Tighe&Bond
Engineers | Environmental Specialists

S-1758-020
May 15, 2019

Massachusetts Department of Environmental Protection – Northeast Region
Bureau of Waste Site Cleanup – Attn: Erik Johnson
205B Lowell Street
Wilmington, MA 01887

Re: **Immediate Response Action (IRA) Status Report**
Gallows Hill Park
Salem, Massachusetts
RTN 3-35355

Dear Erik:

On behalf of City of Salem Department of Planning and Community Development Office, Tighe & Bond has prepared this Immediate Response Action (IRA) Status report for the Gallows Hill Park site located at 50 Proctor Street in Salem, Massachusetts in accordance with the Massachusetts Contingency Plan (MCP, 310 CMR 40.0000). The subject site is shown on a USGS Site Locus map (Figure 1), MassDEP Priority Resources map (Figure 2), and an Orthophotograph (Figure 3) provided in Appendix A.

Site Release Background

The Gallows Hills Park area consists of two parcels, listed at 53 Hanson Street (the main park parcel) and 50 Proctor Street (sometimes referred to as Mansell Field) . The two parcels are separated by a right-of-way area, which is also owned by the City and part of the park area. These features are depicted on Figure 3.

During due diligence investigations that were being completed at the site in November 2018 in preparation for future park renovation work, elevated levels of arsenic were detected in shallow soils in a grass covered area on the eastern portion of the park on the 50 Proctor Street parcel. Subsequent hand boring soil sampling program completed by Tighe & Bond in this area in December 2018 indicated that a condition that could pose an Imminent Hazard (IH) to human health was triggered in accordance with MCP.

On December 19, 2018, the Massachusetts Department of Environmental Protection (MassDEP) issued Release Tracking Number (RTN) 3-35355 to the site. As an interim measure following initial notification to MassDEP, the City of Salem installed a snow fence "warning" barrier (with signage also posted) around the area of concern, and this area was closed to the general public. On January 17, 2019, Tighe & Bond submitted an IRA Plan to MassDEP for site RTN 3-35355. Under the IRA Plan, further mitigation measures were completed to address the IH condition, and further assessment was also completed, as further summarized herein.

Description of Response Actions Completed Since the IRA Plan

Further Mitigation Measures Completed to Address the IH Condition: In accordance with the IRA Plan, a six-foot high chain link construction fence system was installed at the site to better restrict site access in the area of concern (or potential concern). The construction fence was installed along the property lines abutting Proctor Street (east) and Mansell Parkway (south), and it enclosed the playground area within the right-of-way parcel

(i.e., to the west of the 50 Proctor Street parcel). The construction fence was weighed down using sandbags to help secure the fencing and further prevent access. Along the northern portion of the park in this area, connecting fence sections were used in areas where there is currently no existing six-foot chain link fence or where it is damaged or open. The approximate locations where this occurred are shown on Figure 4 provided in Appendix A.

Brief Review of Subsurface Investigations Completed: Since the IRA Plan submittal of January 2019, the following investigations were conducted at the site in general accordance with the IRA Plan:

- Ground Penetrating Radar (GPR) Survey
- Test Pit Explorations
- Additional Soil Boring Advancement
- Monitoring Well Installations and Groundwater Sampling
- Laboratory Analysis of Soil and Groundwater Samples

A brief overview of those investigations is provided below.

GPR Survey*: On February 5, 2019, a GPR survey was completed across the majority of the 50 Proctor Street parcel. In general, there were a lot of subsurface anomalies or other subsurface "interferences" (possible false positives) detected. However, there was no conclusive evidence that there were abandoned underground storage tanks on the site.

Test Pit Explorations*: Exploratory test pit excavation occurred at the site on January 29, 2019, and between February 11-12, 2019 under Tighe & Bond observation. During these activities, a total of 11 exploratory test pits (TP-1 through TP-3, TP-3A, TP-4, TP-4A, and TP-5 through TP-9) were excavated. During this program, dust monitoring was conducted by Tighe & Bond personnel, with those readings compared to a site-specific dust action level prepared by a risk specialist. Our monitoring results indicated that no dust control measures were warranted, which will be further described in a future submittal*. The approximate locations of the test pits are depicted on Figure 5 provided in Appendix A.

From the test pits, the following number of soil samples from varying depths were submitted for laboratory analyses of the 14 MCP Metals (8 samples), arsenic (15 samples), lead (6 samples), total chromium (8 samples), hexavalent chromium (8 samples), polychlorinated biphenyls (PCBs; 4 samples), extractable petroleum hydrocarbons (EPH) with target polycyclic aromatic hydrocarbons (PAHs; 5 samples), volatile organic compounds (VOCs; 2 samples), total cyanide (2 samples), and/or pesticides (2 samples).

Following completion of the test pits program, the excavated materials were returned to the open excavation in the order removed, and the removed grass cover was returned to its previous condition, to the extent feasible. Also, the disturbed ground surfaces of the test pit areas were covered with polyethylene sheeting (with sand bags, or other weighted material placed on top) to protect this area during the interim period until future response actions can occur.

Additional Soil Boring Advancement*: Drilling occurred at the site between February 25 and 26, 2019 under Tighe & Bond observation. As part of this drilling program, a total of 35 borings (IDs: B-17, B-18, B-19, B-19A, and B-20 through B-50) were advanced across the 50 Proctor Street parcel (including along the perimeters of the parcel), as well as within the playground, skate park, and current parking areas. In addition, two of the soil borings (B-17 and B-18) were advanced on the southern portion of the baseball diamond on the 53 Hanson Street parcel. On March 13, 2019, Tighe & Bond personnel also advanced shallow hand borings B-51 and B-52 immediately outside the existing fence line along the northern portion of the 50 Proctor Street parcel within "tree belt" ground cover adjacent to the paved parking

area associated with Langdon Street. The approximate locations of these additional soil boring and hand borings are depicted on Figure 5.

From the soil borings (and hand borings), the following number of soil samples were submitted for laboratory analyses of MCP 14 Metals (5 samples), arsenic (70 samples), total chromium (3 samples), hexavalent chromium (4 samples), PCBs (2 samples), EPH with target PAHs (3 samples), VOCs (1 sample), and/or total cyanide (2 samples).

Monitoring Well Installations and Groundwater Sampling*: During the drilling event, four of the soil borings were completed as groundwater monitoring wells (i.e., B-28/MW-1, B-31/MW-2, B-41/MW-3, and B-45/MW-4). These monitoring well locations are depicted on Figure 5.

On March 14, 2019, Tighe & Bond collected groundwater samples from the four wells. Each groundwater sample was submitted for dissolved RCRA 8 metals analysis, with the samples filtered in the field. The sample collected from the most downgradient well (i.e., MW-4) was also submitted for laboratory analysis of hexavalent chromium, PCBs, EPH, and total cyanide.

Laboratory Analysis*: The soil results are summarized in Table 1 (test pits) and Table 2 (soil borings) provided in Appendix B. The groundwater results are summarized in Table 3 provided in Appendix B. Within the tables, soil and groundwater results are compared to Method 1 standards for the three soil categories (S-1, S-2, and S-3) with the applicable groundwater categories for the site, which include GW-3. Soil and groundwater results are also compared to Method 3 Upper Concentration Limits (UCLs). The laboratory reports are provided in Appendix C.

In general, the findings indicate that site soil is the only environmental media significantly impacted by the release, with arsenic being the primary contaminant of concern for the site. Arsenic levels in site soils not only exceed MCP Method 1 standards in numerous soil samples, but arsenic was also consistently detected above Method 3 UCLs over a large portion of the 50 Proctor Street parcel, including in shallow soils within the top two feet. Based on these assessment findings, there are no additional areas where an IH condition (or potential IH condition) exists outside the area where the construction fence system is currently installed.

[*Note: Further description of these findings will be presented in an upcoming Phase I - Tier Classification, Phase II Comprehensive Site Assessment (CSA), and Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives report being prepared for the site.]

Fence Maintenance and Monitoring: With no current plans to install a permanent fence surrounding the area where the IH condition exists prior to future site remediation occurring, the City began a "maintenance and monitoring program" for the temporary construction fencing. Under this program, City personnel is conducting weekly inspections to confirm that the fencing system is intact and that there are no signs of site activity within the fenced area. Copies of field sheets for the first two inspection events are provided in Appendix D.

It should be also mentioned that Tighe & Bond visited the site on May 7, 2019 and noted that the fencing system was intact. We also noted the polyethylene sheeting that was placed over each of the former test pit areas within this fenced-in area were each still intact (i.e., weighted down).

Management of Remediation Waste: No remediation wastes were generated during the IRA activities described herein.

Description of Remaining IRA

In general, the assessment work scheduled under the IRA Plan has been completed. However, the IRA condition has not been eliminated through these actions to date because the construction fence is "temporary" in nature, and therefore the IH condition in site soils is still a concern that requires continued monitoring and maintenance until either permanent fencing is installed and/or cleanup response actions are completed. As indicated above, the City has begun weekly inspections of the fencing system, and the City will continue this program until permanent fencing is installed and/or cleanup response actions are completed.

In addition, based on our discussions with you, MassDEP has some concern that the polyethylene sheeting that was temporarily placed over the disturbed surface areas of the IRA test pits could become displaced over time due to wind, etc., which could create a potential dust issue. As mentioned above, the test pit area coverings are still intact based on our recent site visit observations. In any event, the City will also add this observation to their weekly site inspection program. Also, as a precautionary measure, the City will place additional sandbags and/or a thin layer of gravel borrow over the existing polyethylene sheeting covers until further response actions at the site can be completed.

Conclusions and Schedule

It is our opinion that the goal of the IRA Plan is being met, but as described herein the IRA condition still requires "maintenance and monitoring" until either permanent fencing is installed and/or cleanup response actions are completed.

The City of Salem's planned park renovation project is still scheduled for the summer of 2019, as mentioned in the IRA Plan submittal. However, that renovation work is set to occur only at the baseball field area and other areas on the 53 Hanson Street parcel, with no "park improvement" work scheduled for the 50 Proctor Street parcel and/or within the disposal site boundary for the subject RTN 3-35355. In any event, the City is planning to submit a Phase I - Tier Classification, Phase II CSA, Phase III Remedial Evaluation report for the subject RTN 3-35355 in the near future, well prior to the time when the next IRA status report is due (and well prior to the one-year anniversary date of the site release) to keep project momentum. That upcoming submittal will also provide a further update on the monitoring and maintenance program being implemented for the IRA condition.

If you have any questions or comments, please feel free to me at 413.572.3222 (office) or 617.548.8939 (cell) at your earliest convenience.

Very truly yours,

TIGHE & BOND, INC.

Todd D. Kirton, LSP
Senior Hydrologist

Appendices

Appendix A – Figures
Appendix B – Summary Tables
Appendix C – Laboratory Reports

Appendix D – Copies of City's Weekly Inspection Sheets (to date)
Appendix E – Report Limitations

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APPENDIX A

FIGURE 1
SITE LOCATION

Gallows Hill Park
Salem, Massachusetts

November 2018

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Based on USGS Topographic Map for Salem, MA Revised 1985.
Circles indicate 500-foot and half-mile radii

1:24,000
0 1,000 2,000
Feet

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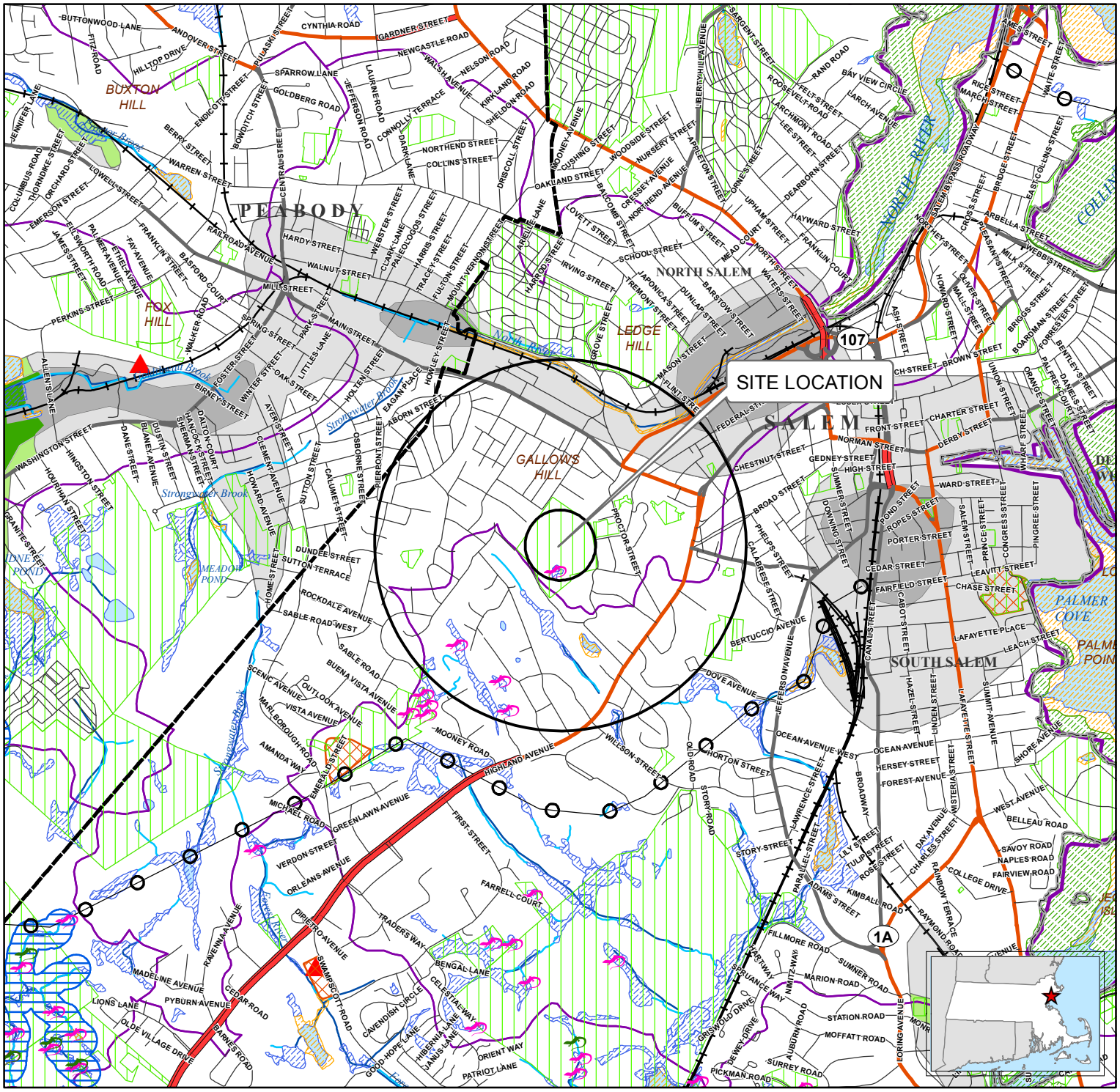

Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Non-Landfill Solid Waste Sites
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Aqueducts
- Hydrologic Connections
- Stream/Intermittent Stream
- Powerline
- Pipeline
- Track or Trail
- Trains
- Public Surface Water Supply Protection Area (Zone A)
- DEP Approved Wellhead Protection Area (Zone I)
- DEP Approved Wellhead Protection Area (Zone II)
- DEP Interim Wellhead Protection Area (IWPA)
- Protected and Recreational Open Space
- Solid Waste Landfill
- Area of Critical Environmental Concern (ACEC)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- EPA Designated Sole Source Aquifer
- Major Drainage Basin
- Sub Drainage Basin
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Public Surface Water Supply (PSWS)
- Water Bodies
- Non-Potential Drinking Water Source Area - High Yield
- Non-Potential Drinking Water Source Area - Medium Yield
- Potentially Productive Medium Yield Aquifer
- Potentially Productive High Yield Aquifer
- County Boundary
- Town Boundary

1:24,000

0 1,000 2,000

Feet

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FIGURE 2
PRIORITY RESOURCE MAP

Gallows Hill Park
Salem, Massachusetts

Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology
Circles indicate 500-foot and half-mile radii.
Data valid as of January 2019.

January 2019

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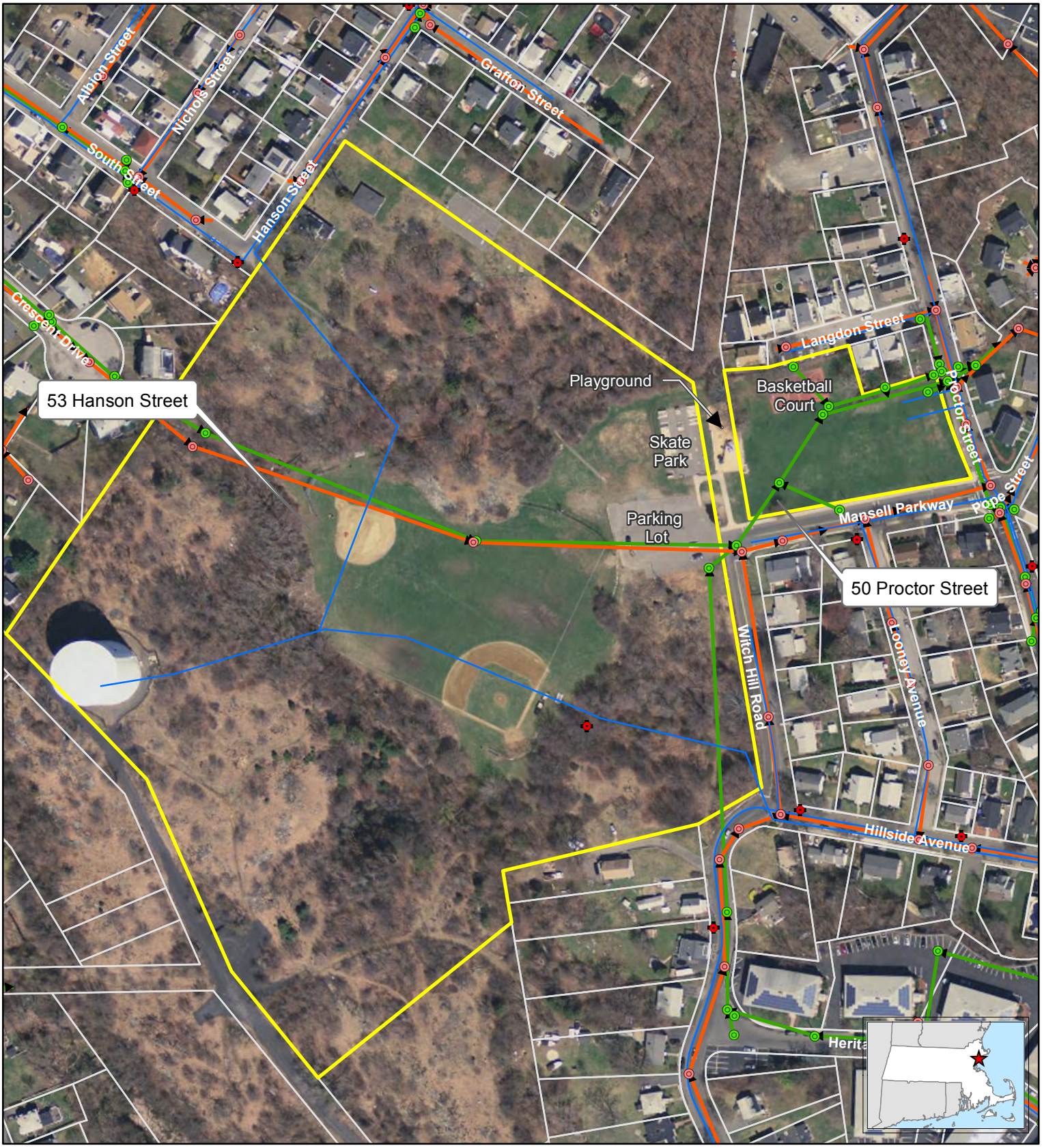

Legend

- Sewer Manholes
- Drain Manholes
- Hydrants
- Water Mains
- Sewer Pipes
- Drain Pipes
- Approximate Site Parcel

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Based on MassGIS Color Orthophotography (2013-2014). Parcels Boundaries (FY 11) are approximate, downloaded from MassGIS. Utility data provided by City of Salem Engineering Dept.

1:2,400
0 100 200
Feet

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FIGURE 3
ORTHOPHOTOGRAPH

Gallows Hill Park
Salem, Massachusetts

January 2019

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Figure 4

PROPOSED FENCE INSTALLATION

LEGEND

Proposed construction chain link fence install area for January 2019 IRA Plan

Work Completed as shown, as referenced in this May 2019 IRA Status Report submittal

See figure 3 for Utility References

LOCUS MAP

N

0 20 40

Feet

1:480

NOTES

1. Based on MassGIS Color Orthophotography (2013).
2. Parcels (FY 2011) downloaded from MassGIS and are approximate.
3. Utility data provided by City of Salem Engineering Dept.

Gallows Hill Park
Salem, Massachusetts

January 2019

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FIGURE 5

IRA SUBSURFACE INVESTIGATION PLAN

LEGEND

- IRA Soil Boring
- IRA Boring Completed as Well
- IRA Test Pit
- Earlier Hand Boring Location (Approximate)
- Earlier Drilling Location (Approximate)
- Approximate Park Boundary

LOCUS MAP

N

0 20 40

Feet

1:480

NOTES

1. Based on MassGIS Color Orthophotography (2013).
2. Parcels (FY 2011) downloaded from MassGIS and are approximate.
3. Utility data provided by City of Salem Engineering Dept., and supplemented by camera utility line survey completed by city, 2-6-19

Gallows Hill Park
Salem, Massachusetts

March 2019

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APPENDIX B

TABLE 1 - Summary of Test Pit Soil Results
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

	MCP - Method 1 Standards						Method 3	Test Pit:	TP-1				TP-2			TP-3A			TP-4		TP-5		
								Sample Depth:	0-2'	3-5'	5'	6.5'	0-2'	5'	6.5'	0-2'	2-5.5'	5.5-6'	0-2'	4-5.5'	0-2'	3-5'	5-6'
Analyses	**S-1/GW-2**	**S-1/GW-3**	**S-2/GW-2**	**S-2/GW-3**	**S-3/GW-2**	**S-3/GW-3**	**UCLs**	Sample Date:	01/28/19	01/28/19	01/28/19	01/28/19	01/28/19	01/28/19	01/28/19	02/11/19	02/11/19	02/11/19	02/11/19	02/11/19	02/11/19	02/11/19	02/11/19
EPH carbon ranges																							
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	ND (21.5)	-	-	-	-	-	-	ND (63.2)	-	-	-	-	-	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	ND (21.5)	-	-	-	-	-	-	145	-	-	-	-	-	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	78.5	-	-	-	-	-	-	150	-	-	-	-	-	-
Target PAHs																							
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	ND (0.57)	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	ND (0.29)	-	-	-	-	-	-	ND (0.84)	-	-	-	-	-	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	ND (0.57)	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	1.6	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	1.57	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	1.76	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	1.02	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	0.61	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	1.64	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	ND (0.29)	-	-	-	-	-	-	*ND (0.84)*	-	-	-	-	-	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	3.33	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	ND (0.57)	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	1.09	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	ND (0.29)	-	-	-	-	-	-	ND (0.84)	-	-	-	-	-	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	ND (0.57)	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	2.45	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	3.20	-	-	-	-	-	-	ND (1.69)	-	-	-	-	-	-
Metals																							
Antimony	20	20	30	30	30	30	300		ND (6.79)	-	ND (4.03)	-	-	-	-	-	-	-	-	ND (5.64)	-	ND (6.8)	ND (5.00)
Arsenic	20	20	20	20	50	50	500		**549**	-	11.8	7.64	**84**	**35.7**	5.77	**5,150**	-	3.28	**2,330**	**34.9**	**508**	4.1	5.12
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		64.5	-	47.9	-	-	-	-	-	-	-	-	60.8	-	38.5	53.9
Beryllium	90	90	200	200	200	200	2,000		0.42	-	0.47	-	-	-	-	-	-	-	-	0.64	-	0.7	0.7
Cadmium	70	70	100	100	100	100	1,000		5.27	-	0.4	-	-	-	-	-	-	-	-	ND (0.56)	-	ND (0.68)	ND (0.50)
Chromium (Total)	100	100	200	200	200	200	2,000		149	-	25.8	21	62.6	23.7	-	1,820	-	-	-	23	106[3]	24.2	20.8
Hexavalent Chromium	100	100	200	200	200	200	2,000		ND (0.5)	-	0.6	-	ND (0.5)	ND (0.6)	-	ND (0.6)	-	-	-	-	-	ND (0.7)	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		149	-	25.2	-	62.6	23.7	-	**1,820**	-	-	-	-	-	24.2	-
Lead	200	200	600	600	600	600	6000		107	-	6.32	12.5	60.8	48.5	-	91.7	-	-	-	8.93	51.1	22.4	8.11
Mercury	20	20	30	30	30	30	300		0.325	-	ND (0.023)	-	-	-	-	-	-	-	-	0.066	-	0.061	0.034
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		13.4	-	15	-	-	-	-	-	-	-	-	18.7	-	15.0	20.0
Selenium	400	400	700	700	700	700	7,000		ND (6.79)	-	ND (4.03)	-	-	-	-	-	-	-	-	ND (5.64)	-	ND (6.8)	ND (5.00)
Silver	100	100	200	200	200	200	2,000		ND (0.68)	-	ND (0.40)	-	-	-	-	-	-	-	-	ND (0.56)	-	ND (0.68)	ND (0.50)
Thallium	8	8	60	60	80	80	800		ND (6.79)	-	ND (4.03)	-	-	-	-	-	-	-	-	ND (5.64)	-	ND (6.8)	ND (5.00)
Vanadium	400	400	700	700	700	700	7,000		37.8	-	25.2	-	-	-	-	-	-	-	-	54.8	-	54.6	39.3
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		196	-	48.4	-	-	-	-	-	-	-	-	80.7	-	56.4	68.5
PCBs																							
All PCB Arochlors	1	1	2	2	4	4	100		ND (0.07)	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.04)	-
VOCs[1]																							
Acetone	50	400	50	400	50	400	10,000		-	-	0.0465	-				-	-	-	-	-	-	-	-
Cyanide																							
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	1.11	-	-	-	-	-	-	-	-	-	-	ND (1.68)	-
Pesticides[1]																							
4,4´-DDE	6	6	30	30	60	60	600		0.0075	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.045)	-
4,4´-DDT	6	6	30	30	60	60	600		0.0051	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.045)	-
Hexachlorobenzene	0.7	0.7	0.8	0.8	0.8	0.8	8		ND (0.035)	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.045)	-

NOTES:

(1) Only analytes detected above laboratory reporting limits in one or more samples are included in the table.

(2) Cyanide expressed as physiologically available cyanide (PAC). In the absence of measured physiologically available cyanide, the standard is applicable to total cyanide per the MCP.

(3) Since only trace to non-detect levels of hexavalent chromium were subsequently detected in site soils, it is assumed that the majority (if not all) of this total chromium concentration is trivalent chromium. Therefore, this level is not considered to be above Method 1 standards, as further reviewed in this report.

Bold boxed values indicates exceedance of Method 1 standard.

Represents values above MCP Method 3 UCLs

ND indicates that the analyte was not detected above laboratory reporting limits.

ND indicates that the laboratory reporting limit is above a Method 1 standard.

\- indicates sample not analyzed for respective analyte.

TABLE 1 - Summary of Test Pit Soil Results
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

	MCP - Method 1 Standards						Method 3	Test Pit:	TP-6		TP-7			TP-8		TP-9		
								Sample Depth:	0-2'	2-5'	0-2'	2-5'	5-5.5'	0-2'	2-6'	0-2'	2-3'	3-5'
Analyses	**S-1/GW-2**	**S-1/GW-3**	**S-2/GW-2**	**S-2/GW-3**	**S-3/GW-2**	**S-3/GW-3**	**UCLs**	Sample Date:	02/11/19	02/11/19	02/12/19	02/12/19	02/12/19	02/12/19	02/12/19	02/12/19	02/12/19	02/12/19
EPH carbon ranges																		
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	ND (19.7)	-	ND (18.2)	-	-	-	-	ND (18.6)	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	83.1	-	ND (18.2)	-	-	-	-	ND (18.6)	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	20.2	-	ND (18.2)	-	-	-	-	ND (18.6)	-
Target PAHs																		
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	0.99	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	ND (0.26)	-	ND (0.24)	-	-	-	-	ND (0.25)	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	1.82	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	3.15	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	**2.97**	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	3.23	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	1.49	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	1.18	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	3.2	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	0.48	-	ND (0.24)	-	-	-	-	ND (0.25)	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	9.32	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	0.96	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	1.78	-	ND (0.49)	-	-	-	-	ND (0.5)	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	0.29	-	ND (0.24)	-	-	-	-	ND (0.25)	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	0.72	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	1.4	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	11.1	-	ND (0.49)	-	-	-	-	ND (0.5)	-
Metals																		
Antimony	20	20	30	30	30	30	300		-	ND (5.41)	-	-	ND (4.42)	-	-	-	ND (5.03)	-
Arsenic	20	20	20	20	50	50	500		**623**	**250**	10.4	3.65	2.66	**132**	18.4	**62.7**	6.94	**31.5**
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	75.1	-	-	35.6	-	-	-	54.9	-
Beryllium	90	90	200	200	200	200	2,000		-	0.34	-	-	0.48	-	-	-	0.57	-
Cadmium	70	70	100	100	100	100	1,000		-	2.6	-	-	ND (0.44)	-	-	-	ND (0.50)	-
Chromium (Total)	100	100	200	200	200	200	2,000		-	92.9	25.5	-	17	-	44.6	302	46.6	-
Hexavalent Chromium	100	100	200	200	200	200	2,000		-	-	ND (0.5)	-	-	-	-	ND (0.6)	-	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	25.5	-	-	-	-	302	-	-
Lead	200	200	600	600	600	600	6000		-	65.9	-	-	6.25	-	12.8	-	31.4	-
Mercury	20	20	30	30	30	30	300		-	13.5	-	-	0.032	-	-	-	0.046	-
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		-	12.6	-	-	13.8	-	-	-	16	-
Selenium	400	400	700	700	700	700	7,000		-	ND (5.41)	-	-	ND (4.42)	-	-	-	ND (5.03)	-
Silver	100	100	200	200	200	200	2,000		-	ND (0.54)	-	-	ND (0.44)	-	-	-	ND (0.50)	-
Thallium	8	8	60	60	80	80	800		-	ND (5.41)	-	-	ND (4.42)	-	-	-	ND (5.03)	-
Vanadium	400	400	700	700	700	700	7,000		-	29.3	-	-	31.6	-	-	-	29.8	-
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		-	114	-	-	51	-	-	-	88.4	-
PCBs																		
All PCB Arochlors	1	1	2	2	4	4	100		-	ND (0.03)	-	-	-	-	-	-	ND (0.03)	-
VOCs[1]																		
Acetone	50	400	50	400	50	400	10,000		-	-	-	-	-	-	-	ND (0.0141)	-	-
Cyanide																		
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	-	-	-	-	-	-	-	-
Pesticides[1]																		
4,4´-DDE	6	6	30	30	60	60	600		-	-	-	-	-	-	-	-	-	-
4,4´-DDT	6	6	30	30	60	60	600		-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	0.7	0.7	0.8	0.8	0.8	0.8	8		-	-	-	-	-	-	-	-	-	-

NOTES:
(1) Only analytes detected above laboratory reporting limits in one or more samples are included in the table.
(2) Cyanide expressed as physiologically available cyanide (PAC). In the absence of measured physiologically available cyanide, the standard is applicable to total cyanide per the MCP.
(3) Since only trace to non-detect levels of hexavalent chromium were subsequently detected in site soils, it is assumed that the majority (if not all) of this total chromium concentration is trivalent chromium. Therefore, this level is not considered to be above Method 1 standards, as further reviewed in this report.

Bold boxed values indicates exceedance of Method 1 standard.
Represents values above MCP Method 3 UCLs
ND indicates that the analyte was not detected above laboratory reporting limits.
ND indicates that the laboratory reporting limit is above a Method 1 standard.
\- indicates sample not analyzed for respective analyte.

TABLE 2 - Summary of Soil Boring Results Under the IRA
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

Analyses	MCP - Method 1 Standards S-1/GW-2	S-1/GW-3	S-2/GW-2	S-2/GW-3	S-3/GW-2	S-3/GW-3	Method 3 UCLs	Soil Boring:	B-17[3]	B-18	B-19A	B-20	B-21	B-22	B-23	B-24		B-25		B-26		B-27		B-28	B-28A /MW-1	
								Sample Depth:	0-2'	0-2'	0-2'	0-2'	0-2'	0-2'	0-2'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	0-2'	0-2'	2-4'
								Sample Date:	02/25/19	02/25/19	02/25/19	02/25/19	02/25/19	02/25/19	02/25/19	02/25/19		02/25/19		02/25/19		02/25/19		02/25/19	02/25/19	
EPH carbon ranges																										
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Target PAHs																										
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																										
Antimony	20	20	30	30	30	30	300		-	ND (5.12)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	20	20	20	20	50	50	500		**21**	19.5	2.69	ND (2.54)	3.71	5.15	4.16	5.12	ND (2.5)	5.32	4.37	5.99	5.2	8.6	2.77	12.9	17	8.63
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	68.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	90	90	200	200	200	200	2,000		-	0.69	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	70	70	100	100	100	100	1,000		-	ND (0.51)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Total)	100	100	200	200	200	200	2,000		-	34.2	-	-	-	-	-	-	-	26.6	-	-	-	-	-	-	-	-
Hexavalent Chromium	100	100	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	200	200	600	600	600	600	6000		-	28.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	20	20	30	30	30	30	300		-	0.039	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		-	24.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	400	400	700	700	700	700	7,000		-	ND (5.12)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	100	100	200	200	200	200	2,000		-	ND (0.51)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	8	8	60	60	80	80	800		-	ND (5.12)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	400	400	700	700	700	700	7,000		-	32.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		-	60.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs																										
All PCB Arochlors	1	1	2	2	4	4	100		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs[1]																										
Acetone	50	400	50	400	50	400	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	NE	NE	NE	NE	NE	NE	NE		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide																										
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:
(1) Only analytes detected above laboratory reporting limits in one or more samples are included in the table.
(2) Cyanide expressed as physiologically available cyanide (PAC). In the absence of measured physiologically available cyanide, the standard is applicable to total cyanide per the MCP.
(3) Boring B-17 advanced on the 53 Hanson Street parcel during the IRA investigations was inadvertently named with same ID as the earlier (i.e., "pre-IRA investigations") hand boring B-17 on the 50 Proctor Street parcel, as further reviewed in this report.
(4) Since only trace to non-detect levels of hexavalent chromium were subsequently detected in site soils, it is assumed that the majority (if not all) of this total chromium concentration is trivalent chromium. Therefore, this level is not considered to be above Method 1 standards, as further reviewed in this report.

Bold boxed values indicates exceedance of Method 1 standard.
Represents values above MCP Method 3 UCLs
ND indicates that the analyte was not detected above laboratory reporting limits.
NE indicates no Method 1 standard (or Method 3 UCL) established for this compound.
\- indicates sample not analyzed for respective analyte.

