GWVC is unchanged from 1996 value of 2 ppb | No change to ARAR |
| Xylene (total) | 530 | CT GWPC | 530 | | No change to ARAR |

* Additional or Alternative CT RSR Criteria had previously been published by CT in a list of revisions; however, these criteria were either incorporated into the 2013 amended CT RSRs or no longer exist.
ARAR – Applicable or Relevant and Appropriate Requirement
ROD – Record of Decision
GWPC – Connecticut Groundwater Protection Criteria for drinking water
GWVC or Vol. Criteria – Connecticut Volatilization Criteria for groundwater that is protective of indoor air
Res – Residential
I/C – Industrial/Commercial
EPA MCL – Federal Maximum Contaminant Level for drinking water

The previous five-year review noted that while arsenic was not identified in the ROD as a COC, the MCL for arsenic was subsequently lowered from 50 ug/L to 10 ug/L, below the maximum concentration detected prior to the ROD of 16.5 ug/L. Based on a recommendation in the previous five-year review, arsenic was incorporated into the groundwater sampling program beginning with the November 2013 sampling event. Three monitoring wells (MW-102 TT, MW-105 TT, and MW-107 TT) that historically contained greater than 10 ug/L arsenic are currently sampled for arsenic among other parameters. Exceedances of the arsenic MCL were detected at well MW-102 TT in 2013, 2014, and 2015, while the 2016 result was just under the MCL at 9 ug/L. Arsenic MCL exceedances were also detected at well MW-107 TT in 2013 and 2014. Arsenic results for MW-105 TT were below the MCL during the 2013 to 2016 events. In general, the data shows decreasing concentrations of arsenic

in groundwater. Arsenic should continue to be monitored and it should be determined whether to add arsenic to the ROD COC list as an ARAR.

The previous five-year review also noted a new CT Action Level for 1,4-dioxane of 3 ug/L. Sampling for 1,4-dioxane was conducted in 2013 and then discontinued based on a lack of significant detections in groundwater downgradient from the site. It is not recommended that this chemical be added to the ROD COC list as an ARAR.

In 2016, EPA issued lifetime, drinking water Health Advisories (HAs) for PFOS and PFOA at 0.070 ug/L. The HA applies to each chemical separately; however, EPA further recommended comparing the sum of the PFOS and PFOA concentrations to the HA value when both are found together. While Health Advisories for drinking water were included in the ROD as a To Be Considered requirement they are not an enforceable standard for action. These two compounds are part of a much larger class of Poly- and Perfluoroalkyl Substances (PFASs) that are considered Emerging Contaminants. There is also a new CT DPH Action Level of 0.07 ug/L for PFASs that was added in November 2016. For comparison to this Action Level, PFASs are calculated as the sum of PFOS, PFOA, perfluorononanoic acid (PFNA), perfluorohexanesulfonate (PFHxS), and perfluoroheptanoic acid (PFHpA). PFASs have not been sampled to date at the Gallup's Quarry Site.

The following table lists the Unsaturated Soil Cleanup Levels from the 1997 ROD and confirms that the cleanup levels identified in the ROD are still valid. While the CT RSRs were amended effective June 27, 2013, no changes were identified for the soil COCs with cleanup levels. The source of the cleanup level for chloromethane cannot be confirmed, since neither the original 1996 CT RSRs or the current amended CT RSRs include Pollutant Mobility Criteria (PMC) for chloromethane.

**Table 4: Review of Unsaturated Soil Cleanup Levels and Changes to ARARs**

| Contaminants of Concern | Unsaturated Soil Cleanup Level from ROD (mg/kg) | Basis for Unsaturated Soil Cleanup Level | Current CT Regulation (mg/kg) | Implication for ARAR |
|---|---|---|---|---|
| Bis(2-ethylhexyl) phthalate | 10* | CT PMC (FPDA) | 10 | No change to ARAR |
| Bis(2-ethylhexyl) phthalate | 1 | CT PMC (FSB) | 1 | No change to ARAR |
| Chloromethane | 0.01 | CT PMC | None | There is no current GA PMC for this compound; Cannot confirm source of original ARAR |
| Ethylbenzene | 10.1 | CT PMC | 10.1 | No change to ARAR |
| Tetrachloroethene (PCE) | 0.1 | CT PMC | 0.1 | No change to ARAR |
| Trichloroethene (TCE) | 0.1 | CT PMC | 0.1 | No change to ARAR |
| Xylenes (total) | 19.5 | CT PMC | 19.5 | No change to ARAR |

* Value for FPDA calculated by multiplying pollutant mobility criterion by 10X dilution factor, pursuant to Section 22a-133k-2(c)(2)(C) of Connecticut Remediation Standard Regulations
ARAR – Applicable or Relevant and Appropriate Requirement
FPDA – Former Primary Disposal Area

FSB – Former Seepage Bed
ROD – Record of Decision
PMC – Pollutant Mobility Criteria protective of soil leaching to groundwater

No revisions have been made to the relevant and appropriate portions of RCRA (40 CFR 264 Subparts F and G) since 2006 (prior to the second five-year review) and previous five-year reviews did not identify any changes that impact the remedy for this Site.

No revisions have been made to the applicable portions of the Connecticut Hazardous Waste Management Requirements (RCSA 22a-449(c)100-102, 104, 105) since 2002. As documented in the previous five-year review, none of the earlier revisions that followed the 1997 ROD impact the remedy being implemented at the Site.

State of Connecticut regulations governing the well drilling industry and noise generation were identified as applicable to the installation of monitoring wells; however, there are no plans for well installation and, therefore, the requirements associated with these regulations are not applicable at this time. Similarly, federal floodplain and wetlands protection requirements were identified as potentially applicable to well drilling efforts, but are not considered applicable at this time.

**QUESTION C:** Has any **other** information come to light that could call into question the protectiveness of the remedy?

No. From all of the activities conducted as part of this five-year review, no new information has come to light which would call into question the effectiveness of the remedy or its short-term protectiveness of human health and the environment. The southwestern two thirds of the Site have been redeveloped as an Alternative Energy Facility. This redevelopment does not impact the effectiveness of the remedy. No other changes in land use within the Site groundwater plume or human and ecological receptors have occurred during the review period that would affect the appropriateness of exposures evaluated in the RI/FS risk assessment. No evidence of damage due to natural disasters was noted during the Site inspection.

# VI. ISSUES/RECOMMENDATIONS

**Issues/Recommendations**

**Issues and Recommendations Identified in the Five-Year Review:**

| OU(s): 1 | **Issue Category: Monitoring** | | | |
|---|---|---|---|---|
| | **Issue:** The MCL for arsenic has been lowered since the ROD and some recent arsenic detections in groundwater exceed the current MCL. | | | |
| | **Recommendation:** Continue to monitor for arsenic in groundwater. Based on recent and future sampling results, make a determination as to whether to add arsenic as a COC and establish an ARAR-based interim cleanup level. | | | |
| **Affect Current Protectiveness** | **Affect Future Protectiveness** | **Party Responsible** | **Oversight Party** | **Milestone Date** |
| No | Yes | PRP | EPA/State | 9/30/2022 |
| **OU(s): 1** | **Issue Category: Monitoring** | | | |
| | **Issue:** PFAS are emerging contaminants that have not been sampled for at this Site, but have the potential to be present due to the indefinite sources of the waste disposed in Gallup's Quarry. | | | |
| | **Recommendation:** Include PFAS in a future groundwater sampling event. | | | |
| **Affect Current Protectiveness** | **Affect Future Protectiveness** | **Party Responsible** | **Oversight Party** | **Milestone Date** |
| No | Yes | PRP | EPA/State | 12/31/2018 |

## OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR, but do not affect current and/or future protectiveness:

- Although posting of warning signs and periodic maintenance of them is included in the ROD, no signs were located during the site inspection. Since the areas of concern are no longer accessible due to the location of the new alternative energy plant, this is not considered a significant issue.
- The ROD estimated cleanup period of 27 years, based on numerical transport modeling. Consideration should be given to re-calibrating the original model using the LTMP monitoring data collected to date to assess the viability of meeting this cleanup period.

# VII. PROTECTIVENESS STATEMENT

| Protectiveness Statement(s) | |
|---|---|
| *Operable Unit:* | *Protectiveness Determination:* |
| OU1 | Short-term Protective |

*Protectiveness Statement:*

The remedy at OU1 (the only Operable Unit) currently protects human health and the environment in the short-term because 1) institutional controls are in place and 2) there are no current exposures to Site media containing contaminant concentrations exceeding applicable clean up criteria. However, in order for the remedy to be protective in the long-term, additional groundwater monitoring for arsenic is warranted to verify that levels are trending below the revised MCL of 10 ppb and PFAS compounds should be included in a future groundwater sampling event to determine if they are present at the Site.

| Sitewide Protectiveness Statement |
|---|
| *Protectiveness Determination:* |
| Short-term Protective |

*Protectiveness Statement:*

The Sitewide remedy currently protects human health and the environment because 1) institutional controls are in place and 2) there are no current exposures to Site media containing contaminant concentrations exceeding applicable clean up criteria. However, in order for the remedy to be protective in the long-term, additional groundwater monitoring for arsenic is warranted to verify that levels are trending below the revised MCL of 10 ppb and PFAS compounds should be included in a future groundwater sampling event to determine if they are present at the Site.

# VIII. NEXT REVIEW

The next five-year review report for the Gallup's Quarry Superfund Site will be completed by September 14, 2022.

# APPENDIX A – REFERENCE LIST


Hall & Wilson LLC. 2017. Groundwater Monitoring Report: November 2016 Gallup's Quarry Superfund Project. February.

Hall & Wilson LLC. 2016. Groundwater Monitoring Report: November 2015 Gallup's Quarry Superfund Project. February.

Hall & Wilson LLC. 2015. Groundwater Monitoring Report: November 2014 Gallup's Quarry Superfund Project. January.

Hall & Wilson LLC. 2014. Groundwater Monitoring Report: November 2013 Gallup's Quarry Superfund Project. January.

QST Environmental. 1997. Remedial Investigation Report. Gallup's Quarry. June.

United States Environmental Protection Agency (USEPA). 2017. Regional Screening Level Tables. June 2017. https://www.epa.gov/risk/regional-screening-levels-rsls

USEPA. 2016a. Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). Office of Water. EPA 822-R-16-005. May 2016.

USEPA. 2016b. Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). Office of Water. EPA 822-R-16-004. May 2016.

USEPA. 2015. Gallup's Quarry Superfund Site, Plainfield, CT Completion of Institutional Controls under the September 1997 ROD. June.

USEPA. 2014a. Provisional Peer-Reviewed Toxicity Values for Perfluorobutane Sulfonate (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3). Superfund Health Risk Technical Support Center. Final 7-17-2014.

USEPA. 2012. Third Five-Year Review Report for Gallup's Quarry Superfund Site. September.

USEPA. 2002. First Five-Year Review Report for Gallup's Quarry Superfund Site. September.

USEPA. 1997. EPA Superfund Record of Decision for Gallup's Quarry Superfund Site. September.

# APPENDIX B – FIGURES

**Figure 1. Location map Gallup's Quarry Superfund Site, Plainfield, Connecticut**

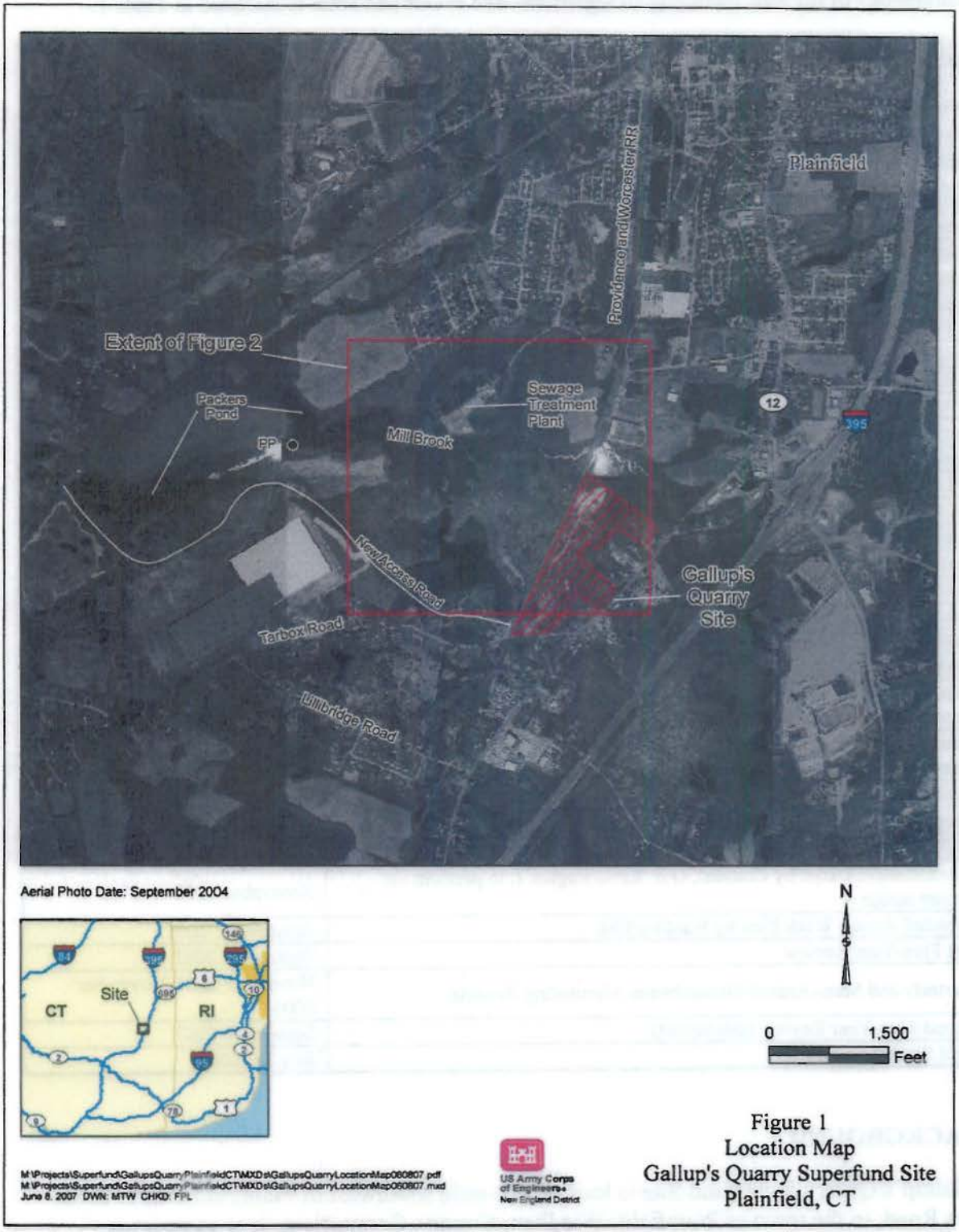
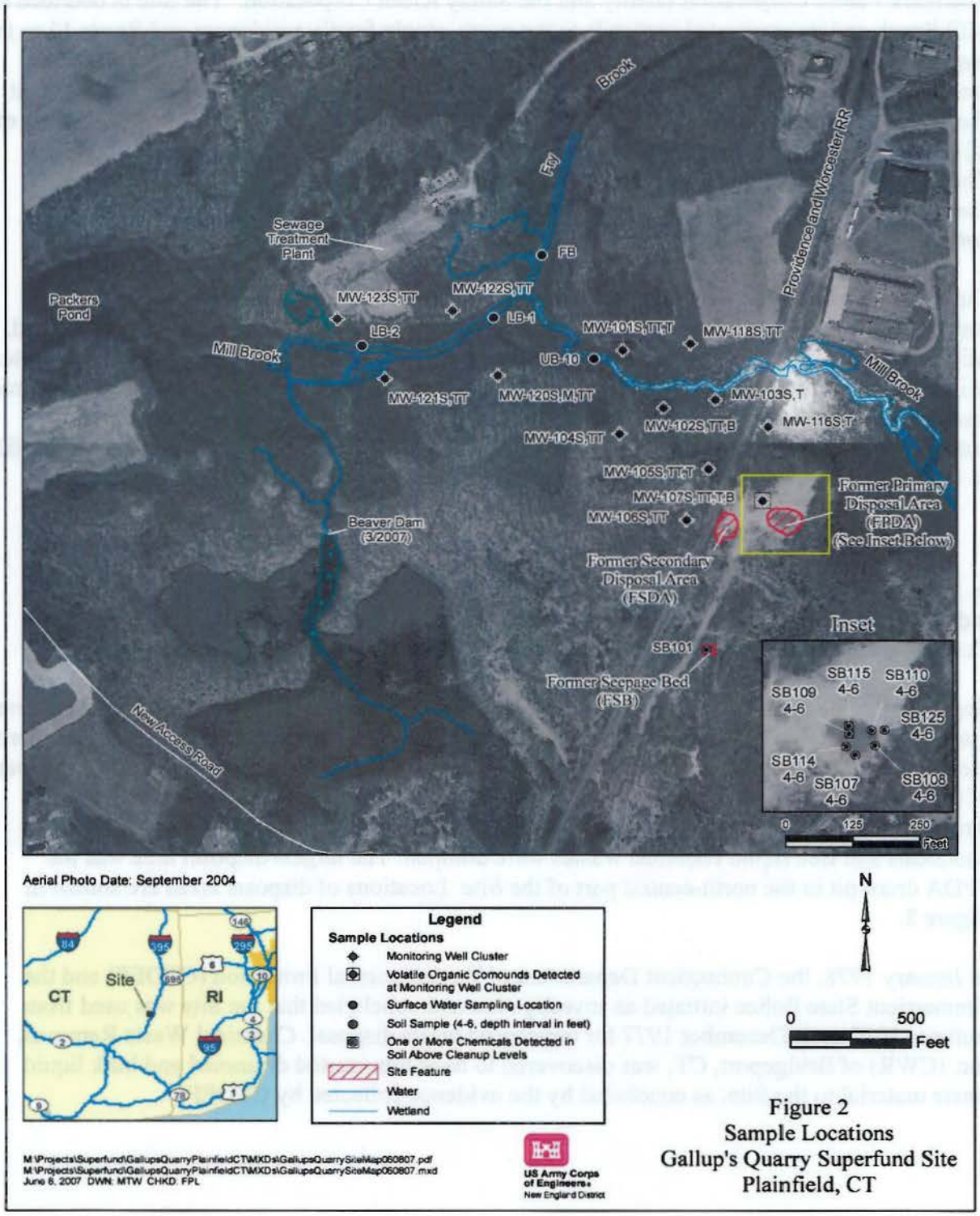


**Figure 2. Sample locations, Gallup's Quarry Superfund Site, Plainfield, Connecticut.**



# APPENDIX C – INSTITUTIONAL CONTROLS

United States Environmental Protection Agency
New England, Region I
5 Post Office Square, Suite100, Mailbox OSSR07-4
Boston, MA 02109-3912

MEMORANDUM

Date: June 1, 2015

Subj: Gallup's Quarry Superfund Site, Plainfield, CT
Completion of Institutional Controls under the September 1997 ROD

From: Leslie McVickar, Project Manager
RuthAnn Sherman, Senior Enforcement Counsel

To: File

Summary

This memorandum documents the evaluation and determination that all components of the Institutional Control requirement established for the Gallup's Quarry Superfund Site, pursuant to the September 30, 1997 ROD, have been satisfied. Environmental Land Use Restrictions (ELURs) were required at six parcels with documented volatile organic compounds (VOCs), semi-VOCs, and/or inorganic contamination in groundwater at concentrations exceeding safe drinking water standards (Plate 1). To date, ELURs have been established at all but one parcel.

Despite the Settling Defendants' best efforts under the 1999 Consent Decree, no ELUR has been recorded for a portion of the Site known as Lot 8, owned by Tilcon Inc. (Plate 1). However, groundwater monitoring data collected over a 17 year period documents the absence of any VOCs previously detected at this location during the RI/FS. In addition, there has been no exceedance of groundwater cleanup standards for the remaining contaminants of concern (COCs) on Tilcon's parcel. It should also be noted that VOCs have not been detected in monitoring wells at any downgradient sentry locations.

Groundwater contaminants at the Site have been successfully reduced over time through natural attenuation processes. The institutional control contemplated for the Tilcon property is no longer required or necessary to protect human health and the environment. EPA will evaluate all future long-term monitoring results to ensure that there are no unanticipated future conditions which might warrant implementation of additional Institutional Control measures at the Site.

On May 5, 2015 the Connecticut Department of Energy and Environmental Protection (CT DEEP) concurred with the above decision, provided that EPA continues to evaluate all future long-term monitoring results to ensure that there are no unanticipated future conditions which might warrant implementation of additional institutional control measures at the Site.

## Background

### *Site Location and Description*

The Gallup's Quarry Superfund Site is located at 86 Tarbox Road, approximately one mile south of the Town of Plainfield, Windham County, Connecticut (Figure 1). The Site is bounded by Mill Brook and its associated wetlands to the north, single family residences to the east, an active railroad (Providence and Worcester Railroad) and woodlands to the west, and single family residences to the south. While the Site is industrially zoned, the land use in the surrounding area is a mix of residential, agricultural, and light industrial. The majority of the Site is currently vacant open land, and much of it is heavily vegetated. A new wood burning (green energy) facility has been constructed on a portion of the Site that is closest to its entrance on Tarbox Road. This facility is currently operational.

All nearby homes are connected to public water and sewer. Groundwater at the Site is classified by the State of Connecticut as GA impaired, which means that the groundwater may not be suitable for direct human consumption without treatment. The State's goal is to restore the groundwater to drinking water quality. Surface water bodies located within or near the Site are classified as B/A, which indicates that these water bodies may not be meeting Class A water quality criteria but are suitable for cold water fisheries.

### *Site History*

Limited information is available regarding the early operational history of the Site. Historical aerial photographs and town records indicate that from 1951 to 1964 the Site was operated as a sand and gravel quarry. In 1964 C. Stanton Gallup purchased the property and initiated his own sand and gravel operation. Mr. Gallup teamed with a chemical waste removal company to operate a similar business. An unknown quantity of bulk liquid wastes were disposed of by the industrial waste removal company at three locations on the property. Half buried barrels were discovered and all operations at the Site were shut down by the Connecticut Department of Energy and Environmental Protection (CT DEEP).

CT DEEP's initial investigation of the Site concluded that the waste disposal consisted primarily of VOCs and metals which had contaminated groundwater, soil, and adjacent surface water at unacceptable concentrations. CT DEEP performed an emergency cleanup effort during the summer of 1978 which included the removal and off-site disposal of 1,584 drums, 5,000 gallons of free liquid, and 2,277 cubic yards of contaminated soil from three distinct locations on the Site. The Site remained vacant until subsequent sampling performed by CT DEEP led to a limited Site Investigation by EPA to evaluate the Site with respect to conditions for additional removal actions under the NCP. As a result, on October 4, 1989 the Site was listed on the NPL.

### *Enforcement History*

In 1993, EPA notified forty parties, as either an owner operator of the facility or as generators of wastes that were disposed of at the Site, of their potential liability with respect to the Site.

Thereafter, negotiations commenced with these potentially responsible parties (PRPs) regarding the settlement of the PRP's liability at the Site.

On September 7, 1993, EPA and twenty-three PRPs, entered into an Administrative Order by Consent, U.S. EPA Region I CERCLA Docket No. I-93-1080 for the performance of a remedial investigation and feasibility study (RI/FS). EPA also recovered past costs from the same parties under a separate Administrative Order by Consent, U.S. EPA Region I CERCLA Docket No. I-93-1079. The payment fully satisfied their civil liability under CERCLA §107(a) for response costs in connection with the Site as of February 28, 1993.

*Remedial Action*

The Record of Decision was issued on September 30, 1997. The major components of the selected source control remedy include: institutional controls including land use restrictions to limit the use and disturbance of contaminated soils at the Site, posting warning signs, periodic maintenance of warning signs and entry gate, and periodic sampling and analysis of contaminated unsaturated soils for contaminants of concern. The major components of the selected groundwater remedy include institutional controls, including land use restrictions to prevent future use of impacted groundwater until Interim Groundwater Cleanup Levels are met; and long term monitoring of groundwater and surface water quality to assess compliance with groundwater cleanup levels and to ensure that surface water has not been adversely impacted.