TABLE 2 - Summary of Soil Boring Results Under the IRA
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

	MCP - Method 1 Standards						Method 3	Soil Boring:	B-29			B-30		B-31 / MW-2		B-32		B-33			B-34		B-35				B-36	
								Sample Depth:	0-2'	2-4'	4-5.5'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	4-6'	0-2'	2-4'	0-2'	2-4'	4-5.5'	6-8'	0-2'	2-4'
Analyses	**S-1/GW-2**	**S-1/GW-3**	**S-2/GW-2**	**S-2/GW-3**	**S-3/GW-2**	**S-3/GW-3**	**UCLs**	Sample Date:	02/25/19			02/25/19		02/25/19		02/26/19		02/26/19			02/26/19		02/26/19				02/26/19	
EPH carbon ranges																												
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (27.7)	-	-	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56.1	-	-	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (27.7)	-	-	-
Target PAHs																												
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.74)	-	-	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.37)	-	-	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.97	-	-	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.03	-	-	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.75	-	-	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.32	-	-	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.94	-	-	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.74)	-	-	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.82	-	-	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.37)	-	-	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.27	-	-	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.74)	-	-	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.13	-	-	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.37)	-	-	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.85	-	-	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.13	-	-	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.82	-	-	-
Metals																												
Antimony	20	20	30	30	30	30	300		-	-	ND (6.54)	-	-	-	-	-	-	-	-	-	-	-	-	7.18	-	-	-
Arsenic	20	20	20	20	50	50	500		**32**	8.89	5.02	15.4	6.9	**102**	12.2	8.33	7.85	8.02	**603**	13.1	11.6	5.4	**1,510**	**12,300**	**10,900**	6.04	**345**	**419**
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	26.4	-	-	-	-	-	-	-	-	-	-	-	-	-	97.4	-	-	-
Beryllium	90	90	200	200	200	200	2,000		-	-	0.46	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.17)	-	-	-
Cadmium	70	70	100	100	100	100	1,000		-	-	ND (0.65)	-	-	-	-	-	-	-	-	-	-	-	-	-	**102**	-	-	-
Chromium (Total)	100	100	200	200	200	200	2,000		-	-	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	428	-	-	-
Hexavalent Chromium	100	100	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.8)	-	-	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-
Lead	200	200	600	600	600	600	6000		-	-	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	70.6	-	-	-
Mercury	20	20	30	30	30	30	300		-	-	ND (0.025)	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		-	-	9.58	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (3.94)	-	-	-
Selenium	400	400	700	700	700	700	7,000		-	-	ND (6.54)	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (7.87)	-	-	-
Silver	100	100	200	200	200	200	2,000		-	-	ND (0.65)	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-
Thallium	8	8	60	60	80	80	800		-	-	ND (6.54)	-	-	-	-	-	-	-	-	-	-	-	-	-	ND (7.87)	-	-	-
Vanadium	400	400	700	700	700	700	7,000		-	-	22.1	-	-	-	-	-	-	-	-	-	-	-	-	-	5.73	-	-	-
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		-	-	43.2	-	-	-	-	-	-	-	-	-	-	-	-	-	69.1	-	-	-
PCBs																												
All PCB Arochlors	1	1	2	2	4	4	100		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VOCs[1]																												
Acetone	50	400	50	400	50	400	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	NE	NE	NE	NE	NE	NE	NE		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide																												
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:
(1) Only analytes detected above laboratory reporting limits in one or more samples are included in the table.
(2) Cyanide expressed as physiologically available cyanide (PAC). In the absence of measured physiologically available cyanide, the standard is applicable to total cyanide per the MCP.
(3) Boring B-17 advanced on the 53 Hanson Street parcel during the IRA investigations was inadvertently named with same ID as the earlier (i.e., "pre-IRA investigations") hand boring B-17 on the 50 Proctor Street parcel, as further reviewed in this report.
(4) Since only trace to non-detect levels of hexavalent chromium were subsequently detected in site soils, it is assumed that the majority (if not all) of this total chromium concentration is trivalent chromium. Therefore, this level is not considered to be above Method 1 standards, as further reviewed in this report.

Bold boxed values indicates exceedance of Method 1 standard.
Represents values above MCP Method 3 UCLs
ND indicates that the analyte was not detected above laboratory reporting limits.
NE indicates no Method 1 standard (or Method 3 UCL) established for this compound.
\- indicates sample not analyzed for respective analyte.

TABLE 2 - Summary of Soil Boring Results Under the IRA
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

Analyses	MCP - Method 1 Standards S-1/GW-2	S-1/GW-3	S-2/GW-2	S-2/GW-3	S-3/GW-2	S-3/GW-3	Method 3 UCLs	Soil Boring:	B-37			B-38	B-39			B-40		B-41/MW-3		B-42	B-43		B-44		B-45/MW-4		
								Sample Depth:	0-2'	2-4'	4-8'	0-2'	0-2'	2-4'	4-6'	0-2'	2-4'	0-2'	2-4'	0-2'	0-2'	2-4'	4-8'	0-2'	2-4'	0-2'	2-4'	4-8'
								Sample Date:	02/26/19			02/26/19	02/26/19			02/26/19		02/26/19		02/26/19	02/26/19			02/26/19		02/26/19		
EPH carbon ranges																												
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	-	ND (22.6)	-	-	-	-	-	-	-	-	-	-	94.5	-	-	-	-	-	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (22.6)	-	-	-	-	-	-	-	-	-	-	**2,210**	-	-	-	-	-	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	-	ND (22.6)	-	-	-	-	-	-	-	-	-	-	2,050	-	-	-	-	-	-
Target PAHs																												
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	-	ND (0.30)	-	-	-	-	-	-	-	-	-	-	ND (1.26)	-	-	-	-	-	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	*ND (2.52)*	-	-	-	-	-	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	-	ND (0.30)	-	-	-	-	-	-	-	-	-	-	*ND (1.26)*	-	-	-	-	-	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	-	ND (0.30)	-	-	-	-	-	-	-	-	-	-	ND (1.26)	-	-	-	-	-	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	ND (0.60)	-	-	-	-	-	-	-	-	-	-	ND (2.52)	-	-	-	-	-	-
Metals																												
Antimony	20	20	30	30	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (5.52)	-	-	-	-	-	-
Arsenic	20	20	20	20	50	50	500		**1,260**	**1,700**	**99.5**	**41.1**	**2,140**	**62.9**	**3,190**	**145**	**669**	**2,150**	**179**	**81.8**	13.5	6.72	8.92	**189**	**77.7**	**27.7**	12.3	5.82
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	49.3	-	-	-	-	-	-
Beryllium	90	90	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	-	-	-	-	0.32	-	-	-	-	-	-
Cadmium	70	70	100	100	100	100	1,000		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (0.55)	-	-	-	-	-	-
Chromium (Total)	100	100	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	185	-	399	-	266[4]	-	-	-	-	-	-
Hexavalent Chromium	100	100	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	ND (0.6)	-	ND (0.6)	-	-	-	-	-	-	-	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	185	-	399	-	-	-	-	-	-	-	-
Lead	200	200	600	600	600	600	6000		-	-	-	-	-	-	-	-	-	-	-	-	-	41.3	-	-	-	-	-	-
Mercury	20	20	30	30	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (2.02)	-	-	-	-	-	-
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	12.8	-	-	-	-	-	-
Selenium	400	400	700	700	700	700	7,000		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (5.52)	-	-	-	-	-	-
Silver	100	100	200	200	200	200	2,000		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (1.10)	-	-	-	-	-	-
Thallium	8	8	60	60	80	80	800		-	-	-	-	-	-	-	-	-	-	-	-	-	ND (5.52)	-	-	-	-	-	-
Vanadium	400	400	700	700	700	700	7,000		-	-	-	-	-	-	-	-	-	-	-	-	-	36.9	-	-	-	-	-	-
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-	-	48.6	-	-	-	-	-	-
PCBs																												
All PCB Arochlors	1	1	2	2	4	4	100		-	-	ND (0.08)	-	-	-	-	-	-	ND (0.08)	-	-	-	-	-	-	-	-	-	-
VOCs[1]																												
Acetone	50	400	50	400	50	400	10,000		-	-	0.442	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	NE	NE	NE	NE	NE	NE	NE		-	-	0.0556	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide																												
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	-	-	-	-	-	-	-	-	ND (1.66)	-	-	-	-	-	-	-	ND (1.72)	-

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TABLE 2 - Summary of Soil Boring Results Under the IRA
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

	MCP - Method 1 Standards						Method 3	Soil Boring:	B-46		B-47	B-48		B-49		B-50		B-51	B-52	B-53
								Sample Depth:	0-2'	2-4'	0-2'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	0-1'
Analyses	**S-1/GW-2**	**S-1/GW-3**	**S-2/GW-2**	**S-2/GW-3**	**S-3/GW-2**	**S-3/GW-3**	**UCLs**	Sample Date:	02/26/19		02/26/19	02/26/19		02/26/19		02/26/19			03/13/19	
EPH carbon ranges																				
C9-C18 Aliphatics	1,000	1,000	3,000	3,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-
C11-C22 Aromatics	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
C19-C36 Aliphatics	3,000	3,000	5,000	5,000	5,000	5,000	20,000		-	-	-	-	-	-	-	-	-	-	-	-
Target PAHs																				
Acenaphthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	600	10	600	10	600	10	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Benz(a)anthracene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	2	2	7	7	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	70	70	400	400	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	0.7	0.7	4	4	30	30	300		-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	7	7	40	40	300	300	3,000		-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	80	300	80	500	80	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	20	500	20	1,000	20	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	500	500	1,000	1,000	3,000	3,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	-	-	-	-	-	-	-
Metals																				
Antimony	20	20	30	30	30	30	300		-	-	-	-	-	3	-	-	-	-	-	-
Arsenic	20	20	20	20	50	50	500		14.6	13.1	**50.2**	**208**	**203**	**444**	**990**	**344**	**528**	**21.2**	8.78	**91.2**
Barium	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	**1,060**	-	-	-	-	-	-
Beryllium	90	90	200	200	200	200	2,000		-	-	-	-	-	0.31	-	-	-	-	-	-
Cadmium	70	70	100	100	100	100	1,000		-	-	-	-	-	5.42	-	-	-	-	-	-
Chromium (Total)	100	100	200	200	200	200	2,000		-	-	-	-	-	1,030	-	-	-	-	-	-
Hexavalent Chromium	100	100	200	200	200	200	2,000		-	-	-	-	-	9.3	-	-	-	-	-	-
[calculated Cr3]	1,000	1,000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	**1,021**	-	-	-	-	-	-
Lead	200	200	600	600	600	600	6000		-	-	-	-	-	**354**	-	-	-	-	-	-
Mercury	20	20	30	30	30	30	300		-	-	-	-	-	4.2	-	-	-	-	-	-
Nickel	600	600	1,000	1,000	1,000	1,000	10,000		-	-	-	-	-	18	-	-	-	-	-	-
Selenium	400	400	700	700	700	700	7,000		-	-	-	-	-	ND (7.81)	-	-	-	-	-	-
Silver	100	100	200	200	200	200	2,000		-	-	-	-	-	0.78	-	-	-	-	-	-
Thallium	8	8	60	60	80	80	800		-	-	-	-	-	ND (7.81)	-	-	-	-	-	-
Vanadium	400	400	700	700	700	700	7,000		-	-	-	-	-	41.2	-	-	-	-	-	-
Zinc	1000	1000	3,000	3,000	5,000	5,000	10,000		-	-	-	-	-	696	-	-	-	-	-	-
PCBs																				
All PCB Arochlors	1	1	2	2	4	4	100		-	-	-	-	-	-	-	-	-	-	-	-
VOCs[1]																				
Acetone	50	400	50	400	50	400	10,000		-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone	NE	NE	NE	NE	NE	NE	NE		-	-	-	-	-	-	-	-	-	-	-	-
Cyanide																				
Total Cyanide[2]	30	30	100	100	500	500	5,000		-	-	-	-	-	-	-	-	-	-	-	-

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(3) Boring B-17 advanced on the 53 Hanson Street parcel during the IRA investigations was inadvertently named with same ID as the earlier (i.e., "pre-IRA investigations") hand boring B-17 on the 50 Proctor Street parcel, as further reviewed in this report.
(4) Since only trace to non-detect levels of hexavalent chromium were subsequently detected in site soils, it is assumed that the majority (if not all) of this total chromium concentration is trivalent chromium. Therefore, this level is not considered to be above Method 1 standards, as further reviewed in this report.

Bold boxed values indicates exceedance of Method 1 standard.
Represents values above MCP Method 3 UCLs
ND indicates that the analyte was not detected above laboratory reporting limits.
NE indicates no Method 1 standard (or Method 3 UCL) established for this compound.
- indicates sample not analyzed for respective analyte.

TABLE 3 - Summary of Groundwater Results
Gallows Hill Park
50 Proctor Street (and 53 Hanson Street)
Salem, Massachusetts

Analysis	Method 1 Standards	Method 3 UCLs	Sample Identification:	MW-1	MW-2	MW-3	MW-4
	GW-3		Date Collected:	3/13/2019			
EPH carbon ranges							
C9-C18 Aliphatic	50,000	100,000		-	-	-	ND (93)
C19-C36 Aliphatic	50,000	100,000		-	-	-	ND (93)
C11-C22 Aromatic	5,000	100,000		-	-	-	ND (93)
Target PAHs							
Acenaphthene	10,000	60,000		-	-	-	ND (0.19)
Acenaphthylene	40	100,000		-	-	-	ND (0.19)
Anthracene	30	600		-	-	-	ND (0.19)
Benzo(a)anthracene	1,000	10,000		-	-	-	ND (0.19)
Benzo(a)pyrene	500	5,000		-	-	-	ND (0.19)
Benzo(b)fluoranthene	400	4,000		-	-	-	ND (0.19)
Benzo(g,h,i)perylene	20	500		-	-	-	ND (0.19)
Benzo(k)fluoranthene	100	1,000		-	-	-	ND (0.19)
Chrysene	70	700		-	-	-	ND (0.19)
Dibenzo(a,h)anthracene	40	400		-	-	-	ND (0.19)
Fluoranthene	200	2,000		-	-	-	ND (0.19)
Fluorene	40	400		-	-	-	ND (0.19)
Indeno(1,2,3-cd)pyrene	100	1,000		-	-	-	ND (0.19)
2-Methylnaphthalene	20,000	100,000		-	-	-	ND (0.47)
Naphthalene	20,000	100,000		-	-	-	ND (0.47)
Phenanthrene	10,000	100,000		-	-	-	ND (0.47)
Pyrene	20	800		-	-	-	ND (0.19)
Cyanide							
Total Cyanide	30	2,000		-	-	-	ND (5)
Dissolved Metals							
Arsenic	900	9,000		ND (5.0)	ND (5.0)	20.1	ND (5.0)
Barium	50,000	100,000		ND (50)	ND (50)	ND (50)	101
Cadmium	4	50		ND (1.0)	ND (1.0)	ND (1.0)	1.2
Chromium (total)	300	3,000		ND (10)	ND (10)	ND (10)	ND (10)
Lead	10	150		ND (1.0)	1.9	ND (1.0)	ND (1.0)
Mercury	20	200		ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)
Selenium	100	1,000		ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Silver	7	1,000		ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Hexavalent Chromium (total)							
Hexavalent Chromium	300	3,000		-	-	-	ND (10)

NOTES:
All results are reported in micrograms per liter (µg/L).
ND indicates analyte not detected (laboratory reporting limit).

Tighe&Bond

APPENDIX C

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1901588

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:40 pm, Feb 01, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

SAMPLE RECEIPT

The following samples were received on January 28, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
1901588-01	TP-1 0-2ft	Soil	2580, 7196A, 9045
1901588-02	TP-1 5ft	Soil	2580, 7196A, 9045
1901588-03	TP-2 0-2ft	Soil	2580, 7196A, 9045
1901588-04	TP-25ft	Soil	2580, 7196A, 9045

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1901588-01 through 1901588-04**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	(X) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )

)*

Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***

H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: February 01, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 0-2ft
Date Sampled: 01/28/19 09:00
Percent Solids: 73

ESS Laboratory Work Order: 1901588
ESS Laboratory Sample ID: 1901588-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**6.28** (N/A)		9045		1	CCP	01/28/19 19:10	S.U.	CA92820
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.2 ºC.**								
Eh (ORP)	**WL 393** (N/A)		2580		1	CCP	01/28/19 19:10	mv	CA92821
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	01/29/19 15:49	mg/kg dry	CA92932

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 09:45
Percent Solids: 87

ESS Laboratory Work Order: 1901588
ESS Laboratory Sample ID: 1901588-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**9.35** (N/A)		9045		1	CCP	01/28/19 19:10	S.U.	CA92820
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.5 ºC.**								
Eh (ORP)	**WL 236** (N/A)		2580		1	CCP	01/28/19 19:10	mv	CA92821
Hexavalent Chromium	**0.6** (0.5)		7196A		1	JLK	01/29/19 15:49	mg/kg dry	CA92932

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-2 0-2ft
Date Sampled: 01/28/19 10:30
Percent Solids: 83

ESS Laboratory Work Order: 1901588
ESS Laboratory Sample ID: 1901588-03
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**6.31** (N/A)		9045		1	CCP	01/28/19 19:10	S.U.	CA92820
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.5 ºC.**								
Eh (ORP)	**WL 336** (N/A)		2580		1	CCP	01/28/19 19:10	mv	CA92821
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	01/29/19 15:49	mg/kg dry	CA92932

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-25ft
Date Sampled: 01/28/19 11:00
Percent Solids: 77

ESS Laboratory Work Order: 1901588
ESS Laboratory Sample ID: 1901588-04
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**6.70** (N/A)		9045		1	CCP	01/28/19 19:10	S.U.	CA92820
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.5 ºC.**								
Eh (ORP)	**WL 284** (N/A)		2580		1	CCP	01/28/19 19:10	mv	CA92821
Hexavalent Chromium	ND (0.6)		7196A		1	JLK	01/29/19 15:49	mg/kg dry	CA92932

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CA92932 - General Preparation										
Blank										
Hexavalent Chromium	ND	0.7	mg/kg wet							
LCS										
Hexavalent Chromium	31.7	0.7	mg/kg wet	33.32		95	80-120			
LCS Dup										
Hexavalent Chromium	32.5	0.7	mg/kg wet	33.32		97	80-120	2	20	
Reference										
Hexavalent Chromium	75.8	2.0	mg/kg wet	71.00		107	20.3-222.5			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1901588

Notes and Definitions

Z-10a	Soil pH measured in water at 20.5 ºC.
Z-10	Soil pH measured in water at 20.2 ºC.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901588

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1901588
Date Received: 1/28/2019
Project Due Date: 2/4/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.4 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / (No)
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	312273	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	312272	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	312271	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	312270	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials: ll
Are barcode labels on correct containers? (Yes) / No
Are all necessary stickers attached? (Yes) / No

Completed By: Date & Time: 1/28/19 1602
Reviewed By: Date & Time: 1/28/19 16:42
Delivered By: 1/28/19 16:42

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1901588

Turn Time: Std Rush:

Regulatory State: MA

Reporting Limits: S-1 / S-2 / S-3

Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Electonic Deliverables: ☑ Limit Checker ☐ Excel ☐ Other (Please Specifiy) → PDF

Company Name	Project #	Project Name
Tighe + Bond	S-1757-020	Gallows Hill Park, Salem

Contact Person	Address
Todd Kirton	446 Main St

City	State	Zip Code	PO #
Worcester	MA	01608	

Telephone Number	FAX Number	Email Address
		TDKirton@TigheBond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Analysis: Hex Cr
1	1/28/19	900	G	S	TP-1 (0-2')	X
2	↓	945	G	S	TP-1 (5')	X
3		1030	G	S	TP-2 (0-2')	X
4	↓	1100	G	S	TP-2 (5')	X

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other — ag ag

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 1

Number of Containers: 4

Laboratory Use Only

Cooler Present: ✓

Seals Intact: NA

Cooler Temperature: °C ice temp: 0.4

Sampled by: Ken

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
1/28/19 1330	1/28/19 13:09	1/28/19 15:24	1/28/19 1600
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1901617

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:34 pm, Feb 27, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

SAMPLE RECEIPT

The following samples were received on January 29, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Low Level VOA vials were frozen by ESS Laboratory on January 29, 2019 at 15:57.

Question I: Samples 1901617-04 thorugh 1901617-07 for Metals were analyzed for a subset of the required MCP list per the client's request.

Revision 1, February 27, 2019: This report has been revised to include Chlordane on the Pesticide list. This compound was analyzed but not reported.

Lab Number	Sample Name	Matrix	Analysis
1901617-01	TP-1 0-2ft	Soil	6010C, 7471B, 8081B, 8082A
1901617-02	TP-1 3-5ft	Soil	EPH8270, MADEP-EPH
1901617-03	TP-1 5ft	Soil	6010C, 7471B, 8260B Low, 9014
1901617-04	TP-1 6.5ft	Soil	6010C
1901617-05	TP-2 0-2ft	Soil	6010C
1901617-06	TP-2 5ft	Soil	6010C
1901617-07	TP-2 6-6.5ft	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1901617

PROJECT NARRATIVE

5035/8260B Volatile Organic Compounds / Low Level

CA93115-BS1 **Blank Spike recovery is above upper control limit (B+).**
1,4-Dioxane (153% @ 70-130%), 2-Butanone (131% @ 70-130%), 2-Hexanone (134% @ 70-130%), 4-Methyl-2-Pentanone (139% @ 70-130%), Acetone (140% @ 70-130%), Methyl tert-Butyl Ether (131% @ 70-130%), Tetrahydrofuran (145% @ 70-130%)

CA93115-BSD1 **Blank Spike recovery is above upper control limit (B+).**
1,4-Dioxane (133% @ 70-130%)

Total Metals

CA93041-SRM1 **Standard Reference Material is biased low (R-).**
Silver (38% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1901617-01 through 1901617-07**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	(X) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(X) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	(X) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: February 05, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 0-2ft
Date Sampled: 01/28/19 09:00
Percent Solids: 70

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (6.79)		6010C		1	KJK	01/31/19 14:07	2.11	100	CA93041
Arsenic	**549** (3.39)		6010C		1	KJK	01/31/19 14:07	2.11	100	CA93041
Barium	**64.5** (3.39)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Beryllium	**0.42** (0.15)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Cadmium	**5.27** (0.68)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Chromium	**149** (1.36)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Lead	**107** (6.79)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Mercury	**0.325** (0.033)		7471B		1	BJV	02/01/19 13:23	0.87	40	CA93042
Nickel	**13.4** (3.39)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Selenium	ND (6.79)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Silver	ND (0.68)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Thallium	ND (6.79)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Vanadium	**37.8** (1.36)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041
Zinc	**196** (3.39)		6010C		1	KJK	01/31/19 0:13	2.11	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 0-2ft
Date Sampled: 01/28/19 09:00
Percent Solids: 70
Initial Volume: 20.4
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 1/31/19 13:41

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
4,4´-DDE	**0.0075** (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
4,4´-DDT	**0.0051** (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Aldrin	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
alpha-BHC	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
alpha-Chlordane	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
beta-BHC	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Chlordane (Total)	ND (0.0281)		8081B		1	02/01/19 21:31	C9B0016	CA93109
delta-BHC	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Dieldrin	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Endosulfan I	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Endosulfan II	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Endosulfan Sulfate	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Endrin	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Endrin Ketone	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
gamma-BHC (Lindane)	ND (0.0021)		8081B		1	02/01/19 21:31	C9B0016	CA93109
gamma-Chlordane	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Heptachlor	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Heptachlor Epoxide	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Hexachlorobenzene	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109
Methoxychlor	ND (0.0035)		8081B		1	02/01/19 21:31	C9B0016	CA93109

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*71 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*79 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*75 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*68 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 0-2ft
Date Sampled: 01/28/19 09:00
Percent Solids: 70
Initial Volume: 19.3
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 1/30/19 16:22

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1221	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1232	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1242	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1248	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1254	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1260	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1262	ND (0.07)		8082A		1	01/31/19 14:24		CA93002
Aroclor 1268	ND (0.07)		8082A		1	01/31/19 14:24		CA93002

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*70 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*72 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*77 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*81 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 3-5ft
Date Sampled: 01/28/19 09:45
Percent Solids: 71
Initial Volume: 24.6
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-02
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 1/30/19 13:45

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (21.5)		MADEP-EPH		1	CAD	01/31/19 6:01	C9A0476	CA93001
C19-C36 Aliphatics1	ND (21.5)		MADEP-EPH		1	CAD	01/31/19 6:01	C9A0476	CA93001
C11-C22 Unadjusted Aromatics1	**96.8** (21.5)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
C11-C22 Aromatics1,2	**78.5** (21.5)		EPH8270			ZLC	01/31/19 0:18		[CALC]
2-Methylnaphthalene	ND (0.29)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Acenaphthene	ND (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Naphthalene	ND (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Phenanthrene	**2.45** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Acenaphthylene	ND (0.29)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Anthracene	ND (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Benzo(a)anthracene	**1.60** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Benzo(a)pyrene	**1.57** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Benzo(b)fluoranthene	**1.76** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Benzo(g,h,i)perylene	**1.02** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Benzo(k)fluoranthene	**0.61** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Chrysene	**1.64** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Dibenzo(a,h)Anthracene	ND (0.29)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Fluoranthene	**3.33** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Fluorene	ND (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Indeno(1,2,3-cd)Pyrene	**1.09** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001
Pyrene	**3.20** (0.57)		EPH8270		1	ZLC	01/31/19 0:18	C9A0517	CA93001

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*74 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*97 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*95 %*		*40-140*
Surrogate: O-Terphenyl	*85 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 10:00
Percent Solids: 82

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (4.03)		6010C		1	KJK	01/31/19 14:11	3.02	100	CA93041
Arsenic	**11.8** (2.01)		6010C		1	KJK	01/31/19 14:11	3.02	100	CA93041
Barium	**47.9** (2.01)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Beryllium	**0.47** (0.09)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Cadmium	ND (0.40)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Chromium	**25.8** (0.81)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Lead	**6.32** (4.03)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Mercury	ND (0.023)		7471B		1	BJV	02/01/19 13:25	1.03	40	CA93042
Nickel	**15.0** (2.01)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Selenium	ND (4.03)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Silver	ND (0.40)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Thallium	ND (4.03)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Vanadium	**25.2** (0.81)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041
Zinc	**48.4** (2.01)		6010C		1	KJK	01/31/19 0:17	3.02	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 10:00
Percent Solids: 82
Initial Volume: 6.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1,1-Trichloroethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1,2,2-Tetrachloroethane	ND (0.0018)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1,2-Trichloroethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1-Dichloroethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1-Dichloroethene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,1-Dichloropropene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2,3-Trichlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2,3-Trichloropropane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2,4-Trichlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2,4-Trimethylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2-Dibromo-3-Chloropropane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2-Dibromoethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2-Dichlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2-Dichloroethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,2-Dichloropropane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,3,5-Trimethylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,3-Dichlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,3-Dichloropropane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,4-Dichlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
1,4-Dioxane	ND (0.0882)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
2,2-Dichloropropane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
2-Butanone	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
2-Chlorotoluene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
2-Hexanone	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
4-Chlorotoluene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
4-Isopropyltoluene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
4-Methyl-2-Pentanone	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Acetone	**0.0465** (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Benzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Bromobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Bromochloromethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 10:00
Percent Solids: 82
Initial Volume: 6.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Bromoform	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Bromomethane	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Carbon Disulfide	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Carbon Tetrachloride	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Chlorobenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Chloroethane	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Chloroform	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Chloromethane	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
cis-1,2-Dichloroethene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
cis-1,3-Dichloropropene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Dibromochloromethane	ND (0.0018)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Dibromomethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Dichlorodifluoromethane	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Diethyl Ether	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Di-isopropyl ether	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Ethyl tertiary-butyl ether	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Ethylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Hexachlorobutadiene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Isopropylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Methyl tert-Butyl Ether	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Methylene Chloride	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Naphthalene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
n-Butylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
n-Propylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
sec-Butylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Styrene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
tert-Butylbenzene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Tertiary-amyl methyl ether	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Tetrachloroethene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Tetrahydrofuran	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Toluene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 10:00
Percent Solids: 82
Initial Volume: 6.9
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
trans-1,3-Dichloropropene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Trichloroethene	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Trichlorofluoromethane	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Vinyl Chloride	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Xylene O	ND (0.0044)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Xylene P,M	ND (0.0088)		8260B Low		1	01/31/19 14:41	C9A0549	CA93115
Xylenes (Total)	ND (0.0088)		8260B Low		1	01/31/19 14:41		[CALC]

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1,2-Dichloroethane-d4	*127 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*94 %*		*70-130*
Surrogate: Dibromofluoromethane	*116 %*		*70-130*
Surrogate: Toluene-d8	*98 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 5ft
Date Sampled: 01/28/19 10:00
Percent Solids: 82

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-03
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Total Cyanide	ND (1.11)		9014		1	EEM	01/30/19 11:05	mg/kg dry	CA93012

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-1 6.5ft
Date Sampled: 01/28/19 10:15
Percent Solids: 79

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**7.64** (6.27)		6010C		2	KJK	01/31/19 14:27	2.02	100	CA93041
Chromium	**21.0** (2.51)		6010C		2	KJK	01/31/19 14:27	2.02	100	CA93041
Lead	ND (12.5)		6010C		2	KJK	01/31/19 14:27	2.02	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-2 0-2ft
Date Sampled: 01/28/19 11:00
Percent Solids: 81

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**84.0** (2.67)		6010C		1	KJK	01/31/19 14:31	2.31	100	CA93041
Chromium	**62.6** (1.07)		6010C		1	KJK	01/31/19 0:37	2.31	100	CA93041
Lead	**60.8** (5.35)		6010C		1	KJK	01/31/19 0:37	2.31	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-2 5ft
Date Sampled: 01/28/19 11:15
Percent Solids: 60

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**35.7** (2.63)		6010C		1	KJK	01/31/19 14:35	3.14	100	CA93041
Chromium	**23.7** (1.05)		6010C		1	KJK	01/31/19 0:41	3.14	100	CA93041
Lead	**48.5** (5.27)		6010C		1	KJK	01/31/19 0:41	3.14	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-2 6-6.5ft
Date Sampled: 01/28/19 11:30
Percent Solids: 78

ESS Laboratory Work Order: 1901617
ESS Laboratory Sample ID: 1901617-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.77** (2.34)		6010C		1	KJK	01/31/19 14:38	2.73	100	CA93041

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CA93041 - 3050B										
Blank										
Antimony	ND	5.00	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	42.5	19.6	mg/kg wet	42.40		100	80-120			
Arsenic	134	9.80	mg/kg wet	128.0		105	85-114			
Barium	494	9.80	mg/kg wet	536.0		92	82-118			
Beryllium	206	0.43	mg/kg wet	217.0		95	84-116			
Cadmium	90.1	1.96	mg/kg wet	99.00		91	87-113			
Chromium	110	3.92	mg/kg wet	116.0		95	82-118			
Lead	272	19.6	mg/kg wet	277.0		98	84-116			
Nickel	103	9.80	mg/kg wet	107.0		96	84-117			
Selenium	226	19.6	mg/kg wet	242.0		93	80-120			
Silver	65.2	1.96	mg/kg wet	64.30		101	86-114			
Thallium	178	19.6	mg/kg wet	183.0		97	80-120			
Vanadium	144	3.92	mg/kg wet	146.0		99	86-114			
Zinc	520	9.80	mg/kg wet	561.0		93	86-114			
LCS Dup										
Antimony	43.0	17.5	mg/kg wet	42.40		101	80-120	1	20	
Arsenic	138	8.77	mg/kg wet	128.0		108	85-114	3	20	
Barium	536	8.77	mg/kg wet	536.0		100	82-118	8	20	
Beryllium	211	0.39	mg/kg wet	217.0		97	84-116	2	20	
Cadmium	92.6	1.75	mg/kg wet	99.00		94	87-113	3	20	
Chromium	114	3.51	mg/kg wet	116.0		98	82-118	3	20	
Lead	279	17.5	mg/kg wet	277.0		101	84-116	2	20	
Nickel	99.6	8.77	mg/kg wet	107.0		93	84-117	4	20	
Selenium	235	17.5	mg/kg wet	242.0		97	80-120	4	20	
Silver	66.9	1.75	mg/kg wet	64.30		104	86-114	3	20	
Thallium	182	17.5	mg/kg wet	183.0		100	80-120	2	20	
Vanadium	148	3.51	mg/kg wet	146.0		101	86-114	3	20	
Zinc	534	8.77	mg/kg wet	561.0		95	86-114	3	20	
Reference										
Barium	459	8.62	mg/kg wet	500.0		92	70-130			
Cadmium	398	1.72	mg/kg wet	500.0		80	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CA93041 - 3050B										
Chromium	462	3.45	mg/kg wet	500.0		92	70-130			
Lead	443	17.2	mg/kg wet	500.0		89	70-130			
Nickel	405	8.62	mg/kg wet	500.0		81	70-130			
Silver	190	1.72	mg/kg wet	500.0		38	70-130			R-
Vanadium	453	3.45	mg/kg wet	500.0		91	70-130			
Zinc	436	8.62	mg/kg wet	500.0		87	70-130			
Batch CA93042 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.57	0.360	mg/kg wet	3.710		96	50-103			
LCS Dup										
Mercury	3.38	0.360	mg/kg wet	3.710		91	50-103	5	20	
Reference										
Mercury	1.00	0.155	mg/kg wet	1000		0.1	0-200			
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0644*		mg/kg wet	*0.05000*		*129*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0457*		mg/kg wet	*0.05000*		*91*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0566*		mg/kg wet	*0.05000*		*113*	*70-130*			
Surrogate: Toluene-d8	*0.0488*		mg/kg wet	*0.05000*		*98*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0541	0.0050	mg/kg wet	0.05000		108	70-130			
1,1,1-Trichloroethane	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
1,1,2,2-Tetrachloroethane	0.0635	0.0020	mg/kg wet	0.05000		127	70-130			
1,1,2-Trichloroethane	0.0587	0.0050	mg/kg wet	0.05000		117	70-130			
1,1-Dichloroethane	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
1,1-Dichloroethene	0.0577	0.0050	mg/kg wet	0.05000		115	70-130			
1,1-Dichloropropene	0.0570	0.0050	mg/kg wet	0.05000		114	70-130			
1,2,3-Trichlorobenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
1,2,3-Trichloropropane	0.0646	0.0050	mg/kg wet	0.05000		129	70-130			
1,2,4-Trichlorobenzene	0.0517	0.0050	mg/kg wet	0.05000		103	70-130			
1,2,4-Trimethylbenzene	0.0505	0.0050	mg/kg wet	0.05000		101	70-130			
1,2-Dibromo-3-Chloropropane	0.0622	0.0050	mg/kg wet	0.05000		124	70-130			
1,2-Dibromoethane	0.0613	0.0050	mg/kg wet	0.05000		123	70-130			
1,2-Dichlorobenzene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130			
1,2-Dichloroethane	0.0570	0.0050	mg/kg wet	0.05000		114	70-130			
1,2-Dichloropropane	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
1,3,5-Trimethylbenzene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130			
1,3-Dichlorobenzene	0.0501	0.0050	mg/kg wet	0.05000		100	70-130			
1,3-Dichloropropane	0.0601	0.0050	mg/kg wet	0.05000		120	70-130			
1,4-Dichlorobenzene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130			
1,4-Dioxane	1.53	0.100	mg/kg wet	1.000		153	70-130			B+
2,2-Dichloropropane	0.0569	0.0050	mg/kg wet	0.05000		114	70-130			
2-Butanone	0.327	0.0100	mg/kg wet	0.2500		131	70-130			B+
2-Chlorotoluene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
2-Hexanone	0.336	0.0100	mg/kg wet	0.2500		134	70-130			B+
4-Chlorotoluene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
4-Isopropyltoluene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130			
4-Methyl-2-Pentanone	0.349	0.0100	mg/kg wet	0.2500		139	70-130			B+
Acetone	0.349	0.0100	mg/kg wet	0.2500		140	70-130			B+
Benzene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130			
Bromobenzene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
Bromochloromethane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130			
Bromodichloromethane	0.0567	0.0050	mg/kg wet	0.05000		113	70-130			
Bromoform	0.0599	0.0050	mg/kg wet	0.05000		120	70-130			
Bromomethane	0.0503	0.0100	mg/kg wet	0.05000		101	70-130			
Carbon Disulfide	0.0592	0.0050	mg/kg wet	0.05000		118	70-130			
Carbon Tetrachloride	0.0546	0.0050	mg/kg wet	0.05000		109	70-130			
Chlorobenzene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
Chloroethane	0.0516	0.0100	mg/kg wet	0.05000		103	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
Chloroform	0.0531	0.0050	mg/kg wet	0.05000		106	70-130			
Chloromethane	0.0475	0.0100	mg/kg wet	0.05000		95	70-130			
cis-1,2-Dichloroethene	0.0557	0.0050	mg/kg wet	0.05000		111	70-130			
cis-1,3-Dichloropropene	0.0506	0.0050	mg/kg wet	0.05000		101	70-130			
Dibromochloromethane	0.0481	0.0020	mg/kg wet	0.05000		96	70-130			
Dibromomethane	0.0596	0.0050	mg/kg wet	0.05000		119	70-130			
Dichlorodifluoromethane	0.0519	0.0100	mg/kg wet	0.05000		104	70-130			
Diethyl Ether	0.0583	0.0050	mg/kg wet	0.05000		117	70-130			
Di-isopropyl ether	0.0528	0.0050	mg/kg wet	0.05000		106	70-130			
Ethyl tertiary-butyl ether	0.0501	0.0050	mg/kg wet	0.05000		100	70-130			
Ethylbenzene	0.0547	0.0050	mg/kg wet	0.05000		109	70-130			
Hexachlorobutadiene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
Isopropylbenzene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
Methyl tert-Butyl Ether	0.0654	0.0050	mg/kg wet	0.05000		131	70-130			B+
Methylene Chloride	0.0504	0.0100	mg/kg wet	0.05000		101	70-130			
Naphthalene	0.0573	0.0050	mg/kg wet	0.05000		115	70-130			
n-Butylbenzene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130			
n-Propylbenzene	0.0553	0.0050	mg/kg wet	0.05000		111	70-130			
sec-Butylbenzene	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Styrene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130			
tert-Butylbenzene	0.0507	0.0050	mg/kg wet	0.05000		101	70-130			
Tertiary-amyl methyl ether	0.0536	0.0050	mg/kg wet	0.05000		107	70-130			
Tetrachloroethene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130			
Tetrahydrofuran	0.0727	0.0050	mg/kg wet	0.05000		145	70-130			B+
Toluene	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
trans-1,2-Dichloroethene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130			
trans-1,3-Dichloropropene	0.0472	0.0050	mg/kg wet	0.05000		94	70-130			
Trichloroethene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
Trichlorofluoromethane	0.0548	0.0050	mg/kg wet	0.05000		110	70-130			
Vinyl Chloride	0.0518	0.0100	mg/kg wet	0.05000		104	70-130			
Xylene O	0.0504	0.0050	mg/kg wet	0.05000		101	70-130			
Xylene P,M	0.101	0.0100	mg/kg wet	0.1000		101	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0542*		mg/kg wet	*0.05000*		*108*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0513*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0516*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: Toluene-d8	*0.0499*		mg/kg wet	*0.05000*		*100*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	0.3	20	
1,1,1-Trichloroethane	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
1,1,2,2-Tetrachloroethane	0.0623	0.0020	mg/kg wet	0.05000		125	70-130	2	20	
1,1,2-Trichloroethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130	5	20	
1,1-Dichloroethane	0.0506	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
1,1-Dichloroethene	0.0564	0.0050	mg/kg wet	0.05000		113	70-130	2	20	
1,1-Dichloropropene	0.0553	0.0050	mg/kg wet	0.05000		111	70-130	3	20	
1,2,3-Trichlorobenzene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130	1	20	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
1,2,3-Trichloropropane	0.0622	0.0050	mg/kg wet	0.05000		124	70-130	4	20	
1,2,4-Trichlorobenzene	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	2	20	
1,2,4-Trimethylbenzene	0.0515	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
1,2-Dibromo-3-Chloropropane	0.0590	0.0050	mg/kg wet	0.05000		118	70-130	5	20	
1,2-Dibromoethane	0.0596	0.0050	mg/kg wet	0.05000		119	70-130	3	20	
1,2-Dichlorobenzene	0.0549	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,2-Dichloroethane	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
1,2-Dichloropropane	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	1	20	
1,3,5-Trimethylbenzene	0.0557	0.0050	mg/kg wet	0.05000		111	70-130	2	20	
1,3-Dichlorobenzene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130	3	20	
1,3-Dichloropropane	0.0582	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
1,4-Dichlorobenzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
1,4-Dioxane	1.33	0.100	mg/kg wet	1.000		133	70-130	14	20	B+
2,2-Dichloropropane	0.0552	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
2-Butanone	0.298	0.0100	mg/kg wet	0.2500		119	70-130	9	20	
2-Chlorotoluene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130	3	20	
2-Hexanone	0.303	0.0100	mg/kg wet	0.2500		121	70-130	10	20	
4-Chlorotoluene	0.0554	0.0050	mg/kg wet	0.05000		111	70-130	3	20	
4-Isopropyltoluene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	2	20	
4-Methyl-2-Pentanone	0.309	0.0100	mg/kg wet	0.2500		124	70-130	12	20	
Acetone	0.301	0.0100	mg/kg wet	0.2500		120	70-130	15	20	
Benzene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Bromobenzene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130	3	20	
Bromochloromethane	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	2	20	
Bromodichloromethane	0.0563	0.0050	mg/kg wet	0.05000		113	70-130	0.7	20	
Bromoform	0.0592	0.0050	mg/kg wet	0.05000		118	70-130	1	20	
Bromomethane	0.0478	0.0100	mg/kg wet	0.05000		96	70-130	5	20	
Carbon Disulfide	0.0572	0.0050	mg/kg wet	0.05000		114	70-130	4	20	
Carbon Tetrachloride	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	4	20	
Chlorobenzene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	0.1	20	
Chloroethane	0.0503	0.0100	mg/kg wet	0.05000		101	70-130	2	20	
Chloroform	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	2	20	
Chloromethane	0.0462	0.0100	mg/kg wet	0.05000		92	70-130	3	20	
cis-1,2-Dichloroethene	0.0548	0.0050	mg/kg wet	0.05000		110	70-130	2	20	
cis-1,3-Dichloropropene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	0.7	20	
Dibromochloromethane	0.0477	0.0020	mg/kg wet	0.05000		95	70-130	0.8	20	
Dibromomethane	0.0576	0.0050	mg/kg wet	0.05000		115	70-130	3	20	
Dichlorodifluoromethane	0.0486	0.0100	mg/kg wet	0.05000		97	70-130	7	20	
Diethyl Ether	0.0569	0.0050	mg/kg wet	0.05000		114	70-130	2	20	
Di-isopropyl ether	0.0524	0.0050	mg/kg wet	0.05000		105	70-130	0.7	20	
Ethyl tertiary-butyl ether	0.0497	0.0050	mg/kg wet	0.05000		99	70-130	0.9	20	
Ethylbenzene	0.0552	0.0050	mg/kg wet	0.05000		110	70-130	0.9	20	
Hexachlorobutadiene	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	2	20	
Isopropylbenzene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	3	20	
Methyl tert-Butyl Ether	0.0637	0.0050	mg/kg wet	0.05000		127	70-130	3	20	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CA93115 - 5035										
Methylene Chloride	0.0497	0.0100	mg/kg wet	0.05000		99	70-130	1	20	
Naphthalene	0.0570	0.0050	mg/kg wet	0.05000		114	70-130	0.4	20	
n-Butylbenzene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130	2	20	
n-Propylbenzene	0.0563	0.0050	mg/kg wet	0.05000		113	70-130	2	20	
sec-Butylbenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	2	20	
Styrene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
tert-Butylbenzene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	2	20	
Tertiary-amyl methyl ether	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Tetrachloroethene	0.0502	0.0050	mg/kg wet	0.05000		100	70-130	2	20	
Tetrahydrofuran	0.0635	0.0050	mg/kg wet	0.05000		127	70-130	14	20	
Toluene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	3	20	
trans-1,2-Dichloroethene	0.0519	0.0050	mg/kg wet	0.05000		104	70-130	0.7	20	
trans-1,3-Dichloropropene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130	2	20	
Trichloroethene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	2	20	
Trichlorofluoromethane	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	5	20	
Vinyl Chloride	0.0499	0.0100	mg/kg wet	0.05000		100	70-130	4	20	
Xylene O	0.0504	0.0050	mg/kg wet	0.05000		101	70-130	0.04	20	
Xylene P,M	0.101	0.0100	mg/kg wet	0.1000		101	70-130	0.4	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0505*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0501*		mg/kg wet	*0.05000*		*100*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0497*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: Toluene-d8	*0.0500*		mg/kg wet	*0.05000*		*100*	*70-130*			
8081B Organochlorine Pesticides										
Batch CA93109 - 3546										
Blank										
4,4´-DDD	ND	0.0025	mg/kg wet							
4,4´-DDD [2C]	ND	0.0025	mg/kg wet							
4,4´-DDE	ND	0.0025	mg/kg wet							
4,4´-DDE [2C]	ND	0.0025	mg/kg wet							
4,4´-DDT	ND	0.0025	mg/kg wet							
4,4´-DDT [2C]	ND	0.0025	mg/kg wet							
Aldrin	ND	0.0025	mg/kg wet							
Aldrin [2C]	ND	0.0025	mg/kg wet							
alpha-BHC	ND	0.0025	mg/kg wet							
alpha-BHC [2C]	ND	0.0025	mg/kg wet							
alpha-Chlordane	ND	0.0025	mg/kg wet							
alpha-Chlordane [2C]	ND	0.0025	mg/kg wet							
beta-BHC	ND	0.0025	mg/kg wet							
beta-BHC [2C]	ND	0.0025	mg/kg wet							
Chlordane (Total)	ND	0.0200	mg/kg wet							
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet							
delta-BHC	ND	0.0025	mg/kg wet							
delta-BHC [2C]	ND	0.0025	mg/kg wet							
Dieldrin	ND	0.0025	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA93109 - 3546										
Dieldrin [2C]	ND	0.0025	mg/kg wet							
Endosulfan I	ND	0.0025	mg/kg wet							
Endosulfan I [2C]	ND	0.0025	mg/kg wet							
Endosulfan II	ND	0.0025	mg/kg wet							
Endosulfan II [2C]	ND	0.0025	mg/kg wet							
Endosulfan Sulfate	ND	0.0025	mg/kg wet							
Endosulfan Sulfate [2C]	ND	0.0025	mg/kg wet							
Endrin	ND	0.0025	mg/kg wet							
Endrin [2C]	ND	0.0025	mg/kg wet							
Endrin Ketone	ND	0.0025	mg/kg wet							
Endrin Ketone [2C]	ND	0.0025	mg/kg wet							
gamma-BHC (Lindane)	ND	0.0015	mg/kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0015	mg/kg wet							
gamma-Chlordane	ND	0.0025	mg/kg wet							
gamma-Chlordane [2C]	ND	0.0025	mg/kg wet							
Heptachlor	ND	0.0025	mg/kg wet							
Heptachlor [2C]	ND	0.0025	mg/kg wet							
Heptachlor Epoxide	ND	0.0025	mg/kg wet							
Heptachlor Epoxide [2C]	ND	0.0025	mg/kg wet							
Hexachlorobenzene	ND	0.0025	mg/kg wet							
Hexachlorobenzene [2C]	ND	0.0025	mg/kg wet							
Methoxychlor	ND	0.0025	mg/kg wet							
Methoxychlor [2C]	ND	0.0025	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0154*		mg/kg wet	*0.01250*		*123*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0144*		mg/kg wet	*0.01250*		*115*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0130*		mg/kg wet	*0.01250*		*104*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0124*		mg/kg wet	*0.01250*		*100*	*30-150*			
LCS										
4,4´-DDD	0.0147	0.0025	mg/kg wet	0.01250		118	40-140			
4,4´-DDD [2C]	0.0135	0.0025	mg/kg wet	0.01250		108	40-140			
4,4´-DDE	0.0143	0.0025	mg/kg wet	0.01250		115	40-140			
4,4´-DDE [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140			
4,4´-DDT	0.0147	0.0025	mg/kg wet	0.01250		117	40-140			
4,4´-DDT [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140			
Aldrin	0.0141	0.0025	mg/kg wet	0.01250		113	40-140			
Aldrin [2C]	0.0137	0.0025	mg/kg wet	0.01250		110	40-140			
alpha-BHC	0.0136	0.0025	mg/kg wet	0.01250		109	40-140			
alpha-BHC [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
alpha-Chlordane	0.0134	0.0025	mg/kg wet	0.01250		107	40-140			
alpha-Chlordane [2C]	0.0129	0.0025	mg/kg wet	0.01250		103	40-140			
beta-BHC	0.0129	0.0025	mg/kg wet	0.01250		103	40-140			
beta-BHC [2C]	0.0138	0.0025	mg/kg wet	0.01250		111	40-140			
delta-BHC	0.0111	0.0025	mg/kg wet	0.01250		89	40-140			
delta-BHC [2C]	0.0106	0.0025	mg/kg wet	0.01250		85	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA93109 - 3546										
Dieldrin	0.0149	0.0025	mg/kg wet	0.01250		119	40-140			
Dieldrin [2C]	0.0143	0.0025	mg/kg wet	0.01250		114	40-140			
Endosulfan I	0.0133	0.0025	mg/kg wet	0.01250		107	40-140			
Endosulfan I [2C]	0.0127	0.0025	mg/kg wet	0.01250		101	40-140			
Endosulfan II	0.0133	0.0025	mg/kg wet	0.01250		106	40-140			
Endosulfan II [2C]	0.0128	0.0025	mg/kg wet	0.01250		102	40-140			
Endosulfan Sulfate	0.0129	0.0025	mg/kg wet	0.01250		103	40-140			
Endosulfan Sulfate [2C]	0.0122	0.0025	mg/kg wet	0.01250		98	40-140			
Endrin	0.0154	0.0025	mg/kg wet	0.01250		123	40-140			
Endrin [2C]	0.0147	0.0025	mg/kg wet	0.01250		118	40-140			
Endrin Ketone	0.0142	0.0025	mg/kg wet	0.01250		114	40-140			
Endrin Ketone [2C]	0.0134	0.0025	mg/kg wet	0.01250		107	40-140			
gamma-BHC (Lindane)	0.0137	0.0015	mg/kg wet	0.01250		109	40-140			
gamma-BHC (Lindane) [2C]	0.0131	0.0015	mg/kg wet	0.01250		105	40-140			
gamma-Chlordane	0.0137	0.0025	mg/kg wet	0.01250		110	40-140			
gamma-Chlordane [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Heptachlor	0.0143	0.0025	mg/kg wet	0.01250		115	40-140			
Heptachlor [2C]	0.0140	0.0025	mg/kg wet	0.01250		112	40-140			
Heptachlor Epoxide	0.0144	0.0025	mg/kg wet	0.01250		115	40-140			
Heptachlor Epoxide [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140			
Hexachlorobenzene	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			
Hexachlorobenzene [2C]	0.0136	0.0025	mg/kg wet	0.01250		109	40-140			
Methoxychlor	0.0145	0.0025	mg/kg wet	0.01250		116	40-140			
Methoxychlor [2C]	0.0133	0.0025	mg/kg wet	0.01250		106	40-140			
Surrogate: Decachlorobiphenyl	*0.0156*		mg/kg wet	*0.01250*		*125*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0145*		mg/kg wet	*0.01250*		*116*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0128*		mg/kg wet	*0.01250*		*102*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0124*		mg/kg wet	*0.01250*		*99*	*30-150*			
LCS Dup										
4,4´-DDD	0.0150	0.0025	mg/kg wet	0.01250		120	40-140	2	30	
4,4´-DDD [2C]	0.0136	0.0025	mg/kg wet	0.01250		109	40-140	0.7	30	
4,4´-DDE	0.0145	0.0025	mg/kg wet	0.01250		116	40-140	1	30	
4,4´-DDE [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	1	30	
4,4´-DDT	0.0148	0.0025	mg/kg wet	0.01250		119	40-140	1	30	
4,4´-DDT [2C]	0.0142	0.0025	mg/kg wet	0.01250		113	40-140	0.4	30	
Aldrin	0.0144	0.0025	mg/kg wet	0.01250		115	40-140	2	30	
Aldrin [2C]	0.0141	0.0025	mg/kg wet	0.01250		112	40-140	2	30	
alpha-BHC	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	3	30	
alpha-BHC [2C]	0.0136	0.0025	mg/kg wet	0.01250		108	40-140	3	30	
alpha-Chlordane	0.0137	0.0025	mg/kg wet	0.01250		110	40-140	2	30	
alpha-Chlordane [2C]	0.0132	0.0025	mg/kg wet	0.01250		106	40-140	2	30	
beta-BHC	0.0131	0.0025	mg/kg wet	0.01250		104	40-140	2	30	
beta-BHC [2C]	0.0141	0.0025	mg/kg wet	0.01250		113	40-140	2	30	
delta-BHC	0.0114	0.0025	mg/kg wet	0.01250		91	40-140	3	30	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CA93109 - 3546										
delta-BHC [2C]	0.0109	0.0025	mg/kg wet	0.01250		87	40-140	2	30	
Dieldrin	0.0152	0.0025	mg/kg wet	0.01250		122	40-140	2	30	
Dieldrin [2C]	0.0145	0.0025	mg/kg wet	0.01250		116	40-140	2	30	
Endosulfan I	0.0136	0.0025	mg/kg wet	0.01250		109	40-140	2	30	
Endosulfan I [2C]	0.0129	0.0025	mg/kg wet	0.01250		104	40-140	2	30	
Endosulfan II	0.0136	0.0025	mg/kg wet	0.01250		109	40-140	2	30	
Endosulfan II [2C]	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	1	30	
Endosulfan Sulfate	0.0129	0.0025	mg/kg wet	0.01250		104	40-140	0.2	30	
Endosulfan Sulfate [2C]	0.0123	0.0025	mg/kg wet	0.01250		98	40-140	0.05	30	
Endrin	0.0157	0.0025	mg/kg wet	0.01250		126	40-140	2	30	
Endrin [2C]	0.0150	0.0025	mg/kg wet	0.01250		120	40-140	2	30	
Endrin Ketone	0.0142	0.0025	mg/kg wet	0.01250		113	40-140	0.6	30	
Endrin Ketone [2C]	0.0133	0.0025	mg/kg wet	0.01250		107	40-140	0.3	30	
gamma-BHC (Lindane)	0.0140	0.0015	mg/kg wet	0.01250		112	40-140	3	30	
gamma-BHC (Lindane) [2C]	0.0135	0.0015	mg/kg wet	0.01250		108	40-140	3	30	
gamma-Chlordane	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	2	30	
gamma-Chlordane [2C]	0.0134	0.0025	mg/kg wet	0.01250		107	40-140	2	30	
Heptachlor	0.0147	0.0025	mg/kg wet	0.01250		118	40-140	3	30	
Heptachlor [2C]	0.0143	0.0025	mg/kg wet	0.01250		115	40-140	2	30	
Heptachlor Epoxide	0.0148	0.0025	mg/kg wet	0.01250		118	40-140	2	30	
Heptachlor Epoxide [2C]	0.0144	0.0025	mg/kg wet	0.01250		115	40-140	2	30	
Hexachlorobenzene	0.0128	0.0025	mg/kg wet	0.01250		102	40-140	2	30	
Hexachlorobenzene [2C]	0.0139	0.0025	mg/kg wet	0.01250		111	40-140	3	30	
Methoxychlor	0.0144	0.0025	mg/kg wet	0.01250		115	40-140	1	30	
Methoxychlor [2C]	0.0132	0.0025	mg/kg wet	0.01250		106	40-140	0.6	30	
Surrogate: Decachlorobiphenyl	*0.0150*		mg/kg wet	*0.01250*		*120*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0139*		mg/kg wet	*0.01250*		*111*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0128*		mg/kg wet	*0.01250*		*102*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0125*		mg/kg wet	*0.01250*		*100*	*30-150*			
8082A Polychlorinated Biphenyls (PCB)										
Batch CA93002 - 3540C										
Blank										
Aroclor 1016	ND	0.02	mg/kg wet							
Aroclor 1016 [2C]	ND	0.02	mg/kg wet							
Aroclor 1221	ND	0.02	mg/kg wet							
Aroclor 1221 [2C]	ND	0.02	mg/kg wet							
Aroclor 1232	ND	0.02	mg/kg wet							
Aroclor 1232 [2C]	ND	0.02	mg/kg wet							
Aroclor 1242	ND	0.02	mg/kg wet							
Aroclor 1242 [2C]	ND	0.02	mg/kg wet							
Aroclor 1248	ND	0.02	mg/kg wet							
Aroclor 1248 [2C]	ND	0.02	mg/kg wet							
Aroclor 1254	ND	0.02	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CA93002 - 3540C										
Aroclor 1254 [2C]	ND	0.02	mg/kg wet							
Aroclor 1260	ND	0.02	mg/kg wet							
Aroclor 1260 [2C]	ND	0.02	mg/kg wet							
Aroclor 1262	ND	0.02	mg/kg wet							
Aroclor 1262 [2C]	ND	0.02	mg/kg wet							
Aroclor 1268	ND	0.02	mg/kg wet							
Aroclor 1268 [2C]	ND	0.02	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0215*		mg/kg wet	*0.02500*		*86*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0218*		mg/kg wet	*0.02500*		*87*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0204*		mg/kg wet	*0.02500*		*82*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0224*		mg/kg wet	*0.02500*		*89*	*30-150*			
LCS										
Aroclor 1016	0.4	0.02	mg/kg wet	0.5000		90	40-140			
Aroclor 1016 [2C]	0.4	0.02	mg/kg wet	0.5000		88	40-140			
Aroclor 1260	0.4	0.02	mg/kg wet	0.5000		86	40-140			
Aroclor 1260 [2C]	0.4	0.02	mg/kg wet	0.5000		83	40-140			
Surrogate: Decachlorobiphenyl	*0.0215*		mg/kg wet	*0.02500*		*86*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0219*		mg/kg wet	*0.02500*		*88*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0208*		mg/kg wet	*0.02500*		*83*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0208*		mg/kg wet	*0.02500*		*83*	*30-150*			
LCS Dup										
Aroclor 1016	0.4	0.02	mg/kg wet	0.5000		87	40-140	4	30	
Aroclor 1016 [2C]	0.4	0.02	mg/kg wet	0.5000		85	40-140	4	30	
Aroclor 1260	0.4	0.02	mg/kg wet	0.5000		83	40-140	4	30	
Aroclor 1260 [2C]	0.4	0.02	mg/kg wet	0.5000		81	40-140	3	30	
Surrogate: Decachlorobiphenyl	*0.0206*		mg/kg wet	*0.02500*		*82*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0210*		mg/kg wet	*0.02500*		*84*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0196*		mg/kg wet	*0.02500*		*78*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0196*		mg/kg wet	*0.02500*		*78*	*30-150*			
Classical Chemistry										
Batch CA93012 - TCN Prep										
Blank										
Total Cyanide	ND	1.00	mg/kg wet							
LCS										
Total Cyanide	4.99	1.00	mg/kg wet	5.015		100	90-110			
Reference										
Total Cyanide	154	9.96	mg/kg wet	157.0		98	24-110			
Reference										
Total Cyanide	151	9.84	mg/kg wet	157.0		96	24-110			
MADEP-EPH Extractable Petroleum Hydrocarbons										

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CA93001 - 3546										
Blank										
C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.67*		mg/kg wet	*2.000*		*83*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.20	mg/kg wet							
Acenaphthene	ND	0.40	mg/kg wet							
Acenaphthylene	ND	0.20	mg/kg wet							
Anthracene	ND	0.40	mg/kg wet							
Benzo(a)anthracene	ND	0.40	mg/kg wet							
Benzo(a)pyrene	ND	0.40	mg/kg wet							
Benzo(b)fluoranthene	ND	0.40	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.40	mg/kg wet							
Benzo(k)fluoranthene	ND	0.40	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Chrysene	ND	0.40	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.20	mg/kg wet							
Fluoranthene	ND	0.40	mg/kg wet							
Fluorene	ND	0.40	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.40	mg/kg wet							
Naphthalene	ND	0.40	mg/kg wet							
Phenanthrene	ND	0.40	mg/kg wet							
Pyrene	ND	0.40	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*51.8*		mg/L	*50.00*		*104*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*52.1*		mg/L	*50.00*		*104*	*40-140*			
Surrogate: O-Terphenyl	*1.85*		mg/kg wet	*2.000*		*92*	*40-140*			
LCS										
C19-C36 Aliphatics1	16.7	15.0	mg/kg wet	16.00		104	40-140			
C9-C18 Aliphatics1	9.8	15.0	mg/kg wet	12.00		82	40-140			
Decane (C10)	1.0	0.5	mg/kg wet	2.000		49	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CA93001 - 3546										
Docosane (C22)	1.6	0.5	mg/kg wet	2.000		80	40-140			
Dodecane (C12)	1.2	0.5	mg/kg wet	2.000		59	40-140			
Eicosane (C20)	1.6	0.5	mg/kg wet	2.000		79	40-140			
Hexacosane (C26)	1.5	0.5	mg/kg wet	2.000		77	40-140			
Hexadecane (C16)	1.6	0.5	mg/kg wet	2.000		80	40-140			
Hexatriacontane (C36)	1.7	0.5	mg/kg wet	2.000		87	40-140			
Nonadecane (C19)	1.6	0.5	mg/kg wet	2.000		79	40-140			
Nonane (C9)	0.8	0.5	mg/kg wet	2.000		39	30-140			
Octacosane (C28)	1.5	0.5	mg/kg wet	2.000		75	40-140			
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		79	40-140			
Tetracosane (C24)	1.6	0.5	mg/kg wet	2.000		80	40-140			
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		71	40-140			
Triacontane (C30)	1.5	0.5	mg/kg wet	2.000		74	40-140			
Surrogate: 1-Chlorooctadecane	*1.70*		mg/kg wet	*2.000*		*85*	*40-140*			
LCS										
2-Methylnaphthalene	1.70	0.20	mg/kg wet	2.000		85	40-140			
Acenaphthene	1.69	0.40	mg/kg wet	2.000		84	40-140			
Acenaphthylene	1.70	0.20	mg/kg wet	2.000		85	40-140			
Anthracene	1.65	0.40	mg/kg wet	2.000		82	40-140			
Benzo(a)anthracene	1.86	0.40	mg/kg wet	2.000		93	40-140			
Benzo(a)pyrene	1.81	0.40	mg/kg wet	2.000		90	40-140			
Benzo(b)fluoranthene	1.92	0.40	mg/kg wet	2.000		96	40-140			
Benzo(g,h,i)perylene	1.83	0.40	mg/kg wet	2.000		91	40-140			
Benzo(k)fluoranthene	1.83	0.40	mg/kg wet	2.000		91	40-140			
C11-C22 Unadjusted Aromatics1	42.7	15.0	mg/kg wet	34.00		126	40-140			
Chrysene	1.77	0.40	mg/kg wet	2.000		88	40-140			
Dibenzo(a,h)Anthracene	1.97	0.20	mg/kg wet	2.000		99	40-140			
Fluoranthene	1.72	0.40	mg/kg wet	2.000		86	40-140			
Fluorene	1.68	0.40	mg/kg wet	2.000		84	40-140			
Indeno(1,2,3-cd)Pyrene	1.95	0.40	mg/kg wet	2.000		97	40-140			
Naphthalene	1.71	0.40	mg/kg wet	2.000		85	40-140			
Phenanthrene	1.63	0.40	mg/kg wet	2.000		82	40-140			
Pyrene	1.73	0.40	mg/kg wet	2.000		87	40-140			
Surrogate: 2-Bromonaphthalene	*41.8*		mg/L	*50.00*		*84*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*50.8*		mg/L	*50.00*		*102*	*40-140*			
Surrogate: O-Terphenyl	*1.92*		mg/kg wet	*2.000*		*96*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	15.7	15.0	mg/kg wet	16.00		98	40-140	6	25	
C9-C18 Aliphatics1	9.4	15.0	mg/kg wet	12.00		79	40-140	4	25	
Decane (C10)	1.0	0.5	mg/kg wet	2.000		48	40-140	4	25	
Docosane (C22)	1.5	0.5	mg/kg wet	2.000		75	40-140	7	25	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CA93001 - 3546										
Dodecane (C12)	1.1	0.5	mg/kg wet	2.000		57	40-140	4	25	
Eicosane (C20)	1.5	0.5	mg/kg wet	2.000		74	40-140	7	25	
Hexacosane (C26)	1.4	0.5	mg/kg wet	2.000		71	40-140	8	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		75	40-140	6	25	
Hexatriacontane (C36)	1.6	0.5	mg/kg wet	2.000		80	40-140	8	25	
Nonadecane (C19)	1.5	0.5	mg/kg wet	2.000		74	40-140	7	25	
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		37	30-140	6	25	
Octacosane (C28)	1.4	0.5	mg/kg wet	2.000		70	40-140	7	25	
Octadecane (C18)	1.5	0.5	mg/kg wet	2.000		74	40-140	6	25	
Tetracosane (C24)	1.5	0.5	mg/kg wet	2.000		73	40-140	9	25	
Tetradecane (C14)	1.4	0.5	mg/kg wet	2.000		68	40-140	4	25	
Triacontane (C30)	1.4	0.5	mg/kg wet	2.000		69	40-140	7	25	
Surrogate: 1-Chlorooctadecane	*1.55*		mg/kg wet	*2.000*		*78*	*40-140*			
LCS Dup										
2-Methylnaphthalene	1.74	0.20	mg/kg wet	2.000		87	40-140	2	30	
Acenaphthene	1.72	0.40	mg/kg wet	2.000		86	40-140	2	30	
Acenaphthylene	1.68	0.20	mg/kg wet	2.000		84	40-140	2	30	
Anthracene	1.74	0.40	mg/kg wet	2.000		87	40-140	5	30	
Benzo(a)anthracene	1.84	0.40	mg/kg wet	2.000		92	40-140	1	30	
Benzo(a)pyrene	1.88	0.40	mg/kg wet	2.000		94	40-140	4	30	
Benzo(b)fluoranthene	1.94	0.40	mg/kg wet	2.000		97	40-140	1	30	
Benzo(g,h,i)perylene	1.85	0.40	mg/kg wet	2.000		93	40-140	1	30	
Benzo(k)fluoranthene	1.91	0.40	mg/kg wet	2.000		95	40-140	4	30	
C11-C22 Unadjusted Aromatics1	42.9	15.0	mg/kg wet	34.00		126	40-140	0.5	25	
Chrysene	1.84	0.40	mg/kg wet	2.000		92	40-140	4	30	
Dibenzo(a,h)Anthracene	1.96	0.20	mg/kg wet	2.000		98	40-140	0.7	30	
Fluoranthene	1.76	0.40	mg/kg wet	2.000		88	40-140	2	30	
Fluorene	1.75	0.40	mg/kg wet	2.000		87	40-140	4	30	
Indeno(1,2,3-cd)Pyrene	2.01	0.40	mg/kg wet	2.000		101	40-140	3	30	
Naphthalene	1.69	0.40	mg/kg wet	2.000		84	40-140	1	30	
Phenanthrene	1.66	0.40	mg/kg wet	2.000		83	40-140	2	30	
Pyrene	1.73	0.40	mg/kg wet	2.000		87	40-140	0.05	30	
Surrogate: 2-Bromonaphthalene	*44.7*		mg/L	*50.00*		*89*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*51.4*		mg/L	*50.00*		*103*	*40-140*			
Surrogate: O-Terphenyl	*1.90*		mg/kg wet	*2.000*		*95*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

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Notes and Definitions

U	Analyte included in the analysis, but not detected
R-	Standard Reference Material is biased low (R-).
D	Diluted.
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1901617

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1901617
Date Received: 1/29/2019
Project Due Date: 2/5/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: .4 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? (Yes) / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: 1/29/19 Time: ~~15:~~ 1557 By: [illegible]

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	312555	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	312556	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	312557	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	312554	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	312553	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	312558	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	312565	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
03	312566	Yes	NA	Yes	VOA Vial - Other	Other	
03	312567	Yes	NA	Yes	VOA Vial - Other	Other	
04	312552	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	312563	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	312564	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	312551	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	312561	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	312562	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	312550	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	312559	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	312560	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	312549	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab
Are barcode labels on correct containers? (Yes) / No

Initials: [illegible]

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1901617
Date Received: 1/29/2019

Are all necessary stickers attached? Yes / No

Completed By: _____ Date & Time: 1/29/19 15:54

Reviewed By: _____ Date & Time: 1/29/19 1558

Delivered By: _____ 1/29/19 1558

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1901617

Turn Time: Std Rush:
Regulatory State: MA
Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Reporting Limits: S-1 / S-2 / S-3
Electonic Deliverables: ☑ Limit Checker ☑ Excel ☐ Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Contact Person: Todd Kirton / Kerri Lewis
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@Tigheband.com

Analysis: MCP 14 metals, Total Cr, PCBs, Pesticides, EPH-w/ Target PAHs, Cyanide, VOCs, Arsenic, Lead

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	MCP 14 metals	Total Cr	PCBs	Pesticides	EPH-w/ Target PAHs	Cyanide	VOCs	Arsenic	Lead
1	1/28/19	900	G	S	TP-1 (0-2)	X		X	X					
2		945			TP-1 (3-5')					X				
3		1000			TP-1 (5')	X					X	X		
4		1015			TP-1 (6.5')		X						X	X
5		1100			TP-2 (0-2')		X						X	X
6		1115			TP-2 (5')		X						X	X
7		1130			TP-2 (6-6.5')								X	
Container Type:			AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other			ag	ag							
Preservation Code:			1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*											
Number of Containers:														

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 0.4 Ice °C

Sampled by: KW
Comments: Please specify "Other" preservative and containers types in this space
Use quote from Gallows Hill Park, Salem

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
1/29/19 1405	1/29/19 14:05	1/29/19 15:31	1/29/19 15:39
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902212

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 1:53 pm, Feb 19, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902212

SAMPLE RECEIPT

The following samples were received on February 11, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
1902212-01	TP-3A 0-2ft	Soil	2580, 7196A, 9045
1902212-02	TP-5 3-5ft	Soil	2580, 7196A, 9045

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902212

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902212

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902212

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902212-01 through 1902212-02**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	(X) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes (X) No ( )*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: February 15, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-3A 0-2ft
Date Sampled: 02/11/19 09:30
Percent Solids: 75

ESS Laboratory Work Order: 1902212
ESS Laboratory Sample ID: 1902212-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**7.93** (N/A)		9045		1	CCP	02/11/19 20:25	S.U.	CB91119
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.2 ºC.**								
Eh (ORP)	**WL 319** (N/A)		2580		1	CCP	02/11/19 20:25	mv	CB91120
Hexavalent Chromium	ND (0.6)		7196A		1	JLK	02/11/19 17:31	mg/kg dry	CB91135

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 3-5ft
Date Sampled: 02/11/19 12:15
Percent Solids: 63

ESS Laboratory Work Order: 1902212
ESS Laboratory Sample ID: 1902212-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**6.84** (N/A)		9045		1	CCP	02/11/19 20:25	S.U.	CB91119
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.2 ºC.**								
Eh (ORP)	**WL 287** (N/A)		2580		1	CCP	02/11/19 20:25	mv	CB91120
Hexavalent Chromium	ND (0.7)		7196A		1	JLK	02/11/19 17:31	mg/kg dry	CB91135

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902212

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CB91135 - General Preparation										
Blank										
Hexavalent Chromium	ND	0.7	mg/kg wet							
LCS										
Hexavalent Chromium	31.7	0.7	mg/kg wet	33.32		95	80-120			
LCS Dup										
Hexavalent Chromium	32.3	0.7	mg/kg wet	33.32		97	80-120	2	20	
Reference										
Hexavalent Chromium	74.2	2.0	mg/kg wet	71.00		105	20.3-222.5			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902212

Notes and Definitions

Z-10	Soil pH measured in water at 20.2 ºC.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902212

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902212
Date Received: 2/11/2019
Project Due Date: 2/19/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.6 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

Rec'd 1 4oz jar per sample for CrIV analysis

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	315527	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	315526	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 2/11/19 1443
Reviewed By: Date & Time: 2/11/19 15:09
Delivered By: 2/11/19 15:55

ESS Laboratory
Division of Thielsch Engineering, Inc.
85 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902212

Turn Time: std Rush:
Regulatory State: MA
Reporting Limits: RCS-1
Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation
Electonic Deliverables: ☑ Limit Checker ☑ Excel ☐ Other (Please Specifiy) →

Company Name: Tighe + Bond
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Contact Person: Todd Kirton
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@Tigheband.com cc Kerri Lewis

Analysis: Hex Cr.