Site Progress Since ROD Implementation

The Site achieved construction completion with the signing of the ROD, which was the trigger date for the First Five-Year Review completed in August 2002. The most recent Third Five-Year Review Report was completed in September 2012, and documents that the remedy is protective of human health and the environment in the short-term based on a lack of current use or exposure to Site media containing contaminant concentrations exceeding applicable criteria. Long-term protectiveness was noted as being deferred until all institutional controls are implemented.

Based on a comparison of all current data with historical analytical results, monitored natural attenuation continues to be an appropriate remedy for this Site. Overall, total VOC concentration trends throughout the last 17 years in core plume wells demonstrate the significant and continuing decrease in VOC concentrations in the groundwater downgradient of the former Site source areas. Table 1 shows VOC concentrations detected in the latest 2014 monitoring report, and Plates 4, 5 and 6 show the VOC concentration trends throughout the last 17 years in the core plume wells, as shown on Figure 2 (MW-102S, MW-102-TT, MW-105-TT, MW 105-T, MW-102TT and MW-102S). Changes in the plume are generally occurring according to the predictive results of the hydrogeologic computer model developed during the RI/FS in support of remedy selection. Long-term monitoring data demonstrates that the 27-year cleanup goal stated in the ROD will likely be accomplished.

Institutional Controls and Best Efforts

Section IX, Paragraph 27 of the 1999 Consent Decree requires that the PRPs use "Best Efforts" to secure both necessary access and/or land and water use restrictions. The Statement of Work

(SOW) that accompanied the Consent Decree outlined the institutional controls remedial process. The PRPs had to prepare and submit an Access and Institutional Controls Plan. That plan contemplated the use of an ELUR as an effective institutional control mechanism as provided in Connecticut law and regulations. The attached exhibit provides he proposed ELUR language included in this plan. As defined in Section IV, Paragraph 4, of the Consent Decree, "Best Efforts" is defined as "including the payment of reasonable sums of money in consideration of securing access, access easements, land or water use restrictions, and/or restrictive easements." Accordingly, the PRPs were successful in securing both access and ELURs for all but one of the required properties, owned by Tilcon, Inc.

The PRPs were initially able to obtain the necessary access from Tilcon. However, despite their extensive efforts to work cooperatively with both Tilcon and the CT DEEP, they were unable to reach a collective agreement on the terms of the ELUR. Included in their effort was the PRP's agreement to provide a $20,000 payment to Tilcon in exchange for the ELUR (a check which was actually sent to Tilcon). Negotiations between the parties occurred over a period of many years and largely pertained to the exact language of the ELUR. Upon ultimately receiving pre-approval of the negotiated language from CT DEEP, Tilcon determined that the language was still unacceptable and returned the check to the PRPs with additional ELUR edits that were deemed unacceptable to CT DEEP.

EPA has determined that the PRPs efforts to obtain an ELUR from Tilcon has satisfied the "Best Efforts" standard set forth in the Consent Decree for this Site. Furthermore, Remedial Action sampling to date has demonstrated that: 1) VOC contamination has not been detected above federal and state groundwater drinking water standards on Tilcon property for a period of at least ten years, and 2) there are no cleanup standard exceedances for the remaining contaminants of concern.

Data collected during the Remedial Action indicates that natural attenuation processes have greatly reduced the contaminated plume and that groundwater underlying the Tilcon property is no longer contaminated above the ROD cleanup standards. Therefore an ELUR on this property is technically no longer necessary to satisfy the underlying intent of this requirement of being protective of human health and the environment. The plume reduction has been well defined and provides adequate assurance that Site contamination is unlikely to impact the Tilcon property in the future.

**FIGURE 1: Location map Gallup's Quarry Superfund Site, Plainfield, Connecticut**


Aerial Photo Date: September 2004


N

0 1,500 Feet

M:\Projects\Superfund\GallupsQuarryPlainfieldCT\MXDs\GallupsQuarryLocationMap060807.pdf
M:\Projects\Superfund\GallupsQuarryPlainfieldCT\MXDs\GallupsQuarryLocationMap060807.mxd
June 8, 2007 DWN: MTW CHKD: FPL

US Army Corps of Engineers
New England District

Figure 1
Location Map
Gallup's Quarry Superfund Site
Plainfield, CT

**FIGURE 2: Monitoring Well Locations and ELUR Property boundaries**

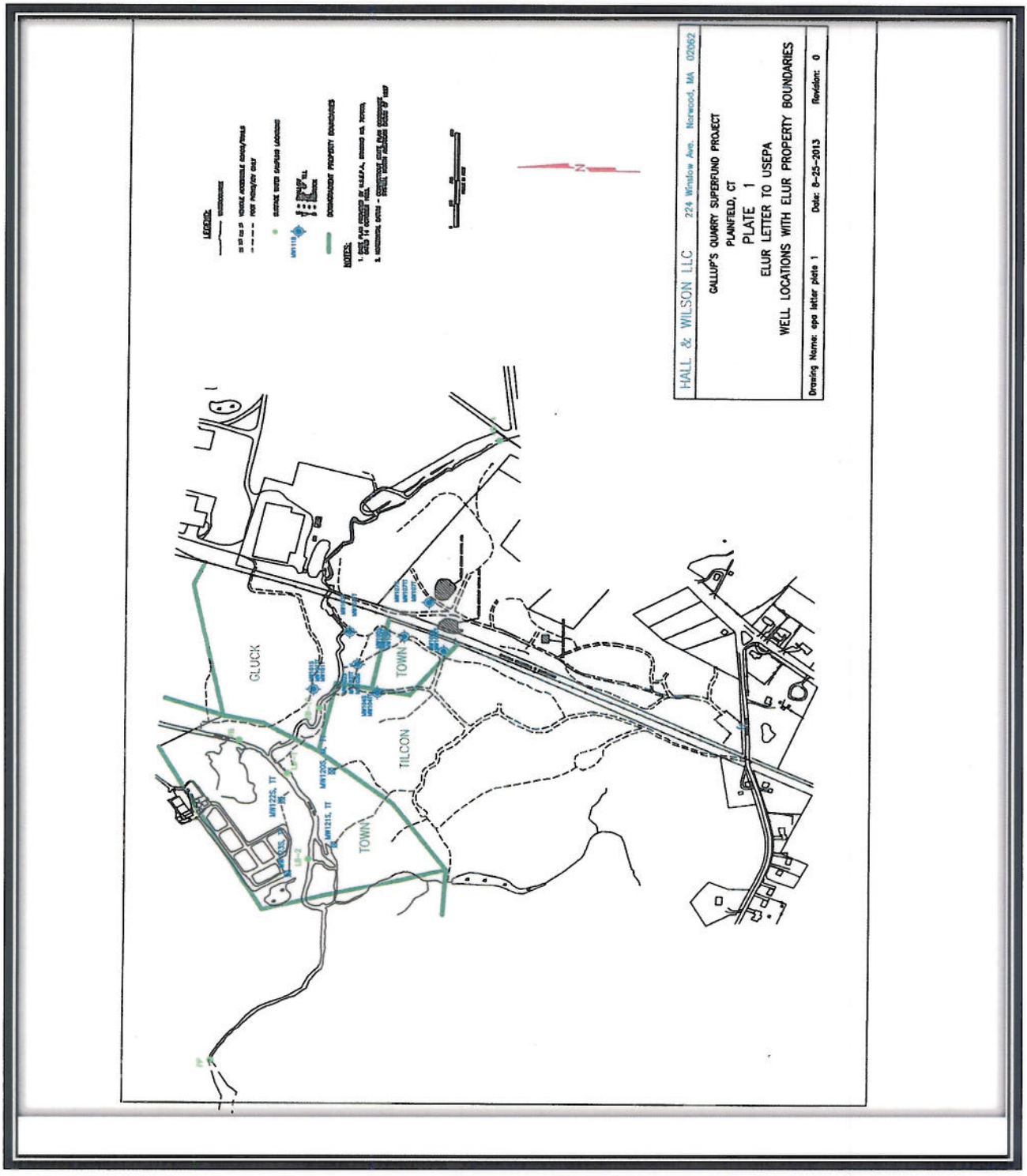


**FIGURE 3: Site ELUR and Tilcon Property ELUR**

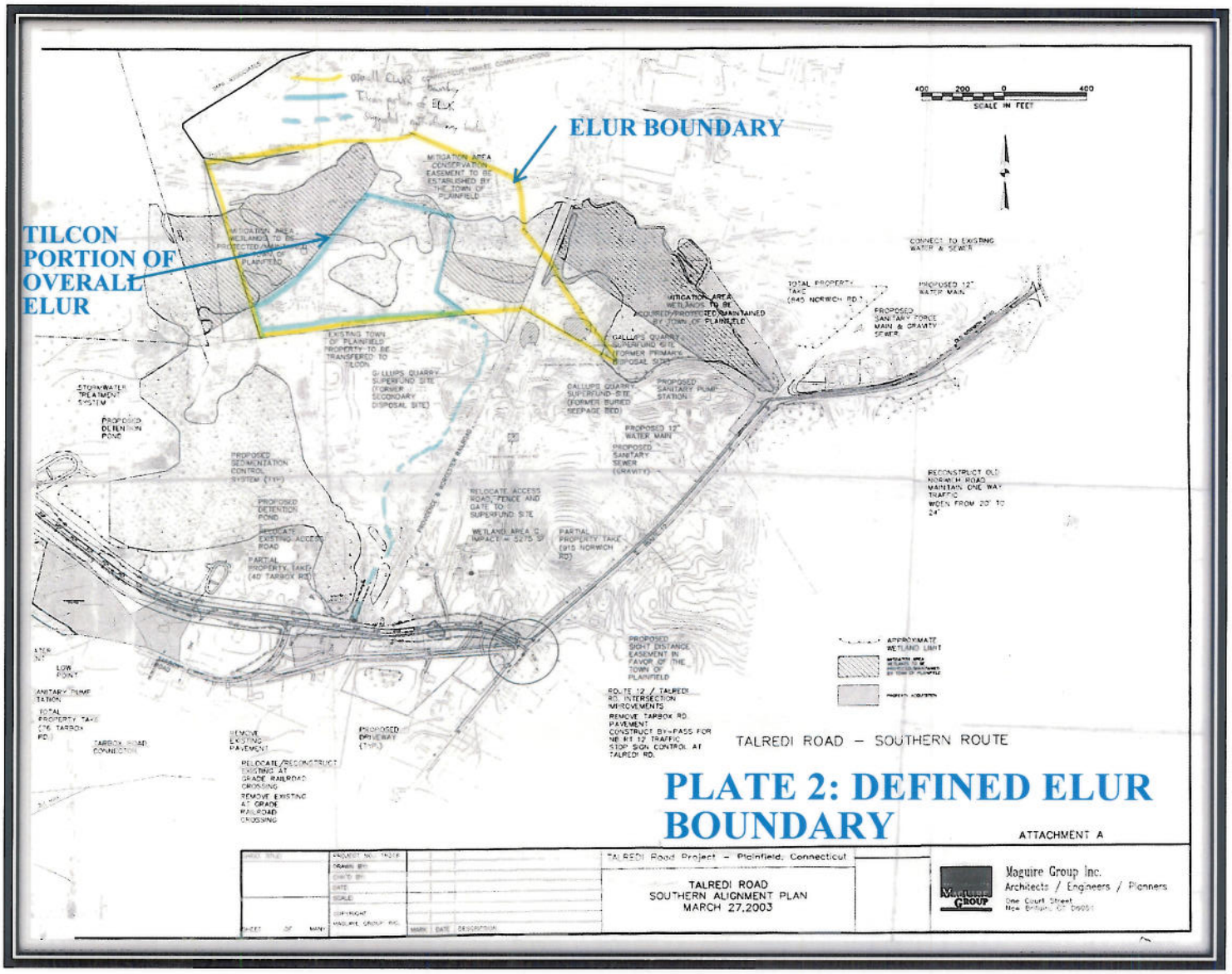
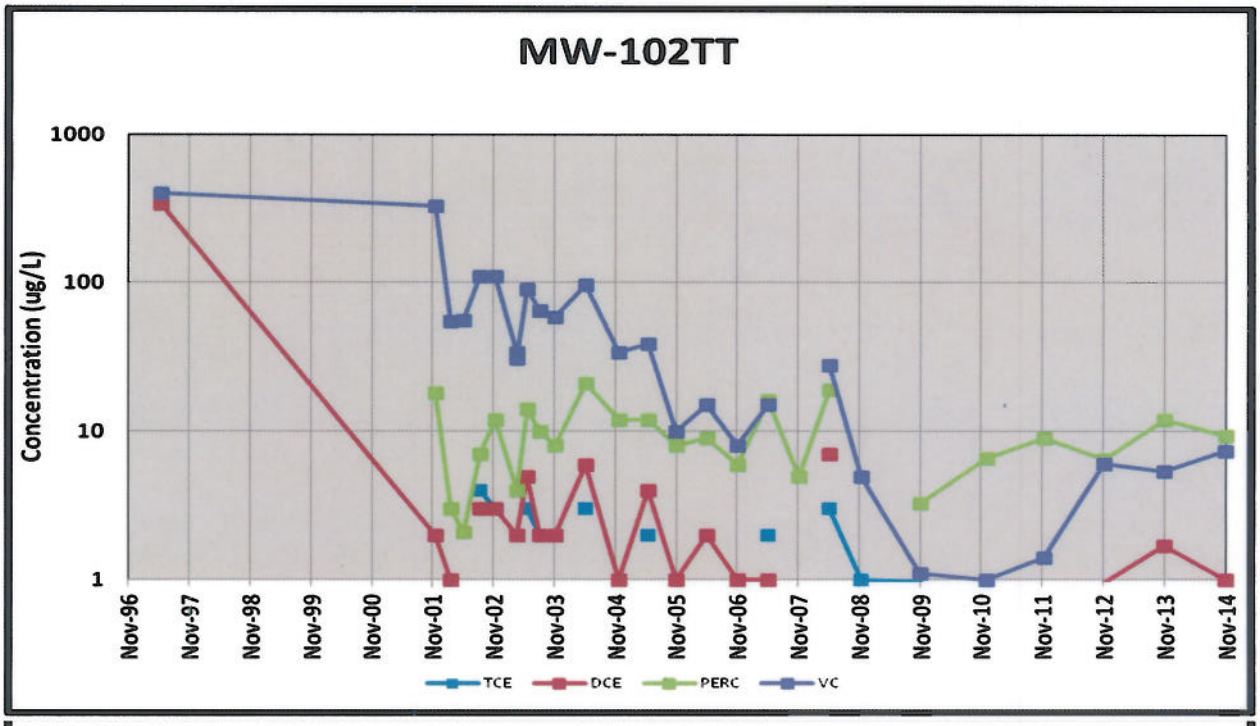


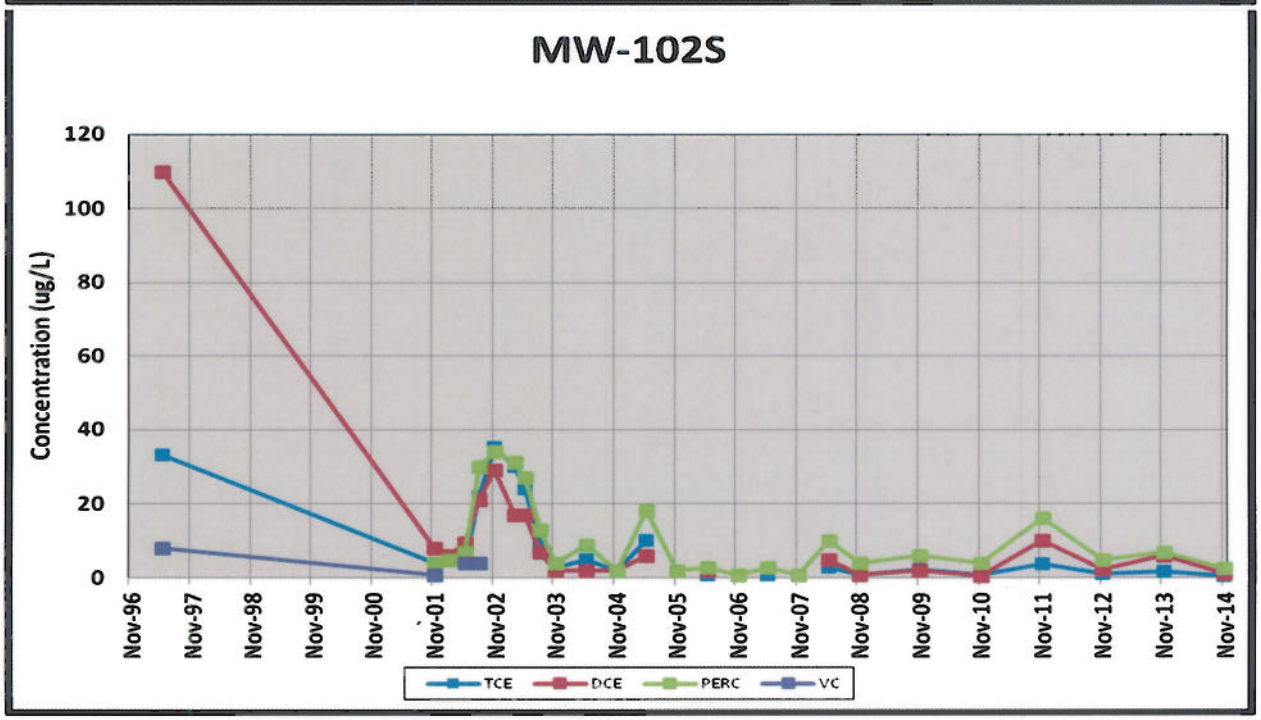
**TABLE 1**
Volatile Organic Compounds Detected in Groundwater
November 2014 Sampling Event
Gallup's Quarry Superfund Site

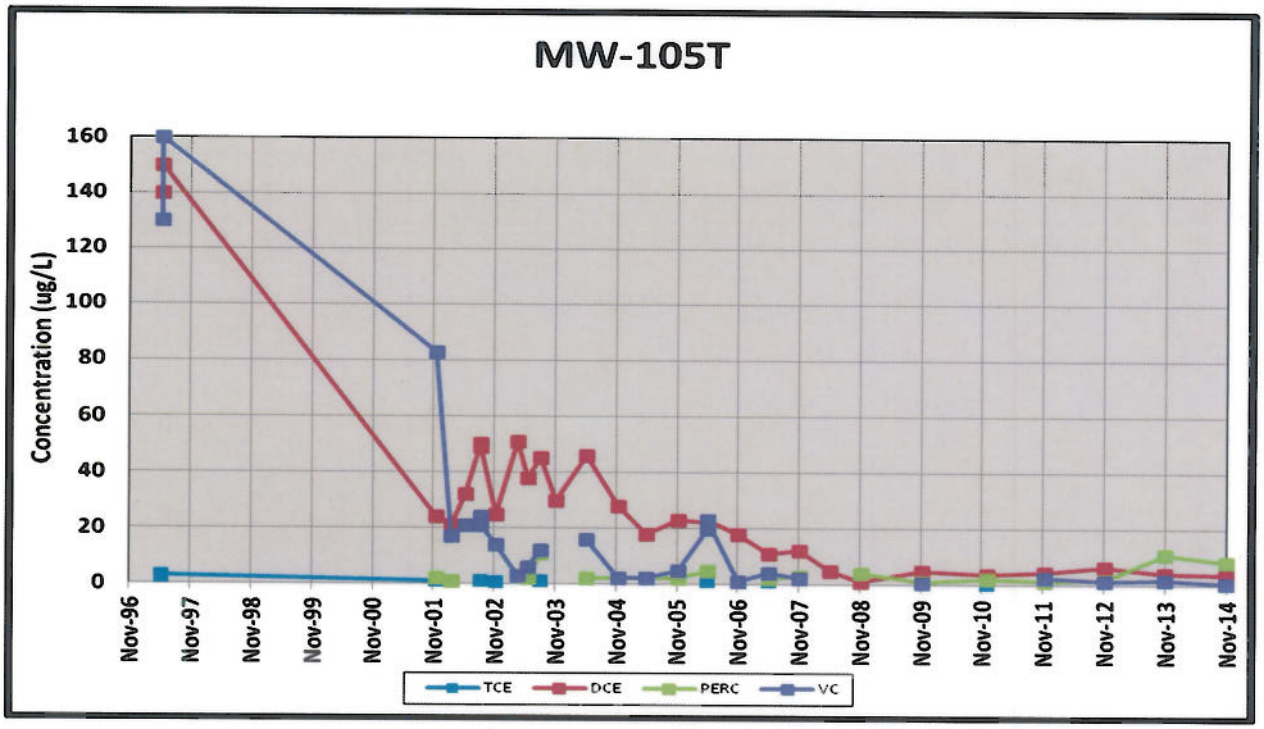
| Sample ID | Screen Depth (ft bgs) | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (Total) | 1,2-Dichloroethane | 1,1,1-TCA | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| MW-101S | 10-20 | | | | | | | | | | |
| MW-101TT | 59-69 | | | | | | | | | 0.45 | |
| MW-101T | 72-77 | | | | | | 0.35 | | | 3.9 | |
| MW102S | 3-13 | | | | 1.1 | | 1.3 | 0.46 | | 2.7 | |
| MW-102TT | 49-59 | **7.4** | | | 1 | | 0.55 | 0.69 | | **9.4** | |
| MW-102B | 78-88 | | | | | | | | | | |
| MW-103S | 2-12 | | | | | | | | | | |
| MW-103TT | 43.5-53.5 | | | | | | | 0.51 | | 0.41 | |
| MW-104S | 12-22 | | | | | | | | | | |
| MW-104TT | 58-68 | | | | | | | | | | |
| MW-105S | 3-13 | | | | 0.7 | | 0.46 | | | 1.9 | |
| MW-105TT | 23-33 | 0.53 | | | 0.48 | | 0.72 | 0.72 | | **7.4** | |
| MW-105T | 43-48 | 0.79 | | | 3.6 | | 1.2 | | | **8.4** | |
| MW-106S | 10-20 | | | | | | | | | | |
| MW-106TT | 21-26 | | | | | | | | | | |
| MW-107S | 9.5-19.5 | | | | | | | | | | |
| MW-107TT | 31-41 | | | | 0.47 | | | 0.9 | | **5.3** | 3.8 |
| *MW-107TT* | *31-41* | | | | *0.57* | | | *0.67* | | *3.2* | *2.1* |
| MW-107T | 33-43 | | | | | | | | | | |
| MW-120S | 5-15 | | | | | | | | | | |
| MW-120M | 48-58 | | | | | | | | | | |
| MW-120TT | 61-71 | | | | | | | | | | |
| MW-121S | 5-15 | | | | | | | | | | |
| MW-121TT | 60-70 | | | | | | | | | | |
| MW-122S | 6-16 | | | | | | | | | | |
| MW-122TT | 53-63 | | | | | | | | | | |
| MW-123S | 18.5-28.5 | | | | | | | | | | |
| MW-123TT | 65-75 | | | | | | | | | | |

Blank cells indicate compound not detected
*Multiple entries indicate a duplicate sample was collected for QA purposes*