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Hex Cr.
1	2/11/19	930	G	S	TP-3A (0-2')	X
2	2/11/19	1215	G	S	TP-5 (3-5')	X

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other — ag
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 1
Number of Containers: 2

Laboratory Use Only
Cooler Present: ✓
Seals Intact: N/A
Cooler Temperature: °C ice temp: 0.6

Sampled by: KL
Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/11/19 1250	2/11/19 12:50	2/11/19 14:26	2/11/19 1436
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902242

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 11:25 am, Feb 20, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

SAMPLE RECEIPT

The following samples were received on February 12, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Low Level VOA vials were frozen by ESS Laboratory on February 12, 2019 at 18:03.

Lab Number	Sample Name	Matrix	Analysis
1902242-01	TP-7 0-2	Soil	2580, 7196A, 9045
1902242-02	TP-9 0-2	Soil	2580, 7196A, 8260B Low, 9045

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

PROJECT NARRATIVE

5035/8260B Volatile Organic Compounds / Low Level

C9B0215-CCV1 **Continuing Calibration %Diff/Drift is below control limit (CD-).**
1,2-Dibromo-3-Chloropropane (33% @ 20%), Bromoform (25% @ 20%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
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ESS Laboratory Work Order: 1902242

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902242-01 through 1902242-02**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	(X) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard

Date: February 20, 2019

Printed Name: Laurel Stoddard

Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-7 0-2
Date Sampled: 02/12/19 08:30
Percent Solids: 81

ESS Laboratory Work Order: 1902242
ESS Laboratory Sample ID: 1902242-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**6.08** (N/A)		9045		1	CCP	02/12/19 20:20	S.U.	CB91220
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.7 ºC.**								
Eh (ORP)	**397** (N/A)		2580		1	CCP	02/12/19 20:20	mv	CB91221
Hexavalent Chromium	ND (0.5)		7196A		1	JLK	02/19/19 16:50	mg/kg dry	CB91946

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 0-2
Date Sampled: 02/12/19 09:45
Percent Solids: 74
Initial Volume: 4.8
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902242
ESS Laboratory Sample ID: 1902242-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1,1-Trichloroethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1,2,2-Tetrachloroethane	ND (0.0028)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1,2-Trichloroethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1-Dichloroethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1-Dichloroethene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,1-Dichloropropene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2,3-Trichlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2,3-Trichloropropane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2,4-Trichlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2,4-Trimethylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2-Dibromo-3-Chloropropane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2-Dibromoethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2-Dichlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2-Dichloroethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,2-Dichloropropane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,3,5-Trimethylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,3-Dichlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,3-Dichloropropane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,4-Dichlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
1,4-Dioxane	ND (0.141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
2,2-Dichloropropane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
2-Butanone	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
2-Chlorotoluene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
2-Hexanone	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
4-Chlorotoluene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
4-Isopropyltoluene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
4-Methyl-2-Pentanone	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Acetone	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Benzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Bromobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Bromochloromethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 0-2
Date Sampled: 02/12/19 09:45
Percent Solids: 74
Initial Volume: 4.8
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902242
ESS Laboratory Sample ID: 1902242-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Bromoform	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Bromomethane	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Carbon Disulfide	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Carbon Tetrachloride	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Chlorobenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Chloroethane	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Chloroform	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Chloromethane	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
cis-1,2-Dichloroethene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
cis-1,3-Dichloropropene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Dibromochloromethane	ND (0.0028)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Dibromomethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Dichlorodifluoromethane	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Diethyl Ether	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Di-isopropyl ether	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Ethyl tertiary-butyl ether	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Ethylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Hexachlorobutadiene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Isopropylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Methyl tert-Butyl Ether	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Methylene Chloride	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Naphthalene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
n-Butylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
n-Propylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
sec-Butylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Styrene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
tert-Butylbenzene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Tertiary-amyl methyl ether	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Tetrachloroethene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Tetrahydrofuran	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Toluene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 0-2
Date Sampled: 02/12/19 09:45
Percent Solids: 74
Initial Volume: 4.8
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902242
ESS Laboratory Sample ID: 1902242-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
trans-1,3-Dichloropropene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Trichloroethene	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Trichlorofluoromethane	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Vinyl Chloride	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Xylene O	ND (0.0070)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Xylene P,M	ND (0.0141)		8260B Low		1	02/14/19 21:08	C9B0215	CB91419
Xylenes (Total)	ND (0.0141)		8260B Low		1	02/14/19 21:08		[CALC]

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1,2-Dichloroethane-d4	*109 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*98 %*		*70-130*
Surrogate: Dibromofluoromethane	*98 %*		*70-130*
Surrogate: Toluene-d8	*99 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 0-2
Date Sampled: 02/12/19 09:45
Percent Solids: 74

ESS Laboratory Work Order: 1902242
ESS Laboratory Sample ID: 1902242-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**7.79** (N/A)		9045		1	CCP	02/12/19 20:20	S.U.	CB91220
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.6 ºC.**								
Eh (ORP)	**321** (N/A)		2580		1	CCP	02/12/19 20:20	mv	CB91221
Hexavalent Chromium	ND (0.6)		7196A		1	JLK	02/19/19 16:50	mg/kg dry	CB91946

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0491*		mg/kg wet	*0.05000*		*98*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0489*		mg/kg wet	*0.05000*		*98*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0474*		mg/kg wet	*0.05000*		*95*	*70-130*			
Surrogate: Toluene-d8	*0.0494*		mg/kg wet	*0.05000*		*99*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	0.0479	0.0050	mg/kg wet	0.05000		96	70-130			
1,1,1-Trichloroethane	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
1,1,2,2-Tetrachloroethane	0.0466	0.0020	mg/kg wet	0.05000		93	70-130			
1,1,2-Trichloroethane	0.0455	0.0050	mg/kg wet	0.05000		91	70-130			
1,1-Dichloroethane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
1,1-Dichloroethene	0.0560	0.0050	mg/kg wet	0.05000		112	70-130			
1,1-Dichloropropene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
1,2,3-Trichlorobenzene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
1,2,3-Trichloropropane	0.0427	0.0050	mg/kg wet	0.05000		85	70-130			
1,2,4-Trichlorobenzene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
1,2,4-Trimethylbenzene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
1,2-Dibromo-3-Chloropropane	0.0349	0.0050	mg/kg wet	0.05000		70	70-130			
1,2-Dibromoethane	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
1,2-Dichlorobenzene	0.0504	0.0050	mg/kg wet	0.05000		101	70-130			
1,2-Dichloroethane	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
1,2-Dichloropropane	0.0483	0.0050	mg/kg wet	0.05000		97	70-130			
1,3,5-Trimethylbenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130			
1,3-Dichlorobenzene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130			
1,3-Dichloropropane	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
1,4-Dichlorobenzene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
1,4-Dioxane	0.865	0.100	mg/kg wet	1.000		87	70-130			
2,2-Dichloropropane	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
2-Butanone	0.240	0.0100	mg/kg wet	0.2500		96	70-130			
2-Chlorotoluene	0.0530	0.0050	mg/kg wet	0.05000		106	70-130			
2-Hexanone	0.236	0.0100	mg/kg wet	0.2500		94	70-130			
4-Chlorotoluene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130			
4-Isopropyltoluene	0.0546	0.0050	mg/kg wet	0.05000		109	70-130			
4-Methyl-2-Pentanone	0.224	0.0100	mg/kg wet	0.2500		89	70-130			
Acetone	0.215	0.0100	mg/kg wet	0.2500		86	70-130			
Benzene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
Bromobenzene	0.0511	0.0050	mg/kg wet	0.05000		102	70-130			
Bromochloromethane	0.0477	0.0050	mg/kg wet	0.05000		95	70-130			
Bromodichloromethane	0.0468	0.0050	mg/kg wet	0.05000		94	70-130			
Bromoform	0.0399	0.0050	mg/kg wet	0.05000		80	70-130			
Bromomethane	0.0611	0.0100	mg/kg wet	0.05000		122	70-130			
Carbon Disulfide	0.0564	0.0050	mg/kg wet	0.05000		113	70-130			
Carbon Tetrachloride	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
Chlorobenzene	0.0517	0.0050	mg/kg wet	0.05000		103	70-130			
Chloroethane	0.0530	0.0100	mg/kg wet	0.05000		106	70-130			
Chloroform	0.0498	0.0050	mg/kg wet	0.05000		100	70-130			
Chloromethane	0.0490	0.0100	mg/kg wet	0.05000		98	70-130			
cis-1,2-Dichloroethene	0.0514	0.0050	mg/kg wet	0.05000		103	70-130			
cis-1,3-Dichloropropene	0.0451	0.0050	mg/kg wet	0.05000		90	70-130			
Dibromochloromethane	0.0426	0.0020	mg/kg wet	0.05000		85	70-130			
Dibromomethane	0.0468	0.0050	mg/kg wet	0.05000		94	70-130			
Dichlorodifluoromethane	0.0590	0.0100	mg/kg wet	0.05000		118	70-130			
Diethyl Ether	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
Di-isopropyl ether	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
Ethyl tertiary-butyl ether	0.0436	0.0050	mg/kg wet	0.05000		87	70-130			
Ethylbenzene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
Hexachlorobutadiene	0.0525	0.0050	mg/kg wet	0.05000		105	70-130			
Isopropylbenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130			
Methyl tert-Butyl Ether	0.0460	0.0050	mg/kg wet	0.05000		92	70-130			
Methylene Chloride	0.0464	0.0100	mg/kg wet	0.05000		93	70-130			
Naphthalene	0.0481	0.0050	mg/kg wet	0.05000		96	70-130			
n-Butylbenzene	0.0562	0.0050	mg/kg wet	0.05000		112	70-130			
n-Propylbenzene	0.0556	0.0050	mg/kg wet	0.05000		111	70-130			
sec-Butylbenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
Styrene	0.0517	0.0050	mg/kg wet	0.05000		103	70-130			
tert-Butylbenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
Tertiary-amyl methyl ether	0.0437	0.0050	mg/kg wet	0.05000		87	70-130			
Tetrachloroethene	0.0551	0.0050	mg/kg wet	0.05000		110	70-130			
Tetrahydrofuran	0.0427	0.0050	mg/kg wet	0.05000		85	70-130			
Toluene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
trans-1,2-Dichloroethene	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
trans-1,3-Dichloropropene	0.0405	0.0050	mg/kg wet	0.05000		81	70-130			
Trichloroethene	0.0511	0.0050	mg/kg wet	0.05000		102	70-130			
Trichlorofluoromethane	0.0561	0.0050	mg/kg wet	0.05000		112	70-130			
Vinyl Chloride	0.0558	0.0100	mg/kg wet	0.05000		112	70-130			
Xylene O	0.0537	0.0050	mg/kg wet	0.05000		107	70-130			
Xylene P,M	0.110	0.0100	mg/kg wet	0.1000		110	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0471*		mg/kg wet	*0.05000*		*94*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0495*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0478*		mg/kg wet	*0.05000*		*96*	*70-130*			
Surrogate: Toluene-d8	*0.0520*		mg/kg wet	*0.05000*		*104*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
1,1,1-Trichloroethane	0.0538	0.0050	mg/kg wet	0.05000		108	70-130	4	20	
1,1,2,2-Tetrachloroethane	0.0508	0.0020	mg/kg wet	0.05000		102	70-130	9	20	
1,1,2-Trichloroethane	0.0494	0.0050	mg/kg wet	0.05000		99	70-130	8	20	
1,1-Dichloroethane	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	5	20	
1,1-Dichloroethene	0.0579	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
1,1-Dichloropropene	0.0561	0.0050	mg/kg wet	0.05000		112	70-130	4	20	
1,2,3-Trichlorobenzene	0.0526	0.0050	mg/kg wet	0.05000		105	70-130	5	20	
1,2,3-Trichloropropane	0.0471	0.0050	mg/kg wet	0.05000		94	70-130	10	20	
1,2,4-Trichlorobenzene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	3	20	
1,2,4-Trimethylbenzene	0.0547	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
1,2-Dibromo-3-Chloropropane	0.0384	0.0050	mg/kg wet	0.05000		77	70-130	10	20	
1,2-Dibromoethane	0.0498	0.0050	mg/kg wet	0.05000		100	70-130	5	20	
1,2-Dichlorobenzene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	5	20	
1,2-Dichloroethane	0.0518	0.0050	mg/kg wet	0.05000		104	70-130	8	20	
1,2-Dichloropropane	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	6	20	
1,3,5-Trimethylbenzene	0.0554	0.0050	mg/kg wet	0.05000		111	70-130	4	20	
1,3-Dichlorobenzene	0.0541	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
1,3-Dichloropropane	0.0518	0.0050	mg/kg wet	0.05000		104	70-130	4	20	
1,4-Dichlorobenzene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	3	20	
1,4-Dioxane	0.929	0.100	mg/kg wet	1.000		93	70-130	7	20	
2,2-Dichloropropane	0.0539	0.0050	mg/kg wet	0.05000		108	70-130	4	20	
2-Butanone	0.264	0.0100	mg/kg wet	0.2500		105	70-130	9	20	
2-Chlorotoluene	0.0550	0.0050	mg/kg wet	0.05000		110	70-130	4	20	
2-Hexanone	0.254	0.0100	mg/kg wet	0.2500		101	70-130	7	20	
4-Chlorotoluene	0.0558	0.0050	mg/kg wet	0.05000		112	70-130	3	20	
4-Isopropyltoluene	0.0564	0.0050	mg/kg wet	0.05000		113	70-130	3	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
4-Methyl-2-Pentanone	0.249	0.0100	mg/kg wet	0.2500		100	70-130	11	20	
Acetone	0.235	0.0100	mg/kg wet	0.2500		94	70-130	9	20	
Benzene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
Bromobenzene	0.0535	0.0050	mg/kg wet	0.05000		107	70-130	5	20	
Bromochloromethane	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	8	20	
Bromodichloromethane	0.0499	0.0050	mg/kg wet	0.05000		100	70-130	6	20	
Bromoform	0.0422	0.0050	mg/kg wet	0.05000		84	70-130	6	20	
Bromomethane	0.0541	0.0100	mg/kg wet	0.05000		108	70-130	12	20	
Carbon Disulfide	0.0582	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
Carbon Tetrachloride	0.0522	0.0050	mg/kg wet	0.05000		104	70-130	4	20	
Chlorobenzene	0.0527	0.0050	mg/kg wet	0.05000		105	70-130	2	20	
Chloroethane	0.0551	0.0100	mg/kg wet	0.05000		110	70-130	4	20	
Chloroform	0.0528	0.0050	mg/kg wet	0.05000		106	70-130	6	20	
Chloromethane	0.0508	0.0100	mg/kg wet	0.05000		102	70-130	4	20	
cis-1,2-Dichloroethene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
cis-1,3-Dichloropropene	0.0486	0.0050	mg/kg wet	0.05000		97	70-130	7	20	
Dibromochloromethane	0.0445	0.0020	mg/kg wet	0.05000		89	70-130	4	20	
Dibromomethane	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	8	20	
Dichlorodifluoromethane	0.0598	0.0100	mg/kg wet	0.05000		120	70-130	1	20	
Diethyl Ether	0.0527	0.0050	mg/kg wet	0.05000		105	70-130	8	20	
Di-isopropyl ether	0.0525	0.0050	mg/kg wet	0.05000		105	70-130	7	20	
Ethyl tertiary-butyl ether	0.0469	0.0050	mg/kg wet	0.05000		94	70-130	7	20	
Ethylbenzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	0.1	20	
Hexachlorobutadiene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
Isopropylbenzene	0.0561	0.0050	mg/kg wet	0.05000		112	70-130	3	20	
Methyl tert-Butyl Ether	0.0506	0.0050	mg/kg wet	0.05000		101	70-130	9	20	
Methylene Chloride	0.0491	0.0100	mg/kg wet	0.05000		98	70-130	6	20	
Naphthalene	0.0512	0.0050	mg/kg wet	0.05000		102	70-130	6	20	
n-Butylbenzene	0.0572	0.0050	mg/kg wet	0.05000		114	70-130	2	20	
n-Propylbenzene	0.0572	0.0050	mg/kg wet	0.05000		114	70-130	3	20	
sec-Butylbenzene	0.0563	0.0050	mg/kg wet	0.05000		113	70-130	3	20	
Styrene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130	1	20	
tert-Butylbenzene	0.0562	0.0050	mg/kg wet	0.05000		112	70-130	3	20	
Tertiary-amyl methyl ether	0.0480	0.0050	mg/kg wet	0.05000		96	70-130	9	20	
Tetrachloroethene	0.0545	0.0050	mg/kg wet	0.05000		109	70-130	1	20	
Tetrahydrofuran	0.0475	0.0050	mg/kg wet	0.05000		95	70-130	11	20	
Toluene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	5	20	
trans-1,2-Dichloroethene	0.0529	0.0050	mg/kg wet	0.05000		106	70-130	4	20	
trans-1,3-Dichloropropene	0.0438	0.0050	mg/kg wet	0.05000		88	70-130	8	20	
Trichloroethene	0.0532	0.0050	mg/kg wet	0.05000		106	70-130	4	20	
Trichlorofluoromethane	0.0578	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
Vinyl Chloride	0.0579	0.0100	mg/kg wet	0.05000		116	70-130	4	20	
Xylene O	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	1	20	
Xylene P,M	0.111	0.0100	mg/kg wet	0.1000		111	70-130	0.4	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0476*		mg/kg wet	*0.05000*		*95*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CB91419 - 5035										
Surrogate: 4-Bromofluorobenzene	*0.0477*		mg/kg wet	*0.05000*		*95*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0490*		mg/kg wet	*0.05000*		*98*	*70-130*			
Surrogate: Toluene-d8	*0.0497*		mg/kg wet	*0.05000*		*99*	*70-130*			
Classical Chemistry										
Batch CB91946 - General Preparation										
Blank										
Hexavalent Chromium	ND	0.7	mg/kg wet							
LCS										
Hexavalent Chromium	32.6	0.7	mg/kg wet	33.32		98	80-120			
LCS Dup										
Hexavalent Chromium	32.8	0.7	mg/kg wet	33.32		98	80-120	0.6	20	
Reference										
Hexavalent Chromium	72.8	2.0	mg/kg wet	71.00		103	20.3-222.5			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902242

Notes and Definitions

Z-10a	Soil pH measured in water at 20.7 ºC.
Z-10	Soil pH measured in water at 20.6 ºC.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902242

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902242
Date Received: 2/12/2019
Project Due Date: 2/20/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 4.1 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: 2/12/19 Time: 1803 By: M
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted: Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	315885	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	315886	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	315882	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
02	315883	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	315884	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	315888	Yes	NA	Yes	VOA Vial - Other	Other	
02	315889	Yes	NA	Yes	VOA Vial - Other	Other	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 2/12/19 1801
Reviewed By: Date & Time: 2/12/19 1803
Delivered By: 2/12/19 1803

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902242

Turn Time: Std Rush:
Regulatory State: MA
Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Reporting Limits: S-1 / S-2 / S-3
Electonic Deliverables: ☑ Limit Checker ☑ Excel ☐ Other (Please Specify) → PDF

Company Name: Tighe + Bond
Contact Person: Todd Kirton c.c. Kerri Lewis
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@TigheBond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Hex Cr	VOCs
1	2/12/19	830	G	S	TP-7 (0-2)	X	
2	↓	945	G	S	TP-9 (0-2)	X	X

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other — ag ag
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* 1/6/10
Number of Containers: 7

Sampled by: Kli
Comments: Please specify "Other" preservative and containers types in this space

Laboratory Use Only
Cooler Present: Y
Seals Intact: N
Cooler Temperature: 4.1 °C

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/12/19 1100	[signature]	[signature]	[signature] 2/12/19 1140
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
	12:15	5:41	

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902265

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:41 pm, Feb 27, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

SAMPLE RECEIPT

The following samples were received on February 13, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: Samples 1902265-01, -03, -04, -06, -09, -11, -12, -14, -15, -16, and -18 for Metals were analyzed for a subset of the required MCP list per the client's request.

Revision 1, February 27, 2019: This report has been revised to include Chlordane on the Pesticide list. This compound was analyzed but not reported.

Lab Number	Sample Name	Matrix	Analysis
1902265-01	TP-3A 0-2	Soil	6010C
1902265-02	TP-3A 2-5.5	Soil	EPH8270, MADEP-EPH
1902265-03	TP-3A 5.5-6.5	Soil	6010C
1902265-04	TP-4 0-2	Soil	6010C
1902265-05	TP-4 4.5-5	Soil	6010C, 7471B
1902265-06	TP-5 0-2	Soil	6010C
1902265-07	TP-5 3-5	Soil	6010C, 7471B, 8081B, 8082A, 9014
1902265-08	TP-5 5-6	Soil	6010C, 7471B
1902265-09	TP-6 0-2	Soil	6010C
1902265-10	TP-6 2-5	Soil	6010C, 7471B, 8082A, EPH8270, MADEP-EPH
1902265-11	TP-7 0-2	Soil	6010C
1902265-12	TP-7 2-5	Soil	6010C, EPH8270, MADEP-EPH
1902265-13	TP-7 5-5.5	Soil	6010C, 7471B
1902265-14	TP-8 0-2	Soil	6010C
1902265-15	TP-8 2-6	Soil	6010C
1902265-16	TP-9 0-2	Soil	6010C
1902265-17	TP-9 2-3	Soil	6010C, 7471B, 8082A, EPH8270, MADEP-EPH
1902265-18	TP-9 3-5	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

PROJECT NARRATIVE

Total Metals
CB91544-BSD1 **Blank Spike recovery is below lower control limit (B-).**
Cadmium (86% @ 87-113%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902265-01 through 1902265-18**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	(X) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(X) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	(X) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: February 21, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-3A 0-2
Date Sampled: 02/11/19 08:15
Percent Solids: 75

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5150** (32.2)		6010C		10	KJK	02/19/19 14:43	2.07	100	CB91544
Chromium	**1820** (1.29)		6010C		1	KJK	02/16/19 1:14	2.07	100	CB91544
Lead	**91.7** (6.43)		6010C		1	KJK	02/16/19 1:14	2.07	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-3A 2-5.5
Date Sampled: 02/11/19 08:30
Percent Solids: 24
Initial Volume: 24.7
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-02
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/14/19 14:00

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (63.2)		MADEP-EPH		1	CAD	02/15/19 3:34	C9B0223	CB91403
C19-C36 Aliphatics1	**150** (63.2)		MADEP-EPH		1	CAD	02/15/19 3:34	C9B0223	CB91403
C11-C22 Unadjusted Aromatics1	**145** (63.2)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
C11-C22 Aromatics1,2	**145** (63.2)		EPH8270			ZLC	02/15/19 23:55		[CALC]
2-Methylnaphthalene	ND (0.84)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Acenaphthene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Naphthalene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Phenanthrene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Acenaphthylene	ND (0.84)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Anthracene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Benzo(a)anthracene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Benzo(a)pyrene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Benzo(b)fluoranthene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Benzo(g,h,i)perylene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Benzo(k)fluoranthene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Chrysene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Dibenzo(a,h)Anthracene	ND (0.84)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Fluoranthene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Fluorene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Indeno(1,2,3-cd)Pyrene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403
Pyrene	ND (1.69)		EPH8270		1	ZLC	02/15/19 23:55	C9B0233	CB91403

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*55 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*88 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*88 %*		*40-140*
Surrogate: O-Terphenyl	*74 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-3A 5.5-6.5
Date Sampled: 02/11/19 08:45
Percent Solids: 70

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**32.8** (2.64)		6010C		1	KJK	02/16/19 1:19	2.72	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-4 0-2
Date Sampled: 02/11/19 09:15
Percent Solids: 69

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2330** (3.05)		6010C		1	KJK	02/16/19 1:24	2.36	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-4 4.5-5
Date Sampled: 02/11/19 09:30
Percent Solids: 80

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.64)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Arsenic	**34.9** (2.82)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Barium	**60.8** (2.82)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Beryllium	**0.64** (0.12)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Cadmium	ND (0.56)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Chromium	**23.0** (1.13)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Lead	**8.93** (5.64)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Mercury	**0.066** (0.024)		7471B		1	MKS	02/20/19 11:10	1.03	40	CB91545
Nickel	**18.7** (2.82)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Selenium	ND (5.64)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Silver	ND (0.56)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Thallium	ND (5.64)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Vanadium	**54.8** (1.13)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544
Zinc	**80.7** (2.82)		6010C		1	KJK	02/16/19 1:42	2.23	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 0-2
Date Sampled: 02/11/19 10:00
Percent Solids: 79

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**508** (2.52)		6010C		1	KJK	02/16/19 2:05	2.5	100	CB91544
Chromium	**106** (1.01)		6010C		1	KJK	02/16/19 2:05	2.5	100	CB91544
Lead	**51.1** (5.05)		6010C		1	KJK	02/16/19 2:05	2.5	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 3-5
Date Sampled: 02/11/19 10:15
Percent Solids: 57

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (6.80)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Arsenic	**4.10** (3.40)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Barium	**38.5** (3.40)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Beryllium	**0.70** (0.15)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Cadmium	ND (0.68)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Chromium	**24.2** (1.36)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Lead	**22.4** (6.80)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Mercury	**0.061** (0.043)		7471B		1	MKS	02/20/19 11:20	0.8	40	CB91545
Nickel	**15.0** (3.40)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Selenium	ND (6.80)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Silver	ND (0.68)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Thallium	ND (6.80)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Vanadium	**54.6** (1.36)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544
Zinc	**56.4** (3.40)		6010C		1	KJK	02/16/19 2:09	2.56	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 3-5
Date Sampled: 02/11/19 10:15
Percent Solids: 57
Initial Volume: 19.5
Final Volume: 5
Extraction Method: 3546

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-07
Sample Matrix: Soil
Units: mg/kg dry
Analyst: DMC
Prepared: 2/19/19 14:18

8081B Organochlorine Pesticides

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
4,4´-DDD	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
4,4´-DDE	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
4,4´-DDT	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Aldrin	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
alpha-BHC	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
alpha-Chlordane	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
beta-BHC	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Chlordane (Total)	ND (0.0357)		8081B		1	02/20/19 18:34	C9B0265	CB91903
delta-BHC	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Dieldrin	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Endosulfan I	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Endosulfan II	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Endosulfan Sulfate	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Endrin	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Endrin Ketone	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
gamma-BHC (Lindane)	ND (0.0027)		8081B		1	02/20/19 18:34	C9B0265	CB91903
gamma-Chlordane	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Heptachlor	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Heptachlor Epoxide	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Hexachlorobenzene	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903
Methoxychlor	ND (0.0045)		8081B		1	02/20/19 18:34	C9B0265	CB91903

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*87 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*82 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*86 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*83 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 3-5
Date Sampled: 02/11/19 10:15
Percent Solids: 57
Initial Volume: 20.1
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-07
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 2/14/19 16:15

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1221	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1232	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1242	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1248	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1254	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1260	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1262	ND (0.04)		8082A		1	02/15/19 23:12		CB91541
Aroclor 1268	ND (0.04)		8082A		1	02/15/19 23:12		CB91541

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*102 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*104 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*115 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*127 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 3-5
Date Sampled: 02/11/19 10:15
Percent Solids: 57

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-07
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Total Cyanide	ND (1.68)		9014		1	EEM	02/19/19 12:00	mg/kg dry	CB91919

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-5 5-6
Date Sampled: 02/11/19 10:30
Percent Solids: 86

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Arsenic	**5.12** (2.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Barium	**53.9** (2.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Beryllium	**0.70** (0.11)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Cadmium	ND (0.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Chromium	**20.8** (1.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Lead	**8.11** (5.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Mercury	ND (0.034)		7471B		1	MKS	02/20/19 11:34	0.68	40	CB91545
Nickel	**20.0** (2.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Selenium	ND (5.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Silver	ND (0.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Thallium	ND (5.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Vanadium	**39.3** (1.00)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544
Zinc	**68.5** (2.50)		6010C		1	KJK	02/16/19 2:41	2.32	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-6 0-2
Date Sampled: 02/11/19 11:00
Percent Solids: 69

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**623** (3.40)		6010C		1	KJK	02/16/19 2:47	2.14	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-6 2-5
Date Sampled: 02/11/19 11:15
Percent Solids: 77

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.41)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Arsenic	**250** (2.71)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Barium	**75.1** (2.71)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Beryllium	**0.34** (0.12)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Cadmium	**2.60** (0.54)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Chromium	**92.9** (1.08)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Lead	**65.9** (5.41)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Mercury	**13.5** (1.37)		7471B		50	MKS	02/20/19 15:24	0.94	40	CB91545
Nickel	**12.6** (2.71)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Selenium	ND (5.41)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Silver	ND (0.54)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Thallium	ND (5.41)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Vanadium	**29.3** (1.08)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544
Zinc	**114** (2.71)		6010C		1	KJK	02/16/19 2:51	2.4	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-6 2-5
Date Sampled: 02/11/19 11:15
Percent Solids: 77
Initial Volume: 20.9
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-10
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 2/14/19 16:15

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1221	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1232	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1242	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1248	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1254	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1260	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1262	ND (0.03)		8082A		1	02/15/19 15:32		CB91406
Aroclor 1268	ND (0.03)		8082A		1	02/15/19 15:32		CB91406

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*75 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*72 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*75 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*97 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-6 2-5
Date Sampled: 02/11/19 11:15
Percent Solids: 77
Initial Volume: 24.7
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-10
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/14/19 14:00

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (19.7)		MADEP-EPH		1	CAD	02/15/19 4:21	C9B0223	CB91403
C19-C36 Aliphatics1	**20.2** (19.7)		MADEP-EPH		1	CAD	02/15/19 4:21	C9B0223	CB91403
C11-C22 Unadjusted Aromatics1	**137** (19.7)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
C11-C22 Aromatics1,2	**83.1** (19.7)		EPH8270			VSC	02/19/19 14:21		[CALC]
2-Methylnaphthalene	**0.29** (0.26)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Acenaphthene	**0.99** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Naphthalene	**0.72** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Phenanthrene	**11.4** (2.63)		EPH8270		5	VSC	02/19/19 14:21	C9B0233	CB91403
Acenaphthylene	ND (0.26)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Anthracene	**1.82** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Benzo(a)anthracene	**3.15** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Benzo(a)pyrene	**2.97** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Benzo(b)fluoranthene	**3.23** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Benzo(g,h,i)perylene	**1.49** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Benzo(k)fluoranthene	**1.18** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Chrysene	**3.20** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Dibenzo(a,h)Anthracene	**0.48** (0.26)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Fluoranthene	**9.32** (2.63)		EPH8270		5	VSC	02/19/19 14:21	C9B0233	CB91403
Fluorene	**0.96** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Indeno(1,2,3-cd)Pyrene	**1.78** (0.53)		EPH8270		1	ZLC	02/16/19 0:38	C9B0233	CB91403
Pyrene	**11.1** (2.63)		EPH8270		5	VSC	02/19/19 14:21	C9B0233	CB91403

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*63 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*90 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*93 %*		*40-140*
Surrogate: O-Terphenyl	*85 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-7 0-2
Date Sampled: 02/12/19 08:00
Percent Solids: 81

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-11
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**10.4** (2.78)		6010C		1	KJK	02/16/19 2:55	2.21	100	CB91544
Chromium	**25.5** (1.11)		6010C		1	KJK	02/16/19 2:55	2.21	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-7 2-5
Date Sampled: 02/12/19 08:30
Percent Solids: 86

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-12
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**3.65** (2.42)		6010C		1	KJK	02/16/19 2:59	2.41	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-7 2-5
Date Sampled: 02/12/19 08:30
Percent Solids: 86
Initial Volume: 24
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-12
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/14/19 14:00

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (18.2)		MADEP-EPH		1	CAD	02/15/19 5:08	C9B0223	CB91403
C19-C36 Aliphatics1	ND (18.2)		MADEP-EPH		1	CAD	02/15/19 5:08	C9B0223	CB91403
C11-C22 Unadjusted Aromatics1	ND (18.2)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
C11-C22 Aromatics1,2	ND (18.2)		EPH8270			ZLC	02/16/19 1:21		[CALC]
2-Methylnaphthalene	ND (0.24)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Acenaphthene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Naphthalene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Phenanthrene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Acenaphthylene	ND (0.24)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Anthracene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Benzo(a)anthracene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Benzo(a)pyrene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Benzo(b)fluoranthene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Benzo(g,h,i)perylene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Benzo(k)fluoranthene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Chrysene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Dibenzo(a,h)Anthracene	ND (0.24)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Fluoranthene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Fluorene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Indeno(1,2,3-cd)Pyrene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403
Pyrene	ND (0.49)		EPH8270		1	ZLC	02/16/19 1:21	C9B0233	CB91403

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*62 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*94 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*94 %*		*40-140*
Surrogate: O-Terphenyl	*84 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-7 5-5.5
Date Sampled: 02/12/19 08:45
Percent Solids: 86

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-13
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (4.42)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Arsenic	**2.66** (2.21)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Barium	**35.6** (2.21)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Beryllium	**0.48** (0.10)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Cadmium	ND (0.44)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Chromium	**17.0** (0.88)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Lead	**6.25** (4.42)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Mercury	ND (0.032)		7471B		1	MKS	02/20/19 11:38	0.72	40	CB91545
Nickel	**13.8** (2.21)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Selenium	ND (4.42)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Silver	ND (0.44)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Thallium	ND (4.42)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Vanadium	**31.6** (0.88)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544
Zinc	**51.0** (2.21)		6010C		1	KJK	02/16/19 3:03	2.62	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-8 0-2
Date Sampled: 02/12/19 10:30
Percent Solids: 85

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-14
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**132** (2.53)		6010C		1	KJK	02/16/19 3:06	2.32	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-8 2-6
Date Sampled: 02/12/19 10:45
Percent Solids: 87

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-15
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**18.4** (2.82)		6010C		1	KJK	02/16/19 3:10	2.03	100	CB91544
Chromium	**44.6** (1.13)		6010C		1	KJK	02/16/19 3:10	2.03	100	CB91544
Lead	**12.8** (5.64)		6010C		1	KJK	02/16/19 3:10	2.03	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 0-2
Date Sampled: 02/12/19 09:15
Percent Solids: 80

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-16
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**62.7** (3.08)		6010C		1	KJK	02/16/19 3:14	2.03	100	CB91544
Chromium	**302** (1.23)		6010C		1	KJK	02/16/19 3:14	2.03	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 2-3
Date Sampled: 02/12/19 09:30
Percent Solids: 80

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-17
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.03)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Arsenic	**6.94** (2.51)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Barium	**54.9** (2.51)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Beryllium	**0.57** (0.11)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Cadmium	ND (0.50)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Chromium	**46.6** (1.01)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Lead	**31.4** (5.03)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Mercury	**0.046** (0.025)		7471B		1	MKS	02/20/19 11:40	1	40	CB91545
Nickel	**16.0** (2.51)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Selenium	ND (5.03)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Silver	ND (0.50)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Thallium	ND (5.03)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Vanadium	**29.8** (1.01)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544
Zinc	**88.4** (2.51)		6010C		1	KJK	02/16/19 3:31	2.48	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 2-3
Date Sampled: 02/12/19 09:30
Percent Solids: 80
Initial Volume: 20
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 2/14/19 16:15

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1221	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1232	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1242	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1248	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1254	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1260	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1262	ND (0.03)		8082A		1	02/15/19 15:51		CB91406
Aroclor 1268	ND (0.03)		8082A		1	02/15/19 15:51		CB91406

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*101 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*109 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*121 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*131 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 2-3
Date Sampled: 02/12/19 09:30
Percent Solids: 80
Initial Volume: 25.1
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-17
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 2/14/19 14:00

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (18.6)		MADEP-EPH		1	CAD	02/15/19 5:55	C9B0223	CB91403
C19-C36 Aliphatics1	ND (18.6)		MADEP-EPH		1	CAD	02/15/19 5:55	C9B0223	CB91403
C11-C22 Unadjusted Aromatics1	ND (18.6)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
C11-C22 Aromatics1,2	ND (18.6)		EPH8270			ZLC	02/16/19 2:05		[CALC]
2-Methylnaphthalene	ND (0.25)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Acenaphthene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Naphthalene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Phenanthrene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Acenaphthylene	ND (0.25)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Anthracene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Benzo(a)anthracene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Benzo(a)pyrene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Benzo(b)fluoranthene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Benzo(g,h,i)perylene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Benzo(k)fluoranthene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Chrysene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Dibenzo(a,h)Anthracene	ND (0.25)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Fluoranthene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Fluorene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Indeno(1,2,3-cd)Pyrene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403
Pyrene	ND (0.50)		EPH8270		1	ZLC	02/16/19 2:05	C9B0233	CB91403

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*63 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*88 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*89 %*		*40-140*
Surrogate: O-Terphenyl	*89 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: TP-9 3-5
Date Sampled: 02/12/19 09:45
Percent Solids: 85

ESS Laboratory Work Order: 1902265
ESS Laboratory Sample ID: 1902265-18
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**31.5** (2.85)		6010C		1	KJK	02/16/19 3:34	2.06	100	CB91544

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CB91544 - 3050B										
Blank										
Antimony	ND	5.00	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	44.0	18.5	mg/kg wet	42.40		104	80-120			
Arsenic	109	9.26	mg/kg wet	128.0		85	85-114			
Barium	594	9.26	mg/kg wet	536.0		111	82-118			
Beryllium	190	0.41	mg/kg wet	217.0		88	84-116			
Cadmium	85.9	1.85	mg/kg wet	99.00		87	87-113			
Chromium	105	3.70	mg/kg wet	116.0		90	82-118			
Lead	258	18.5	mg/kg wet	277.0		93	84-116			
Nickel	103	9.26	mg/kg wet	107.0		96	84-117			
Selenium	211	18.5	mg/kg wet	242.0		87	80-120			
Silver	56.2	1.85	mg/kg wet	64.30		87	86-114			
Thallium	165	18.5	mg/kg wet	183.0		90	80-120			
Vanadium	134	3.70	mg/kg wet	146.0		92	86-114			
Zinc	486	9.26	mg/kg wet	561.0		87	86-114			
LCS Dup										
Antimony	43.6	20.0	mg/kg wet	42.40		103	80-120	1	20	
Arsenic	110	10.0	mg/kg wet	128.0		86	85-114	1	20	
Barium	532	10.0	mg/kg wet	536.0		99	82-118	11	20	
Beryllium	192	0.44	mg/kg wet	217.0		88	84-116	0.9	20	
Cadmium	85.2	2.00	mg/kg wet	99.00		86	87-113	0.9	20	B-
Chromium	107	4.00	mg/kg wet	116.0		93	82-118	2	20	
Lead	261	20.0	mg/kg wet	277.0		94	84-116	1	20	
Nickel	110	10.0	mg/kg wet	107.0		103	84-117	7	20	
Selenium	212	20.0	mg/kg wet	242.0		87	80-120	0.3	20	
Silver	57.7	2.00	mg/kg wet	64.30		90	86-114	3	20	
Thallium	165	20.0	mg/kg wet	183.0		90	80-120	0.08	20	
Vanadium	137	4.00	mg/kg wet	146.0		94	86-114	2	20	
Zinc	495	10.0	mg/kg wet	561.0		88	86-114	2	20	
Batch CB91545 - 7471B										
Blank										

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CB91545 - 7471B										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.53	0.336	mg/kg wet	3.710		95	65-135			
LCS Dup										
Mercury	3.71	0.374	mg/kg wet	3.710		100	65-135	5	20	
Reference										
Mercury	1.02	0.177	mg/kg wet	1000		0.1	0-200			
8081B Organochlorine Pesticides										
Batch CB91903 - 3546										
Blank										
4,4´-DDD	ND	0.0025	mg/kg wet							
4,4´-DDD [2C]	ND	0.0025	mg/kg wet							
4,4´-DDE	ND	0.0025	mg/kg wet							
4,4´-DDE [2C]	ND	0.0025	mg/kg wet							
4,4´-DDT	ND	0.0025	mg/kg wet							
4,4´-DDT [2C]	ND	0.0025	mg/kg wet							
Aldrin	ND	0.0025	mg/kg wet							
Aldrin [2C]	ND	0.0025	mg/kg wet							
alpha-BHC	ND	0.0025	mg/kg wet							
alpha-BHC [2C]	ND	0.0025	mg/kg wet							
alpha-Chlordane	ND	0.0025	mg/kg wet							
alpha-Chlordane [2C]	ND	0.0025	mg/kg wet							
beta-BHC	ND	0.0025	mg/kg wet							
beta-BHC [2C]	ND	0.0025	mg/kg wet							
Chlordane (Total)	ND	0.0200	mg/kg wet							
Chlordane (Total) [2C]	ND	0.0200	mg/kg wet							
delta-BHC	ND	0.0025	mg/kg wet							
delta-BHC [2C]	ND	0.0025	mg/kg wet							
Dieldrin	ND	0.0010	mg/kg wet							
Dieldrin [2C]	ND	0.0010	mg/kg wet							
Endosulfan I	ND	0.0025	mg/kg wet							
Endosulfan I [2C]	ND	0.0025	mg/kg wet							
Endosulfan II	ND	0.0025	mg/kg wet							
Endosulfan II [2C]	ND	0.0025	mg/kg wet							
Endosulfan Sulfate	ND	0.0025	mg/kg wet							
Endosulfan Sulfate [2C]	ND	0.0025	mg/kg wet							
Endrin	ND	0.0025	mg/kg wet							
Endrin [2C]	ND	0.0025	mg/kg wet							
Endrin Ketone	ND	0.0025	mg/kg wet							
Endrin Ketone [2C]	ND	0.0025	mg/kg wet							
gamma-BHC (Lindane)	ND	0.0008	mg/kg wet							
gamma-BHC (Lindane) [2C]	ND	0.0008	mg/kg wet							
gamma-Chlordane	ND	0.0025	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CB91903 - 3546										
gamma-Chlordane [2C]	ND	0.0025	mg/kg wet							
Heptachlor	ND	0.0025	mg/kg wet							
Heptachlor [2C]	ND	0.0025	mg/kg wet							
Heptachlor Epoxide	ND	0.0025	mg/kg wet							
Heptachlor Epoxide [2C]	ND	0.0025	mg/kg wet							
Hexachlorobenzene	ND	0.0025	mg/kg wet							
Hexachlorobenzene [2C]	ND	0.0025	mg/kg wet							
Methoxychlor	ND	0.0025	mg/kg wet							
Methoxychlor [2C]	ND	0.0025	mg/kg wet							
Toxaphene	ND	0.125	mg/kg wet							
Toxaphene [2C]	ND	0.125	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0140*		mg/kg wet	*0.01250*		*112*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0133*		mg/kg wet	*0.01250*		*106*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0143*		mg/kg wet	*0.01250*		*114*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0134*		mg/kg wet	*0.01250*		*107*	*30-150*			
LCS										
4,4´-DDD	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
4,4´-DDD [2C]	0.0116	0.0025	mg/kg wet	0.01250		93	40-140			
4,4´-DDE	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			
4,4´-DDE [2C]	0.0124	0.0025	mg/kg wet	0.01250		99	40-140			
4,4´-DDT	0.0129	0.0025	mg/kg wet	0.01250		103	40-140			
4,4´-DDT [2C]	0.0133	0.0025	mg/kg wet	0.01250		106	40-140			
Aldrin	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Aldrin [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
alpha-BHC	0.0133	0.0025	mg/kg wet	0.01250		107	40-140			
alpha-BHC [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
alpha-Chlordane	0.0118	0.0025	mg/kg wet	0.01250		95	40-140			
alpha-Chlordane [2C]	0.0118	0.0025	mg/kg wet	0.01250		94	40-140			
beta-BHC	0.0114	0.0025	mg/kg wet	0.01250		91	40-140			
beta-BHC [2C]	0.0110	0.0025	mg/kg wet	0.01250		88	40-140			
delta-BHC	0.0115	0.0025	mg/kg wet	0.01250		92	40-140			
delta-BHC [2C]	0.0109	0.0025	mg/kg wet	0.01250		87	40-140			
Dieldrin	0.0136	0.0025	mg/kg wet	0.01250		109	40-140			
Dieldrin [2C]	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Endosulfan I	0.0118	0.0025	mg/kg wet	0.01250		95	40-140			
Endosulfan I [2C]	0.0117	0.0025	mg/kg wet	0.01250		93	40-140			
Endosulfan II	0.0115	0.0025	mg/kg wet	0.01250		92	40-140			
Endosulfan II [2C]	0.0115	0.0025	mg/kg wet	0.01250		92	40-140			
Endosulfan Sulfate	0.0119	0.0025	mg/kg wet	0.01250		95	40-140			
Endosulfan Sulfate [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Endrin	0.0127	0.0025	mg/kg wet	0.01250		101	40-140			
Endrin [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140			
Endrin Ketone	0.0132	0.0025	mg/kg wet	0.01250		105	40-140			
Endrin Ketone [2C]	0.0130	0.0025	mg/kg wet	0.01250		104	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CB91903 - 3546										
gamma-BHC (Lindane)	0.0132	0.0015	mg/kg wet	0.01250		106	40-140			
gamma-BHC (Lindane) [2C]	0.0124	0.0015	mg/kg wet	0.01250		99	40-140			
gamma-Chlordane	0.0124	0.0025	mg/kg wet	0.01250		99	40-140			
gamma-Chlordane [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140			
Heptachlor	0.0128	0.0025	mg/kg wet	0.01250		102	40-140			
Heptachlor [2C]	0.0125	0.0025	mg/kg wet	0.01250		100	40-140			
Heptachlor Epoxide	0.0131	0.0025	mg/kg wet	0.01250		105	40-140			
Heptachlor Epoxide [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140			
Hexachlorobenzene	0.0115	0.0025	mg/kg wet	0.01250		92	40-140			
Hexachlorobenzene [2C]	0.0110	0.0025	mg/kg wet	0.01250		88	40-140			
Methoxychlor	0.0110	0.0025	mg/kg wet	0.01250		88	40-140			
Methoxychlor [2C]	0.0110	0.0025	mg/kg wet	0.01250		88	40-140			
Surrogate: Decachlorobiphenyl	*0.0153*		mg/kg wet	*0.01250*		*123*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0147*		mg/kg wet	*0.01250*		*118*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0148*		mg/kg wet	*0.01250*		*119*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0142*		mg/kg wet	*0.01250*		*113*	*30-150*			
LCS Dup										
4,4´-DDD	0.0124	0.0025	mg/kg wet	0.01250		99	40-140	7	30	
4,4´-DDD [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140	4	30	
4,4´-DDE	0.0131	0.0025	mg/kg wet	0.01250		105	40-140	5	30	
4,4´-DDE [2C]	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	3	30	
4,4´-DDT	0.0142	0.0025	mg/kg wet	0.01250		113	40-140	9	30	
4,4´-DDT [2C]	0.0142	0.0025	mg/kg wet	0.01250		113	40-140	7	30	
Aldrin	0.0132	0.0025	mg/kg wet	0.01250		105	40-140	0.7	30	
Aldrin [2C]	0.0127	0.0025	mg/kg wet	0.01250		101	40-140	0.7	30	
alpha-BHC	0.0133	0.0025	mg/kg wet	0.01250		107	40-140	0.04	30	
alpha-BHC [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140	0.4	30	
alpha-Chlordane	0.0122	0.0025	mg/kg wet	0.01250		97	40-140	3	30	
alpha-Chlordane [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140	3	30	
beta-BHC	0.0117	0.0025	mg/kg wet	0.01250		93	40-140	2	30	
beta-BHC [2C]	0.0113	0.0025	mg/kg wet	0.01250		90	40-140	2	30	
delta-BHC	0.0118	0.0025	mg/kg wet	0.01250		94	40-140	2	30	
delta-BHC [2C]	0.0112	0.0025	mg/kg wet	0.01250		90	40-140	3	30	
Dieldrin	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	3	30	
Dieldrin [2C]	0.0135	0.0025	mg/kg wet	0.01250		108	40-140	3	30	
Endosulfan I	0.0122	0.0025	mg/kg wet	0.01250		97	40-140	3	30	
Endosulfan I [2C]	0.0120	0.0025	mg/kg wet	0.01250		96	40-140	2	30	
Endosulfan II	0.0121	0.0025	mg/kg wet	0.01250		97	40-140	5	30	
Endosulfan II [2C]	0.0121	0.0025	mg/kg wet	0.01250		97	40-140	5	30	
Endosulfan Sulfate	0.0126	0.0025	mg/kg wet	0.01250		101	40-140	6	30	
Endosulfan Sulfate [2C]	0.0127	0.0025	mg/kg wet	0.01250		102	40-140	6	30	
Endrin	0.0132	0.0025	mg/kg wet	0.01250		105	40-140	4	30	
Endrin [2C]	0.0130	0.0025	mg/kg wet	0.01250		104	40-140	3	30	
Endrin Ketone	0.0140	0.0025	mg/kg wet	0.01250		112	40-140	6	30	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8081B Organochlorine Pesticides										
Batch CB91903 - 3546										
Endrin Ketone [2C]	0.0138	0.0025	mg/kg wet	0.01250		110	40-140	6	30	
gamma-BHC (Lindane)	0.0134	0.0015	mg/kg wet	0.01250		107	40-140	1	30	
gamma-BHC (Lindane) [2C]	0.0126	0.0015	mg/kg wet	0.01250		101	40-140	2	30	
gamma-Chlordane	0.0127	0.0025	mg/kg wet	0.01250		102	40-140	3	30	
gamma-Chlordane [2C]	0.0123	0.0025	mg/kg wet	0.01250		99	40-140	3	30	
Heptachlor	0.0129	0.0025	mg/kg wet	0.01250		103	40-140	1	30	
Heptachlor [2C]	0.0126	0.0025	mg/kg wet	0.01250		101	40-140	1	30	
Heptachlor Epoxide	0.0133	0.0025	mg/kg wet	0.01250		107	40-140	2	30	
Heptachlor Epoxide [2C]	0.0130	0.0025	mg/kg wet	0.01250		104	40-140	2	30	
Hexachlorobenzene	0.0114	0.0025	mg/kg wet	0.01250		92	40-140	0.7	30	
Hexachlorobenzene [2C]	0.0110	0.0025	mg/kg wet	0.01250		88	40-140	0.6	30	
Methoxychlor	0.0122	0.0025	mg/kg wet	0.01250		97	40-140	10	30	
Methoxychlor [2C]	0.0122	0.0025	mg/kg wet	0.01250		98	40-140	10	30	
Surrogate: Decachlorobiphenyl	*0.0164*		mg/kg wet	*0.01250*		*131*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0157*		mg/kg wet	*0.01250*		*126*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0141*		mg/kg wet	*0.01250*		*113*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0136*		mg/kg wet	*0.01250*		*108*	*30-150*			
8082A Polychlorinated Biphenyls (PCB)										
Batch CB91406 - 3540C										
Blank										
Aroclor 1016	ND	0.02	mg/kg wet							
Aroclor 1016 [2C]	ND	0.02	mg/kg wet							
Aroclor 1221	ND	0.02	mg/kg wet							
Aroclor 1221 [2C]	ND	0.02	mg/kg wet							
Aroclor 1232	ND	0.02	mg/kg wet							
Aroclor 1232 [2C]	ND	0.02	mg/kg wet							
Aroclor 1242	ND	0.02	mg/kg wet							
Aroclor 1242 [2C]	ND	0.02	mg/kg wet							
Aroclor 1248	ND	0.02	mg/kg wet							
Aroclor 1248 [2C]	ND	0.02	mg/kg wet							
Aroclor 1254	ND	0.02	mg/kg wet							
Aroclor 1254 [2C]	ND	0.02	mg/kg wet							
Aroclor 1260	ND	0.02	mg/kg wet							
Aroclor 1260 [2C]	ND	0.02	mg/kg wet							
Aroclor 1262	ND	0.02	mg/kg wet							
Aroclor 1262 [2C]	ND	0.02	mg/kg wet							
Aroclor 1268	ND	0.02	mg/kg wet							
Aroclor 1268 [2C]	ND	0.02	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0253*		mg/kg wet	*0.02500*		*101*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0263*		mg/kg wet	*0.02500*		*105*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0286*		mg/kg wet	*0.02500*		*114*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0315*		mg/kg wet	*0.02500*		*126*	*30-150*			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CB91406 - 3540C										
LCS										
Aroclor 1016	0.5	0.02	mg/kg wet	0.5000		103	40-140			
Aroclor 1016 [2C]	0.5	0.02	mg/kg wet	0.5000		104	40-140			
Aroclor 1260	0.5	0.02	mg/kg wet	0.5000		91	40-140			
Aroclor 1260 [2C]	0.5	0.02	mg/kg wet	0.5000		93	40-140			
Surrogate: Decachlorobiphenyl	*0.0264*		mg/kg wet	*0.02500*		*106*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0283*		mg/kg wet	*0.02500*		*113*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0306*		mg/kg wet	*0.02500*		*122*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0312*		mg/kg wet	*0.02500*		*125*	*30-150*			
LCS Dup										
Aroclor 1016	0.5	0.02	mg/kg wet	0.5000		104	40-140	1	30	
Aroclor 1016 [2C]	0.5	0.02	mg/kg wet	0.5000		104	40-140	0.2	30	
Aroclor 1260	0.5	0.02	mg/kg wet	0.5000		95	40-140	4	30	
Aroclor 1260 [2C]	0.5	0.02	mg/kg wet	0.5000		96	40-140	3	30	
Surrogate: Decachlorobiphenyl	*0.0273*		mg/kg wet	*0.02500*		*109*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0285*		mg/kg wet	*0.02500*		*114*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0302*		mg/kg wet	*0.02500*		*121*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0306*		mg/kg wet	*0.02500*		*123*	*30-150*			
Batch CB91541 - 3540C										
Blank										
Aroclor 1016	ND	0.02	mg/kg wet							
Aroclor 1016 [2C]	ND	0.02	mg/kg wet							
Aroclor 1221	ND	0.02	mg/kg wet							
Aroclor 1221 [2C]	ND	0.02	mg/kg wet							
Aroclor 1232	ND	0.02	mg/kg wet							
Aroclor 1232 [2C]	ND	0.02	mg/kg wet							
Aroclor 1242	ND	0.02	mg/kg wet							
Aroclor 1242 [2C]	ND	0.02	mg/kg wet							
Aroclor 1248	ND	0.02	mg/kg wet							
Aroclor 1248 [2C]	ND	0.02	mg/kg wet							
Aroclor 1254	ND	0.02	mg/kg wet							
Aroclor 1254 [2C]	ND	0.02	mg/kg wet							
Aroclor 1260	ND	0.02	mg/kg wet							
Aroclor 1260 [2C]	ND	0.02	mg/kg wet							
Aroclor 1262	ND	0.02	mg/kg wet							
Aroclor 1262 [2C]	ND	0.02	mg/kg wet							
Aroclor 1268	ND	0.02	mg/kg wet							
Aroclor 1268 [2C]	ND	0.02	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0276*		mg/kg wet	*0.02500*		*110*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0285*		mg/kg wet	*0.02500*		*114*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0316*		mg/kg wet	*0.02500*		*127*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0327*		mg/kg wet	*0.02500*		*131*	*30-150*			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CB91541 - 3540C										
LCS										
Aroclor 1016	0.5	0.02	mg/kg wet	0.5000		108	40-140			
Aroclor 1016 [2C]	0.5	0.02	mg/kg wet	0.5000		107	40-140			
Aroclor 1260	0.5	0.02	mg/kg wet	0.5000		102	40-140			
Aroclor 1260 [2C]	0.5	0.02	mg/kg wet	0.5000		99	40-140			
Surrogate: Decachlorobiphenyl	*0.0286*		mg/kg wet	*0.02500*		*114*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0295*		mg/kg wet	*0.02500*		*118*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0320*		mg/kg wet	*0.02500*		*128*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0320*		mg/kg wet	*0.02500*		*128*	*30-150*			
LCS Dup										
Aroclor 1016	0.5	0.02	mg/kg wet	0.5000		106	40-140	2	30	
Aroclor 1016 [2C]	0.6	0.02	mg/kg wet	0.5000		116	40-140	8	30	
Aroclor 1260	0.5	0.02	mg/kg wet	0.5000		102	40-140	0.4	30	
Aroclor 1260 [2C]	0.5	0.02	mg/kg wet	0.5000		100	40-140	1	30	
Surrogate: Decachlorobiphenyl	*0.0284*		mg/kg wet	*0.02500*		*113*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0294*		mg/kg wet	*0.02500*		*117*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0306*		mg/kg wet	*0.02500*		*123*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0309*		mg/kg wet	*0.02500*		*124*	*30-150*			
Classical Chemistry										
Batch CB91919 - TCN Prep										
Blank										
Total Cyanide	ND	1.00	mg/kg wet							
LCS										
Total Cyanide	4.97	1.00	mg/kg wet	5.015		99	90-110			
Reference										
Total Cyanide	151	9.87	mg/kg wet	157.0		96	24-110			
Reference										
Total Cyanide	149	9.79	mg/kg wet	157.0		95	24-110			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB91403 - 3546										
Blank										
C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB91403 - 3546										
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.46*		mg/kg wet	*2.000*		*73*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.20	mg/kg wet							
Acenaphthene	ND	0.40	mg/kg wet							
Acenaphthylene	ND	0.20	mg/kg wet							
Anthracene	ND	0.40	mg/kg wet							
Benzo(a)anthracene	ND	0.40	mg/kg wet							
Benzo(a)pyrene	ND	0.40	mg/kg wet							
Benzo(b)fluoranthene	ND	0.20	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.40	mg/kg wet							
Benzo(k)fluoranthene	ND	0.20	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Chrysene	ND	0.40	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.20	mg/kg wet							
Fluoranthene	ND	0.40	mg/kg wet							
Fluorene	ND	0.40	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.40	mg/kg wet							
Naphthalene	ND	0.40	mg/kg wet							
Phenanthrene	ND	0.40	mg/kg wet							
Pyrene	ND	0.40	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*48.6*		mg/L	*50.00*		*97*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*48.5*		mg/L	*50.00*		*97*	*40-140*			
Surrogate: O-Terphenyl	*2.10*		mg/kg wet	*2.000*		*105*	*40-140*			
LCS										
C19-C36 Aliphatics1	16.5	15.0	mg/kg wet	16.00		103	40-140			
C9-C18 Aliphatics1	9.1	15.0	mg/kg wet	12.00		76	40-140			
Decane (C10)	0.8	0.5	mg/kg wet	2.000		40	40-140			
Docosane (C22)	1.5	0.5	mg/kg wet	2.000		73	40-140			
Dodecane (C12)	0.9	0.5	mg/kg wet	2.000		47	40-140			
Eicosane (C20)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Hexacosane (C26)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Hexadecane (C16)	1.4	0.5	mg/kg wet	2.000		68	40-140			
Hexatriacontane (C36)	1.5	0.5	mg/kg wet	2.000		77	40-140			
Nonadecane (C19)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		33	30-140			
Octacosane (C28)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Octadecane (C18)	1.4	0.5	mg/kg wet	2.000		72	40-140			

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Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB91403 - 3546										
Tetracosane (C24)	1.5	0.5	mg/kg wet	2.000		74	40-140			
Tetradecane (C14)	1.1	0.5	mg/kg wet	2.000		56	40-140			
Triacontane (C30)	1.4	0.5	mg/kg wet	2.000		69	40-140			
Surrogate: 1-Chlorooctadecane	*1.45*		mg/kg wet	*2.000*		*73*	*40-140*			
LCS										
2-Methylnaphthalene	1.56	0.20	mg/kg wet	2.000		78	40-140			
Acenaphthene	1.61	0.40	mg/kg wet	2.000		80	40-140			
Acenaphthylene	1.82	0.20	mg/kg wet	2.000		91	40-140			
Anthracene	1.79	0.40	mg/kg wet	2.000		90	40-140			
Benzo(a)anthracene	1.87	0.40	mg/kg wet	2.000		94	40-140			
Benzo(a)pyrene	1.77	0.40	mg/kg wet	2.000		88	40-140			
Benzo(b)fluoranthene	1.85	0.20	mg/kg wet	2.000		92	40-140			
Benzo(g,h,i)perylene	1.55	0.40	mg/kg wet	2.000		77	40-140			
Benzo(k)fluoranthene	1.87	0.20	mg/kg wet	2.000		94	40-140			
C11-C22 Unadjusted Aromatics1	37.6	15.0	mg/kg wet	34.00		111	40-140			
Chrysene	1.87	0.40	mg/kg wet	2.000		93	40-140			
Dibenzo(a,h)Anthracene	1.60	0.20	mg/kg wet	2.000		80	40-140			
Fluoranthene	1.86	0.40	mg/kg wet	2.000		93	40-140			
Fluorene	1.78	0.40	mg/kg wet	2.000		89	40-140			
Indeno(1,2,3-cd)Pyrene	1.69	0.40	mg/kg wet	2.000		85	40-140			
Naphthalene	1.41	0.40	mg/kg wet	2.000		71	40-140			
Phenanthrene	1.82	0.40	mg/kg wet	2.000		91	40-140			
Pyrene	1.86	0.40	mg/kg wet	2.000		93	40-140			
Surrogate: 2-Bromonaphthalene	*48.8*		mg/L	*50.00*		*98*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*48.8*		mg/L	*50.00*		*98*	*40-140*			
Surrogate: O-Terphenyl	*2.10*		mg/kg wet	*2.000*		*105*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	17.6	15.0	mg/kg wet	16.00		110	40-140	6	25	
C9-C18 Aliphatics1	9.4	15.0	mg/kg wet	12.00		78	40-140	3	25	
Decane (C10)	0.8	0.5	mg/kg wet	2.000		40	40-140	0.9	25	
Docosane (C22)	1.6	0.5	mg/kg wet	2.000		79	40-140	7	25	
Dodecane (C12)	0.9	0.5	mg/kg wet	2.000		47	40-140	0.3	25	
Eicosane (C20)	1.5	0.5	mg/kg wet	2.000		77	40-140	7	25	
Hexacosane (C26)	1.5	0.5	mg/kg wet	2.000		77	40-140	8	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		74	40-140	8	25	
Hexatriacontane (C36)	1.7	0.5	mg/kg wet	2.000		84	40-140	8	25	
Nonadecane (C19)	1.5	0.5	mg/kg wet	2.000		77	40-140	8	25	
Nonane (C9)	0.6	0.5	mg/kg wet	2.000		31	30-140	4	25	
Octacosane (C28)	1.5	0.5	mg/kg wet	2.000		75	40-140	7	25	
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		78	40-140	8	25	
Tetracosane (C24)	1.6	0.5	mg/kg wet	2.000		79	40-140	8	25	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB91403 - 3546										
Tetradecane (C14)	1.2	0.5	mg/kg wet	2.000		59	40-140	7	25	
Triacontane (C30)	1.5	0.5	mg/kg wet	2.000		74	40-140	7	25	
Surrogate: 1-Chlorooctadecane	*1.57*		mg/kg wet	*2.000*		*78*	*40-140*			
LCS Dup										
2-Methylnaphthalene	1.56	0.20	mg/kg wet	2.000		78	40-140	0.2	30	
Acenaphthene	1.66	0.40	mg/kg wet	2.000		83	40-140	3	30	
Acenaphthylene	1.85	0.20	mg/kg wet	2.000		93	40-140	2	30	
Anthracene	1.86	0.40	mg/kg wet	2.000		93	40-140	4	30	
Benzo(a)anthracene	1.95	0.40	mg/kg wet	2.000		98	40-140	4	30	
Benzo(a)pyrene	1.84	0.40	mg/kg wet	2.000		92	40-140	4	30	
Benzo(b)fluoranthene	1.93	0.20	mg/kg wet	2.000		96	40-140	4	30	
Benzo(g,h,i)perylene	1.60	0.40	mg/kg wet	2.000		80	40-140	3	30	
Benzo(k)fluoranthene	1.95	0.20	mg/kg wet	2.000		97	40-140	4	30	
C11-C22 Unadjusted Aromatics1	39.6	15.0	mg/kg wet	34.00		116	40-140	5	25	
Chrysene	1.94	0.40	mg/kg wet	2.000		97	40-140	4	30	
Dibenzo(a,h)Anthracene	1.66	0.20	mg/kg wet	2.000		83	40-140	4	30	
Fluoranthene	1.93	0.40	mg/kg wet	2.000		96	40-140	4	30	
Fluorene	1.84	0.40	mg/kg wet	2.000		92	40-140	4	30	
Indeno(1,2,3-cd)Pyrene	1.76	0.40	mg/kg wet	2.000		88	40-140	4	30	
Naphthalene	1.39	0.40	mg/kg wet	2.000		70	40-140	1	30	
Phenanthrene	1.89	0.40	mg/kg wet	2.000		95	40-140	4	30	
Pyrene	1.93	0.40	mg/kg wet	2.000		96	40-140	3	30	
Surrogate: 2-Bromonaphthalene	*49.0*		mg/L	*50.00*		*98*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*49.1*		mg/L	*50.00*		*98*	*40-140*			
Surrogate: O-Terphenyl	*2.15*		mg/kg wet	*2.000*		*108*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902265

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
B-	Blank Spike recovery is below lower control limit (B-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902265

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902265
Date Received: 2/13/2019
Project Due Date: 2/21/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: .3 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	316105	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	316106	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	316107	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	316104	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	316103	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	316102	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	316108	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	316101	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	316100	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	316109	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	316110	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	316099	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	316111	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	316112	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	316113	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	316098	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	316097	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	316096	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	316114	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	316115	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
11	316095	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	316116	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	316117	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
13	316093	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1902265
Date Received: 2/13/2019

14	316092	Yes	NA	Yes	4 oz. Jar - Unpres	NP
15	316091	Yes	NA	Yes	4 oz. Jar - Unpres	NP
15	316118	Yes	NA	Yes	4 oz. Jar - Unpres	NP
15	316119	Yes	NA	Yes	4 oz. Jar - Unpres	NP
16	316090	Yes	NA	Yes	4 oz. Jar - Unpres	NP
16	316120	Yes	NA	Yes	4 oz. Jar - Unpres	NP
17	316089	Yes	NA	Yes	4 oz. Jar - Unpres	NP
17	316121	Yes	NA	Yes	4 oz. Jar - Unpres	NP
17	316122	Yes	NA	Yes	4 oz. Jar - Unpres	NP
18	316088	Yes	NA	Yes	4 oz. Jar - Unpres	NP

2nd Review

All containers scanned into storage/lab Initials: _____

Are barcode labels on correct containers? Yes / No

Are all necessary stickers attached? Yes / No

Completed By: _____ Date & Time: 2/13/19 16:07

Reviewed By: _____ Date & Time: 2/13/19 1625

Delivered By: _____ 2/13/19 1625

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www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: 5 d Rush:
Regulatory State: MA
Is this project for any of the following?: [X] MA-MCP [ ] CT-RCP [ ] RGP [ ] Remediation

ESS Lab # 1902265
Reporting Limits S-1/S-2/S-3
Electonic Deliverables [X] Limit Checker [X] Excel [ ] Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Contact Person: Todd Kirton
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Address: 446 Main Street
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@Tighebond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Total Cr	PCBs	Lead	MCP 14 metals	Pesticides	EPH (Target PAH)	Arsenic		Total Cyanide							
1	2/11/19	815	G	S	TP-3A (0-2)	X		X				X									
2		830			TP-3A (2-5.5)						X										
3		845			TP-3A (5.5-6.5)							X									
4		915			TP-4 (0-2)							X									
5		930			TP-4 (4.5-5)				X												
6		1000			TP-5 (0-2)	X		X				X									
7		1015			TP-5 (3-5)		X		X	X				X							
8		1030			TP-5 (5-6)				X					ML - 2/14/19							
9		1100			TP-6 (0-2)							X									
10		1115			TP-6 (2-5)		X		X		X										

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Container Type:																					
Preservation Code:							ag	ag													
Number of Containers:																					

Laboratory Use Only
Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °C ice temp: 0.3

Sampled by: [illegible]
Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill Park Quote

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/13/19 1400	2/13/19 14:00	2/13/19 15:21	2/13/19 16:06
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

2 of 2

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www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: Std Rush:
Regulatory State: MA
Is this project for any of the following?: ☒ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

ESS Lab # 1902265
Reporting Limits S1/S-2/S-3
Electonic Deliverables ☒ Limit Checker ☒ Excel ☐ Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Contact Person: Todd Kirton
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@Tigheband.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Total Cr	PCBs	Lead	MCP metals 5M	Pesticides	EPH C10-C18	Arsenic
11	2/12/19	700	G	S	TP-7 (0-2)	X						X
12	↓	730	↓	↓	TP-7 (2-5)						X	X
13		745			TP-7 (5-5.5)				X			
14		1030			TP-8 (0-2)							X
15 ~~16~~		1045			TP-8 (2-6)	X		X				X
16 ~~17~~		915			TP-9 (0-2)	X						X
17 ~~18~~		930			TP-9 (2-3)		X		X		X	
18 ~~19~~	↓	945	↓	↓	TP-9 (3-5)							X
Container Type:			AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other			ag	ag					
Preservation Code:			1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*									
					Number of Containers:							

Laboratory Use Only
Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °c Icetemp: 0.3

Sampled by: KLL
Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill Park Quote

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/13/19 1400	2/13/19 14:00	2/13/19 15:21	2/13/19 16:06
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

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CHAIN OF CUSTODY

Turn Time: 5 d Rush:
Regulatory State: MA
Is this project for any of the following?: [X] MA-MCP [ ] CT-RCP [ ] RGP [ ] Remediation

ESS Lab # 1902265
Reporting Limits S-1/S-2/S-3
Electonic Deliverables [X] Limit Checker [X] Excel [ ] Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Contact Person: Todd Kirton
Project #: S-1758-020
Project Name: Gallows Hill Park, Salem
Address: 446 Main Street
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Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@Tighebond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Total Cr	PCBs	Lead	MCP 14 metals	Pesticides	EPH (Target PAH)	Arsenic
1	2/11/19	815	G	S	TP-3A (0-2)	X		X				X
2		830			TP-3A (2-5.5)						X	
3		845			TP-3A (5.5-6.5)							X
4		915			TP-4 (0-2)							X
5		930			TP-4 (4.5-5)				X			
6		1000			TP-5 (0-2)	X		X				X
7		1015			TP-5 (3-5)		X		X	X		
8		1030			TP-5 (5-6)				X			
9		1100			TP-6 (0-2)							X
10		1115			TP-6 (2-5)		X		X		X	

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
Number of Containers: ag ag

Laboratory Use Only
Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °C ice temp: 0.3

Sampled by: [illegible]
Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill Park Quote

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
[signature] 2/13/19 1400	[signature] 2/13/19 14:00	[signature] 2/13/19 15:21	[signature] 2/13/19 16:06
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

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CHAIN OF CUSTODY

Turn Time: Std Rush:
Regulatory State: MA
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12		730			TP-7 (2-5)						X	X
13		745			TP-7 (5-5.5)				X			
14		1030			TP-8 (0-2)							X
16		1045			TP-8 (2-6)	X		X				X
17		915			TP-9 (0-2)	X						X
18		930			TP-9 (2-3)		X		X		X	
19		945			TP-9 (3-5)							X
Container Type:			AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other			ag	ag					
Preservation Code:			1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*										
					Number of Containers:							

Laboratory Use Only
Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °c Icetemp: 0.3

Sampled by: KLL
Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill Park Quote

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/13/19 1400	2/13/19 14:00	2/13/19 15:21	2/13/19 16:06
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902619

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:38 pm, Mar 07, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