**PLATES: VOC Concentration Trends in Core Monitoring Wells, MW-102TT, MW-102S, MW-105TT, MW-105T, Mw-107TT 1996-2014**




MW-105T
Concentration (ug/L)
160
140
120
100
80
60
40
20
0
Nov-96
Nov-97
Nov-98
Nov-99
Nov-00
Nov-01
Nov-02
Nov-03
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
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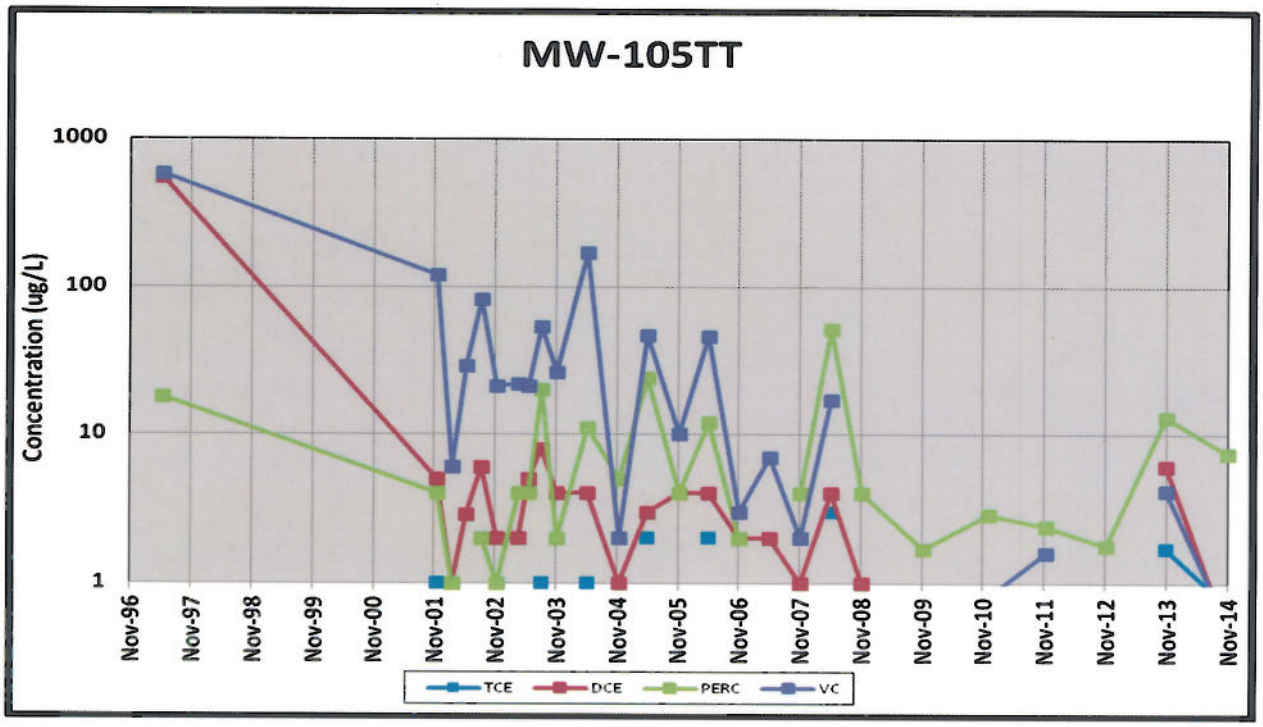
Nov-12
Nov-13
Nov-14
TCE
DCE
PERC
VC


MW-105TT
Concentration (ug/L)
1000
100
10
1
Nov-96
Nov-97
Nov-98
Nov-99
Nov-00
Nov-01
Nov-02
Nov-03
Nov-04
Nov-05
Nov-06
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Nov-12
Nov-13
Nov-14
TCE
DCE
PERC
VC

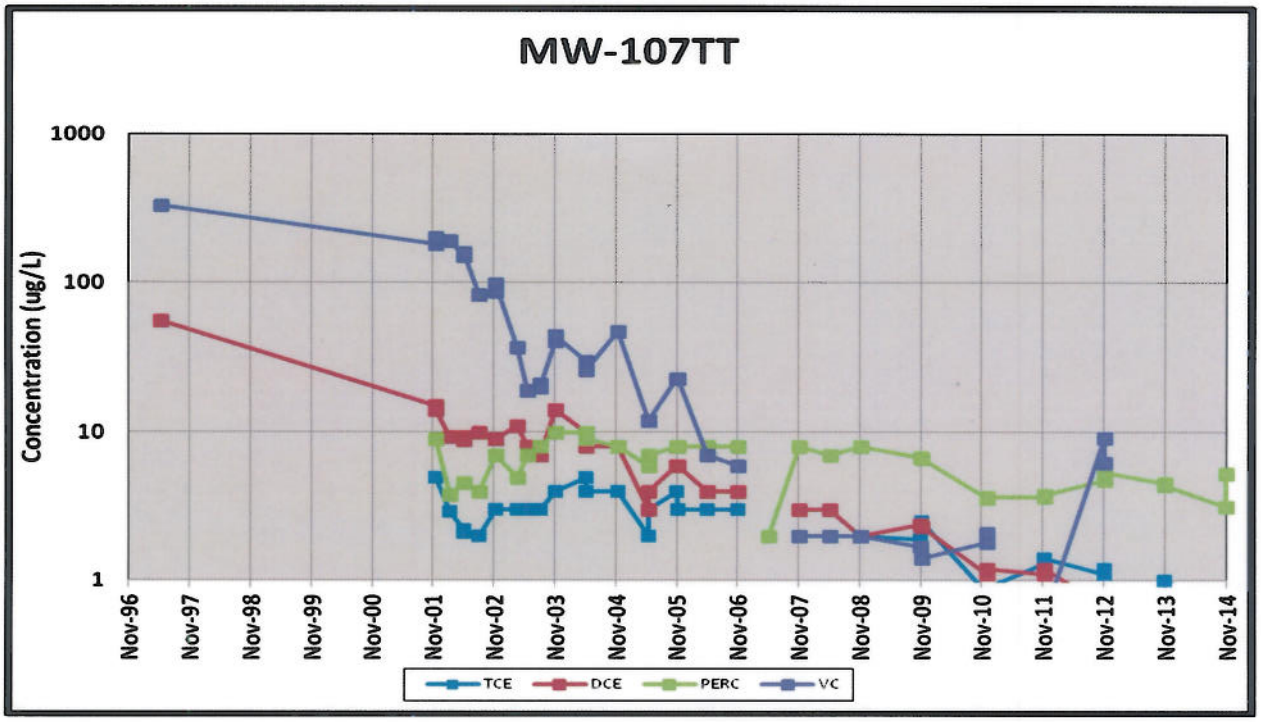

MW-107TT
Concentration (ug/L)
1000
100
10
1
Nov-96
Nov-97
Nov-98
Nov-99
Nov-00
Nov-01
Nov-02
Nov-03
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
TCE
DCE
PERC
VC

**EXHIBIT 1**

**Example Environmental Land Use Restriction**
**Gallup's Quarry Access and Institutional Control Plan**

## DECLARATION OF ENVIRONMENTAL LAND USE RESTRICTION AND GRANT OF EASEMENT

This Declaration of Environmental Land Use Restriction and Grant of Easement is made this day of, 2001, between ("the Grantor") and the Commissioner of Environmental Protection of the State of Connecticut ("the Grantee").

WITNESSETH:

WHEREAS, Grantor is the owner in fee simple of certain real property (the "Property") known as the Gallup's Quarry Superfund Site, encompassing approximately 29 acres, located on Road in the Town of Plainfield in County, Connecticut, designated at Lot 32, Block 30 on tax map number 10 of the Town of Plainfield in County, more particularly described on Exhibit A which is attached hereto and made a part hereof; and

WHEREAS, the Grantee has determined that the environmental land use restriction set forth below is consistent with regulations adopted by him pursuant to Section 22a-133k of the Connecticut General Statutes; and

WHEREAS, the Grantee has determined that this environmental land use restriction will effectively protect public health and the environment from the hazards of pollution; and

WHEREAS, the Grantee's written approval of this Environmental land use restriction is contained in the document attached hereto as Exhibit B (the "Decision Document") which is made a part hereof; and

WHEREAS, the property or portion thereof identified in the class A-2 survey ("the Subject Area") which survey is attached hereto as Exhibit C which is made a part hereof, contains pollutants; and

WHEREAS, to prevent exposure to or migration of such pollutants and to abate hazards to human health and the environment, and in accordance with the Decision Document, the Grantor desires to impose certain restrictions upon the use, occupancy, and activities of and at the Subject Area, and to grant this environmental land use restriction to the Grantee on the and conditions set forth below; and

WHEREAS, Grantor intends that such restrictions shall run with the land and be binding upon and enforceable against Grantor and Grantor's successors and assigns;

NOW, THEREFORE, Grantor agrees as follows:

**1. Purpose**

In accordance with the Decision Document, the purpose of this Environmental land use restriction is to assure that contaminated portions of the Subject Area are not used for residential activities, that contaminated groundwater at the Subject Area is not utilized for drinking purposes, and that buildings are not constructed over soils or ground water at the Subject Area polluted with substances in concentrations exceeding the volatilization criteria established in R.C.S.A. sections 22a-through 32a-133k-3 inclusive.

**2. Restrictions Applicable to the Subject Area**

In furtherance of the purposes of this environmental land use restriction, Grantor shall assure that use, occupancy, and activity of and at the Subject Area are restricted as follows:

a. Use.

Any portion of the Subject Area affected by contamination above cleanup levels, as specified in Section IX, Paragraph of the Consent Decree in settlement of Civil Action No. CV 252 (AVC) ("Consent Decree"), shall not be developed for residential activities as defined in the Connecticut Department of Environmental Protection Remediation Standard Regulations, in R.C.S.A. Section 1 3 3k-1(a)(53).

b. Ground water.

Pursuant to Section IX, Paragraph of the Consent Decree, contaminated groundwater underlying the Subject Area shall not be withdrawn for any purpose unless otherwise provided for in the Consent Decree's Statement of Work. Groundwater supply wells shall not be installed or otherwise operated in a manner that would conflict with the natural attenuation of groundwater at the Subject Area or that would conduct contaminated groundwater the Subject Area.

c. Disturbances.

(i) Contaminated soils in the Former Primary Disposal Area and Former Seepage Bed shall not be disturbed, except pursuant to a plan approved by EPA, after reasonable opportunity for review and comment by the CT DEP. Consent Decree, Section IX, Paragraph

(ii) No use or activity shall be permitted which will disturb any of the remedial measures implemented at the Property, including without limitation: the installation of groundwater monitoring wells, long-term monitoring of groundwater, surface water, and soils, installation of signs, and maintenance of monitoring equipment, entry fences and signs. Consent Decree, Section IX, Paragraph 26(b)(5).

d. Construction.

No building shall be constructed in the Former Primary Disposal Area and Former Seepage Bed, except pursuant to a plan approved by EPA for approval, after reasonable opportunity for review and comment by the CT DEP. Consent Decree, Section IX, Paragraph 3.

Except as provided in Paragraph 4 below, no action shall be taken, allowed, suffered, or omitted if such action or omission is reasonably likely to:

(i) Create a risk of migration of pollutants or a potential hazard to human health or the environment; or

(ii) Result in a disturbance of the structural integrity of any engineering controls or other structures designed or utilized at the Property to contain pollutants or limit human exposure to pollutants.

**3. Emergencies**

In the event of an emergency which presents a significant risk to human health or the environment, the application of Paragraph 3 above may be suspended, provided such risk cannot be abated without suspending such Paragraph and the Grantor:

(i) Immediately notifies the Grantee of the emergency;

(ii) Limits both the extent and duration of the suspension to the minimum reasonably necessary to adequately respond to the emergency;

(iii) Implements all measures necessary to limit actual and potential present and future risk to human health and the environment resulting from such suspension; and

(iv) Implements a plan approved in writing by the Grantee, on a schedule approved by the Grantee, to ensure that the Subject Area is remediated in accordance with R.C.S.A. sections 22a-133k-1 through 22a-1 33k-3, inclusive, or restored to its condition prior to such emergency.

**4. Release of Restriction; Alterations of Subject Area**

Grantor shall not make, or allow or suffer to be made, any alteration of any kind in, to, or about any portion of any the Subject Area inconsistent with this Environmental land use restriction unless the Grantor has first recorded the Grantee's written approval of such alteration upon the land records of Plainfield. The Grantee shall not approve any such alteration and shall not release the Property from the provisions of this environmental land use restriction unless the Grantor demonstrates to the Grantee's satisfaction that Grantor has remediated the Subject Area in accordance sections 22a-133k-1 through 22a-133k-3, inclusive.

**5. Grant of Easement to the Grantee**

Grantor hereby grants and conveys to the Grantee, his agents, contractors, and with R.C.S.A. employees, and to any person performing pollution remediation activities under the direction thereof, a non-exclusive easement (the "Easement") over the Subject Area and over such other parts of the Property as are necessary for access to the Subject Area or for carrying out any actions to abate a threat to human health or the environment associated with the Subject Area.

Pursuant to this Easement, the Grantee, his agents, contractors, and employees, and any person performing pollution remediation activities under the direction thereof, may enter upon and inspect the Property and perform such investigations and actions as the Grantee deems necessary for any one or more of the following purposes:

(i) Ensuring that use, occupancy, and activities of and at the Property are consistent with this environmental land use restriction;

(ii) Ensuring that any remediation implemented complies with R.C. S.A. sections 22a-1 through 22a-133k-3, inclusive; and

(iii) Performing any additional investigations or remediation necessary to protect human health and the environment.

**6. Notice and Time of Entry onto Property**

Entry onto the Property by the Grantee pursuant to this Easement shall be upon reasonable notice and at reasonable times, provided that entry shall not be subject to these limitations if the Grantee determines that immediate entry is necessary to protect human health or the environment.

**7. Notice to Lessees and Other Holders of Interests in the Property**

Grantor, or any holder of any interest in the property, shall cause any lease, grant, or other transfer of any interest in the Property to include a provision expressly requiring the lessee, grantee, or transferee to comply with this environmental land use restriction and Grant of Easement. The failure to include such provision shall not affect the validity or applicability to the Property of this environmental land use restriction and Grant of Easement.

**8. Persons Entitled to Enforce Restrictions**

The restrictions in this environmental land use restriction on use, occupancy, and activity of and at the Property shall be enforceable in accordance with section of the General Statutes.

**9. Severability and Termination**

If any court of competent jurisdiction that any provision of this environmental land use restriction or Grant of Easement is invalid or unenforceable, such provision shall be deemed to

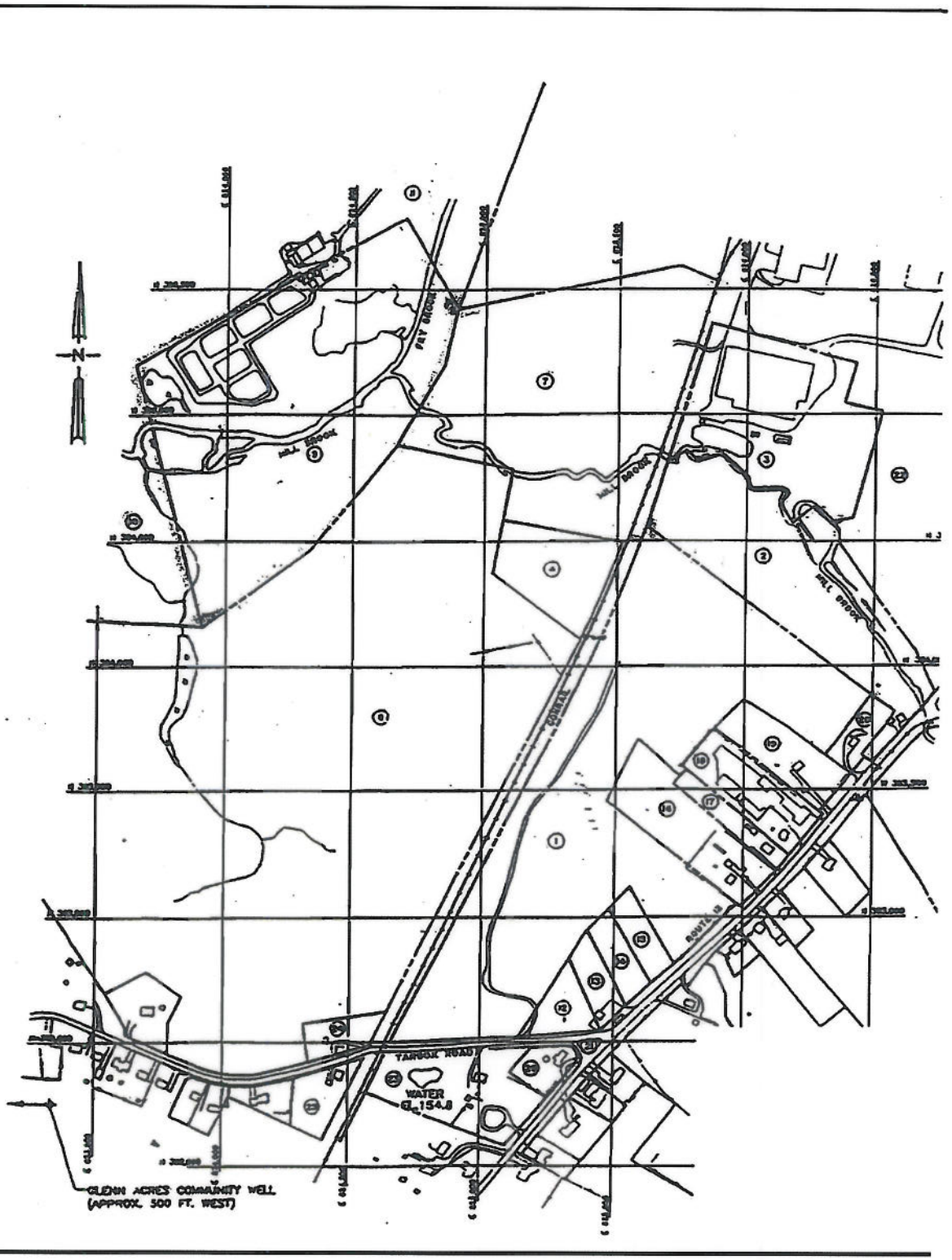
have been modified automatically to conform to the requirements for validity and enforceability as determined by such court. In the event that the provision invalidated is of such nature that it cannot be so modified, the provision shall be deemed deleted this instrument as though it had never been included herein. In either case, the remaining provisions of this instrument shall remain in full force and effect. Further, in either case, the Grantor shall submit a copy of this restriction and of the judgement of the Court to the Grantee in accordance with R.C.S.A. section 22a-133q-1(1). This environmental land use restriction shall be terminated if the Grantee provides notification pursuant to R.C.S.A. section 22a-133q-1(1).

**10. Binding Effect**

All of the terms, covenants and conditions of this environmental land use restriction and grant of easement shall run with the land and shall be binding on the Grantor, the Grantor's successors and assigns, and each owner and any other party entitled to possession or use of the Property during such period of ownership or possession.

**11. Terms Used Herein**

The definitions of terms used herein shall be the same as the definitions contained in sections 22a-133k-1 and22a-133o-1 of the Regulations of Connecticut State Agencies as such sections existed on the date of execution of this environmental land use restriction.




FILE NO. 90751-48

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

May 5, 2015

Ms. Leslie McVickar, Project Manager
United States Environmental Protection Agency
New England, Region 1
5 Post Office Square, Suite 100, Mailbox OSSR07-4
Boston, Massachusetts 02109-3912

RE: Gallup's Quarry Superfund Site
Completion of Institutional Controls
Under the September 1997 ROD
Plainfield, CT

Dear Ms. McVickar:

The Department has reviewed the memorandum, dated May 2015 that you and RuthAnn Sherman, Senior Enforcement Counsel for the United States Environmental Protection Agency (USEPA), drafted regarding the above captioned matter.

The Department concurs with the USEPA's memorandum that an institutional control contemplated for the portion of the site known as Lot 8, which is presently owned by Tilcon Connecticut Inc., is no longer required or necessary to protect human health and the environment. The ground water monitoring conducted on and in vicinity of Lot 8 verify the absence of volatile organic compounds previously detected based on subsurface investigations conducted at the site nor has there been any exceedance of the state's applicable ground water cleanup standards for any of the other contaminants of concern at the Tilcon parcel.

It is understood that USEPA will evaluate all future long-term monitoring results to ensure that there are no unanticipated future conditions, which may warrant implementation of additional institutional control measures on Lot 8.

Should you have any questions regarding this letter do not hesitate to call me at 860-424-3776. Thank you.

Sincerely,

William G. Warzecha
Supervising Environmental Analyst
Remediation Division

cc: RuthAnn Sherman, USEPA

# APPENDIX D – GROUNDWATER, SURFACE WATER, AND SOIL DATA

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-101S | 10-20 | May-97 | | | | | | | | | | 2 |
| | | Nov-01 | | | | 0.5 | | 0.1 | | | 1 | |
| | | Feb-02 | | | | 0.6 | | | 0.7 | | 1 | |
| | | May-02 | | | | 0.5 | | | | | 0.7 | |
| | | Aug-02 | | | | 0.6 | | | | | 2 | |
| | | Nov-02 | | | | 0.6 | | | | | 2 | |
| | | Mar-03 | | | | 0.6 | | | | | 0.7 | |
| | | May-03 | | | | 0.7 | | | 0.7 | | 1 | |
| | | Aug-03 | | | | 0.6 | | | 0.5 | | 2 | |
| | | Nov-03 | | | | | | | | | 0.7 | |
| | | May-04 | | | | | | | | | 0.5 | |
| | | Nov-04 | | | | | | | | | 0.9 | |
| | | May-05 | | | | 0.5 | | | 0.4 | | 0.5 | |
| | | Nov-05 | | | | 0.3 | | | 0.3 | | 0.5 | |
| | | May-06 | | | 0.2 | 1 | | | 0.6 | | 0.3 | |
| | | Nov-06 | | | | 0.3 | | | 0.3 | | 0.3 | |
| | | May-07 | | | | 0.4 | | | 0.3 | | 0.7 | |
| | | Nov-07 | | | | | | | | | 0.3 | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | 0.3 | | 0.4 | |
| | | Nov-09 | | | | | | | 0.32 | | 0.62 | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-101TT | 59-69 | May-97 | | | | 2 | | | | | | |
| | | Nov-01 | | | 0.3 | 2 | | 2 | | | **8** | |
| | | Feb-02 | | | | 2 | | 2 | | | **9** | |
| | | May-02 | | | | 2 | | 2 | | | **10** | |
| | | Aug-02 | | | | 2 | | 1 | | | **7** | |
| | | Nov-02 | | | | 2 | | 2 | | | **8** | |
| | | Mar-03 | | | | 2 | | 1 | | | **6** | |
| | | May-03 | | | | 2 | | 1 | | | 5 | |
| | | Aug-03 | | | | 1 | | 1 | | | **6** | |
| | | Nov-03 | | | | 2 | | 2 | | | **6** | |
| | | May-04 | | | | 1 | | 1 | | | 5 | |
| | | Nov-04 | | | | 1 | | 1 | | | **6** | |
| | | May-05 | | | 0.3 | 1 | | 1 | 0.3 | | 5 | |
| | | Nov-05 | | | | 1 | | 1 | 0.2 | | 5 | |
| | | May-06 | | | 0.3 | 0.9 | | | 0.3 | | 5 | |
| | | Nov-06 | | | 0.3 | 0.9 | | 0.9 | 0.2 | | 4 | |
| | | May-07 | | | | 0.5 | | 0.6 | | | 3 | |
| | | Nov-07 | | | | 0.5 | | 0.5 | | | 3 | |
| | | May-08 | | | | | | | | | 5 | |
| | | Nov-08 | | | 0.4 | 0.9 | | | | | | |
| | | Nov-09 | | | 0.34 | 0.8 | | 0.7 | | | **5.4** | |
| | | Nov-10 | | | | 0.82 | | 0.82 | | | **6** | |
| | | Nov-11 | | | | | | | | | 3 | |
| | | Nov-12 | | | | | | | | | 1.4 | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | 0.45 | |
| | | Nov-15 | | | | | | | | | 0.77 | |
| | | Nov-16 | | | | | | | | | 1.7 | |
| MW-101T | 72-77 | May-97 | | | | 3 | | | | | | |
| | | Nov-01 | | | 0.5 | 3 | | 3 | | | **17** | |
| | | Feb-02 | | | 0.6 | 2 | | 3 | 0.7 | | **19** | |
| | | May-02 | | | | 3 | | 2 | 0.5 | | **14** | |
| | | Aug-02 | | | 0.6 | 2 | | 2 | 0.6 | | **15** | |
| | | Nov-02 | | | | 3 | | 2 | 0.5 | | **12** | |
| | | *Nov-02* | | | *0.5* | *2* | | *2* | *0.6* | | **16** | |
| | | Mar-03 | | | 0.6 | 2 | | 2 | 0.6 | | **10** | |
| | | May-03 | | | | 2 | | 2 | 0.5 | | **9** | |
| | | Aug-03 | | | | 2 | | 2 | 0.6 | | **13** | |
| | | Nov-03 | | | | 2 | | 2 | 0.6 | | **10** | |
| | | May-04 | | | | 2 | | 2 | | | **10** | |
| | | Nov-04 | | | | 2 | | 2 | | | **9** | |
| | | May-05 | | | 0.5 | 2 | | 2 | 0.4 | | **8** | |
| | | Nov-05 | | | 0.4 | | | 1 | 0.4 | | **7** | |
| | | May-06 | | | 0.5 | 1.2 | | 2 | | | **9** | |
| | | Nov-06 | | | 0.5 | 1 | | 2 | 0.4 | | **8** | |
| | | May-07 | | | 0.4 | 1 | | 1 | 0.4 | | **7** | |
| | | Nov-07 | | | 0.4 | 1 | | 1 | 0.3 | | **6** | |
| | | May-08 | | | | 1 | | 1 | | | **9** | |
| | | Nov-08 | | | 0.4 | 1 | | 1 | 0.4 | | **8** | |
| | | Nov-09 | | | 0.39 | 1.1 | | 0.91 | 0.39 | | **7.4** | |
| | | Nov-10 | | | | | | 0.55 | | | 3.8 | |
| | | Nov-11 | | | | | | | | | 4.9 | |
| | | Nov-12 | | | | 0.55 | | | | | 4 | |
| | | Nov-13 | | | | | | | | | 4 | |
| | | Nov-14 | | | | | | 0.35 | | | 3.9 | |
| | | Nov-15 | | | | | | | | | 3.7 | |
| | | Nov-16 | | | | | | | | | 3.3 | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW102S | 3-13 | May-97 | **8** | | 4 | **110** | **7** | | **33** | | | |
| | | Nov-01 | 1 | | 0.5 | 8 | | 9 | 4 | | 4 | |
| | | Feb-02 | | | | 6 | | 13 | 5 | | 5 | |
| | | May-02 | **3.9** | | 1 | 9.5 | | 20 | 5 | | **6.8** | |
| | | Aug-02 | **4** | | 2 | 21 | | 78 | **22** | | **30** | |
| | | Nov-02 | | | 3 | 29 | | 93 | **35** | | **34** | |
| | | Mar-03 | | | 2 | 17 | | 78 | **30** | | **31** | |
| | | May-03 | | | 2 | 17 | | 71 | **24** | | **27** | |
| | | Aug-03 | | | | 7 | | 25 | **9** | | **13** | |
| | | Nov-03 | | | | 2 | | 8 | 3 | | 4 | |
| | | May-04 | | | | 2 | | 17 | 5 | | **9** | |
| | | Nov-04 | | | | 2 | | 3 | 2 | | 2 | |
| | | May-05 | | | 0.6 | 6 | | 29 | **10** | | **18** | |
| | | Nov-05 | | | | | | 2 | | | 2 | |
| | | May-06 | | | | 2 | | 4 | 1 | | 3 | |
| | | Nov-06 | | | | | | 2 | | | 1 | |
| | | May-07 | | | | | | 4 | 1 | | 3 | |
| | | Nov-07 | | | | | | 1 | | | 0.9 | |
| | | May-08 | | | | 5 | | 11 | 3 | | **10** | |
| | | Nov-08 | | | | 1 | | 3 | 1 | | 4 | |
| | | Nov-09 | | | | 2 | | 5.6 | 2.2 | | **6.1** | |
| | | Nov-10 | | | | 0.71 | | 3.1 | 0.85 | | 3.9 | |
| | | Nov-11 | | | 0.23 | 10 | | 13 | 3.7 | | **16** | |
| | | Nov-12 | | | | 2.2 | | 3 | 1.2 | | 4.9 | |
| | | Nov-13 | | | | 6 | | 4 | 1.7 | | **6.9** | |
| | | Nov-14 | | | | 1.1 | | 1.3 | 0.46 | | 2.7 | |
| | | Nov-15 | | | | 1.3 | | 1.6 | 0.72 | | 4.6 | |
| | | Nov-16 | | | | 1.4 | | 2.7 | 0.81 | | **5.4** | |
| MW-102TT | 49-59 | May-97 | **400** | | **17** | **340** | **38** | 210 | | **2** | | **660** |
| | | Nov-01 | **330** | | | 2 | | 48 | 0.9 | | **18** | 17 |
| | | Feb-02 | **55** | | | 1 | | 10 | | | 3 | 2 |
| | | May-02 | **56** | | | | | 5.5 | | | 2.1 | 2.9 |
| | | Aug-02 | **110** | | 0.7 | 3 | | 19 | 4 | | **7** | 4 |
| | | Nov-02 | **110** | | | 3 | | 20 | 3 | | **12** | |
| | | Mar-03 | **34** | | | 2 | | 9 | | | 4 | |
| | | *Mar-03* | **31** | | | *2* | | *9* | | | *4* | |
| | | May-03 | **90** | | 0.8 | 5 | | 42 | 3 | | **14** | |
| | | Aug-03 | **65** | | | 2 | | 31 | 2 | | **10** | |
| | | Nov-03 | **59** | | | 2 | | 27 | | | **8** | 2 |
| | | May-04 | **96** | | 1 | 6 | | 38 | 3 | | **21** | 37 |
| | | Nov-04 | **34** | | | 1 | | 11 | | | **12** | |
| | | May-05 | **39** | | | 4 | | 19 | 2 | | **12** | 74 |
| | | Nov-05 | **10** | | | 1 | | 9 | | | **8** | 7 |
| | | May-06 | **15** | | | 2 | | 14 | 0.9 | | **9** | |
| | | Nov-06 | **8** | | | 1 | | 8 | | | **6** | 12 |
| | | *Nov-06* | **8** | | | *1* | | *8* | | | **6** | *11* |
| | | May-07 | **15** | | | 1 | | 10 | 2 | | **16** | |
| | | Nov-07 | | | | | | 3 | | | 5 | |
| | | May-08 | **28** | | | 7 | | 12 | 3 | | **19** | |
| | | Nov-08 | **5** | | | | | 5 | 1 | | | 1 |
| | | Nov-09 | 1.1 | | | | | 2.1 | 0.96 | | 3.3 | 140 |
| | | Nov-10 | 1 | | | 0.98 | | 2.2 | 0.54 | | **6.6** | |
| | | Nov-11 | 1.4 | | | 0.56 | | 1.8 | 0.56 | | **9** | |
| | | Nov-12 | **6.1** | | | 0.94 | | | | | **6.5** | |
| | | Nov-13 | **5.4** | | | 1.7 | | 1.4 | | | **12** | |
| | | Nov-14 | **7.4** | | | 1 | | 0.55 | 0.69 | | **9.4** | |
| | | Nov-15 | | | | | | | | | **10** | |
| | | Nov-16 | 1 | | | | | | | | **6.7** | |
| MW-102B | 78-88 | May-97 | | | | 1 | | | | | | |
| | | Nov-01 | | | 0.2 | | | 0.3 | | | 1 | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | 0.7 | |
| | | Mar-03 | | | | | | | | | 0.6 | |
| | | May-03 | | | | | | | | | 0.5 | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | 0.5 | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | 0.4 | |
| | | Nov-05 | | | | | | | | | 0.4 | |
| | | May-06 | | | | 0.4 | | | 0.3 | | 0.3 | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | 0.2 | |
| | | Nov-07 | | | | | | | | | 0.3 | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | 0.63 | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | 0.48 | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-103S | 2-12 | May-97 | | | | | | | **8** | | | |
| | | Nov-01 | | | | 0.3 | | | | | | |
| | | Feb-02 | | | | | | | 0.9 | | | |
| | | May-02 | | | | | | | 0.53 | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | 0.9 | | | |
| | | Aug-03 | | | | | | | 0.8 | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | 0.2 | | | 0.4 | | | |
| | | Nov-05 | | | | | | | 0.3 | | | |
| | | May-06 | | | | 0.3 | | | 0.5 | | | |
| | | Nov-06 | | | | 0.3 | | | 0.5 | | | |
| | | May-07 | | | | 0.4 | | | 0.7 | | | |
| | | Nov-07 | | | | | | | 0.5 | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | 1.4 | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-103TT | 43.5-53.5 | May-97 | | | | 7 | | | | | | 2 |
| | | Nov-01 | | | 0.6 | 8 | | 0.5 | | | 1 | |
| | | Feb-02 | | | | 4 | | | 0.6 | | 0.8 | |
| | | May-02 | | | | 3.7 | | | | | 0.81 | |
| | | Aug-02 | | | 0.6 | 3 | | | | | 1 | |
| | | Nov-02 | | | 0.5 | 4 | | | | | 1 | |
| | | Mar-03 | | | 0.6 | 4 | | | | | 1 | |
| | | May-03 | | | | 6 | | | | | 1 | |
| | | Aug-03 | | | 0.7 | 6 | | | | | 2 | |
| | | Nov-03 | | | 0.7 | 5 | | | | | 1 | |
| | | May-04 | | | 0.5 | 4 | | | | | 2 | |
| | | Nov-04 | | | 0.6 | 3 | | | | | 1 | |
| | | May-05 | | | 0.8 | 3 | | | | | 2 | |
| | | Nov-05 | | | 0.8 | 2 | | | 0.2 | | 2 | |
| | | May-06 | | | 0.7 | 2.2 | | | 0.4 | | 1 | |
| | | Nov-06 | | | 0.6 | 1 | | | 0.2 | | 1 | |
| | | May-07 | | | 0.6 | 1 | | | 0.3 | | 1 | |
| | | Nov-07 | | | 0.6 | 0.9 | | | | | 1 | |
| | | May-08 | | | | 1 | | | | | 1 | |
| | | *May-08* | | | | *1* | | | | | *1* | |
| | | Nov-08 | | | 0.5 | 0.6 | | | | | 1 | |
| | | Nov-09 | | | | | | | | | 0.98 | |
| | | Nov-10 | | | | | | | 0.53 | | 0.64 | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | 0.96 | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | 0.51 | | 0.41 | |
| | | Nov-15 | | | | | | | | | 0.37 | |
| | | Nov-16 | | | | | | | | | 0.41 | |
| MW-104S | 12-22 | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | **6.7** | | | |
| | | Jan-10 | | | | | | | | | | |
| | | Mar-10 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-104TT | 58-68 | May-97 | | | | | | | | | | |
| | | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | *Aug-03* | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-105S | 3-13 | May-97 | | | | 3 | | 2 | 4 | | | |
| | | Nov-01 | | | | 0.1 | | 1 | | | 0.4 | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | 2 | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | 0.7 | | | | |
| | | Nov-03 | | | | | | 0.5 | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | 0.7 | | | 0.3 | |
| | | *Nov-05* | | | | | | *0.7* | | | *0.3* | |
| | | May-06 | | | | | | 0.2 | | | | |
| | | Nov-06 | | | | | | 0.5 | | | | |
| | | May-07 | | | | | | 0.3 | | | | |
| | | Nov-07 | | | | | | 2 | | | 1 | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | 0.38 | |
| | | Nov-13 | | | | 8.7 | | 3.2 | 1.3 | | 4.8 | |
| | | Nov-14 | | | | 0.7 | | 0.46 | | | 1.9 | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-105TT | 23-33 | May-97 | **580** | **12** | **20** | **550** | | 350 | | | **18** | **930** |
| | | Nov-01 | **120** | | | 5 | | 31 | 1 | | 4 | 56 |
| | | Feb-02 | **6** | | | 1 | | 5 | 0.8 | | 1 | |
| | | *Feb-02* | **6** | | | *1* | | *6* | *0.7* | | *1* | |
| | | May-02 | **29** | | | 2.9 | | 5.2 | | | | 3.6 |
| | | Aug-02 | **82** | | | 6 | | 42 | | | 2 | **610** |
| | | Nov-02 | **21** | | | 2 | | 7 | | | 1 | 18 |
| | | Mar-03 | **22** | | | 2 | | 36 | | | 4 | 370 |
| | | May-03 | **21** | | | 5 | | 87 | | | 4 | **740** |
| | | Aug-03 | **53** | | | 8 | | 71 | 1 | | **20** | 210 |
| | | Nov-03 | **26** | | | 4 | | 18 | | | 2 | 94 |
| | | May-04 | **170** | | | 4 | | 110 | 1 | | **11** | **1300** |
| | | Nov-04 | 2 | | | 1 | | 5 | | | 5 | 26 |
| | | May-05 | **47** | | | 3 | | 40 | 2 | | **24** | 150 |
| | | Nov-05 | **10** | | | 4 | | 10 | | | 4 | 70 |
| | | May-06 | **46** | | | 4 | | 29 | 2 | | **12** | 140 |
| | | Nov-06 | **3** | | | 2 | | 7 | | | **2** | 87 |
| | | May-07 | **7** | | | 2 | | 15 | | | | 17 |
| | | *Nov-07* | *2* | | | *1* | | *7* | | | *4* | *16* |
| | | Nov-07 | 2 | | | 1 | | 7 | | | 4 | 15 |
| | | May-08 | **17** | | 1 | 4 | | 23 | 3 | | **52** | 44 |
| | | Nov-08 | | | | 1 | | 2 | | | 4 | 5 |
| | | Nov-09 | | | | | | 2.8 | | | 1.7 | 1.8 |
| | | Nov-10 | 0.81 | | | 0.5 | | 1.8 | 0.42 | | 2.9 | |
| | | Nov-11 | 1.6 | | | | | 4.4 | | | 2.4 | 11 |
| | | Nov-12 | | | | | | 0.8 | | | 1.8 | |
| | | Nov-13 | **4.2** | | | 6.1 | | 4.2 | 1.7 | | **13** | |
| | | Nov-14 | 0.53 | | | 0.48 | | 0.72 | 0.72 | | **7.4** | |
| | | Nov-15 | | | | 1.5 | | | | | 3.4 | |
| | | Nov-16 | | | | | | | 0.87 | | 2.1 | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-105T | 43-48 | May-97 | **130** | | 4 | **140** | | 90 | 2 | | | 400 |
| | | May-97 | **160** | | 5 | **150** | | 97 | 3 | | | 420 |
| | | Nov-01 | **83** | | 0.9 | 24 | | 14 | 1 | | 2 | 9 |
| | | Feb-02 | **17** | | | 21 | | 5 | 1 | | 1 | |
| | | May-02 | **21** | | | 32 | | 2.8 | | | | |
| | | Aug-02 | **24** | | | 50 | | 16 | | | | 190 |
| | | *Aug-02* | **21** | | | *49* | | *15* | *1* | | | *180* |
| | | Nov-02 | **14** | | | 25 | | 3 | 0.8 | | | 2 |
| | | Mar-03 | **3** | | | 51 | | 4 | | | | 30 |
| | | May-03 | **6** | | | 38 | | 36 | | | 2 | 200 |
| | | Aug-03 | **12** | | | 45 | | 25 | 1 | | **11** | 30 |
| | | Nov-03 | | | | 30 | | | | | | |
| | | May-04 | **16** | | | 46 | | 14 | | | 2 | 83 |
| | | Nov-04 | 2 | | | 28 | | 2 | | | 2 | |
| | | May-05 | 2 | | | 18 | | 3 | | | 2 | 4 |
| | | Nov-05 | **5** | | | 23 | | 11 | | | 2 | 210 |
| | | May-06 | **20** | | | 22 | | 14 | 1 | | 5 | 48 |
| | | *May-06* | **23** | | | *23* | | *13* | *1* | | *5* | *47* |
| | | Nov-06 | *1* | | | *18* | | *2* | | | | *35* |
| | | May-07 | **4** | | | 11 | | 8 | 1 | | 2 | 3 |
| | | Nov-07 | 2 | | | 12 | | 4 | | | 3 | |
| | | May-08 | | | | 5 | | | | | | |
| | | Nov-08 | | | | 1 | | 2 | | | 4 | |
| | | Nov-09 | 0.76 | | | 4.7 | | 0.93 | | | 0.92 | |
| | | Nov-10 | | | | 3.6 | | 1 | 0.33 | | 2.1 | |
| | | Nov-11 | **2.4** | | | 4.6 | | 9.4 | | | 1.3 | 96 |
| | | Nov-12 | 1.4 | | | 6.3 | | | | | 1.9 | |
| | | Nov-13 | 1.8 | | | 4.2 | | 2.9 | | | **11** | |
| | | Nov-14 | 0.79 | | | 3.6 | | 1.2 | | | **8.4** | |
| | | Nov-15 | | | | 4.1 | | | | | | |
| | | Nov-16 | | | | 5.7 | | | | | 1.4 | |
| MW-106S | 10-20 | May-97 | | | | | | | | | | |
| | | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-106TT | 21-26 | May-97 | | | | | | | | | | |
| | | Nov-01 | | | | | | 0.1 | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | *May-06* | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-107S | 9.5-19.5 | May-97 | | | | | | | | | | |
| | | Nov-01 | | | | | | 0.1 | | | 0.2 | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | *May-05* | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | *Nov-08* | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | *Nov-09* | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-107TT | 31-41 | May-97 | **330** | | 1 | 56 | | | | | | **550** |
| | | Nov-01 | **180** | | 1 | 15 | | 24 | 5 | | **9** | 97 |
| | | *Nov-01*** | **200** | | *0.9* | *14* | | *23* | *5* | | **9** | *100* |
| | | Feb-02 | **190** | | | 9.3 | | 38 | 2.9 | | 3.8 | 98 |
| | | May-02 | **150** | | | 9.4 | | 21 | 2.2 | | 4.6 | 54 |
| | | *May-02* | **160** | | | *8.8* | | *22* | *2.1* | | *4.6* | *53* |
| | | Aug-02 | **83** | | | 10 | | 13 | 2 | | 4 | 57 |
| | | Nov-02 | **88** | | | 9 | | 11 | 3 | | **7** | 44 |
| | | *Nov-02* | **98** | | | *9* | | *12* | *3* | | **7** | *47* |
| | | Mar-03 | **37** | | | 11 | | 10 | 3 | | 5 | 41 |
| | | May-03 | **19** | | | 8 | | 13 | 3 | | **7** | 97 |
| | | *May-03* | **19** | | | *8* | | *13* | *3* | | **7** | *77* |
| | | Aug-03 | **21** | | 0.5 | 8 | | 15 | 3 | | **8** | 110 |
| | | *Aug-03* | **20** | | | *7* | | *15* | *3* | | **8** | *110* |
| | | Nov-03 | **41** | | | 14 | | 11 | 4 | | **10** | 38 |
| | | *Nov-03* | **44** | | | *14* | | *12* | *4* | | **10** | *46* |
| | | May-04 | **30** | | 1 | 10 | | 23 | 5 | 1 | **10** | 240 |
| | | *May-04* | **26** | | | *8* | | *21* | *4* | | **9** | *220* |
| | | Nov-04 | **47** | | | 8 | | 10 | 4 | | **8** | 28 |
| | | *Nov-04* | **47** | | | *8* | | *10* | *4* | | **8** | *28* |
| | | May-05 | **12** | | | 3 | | 10 | 2 | | **6** | 160 |
| | | *May-05* | **12** | | | *4* | | *11* | *3* | | **7** | *170* |
| | | Nov-05 | **23** | | | 6 | | *7* | 3 | | **8** | 30 |
| | | *Nov-05* | **23** | | | *6* | | *7* | *4* | | **8** | *30* |
| | | May-06 | **7** | | | 4 | | 4 | 3 | | **8** | 9 |
| | | Nov-06 | **6** | | | 4 | | 4 | 3 | | **8** | 18 |
| | | May-07 | | | | | | 4 | | | | 17 |
| | | *May-07* | | | | | | *4* | | | *2* | *17* |
| | | Nov-07 | 2 | | | 3 | | 2 | 2 | | **8** | 5 |
| | | May-08 | 2 | | | 3 | | 1 | 2 | | **7** | *7* |
| | | Nov-08 | 2 | | | 2 | | 2 | 2 | | **8** | 16 |
| | | *Nov-08* | *2* | | | *2* | | *2* | *2* | | **8** | *17* |
| | | *Nov-09* | *1.7* | | | *2.4* | | *1.3* | *1.9* | | **6.8** | *37* |
| | | Nov-09 | 1.4 | | | 2.3 | | 1.3 | 2.5 | | **6.7** | 52 |
| | | *Nov-10* | *1.8* | | | *1.1* | | *2.5* | *0.82* | | *3.6* | *33* |
| | | Nov-10 | **2.1** | | | 1.2 | | 2.6 | 0.88 | | 3.7 | 34 |
| | | *Nov-11* | | | | *1.1* | | *0.77* | *1.3* | | *3.7* | *19* |
| | | Nov-11 | 0.57 | | | 1.2 | | 0.83 | 1.4 | | 3.8 | 24 |
| | | *Nov-12* | **9.1** | | | *0.67* | | | *1.1* | | *4.8* | |
| | | Nov-12 | **6.3** | | | 0.69 | | | 1.2 | | **5.4** | |
| | | *Nov-13* | | | | | | | | | *4.6* | *5.3* |
| | | Nov-13 | | | | | | | 1 | | 4.4 | 5.1 |
| | | *Nov-14* | | | | *0.57* | | | *0.67* | | *3.2* | *2.1* |
| | | Nov-14 | | | | 0.47 | | | 0.9 | | **5.3** | 3.8 |
| | | *Nov-15* | | | | | | | *0.64* | | *4* | *3.3* |
| | | Nov-15 | | | | | | | 0.66 | | 3.9 | 3.3 |
| | | *Nov-16* | **4.6** | | | | | | *0.52* | | *3.1* | |
| | | Nov-16 | **4.6** | | | | | | 0.53 | | 3 | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-107T | 33-43 | May-97 | | | | | | | | | | |
| | | Nov-01 | | | | | | 0.1 | | | 0.2 | |
| | | Feb-02 | 0.7 | | | 0.9 | | 0.8 | 1 | | | |
| | | May-02 | | | | | | 0.89 | 1.2 | | 0.5 | |
| | | Aug-02 | | | | | | 0.5 | 0.9 | | | |
| | | Nov-02 | | | | | | | 0.7 | | | |
| | | Mar-03 | | | | | | | 0.7 | | | |
| | | May-03 | | | | | | | 0.6 | | | |
| | | *May-03* | | | | | | | *0.8* | | | |
| | | Aug-03 | | | | | | | 0.6 | | | |
| | | Nov-03 | | | | | | | 0.5 | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | *Nov-04* | | | | | | | | | | |
| | | May-05 | | | | | | 0.4 | 0.5 | | 0.2 | |
| | | Nov-05 | | | | | | 0.3 | 0.4 | | | 3 |
| | | May-06 | | | | | | 0.2 | 0.4 | | | |
| | | Nov-06 | | | | | | 0.3 | 0.4 | | | |
| | | May-07 | | | | | | 0.3 | 0.4 | | | |
| | | Nov-07 | | | | | | 0.2 | 0.4 | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-120S | 5-15 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-120M | 48-58 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-120TT | 61-71 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | *Feb-02* | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-121S | 5-15 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-121TT | 60-70 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | *Nov-06* | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-122S | 6-16 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-122TT | 53-63 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |
| MW-123S | 18.5-28.5 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

**TABLE D-1**
**Groundwater Sample Results for Volatile Organic Compounds**
**Through Round 27**
**Gallup's Quarry Superfund Site**
**Plainfield, Connecticut**


| Sample ID | Screen Depth (ft bgs) | Sampling Date | Vinyl chloride | Methylene chloride | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | 1,2-Dichloroethane | 1,1,1-Trichloroethane | Trichloroethene | Benzene | Tetrachloroethene | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cleanup Level | | | 2 | 5 | 6 | 70 | 1 | 200 | 5 | 1 | 5 | 530 |
| Residential VISL * | | | 1.5 | 760 | 200 | -- | 220 | 7400 | 1.2 | 1.6 | 15 | 380 |
| MW-123TT | 65-75 | Nov-01 | | | | | | | | | | |
| | | Feb-02 | | | | | | | | | | |
| | | May-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Aug-02 | | | | | | | | | | |
| | | Nov-02 | | | | | | | | | | |
| | | Mar-03 | | | | | | | | | | |
| | | May-03 | | | | | | | | | | |
| | | Aug-03 | | | | | | | | | | |
| | | Nov-03 | | | | | | | | | | |
| | | May-04 | | | | | | | | | | |
| | | Nov-04 | | | | | | | | | | |
| | | May-05 | | | | | | | | | | |
| | | Nov-05 | | | | | | | | | | |
| | | May-06 | | | | | | | | | | |
| | | Nov-06 | | | | | | | | | | |
| | | May-07 | | | | | | | | | | |
| | | Nov-07 | | | | | | | | | | |
| | | May-08 | | | | | | | | | | |
| | + | Nov-08 | | | | | | | | | | |
| | | Nov-09 | | | | | | | 3.3 | | | |
| | | Jan-10 | | | | | | | | | | |
| | | Mar-10 | | | | | | | | | | |
| | | Nov-10 | | | | | | | | | | |
| | | Nov-11 | | | | | | | | | | |
| | | Nov-12 | | | | | | | | | | |
| | | Nov-13 | | | | | | | | | | |
| | | Nov-14 | | | | | | | | | | |
| | | Nov-15 | | | | | | | | | | |
| | | Nov-16 | | | | | | | | | | |

Blank cells indicate compound not detected
*Multiple entries for the same date indicate a duplicate sample was collected for QA purposes*
* EPA Vapor Instrusion Screening Level (VISL) Calculator, Version 3.5.1 (May 2016 RSLs);
Target Groundwater Concentrations corresponding to cancer risk of 1 x 10-6 and non-cancer hazard quotient of 1 are shown.