SAMPLE RECEIPT

The following samples were received on February 28, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals except 1902619-06 were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1902619-01	B-40 0-2ft	Soil	6010C
1902619-02	B-41 0-2ft	Soil	6010C, 8082A
1902619-03	B-41 2-4ft	Soil	6010C, 9014
1902619-04	B-42 0-2ft	Soil	6010C
1902619-05	B-43 0-2ft	Soil	6010C
1902619-06	B-43 2-4ft	Soil	6010C, 7471B, EPH8270, MADEP-EPH
1902619-07	B-43 4-8ft	Soil	6010C
1902619-08	B-44 0-2ft	Soil	6010C
1902619-09	B-44 2-4ft	Soil	6010C
1902619-10	B-45 0-2ft	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902619

PROJECT NARRATIVE

MADEP-EPH Extractable Petroleum Hydrocarbons
1902619-06 **Elevated Method Reporting Limits due to sample matrix (EL).**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902619-01 through 1902619-10**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	(X) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(X) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes ( ) No (X)*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard Date: March 07, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-40 0-2ft
Date Sampled: 02/26/19 11:45
Percent Solids: 68

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**145** (3.01)		6010C		1	KJK	03/06/19 22:26	2.43	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-41 0-2ft
Date Sampled: 02/26/19 11:50
Percent Solids: 68

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2150** (3.01)		6010C		1	KJK	03/06/19 22:30	2.45	100	CC90538
Chromium	**185** (1.20)		6010C		1	KJK	03/06/19 22:30	2.45	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-41 0-2ft
Date Sampled: 02/26/19 11:50
Percent Solids: 68
Initial Volume: 19.4
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 3/1/19 16:51

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1221	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1232	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1242	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1248	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1254	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1260	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1262	ND (0.08)		8082A		1	03/04/19 20:54		CC90102
Aroclor 1268	ND (0.08)		8082A		1	03/04/19 20:54		CC90102

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*63 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*75 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*77 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*100 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-41 2-4ft
Date Sampled: 02/26/19 12:00
Percent Solids: 59

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**179** (3.85)		6010C		1	KJK	03/06/19 22:36	2.19	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-41 2-4ft
Date Sampled: 02/26/19 12:00
Percent Solids: 59

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-03
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Total Cyanide	ND (1.66)		9014		1	EEM	03/04/19 13:45	mg/kg dry	CC90419

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-42 0-2ft
Date Sampled: 02/26/19 12:10
Percent Solids: 68

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**81.8** (3.65)		6010C		1	KJK	03/06/19 22:40	2.03	100	CC90538
Chromium	**399** (1.46)		6010C		1	KJK	03/06/19 22:40	2.03	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-43 0-2ft
Date Sampled: 02/26/19 12:15
Percent Solids: 79

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**13.5** (2.93)		6010C		1	KJK	03/06/19 22:59	2.17	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-43 2-4ft
Date Sampled: 02/26/19 12:30
Percent Solids: 78

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.52)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Arsenic	**6.72** (2.76)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Barium	**49.3** (2.76)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Beryllium	**0.32** (0.12)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Cadmium	ND (0.55)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Chromium	**266** (1.10)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Lead	**41.3** (5.52)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Mercury	**2.02** (0.383)		7471B		10	MKS	03/05/19 13:32	0.66	40	CC90447
Nickel	**12.8** (2.76)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Selenium	ND (5.52)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Silver	ND (1.10)		6010C		2	KJK	03/07/19 14:27	2.31	100	CC90538
Thallium	ND (5.52)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Vanadium	**36.9** (1.10)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538
Zinc	**48.6** (2.76)		6010C		1	KJK	03/06/19 23:31	2.31	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-43 2-4ft
Date Sampled: 02/26/19 12:30
Percent Solids: 78
Initial Volume: 25.3
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-06
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 3/1/19 9:45

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (94.5)		MADEP-EPH		5	CAD	03/06/19 0:59	C9C0056	CB92803
C19-C36 Aliphatics1	**2050** (94.5)		MADEP-EPH		5	CAD	03/06/19 0:59	C9C0056	CB92803
C11-C22 Unadjusted Aromatics1	**2210** (94.5)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
C11-C22 Aromatics1,2	**2210** (94.5)		EPH8270			ZLC	03/05/19 11:02		[CALC]
2-Methylnaphthalene	ND (1.26)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Acenaphthene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Naphthalene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Phenanthrene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Acenaphthylene	ND (1.26)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Anthracene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Benzo(a)anthracene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Benzo(a)pyrene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Benzo(b)fluoranthene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Benzo(g,h,i)perylene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Benzo(k)fluoranthene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Chrysene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Dibenzo(a,h)Anthracene	ND (1.26)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Fluoranthene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Fluorene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Indeno(1,2,3-cd)Pyrene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803
Pyrene	ND (2.52)		EPH8270		5	ZLC	03/05/19 11:02	C9C0052	CB92803

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*76 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*112 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*116 %*		*40-140*
Surrogate: O-Terphenyl	*93 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-43 4-8ft
Date Sampled: 02/26/19 12:40
Percent Solids: 79

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.92** (5.99)		6010C		2	KJK	03/07/19 14:31	2.11	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-44 0-2ft
Date Sampled: 02/26/19 12:45
Percent Solids: 72

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**189** (6.29)		6010C		2	KJK	03/07/19 14:35	2.21	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-44 2-4ft
Date Sampled: 02/26/19 13:00
Percent Solids: 82

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**77.7** (5.76)		6010C		2	KJK	03/07/19 14:39	2.13	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-45 0-2ft
Date Sampled: 02/26/19 13:15
Percent Solids: 78

ESS Laboratory Work Order: 1902619
ESS Laboratory Sample ID: 1902619-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**27.7** (2.55)		6010C		1	KJK	03/06/19 23:48	2.51	100	CC90538

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CC90447 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.29	0.347	mg/kg wet	3.710		89	80-120			
LCS Dup										
Mercury	3.51	0.347	mg/kg wet	3.710		95	80-120	6	20	
Batch CC90538 - 3050B										
Blank										
Antimony	ND	5.00	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	43.9	18.9	mg/kg wet	42.40		103	80-120			
Arsenic	114	9.43	mg/kg wet	128.0		89	85-114			
Barium	532	9.43	mg/kg wet	536.0		99	82-118			
Beryllium	209	0.42	mg/kg wet	217.0		96	84-116			
Cadmium	93.7	1.89	mg/kg wet	99.00		95	87-113			
Chromium	113	3.77	mg/kg wet	116.0		98	82-118			
Lead	280	18.9	mg/kg wet	277.0		101	84-116			
Nickel	105	9.43	mg/kg wet	107.0		98	84-117			
Selenium	225	18.9	mg/kg wet	242.0		93	80-120			
Silver	60.2	1.89	mg/kg wet	64.30		94	86-114			
Thallium	179	18.9	mg/kg wet	183.0		98	80-120			
Vanadium	147	3.77	mg/kg wet	146.0		101	86-114			
Zinc	532	9.43	mg/kg wet	561.0		95	86-114			
LCS Dup										
Antimony	41.7	17.2	mg/kg wet	42.40		98	80-120	5	20	
Arsenic	113	8.62	mg/kg wet	128.0		88	85-114	0.5	20	
Barium	519	8.62	mg/kg wet	536.0		97	82-118	2	20	
Beryllium	203	0.38	mg/kg wet	217.0		94	84-116	3	20	
Cadmium	89.4	1.72	mg/kg wet	99.00		90	87-113	5	20	
Chromium	110	3.45	mg/kg wet	116.0		95	82-118	3	20	
Lead	271	17.2	mg/kg wet	277.0		98	84-116	3	20	
Nickel	101	8.62	mg/kg wet	107.0		94	84-117	4	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC90538 - 3050B										
Selenium	221	17.2	mg/kg wet	242.0		91	80-120	2	20	
Silver	57.8	1.72	mg/kg wet	64.30		90	86-114	4	20	
Thallium	171	17.2	mg/kg wet	183.0		93	80-120	5	20	
Vanadium	141	3.45	mg/kg wet	146.0		96	86-114	5	20	
Zinc	510	8.62	mg/kg wet	561.0		91	86-114	4	20	
8082A Polychlorinated Biphenyls (PCB)										
Batch CC90102 - 3540C										
Blank										
Aroclor 1016	ND	0.02	mg/kg wet							
Aroclor 1016 [2C]	ND	0.02	mg/kg wet							
Aroclor 1221	ND	0.02	mg/kg wet							
Aroclor 1221 [2C]	ND	0.02	mg/kg wet							
Aroclor 1232	ND	0.02	mg/kg wet							
Aroclor 1232 [2C]	ND	0.02	mg/kg wet							
Aroclor 1242	ND	0.02	mg/kg wet							
Aroclor 1242 [2C]	ND	0.02	mg/kg wet							
Aroclor 1248	ND	0.02	mg/kg wet							
Aroclor 1248 [2C]	ND	0.02	mg/kg wet							
Aroclor 1254	ND	0.02	mg/kg wet							
Aroclor 1254 [2C]	ND	0.02	mg/kg wet							
Aroclor 1260	ND	0.02	mg/kg wet							
Aroclor 1260 [2C]	ND	0.02	mg/kg wet							
Aroclor 1262	ND	0.02	mg/kg wet							
Aroclor 1262 [2C]	ND	0.02	mg/kg wet							
Aroclor 1268	ND	0.02	mg/kg wet							
Aroclor 1268 [2C]	ND	0.02	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0200*		mg/kg wet	*0.02500*		*80*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0213*		mg/kg wet	*0.02500*		*85*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0194*		mg/kg wet	*0.02500*		*78*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0212*		mg/kg wet	*0.02500*		*85*	*30-150*			
LCS										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		109	40-140			
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		101	40-140			
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		98	40-140			
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		96	40-140			
Surrogate: Decachlorobiphenyl	*0.0217*		mg/kg wet	*0.02500*		*87*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0229*		mg/kg wet	*0.02500*		*92*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0227*		mg/kg wet	*0.02500*		*91*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0219*		mg/kg wet	*0.02500*		*88*	*30-150*			
LCS Dup										
Aroclor 1016	0.5	0.05	mg/kg wet	0.5000		109	40-140	0.1	30	
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		104	40-140	2	30	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CC90102 - 3540C										
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		101	40-140	3	30	
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		100	40-140	5	30	
Surrogate: Decachlorobiphenyl	*0.0222*		mg/kg wet	*0.02500*		*89*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0235*		mg/kg wet	*0.02500*		*94*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0234*		mg/kg wet	*0.02500*		*93*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0225*		mg/kg wet	*0.02500*		*90*	*30-150*			
Classical Chemistry										
Batch CC90419 - TCN Prep										
Blank										
Total Cyanide	ND	1.00	mg/kg wet							
LCS										
Total Cyanide	5.00	1.00	mg/kg wet	5.015		100	90-110			
Reference										
Total Cyanide	152	9.82	mg/kg wet	157.0		97	24-110			
Reference										
Total Cyanide	152	9.89	mg/kg wet	157.0		97	24-110			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB92803 - 3546										
Blank										
C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.48*		mg/kg wet	*2.000*		*74*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.20	mg/kg wet							
Acenaphthene	ND	0.40	mg/kg wet							
Acenaphthylene	ND	0.20	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB92803 - 3546										
Anthracene	ND	0.40	mg/kg wet							
Benzo(a)anthracene	ND	0.40	mg/kg wet							
Benzo(a)pyrene	ND	0.40	mg/kg wet							
Benzo(b)fluoranthene	ND	0.40	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.40	mg/kg wet							
Benzo(k)fluoranthene	ND	0.40	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Chrysene	ND	0.40	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.20	mg/kg wet							
Fluoranthene	ND	0.40	mg/kg wet							
Fluorene	ND	0.40	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.40	mg/kg wet							
Naphthalene	ND	0.40	mg/kg wet							
Phenanthrene	ND	0.40	mg/kg wet							
Pyrene	ND	0.40	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*52.6*		mg/L	*50.00*		*105*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*52.4*		mg/L	*50.00*		*105*	*40-140*			
Surrogate: O-Terphenyl	*2.02*		mg/kg wet	*2.000*		*101*	*40-140*			
LCS										
C19-C36 Aliphatics1	15.7	15.0	mg/kg wet	16.00		98	40-140			
C9-C18 Aliphatics1	8.7	15.0	mg/kg wet	12.00		72	40-140			
Decane (C10)	0.9	0.5	mg/kg wet	2.000		47	40-140			
Docosane (C22)	1.4	0.5	mg/kg wet	2.000		71	40-140			
Dodecane (C12)	1.0	0.5	mg/kg wet	2.000		52	40-140			
Eicosane (C20)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Hexacosane (C26)	1.4	0.5	mg/kg wet	2.000		69	40-140			
Hexadecane (C16)	1.3	0.5	mg/kg wet	2.000		67	40-140			
Hexatriacontane (C36)	1.5	0.5	mg/kg wet	2.000		76	40-140			
Nonadecane (C19)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		37	30-140			
Octacosane (C28)	1.4	0.5	mg/kg wet	2.000		68	40-140			
Octadecane (C18)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Tetracosane (C24)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Tetradecane (C14)	1.1	0.5	mg/kg wet	2.000		57	40-140			
Triacontane (C30)	1.4	0.5	mg/kg wet	2.000		68	40-140			
Surrogate: 1-Chlorooctadecane	*1.45*		mg/kg wet	*2.000*		*73*	*40-140*			
LCS										
2-Methylnaphthalene	1.50	0.20	mg/kg wet	2.000		75	40-140			
Acenaphthene	1.54	0.40	mg/kg wet	2.000		77	40-140			
Acenaphthylene	1.74	0.20	mg/kg wet	2.000		87	40-140			
Anthracene	1.77	0.40	mg/kg wet	2.000		88	40-140			
Benzo(a)anthracene	1.88	0.40	mg/kg wet	2.000		94	40-140			
Benzo(a)pyrene	1.84	0.40	mg/kg wet	2.000		92	40-140			
Benzo(b)fluoranthene	1.91	0.40	mg/kg wet	2.000		96	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB92803 - 3546										
Benzo(g,h,i)perylene	1.96	0.40	mg/kg wet	2.000		98	40-140			
Benzo(k)fluoranthene	1.91	0.40	mg/kg wet	2.000		95	40-140			
C11-C22 Unadjusted Aromatics1	36.5	15.0	mg/kg wet	34.00		107	40-140			
Chrysene	1.88	0.40	mg/kg wet	2.000		94	40-140			
Dibenzo(a,h)Anthracene	2.02	0.20	mg/kg wet	2.000		101	40-140			
Fluoranthene	1.82	0.40	mg/kg wet	2.000		91	40-140			
Fluorene	1.74	0.40	mg/kg wet	2.000		87	40-140			
Indeno(1,2,3-cd)Pyrene	2.09	0.40	mg/kg wet	2.000		105	40-140			
Naphthalene	1.34	0.40	mg/kg wet	2.000		67	40-140			
Phenanthrene	1.78	0.40	mg/kg wet	2.000		89	40-140			
Pyrene	1.83	0.40	mg/kg wet	2.000		91	40-140			
Surrogate: 2-Bromonaphthalene	*49.8*		mg/L	*50.00*		*100*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*49.8*		mg/L	*50.00*		*100*	*40-140*			
Surrogate: O-Terphenyl	*1.96*		mg/kg wet	*2.000*		*98*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	18.0	15.0	mg/kg wet	16.00		113	40-140	14	25	
C9-C18 Aliphatics1	9.9	15.0	mg/kg wet	12.00		82	40-140	13	25	
Decane (C10)	1.0	0.5	mg/kg wet	2.000		50	40-140	7	25	
Docosane (C22)	1.6	0.5	mg/kg wet	2.000		81	40-140	13	25	
Dodecane (C12)	1.1	0.5	mg/kg wet	2.000		57	40-140	9	25	
Eicosane (C20)	1.6	0.5	mg/kg wet	2.000		79	40-140	12	25	
Hexacosane (C26)	1.6	0.5	mg/kg wet	2.000		79	40-140	13	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		75	40-140	12	25	
Hexatriacontane (C36)	1.7	0.5	mg/kg wet	2.000		87	40-140	13	25	
Nonadecane (C19)	1.6	0.5	mg/kg wet	2.000		79	40-140	12	25	
Nonane (C9)	0.8	0.5	mg/kg wet	2.000		40	30-140	7	25	
Octacosane (C28)	1.5	0.5	mg/kg wet	2.000		77	40-140	13	25	
Octadecane (C18)	1.6	0.5	mg/kg wet	2.000		78	40-140	12	25	
Tetracosane (C24)	1.6	0.5	mg/kg wet	2.000		82	40-140	13	25	
Tetradecane (C14)	1.3	0.5	mg/kg wet	2.000		64	40-140	11	25	
Triacontane (C30)	1.5	0.5	mg/kg wet	2.000		77	40-140	12	25	
Surrogate: 1-Chlorooctadecane	*1.63*		mg/kg wet	*2.000*		*82*	*40-140*			
LCS Dup										
2-Methylnaphthalene	1.58	0.20	mg/kg wet	2.000		79	40-140	5	30	
Acenaphthene	1.63	0.40	mg/kg wet	2.000		81	40-140	5	30	
Acenaphthylene	1.84	0.20	mg/kg wet	2.000		92	40-140	6	30	
Anthracene	1.86	0.40	mg/kg wet	2.000		93	40-140	5	30	
Benzo(a)anthracene	1.98	0.40	mg/kg wet	2.000		99	40-140	6	30	
Benzo(a)pyrene	1.95	0.40	mg/kg wet	2.000		97	40-140	6	30	
Benzo(b)fluoranthene	2.01	0.40	mg/kg wet	2.000		101	40-140	5	30	
Benzo(g,h,i)perylene	2.07	0.40	mg/kg wet	2.000		103	40-140	6	30	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CB92803 - 3546										
Benzo(k)fluoranthene	2.01	0.40	mg/kg wet	2.000		101	40-140	5	30	
C11-C22 Unadjusted Aromatics1	41.1	15.0	mg/kg wet	34.00		121	40-140	12	25	
Chrysene	1.98	0.40	mg/kg wet	2.000		99	40-140	5	30	
Dibenzo(a,h)Anthracene	2.08	0.20	mg/kg wet	2.000		104	40-140	3	30	
Fluoranthene	1.93	0.40	mg/kg wet	2.000		97	40-140	6	30	
Fluorene	1.84	0.40	mg/kg wet	2.000		92	40-140	5	30	
Indeno(1,2,3-cd)Pyrene	2.20	0.40	mg/kg wet	2.000		110	40-140	5	30	
Naphthalene	1.40	0.40	mg/kg wet	2.000		70	40-140	4	30	
Phenanthrene	1.87	0.40	mg/kg wet	2.000		94	40-140	5	30	
Pyrene	1.93	0.40	mg/kg wet	2.000		97	40-140	5	30	
Surrogate: 2-Bromonaphthalene	*52.9*		mg/L	*50.00*		*106*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*52.6*		mg/L	*50.00*		*105*	*40-140*			
Surrogate: O-Terphenyl	*2.04*		mg/kg wet	*2.000*		*102*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902619

Notes and Definitions

U	Analyte included in the analysis, but not detected
EL	Elevated Method Reporting Limits due to sample matrix (EL).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902619

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902619
Date Received: 2/28/2019
Project Due Date: 3/7/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.1 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	320278	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	320268	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	320277	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	320267	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	320276	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320266	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320275	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	320274	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	320265	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	320273	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	320272	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	320271	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	320270	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	320269	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By:
Reviewed

Date & Time: 2/26/19 2010

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1902619

Date Received: 2/28/2019

By: [illegible]

Date & Time: 2/28/19 2020

Delivered By: [illegible]

2/28/19 2020

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902619

Turn Time: 5 day Rush:

Regulatory State: MA

Reporting Limits: S-1/S-2/S-3

Is this project for any of the following?: ☒ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Electonic Deliverables: ☐ Limit Checker ☒ Excel ☐ Other (Please Specifiy) → PDF

Company Name: Tighe + Bond

Project #: S-1752-020

Project Name: Gallows Hill Park Salem

Contact Person: Todd Kirton

Address: 446 Main St

City: Worcester

State: MA

Zip Code:

PO #:

Telephone Number:

FAX Number:

Email Address: TDKirton@tighebond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Arsenic	Total Cr	MCP 14 Metals	EPH	Cyanide	PCBs
1	2/26/19	1145	G	S	B-40 (0-2)	X					
2		1150			B-41 (0-2)	X	X			X	X
3		1200			B-41 (2-4)	X				X	
4		1210			B-42 (0-2)	X	X				
5		1215			B-43 (0-2)	X					
6		1230			B-43 (2-4)			X	X		
7		1240			B-43 (4-8)	X					
8		1245			B-44 (0-2)	X					
9		1300			B-44 (2-4)	X					
10		1315			B-45 (0-2)	X					
Container Type:			AG-Amber Glass	B-BOD Bottle	G-Glass P-Poly S-Sterile V-Vial O-Other	ag	ag				
Preservation Code:			1-Non Preserved	2-HCl	3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*						
Number of Containers:						4					

Sampled by: JM

Comments: Please specify "Other" preservative and containers types in this space

Laboratory Use Only

Cooler Present: ✓

Seals Intact:

Cooler Temperature: 1.1 °C ICE RC

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	R Carlson 2/28/19 1500	R Carlson 2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902616

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 3:45 pm, Mar 07, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

SAMPLE RECEIPT

The following samples were received on February 28, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals except for 1902616-02 were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1902616-01	B-17 0-2ft	Soil	6010C
1902616-02	B-18 0-2ft	Soil	6010C, 7471B
1902616-03	B-19A 0-2ft	Soil	6010C
1902616-04	B-20 0-2ft	Soil	6010C
1902616-05	B-21 0-2ft	Soil	6010C
1902616-06	B-22 0-2ft	Soil	6010C
1902616-07	B-23 0-2ft	Soil	6010C
1902616-08	B-24 0-2ft	Soil	6010C
1902616-09	B-24 2-4ft	Soil	6010C
1902616-10	B-25 0-2ft	Soil	6010C
1902616-11	B-25 2-4ft	Soil	6010C
1902616-12	B-26 0-2ft	Soil	6010C
1902616-13	B-26 2-4ft	Soil	6010C
1902616-14	B-27 0-2ft	Soil	6010C
1902616-15	B-27 2-4ft	Soil	6010C
1902616-16	B-28 0-2ft	Soil	6010C
1902616-17	B-28A 0-2ft	Soil	6010C
1902616-18	B-28A 2-4ft	Soil	6010C
1902616-19	B-29 0-2ft	Soil	6010C
1902616-20	B-29 2-4ft	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902616-01 through 1902616-20**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes (X) No ( )*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard Date: March 07, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-17 0-2ft
Date Sampled: 02/25/19 08:00
Percent Solids: 77

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**21.0** (2.02)		6010C		1	KJK	03/05/19 22:40	3.23	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-18 0-2ft
Date Sampled: 02/25/19 08:20
Percent Solids: 69

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (5.12)		6010C		1	KJK	03/06/19 18:18	2.82	100	CC90446
Arsenic	**19.5** (2.56)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Barium	**68.5** (2.56)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Beryllium	**0.69** (0.11)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Cadmium	ND (0.51)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Chromium	**34.2** (1.02)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Lead	**28.2** (5.12)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Mercury	**0.039** (0.032)		7471B		1	MKS	03/05/19 11:59	0.89	40	CC90447
Nickel	**24.4** (2.56)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Selenium	ND (5.12)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Silver	ND (0.51)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Thallium	ND (5.12)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Vanadium	**32.7** (1.02)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446
Zinc	**60.3** (2.56)		6010C		1	KJK	03/05/19 22:44	2.82	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-19A 0-2ft
Date Sampled: 02/25/19 08:30
Percent Solids: 96

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2.69** (2.17)		6010C		1	KJK	03/05/19 23:16	2.41	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-20 0-2ft
Date Sampled: 02/25/19 08:45
Percent Solids: 94

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (2.54)		6010C		1	KJK	03/05/19 23:36	2.1	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-21 0-2ft
Date Sampled: 02/25/19 09:00
Percent Solids: 84

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**3.71** (2.77)		6010C		1	KJK	03/06/19 18:49	2.16	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-22 0-2ft
Date Sampled: 02/25/19 09:15
Percent Solids: 82

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.15** (2.99)		6010C		1	KJK	03/05/19 23:44	2.04	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-23 0-2ft
Date Sampled: 02/25/19 09:30
Percent Solids: 85

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**4.16** (2.22)		6010C		1	KJK	03/06/19 0:00	2.67	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-24 0-2ft
Date Sampled: 02/25/19 09:45
Percent Solids: 98

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.12** (2.47)		6010C		1	KJK	03/06/19 0:04	2.07	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-24 2-4ft
Date Sampled: 02/25/19 10:00
Percent Solids: 88

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (2.50)		6010C		1	KJK	03/06/19 0:08	2.26	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-25 0-2ft
Date Sampled: 02/25/19 10:15
Percent Solids: 68

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.32** (3.15)		6010C		1	KJK	03/06/19 0:12	2.35	100	CC90446
Chromium	**26.6** (1.26)		6010C		1	KJK	03/06/19 0:12	2.35	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-25 2-4ft
Date Sampled: 02/25/19 10:15
Percent Solids: 83

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-11
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**4.37** (2.94)		6010C		1	KJK	03/06/19 0:15	2.05	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-26 0-2ft
Date Sampled: 02/25/19 10:30
Percent Solids: 84

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-12
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.99** (2.80)		6010C		1	KJK	03/06/19 0:19	2.11	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-26 2-4ft
Date Sampled: 02/25/19 10:30
Percent Solids: 76

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-13
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.20** (2.94)		6010C		1	KJK	03/06/19 0:23	2.24	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-27 0-2ft
Date Sampled: 02/25/19 10:45
Percent Solids: 79

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-14
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.60** (2.70)		6010C		1	KJK	03/06/19 0:27	2.33	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-27 2-4ft
Date Sampled: 02/25/19 10:50
Percent Solids: 97

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-15
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2.77** (2.53)		6010C		1	KJK	03/06/19 0:31	2.04	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-28 0-2ft
Date Sampled: 02/25/19 11:00
Percent Solids: 84

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-16
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**12.9** (2.35)		6010C		1	KJK	03/06/19 0:47	2.52	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-28A 0-2ft
Date Sampled: 02/25/19 11:15
Percent Solids: 69

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-17
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**17.0** (3.18)		6010C		1	KJK	03/06/19 0:51	2.27	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-28A 2-4ft
Date Sampled: 02/25/19 11:20
Percent Solids: 84

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-18
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.63** (1.93)		6010C		1	KJK	03/06/19 0:55	3.09	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-29 0-2ft
Date Sampled: 02/25/19 11:30
Percent Solids: 76

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-19
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**32.0** (2.63)		6010C		1	KJK	03/06/19 0:59	2.51	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-29 2-4ft
Date Sampled: 02/25/19 11:35
Percent Solids: 83

ESS Laboratory Work Order: 1902616
ESS Laboratory Sample ID: 1902616-20
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.89** (2.42)		6010C		1	KJK	03/06/19 1:03	2.5	100	CC90446

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Total Metals						
Batch CC90446 - 3050B										
Blank										
Antimony	ND	5.00	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	36.9	16.4	mg/kg wet	42.40		87	80-120			
Barium	517	8.20	mg/kg wet	536.0		96	82-118			
Beryllium	195	0.36	mg/kg wet	217.0		90	84-116			
Chromium	106	3.28	mg/kg wet	116.0		92	82-118			
Lead	266	16.4	mg/kg wet	277.0		96	84-116			
Nickel	106	8.20	mg/kg wet	107.0		99	84-117			
Selenium	209	16.4	mg/kg wet	242.0		86	80-120			
Silver	57.0	1.64	mg/kg wet	64.30		89	86-114			
Thallium	167	16.4	mg/kg wet	183.0		91	80-120			
Vanadium	136	3.28	mg/kg wet	146.0		93	86-114			
Zinc	501	8.20	mg/kg wet	561.0		89	86-114			
LCS										
Arsenic	172	8.20	mg/kg wet	202.0		85	76-107			
Cadmium	116	1.64	mg/kg wet	141.0		82	76-108			
LCS Dup										
Antimony	38.9	19.2	mg/kg wet	42.40		92	80-120	5	20	
Barium	579	9.62	mg/kg wet	536.0		108	82-118	11	20	
Beryllium	192	0.42	mg/kg wet	217.0		88	84-116	2	20	
Chromium	106	3.85	mg/kg wet	116.0		91	82-118	0.04	20	
Lead	264	19.2	mg/kg wet	277.0		95	84-116	0.8	20	
Nickel	115	9.62	mg/kg wet	107.0		107	84-117	8	20	
Selenium	208	19.2	mg/kg wet	242.0		86	80-120	0.3	20	
Silver	56.8	1.92	mg/kg wet	64.30		88	86-114	0.3	20	
Thallium	163	19.2	mg/kg wet	183.0		89	80-120	2	20	
Vanadium	136	3.85	mg/kg wet	146.0		93	86-114	0.0007	20	
Zinc	502	9.62	mg/kg wet	561.0		90	86-114	0.3	20	
LCS Dup										
Arsenic	166	9.43	mg/kg wet	202.0		82	76-107	4	20	
Cadmium	117	1.89	mg/kg wet	141.0		83	76-108	0.8	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902616

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Total Metals						
Batch CC90447 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.29	0.347	mg/kg wet	3.710		89	80-120			
LCS Dup										
Mercury	3.51	0.347	mg/kg wet	3.710		95	80-120	6	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902616

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902616

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902616
Date Received: 2/28/2019
Project Due Date: 3/7/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.1 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	320262	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	320261	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	320260	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320259	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320264	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	320258	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	320257	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	320256	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	320255	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	320254	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	320253	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	320263	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
11	320252	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	320251	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
13	320250	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
14	320249	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
15	320248	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
16	320247	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
17	320246	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
18	320245	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
19	320244	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
20	320243	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1902616
Date Received: 2/28/2019

2nd Review

All containers scanned into storage/lab Initials: ll

Are barcode labels on correct containers? Yes / No

Are all necessary stickers attached? Yes / No

Completed By: _____ Date & Time: 2/28/19 2017

Reviewed By: _____ Date & Time: 2/28/19 2026

Delivered By: _____ 2/28/19 2026

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: 5 day Rush:
Regulatory State: MA
Is this project for any of the following?: [X] MA-MCP [ ] CT-RCP [ ] RGP [ ] Remediation

ESS Lab # 1902616
Reporting Limits S-1/S-2/S-3
Electonic Deliverables [X] Limit Checker [X] Excel [ ] Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Project #: S-1758-020
Project Name: Gallows Hill Park ~~Housing~~ Salem
Contact Person: Todd Kirton / Kerri Lewis
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirton@TigheBond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	PCBs	VOCs	Arsenic	MCP 14 Metals	EPH	Cr (total)	Cyanide
1	2/25/19	800	G	S	B-17 (0-2')			X				
2		820			B-18 (0-2')			X	X			
3		830			B-19A (0-2')			X				
4		845			B-20 (0-2')			X				
5		900			B-21 (0-2')			X				
6		915			B-22 (0-2')			X				
7		930			B-23 (0-2')			X				
8		945			B-24 (0-2')			X				
9		1000			B-24 (2-4')			X				
10		1015			B-25 (0-2')			X		X		

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
Number of Containers: ag ag

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 1.1 °C ICE RC

Sampled by: KM
Comments: Please specify "Other" preservative and containers types in this space
Use Gallow Hills Park Quote Pricing

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	R. Carlson 2/28/19 1500	R. Carlson 2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: 5 day Rush:
Regulatory State: MA
Is this project for any of the following?:
☒ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

ESS Lab # 1902616
Reporting Limits S-1 / S-2 / S-3
Electonic Deliverables ☑ Limit Checker ☑ Excel ☐ Other (Please Specifiy) →

Company Name	Project #	Project Name
Tighe + Bond	S-1758-020	Gallows Hill Park Salem

Contact Person	Address
Todd Kirton	446 Main St

City	State	Zip Code	PO #
Worcester	MA	01609	

Telephone Number	FAX Number	Email Address
		TDKirton@TigheBond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	PCBs	VOCs	Arsenic	Metals/Hg	EDH	Cr (total)	Cyanide
11	2/25/19	1015	G	S	B-25 (2-4)			X				
12		1030			B-26 (0-2)			X				
13		1030			B-26 (2-4)			X				
14		1045			B-27 (0-2)			X				
15		1050			B-27 (2-4)			X				
16		1100			B-28 (0-2)			X				
17		1115			B-28A (0-2)			X				
18		1120			B-28A (2-4)			X				
19		1130			B-29 (0-2)			X				
20		1135			B-29 (2-4)			X				

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other

	PCBs	VOCs	Arsenic	Metals/Hg	EDH	Cr (total)	Cyanide
Container Type:	ag	ag					
Preservation Code:							
Number of Containers:							

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 1.1 °C ICE RC

Sampled by : KW

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	2/28/19 1500	2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902539

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 2:24 pm, Mar 05, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

SAMPLE RECEIPT

The following samples were received on February 26, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
1902539-01	B-41 0-2ft	Soil	2580, 7196A, 9045
1902539-02	B-42 0-2ft	Soil	2580, 7196A, 9045
1902539-03	B-35 4-6ft	Soil	2580, 7196A, 9045
1902539-04	B-49 0-1ft	Soil	2580, 7196A, 9045

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902539-01 through 1902539-04**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	(X) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes (X) No ( )*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: March 05, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-41 0-2ft
Date Sampled: 02/26/19 14:11
Percent Solids: 68

ESS Laboratory Work Order: 1902539
ESS Laboratory Sample ID: 1902539-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**11.8** (N/A)		9045		1	CCP	02/26/19 17:46	S.U.	CB92629
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.5 ºC.**								
Eh (ORP)	**WL 28** (N/A)		2580		1	CCP	02/26/19 17:46	mv	CB92628
Hexavalent Chromium	ND (0.6)		7196A		1	JLK	02/27/19 17:37	mg/kg dry	CB92726

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-42 0-2ft
Date Sampled: 02/26/19 14:20
Percent Solids: 72

ESS Laboratory Work Order: 1902539
ESS Laboratory Sample ID: 1902539-02
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**5.33** (N/A)		9045		1	CCP	02/26/19 17:46	S.U.	CB92629
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.4 ºC.**								
Eh (ORP)	**WL 308** (N/A)		2580		1	CCP	02/26/19 17:46	mv	CB92628
Hexavalent Chromium	ND (0.6)		7196A		1	JLK	02/27/19 17:37	mg/kg dry	CB92726

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 4-6ft
Date Sampled: 02/26/19 14:30
Percent Solids: 50

ESS Laboratory Work Order: 1902539
ESS Laboratory Sample ID: 1902539-03
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**12.2** (N/A)		9045		1	CCP	02/26/19 17:46	S.U.	CB92629
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.0 ºC.**								
Eh (ORP)	**WL 23** (N/A)		2580		1	CCP	02/26/19 17:46	mv	CB92628
Hexavalent Chromium	ND (0.8)		7196A		1	JLK	02/27/19 17:37	mg/kg dry	CB92726

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-49 0-1ft
Date Sampled: 02/26/19 14:00
Percent Solids: 66

ESS Laboratory Work Order: 1902539
ESS Laboratory Sample ID: 1902539-04
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Corrosivity (pH)	**8.22** (N/A)		9045		1	CCP	02/26/19 17:46	S.U.	CB92629
Corrosivity (pH) Sample Temp	**Soil pH measured in water at 20.4 ºC.**								
Eh (ORP)	**WL 144** (N/A)		2580		1	CCP	02/26/19 17:46	mv	CB92628
Hexavalent Chromium	**9.3** (0.7)		7196A		1	JLK	02/27/19 17:37	mg/kg dry	CB92726

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CB92726 - General Preparation										
Blank										
Hexavalent Chromium	ND	0.7	mg/kg wet							
LCS										
Hexavalent Chromium	32.8	0.7	mg/kg wet	33.32		98	80-120			
LCS Dup										
Hexavalent Chromium	33.3	0.7	mg/kg wet	33.32		100	80-120	2	20	
Reference										
Hexavalent Chromium	75.2	2.0	mg/kg wet	71.00		106	20.3-222.5			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902539

Notes and Definitions

Z-10b	Soil pH measured in water at 20.5 ºC.
Z-10a	Soil pH measured in water at 20.4 ºC.
Z-10	Soil pH measured in water at 20.0 ºC.
WL	Results obtained from a deionized water leach of the sample.
U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902539

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902539
Date Received: 2/26/2019
Project Due Date: 3/5/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: -0.6 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	319412	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	319467	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	319411	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	319466	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	319410	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	319465	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	319409	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	319464	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials: [illegible]
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: [signature] Date & Time: 2/26/19 1611
Reviewed By: [signature] Date & Time: 2/26/19 16:47
Delivered By: [signature] 2/26/19 16:47

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902539

Turn Time: 5day Rush:

Regulatory State: MA

Reporting Limits: S-1/S-2/S-3

Is this project for any of the following?:
☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Electonic Deliverables: ☑ Limit Checker ☑ Excel ☐ Other (Please Specifiy) → PDF

Company Name: Tighe + Bond
Project #: S-1758-020
Project Name: Gallows Hill Park Salem
Contact Person: Todd Kirtay
Address: 446 Main St
City: Worcester
State: MA
Zip Code: 01608
PO #:
Telephone Number:
FAX Number:
Email Address: TDKirtay@tighebond.com

Analysis: Hg Cr

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Hg	Cr
1	2/26/19	1411	G	S	B-41 (0-2)	X	
2	↓	1420	↓	↓	B-42 (0-2)	X	
3		1430			B-35 (4-6')	X	
4		1400			B-49 (0-1')	X	

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

	ag	
Number of Containers:	4	

Laboratory Use Only

Cooler Present: ✓
Seals Intact: NA
Cooler Temperature: °C ice temp; -0.6

Sampled by: [illegible]

Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill quote pricing

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
[illegible] 2/26/19 1415	[illegible] 2/26/19 15:55	[illegible] 2/26/19 15:53	[illegible] 2/26/19 1601
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902617

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 2:53 pm, Mar 08, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

SAMPLE RECEIPT

The following samples were received on February 28, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Low Level VOA vials were frozen by ESS Laboratory on February 28, 2019 at 20:29.