TABLE D-2
Groundwater Sample Results for Other Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Approximate Sampling Depth (ft bgs) | Sampling Date | bis (2-ethyl hexyl) phthalate | Chromium | Lead | Vanadium | Arsenic |
|---|---|---|---|---|---|---|---|
| **Cleanup Level** | | | **2** | **50** | **15** | **50** | **10** |
| MW-102TT | 49-59 | 5/14/1997 | | | | | * |
| | | 11/19/2001 | | | | | * |
| | | 11/11/2002 | | | | | * |
| | | 1/14/2004 | | | | | * |
| | | 11/18/2004 | | | | | * |
| | | 11/2/2005 | | | | | * |
| | | 11/29/2006 | **170** | | | | * |
| | | 11/29/2006 | | | | | * |
| | | 11/7/2007 | | | | | * |
| | | 11/13/2008 | **13** | | | | * |
| | | 11/17/2009 | **4.9** | 4.4 | | | * |
| | | 11/30/2010 | | | 13.5 | 1.6 | * |
| | | 11/15/2011 | | | | 3.8 | * |
| | | 11/27/2012 | | | | | * |
| | | 11/5/2013 | **2.1** | | | | 12.3 |
| | | 11/4/2014 | | | | | 15.5 |
| | | 11/11/2015 | | | | | 13.7 |
| | | 11/10/2016 | | 1.2 | 3.4 | | 9 |
| MW-105TT | 23-33 | 5/12/1997 | | | | | * |
| | | 11/16/2001 | | | | | * |
| | | 12/19/2001 | | | | | * |
| | | 12/19/2001 | | | | | * |
| | | 11/11/2002 | | | | | * |
| | | 1/14/2004 | | 1 | | | * |
| | | 11/16/2004 | | | | | * |
| | | 11/1/2005 | | | | | * |
| | | 11/29/2006 | 2 | | | | * |
| | | 11/7/2007 | | | | | * |
| | | 11/7/2007 | | | 2.9 | | * |
| | | 11/13/2008 | **5** | | | | * |
| | | 11/16/2009 | **4.7** | | | | * |
| | | 11/30/2010 | | | | | * |
| | | 11/15/2011 | | | | 2.8 | * |
| | | 11/28/2012 | | | | | * |
| | | 11/4/2013 | | | | | 8.1 |
| | | 11/4/2014 | | | | | 5.6 |
| | | 11/11/2015 | | | | | 5.9 |
| | | 11/10/2016 | | | | | 5.6 |

TABLE D-2
Groundwater Sample Results for Other Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Approximate Sampling Depth (ft bgs) | Sampling Date | bis (2-ethyl hexyl) phthalate | Chromium | Lead | Vanadium | Arsenic |
|---|---|---|---|---|---|---|---|
| **Cleanup Level** | | | **2** | **50** | **15** | **50** | **10** |
| MW-107TT | 31-41 | 5/13/1997 | | | | | * |
| | | 11/15/2001 | | | | | * |
| | | 11/15/2001 | | | | | * |
| | | 12/19/2001 | | | | | * |
| | | 11/11/2002 | | | | | * |
| | | 11/11/2002 | | | | | * |
| | | 1/14/2004 | | 1.2 | | | * |
| | | 11/16/2004 | 2 | | | | * |
| | | 11/16/2004 | 2 | | | | * |
| | | 11/1/2005 | | | | | * |
| | | 11/1/2005 | | | | | * |
| | | 11/29/2006 | | | | | * |
| | | 11/7/2007 | | | | | * |
| | | 11/13/2008 | **5** | | | | * |
| | | 11/13/2008 | **28** | | | | * |
| | | 11/16/2009 | **4.7** | 4.9 | 3.3 | 5.9 | * |
| | | 11/16/2009 | **4.9** | | | | * |
| | | 12/1/2010 | | | | | * |
| | | 12/1/2010 | | | | | * |
| | | 11/14/2011 | | | | 1.1 | * |
| | | 11/28/2012 | | | | | * |
| | | 11/4/2013 | | | | | 14.2 |
| | | 11/4/2014 | | | | | 11.5 |
| | | 11/11/2015 | | | | | 9.9 |
| | | 11/8/2016 | NOT ANALYZED | | | | |

* Arsenic was added as an analyte for the November 2013 sampling event.
** Arsenic has no cleanup level in the RDRA Work Plan because it was not a COC. The current MCL for aresenic is 10 ug
No value indicates compound was not detected
All concentrations are in ug/L
Concentrations in bold exceed the cleanup level
Multiple entries for the same date indicate a duplicate sample was collected for QA purposes

TABLE D-3
Soil Sample Results for Volatile Organic Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Approximate Sampling Depth (ft bgs) | Sampling Date | Ethyl benzene | Tetrachloroethene | Trichloroethene | Chloromethane | Total Xylenes | bis (2 ethyl hexyl) Phthalate |
|---|---|---|---|---|---|---|---|---|
| Cleanup Level (mg/kg) | | | 10.1 | 0.1 | 0.1 | 0.054 | 19.5 | 10 (FPDA)<br>1 (FSB) |
| SB101 | 0-1 | 10/4/1994 | | | | | | 1.5 |
| | 0-2 | 11/15/2001 | NA | NA | NA | NA | NA | |
| | 0-2 | 6/9/2006 | NA | NA | NA | NA | NA | 0.18 |
| LOCATION EXCAVATED AS PART OF NEW CONSTRUCTION | | | | | | | | |
| SB107 | 2-6 | 10/10/1994 | | | | | | **23** |
| | 4-6 | 11/7/2001 | | **1.2** | | | | **22** |
| | 4-6 | 6/9/2006 | NA | NA | NA | NA | NA | 3.7 |
| | 4-6 | 11/14/2011 | NA | NA | NA | NA | NA | |
| | 4-6 | 11/8/2016 | NA | NA | NA | NA | NA | |
| SB108 | 4-6 | 10/11/1994 | | | **0.77** | 0.039 | 0.71 | |
| | 4-6 | 11/7/2001 | 0.14 | **0.12** | **0.47** | | 0.81 | |
| | 4-6 | 11/7/2001 | 0.22 | **0.24** | **1** | | 1.1 | NA |
| | 4-6 | 6/9/2006 | | 0.032 | 0.064 | | 0.019 | NA |
| | 4-6 | 11/14/2011 | | | | | | NA |
| | 4-6 | 11/8/2016 | | | | | | NA |
| SB109 | 4-6 | 10/11/1994 | 8.5 | **3.6** | **6.2** | | **46** | |
| | 1-4 | 10/11/1994 | | | | | | **20** |
| | 4-6 | 11/7/2001 | 0.62 | **1.4** | **0.23** | | 4.3 | **19** |
| | 4-6 | 6/9/2006 | **41** | **28** | **7.6** | | **230** | **15** |
| | 4-6 | 6/9/2006 | **47** | **34** | **12** | | **240** | **16** |
| | 4-6 | 11/14/2011 | | | | | | |
| | 4-6 | 11/14/2011 | | | | | | |
| | 4-6 | 11/8/2016 | | | | | | 0.32 |
| | 4-6 | 11/8/2016 | | | | | | NA |
| SB110 | 1-3.5 | 10/12/1994 | 5.4 | | | | **46** | **46** |
| | 4-6 | 11/7/2001 | 0.33 | | | | 1.9 | |
| | 4-6 | 6/9/2006 | 1.8 | | | | **13** | 2 |
| | 4-6 | 11/14/2011 | 0.52 | 0.1 | **0.11** | | 2.9 | |
| | 4-6 | 11/8/2016 | | 0.048 | 0.016 | | | |
| SB114 | 1-3 | 11/2/1995 | | **0.14** | 0.013 | | | NA |
| | 4-6 | 11/7/2001 | | **0.31** | 0.027 | | | NA |
| | 4-6 | 6/9/2006 | | 0.001 | 0.001 | | 0.004 | NA |
| | 4-6 | 11/14/2011 | | | | | | NA |
| | 4-6 | 11/8/2016 | | | | | | NA |

TABLE D-3
Soil Sample Results for Volatile Organic Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Approximate Sampling Depth (ft bgs) | Sampling Date | Ethyl benzene | Tetrachloroethene | Trichloroethene | Chloromethane | Total Xylenes | bis (2 ethyl hexyl) Phthalate |
|---|---|---|---|---|---|---|---|---|
| Cleanup Level (mg/kg) | | | 10.1 | 0.1 | 0.1 | 0.054 | 19.5 | 10 (FPDA)<br>1 (FSB) |
| SB115 | 3-5 | 11/2/1995 | **16** | **28** | **1.7** | | **80** | NA |
| | 4-6 | 11/7/2001 | 0.004 | 0.024 | 0.002 | | 0.016 | NA |
| | 4-6 | 6/9/2006 | 0.13 | **0.48** | | | 0.54 | NA |
| | 4-6 | 11/14/2011 | | | | | | NA |
| | 4-6 | 11/8/2016 | | | | | | NA |
| SB125 | 6-8 | 11/7/1996 | 1.7 | **0.85** | **1.2** | | 10 | NA |
| | 4-6 | 11/7/2001 | | 0.0009 | 0.002 | | 0.0003 | NA |
| | 4-6 | 6/9/2006 | 0.001 | 0.001 | 0.001 | | 0.004 | NA |
| | 4-6 | 11/14/2015 | | | | | | NA |
| | 4-6 | 11/8/2016 | | | 0.001 | | | NA |

All results are in mg/kg
No value indicates the compound was not detected in the sample.
NA: not analyzed
Concentrations in bold exceed the cleanup level

TABLE D-4
Surface Water Sample Results for Volatile Organic Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Sampling Date | Benzene | 1,2-Dichloroethane | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | Methylene chloride | Tetrachloroethene | Trichloroethene | 1,1,1-Trichloroethane | Vinyl chloride | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Connecticut Surface-Water Protection Criteria (ug/l) | | 710 | na | 96 | na | 48000 | 88 | 2340 | 62000 | 15750 | na |
| UB-4 | 5/8/1997 | | | | | | | 1 | | | |
| | 11/6/2001 | | | | | | | | | | |
| | 11/6/2001 | | | | | | | | | | |
| | 11/7/2002 | | | | | | | | | | |
| | 11/3/2003 | | | | | | | | | | |
| | 11/3/2003 | | | | | | | | | | |
| | 11/15/2004 | | | | | | | | | | |
| | 10/31/2005 | | | | | | | | | | |
| | 10/31/2005 | | | | | | | | | | |
| | 11/27/2006 | | | | | | | | | | |
| | 11/5/2007 | | | | | | | | | | |
| | 11/11/2008 | | | | | | | | | | |
| | 11/16/2009 | | | | | | | | | | |
| | 11/30/2010 | | | | | | | | | | |
| | 11/14/2011 | | | | | | | | | | |
| | 11/26/2012 | | | | | | | | | | |
| | 11/4/2013 | | | | | | | | | | |
| | 11/3/2014 | | | | | | | | | | |
| | 11/10/2015 | | | | | | | | | | |
| | 11/8/2016 | | | | | | | | | | |
| UB-10 | 5/8/1997 | | | | | | | | | | |
| | 11/6/2001 | | | | | | 0.1 | | 0.3 | 0.5 | |
| | 11/7/2002 | | | | | | | | | | |
| | 11/3/2003 | | | | | | | | | | |
| | 11/15/2004 | | | | | | | | | | |
| | 11/15/2004 | | | | | | | | | | |
| | 10/31/2005 | | | | | | | | | | |
| | 11/27/2006 | | | | | | | | | | |
| | 11/5/2007 | | | | | | | | | | |
| | 11/11/2008 | | | | | | | | | | |
| | 11/16/2009 | | | | | | 1.8 | | 2.8 | 0.62 | 1.7 |
| | 11/30/2010 | | | | | | | | | | |
| | 11/14/2011 | | | | | | | | | | |
| | 11/26/2012 | | | | | | | | | | |
| | 11/4/2013 | | | | | | | | | | |
| | 11/3/2014 | | | | | | | | | | |
| | 11/10/2015 | | | | | | | | | | |
| | 11/8/2016 | | | | | | | | | | |

TABLE D-4
Surface Water Sample Results for Volatile Organic Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Sampling Date | Benzene | 1,2-Dichloroethane | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | Methylene chloride | Tetrachloroethene | Trichloroethene | 1,1,1-Trichloroethane | Vinyl chloride | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Connecticut Surface-Water Protection Criteria (ug/l) | | 710 | na | 96 | na | 48000 | 88 | 2340 | 62000 | 15750 | na |
| LB-1 | 5/8/1997 | | | | | | | | | | |
| | 11/6/2001 | | | | 1 | | 2 | | 0.1 | 0.2 | |
| | 11/7/2002 | | | | 0.7 | | 1 | | | | |
| | 11/3/2003 | | | | | | | | | | |
| | 11/15/2004 | | | | | | | | | | |
| | 10/31/2005 | | | | | | | | | | |
| | 11/27/2006 | | | | | | | | | | |
| | 11/5/2007 | | | | 2 | | 4 | 0.7 | | | |
| | 11/11/2008 | | | | 1 | | | | | | |
| | 11/16/2009 | | | | | | | | | | |
| | 11/30/2010 | | | | 0.52 | | 1.2 | | | | |
| | 11/14/2011 | | | | 1.3 | | 1.9 | | | | |
| | 11/26/2012 | | | | 1.7 | | 4.5 | | | | |
| | 11/4/2013 | | | | 1.3 | | 3.6 | | | | |
| | 11/3/2014 | | | | 0.94 | | 2.2 | 0.27 | | | |
| | 11/10/2015 | | | | 1.7 | | 3.6 | 0.56 | | | |
| | 11/9/2016 | | | | 0.86 | | 1.5 | | | | |
| LB-2 | 5/8/1997 | | | | | | | | | | |
| | 5/8/1997 | | | | | | | | | | |
| | 11/6/2001 | | | 0.1 | 0.9 | | 2 | | 0.2 | 0.2 | |
| | 11/7/2002 | | | | 0.6 | | 1 | | | | |
| | 11/7/2002 | | | | 0.6 | | 1 | | | | |
| | 11/3/2003 | | | | 0.7 | | 1 | | | | |
| | 11/15/2004 | | | | 0.9 | | | | | | |
| | 10/31/2005 | | | | | | | | | | |
| | 11/27/2006 | | | | 0.8 | | 0.7 | | | | 0.2 |
| | 11/5/2007 | | | | 2 | | 3 | 0.5 | | | |
| | 11/11/2008 | | | | | | | | | | |
| | 11/16/2009 | | | | 0.58 | | 0.9 | | | | |
| | 11/30/2010 | | | | 1.2 | | 2.5 | 0.33 | | | |
| | 11/14/2011 | | | | | | | | | | |
| | 11/26/2012 | | | | 0.98 | | 2.8 | | | | |
| | 11/4/2013 | NOT ACCESSIBLE | | | | | | | | | |
| | 11/3/2014 | | | | | | | | | | |
| | 11/10/2015 | | | | 1.1 | | 2.2 | | | | |
| | 11/8/2016 | NOT ACCESSIBLE | | | | | | | | | |
| PP | 5/8/1997 | | | | | | | | | | |
| | 11/6/2001 | | | | 0.7 | | 1 | | 0.1 | 0.1 | |
| | 11/7/2002 | | | | 0.5 | | 0.81 | | | | |
| | 11/3/2003 | | | | 0.7 | | 1 | | | | |
| | 11/15/2004 | | | | 0.8 | | | | | | |
| | 10/31/2005 | | | | 0.7 | | 1 | 0.3 | | | |
| | 11/27/2006 | | | | 0.4 | | | | | | |
| | 11/11/2008 | | | | | | | | | | |
| | 11/16/2009 | | | | 0.6 | | | | | | |
| | 11/30/2010 | | | | 0.86 | | 2 | | | | |
| | 11/14/2011 | | | | | | | | | | |
| | 11/26/2012 | | | | 0.57 | | 2 | | | | |
| | 11/4/2013 | | | | 1.8 | | | | | | |
| | 11/3/2014 | NOT ACCESSIBLE | | | | | | | | | |
| | 11/10/2015 | NOT ACCESSIBLE | | | | | | | | | |
| | 11/8/2016 | NOT ACCESSIBLE | | | | | | | | | |

TABLE D-4
Surface Water Sample Results for Volatile Organic Compounds
Through Round 27
Gallup's Quarry Superfund Site
Plainfield, Connecticut


| Sample ID | Sampling Date | Benzene | 1,2-Dichloroethane | 1,1-Dichloroethene | 1,2-Dichloroethene (total) | Methylene chloride | Tetrachloroethene | Trichloroethene | 1,1,1-Trichloroethane | Vinyl chloride | Xylene (total) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Connecticut Surface-Water Protection Criteria (ug/l) | | 710 | na | 96 | na | 48000 | 88 | 2340 | 62000 | 15750 | na |
| FB | 5/8/1997 | | | 2 | | | | | | | |
| | 11/6/2001 | | 0.1 | 2 | | 4 | | | 0.1 | | |
| | 11/7/2002 | | | 2 | | 3 | 0.6 | | | | |
| | 11/3/2003 | | | 2 | | 2 | 0.6 | | | | |
| | 11/15/2004 | | | 1 | | 2 | | | | | |
| | 10/31/2005 | | | 2 | | 3 | 0.7 | | | | |
| | 11/27/2006 | | | 2 | | 2 | 0.6 | | | | 0.5 |
| | 11/5/2007 | | | 3 | | 5 | 0.9 | | | | |
| | 11/11/2008 | | | 1 | | 3 | | | | | |
| | 11/16/2009 | | | | | | | | | | |
| | 11/30/2010 | | | 1.9 | | 3.8 | 0.51 | | | | |
| | 11/14/2011 | | | 1.3 | | 1.8 | | | | | |
| | 11/26/2012 | | | 1.6 | | 4.2 | | | | | |
| | 11/4/2013 | | | 2 | | 5.2 | | | | | |
| | 11/3/2014 | | | 0.92 | | 2.2 | 0.38 | | | | |
| | 11/10/2015 | | | 2.8 | | 5.1 | 0.71 | | | | |
| | 11/8/2016 | | | | | | | | | | |

na = criteria not available
Blank cell indicates compound was not detected
All concentrations are in ug/L

# APPENDIX E – INTERVIEW DOCUMENTATION

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Gallup's Quarry | **EPA ID No.:** CTD108960972 | |
| **Subject:** Five Year Review | **Time:** 10:00 | **Date:** 05/15/17 |
| **Type:** ☐Telephone ☐ Visit ■ Other<br>**Location of Visit:** Mr. Wilson provided written responses to these questions and submitted them via email on 05/15/2017. | ☐ Incoming ☐ Outgoing | |

## Contact Made By:

| | | |
|---|---|---|
| **Name:** Rachel MacPhee | **Title:** Project Scientist | **Organization:** AECOM |

## Individual Contacted:

| | | |
|---|---|---|
| **Name:** W. Gary Wilson | **Title:** Principal | **Organization:** Hall & Wilson |
| **Telephone No:** (781) 367-0007<br>**Fax No:** N/A<br>**E-Mail Address:** hallwilsonllc@comcast.net | **Street Address:** 224 Winslow Avenue<br>City, State, Zip: Norwood, MA 02062 | |

**1.A. What is your overall impression of the project and Site?**
*The Site remedy has entered a period where VOC concentrations will continue to decrease, but very slowly. The concentrations of vinyl chloride (when detected at all) and PCE are very low. The concentration plume is well defined and has not varied in years. The Site has good side-gradient and down-gradient well clusters which define the plume boundaries.*

**2.A. Are you aware of any issues the five-year review should focus on?**
*No. Not much has changed in the last 5 years. Annual monitoring continues to track VOC concentrations.*

**3.A. Who should EPA speak to in the community to solicit local input?**
*I don't know. We have not had contact with the town in many years.*

**4.A. Is the remedy functioning as expected?**
*Yes. VOC groundwater levels have decreased significantly since the RDRA began.*

**5.A. Has there been any significant changes in the O&M activities or a chance to optimize the O&M?**
*No. The only O&M is replacement of pumps, well locks, and minor road clearing.*

**6.A. Are you aware of any residential well sampling efforts?**
*Not since the RIFS. No residences downgradient of the Site.*

**7.A. Is the Town actively involved in the Site?**
*No.*

**8.A. Do you feel that information related to the Site is readily available?**
*Yes. If not at the Town, through EPA.*

**9.A. Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?**
*The southern 2/3 of the Site has been developed as a waste/energy facility.*

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Gallup's Quarry | **EPA ID No.:** CTD108960972 | |
| **Subject:** Five Year Review | **Time:** 10:00 | **Date:** 05/25/17 |
| **Type:** ☐Telephone ☐ Visit ■ Other<br>**Location of Visit:** Mr. Sweet provided written responses to these questions and submitted them via email on 05/25/2017. | ☐ Incoming ☐ Outgoing | |

## Contact Made By:

| | | |
|---|---|---|
| **Name:**<br>Rachel MacPhee | **Title:**<br>Project Scientist | **Organization:**<br>AECOM |

## Individual Contacted:

| | | |
|---|---|---|
| **Name:**<br>Paul Sweet | **Title:**<br>First Selectman | **Organization:**<br>Town of Plainfield |
| **Telephone No:** (860) 230-3000<br>**Fax No:** N/A<br>**E-Mail Address:** selectman@plainfieldct.org | **Street Address:** 8 Community Ave.<br>City, State, Zip: Plainfield, CT 06374 | |

While Mr. Sweet is fully aware of the Site and the remedy he knows of no current concerns that the Town of Plainfield has. He is not aware of any public concerns as well. He knows of no pending or planned changes to water usage in the area. He mentioned the new energy plant, Plainfield Renewable Energy near the site.