Question I: All Samples for Metals except 1902617-01 and 1902617-12 were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1902617-01	B-29 4-5.5ft	Soil	6010C, 7471B
1902617-02	B-30 0-2ft	Soil	6010C
1902617-03	B-30 2-4ft	Soil	6010C
1902617-04	B-31 0-2ft	Soil	6010C
1902617-05	B-31 2-4ft	Soil	6010C
1902617-06	B-32 0-2ft	Soil	6010C
1902617-07	B-33 0-2ft	Soil	6010C
1902617-08	B-33 2-4ft	Soil	6010C
1902617-09	B-34 0-2ft	Soil	6010C
1902617-10	B-35 0-2ft	Soil	6010C
1902617-11	B-35 2-4ft	Soil	6010C
1902617-12	B-35 4-5.5ft	Soil	6010C, 6020A, 7471B, EPH8270, MADEP-EPH
1902617-13	B-36 0-2ft	Soil	6010C
1902617-14	B-36 2-4ft	Soil	6010C
1902617-15	B-37 0-2ft	Soil	6010C
1902617-16	B-37 2-4ft	Soil	6010C
1902617-17	B-37 4-8ft	Soil	6010C, 8082A, 8260B Low, EPH8270, MADEP-EPH
1902617-18	B-38 0-2ft	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902617

1902617-19	B-39 0-2ft	Soil	6010C
1902617-20	B-39 2-4ft	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902617

PROJECT NARRATIVE

5035/8260B Volatile Organic Compounds / Low Level

CC90143-BS1 **Blank Spike recovery is above upper control limit (B+).**
1,4-Dioxane (132% @ 70-130%)

CC90143-BSD1 **Blank Spike recovery is above upper control limit (B+).**
1,4-Dioxane (137% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902617-01 through 1902617-20**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	(X) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(X) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	(X) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: March 08, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-29 4-5.5ft
Date Sampled: 02/25/19 11:40
Percent Solids: 81

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	ND (6.54)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Arsenic	**5.02** (3.27)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Barium	**26.4** (3.27)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Beryllium	**0.46** (0.14)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Cadmium	ND (0.65)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Chromium	**12.8** (1.31)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Lead	**12.7** (6.54)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Mercury	ND (0.025)		7471B		1	MKS	03/05/19 12:09	0.96	40	CC90447
Nickel	**9.58** (3.27)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Selenium	ND (6.54)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Silver	ND (0.65)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Thallium	ND (6.54)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Vanadium	**22.1** (1.31)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536
Zinc	**43.2** (3.27)		6010C		3	KJK	03/07/19 14:19	5.66	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-30 0-2ft
Date Sampled: 02/25/19 11:45
Percent Solids: 81

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**15.4** (2.49)		6010C		1	KJK	03/06/19 19:18	2.48	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-30 2-4ft
Date Sampled: 02/25/19 11:50
Percent Solids: 82

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**6.90** (2.71)		6010C		1	KJK	03/06/19 20:53	2.25	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-31 0-2ft
Date Sampled: 02/25/19 12:00
Percent Solids: 69

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**102** (2.87)		6010C		1	KJK	03/06/19 20:57	2.52	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-31 2-4ft
Date Sampled: 02/25/19 12:05
Percent Solids: 82

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**12.2** (2.04)		6010C		1	KJK	03/06/19 21:02	3.01	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-32 0-2ft
Date Sampled: 02/26/19 08:00
Percent Solids: 85

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.33** (2.91)		6010C		1	KJK	03/06/19 21:05	2.03	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-33 0-2ft
Date Sampled: 02/26/19 08:30
Percent Solids: 95

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.02** (2.32)		6010C		1	KJK	03/06/19 21:09	2.26	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-33 2-4ft
Date Sampled: 02/26/19 08:45
Percent Solids: 78

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**603** (2.95)		6010C		1	KJK	03/06/19 19:53	2.17	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-34 0-2ft
Date Sampled: 02/26/19 09:00
Percent Solids: 73

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**11.6** (2.63)		6010C		1	KJK	03/06/19 19:58	2.62	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 0-2ft
Date Sampled: 02/26/19 09:30
Percent Solids: 69

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**1510** (2.91)		6010C		1	KJK	03/06/19 20:02	2.48	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 2-4ft
Date Sampled: 02/26/19 09:40
Percent Solids: 56

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-11
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**12300** (87.7)		6010C		20	KJK	03/06/19 22:05	2.03	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 4-5.5ft
Date Sampled: 02/26/19 09:45
Percent Solids: 55

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-12
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	**7.18** (0.79)		6020A		1	KJK	03/07/19 17:33	2.31	100	CC90536
Arsenic	**10900** (197)		6010C		50	KJK	03/06/19 22:10	2.31	100	CC90536
Barium	**97.4** (3.94)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Beryllium	ND (0.17)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Cadmium	**102** (0.79)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Chromium	**428** (1.57)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Lead	**70.6** (7.87)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Mercury	**1.20** (0.240)		7471B		5	MKS	03/05/19 13:28	0.75	40	CC90447
Nickel	ND (3.94)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Selenium	ND (7.87)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Silver	**1.50** (0.79)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Thallium	ND (7.87)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Vanadium	**5.73** (1.57)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536
Zinc	**69.1** (3.94)		6010C		1	KJK	03/06/19 20:13	2.31	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 4-5.5ft
Date Sampled: 02/26/19 09:45
Percent Solids: 55
Initial Volume: 24.6
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-12
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 3/4/19 16:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (27.7)		MADEP-EPH		1	CAD	03/06/19 10:16	C9C0056	CC90405
C19-C36 Aliphatics1	ND (27.7)		MADEP-EPH		1	CAD	03/06/19 10:16	C9C0056	CC90405
C11-C22 Unadjusted Aromatics1	**80.1** (27.7)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
C11-C22 Aromatics1,2	**56.1** (27.7)		EPH8270			VSC	03/07/19 12:38		[CALC]
2-Methylnaphthalene	ND (0.37)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Acenaphthene	ND (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Naphthalene	**0.85** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Phenanthrene	**4.13** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Acenaphthylene	ND (0.37)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Anthracene	**0.97** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Benzo(a)anthracene	**2.03** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Benzo(a)pyrene	**1.75** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Benzo(b)fluoranthene	**2.32** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Benzo(g,h,i)perylene	**0.94** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Benzo(k)fluoranthene	ND (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Chrysene	**1.82** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Dibenzo(a,h)Anthracene	ND (0.37)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Fluoranthene	**4.27** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Fluorene	ND (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Indeno(1,2,3-cd)Pyrene	**1.13** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405
Pyrene	**3.82** (0.74)		EPH8270		1	VSC	03/07/19 12:38	C9C0070	CC90405

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*45 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*123 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*95 %*		*40-140*
Surrogate: O-Terphenyl	*49 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-36 0-2ft
Date Sampled: 02/26/19 10:00
Percent Solids: 68

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-13
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**345** (3.30)		6010C		1	KJK	03/06/19 20:18	2.21	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-36 2-4ft
Date Sampled: 02/26/19 10:10
Percent Solids: 72

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-14
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**419** (2.68)		6010C		1	KJK	03/06/19 20:22	2.58	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 0-2ft
Date Sampled: 02/26/19 10:30
Percent Solids: 60

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-15
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**1260** (3.37)		6010C		1	KJK	03/06/19 21:33	2.47	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 2-4ft
Date Sampled: 02/26/19 10:35
Percent Solids: 44

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-16
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**1700** (5.02)		6010C		1	KJK	03/06/19 21:39	2.25	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**99.5** (3.46)		6010C		1	KJK	03/06/19 21:44	2.13	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68
Initial Volume: 5.3
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1,1-Trichloroethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1,2,2-Tetrachloroethane	ND (0.0028)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1,2-Trichloroethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1-Dichloroethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1-Dichloroethene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,1-Dichloropropene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2,3-Trichlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2,3-Trichloropropane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2,4-Trichlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2,4-Trimethylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2-Dibromo-3-Chloropropane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2-Dibromoethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2-Dichlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2-Dichloroethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,2-Dichloropropane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,3,5-Trimethylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,3-Dichlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,3-Dichloropropane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,4-Dichlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
1,4-Dioxane	ND (0.139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
2,2-Dichloropropane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
2-Butanone	**0.0556** (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
2-Chlorotoluene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
2-Hexanone	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
4-Chlorotoluene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
4-Isopropyltoluene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
4-Methyl-2-Pentanone	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Acetone	**0.442** (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Benzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Bromobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Bromochloromethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68
Initial Volume: 5.3
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Bromoform	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Bromomethane	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Carbon Disulfide	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Carbon Tetrachloride	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Chlorobenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Chloroethane	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Chloroform	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Chloromethane	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
cis-1,2-Dichloroethene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
cis-1,3-Dichloropropene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Dibromochloromethane	ND (0.0028)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Dibromomethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Dichlorodifluoromethane	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Diethyl Ether	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Di-isopropyl ether	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Ethyl tertiary-butyl ether	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Ethylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Hexachlorobutadiene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Isopropylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Methyl tert-Butyl Ether	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Methylene Chloride	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Naphthalene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
n-Butylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
n-Propylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
sec-Butylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Styrene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
tert-Butylbenzene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Tertiary-amyl methyl ether	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Tetrachloroethene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Tetrahydrofuran	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Toluene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68
Initial Volume: 5.3
Final Volume: 10
Extraction Method: 5035

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK

5035/8260B Volatile Organic Compounds / Low Level

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
trans-1,2-Dichloroethene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
trans-1,3-Dichloropropene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Trichloroethene	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Trichlorofluoromethane	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Vinyl Chloride	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Xylene O	ND (0.0070)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Xylene P,M	ND (0.0139)		8260B Low		1	03/01/19 15:39	C9C0010	CC90143
Xylenes (Total)	ND (0.0139)		8260B Low		1	03/01/19 15:39		[CALC]

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1,2-Dichloroethane-d4	*111 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*97 %*		*70-130*
Surrogate: Dibromofluoromethane	*106 %*		*70-130*
Surrogate: Toluene-d8	*94 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68
Initial Volume: 19.3
Final Volume: 10
Extraction Method: 3540C

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MJV
Prepared: 3/1/19 16:51

8082A Polychlorinated Biphenyls (PCB)

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Aroclor 1016	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1221	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1232	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1242	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1248	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1254	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1260	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1262	ND (0.08)		8082A		1	03/05/19 11:32		CC90508
Aroclor 1268	ND (0.08)		8082A		1	03/05/19 11:32		CC90508

	%Recovery	*Qualifier*	*Limits*
Surrogate: Decachlorobiphenyl	*62 %*		*30-150*
Surrogate: Decachlorobiphenyl [2C]	*69 %*		*30-150*
Surrogate: Tetrachloro-m-xylene	*73 %*		*30-150*
Surrogate: Tetrachloro-m-xylene [2C]	*83 %*		*30-150*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-37 4-8ft
Date Sampled: 02/26/19 10:40
Percent Solids: 68
Initial Volume: 24.5
Final Volume: 1
Extraction Method: 3546

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-17
Sample Matrix: Soil
Units: mg/kg dry

Prepared: 3/4/19 16:05

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (22.6)		MADEP-EPH		1	CAD	03/06/19 11:03	C9C0056	CC90405
C19-C36 Aliphatics1	ND (22.6)		MADEP-EPH		1	CAD	03/06/19 11:03	C9C0056	CC90405
C11-C22 Unadjusted Aromatics1	ND (22.6)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
C11-C22 Aromatics1,2	ND (22.6)		EPH8270			VSC	03/06/19 16:32		[CALC]
2-Methylnaphthalene	ND (0.30)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Acenaphthene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Naphthalene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Phenanthrene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Acenaphthylene	ND (0.30)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Anthracene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Benzo(a)anthracene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Benzo(a)pyrene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Benzo(b)fluoranthene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Benzo(g,h,i)perylene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Benzo(k)fluoranthene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Chrysene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Dibenzo(a,h)Anthracene	ND (0.30)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Fluoranthene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Fluorene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Indeno(1,2,3-cd)Pyrene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405
Pyrene	ND (0.60)		EPH8270		1	VSC	03/06/19 16:32	C9C0070	CC90405

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*54 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*127 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*103 %*		*40-140*
Surrogate: O-Terphenyl	*59 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-38 0-2ft
Date Sampled: 02/26/19 11:00
Percent Solids: 46

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-18
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**41.1** (5.39)		6010C		1	KJK	03/06/19 21:48	2.01	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-39 0-2ft
Date Sampled: 02/26/19 11:30
Percent Solids: 68

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-19
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**2140** (3.33)		6010C		1	KJK	03/06/19 21:52	2.21	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-39 2-4ft
Date Sampled: 02/26/19 11:35
Percent Solids: 63

ESS Laboratory Work Order: 1902617
ESS Laboratory Sample ID: 1902617-20
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**62.9** (7.03)		6010C		2	KJK	03/07/19 14:23	2.26	100	CC90536

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Total Metals

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch CC90447 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.29	0.347	mg/kg wet	3.710		89	80-120			
LCS Dup										
Mercury	3.51	0.347	mg/kg wet	3.710		95	80-120	6	20	
Batch CC90536 - 3050B										
Blank										
Antimony	ND	5.00	mg/kg wet							
Antimony	ND	0.50	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	41.9	8.33	mg/kg wet	42.40		99	80-120			
Antimony	35.2	16.7	mg/kg wet	42.40		83	80-120			
Arsenic	110	8.33	mg/kg wet	128.0		86	85-114			
Barium	476	8.33	mg/kg wet	536.0		89	82-118			
Beryllium	191	0.37	mg/kg wet	217.0		88	84-116			
Chromium	104	3.33	mg/kg wet	116.0		90	82-118			
Lead	257	16.7	mg/kg wet	277.0		93	84-116			
Nickel	104	8.33	mg/kg wet	107.0		97	84-117			
Selenium	209	16.7	mg/kg wet	242.0		86	80-120			
Silver	55.9	1.67	mg/kg wet	64.30		87	86-114			
Thallium	160	16.7	mg/kg wet	183.0		88	80-120			
Vanadium	133	3.33	mg/kg wet	146.0		91	86-114			
Zinc	491	8.33	mg/kg wet	561.0		88	86-114			
LCS										
Cadmium	121	1.82	mg/kg wet	141.0		86	76-108			
LCS Dup										
Antimony	50.4	9.26	mg/kg wet	42.40		119	80-120	18	30	
Antimony	37.2	18.5	mg/kg wet	42.40		88	80-120	5	20	
Arsenic	110	9.26	mg/kg wet	128.0		86	85-114	0.5	20	
Barium	471	9.26	mg/kg wet	536.0		88	82-118	1	20	
Beryllium	189	0.41	mg/kg wet	217.0		87	84-116	0.8	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC90536 - 3050B										
Chromium	104	3.70	mg/kg wet	116.0		89	82-118	0.8	20	
Lead	262	18.5	mg/kg wet	277.0		95	84-116	2	20	
Nickel	104	9.26	mg/kg wet	107.0		97	84-117	0.3	20	
Selenium	208	18.5	mg/kg wet	242.0		86	80-120	0.6	20	
Silver	55.7	1.85	mg/kg wet	64.30		87	86-114	0.4	20	
Thallium	167	18.5	mg/kg wet	183.0		91	80-120	4	20	
Vanadium	132	3.70	mg/kg wet	146.0		91	86-114	0.6	20	
Zinc	486	9.26	mg/kg wet	561.0		87	86-114	1	20	
LCS Dup										
Cadmium	114	1.82	mg/kg wet	141.0		81	76-108	6	20	
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.0050	mg/kg wet							
1,1,1-Trichloroethane	ND	0.0050	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.0020	mg/kg wet							
1,1,2-Trichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethane	ND	0.0050	mg/kg wet							
1,1-Dichloroethene	ND	0.0050	mg/kg wet							
1,1-Dichloropropene	ND	0.0050	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,3-Trichloropropane	ND	0.0050	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.0050	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	0.0050	mg/kg wet							
1,2-Dibromoethane	ND	0.0050	mg/kg wet							
1,2-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,2-Dichloroethane	ND	0.0050	mg/kg wet							
1,2-Dichloropropane	ND	0.0050	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.0050	mg/kg wet							
1,3-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,3-Dichloropropane	ND	0.0050	mg/kg wet							
1,4-Dichlorobenzene	ND	0.0050	mg/kg wet							
1,4-Dioxane	ND	0.100	mg/kg wet							
2,2-Dichloropropane	ND	0.0050	mg/kg wet							
2-Butanone	ND	0.0100	mg/kg wet							
2-Chlorotoluene	ND	0.0050	mg/kg wet							
2-Hexanone	ND	0.0100	mg/kg wet							
4-Chlorotoluene	ND	0.0050	mg/kg wet							
4-Isopropyltoluene	ND	0.0050	mg/kg wet							
4-Methyl-2-Pentanone	ND	0.0100	mg/kg wet							
Acetone	ND	0.0100	mg/kg wet							
Benzene	ND	0.0050	mg/kg wet							
Bromobenzene	ND	0.0050	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
Bromochloromethane	ND	0.0050	mg/kg wet							
Bromodichloromethane	ND	0.0050	mg/kg wet							
Bromoform	ND	0.0050	mg/kg wet							
Bromomethane	ND	0.0100	mg/kg wet							
Carbon Disulfide	ND	0.0050	mg/kg wet							
Carbon Tetrachloride	ND	0.0050	mg/kg wet							
Chlorobenzene	ND	0.0050	mg/kg wet							
Chloroethane	ND	0.0100	mg/kg wet							
Chloroform	ND	0.0050	mg/kg wet							
Chloromethane	ND	0.0100	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Dibromochloromethane	ND	0.0020	mg/kg wet							
Dibromomethane	ND	0.0050	mg/kg wet							
Dichlorodifluoromethane	ND	0.0100	mg/kg wet							
Diethyl Ether	ND	0.0050	mg/kg wet							
Di-isopropyl ether	ND	0.0050	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.0050	mg/kg wet							
Ethylbenzene	ND	0.0050	mg/kg wet							
Hexachlorobutadiene	ND	0.0050	mg/kg wet							
Isopropylbenzene	ND	0.0050	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.0050	mg/kg wet							
Methylene Chloride	ND	0.0100	mg/kg wet							
Naphthalene	ND	0.0050	mg/kg wet							
n-Butylbenzene	ND	0.0050	mg/kg wet							
n-Propylbenzene	ND	0.0050	mg/kg wet							
sec-Butylbenzene	ND	0.0050	mg/kg wet							
Styrene	ND	0.0050	mg/kg wet							
tert-Butylbenzene	ND	0.0050	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.0050	mg/kg wet							
Tetrachloroethene	ND	0.0050	mg/kg wet							
Tetrahydrofuran	ND	0.0050	mg/kg wet							
Toluene	ND	0.0050	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.0050	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.0050	mg/kg wet							
Trichloroethene	ND	0.0050	mg/kg wet							
Trichlorofluoromethane	ND	0.0050	mg/kg wet							
Vinyl Chloride	ND	0.0100	mg/kg wet							
Xylene O	ND	0.0050	mg/kg wet							
Xylene P,M	ND	0.0100	mg/kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0506*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0496*		mg/kg wet	*0.05000*		*99*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0506*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: Toluene-d8	*0.0465*		mg/kg wet	*0.05000*		*93*	*70-130*			
LCS										

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
1,1,1,2-Tetrachloroethane	0.0528	0.0050	mg/kg wet	0.05000		106	70-130			
1,1,1-Trichloroethane	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
1,1,2,2-Tetrachloroethane	0.0468	0.0020	mg/kg wet	0.05000		94	70-130			
1,1,2-Trichloroethane	0.0533	0.0050	mg/kg wet	0.05000		107	70-130			
1,1-Dichloroethane	0.0509	0.0050	mg/kg wet	0.05000		102	70-130			
1,1-Dichloroethene	0.0566	0.0050	mg/kg wet	0.05000		113	70-130			
1,1-Dichloropropene	0.0547	0.0050	mg/kg wet	0.05000		109	70-130			
1,2,3-Trichlorobenzene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130			
1,2,3-Trichloropropane	0.0489	0.0050	mg/kg wet	0.05000		98	70-130			
1,2,4-Trichlorobenzene	0.0494	0.0050	mg/kg wet	0.05000		99	70-130			
1,2,4-Trimethylbenzene	0.0467	0.0050	mg/kg wet	0.05000		93	70-130			
1,2-Dibromo-3-Chloropropane	0.0544	0.0050	mg/kg wet	0.05000		109	70-130			
1,2-Dibromoethane	0.0521	0.0050	mg/kg wet	0.05000		104	70-130			
1,2-Dichlorobenzene	0.0461	0.0050	mg/kg wet	0.05000		92	70-130			
1,2-Dichloroethane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130			
1,2-Dichloropropane	0.0513	0.0050	mg/kg wet	0.05000		103	70-130			
1,3,5-Trimethylbenzene	0.0476	0.0050	mg/kg wet	0.05000		95	70-130			
1,3-Dichlorobenzene	0.0453	0.0050	mg/kg wet	0.05000		91	70-130			
1,3-Dichloropropane	0.0512	0.0050	mg/kg wet	0.05000		102	70-130			
1,4-Dichlorobenzene	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			
1,4-Dioxane	1.32	0.100	mg/kg wet	1.000		132	70-130			B+
2,2-Dichloropropane	0.0585	0.0050	mg/kg wet	0.05000		117	70-130			
2-Butanone	0.265	0.0100	mg/kg wet	0.2500		106	70-130			
2-Chlorotoluene	0.0460	0.0050	mg/kg wet	0.05000		92	70-130			
2-Hexanone	0.267	0.0100	mg/kg wet	0.2500		107	70-130			
4-Chlorotoluene	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			
4-Isopropyltoluene	0.0473	0.0050	mg/kg wet	0.05000		95	70-130			
4-Methyl-2-Pentanone	0.294	0.0100	mg/kg wet	0.2500		118	70-130			
Acetone	0.269	0.0100	mg/kg wet	0.2500		108	70-130			
Benzene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130			
Bromobenzene	0.0471	0.0050	mg/kg wet	0.05000		94	70-130			
Bromochloromethane	0.0554	0.0050	mg/kg wet	0.05000		111	70-130			
Bromodichloromethane	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			
Bromoform	0.0518	0.0050	mg/kg wet	0.05000		104	70-130			
Bromomethane	0.0582	0.0100	mg/kg wet	0.05000		116	70-130			
Carbon Disulfide	0.0609	0.0050	mg/kg wet	0.05000		122	70-130			
Carbon Tetrachloride	0.0594	0.0050	mg/kg wet	0.05000		119	70-130			
Chlorobenzene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130			
Chloroethane	0.0507	0.0100	mg/kg wet	0.05000		101	70-130			
Chloroform	0.0538	0.0050	mg/kg wet	0.05000		108	70-130			
Chloromethane	0.0479	0.0100	mg/kg wet	0.05000		96	70-130			
cis-1,2-Dichloroethene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130			
cis-1,3-Dichloropropene	0.0557	0.0050	mg/kg wet	0.05000		111	70-130			
Dibromochloromethane	0.0472	0.0020	mg/kg wet	0.05000		94	70-130			
Dibromomethane	0.0565	0.0050	mg/kg wet	0.05000		113	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
Dichlorodifluoromethane	0.0469	0.0100	mg/kg wet	0.05000		94	70-130			
Diethyl Ether	0.0570	0.0050	mg/kg wet	0.05000		114	70-130			
Di-isopropyl ether	0.0527	0.0050	mg/kg wet	0.05000		105	70-130			
Ethyl tertiary-butyl ether	0.0516	0.0050	mg/kg wet	0.05000		103	70-130			
Ethylbenzene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130			
Hexachlorobutadiene	0.0477	0.0050	mg/kg wet	0.05000		95	70-130			
Isopropylbenzene	0.0474	0.0050	mg/kg wet	0.05000		95	70-130			
Methyl tert-Butyl Ether	0.0582	0.0050	mg/kg wet	0.05000		116	70-130			
Methylene Chloride	0.0527	0.0100	mg/kg wet	0.05000		105	70-130			
Naphthalene	0.0513	0.0050	mg/kg wet	0.05000		103	70-130			
n-Butylbenzene	0.0488	0.0050	mg/kg wet	0.05000		98	70-130			
n-Propylbenzene	0.0472	0.0050	mg/kg wet	0.05000		94	70-130			
sec-Butylbenzene	0.0463	0.0050	mg/kg wet	0.05000		93	70-130			
Styrene	0.0500	0.0050	mg/kg wet	0.05000		100	70-130			
tert-Butylbenzene	0.0478	0.0050	mg/kg wet	0.05000		96	70-130			
Tertiary-amyl methyl ether	0.0558	0.0050	mg/kg wet	0.05000		112	70-130			
Tetrachloroethene	0.0441	0.0050	mg/kg wet	0.05000		88	70-130			
Tetrahydrofuran	0.0620	0.0050	mg/kg wet	0.05000		124	70-130			
Toluene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130			
trans-1,2-Dichloroethene	0.0523	0.0050	mg/kg wet	0.05000		105	70-130			
trans-1,3-Dichloropropene	0.0465	0.0050	mg/kg wet	0.05000		93	70-130			
Trichloroethene	0.0521	0.0050	mg/kg wet	0.05000		104	70-130			
Trichlorofluoromethane	0.0556	0.0050	mg/kg wet	0.05000		111	70-130			
Vinyl Chloride	0.0519	0.0100	mg/kg wet	0.05000		104	70-130			
Xylene O	0.0479	0.0050	mg/kg wet	0.05000		96	70-130			
Xylene P,M	0.0959	0.0100	mg/kg wet	0.1000		96	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0499*		mg/kg wet	*0.05000*		*100*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0513*		mg/kg wet	*0.05000*		*103*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0518*		mg/kg wet	*0.05000*		*104*	*70-130*			
Surrogate: Toluene-d8	*0.0472*		mg/kg wet	*0.05000*		*94*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	0.0562	0.0050	mg/kg wet	0.05000		112	70-130	6	20	
1,1,1-Trichloroethane	0.0582	0.0050	mg/kg wet	0.05000		116	70-130	3	20	
1,1,2,2-Tetrachloroethane	0.0476	0.0020	mg/kg wet	0.05000		95	70-130	2	20	
1,1,2-Trichloroethane	0.0557	0.0050	mg/kg wet	0.05000		111	70-130	4	20	
1,1-Dichloroethane	0.0531	0.0050	mg/kg wet	0.05000		106	70-130	4	20	
1,1-Dichloroethene	0.0583	0.0050	mg/kg wet	0.05000		117	70-130	3	20	
1,1-Dichloropropene	0.0566	0.0050	mg/kg wet	0.05000		113	70-130	3	20	
1,2,3-Trichlorobenzene	0.0510	0.0050	mg/kg wet	0.05000		102	70-130	5	20	
1,2,3-Trichloropropane	0.0495	0.0050	mg/kg wet	0.05000		99	70-130	1	20	
1,2,4-Trichlorobenzene	0.0518	0.0050	mg/kg wet	0.05000		104	70-130	5	20	
1,2,4-Trimethylbenzene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130	4	20	
1,2-Dibromo-3-Chloropropane	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	2	20	
1,2-Dibromoethane	0.0555	0.0050	mg/kg wet	0.05000		111	70-130	6	20	
1,2-Dichlorobenzene	0.0480	0.0050	mg/kg wet	0.05000		96	70-130	4	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
1,2-Dichloroethane	0.0577	0.0050	mg/kg wet	0.05000		115	70-130	4	20	
1,2-Dichloropropane	0.0540	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
1,3,5-Trimethylbenzene	0.0488	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
1,3-Dichlorobenzene	0.0474	0.0050	mg/kg wet	0.05000		95	70-130	5	20	
1,3-Dichloropropane	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	6	20	
1,4-Dichlorobenzene	0.0485	0.0050	mg/kg wet	0.05000		97	70-130	3	20	
1,4-Dioxane	1.37	0.100	mg/kg wet	1.000		137	70-130	4	20	B+
2,2-Dichloropropane	0.0596	0.0050	mg/kg wet	0.05000		119	70-130	2	20	
2-Butanone	0.270	0.0100	mg/kg wet	0.2500		108	70-130	2	20	
2-Chlorotoluene	0.0473	0.0050	mg/kg wet	0.05000		95	70-130	3	20	
2-Hexanone	0.277	0.0100	mg/kg wet	0.2500		111	70-130	3	20	
4-Chlorotoluene	0.0484	0.0050	mg/kg wet	0.05000		97	70-130	3	20	
4-Isopropyltoluene	0.0488	0.0050	mg/kg wet	0.05000		98	70-130	3	20	
4-Methyl-2-Pentanone	0.298	0.0100	mg/kg wet	0.2500		119	70-130	1	20	
Acetone	0.271	0.0100	mg/kg wet	0.2500		108	70-130	0.7	20	
Benzene	0.0543	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
Bromobenzene	0.0496	0.0050	mg/kg wet	0.05000		99	70-130	5	20	
Bromochloromethane	0.0584	0.0050	mg/kg wet	0.05000		117	70-130	5	20	
Bromodichloromethane	0.0592	0.0050	mg/kg wet	0.05000		118	70-130	5	20	
Bromoform	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
Bromomethane	0.0544	0.0100	mg/kg wet	0.05000		109	70-130	7	20	
Carbon Disulfide	0.0630	0.0050	mg/kg wet	0.05000		126	70-130	3	20	
Carbon Tetrachloride	0.0609	0.0050	mg/kg wet	0.05000		122	70-130	2	20	
Chlorobenzene	0.0516	0.0050	mg/kg wet	0.05000		103	70-130	6	20	
Chloroethane	0.0526	0.0100	mg/kg wet	0.05000		105	70-130	4	20	
Chloroform	0.0563	0.0050	mg/kg wet	0.05000		113	70-130	5	20	
Chloromethane	0.0490	0.0100	mg/kg wet	0.05000		98	70-130	2	20	
cis-1,2-Dichloroethene	0.0567	0.0050	mg/kg wet	0.05000		113	70-130	5	20	
cis-1,3-Dichloropropene	0.0586	0.0050	mg/kg wet	0.05000		117	70-130	5	20	
Dibromochloromethane	0.0499	0.0020	mg/kg wet	0.05000		100	70-130	6	20	
Dibromomethane	0.0593	0.0050	mg/kg wet	0.05000		119	70-130	5	20	
Dichlorodifluoromethane	0.0473	0.0100	mg/kg wet	0.05000		95	70-130	0.9	20	
Diethyl Ether	0.0588	0.0050	mg/kg wet	0.05000		118	70-130	3	20	
Di-isopropyl ether	0.0556	0.0050	mg/kg wet	0.05000		111	70-130	5	20	
Ethyl tertiary-butyl ether	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	5	20	
Ethylbenzene	0.0520	0.0050	mg/kg wet	0.05000		104	70-130	6	20	
Hexachlorobutadiene	0.0488	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
Isopropylbenzene	0.0483	0.0050	mg/kg wet	0.05000		97	70-130	2	20	
Methyl tert-Butyl Ether	0.0613	0.0050	mg/kg wet	0.05000		123	70-130	5	20	
Methylene Chloride	0.0555	0.0100	mg/kg wet	0.05000		111	70-130	5	20	
Naphthalene	0.0534	0.0050	mg/kg wet	0.05000		107	70-130	4	20	
n-Butylbenzene	0.0503	0.0050	mg/kg wet	0.05000		101	70-130	3	20	
n-Propylbenzene	0.0482	0.0050	mg/kg wet	0.05000		96	70-130	2	20	
sec-Butylbenzene	0.0476	0.0050	mg/kg wet	0.05000		95	70-130	3	20	
Styrene	0.0542	0.0050	mg/kg wet	0.05000		108	70-130	8	20	