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Gallup's Quarry | **EPA ID No.:** CTD108960972 | |
| **Subject:** Five Year Review | **Time:** | **Date:** 07/10/17 |
| **Type:** ☐Telephone ☐ Visit ■ Other<br>**Location of Visit:** Mr. Warzecha provided written responses to these questions and submitted them via email on 07/10/2017. | ☐ Incoming ☐ Outgoing | |

## Contact Made By:

| | | |
|---|---|---|
| **Name:**<br>Rachel MacPhee | **Title:**<br>Project Scientist | **Organization:**<br>AECOM |

## Individual Contacted:

| | | |
|---|---|---|
| **Name:**<br>Bill Warzecha | **Title:**<br>Eastern District Supervisor | **Organization:**<br>CT DEEP |
| **Telephone No:**<br>**Fax No:** N/A<br>**E-Mail Address:** william.warzecha@ct.gov | **Street Address:** 79 Elm Street<br>City, State, Zip: Hartford, CT 06106-5127 | |

**1.A. What is your overall impression of the project and Site?**
*Its status has been generally controlled. Most notable is the observed decreasing trends of the constituents of concern in ground water due to natural attenuation.*

**2.A. Are you aware of any issues the five-year review should focus on?**
*No*

**3.A. Who should EPA speak to in the community to solicit local input?** *First Selectman Paul Sweet and Town Planner Lou Soja would probably be best. It would also be prudent to apprise the Northeast District Department of Health's senior sanitarian, Lynette Swanson of the site's restriction on ground water withdrawals. The District is responsible for issuing well permits for private drinking water wells.*

**4.A. Is the remedy functioning as expected?**
*Yes*

**5.A. Has there been any significant changes in the O&M activities or a chance to optimize the O&M?**
*No*

**6.A. Are you aware of any residential well sampling efforts?**
*No. Public water mains service the area.*

**7.A. Is the Town actively involved in the Site?**
*DEEP is not aware if it is or not. That would need to be confirmed by Paul Sweet, First Selectman.*

**8.A. Do you feel that information related to the Site is readily available?**
*Yes. However, I've not been able to locate the last few semi-annual reports for the site. Based on the latest, the report was addressed to Mark Lewis who has not been the project manager for a few years. Future reports should be forwarded to my attention; Bill Warzecha, Supervising Environmental Analyst, Remediation Division*

**9.A. Have there been any changes in the Site or surrounding property in the last 5 years, or are changes planned?**
*It would be best to check directly with Lou Soja, Town Planner, on that question.*

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Gallup's Quarry | **EPA ID No.:** CTD108960972 | |
| **Subject:** Five Year Review | **Time:** | **Date: 8/4/17** |
| **Type:** ■Telephone ☐ Visit ☐ Other<br>**Location of Visit:** | ☐ Incoming ■ Outgoing | |

**Contact Made By:**

| | | |
|---|---|---|
| **Name:** Cinthia McLane | **Title:** Project Manager | **Organization:** AECOM |

**Individual Contacted:**

| | | |
|---|---|---|
| **Name:** Terre Bombard | **Title:**<br>Registered Sanitarian | **Organization:**<br>Northeast District Department of Health |
| **Telephone No:** (860) 774-7350<br>**Fax No:** N/A<br>**E-Mail Address:** email@nddh.org | **Street Address:**<br>District Department of Health (NDDH)<br>69 South Main Street, Unit 4<br>Brooklyn, CT 06234 | |

CMcLane contacted and left a message for Lynette Swanson, at the suggestion of Bill Warzecha of CT DEEP. Terre Bombard returned the call on behalf of Ms. Swanson. The reason for the call, to apprise the Northeast District Department of Health of the site's restriction on groundwater withdrawal, was explained. Ms. Bombard said that she was not familiar with this particular site and, therefore, was not familiar with the restriction. She asked for the specific location of the site, including street address, and said that she would look into it further. Ms. Bombard also suggested that AECOM contact the Plainfield First Selectman [Paul Sweet]. C.McLane informed her that AECOM had already been in contact with Mr. Sweet.

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Gallup's Quarry | **EPA ID No.:** CTD108960972 | |
| **Subject:** Five Year Review | **Time:** 11:00 | **Date:** 08/08/17 |
| **Type:** ■Telephone ☐ Visit ☐ Other<br>**Location of Visit:** By telephone. | ■ Incoming ☐ Outgoing<br>(Returned AECOM's call) | |

## Contact Made By:

| | | |
|---|---|---|
| **Name:**<br>Rachel MacPhee | **Title:**<br>Project Scientist | **Organization:**<br>AECOM |

## Individual Contacted:

| | | |
|---|---|---|
| **Name:**<br>Lou Soja | **Title:**<br>Planning & Engineering Supervisor | **Organization:**<br>Town of Plainfield |
| **Telephone No:** 860-230-3028<br>**Fax No:** N/A<br>**E-Mail Address:** lsoja@plainfieldct.org | **Street Address:** 8 Community Ave.<br>City, State, Zip: Plainfield, CT 06374 | |

Mr. Soja said he was not aware of any current or planned land use changes on the property or any closely surrounding properties. The adjacent parcels are either not easily accessible for development or already developed. He had no other opinions, concerns or comments regarding the site.

# Appendix F
# Site Inspection Documentation

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# Five-Year Review Site Inspection Checklist (Template)

| I. SITE INFORMATION | |
|---|---|
| **Site name:** Gallup's Quarry | **Date of inspection:** May 10, 2017 |
| **Location and Region:** Plainfield, CT; Windham County | **EPA ID:** CTD108960972 |
| **Agency, office, or company leading the five-year review:** EPA | **Weather/temperature:** 65 degrees F, sunny |

**Remedy Includes**: (Check all that apply)

☐ Landfill cover/containment
X Access controls
X Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other_____
_____

X Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

**Attachments:** ☐ Inspection team roster attached ☐ Site map attached

**II. INTERVIEWS** (Check all that apply)

1. **O&M site manager**_____ Gary Wilson __ _____ PRP Project Manager____ ____05/10/17_____
   Name Title Date
   Interviewed X at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; X Report attached _____
   _____

2. **O&M staff** _____NA_____ ____NA_____ _____NA_____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; X Report attached

No other regulatory agencies were at the inspection. All Site interviews are included in the separate "Site Interview" section.

_____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

**III. ON-SITE DOCUMENTS & RECORDS VERIFIED** (Check all that apply)

1. **O&M Documents**
   - X O&M manual — X Readily available — X Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

2. **Site-Specific Health and Safety Plan** — X Readily available — X Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

3. **O&M and OSHA Training Records** — X Readily available — X Up to date — ☐ N/A

   Remarks_____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

7. **Groundwater Monitoring Records** — X Readily available — X Up to date — ☐ N/A

   Remarks_____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — X N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — X N/A

   Remarks_____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — X N/A

    Remarks_____

## IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date X Not Available
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons:
_____N/A_____
_____ _____
_____
_____
_____
_____

## V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

### A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks_____ Due to the sprawling nature of the site, and its remote location a perimeter fence is not in place. Access to the Site is restricted by the alternative energy facility to the southwest, and surrounding wetlands. During the site visit, it was observed that the main gate providing access to the southern portion of the site off of Tarbox road was unlocked. Per discussion with Gary Wilson this gate is routinely left open by Tilton staff.

### B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks__ No warning signs were observed at the site during the site inspection.

**C. Institutional Controls (ICs)**

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes X No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes X No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date X Yes ☐ No ☐ N/A
Reports are verified by the lead agency X Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met X Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No X N/A
Other problems or suggestions: ☐ Report attached

_____
_____
_____
_____

2. **Adequacy** X ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____
_____
_____

**D. General**

1. **Vandalism/trespassing** ☐ Location shown on site map X No vandalism evident
Remarks_____ A squatter was observed camping on town land near well cluster MW-106. Gary Wilson states that this person was also observed camping on the site during the November 2016 sampling event. The Plainville police department was informed during the November 2016 sampling event. The squatter is not causing any damage to the Site.

2. **Land use changes on site** ☐ N/A
Remarks___The southwestern 2/3rds of the site have been redeveloped as an Alternative Energy Plant

3. **Land use changes off site** X N/A
Remarks_____
_____

**VI. GENERAL SITE CONDITIONS**

**A. Roads** X Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map X Roads adequate ☐ N/A
Remarks_____
_____

**B. Other Site Conditions**

Remarks _____
_____
_____
_____
_____
_____

**VII. LANDFILL COVERS** ☐ Applicable ☐ N/A

**A. Landfill Surface**

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____
_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____
_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____
_____

**B. Benches** ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

**C. Letdown Channels** ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

**D. Cover Penetrations** ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

**E. Gas Collection and Treatment** ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

**F. Cover Drainage Layer** ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

**G. Detention/Sedimentation Ponds** ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____
   _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____
   _____

**H. Retaining Walls** ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____
   _____

**I. Perimeter Ditches/Off-Site Discharge** ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____
   _____

**VIII. VERTICAL BARRIER WALLS** ☐ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

**IX. GROUNDWATER/SURFACE WATER REMEDIES** ☐ Applicable ☐ N/A

**A. Groundwater Extraction Wells, Pumps, and Pipelines** ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____
   _____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
   Remarks_____
   _____

**B. Surface Water Collection Structures, Pumps, and Pipelines** ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
   Remarks_____
   _____

**C. Treatment System** ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition☐ Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

**D. Monitoring Data**

1. Monitoring Data
   X Is routinely submitted on time X Is of acceptable quality

2. Monitoring data suggests:
   X Groundwater plume is effectively contained X Contaminant concentrations are declining

**D. Monitored Natural Attenuation**

1. **Monitoring Wells** (natural attenuation remedy)

X Properly secured/locked X Functioning X Routinely sampled X Good condition
X All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

## X. OTHER REMEDIES

N/A

## XI. OVERALL OBSERVATIONS

**A. Implementation of the Remedy**

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

_____

_ The purpose of the remedy is to ensure the concentration reduction in groundwater and soil to ensure that MCL's and other identified ARARs are achieved to protect human health and the environment.

_____
_____
_____
_____
_____

**B. Adequacy of O&M**

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

_____

Natural attenuation of the contaminated plume is occurring at the approximate rate that was calculated in the model developed during the RI/FS. It is expected that the cleanup goals will be achieved.

_____
_____
_____
_____

| C. | **Early Indicators of Potential Remedy Problems** |
|---|---|
| | Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.<br>_ N/A _____ |

| D. | **Opportunities for Optimization** |
|---|---|
| | Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.<br>_ N/A _____ |

05/10/17 SITE INSPECTION
PHOTOGRAPHIC LOG

| Site Location: | Project No. |
|---|---|
| Gallup's Quarry Plainville, CT | 60318204 |

| Photo No. | Date: |
|---|---|
| 1 | 05/10/17 |

Direction Photo Taken:
South

Description:

Main site access road and gate.

| Photo No. | Date: |
|---|---|
| 2 | 05/10/17 |

Direction Photo Taken:
North

Description:

Main site access road.

05/10/17 SITE INSPECTION
PHOTOGRAPHIC LOG

| Site Location: | Project No. |
|---|---|
| Gallup's Quarry Plainville, CT | 60318204 |

| Photo No. | Date: |
|---|---|
| 3 | 05/10/17 |

Direction Photo Taken:
South

Description:

Former disposal areas and new Alternative Energy Facility.


| Photo No. | Date: |
|---|---|
| 4 | 05/10/17 |

Direction Photo Taken:
Southwest

Description:

Primary and Secondary Former Disposal Areas.

05/10/17 SITE INSPECTION
PHOTOGRAPHIC LOG

| Site Location: | Project No. |
|---|---|
| Gallup's Quarry Plainville, CT | 60318204 |

| Photo No. | Date: |
|---|---|
| 5 | 05/10/17 |

Direction Photo Taken:
Southeast

Description:

Former primary Disposal Area and soil sampling locations.


| Photo No. | Date: |
|---|---|
| 6 | 05/10/17 |

Direction Photo Taken:
N/A

Description:

MW-101 well pair.

05/10/17 SITE INSPECTION
PHOTOGRAPHIC LOG

| Site Location: | Project No. |
|---|---|
| Gallup's Quarry Plainville, CT | 60318204 |

| Photo No. | Date: |
|---|---|
| 7 | 05/10/17 |

Direction Photo Taken:
N/A

Description:

Well MW-106TT.


| Photo No. | Date: |
|---|---|
| 8 | 05/10/17 |

Direction Photo Taken:

Description:

MW-123 well pair.

# APPENDIX G – STATISTICAL ANALYSIS

Gallup's Quarry Five Year Review
Statistical Analysis
June 2017

## Introduction

A statistical evaluation was conducted to show whether interim clean-up levels in groundwater were met for each of the November 2014, November 2015, and November 2016 sampling events. Vinyl chloride, tetrachloroethene, and arsenic were included in the evaluation. Groundwater concentrations of other metals and volatile organic compounds were below interim clean-up levels for each of the last three sampling events and are not included in this evaluation.

## Methodology

The evaluation included:

- Review of number of detected concentrations and wells with concentrations above the interim clean-up level during each sampling event;
- Graphical depiction of concentrations over time for wells exceeding the interim clean-up level; and,
- Analysis of concentration trends over time using the Mann Kendall test for wells exceeding the interim clean-up level.

The Mann Kendall test was run on a well by well basis using concentrations collected from May 1997 through November 2016. Graphs of concentrations over time suggest there may be seasonal variability. For example the graph of vinyl chloride at MW-102TT on page 3 shows peaks occurring in May and lower concentrations in November. The Mann Kendall test was run on concentrations measured in November and May separately to account for this seasonal variability. The Mann Kendall test evaluates the hypothesis of no significant trend in concentrations. If the p-value of the test was less than the significance level (0.05), then it was concluded that there was a significant trend with direction determined by the sign of the test statistic. If the p-value of the test was greater than the significance level (0.05), then it was concluded that there was not a significant trend.

For analytes and sampling events with adequate detections above the interim clean-up level and numbers of samples, the following were also evaluated:

- Calculations of 95% upper confidence limits for the mean and comparison to interim clean-up levels; and,
- Hypothesis testing to determine if concentrations are less than the interim clean-up levels.

Upper confidence limit calculations and hypothesis testing were conducted on data compiled from each of the last three sampling events. Appropriate confidence limit calculation methods and hypothesis tests were selected given the distribution of data and frequency of detect. The distributions of data were

determined using goodness-of-fit statistics (significance level 0.05, normal regression on order statistic estimates for non-detects).

Hypothesis testing involved a one-sample test with null hypothesis ($H_O$) and alternative hypothesis ($H_A$):

$H_O$ = Mean/Median of Site Concentrations >= Interim Clean-up Level

$H_A$ = Mean/Median of Site Concentrations < Interim Clean-up Level

If the p-value of the one-sample hypothesis test was greater than the significance level (0.05), then the null hypothesis was not rejected and it was concluded that site concentrations are greater than or equal to the interim clean-up level. If the p-value was less than the significance level (0.05), then the null hypothesis was rejected and the alternative hypothesis was accepted: site concentrations are less than the interim clean-up level.

The evaluation was conducted using ProUCL software, version 5.1.002 (USEPA, 2016). Outputs of calculations and tests from ProUCL are included in Attachment 1.

For the purposes of the evaluation duplicates were assigned the maximum concentration of the sample and duplicate. Non-detect concentrations were estimated within ProUCL using regression on order statistics for goodness of fit testing and the Kaplan-Meier method for upper confidence limit calculations, substituted with half the detection limit for hypothesis testing, and substituted with a consistent value below the minimum detected concentration for the Mann Kendall test (Gilbert, 1987).

Vinyl Chloride

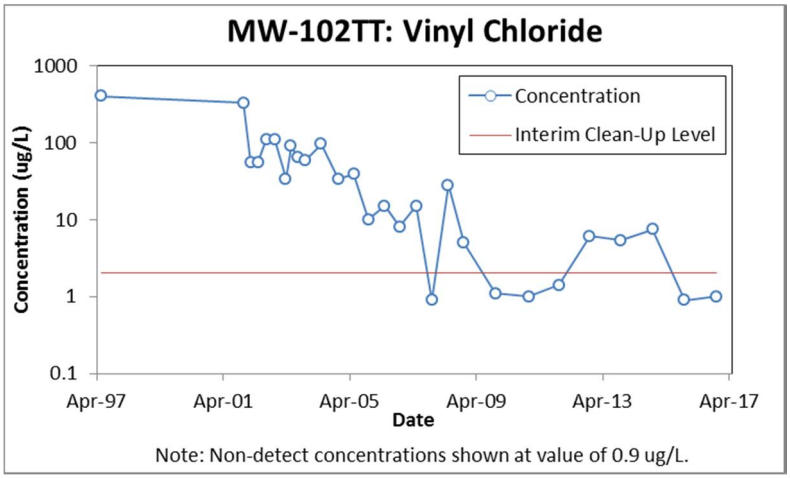
Table 1 shows the number of wells with detected vinyl chloride concentrations and concentrations exceeding the interim clean-up level during November 2014, November 2015, and November 2016.

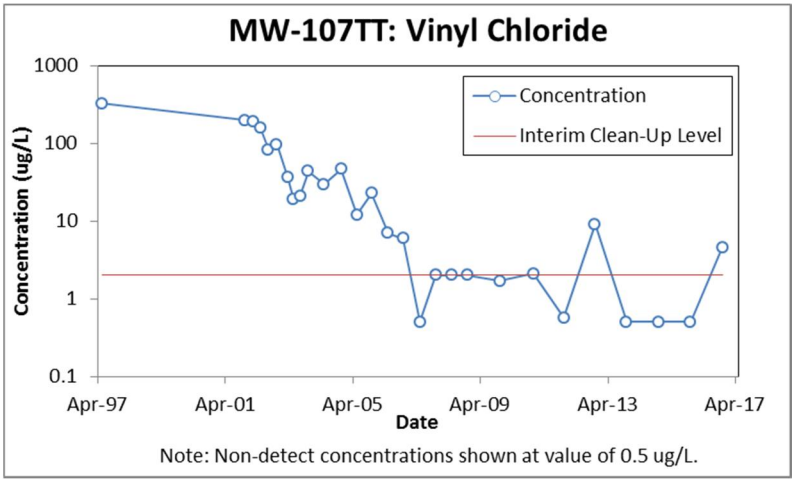
Table 1: Number of Wells with Vinyl Chloride Concentrations Above the Detection Limit and Interim Clean-Up Level (2 ug/L)

| Compound | Sampling Event | Number of Wells Sampled | Number of Wells with Detected Concentrations | Wells with Concentrations Above Interim Clean-Up Level |
|---|---|---|---|---|
| Vinyl Chloride | November 2014 | 27 | 3 | MW-102TT (7.4 ug/L) |
| | November 2015 | 27 | 0 | - |
| | November 2016 | 27 | 2 | MW-107TT (4.6 ug/L) |

Vinyl chloride concentrations exceeded the interim clean-up level at just two wells (MW-102TT and MW-107TT) during the last three sampling events. Only 11% and 7% of sampled wells had detected concentrations during November 2014 and November 2016, respectively, and no vinyl chloride was detected during November 2015. Given these low frequencies of detect, upper confidence limit calculations and hypothesis testing are not appropriate.

Concentration versus time graphs for wells exceeding the interim clean-up level for vinyl chloride during the last three sampling events (MW-102TT and MW-107TT) are presented here. The graph for MW-102TT shows decreasing concentrations from 1997 to 2008 and concentrations fluctuating around the interim clean-up level since 2008. The graph for MW-107TT shows decreasing concentrations from 1997 to 2008 and concentrations below the interim clean-up level with periodic spikes since 2008.




Trends in concentrations at MW-102TT and MW-107TT were evaluated with the Mann Kendall test. The Mann Kendall test was run on concentrations measured in November and May separately to account for seasonal variability. The results of the Mann Kendall test are summarized in Table 2.

Table 2: Mann Kendall Test Results for Vinyl Chloride at Select Wells

| Compound | Well | Sampling Month | Test Statistic | p-value | Conclusion |
|---|---|---|---|---|---|
| Vinyl Chloride | MW-102TT | May | -17 | 0.031 | Decreasing Trend |
| | | November | -68 | 0.001 | Decreasing Trend |
| | MW-107TT | May | -24 | 0.001 | Decreasing Trend |
| | | November | -80 | 0 | Decreasing Trend |

Although recent concentrations of vinyl chloride at MW-102TT and MW-107TT have exceeded the interim clean-up level, the results of the Mann Kendall test indicate concentrations are decreasing. The graphs of concentrations over time at these locations also suggest recent exceedances may represent a short-term condition. Concentrations at remaining locations have not exceeded the interim clean-up level during the last three sampling events.

Tetrachloroethene

Table 3 shows the number of wells with detected tetrachloroethene concentrations and concentrations exceeding the interim clean-up level during November 2014, November 2015, and November 2016.

Table 3: Number of Wells with Tetrachloroethene Concentrations Above the Detection Limit and Interim Clean-Up Level (5 ug/L)

| Compound | Sampling Event | Number of Wells Sampled | Number of Wells with Detected Concentrations | Wells with Concentrations Above Interim Clean-Up Level |
|---|---|---|---|---|
| Tetrachloroethene | November 2014 | 27 | 9 | MW-102TT (9.4 ug/L)<br>MW-105TT (7.4 ug/L)<br>MW-105T (8.4 ug/L)<br>MW-107TT (5.3 ug/L)* |
| | November 2015 | 27 | 7 | MW-102TT (10 ug/L) |
| | November 2016 | 27 | 9 | MW-102S (5.4 ug/L)<br>MW-102TT (6.7 ug/L) |

Note:
* Maximum concentration of parent and duplicate sample.

Tetrachloroethene concentrations exceeded the interim clean-up level at five wells (MW-102S, MW-102TT, MW-105T, MW-105TT, MW-107TT) during the last three sampling events. Between 26% and 33% of sampled wells had detected concentrations during November 2014, November 2015, and November 2016.

Upper confidence limit calculations, hypothesis testing, and trend analysis were conducted on tetrachloroethene concentrations.

Based on goodness-of-fit statistics, November 2014, November 2015, and November 2016 concentrations are normally distributed. Table 4 shows 95% upper confidence limits for tetrachloroethene calculated using the Student's t-Statistic for normally distributed datasets. Upper confidence limits from the last three sampling events are below the interim clean-up level of 5 ug/L.

Table 4: 95% Upper Confidence Limits for Average Tetrachloroethene

| Compound | Sampling Event | 95% Upper Confidence Limit (ug/L) | Upper Confidence Limit Calculation Method |
|---|---|---|---|
| Tetrachloroethene | November 2014 | 2.681 | Kaplan Meier (t) |
| | November 2015 | 2.017 | Kaplan Meier (t) |
| | November 2016 | 1.714 | Kaplan Meier (t) |

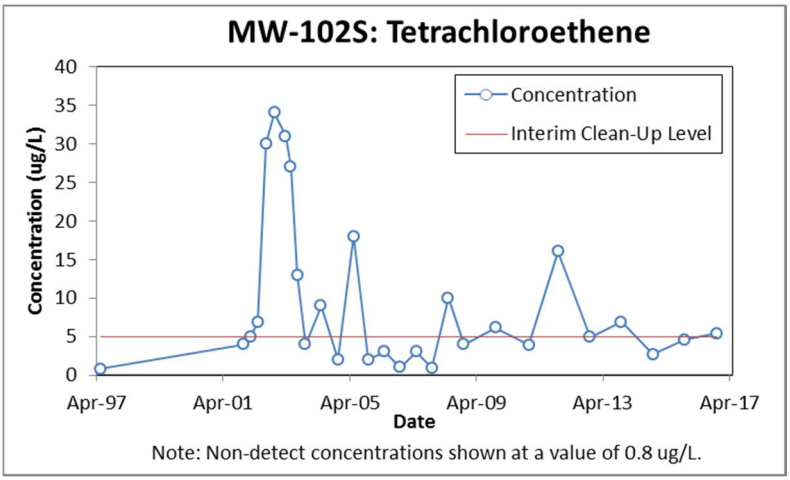
Hypothesis testing was conducted using the Wilcoxon Signed Rank Test. The Wilcoxon Signed Rank Test was selected as the test can be used with datasets including non-detect concentrations and does not assume a particular distribution. The results of hypothesis testing are summarized in Table 5. The null hypothesis that the mean/median of site concentrations >= interim clean-up level was rejected for concentrations from the last three sampling events.

Table 5: Hypothesis Testing Results for Tetrachloroethene

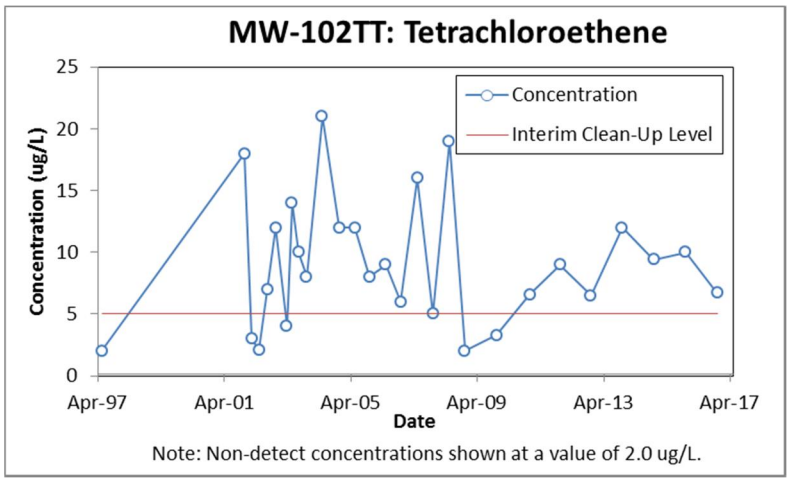
| Compound | Sampling Event | Test | p-value | Conclusion |
|---|---|---|---|---|
| Tetrachloroethene | November 2014 | Wilcoxon Signed Rank | <0.001 | Median Concentration < Interim Clean-up Level |
| | November 2015 | Wilcoxon Signed Rank | <0.001 | Median Concentration < Interim Clean-up Level |
| | November 2016 | Wilcoxon Signed Rank | <0.001 | Median Concentration < Interim Clean-up Level |

Concentration versus time graphs for wells with tetrachloroethene exceeding the interim clean-up level during the last three sampling events (MW-102S, MW-102TT, MW-105T, MW-105TT, and MW-107TT) are presented here. The graphs show:

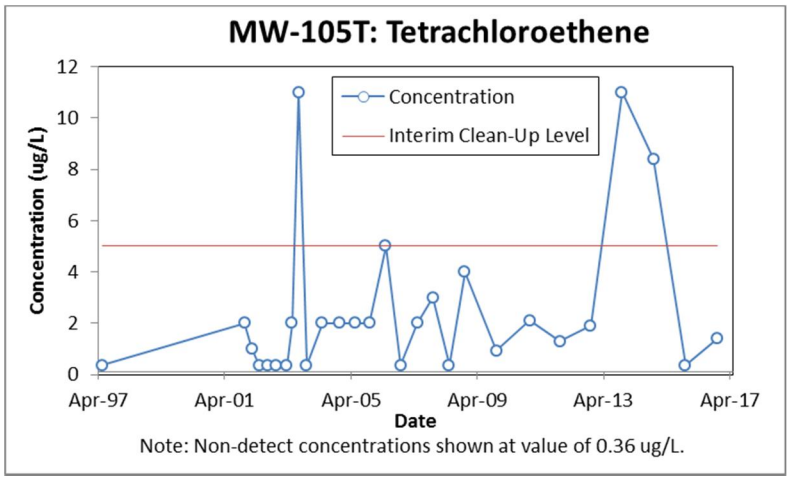
- Decreasing concentrations from 2002 to 2007 and concentrations fluctuating around the interim clean-up level since 2007 at MW-102S;
- Variable concentrations above the interim clean-up level at MW-102TT;
- Concentrations below the interim clean-up level with periodic spikes at MW-105T and MW-105TT; and,
- Decreasing concentrations from 2003 to the present at MW-107TT.



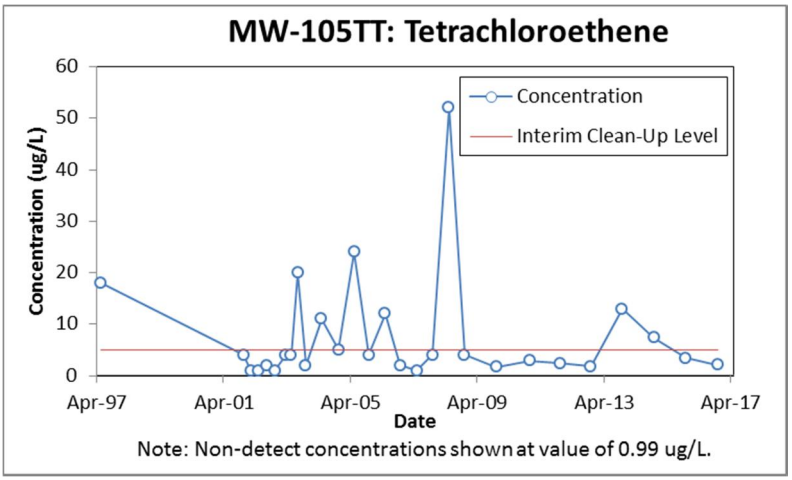
Note: Non-detect concentrations shown at a value of 0.8 ug/L.

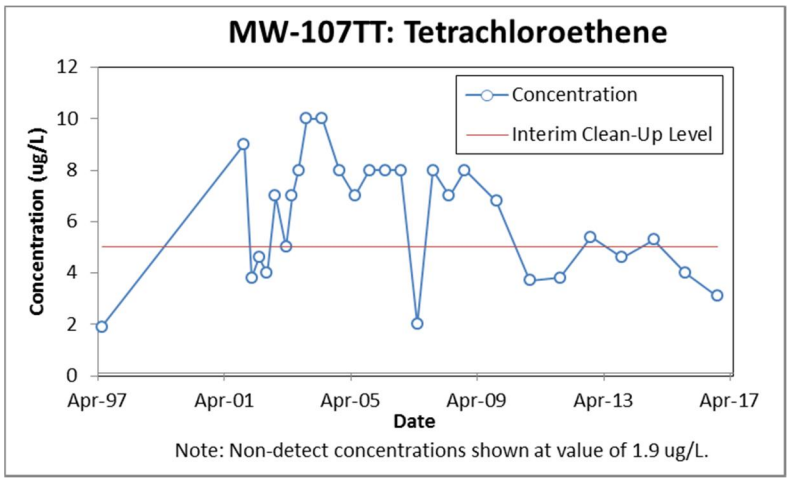


Note: Non-detect concentrations shown at a value of 2.0 ug/L.



Note: Non-detect concentrations shown at value of 0.36 ug/L.




Trends in concentrations from MW-102S, MW-102TT, MW-105T, MW-105TT, and MW-107TT were evaluated with the Mann Kendall test. The Mann Kendall test was run on concentrations measured in November and May separately to account for seasonal variability. The results of the Mann Kendall test are summarized in Table 6. The test results identify a decreasing trend in November concentrations from MW-107TT and no trend in other concentrations.

Table 6: Mann Kendall Test Results for Tetrachloroethene at Select Wells

| Compound | Well | Sampling Month | Test Statistic | p-value | Conclusion |
|---|---|---|---|---|---|
| Tetrachloroethene | MW-102S | May | 3 | 0.452 | No Trend |
| | | November | 18 | 0.225 | No Trend |
| | MW-102TT | May | 14 | 0.054 | No Trend |
| | | November | -14 | 0.282 | No Trend |
| | MW-105T | May | 7 | 0.274 | No Trend |
| | | November | 21 | 0.199 | No Trend |
| | MW-105TT | May | 7 | 0.274 | No Trend |
| | | November | 7 | 0.412 | No Trend |
| | MW-107TT | May | 7 | 0.274 | No Trend |
| | | November | -76 | 0 | Decreasing Trend |

Although recent concentrations of tetrachloroethene at MW-102S, MW-102TT, MW-105T, MW-105TT, and MW-107TT have exceeded the interim clean-up level, upper confidence limit calculations and hypothesis testing results indicate the average concentration across the site was below the interim clean-up level for the last three sampling events. The results of the Mann Kendall test also indicate concentrations at wells with recent exceedances have no trend or a decreasing trend. Concentrations at remaining locations have not exceeded the interim clean-up level during the last three sampling events.

Arsenic

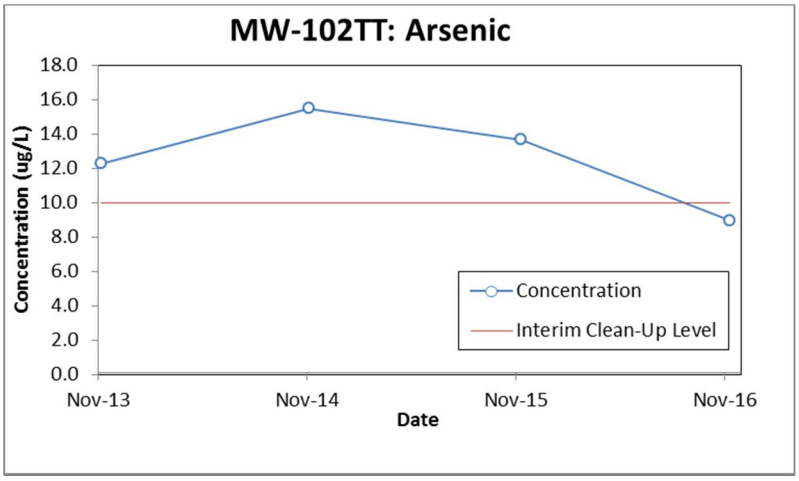
Table 7 shows the number of wells with detected arsenic concentrations and concentrations exceeding the EPA Maximum Contaminant Level (MCL) during November 2014, November 2015, and November 2016. Note that an interim clean-up level is not currently established for arsenic.

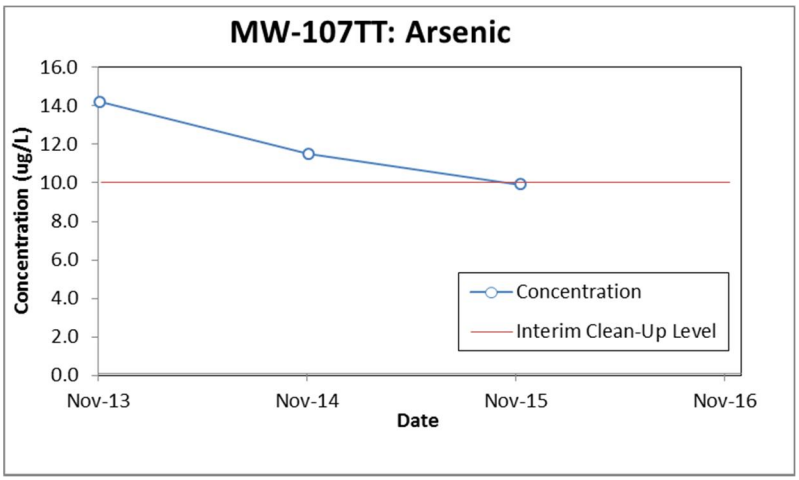
Table 7: Number of Wells with Arsenic Concentrations Above the Detection Limit and MCL (10 ug/L)

| Compound | Sampling Event | Number of Wells Sampled | Number of Wells with Detected Concentrations | Wells with Concentrations Above MCL |
|---|---|---|---|---|
| Arsenic | November 2014 | 3 | 3 | MW-102TT (15.5 ug/L)<br>MW-107TT (11.5 ug/L) |
| | November 2015 | 3 | 3 | MW-102TT (13.7 ug/L) |
| | November 2016 | 2 | 2 | - |

Arsenic concentrations exceeded the MCL at two out of three wells sampled during November 2014 and one out of three wells sampled during November 2015. During the November 2016 sampling event only two wells were sampled and concentrations were below the MCL. Given the low number of wells sampled for arsenic, upper confidence limit calculations and hypothesis testing are not appropriate.

Concentration versus time graphs for wells with arsenic exceeding the MCL during the last three sampling events (MW-102TT and MW-107TT) are presented here. Arsenic was only added as an analyte starting with the November 2013 sampling event and an evaluation of trends is difficult based on the limited data.




Trends in concentrations from MW-102TT were evaluated with the Mann Kendall test, however, the test was not applied to MW-107TT due to insufficient sample results (n = 3). The results of the Mann Kendall test are summarized in Table 8, however, conclusions are based on limited data. Results are only presented for concentrations measured in November as arsenic has not been measured at other times of the year.

Table 8: Mann Kendall Test Results for Arsenic at Select Wells

| Compound | Well | Sampling Month | Test Statistic | p-value | Conclusion |
|---|---|---|---|---|---|
| Arsenic | MW-102TT | November | -2 | 0.375 | No Trend |

The statistical evaluation for arsenic is limited to concentration versus time graphs and the Mann Kendall test on four sample results. Additional evaluation methods could not be applied given the limited data. However, concentrations were below the MCL during the most recent sampling event (November 2016).

Summary

A statistical evaluation was conducted to show whether vinyl chloride, tetrachloroethene, and arsenic concentrations were below interim clean-up levels in groundwater for the last three sampling events. The results of the evaluation were as follows:

Vinyl Chloride

- Vinyl chloride was detected infrequently and exceeded the interim clean-up level at two wells during the last three sampling events;
- The results of the Mann Kendall test indicate concentrations are decreasing over time at the two wells exceeding the interim clean-up level; and,
- Graphs of concentrations over time suggest recent exceedances may represent a short-term condition.

Tetrachloroethene

- Tetrachloroethene was detected in 26% to 33% of sampled wells and was above the interim clean-up level at five wells during the last three sampling events;
- Upper confidence limit calculations and hypothesis testing results indicate the average concentration across the site was below the interim clean-up level for the last three sampling events; and,
- The results of the Mann Kendall test indicate no trend or decreasing trends in concentrations at the five wells exceeding the interim clean-up level.

Arsenic

- Arsenic concentrations exceeded the MCL at two out of three wells sampled during November 2014, one out of three wells sampled during November 2015, and none of the two wells sampled in November 2016; and,
- Graphs of concentrations over time and the Mann Kendall test were used for wells exceeding the MCL, however, conclusions about trends are not reliable due to limited available data.

References

Gilbert, R. 1987. Statistical Methods for Environmental Pollution Monitoring.

USEPA, 2016. ProUCL Version 5.1.002. http://www.epa.gov/land-research/proucl-software

ATTACHMENT 1

## Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/24/2017 9:03:37 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**PCE_Nov14**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 27 | 0 | 27 | 9 | 18 | 66.67% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 18 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 9 | 0.41 | 9.4 | 4.429 | 3.9 | 3.386 |
| Statistics (All: NDs treated as DL value) | 27 | 0.41 | 9.4 | 2.143 | 1 | 2.498 |
| Statistics (All: NDs treated as DL/2 value) | 27 | 0.41 | 9.4 | 1.81 | 0.5 | 2.663 |
| Statistics (Normal ROS Imputed Data) | 27 | -5.799 | 9.4 | 1.136 | 0.775 | 3.666 |
| Statistics (Gamma ROS Imputed Data) | 27 | 0.01 | 9.4 | 1.841 | 0.45 | 2.724 |
| Statistics (Lognormal ROS Imputed Data) | 27 | 0.059 | 9.4 | 1.897 | 0.709 | 2.65 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.252 | 0.909 | 3.538 | 1.038 | 1.19 | 1.146 |
| Statistics (NDs = DL) | 1.344 | 1.219 | 1.595 | 0.346 | 0.827 | 2.39 |
| Statistics (NDs = DL/2) | 0.833 | 0.765 | 2.174 | -0.116 | 1.062 | -9.151 |
| Statistics (Gamma ROS Estimates) | 0.34 | 0.327 | 5.418 | -1.379 | 2.683 | -1.946 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -0.207 | 1.361 | -6.569 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.974 | 0.765 | 0.754 | 0.986 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.924 | 0.829 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.591 | 0.923 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.571 | 0.923 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.971 | 0.923 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.143 | 0.274 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.417 | 0.167 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.429 | 0.167 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.109 | 0.167 | Data Appear Normal |

## Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.932 | 0.916 | 0.935 | 0.966 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.367 | 0.739 | |
| Kolmogorov-Smirnov (Detects Only) | 0.16 | 0.285 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 4.351 | 0.766 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.425 | 0.172 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 5.287 | 0.78 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.458 | 0.174 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 1.183 | 0.844 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.238 | 0.182 | Data Not Gamma Distributed |

## Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.94 | 0.855 | 0.792 | 0.993 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.863 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.733 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.621 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.976 | 0.923 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.162 | 0.274 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.403 | 0.167 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.447 | 0.167 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.0732 | 0.167 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

## Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/24/2017 9:05:06 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**PCE_Nov15**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 27 | 0 | 27 | 7 | 20 | 74.07% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 20 | 0.36 | 0.36 | 0.36 | 0.36 | 1.139E-16 |
| Statistics (Non-Detects Only) | 7 | 0.37 | 10 | 3.834 | 3.7 | 3.168 |
| Statistics (All: NDs treated as DL value) | 27 | 0.36 | 10 | 1.261 | 0.36 | 2.173 |
| Statistics (All: NDs treated as DL/2 value) | 27 | 0.18 | 10 | 1.127 | 0.18 | 2.232 |
| Statistics (Normal ROS Imputed Data) | 27 | -19.48 | 10 | -5.41 | -5.574 | 7.246 |
| Statistics (Gamma ROS Imputed Data) | 27 | 0.01 | 10 | 1.001 | 0.01 | 2.288 |
| Statistics (Lognormal ROS Imputed Data) | 27 | 0.00112 | 10 | 1.074 | 0.112 | 2.258 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.342 | 0.862 | 2.856 | 0.927 | 1.14 | 1.229 |
| Statistics (NDs = DL) | 0.794 | 0.731 | 1.588 | -0.516 | 1.028 | -1.992 |
| Statistics (NDs = DL/2) | 0.545 | 0.509 | 2.068 | -1.03 | 1.301 | -1.263 |
| Statistics (Gamma ROS Estimates) | 0.227 | 0.227 | 4.405 | -3.171 | 2.531 | -0.798 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -2.135 | 2.409 | -1.129 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.925 | 0.685 | 0.694 | 0.997 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.872 | 0.803 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.489 | 0.923 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.501 | 0.923 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.99 | 0.923 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.262 | 0.304 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.437 | 0.167 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.411 | 0.167 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.0732 | 0.167 | Data Appear Normal |

## Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.96 | 0.914 | 0.943 | 0.976 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.432 | 0.723 | |
| Kolmogorov-Smirnov (Detects Only) | 0.277 | 0.318 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 6.338 | 0.782 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.472 | 0.175 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 5.917 | 0.803 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.452 | 0.177 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 5.483 | 0.888 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.466 | 0.186 | Data Not Gamma Distributed |

## Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.935 | 0.737 | 0.761 | 0.993 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.88 | 0.803 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.544 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.576 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.976 | 0.923 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.317 | 0.304 | Data Not Lognormal |
| Lilliefors (NDs = DL) | 0.457 | 0.167 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.442 | 0.167 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.104 | 0.167 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

## Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/24/2017 9:09:41 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**PCE_Nov16**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 27 | 0 | 27 | 9 | 18 | 66.67% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 18 | 0.36 | 0.36 | 0.36 | 0.36 | 1.142E-16 |
| Statistics (Non-Detects Only) | 9 | 0.41 | 6.7 | 2.732 | 2.1 | 2.151 |
| Statistics (All: NDs treated as DL value) | 27 | 0.36 | 6.7 | 1.151 | 0.36 | 1.65 |
| Statistics (All: NDs treated as DL/2 value) | 27 | 0.18 | 6.7 | 1.031 | 0.18 | 1.711 |
| Statistics (Normal ROS Imputed Data) | 27 | -11.37 | 6.7 | -2.412 | -2.54 | 4.602 |
| Statistics (Gamma ROS Imputed Data) | 27 | 0.01 | 6.7 | 0.917 | 0.01 | 1.77 |
| Statistics (Lognormal ROS Imputed Data) | 27 | 0.00478 | 6.7 | 0.999 | 0.205 | 1.731 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.575 | 1.124 | 1.735 | 0.655 | 0.974 | 1.486 |
| Statistics (NDs = DL) | 0.962 | 0.879 | 1.197 | -0.463 | 0.97 | -2.096 |
| Statistics (NDs = DL/2) | 0.641 | 0.594 | 1.609 | -0.925 | 1.26 | -1.363 |
| Statistics (Gamma ROS Estimates) | 0.256 | 0.252 | 3.585 | -2.852 | 2.584 | -0.906 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.532 | 1.966 | -1.283 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.96 | 0.744 | 0.757 | 0.998 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.911 | 0.829 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.563 | 0.923 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.581 | 0.923 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.99 | 0.923 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.174 | 0.274 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.399 | 0.167 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.367 | 0.167 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.0635 | 0.167 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.985 | 0.939 | 0.965 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.217 | 0.734 | |
| Kolmogorov-Smirnov (Detects Only) | 0.143 | 0.284 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 5.024 | 0.775 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.396 | 0.173 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 4.523 | 0.794 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.405 | 0.176 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 4.181 | 0.875 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.422 | 0.184 | Data Not Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.972 | 0.795 | 0.819 | 0.993 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.931 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.627 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.661 | 0.923 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.975 | 0.923 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.149 | 0.274 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.384 | 0.167 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.401 | 0.167 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.0884 | 0.167 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

## One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/24/2017 9:02:31 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Action Level | 5.000 |
| Selected Null Hypothesis | Mean/Median >= Action Level (Form 2) |
| Alternative Hypothesis | Mean/Median < the Action Level |

**PCE_Nov14**

### One Sample Wilcoxon Signed Rank Test

**Raw Statistics**

| | |
|---|---|
| Number of Valid Data | 27 |
| Number of Distinct Data | 10 |
| Number of Non-Detects | 18 |
| Number of Detects | 9 |
| Percent Non-Detects | 66.67% |
| Minimum Non-detect | 1 |
| Maximum Non-detect | 1 |
| Minimum Detect | 0.41 |
| Maximum Detect | 9.4 |
| Mean of Detects | 4.429 |
| Median of Detects | 3.9 |
| SD of Detects | 3.386 |
| Median of Processed Data used in WSR | 0.5 |
| Number Above Action Level | 4 |
| Number Equal Action Level | 0 |
| Number Below Action Level | 23 |
| T-plus | 18 |
| T-minus | 360 |

**H0: Sample Median >= 5 (Form 2)**

| | |
|---|---|
| Large Sample z-Test Statistic | -4.247 |
| Critical Value (0.05) | -1.645 |
| P-Value | 1.0812E-5 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Mean/Median < 5**

**P-Value < Alpha (0.05)**

**All NDs are replaced by their respective DL/2**

## One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/24/2017 9:05:50 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Action Level | 5.000 |
| Selected Null Hypothesis | Mean/Median >= Action Level (Form 2) |
| Alternative Hypothesis | Mean/Median < the Action Level |

**PCE_Nov15**

### One Sample Wilcoxon Signed Rank Test

**Raw Statistics**

| | |
|---|---|
| Number of Valid Data | 27 |
| Number of Distinct Data | 8 |
| Number of Non-Detects | 20 |
| Number of Detects | 7 |
| Percent Non-Detects | 74.07% |
| Minimum Non-detect | 0.36 |
| Maximum Non-detect | 0.36 |
| Minimum Detect | 0.37 |
| Maximum Detect | 10 |
| Mean of Detects | 3.834 |
| Median of Detects | 3.7 |
| SD of Detects | 3.168 |
| Median of Processed Data used in WSR | 0.18 |
| Number Above Action Level | 1 |
| Number Equal Action Level | 0 |
| Number Below Action Level | 26 |
| T-plus | 27 |
| T-minus | 351 |

**H0: Sample Median >= 5 (Form 2)**

| | |
|---|---|
| Large Sample z-Test Statistic | -4.081 |
| Critical Value (0.05) | -1.645 |
| P-Value | 2.2443E-5 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Mean/Median < 5**

**P-Value < Alpha (0.05)**

**All NDs are replaced by their respective DL/2**

# One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/24/2017 9:11:39 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Action Level | 5.000 |
| Selected Null Hypothesis | Mean/Median >= Action Level (Form 2) |
| Alternative Hypothesis | Mean/Median < the Action Level |

**PCE_Nov16**

## One Sample Wilcoxon Signed Rank Test

### Raw Statistics

| | |
|---|---|
| Number of Valid Data | 27 |
| Number of Distinct Data | 10 |
| Number of Non-Detects | 18 |
| Number of Detects | 9 |
| Percent Non-Detects | 66.67% |
| Minimum Non-detect | 0.36 |
| Maximum Non-detect | 0.36 |
| Minimum Detect | 0.41 |
| Maximum Detect | 6.7 |
| Mean of Detects | 2.732 |
| Median of Detects | 2.1 |
| SD of Detects | 2.151 |
| Median of Processed Data used in WSR | 0.18 |
| Number Above Action Level | 2 |
| Number Equal Action Level | 0 |
| Number Below Action Level | 25 |
| T-plus | 3.5 |
| T-minus | 374.5 |

**H0: Sample Median >= 5 (Form 2)**

| | |
|---|---|
| Large Sample z-Test Statistic | -4.609 |
| Critical Value (0.05) | -1.645 |
| P-Value | 2.0248E-6 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Mean/Median < 5**

**P-Value < Alpha (0.05)**

**All NDs are replaced by their respective DL/2**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:43:29 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-102S May**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 0.8 |
| Maximum | 27 |
| Mean | 9.7 |
| Geometric Mean | 6.185 |
| Median | 7.9 |
| Standard Deviation | 8.833 |
| Coefficient of Variation | 0.911 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 3 |
| Tabulated p-value | 0.452 |
| Standard Deviation of S | 8.021 |
| Standardized Value of S | 0.249 |
| Approximate p-value | 0.402 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:43:05 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-102S Nov**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 0.9 |
| Maximum | 34 |
| Mean | 6.4 |
| Geometric Mean | 4.115 |
| Median | 4 |
| Standard Deviation | 8.149 |
| Coefficient of Variation | 1.273 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 18 |
| Tabulated p-value | 0.225 |
| Standard Deviation of S | 22.11 |
| Standardized Value of S | 0.769 |
| Approximate p-value | 0.221 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:42:34 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-102TT May**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 2 |
| Maximum | 21 |
| Mean | 11.89 |
| Geometric Mean | 8.933 |
| Median | 13 |
| Standard Deviation | 7.141 |
| Coefficient of Variation | 0.601 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 14 |
| Tabulated p-value | 0.054 |
| Standard Deviation of S | 8.083 |
| Standardized Value of S | 1.608 |
| Approximate p-value | 0.0539 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:42:01 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-102TT Nov**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 2 |
| Maximum | 18 |
| Mean | 8.406 |
| Geometric Mean | 7.479 |
| Median | 8 |
| Standard Deviation | 3.91 |
| Coefficient of Variation | 0.465 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -14 |
| Tabulated p-value | 0.282 |
| Standard Deviation of S | 22.11 |
| Standardized Value of S | -0.588 |
| Approximate p-value | 0.278 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:40:19 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-105T May**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 0.36 |
| Maximum | 5 |
| Mean | 1.76 |
| Geometric Mean | 1.179 |
| Median | 2 |
| Standard Deviation | 1.54 |
| Coefficient of Variation | 0.875 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 7 |
| Tabulated p-value | 0.274 |
| Standard Deviation of S | 7.28 |
| Standardized Value of S | 0.824 |
| Approximate p-value | 0.205 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:37:16 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-105T Nov**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 0.36 |
| Maximum | 11 |
| Mean | 2.591 |
| Geometric Mean | 1.539 |
| Median | 1.95 |
| Standard Deviation | 2.991 |
| Coefficient of Variation | 1.154 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 21 |
| Tabulated p-value | 0.199 |
| Standard Deviation of S | 21.93 |
| Standardized Value of S | 0.912 |
| Approximate p-value | 0.181 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:36:34 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-105TT May**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 0.99 |
| Maximum | 52 |
| Mean | 15.37 |
| Geometric Mean | 7.641 |
| Median | 11.5 |
| Standard Deviation | 16.89 |
| Coefficient of Variation | 1.099 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 7 |
| Tabulated p-value | 0.274 |
| Standard Deviation of S | 8.021 |
| Standardized Value of S | 0.748 |
| Approximate p-value | 0.227 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:35:49 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-105TT Nov**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 1 |
| Maximum | 13 |
| Mean | 3.794 |
| Geometric Mean | 3.106 |
| Median | 3.15 |
| Standard Deviation | 2.918 |
| Coefficient of Variation | 0.769 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 7 |
| Tabulated p-value | 0.412 |
| Standard Deviation of S | 21.99 |
| Standardized Value of S | 0.273 |
| Approximate p-value | 0.392 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:41:33 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-107TT May**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 1.9 |
| Maximum | 10 |
| Mean | 5.938 |
| Geometric Mean | 5.13 |
| Median | 7 |
| Standard Deviation | 2.872 |
| Coefficient of Variation | 0.484 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | 7 |
| Tabulated p-value | 0.274 |
| Standard Deviation of S | 7.853 |
| Standardized Value of S | 0.764 |
| Approximate p-value | 0.222 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 11:41:03 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

**PCE MW-107TT Nov**

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 3.1 |
| Maximum | 10 |
| Mean | 6.419 |
| Geometric Mean | 6.05 |
| Median | 6.9 |
| Standard Deviation | 2.148 |
| Coefficient of Variation | 0.335 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -76 |
| Tabulated p-value | 0 |
| Standard Deviation of S | 21.83 |
| Standardized Value of S | -3.435 |
| Approximate p-value | 2.9604E-4 |

**Statistically significant evidence of a decreasing trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/31/2017 4:59:47 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

### VC MW-102TT May

#### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 15 |
| Maximum | 400 |
| Mean | 92.38 |
| Geometric Mean | 51.24 |
| Median | 47.5 |
| Standard Deviation | 128.1 |
| Coefficient of Variation | 1.387 |

#### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -17 |
| Tabulated p-value | 0.031 |
| Standard Deviation of S | 8.021 |
| Standardized Value of S | -1.995 |
| Approximate p-value | 0.023 |

**Statistically significant evidence of a decreasing trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/31/2017 5:00:10 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

### VC MW-102TT Nov

#### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 0.9 |
| Maximum | 330 |
| Mean | 36.33 |
| Geometric Mean | 6.445 |
| Median | 5.75 |
| Standard Deviation | 83.6 |
| Coefficient of Variation | 2.302 |

#### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -68 |
| Tabulated p-value | 0.001 |
| Standard Deviation of S | 22.17 |
| Standardized Value of S | -3.023 |
| Approximate p-value | 0.00125 |

**Statistically significant evidence of a decreasing trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/31/2017 5:02:18 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

### VC MW-107TT May

#### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 8 |
| Number Values Reported (n) | 8 |
| Minimum | 0.5 |
| Maximum | 330 |
| Mean | 70.06 |
| Geometric Mean | 14.97 |
| Median | 15.5 |
| Standard Deviation | 117.5 |
| Coefficient of Variation | 1.677 |

#### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -24 |
| Tabulated p-value | 0.001 |
| Standard Deviation of S | 8.083 |
| Standardized Value of S | -2.846 |
| Approximate p-value | 0.00222 |

**Statistically significant evidence of a decreasing trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/31/2017 5:03:04 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

### VC MW-107TT Nov

#### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 16 |
| Number Values Reported (n) | 16 |
| Minimum | 0.5 |
| Maximum | 200 |
| Mean | 27.6 |
| Geometric Mean | 5.141 |
| Median | 3.35 |
| Standard Deviation | 53.07 |
| Coefficient of Variation | 1.923 |

#### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -80 |
| Tabulated p-value | 0 |
| Standard Deviation of S | 22.11 |
| Standardized Value of S | -3.574 |
| Approximate p-value | 1.7597E-4 |

**Statistically significant evidence of a decreasing trend at the specified level of significance.**

## Mann-Kendall Trend Test Analysis

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/1/2017 1:42:19 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |
| Level of Significance | 0.05 |

### Arsenic MW-102TT

### General Statistics

| | |
|---|---|
| Number or Reported Events Not Used | 0 |
| Number of Generated Events | 4 |
| Number Values Reported (n) | 4 |
| Minimum | 9 |
| Maximum | 15.5 |
| Mean | 12.63 |
| Geometric Mean | 12.38 |
| Median | 13 |
| Standard Deviation | 2.749 |
| Coefficient of Variation | 0.218 |

### Mann-Kendall Test

| | |
|---|---|
| M-K Test Value (S) | -2 |
| Tabulated p-value | 0.375 |
| Standard Deviation of S | 2.944 |
| Standardized Value of S | -0.34 |
| Approximate p-value | 0.367 |

**Insufficient evidence to identify a significant trend at the specified level of significance.**

## UCL Statistics for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/24/2017 9:01:22 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**PCE_Nov14**

### General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 27 | Number of Distinct Observations | 10 |
| Number of Detects | 9 | Number of Non-Detects | 18 |
| Number of Distinct Detects | 9 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.41 | Minimum Non-Detect | 1 |
| Maximum Detect | 9.4 | Maximum Non-Detect | 1 |
| Variance Detects | 11.46 | Percent Non-Detects | 66.67% |
| Mean Detects | 4.429 | SD Detects | 3.386 |
| Median Detects | 3.9 | CV Detects | 0.765 |
| Skewness Detects | 0.261 | Kurtosis Detects | -1.516 |
| Mean of Logged Detects | 1.038 | SD of Logged Detects | 1.19 |

### Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.924 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.829 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.143 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.274 | Detected Data appear Normal at 5% Significance Level |

**Detected Data appear Normal at 5% Significance Level**

### Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

| | | | |
|---|---|---|---|
| KM Mean | 1.763 | KM Standard Error of Mean | 0.538 |
| KM SD | 2.636 | 95% KM (BCA) UCL | 2.874 |
| 95% KM (t) UCL | 2.681 | 95% KM (Percentile Bootstrap) UCL | 2.744 |
| 95% KM (z) UCL | 2.648 | 95% KM Bootstrap t UCL | 2.916 |
| 90% KM Chebyshev UCL | 3.378 | 95% KM Chebyshev UCL | 4.109 |
| 97.5% KM Chebyshev UCL | 5.124 | 99% KM Chebyshev UCL | 7.119 |

### Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.367 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.739 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.16 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.285 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

### Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.252 | k star (bias corrected MLE) | 0.909 |
| Theta hat (MLE) | 3.538 | Theta star (bias corrected MLE) | 4.875 |
| nu hat (MLE) | 22.53 | nu star (bias corrected) | 16.35 |
| Mean (detects) | 4.429 | | |

### Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 1.841 |
| Maximum | 9.4 | Median | 0.45 |
| SD | 2.724 | CV | 1.48 |
| k hat (MLE) | 0.34 | k star (bias corrected MLE) | 0.327 |
| Theta hat (MLE) | 5.418 | Theta star (bias corrected MLE) | 5.635 |
| nu hat (MLE) | 18.35 | nu star (bias corrected) | 17.64 |
| Adjusted Level of Significance (β) | 0.0401 | | |
| Approximate Chi Square Value (17.64, α) | 9.132 | Adjusted Chi Square Value (17.64, β) | 8.741 |
| 95% Gamma Approximate UCL (use when n>=50) | 3.556 | 95% Gamma Adjusted UCL (use when n<50) | 3.715 |

### Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.763 | SD (KM) | 2.636 |
| Variance (KM) | 6.951 | SE of Mean (KM) | 0.538 |
| k hat (KM) | 0.447 | k star (KM) | 0.422 |
| nu hat (KM) | 24.15 | nu star (KM) | 22.8 |
| theta hat (KM) | 3.943 | theta star (KM) | 4.176 |
| 80% gamma percentile (KM) | 2.862 | 90% gamma percentile (KM) | 4.931 |
| 95% gamma percentile (KM) | 7.189 | 99% gamma percentile (KM) | 12.83 |

### Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| Approximate Chi Square Value (22.80, α) | 12.94 | Adjusted Chi Square Value (22.80, β) | 12.46 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 3.106 | 95% Gamma Adjusted KM-UCL (use when n<50) | 3.225 |

### Lognormal GOF Test on Detected Observations Only

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.863 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.829 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.162 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.274 | Detected Data appear Lognormal at 5% Significance Level | |

**Detected Data appear Lognormal at 5% Significance Level**

### Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.897 | Mean in Log Scale | -0.207 |
| SD in Original Scale | 2.65 | SD in Log Scale | 1.361 |
| 95% t UCL (assumes normality of ROS data) | 2.767 | 95% Percentile Bootstrap UCL | 2.801 |
| 95% BCA Bootstrap UCL | 3.072 | 95% Bootstrap t UCL | 3.15 |
| 95% H-UCL (Log ROS) | 4.608 | | |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean (logged) | -0.217 | KM Geo Mean | 0.805 |
| KM SD (logged) | 1.099 | 95% Critical H Value (KM-Log) | 2.653 |
| KM Standard Error of Mean (logged) | 0.226 | 95% H-UCL (KM -Log) | 2.61 |
| KM SD (logged) | 1.099 | 95% Critical H Value (KM-Log) | 2.653 |
| KM Standard Error of Mean (logged) | 0.226 | | |

**DL/2 Statistics**

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 1.81 | Mean in Log Scale | -0.116 |
| SD in Original Scale | 2.663 | SD in Log Scale | 1.062 |
| 95% t UCL (Assumes normality) | 2.684 | 95% H-Stat UCL | 2.69 |

**DL/2 is not a recommended method, provided for comparisons and historical reasons**

**Nonparametric Distribution Free UCL Statistics**

**Detected Data appear Normal Distributed at 5% Significance Level**

**Suggested UCL to Use**

| | |
|---|---|
| 95% KM (t) UCL | 2.681 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

## UCL Statistics for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/24/2017 9:07:01 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**PCE_Nov15**

### General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 27 | Number of Distinct Observations | 8 |
| Number of Detects | 7 | Number of Non-Detects | 20 |
| Number of Distinct Detects | 7 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.37 | Minimum Non-Detect | 0.36 |
| Maximum Detect | 10 | Maximum Non-Detect | 0.36 |
| Variance Detects | 10.04 | Percent Non-Detects | 74.07% |
| Mean Detects | 3.834 | SD Detects | 3.168 |
| Median Detects | 3.7 | CV Detects | 0.826 |
| Skewness Detects | 1.206 | Kurtosis Detects | 2.371 |
| Mean of Logged Detects | 0.927 | SD of Logged Detects | 1.14 |

### Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.872 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.803 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.262 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.304 | Detected Data appear Normal at 5% Significance Level |

**Detected Data appear Normal at 5% Significance Level**

### Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

| | | | |
|---|---|---|---|
| KM Mean | 1.261 | KM Standard Error of Mean | 0.443 |
| KM SD | 2.133 | 95% KM (BCA) UCL | 2.007 |
| 95% KM (t) UCL | 2.017 | 95% KM (Percentile Bootstrap) UCL | 2.008 |
| 95% KM (z) UCL | 1.99 | 95% KM Bootstrap t UCL | 2.343 |
| 90% KM Chebyshev UCL | 2.591 | 95% KM Chebyshev UCL | 3.193 |
| 97.5% KM Chebyshev UCL | 4.029 | 99% KM Chebyshev UCL | 5.672 |

### Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.432 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.723 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.277 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.318 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.342 | k star (bias corrected MLE) | 0.862 |
| Theta hat (MLE) | 2.856 | Theta star (bias corrected MLE) | 4.447 |
| nu hat (MLE) | 18.79 | nu star (bias corrected) | 12.07 |
| Mean (detects) | 3.834 | | |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 1.001 |
| Maximum | 10 | Median | 0.01 |
| SD | 2.288 | CV | 2.284 |
| k hat (MLE) | 0.227 | k star (bias corrected MLE) | 0.227 |
| Theta hat (MLE) | 4.405 | Theta star (bias corrected MLE) | 4.416 |
| nu hat (MLE) | 12.28 | nu star (bias corrected) | 12.25 |
| Adjusted Level of Significance (β) | 0.0401 | | |
| Approximate Chi Square Value (12.25, α) | 5.389 | Adjusted Chi Square Value (12.25, β) | 5.1 |
| 95% Gamma Approximate UCL (use when n>=50) | 2.276 | 95% Gamma Adjusted UCL (use when n<50) | 2.405 |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 1.261 | SD (KM) | 2.133 |
| Variance (KM) | 4.549 | SE of Mean (KM) | 0.443 |
| k hat (KM) | 0.349 | k star (KM) | 0.335 |
| nu hat (KM) | 18.87 | nu star (KM) | 18.11 |
| theta hat (KM) | 3.608 | theta star (KM) | 3.76 |
| 80% gamma percentile (KM) | 1.981 | 90% gamma percentile (KM) | 3.664 |
| 95% gamma percentile (KM) | 5.561 | 99% gamma percentile (KM) | 10.43 |

**Gamma Kaplan-Meier (KM) Statistics**

| | | | |
|---|---|---|---|
| Approximate Chi Square Value (18.11, α) | 9.467 | Adjusted Chi Square Value (18.11, β) | 9.069 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 2.411 | 95% Gamma Adjusted KM-UCL (use when n<50) | 2.517 |

**Lognormal GOF Test on Detected Observations Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.88 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.803 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.317 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.304 | Detected Data Not Lognormal at 5% Significance Level | |

**Detected Data appear Approximate Lognormal at 5% Significance Level**

**Lognormal ROS Statistics Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.074 | Mean in Log Scale | -2.135 |
| SD in Original Scale | 2.258 | SD in Log Scale | 2.409 |
| 95% t UCL (assumes normality of ROS data) | 1.815 | 95% Percentile Bootstrap UCL | 1.788 |
| 95% BCA Bootstrap UCL | 2.093 | 95% Bootstrap t UCL | 2.505 |
| 95% H-UCL (Log ROS) | 20.11 | | |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean (logged) | -0.516 | KM Geo Mean | 0.597 |
| KM SD (logged) | 1.009 | 95% Critical H Value (KM-Log) | 2.533 |
| KM Standard Error of Mean (logged) | 0.21 | 95% H-UCL (KM -Log) | 1.639 |
| KM SD (logged) | 1.009 | 95% Critical H Value (KM-Log) | 2.533 |
| KM Standard Error of Mean (logged) | 0.21 | | |

**DL/2 Statistics**

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 1.127 | Mean in Log Scale | -1.03 |
| SD in Original Scale | 2.232 | SD in Log Scale | 1.301 |
| 95% t UCL (Assumes normality) | 1.86 | 95% H-Stat UCL | 1.761 |

**DL/2 is not a recommended method, provided for comparisons and historical reasons**

**Nonparametric Distribution Free UCL Statistics**

**Detected Data appear Normal Distributed at 5% Significance Level**

**Suggested UCL to Use**

| | |
|---|---|
| 95% KM (t) UCL | 2.017 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

## UCL Statistics for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/24/2017 9:12:31 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**PCE_Nov16**

### General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 27 | Number of Distinct Observations | 10 |
| Number of Detects | 9 | Number of Non-Detects | 18 |
| Number of Distinct Detects | 9 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.41 | Minimum Non-Detect | 0.36 |
| Maximum Detect | 6.7 | Maximum Non-Detect | 0.36 |
| Variance Detects | 4.628 | Percent Non-Detects | 66.67% |
| Mean Detects | 2.732 | SD Detects | 2.151 |
| Median Detects | 2.1 | CV Detects | 0.787 |
| Skewness Detects | 0.872 | Kurtosis Detects | -0.0956 |
| Mean of Logged Detects | 0.655 | SD of Logged Detects | 0.974 |

### Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.911 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.829 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.174 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.274 | Detected Data appear Normal at 5% Significance Level |

**Detected Data appear Normal at 5% Significance Level**

### Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

| | | | |
|---|---|---|---|
| KM Mean | 1.151 | KM Standard Error of Mean | 0.331 |
| KM SD | 1.619 | 95% KM (BCA) UCL | 1.711 |
| 95% KM (t) UCL | 1.714 | 95% KM (Percentile Bootstrap) UCL | 1.706 |
| 95% KM (z) UCL | 1.694 | 95% KM Bootstrap t UCL | 2.024 |
| 90% KM Chebyshev UCL | 2.142 | 95% KM Chebyshev UCL | 2.591 |
| 97.5% KM Chebyshev UCL | 3.215 | 99% KM Chebyshev UCL | 4.439 |

### Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.217 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.734 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.143 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.284 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

### Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.575 | k star (bias corrected MLE) | 1.124 |
| Theta hat (MLE) | 1.735 | Theta star (bias corrected MLE) | 2.43 |
| nu hat (MLE) | 28.35 | nu star (bias corrected) | 20.23 |
| Mean (detects) | 2.732 | | |

## Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.917 |
| Maximum | 6.7 | Median | 0.01 |
| SD | 1.77 | CV | 1.93 |
| k hat (MLE) | 0.256 | k star (bias corrected MLE) | 0.252 |
| Theta hat (MLE) | 3.585 | Theta star (bias corrected MLE) | 3.639 |
| nu hat (MLE) | 13.82 | nu star (bias corrected) | 13.62 |
| Adjusted Level of Significance (β) | 0.0401 | | |
| Approximate Chi Square Value (13.62, α) | 6.309 | Adjusted Chi Square Value (13.62, β) | 5.992 |
| 95% Gamma Approximate UCL (use when n>=50) | 1.98 | 95% Gamma Adjusted UCL (use when n<50) | 2.085 |

## Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.151 | SD (KM) | 1.619 |
| Variance (KM) | 2.622 | SE of Mean (KM) | 0.331 |
| k hat (KM) | 0.505 | k star (KM) | 0.474 |
| nu hat (KM) | 27.27 | nu star (KM) | 25.58 |
| theta hat (KM) | 2.278 | theta star (KM) | 2.43 |
| 80% gamma percentile (KM) | 1.885 | 90% gamma percentile (KM) | 3.148 |
| 95% gamma percentile (KM) | 4.506 | 99% gamma percentile (KM) | 7.864 |

## Gamma Kaplan-Meier (KM) Statistics

| | | | |
|---|---|---|---|
| Approximate Chi Square Value (25.58, α) | 15.05 | Adjusted Chi Square Value (25.58, β) | 14.54 |
| 95% Gamma Approximate KM-UCL (use when n>=50) | 1.955 | 95% Gamma Adjusted KM-UCL (use when n<50) | 2.025 |

## Lognormal GOF Test on Detected Observations Only

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.931 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.829 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.149 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.274 | Detected Data appear Lognormal at 5% Significance Level | |

**Detected Data appear Lognormal at 5% Significance Level**

## Lognormal ROS Statistics Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.999 | Mean in Log Scale | -1.532 |
| SD in Original Scale | 1.731 | SD in Log Scale | 1.966 |
| 95% t UCL (assumes normality of ROS data) | 1.567 | 95% Percentile Bootstrap UCL | 1.607 |
| 95% BCA Bootstrap UCL | 1.798 | 95% Bootstrap t UCL | 1.925 |
| 95% H-UCL (Log ROS) | 6.923 | | |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean (logged) | -0.463 | KM Geo Mean | 0.63 |
| KM SD (logged) | 0.952 | 95% Critical H Value (KM-Log) | 2.458 |
| KM Standard Error of Mean (logged) | 0.194 | 95% H-UCL (KM -Log) | 1.567 |
| KM SD (logged) | 0.952 | 95% Critical H Value (KM-Log) | 2.458 |
| KM Standard Error of Mean (logged) | 0.194 | | |

**DL/2 Statistics**

| DL/2 Normal | | DL/2 Log-Transformed | |
|---|---|---|---|
| Mean in Original Scale | 1.031 | Mean in Log Scale | -0.925 |
| SD in Original Scale | 1.711 | SD in Log Scale | 1.26 |
| 95% t UCL (Assumes normality) | 1.592 | 95% H-Stat UCL | 1.787 |

**DL/2 is not a recommended method, provided for comparisons and historical reasons**

**Nonparametric Distribution Free UCL Statistics**

**Detected Data appear Normal Distributed at 5% Significance Level**

**Suggested UCL to Use**

| | |
|---|---|
| 95% KM (t) UCL | 1.714 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.