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Client Name: Tighe & Bond
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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
5035/8260B Volatile Organic Compounds / Low Level										
Batch CC90143 - 5035										
tert-Butylbenzene	0.0490	0.0050	mg/kg wet	0.05000		98	70-130	2	20	
Tertiary-amyl methyl ether	0.0586	0.0050	mg/kg wet	0.05000		117	70-130	5	20	
Tetrachloroethene	0.0462	0.0050	mg/kg wet	0.05000		92	70-130	5	20	
Tetrahydrofuran	0.0617	0.0050	mg/kg wet	0.05000		123	70-130	0.5	20	
Toluene	0.0540	0.0050	mg/kg wet	0.05000		108	70-130	4	20	
trans-1,2-Dichloroethene	0.0544	0.0050	mg/kg wet	0.05000		109	70-130	4	20	
trans-1,3-Dichloropropene	0.0491	0.0050	mg/kg wet	0.05000		98	70-130	5	20	
Trichloroethene	0.0537	0.0050	mg/kg wet	0.05000		107	70-130	3	20	
Trichlorofluoromethane	0.0564	0.0050	mg/kg wet	0.05000		113	70-130	1	20	
Vinyl Chloride	0.0535	0.0100	mg/kg wet	0.05000		107	70-130	3	20	
Xylene O	0.0509	0.0050	mg/kg wet	0.05000		102	70-130	6	20	
Xylene P,M	0.102	0.0100	mg/kg wet	0.1000		102	70-130	6	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0503*		mg/kg wet	*0.05000*		*101*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0524*		mg/kg wet	*0.05000*		*105*	*70-130*			
Surrogate: Dibromofluoromethane	*0.0518*		mg/kg wet	*0.05000*		*104*	*70-130*			
Surrogate: Toluene-d8	*0.0485*		mg/kg wet	*0.05000*		*97*	*70-130*			
8082A Polychlorinated Biphenyls (PCB)										
Batch CC90508 - 3540C										
Blank										
Aroclor 1016	ND	0.05	mg/kg wet							
Aroclor 1016 [2C]	ND	0.05	mg/kg wet							
Aroclor 1221	ND	0.05	mg/kg wet							
Aroclor 1221 [2C]	ND	0.05	mg/kg wet							
Aroclor 1232	ND	0.05	mg/kg wet							
Aroclor 1232 [2C]	ND	0.05	mg/kg wet							
Aroclor 1242	ND	0.05	mg/kg wet							
Aroclor 1242 [2C]	ND	0.05	mg/kg wet							
Aroclor 1248	ND	0.05	mg/kg wet							
Aroclor 1248 [2C]	ND	0.05	mg/kg wet							
Aroclor 1254	ND	0.05	mg/kg wet							
Aroclor 1254 [2C]	ND	0.05	mg/kg wet							
Aroclor 1260	ND	0.05	mg/kg wet							
Aroclor 1260 [2C]	ND	0.05	mg/kg wet							
Aroclor 1262	ND	0.05	mg/kg wet							
Aroclor 1262 [2C]	ND	0.05	mg/kg wet							
Aroclor 1268	ND	0.05	mg/kg wet							
Aroclor 1268 [2C]	ND	0.05	mg/kg wet							
Surrogate: Decachlorobiphenyl	*0.0210*		mg/kg wet	*0.02500*		*84*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0216*		mg/kg wet	*0.02500*		*86*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0194*		mg/kg wet	*0.02500*		*78*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0215*		mg/kg wet	*0.02500*		*86*	*30-150*			
LCS										
Aroclor 1016	0.6	0.05	mg/kg wet	0.5000		110	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8082A Polychlorinated Biphenyls (PCB)										
Batch CC90508 - 3540C										
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		101	40-140			
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		99	40-140			
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		98	40-140			
Surrogate: Decachlorobiphenyl	*0.0226*		mg/kg wet	*0.02500*		*91*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0236*		mg/kg wet	*0.02500*		*94*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0226*		mg/kg wet	*0.02500*		*90*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0220*		mg/kg wet	*0.02500*		*88*	*30-150*			
LCS Dup										
Aroclor 1016	0.6	0.05	mg/kg wet	0.5000		110	40-140	0.02	30	
Aroclor 1016 [2C]	0.5	0.05	mg/kg wet	0.5000		101	40-140	0.2	30	
Aroclor 1260	0.5	0.05	mg/kg wet	0.5000		99	40-140	0.1	30	
Aroclor 1260 [2C]	0.5	0.05	mg/kg wet	0.5000		98	40-140	0.2	30	
Surrogate: Decachlorobiphenyl	*0.0224*		mg/kg wet	*0.02500*		*90*	*30-150*			
Surrogate: Decachlorobiphenyl [2C]	*0.0232*		mg/kg wet	*0.02500*		*93*	*30-150*			
Surrogate: Tetrachloro-m-xylene	*0.0225*		mg/kg wet	*0.02500*		*90*	*30-150*			
Surrogate: Tetrachloro-m-xylene [2C]	*0.0218*		mg/kg wet	*0.02500*		*87*	*30-150*			
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC90405 - 3546										
Blank										
C19-C36 Aliphatics1	ND	15.0	mg/kg wet							
C9-C18 Aliphatics1	ND	15.0	mg/kg wet							
Decane (C10)	ND	0.5	mg/kg wet							
Docosane (C22)	ND	0.5	mg/kg wet							
Dodecane (C12)	ND	0.5	mg/kg wet							
Eicosane (C20)	ND	0.5	mg/kg wet							
Hexacosane (C26)	ND	0.5	mg/kg wet							
Hexadecane (C16)	ND	0.5	mg/kg wet							
Hexatriacontane (C36)	ND	0.5	mg/kg wet							
Nonadecane (C19)	ND	0.5	mg/kg wet							
Nonane (C9)	ND	0.5	mg/kg wet							
Octacosane (C28)	ND	0.5	mg/kg wet							
Octadecane (C18)	ND	0.5	mg/kg wet							
Tetracosane (C24)	ND	0.5	mg/kg wet							
Tetradecane (C14)	ND	0.5	mg/kg wet							
Triacontane (C30)	ND	0.5	mg/kg wet							
Surrogate: 1-Chlorooctadecane	*1.50*		mg/kg wet	*2.000*		*75*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.20	mg/kg wet							
Acenaphthene	ND	0.40	mg/kg wet							
Acenaphthylene	ND	0.20	mg/kg wet							
Anthracene	ND	0.40	mg/kg wet							

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC90405 - 3546										
Benzo(a)anthracene	ND	0.40	mg/kg wet							
Benzo(a)pyrene	ND	0.40	mg/kg wet							
Benzo(b)fluoranthene	ND	0.40	mg/kg wet							
Benzo(g,h,i)perylene	ND	0.40	mg/kg wet							
Benzo(k)fluoranthene	ND	0.40	mg/kg wet							
C11-C22 Unadjusted Aromatics1	ND	15.0	mg/kg wet							
Chrysene	ND	0.40	mg/kg wet							
Dibenzo(a,h)Anthracene	ND	0.20	mg/kg wet							
Fluoranthene	ND	0.40	mg/kg wet							
Fluorene	ND	0.40	mg/kg wet							
Indeno(1,2,3-cd)Pyrene	ND	0.40	mg/kg wet							
Naphthalene	ND	0.40	mg/kg wet							
Phenanthrene	ND	0.40	mg/kg wet							
Pyrene	ND	0.40	mg/kg wet							
Surrogate: 2-Bromonaphthalene	*54.5*		mg/L	*50.00*		*109*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*54.7*		mg/L	*50.00*		*109*	*40-140*			
Surrogate: O-Terphenyl	*2.14*		mg/kg wet	*2.000*		*107*	*40-140*			
LCS										
C19-C36 Aliphatics1	17.0	15.0	mg/kg wet	16.00		106	40-140			
C9-C18 Aliphatics1	9.0	15.0	mg/kg wet	12.00		75	40-140			
Decane (C10)	0.8	0.5	mg/kg wet	2.000		41	40-140			
Docosane (C22)	1.5	0.5	mg/kg wet	2.000		75	40-140			
Dodecane (C12)	0.9	0.5	mg/kg wet	2.000		46	40-140			
Eicosane (C20)	1.5	0.5	mg/kg wet	2.000		73	40-140			
Hexacosane (C26)	1.4	0.5	mg/kg wet	2.000		72	40-140			
Hexadecane (C16)	1.4	0.5	mg/kg wet	2.000		71	40-140			
Hexatriacontane (C36)	1.6	0.5	mg/kg wet	2.000		79	40-140			
Nonadecane (C19)	1.5	0.5	mg/kg wet	2.000		73	40-140			
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		33	30-140			
Octacosane (C28)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Octadecane (C18)	1.5	0.5	mg/kg wet	2.000		73	40-140			
Tetracosane (C24)	1.5	0.5	mg/kg wet	2.000		75	40-140			
Tetradecane (C14)	1.1	0.5	mg/kg wet	2.000		56	40-140			
Triacontane (C30)	1.4	0.5	mg/kg wet	2.000		70	40-140			
Surrogate: 1-Chlorooctadecane	*1.53*		mg/kg wet	*2.000*		*77*	*40-140*			
LCS										
2-Methylnaphthalene	1.71	0.20	mg/kg wet	2.000		85	40-140			
Acenaphthene	1.76	0.40	mg/kg wet	2.000		88	40-140			
Acenaphthylene	2.00	0.20	mg/kg wet	2.000		100	40-140			
Anthracene	1.95	0.40	mg/kg wet	2.000		97	40-140			
Benzo(a)anthracene	2.10	0.40	mg/kg wet	2.000		105	40-140			
Benzo(a)pyrene	2.06	0.40	mg/kg wet	2.000		103	40-140			
Benzo(b)fluoranthene	2.17	0.40	mg/kg wet	2.000		108	40-140			
Benzo(g,h,i)perylene	1.65	0.40	mg/kg wet	2.000		83	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC90405 - 3546										
Benzo(k)fluoranthene	2.13	0.40	mg/kg wet	2.000		106	40-140			
C11-C22 Unadjusted Aromatics1	37.1	15.0	mg/kg wet	34.00		109	40-140			
Chrysene	2.09	0.40	mg/kg wet	2.000		105	40-140			
Dibenzo(a,h)Anthracene	1.92	0.20	mg/kg wet	2.000		96	40-140			
Fluoranthene	2.03	0.40	mg/kg wet	2.000		101	40-140			
Fluorene	1.96	0.40	mg/kg wet	2.000		98	40-140			
Indeno(1,2,3-cd)Pyrene	1.97	0.40	mg/kg wet	2.000		99	40-140			
Naphthalene	1.54	0.40	mg/kg wet	2.000		77	40-140			
Phenanthrene	1.98	0.40	mg/kg wet	2.000		99	40-140			
Pyrene	2.03	0.40	mg/kg wet	2.000		101	40-140			
Surrogate: 2-Bromonaphthalene	*55.3*		mg/L	*50.00*		*111*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*55.6*		mg/L	*50.00*		*111*	*40-140*			
Surrogate: O-Terphenyl	*2.20*		mg/kg wet	*2.000*		*110*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	17.8	15.0	mg/kg wet	16.00		111	40-140	4	25	
C9-C18 Aliphatics1	9.4	15.0	mg/kg wet	12.00		78	40-140	4	25	
Decane (C10)	0.9	0.5	mg/kg wet	2.000		43	40-140	4	25	
Docosane (C22)	1.6	0.5	mg/kg wet	2.000		78	40-140	4	25	
Dodecane (C12)	1.0	0.5	mg/kg wet	2.000		48	40-140	4	25	
Eicosane (C20)	1.5	0.5	mg/kg wet	2.000		76	40-140	5	25	
Hexacosane (C26)	1.5	0.5	mg/kg wet	2.000		76	40-140	4	25	
Hexadecane (C16)	1.5	0.5	mg/kg wet	2.000		75	40-140	5	25	
Hexatriacontane (C36)	1.6	0.5	mg/kg wet	2.000		82	40-140	3	25	
Nonadecane (C19)	1.5	0.5	mg/kg wet	2.000		76	40-140	5	25	
Nonane (C9)	0.7	0.5	mg/kg wet	2.000		34	30-140	3	25	
Octacosane (C28)	1.5	0.5	mg/kg wet	2.000		74	40-140	5	25	
Octadecane (C18)	1.5	0.5	mg/kg wet	2.000		76	40-140	4	25	
Tetracosane (C24)	1.6	0.5	mg/kg wet	2.000		78	40-140	4	25	
Tetradecane (C14)	1.2	0.5	mg/kg wet	2.000		60	40-140	6	25	
Triacontane (C30)	1.5	0.5	mg/kg wet	2.000		74	40-140	5	25	
Surrogate: 1-Chlorooctadecane	*1.60*		mg/kg wet	*2.000*		*80*	*40-140*			
LCS Dup										
2-Methylnaphthalene	1.73	0.20	mg/kg wet	2.000		87	40-140	1	30	
Acenaphthene	1.76	0.40	mg/kg wet	2.000		88	40-140	0.3	30	
Acenaphthylene	2.00	0.20	mg/kg wet	2.000		100	40-140	0.02	30	
Anthracene	1.94	0.40	mg/kg wet	2.000		97	40-140	0.6	30	
Benzo(a)anthracene	2.07	0.40	mg/kg wet	2.000		104	40-140	1	30	
Benzo(a)pyrene	2.03	0.40	mg/kg wet	2.000		101	40-140	2	30	
Benzo(b)fluoranthene	2.15	0.40	mg/kg wet	2.000		107	40-140	1	30	
Benzo(g,h,i)perylene	1.66	0.40	mg/kg wet	2.000		83	40-140	0.3	30	
Benzo(k)fluoranthene	2.11	0.40	mg/kg wet	2.000		106	40-140	0.5	30	

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC90405 - 3546										
C11-C22 Unadjusted Aromatics1	33.3	15.0	mg/kg wet	34.00		98	40-140	11	25	
Chrysene	2.07	0.40	mg/kg wet	2.000		104	40-140	1	30	
Dibenzo(a,h)Anthracene	1.90	0.20	mg/kg wet	2.000		95	40-140	1	30	
Fluoranthene	2.00	0.40	mg/kg wet	2.000		100	40-140	2	30	
Fluorene	1.95	0.40	mg/kg wet	2.000		97	40-140	0.7	30	
Indeno(1,2,3-cd)Pyrene	1.95	0.40	mg/kg wet	2.000		97	40-140	1	30	
Naphthalene	1.56	0.40	mg/kg wet	2.000		78	40-140	1	30	
Phenanthrene	1.95	0.40	mg/kg wet	2.000		98	40-140	2	30	
Pyrene	1.99	0.40	mg/kg wet	2.000		100	40-140	2	30	
Surrogate: 2-Bromonaphthalene	*53.9*		mg/L	*50.00*		*108*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*54.0*		mg/L	*50.00*		*108*	*40-140*			
Surrogate: O-Terphenyl	*2.15*		mg/kg wet	*2.000*		*108*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

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Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902617

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902617
Date Received: 2/28/2019
Project Due Date: 3/7/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.1 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: 2/28/19 Time: 2029 By: [illegible]

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted: Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	320316	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	320315	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	320314	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320313	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	320312	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	320311	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	320310	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	320309	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	320308	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	320307	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
11	320306	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	320296	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
12	320305	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
13	320304	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
14	320303	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
15	320302	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
16	320301	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
17	320291	Yes	NA	Yes	VOA Vial - Methanol	MeOH	
17	320292	Yes	NA	Yes	VOA Vial - Other	Other	
17	320293	Yes	NA	Yes	VOA Vial - Other	Other	
17	320295	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
17	320300	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
18	320299	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
19	320294	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

ESS Project ID: 1902617
Date Received: 2/28/2019

19	320298	Yes	NA	Yes	4 oz. Jar - Unpres	NP
20	320297	Yes	NA	Yes	4 oz. Jar - Unpres	NP

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: _____ Date & Time: 2/28/19 2025
Reviewed By: _____ Date & Time: 2/28/19 2029
Delivered By: _____ 2/28/19 2029

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time: 5 day Rush:
Regulatory State: MA
Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

ESS Lab # 1902617
Reporting Limits S-1/S-2/S-3
Electonic Deliverables ☒ Limit Checker ☒ Excel ☐ Other (Please Specifiy) → PDF

Company Name	Project #	Project Name
Tighe+Bond	S-1758-020	Gallows Hill Park Salem

Contact Person	Address
Todd Kirton	446 Main St.

City	State	Zip Code	PO #
Worcester	MA	01608	

Telephone Number	FAX Number	Email Address
		TDKirton@Tighebond.com

Analysis: PCBs, VOCs, Arsenic, MCP 14 metals, EPH, Cr (total), Cyanide

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	PCBs	VOCs	Arsenic	MCP 14 metals	EPH	Cr (total)	Cyanide
1	2/25/19	1140	G	S	B-29 (4-5.5')				X			
2	↓	1145	↓	↓	B-30 (0-2')			X				
3		1150			B-30 (2-4')			X				
4		1200			B-31 (0-2')			X				
5		1205			B-31 (2-4')			X				
6	2/24/19	800			B-32 (0-2')			X				
7		830			B-33 (0-2')			X				
8		845			B-33 (2-4')			X				
9		900			B-34 (0-2')			X				
10		930			B-35 (0-2')			X				

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other — ag ag
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
Number of Containers:

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 1.1 °C ICE RC

Sampled by: KM
Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	R Carlson 2/28/19 1500	R Carlson 2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

ESS Laboratory
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185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902617

Turn Time: 5 day Rush:
Regulatory State: MA
Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Reporting Limits: S-1/S-2/S-3
Electonic Deliverables: ☑ Limit Checker ☑ Excel ☐ Other (Please Specifiy) → PDF

Company Name	Project #	Project Name
Tighe + Bond	S-1757-020	Gallows Hill PFK System
Contact Person	**Address**	
Todd Kirton	446 Main St	
City	**State**	**Zip Code** / **PO #**
Worcester	MA	01608
Telephone Number	**FAX Number**	**Email Address**
		TDKirton@Tighebond.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	PCBs	VOCs	Arsenic	MCP 14 metals	EPH	Cr (total)	Cyanide
11	2/24/19	940	G	S	B-35 (2-4')			X				
12		945			B-35 (4-5.5)				X	X		
13		1000			B-36 (0-2')			X				
14		1010			B-36 (2-4')			X				
15		1030			B-37 (0-2')			X				
16		1035			B-37 (2-4')			X				
17		1040			B-37 (4-8')	X	X	X		X		
18		1100			B-38 (0-2')			X				
19		1130			B-39 (0-2')			X				
20		1135			B-39 (2-4')			X				
Container Type:			AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other			ag	ag					
Preservation Code:			1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*									
					Number of Containers:							

Laboratory Use Only
Cooler Present: ✓
Seals Intact:
Cooler Temperature: 1.1 °C ICE RC

Sampled by: KW
Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	R Carlson 2/28/19 1500	R Carlson 2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	**Received By: (Signature, Date & Time)**	**Relinquished By: (Signature, Date & Time)**	**Received By: (Signature, Date & Time)**

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1902618

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 2:57 pm, Mar 08, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

SAMPLE RECEIPT

The following samples were received on February 28, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals except 1902618-08 were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1902618-01	B-45 2-4	Soil	6010C, 9014
1902618-02	B-45 4-8	Soil	6010C
1902618-03	B-46 0-2	Soil	6010C
1902618-04	B-46 2-4	Soil	6010C
1902618-05	B-47 0-2	Soil	6010C
1902618-06	B-48 0-1	Soil	6010C
1902618-07	B-48 1-2	Soil	6010C
1902618-08	B-49 0-1	Soil	6010C, 6020A, 7471B
1902618-09	B-49 1-2	Soil	6010C
1902618-10	B-50 0-1	Soil	6010C
1902618-11	B-50 1-2	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 04-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1902618-01 through 1902618-11**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	(X) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	(X) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes (X) No ( )*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard Date: March 08, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-45 2-4
Date Sampled: 02/26/19 13:20
Percent Solids: 54

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**12.3** (3.79)		6010C		1	KJK	03/07/19 2:36	2.46	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-45 2-4
Date Sampled: 02/26/19 13:20
Percent Solids: 54

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-01
Sample Matrix: Soil

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Total Cyanide	ND (1.72)		9014		1	EEM	03/04/19 13:45	mg/kg dry	CC90419

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-45 4-8
Date Sampled: 02/26/19 13:25
Percent Solids: 77

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.82** (2.98)		6010C		1	KJK	03/07/19 3:08	2.19	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-46 0-2
Date Sampled: 02/26/19 13:30
Percent Solids: 76

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**14.6** (3.09)		6010C		1	KJK	03/07/19 3:28	2.13	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-46 2-4
Date Sampled: 02/26/19 13:45
Percent Solids: 83

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**13.1** (2.80)		6010C		1	KJK	03/07/19 3:32	2.15	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-47 0-2
Date Sampled: 02/26/19 14:00
Percent Solids: 84

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**50.2** (4.30)		6010C		2	KJK	03/07/19 15:31	2.77	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-48 0-1
Date Sampled: 02/26/19 14:30
Percent Solids: 59

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**208** (3.24)		6010C		1	KJK	03/07/19 3:39	2.61	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-48 1-2
Date Sampled: 02/26/19 14:35
Percent Solids: 78

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-07
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**203** (3.18)		6010C		1	KJK	03/07/19 3:43	2.01	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-49 0-1
Date Sampled: 02/26/19 14:45
Percent Solids: 61

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-08
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Antimony	**3.00** (0.78)		6020A		1	KJK	03/07/19 18:02	2.11	100	CC90537
Arsenic	**444** (3.91)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Barium	**1060** (3.91)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Beryllium	**0.31** (0.17)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Cadmium	**5.42** (0.78)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Chromium	**1030** (1.56)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Lead	**354** (7.81)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Mercury	**4.20** (0.768)		7471B		20	MKS	03/05/19 13:30	0.85	40	CC90447
Nickel	**18.0** (3.91)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Selenium	ND (7.81)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Silver	ND (0.78)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Thallium	ND (7.81)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Vanadium	**41.2** (1.56)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537
Zinc	**696** (3.91)		6010C		1	KJK	03/07/19 4:00	2.11	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-49 1-2
Date Sampled: 02/26/19 14:50
Percent Solids: 77

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-09
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**990** (3.10)		6010C		1	KJK	03/07/19 15:47	2.09	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-50 0-1
Date Sampled: 02/26/19 15:00
Percent Solids: 56

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-10
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**344** (4.17)		6010C		1	KJK	03/07/19 4:08	2.13	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-50 1-2
Date Sampled: 02/26/19 15:00
Percent Solids: 80

ESS Laboratory Work Order: 1902618
ESS Laboratory Sample ID: 1902618-11
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**528** (2.48)		6010C		1	KJK	03/07/19 4:12	2.51	100	CC90537

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Total Metals						
Batch CC90447 - 7471B										
Blank										
Mercury	ND	0.033	mg/kg wet							
LCS										
Mercury	3.29	0.347	mg/kg wet	3.710		89	80-120			
LCS Dup										
Mercury	3.51	0.347	mg/kg wet	3.710		95	80-120	6	20	
Batch CC90537 - 3050B										
Blank										
Antimony	ND	0.50	mg/kg wet							
Arsenic	ND	2.50	mg/kg wet							
Barium	ND	2.50	mg/kg wet							
Beryllium	ND	0.11	mg/kg wet							
Cadmium	ND	0.50	mg/kg wet							
Chromium	ND	1.00	mg/kg wet							
Lead	ND	5.00	mg/kg wet							
Nickel	ND	2.50	mg/kg wet							
Selenium	ND	5.00	mg/kg wet							
Silver	ND	0.50	mg/kg wet							
Thallium	ND	5.00	mg/kg wet							
Vanadium	ND	1.00	mg/kg wet							
Zinc	ND	2.50	mg/kg wet							
LCS										
Antimony	42.1	8.62	mg/kg wet	42.40		99	80-120			
Arsenic	130	8.62	mg/kg wet	128.0		101	85-114			
Barium	500	8.62	mg/kg wet	536.0		93	82-118			
Beryllium	206	0.38	mg/kg wet	217.0		95	84-116			
Cadmium	92.0	1.72	mg/kg wet	99.00		93	87-113			
Chromium	114	3.45	mg/kg wet	116.0		99	82-118			
Lead	292	17.2	mg/kg wet	277.0		106	84-116			
Nickel	109	8.62	mg/kg wet	107.0		102	84-117			
Selenium	233	17.2	mg/kg wet	242.0		96	80-120			
Silver	64.6	1.72	mg/kg wet	64.30		100	86-114			
Thallium	179	17.2	mg/kg wet	183.0		98	80-120			
Vanadium	147	3.45	mg/kg wet	146.0		101	86-114			
Zinc	528	8.62	mg/kg wet	561.0		94	86-114			
LCS Dup										
Antimony	44.4	9.80	mg/kg wet	42.40		105	80-120	5	30	
Arsenic	119	9.80	mg/kg wet	128.0		93	85-114	9	20	
Barium	509	9.80	mg/kg wet	536.0		95	82-118	2	20	
Beryllium	199	0.43	mg/kg wet	217.0		92	84-116	3	20	
Cadmium	90.3	1.96	mg/kg wet	99.00		91	87-113	2	20	
Chromium	110	3.92	mg/kg wet	116.0		95	82-118	4	20	
Lead	276	19.6	mg/kg wet	277.0		100	84-116	6	20	
Nickel	100	9.80	mg/kg wet	107.0		94	84-117	9	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC90537 - 3050B										
Selenium	225	19.6	mg/kg wet	242.0		93	80-120	4	20	
Silver	60.6	1.96	mg/kg wet	64.30		94	86-114	6	20	
Thallium	178	19.6	mg/kg wet	183.0		97	80-120	0.8	20	
Vanadium	141	3.92	mg/kg wet	146.0		96	86-114	5	20	
Zinc	519	9.80	mg/kg wet	561.0		93	86-114	2	20	
Classical Chemistry										
Batch CC90419 - TCN Prep										
Blank										
Total Cyanide	ND	1.00	mg/kg wet							
LCS										
Total Cyanide	5.00	1.00	mg/kg wet	5.015		100	90-110			
Reference										
Total Cyanide	152	9.82	mg/kg wet	157.0		97	24-110			
Reference										
Total Cyanide	152	9.89	mg/kg wet	157.0		97	24-110			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1902618

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1902618

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1902618
Date Received: 2/28/2019
Project Due Date: 3/7/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.1 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / (No)
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	320289	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
01	320290	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
02	320288	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
03	320287	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
04	320286	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
05	320285	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
06	320284	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
07	320283	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
08	320282	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
09	320281	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
10	320280	Yes	NA	Yes	4 oz. Jar - Unpres	NP	
11	320279	Yes	NA	Yes	4 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials: ll
Are barcode labels on correct containers? Yes / (No)
Are all necessary stickers attached? Yes / (No)

Completed By: Date & Time: 2/28/19 1011
Reviewed By: Date & Time: 2/28/19 2029
Delivered

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

By: 2/28/19 2029

ESS Project ID: 1902618

Date Received: 2/28/2019

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902618

Turn Time: 5 day Rush:

Regulatory State: MA

Reporting Limits: S-1 / S-2 / S-3

Is this project for any of the following?: ☑ MA-MCP ☐ CT-RCP ☐ RGP ☐ Remediation

Electronic Deliverables: ☒ Limit Checker ☒ Excel ☐ Other (Please Specify) → PDF

Company Name: Tighe & Bond	Project #: S-1758-02	Project Name: Gallows Hill Park Sewer	
Contact Person: Todd Kirton	Address: 446 Main St		
City: Worcester	State: MA	Zip Code: 01608	PO #
Telephone Number	FAX Number	Email Address: TPKirton@Tigheband.com	

Analysis: Arsenic; Cyanide; MCP 14 Metals

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Arsenic	Cyanide	MCP 14 Metals
1	2/26/19	1320	G	S	B-45 (2-4)	X	X	
2		1325			B-45 (4-8)	X		
3		1330			B-46 (0-2)	X		
4		1345			B-46 (2-4)	X		
5		1400			B-47 (0-2)	X		
6		1430			B-48 (0-1)	X		
7		1435			B-48 (1-2)	X		
8		1445			B-49 (0-1)			X
9		1450			B-49 (1-2)	X		
10		1500			B-50 (0-1)	X		

Container Type: AG-Amber Glass B-BOD Bottle G-Glass P-Poly S-Sterile V-Vial O-Other

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Number of Containers: ag ag

Laboratory Use Only

Cooler Present: ✓

Seals Intact:

Cooler Temperature: 1.1 °C ICE RC

Sampled by :

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	2/28/19 1500	2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

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www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 1902618

Turn Time	5	Days
Regulatory State		

Reporting Limits: S-1 / S-2 / S-3

Is this project for any of the following?: ○ CT RCP ☑ MA MCP ○ RGP

Electonic Deliverables: ☑ Data Checker ☑ Excel ☐ Other (Please Specify →) PDF

Company Name	Project #	Project Name
Tighe & Bond	S-1758-020	Gallows Hill Park Salem

Contact Person	Address
Ted Kirton	446 Main St

City	State	Zip Code	PO #
Worcester	MA	01608	

Telephone Number	FAX Number	Email Address
		TDKirton@Tighebond.com

Analysis: Arsenic

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Arsenic
11	2/26/19	1500	G	S	B-50 (1-2)	X

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial

Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Number of Containers per Sample:

Laboratory Use Only

Cooler Present: ✓ ○ Drop Off
Seals Intact: ☑ Pickup
Cooler Temperature: 1.1 °C ICE RC

Sampled by: KM

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
2/28/19 1230	2/28/19 1500	2/28/19 1624	2/28/19 1900
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1903345

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:53 pm, Mar 21, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

SAMPLE RECEIPT

The following samples were received on March 14, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1903345-01	B-53 0-1	Soil	6010C
1903345-02	B-51 0-1	Soil	6010C
1903345-03	B-52 0-1	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1903345-01 through 1903345-03**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: March 21, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-53 0-1
Date Sampled: 03/13/19 12:00
Percent Solids: 74

ESS Laboratory Work Order: 1903345
ESS Laboratory Sample ID: 1903345-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**91.2** (2.44)		6010C		1	KJK	03/19/19 15:58	2.78	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-51 0-1
Date Sampled: 03/13/19 12:10
Percent Solids: 66

ESS Laboratory Work Order: 1903345
ESS Laboratory Sample ID: 1903345-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**21.2** (3.65)		6010C		1	KJK	03/19/19 16:02	2.07	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-52 0-1
Date Sampled: 03/13/19 12:20
Percent Solids: 64

ESS Laboratory Work Order: 1903345
ESS Laboratory Sample ID: 1903345-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**8.78** (2.64)		6010C		1	KJK	03/19/19 16:06	2.94	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch CC91853 - 3050B										
Blank										
Arsenic	ND	2.50	mg/kg wet							
LCS										
Arsenic	122	9.43	mg/kg wet	128.0		95	85-114			
LCS Dup										
Arsenic	121	9.43	mg/kg wet	128.0		94	85-114	0.9	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1903345

Notes and Definitions

U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903345

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1903345
Date Received: 3/14/2019
Project Due Date: 3/21/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	323739	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	323738	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
03	323737	Yes	NA	Yes	8 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 3/14/19 1759
Reviewed By: Date & Time: 3/14/19 1815
Delivered By: 3/14/19 1815

ESS Laboratory
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185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab #	1903345
Turn Time	5 Days
Regulatory State	MA
Reporting Limits	S-1 / S-2 / S-3
Is this project for any of the following?:	○ CT RCP ⊘ MA MCP ○ RGP
Electonic Deliverables	☑ Data Checker ☐ Excel ☐ Other (Please Specify →)
Company Name	Tighe + Bond
Project #	S-1758-020
Project Name	Gallows Hill Park, Salem
Contact Person	Todd Kirton
Address	446 Main St
City	Worcester
State	MA
Zip Code	01608
PO #	
Telephone Number	
FAX Number	
Email Address	TDKirton@Tighebond.com

Analysis: Arsenic

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Arsenic
1	3/13/19	1200	G	S	B-53 (0-1)	X
2	↓	1210	↓	↓	B-51 (0-1)	X
3	↓	1220	↓	↓	B-52 (0-1)	X

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
Number of Containers per Sample:

Laboratory Use Only
Cooler Present: ✓
Seals Intact: ⊘ Drop Off ☒ Pickup
Cooler Temperature: 0.2 °C

Sampled by: JM

Comments: Please specify "Other" preservative and containers types in this space
Use Gallows Hill Park Pricing

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
3/14/19 900	3/14/19 12:37	3/14/19 17:09	3/14/19 1750
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1903344

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:46 pm, Mar 21, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

SAMPLE RECEIPT

The following samples were received on March 14, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1903344-01	B-32 2-4	Soil	6010C
1903344-02	B-33 4-6	Soil	6010C
1903344-03	B-34 2-4	Soil	6010C
1903344-04	B-39 4-6	Soil	6010C
1903344-05	B-40 2-4	Soil	6010C
1903344-06	B-35 6-8	Soil	6010C

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1903344-01 through 1903344-06**

Matrices: ( ) Ground Water/Surface Water (X) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard
Date: March 21, 2019
Printed Name: Laurel Stoddard
Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-32 2-4
Date Sampled: 02/26/19 09:00
Percent Solids: 84

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-01
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**7.85** (1.90)		6010C		1	KJK	03/19/19 15:21	3.13	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-33 4-6
Date Sampled: 02/26/19 10:00
Percent Solids: 84

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-02
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**13.1** (1.53)		6010C		1	KJK	03/19/19 15:26	3.9	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-34 2-4
Date Sampled: 02/26/19 10:30
Percent Solids: 84

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-03
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**5.40** (2.82)		6010C		1	KJK	03/19/19 15:42	2.12	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-39 4-6
Date Sampled: 02/26/19 11:30
Percent Solids: 54

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-04
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**3190** (4.23)		6010C		1	KJK	03/19/19 15:46	2.21	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-40 2-4
Date Sampled: 02/26/19 12:00
Percent Solids: 77

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-05
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**669** (2.67)		6010C		1	KJK	03/19/19 15:49	2.43	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: B-35 6-8
Date Sampled: 02/26/19 12:30
Percent Solids: 85

ESS Laboratory Work Order: 1903344
ESS Laboratory Sample ID: 1903344-06
Sample Matrix: Soil
Units: mg/kg dry

Extraction Method: 3050B

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**6.04** (2.04)		6010C		1	KJK	03/19/19 15:55	2.87	100	CC91853

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Total Metals						
Batch CC91853 - 3050B										
Blank										
Arsenic	ND	2.50	mg/kg wet							
LCS										
Arsenic	122	9.43	mg/kg wet	128.0		95	85-114			
LCS Dup										
Arsenic	121	9.43	mg/kg wet	128.0		94	85-114	0.9	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1903344

Notes and Definitions

U	Analyte included in the analysis, but not detected
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903344

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1903344
Date Received: 3/14/2019
Project Due Date: 3/21/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	323736	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
02	323735	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
03	323734	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
04	323733	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
05	323732	Yes	NA	Yes	8 oz. Jar - Unpres	NP	
06	323731	Yes	NA	Yes	8 oz. Jar - Unpres	NP	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 3/14/19 1758
Reviewed By: Date & Time: 3/14/19 1814
Delivered By: 3/14/19 1814

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab #	1903344
Reporting Limits	S-1/S-2/G-3
Electonic Deliverables	☑ Data Checker ☑ Excel ☐ Other (Please Specify →) PDF ✓

Turn Time	5	Days
Regulatory State	MA	

Is this project for any of the following?: ○ CT RCP ○ ~~MA MCP~~ ○ RGP

Company Name	Tighe & Bond
Contact Person	Todd Kirton / c.c. Kerri Lewis
Project #	S-1733-020
Project Name	Gallows Hill Park, Salem
Address	446 Main St
City	Worcester
State	MA
Zip Code	01608
PO #	
Telephone Number	
FAX Number	
Email Address	TDKirton@Tighebond.com / c.c. klewis@TB.com

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Analysis: Arsenic
1	2/26/19	900	G	S	B-32 (2-4)	X
2	↓	1000	↓	↓	B-33 (4-6)	X
3		1030			B-34 (2-4)	X
4		1130			B-39 (4-6)	X
5		1200			B-40 (2-4)	X
6	↓	1230	↓	↓	B-35 (6-8)	X

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial

Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Number of Containers per Sample:

Laboratory Use Only

Cooler Present: ✓
Seals Intact:
Cooler Temperature: 0.2 °C

○ Drop Off
● Pickup

Sampled by : KM

Comments: Please specify "Other" preservative and containers types in this space

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
3/11/19 1430	3/14/19 12:37	3/14/19 17:09	3/14/19 1750
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

CERTIFICATE OF ANALYSIS

Todd Kirton
Tighe & Bond
446 Main Street #23
Worcester, MA 01608

RE: Gallows Hill Park Salem (S-1758-020)
ESS Laboratory Work Order Number: 1903343

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:43 pm, Mar 21, 2019

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

SAMPLE RECEIPT

The following samples were received on March 14, 2019 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for Metals were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
1903343-01	MW-4	Ground Water	6010C, 6020A, 7196A, 7470A, 9014, EPH8270, EPH8270SIM, MADEP-EPH
1903343-02	MW-3	Ground Water	6010C, 6020A, 7010, 7470A
1903343-03	MW-2	Ground Water	6010C, 6020A, 7470A
1903343-04	MW-1	Ground Water	6010C, 6020A, 7470A

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1903343

PROJECT NARRATIVE

Classical Chemistry

1903343-01 **Estimated value. Sample hold times were exceeded (H).**
Hexavalent Chromium

MADEP-EPH Extractable Petroleum Hydrocarbons

C9C0213-CCV2 **Continuing Calibration %Diff/Drift is below control limit (CD-).**
Hexatriacontane (C36) (32% @ 25%)

C9C0213-CCV3 **Continuing Calibration %Diff/Drift is below control limit (CD-).**
Hexatriacontane (C36) (36% @ 25%)

C9C0213-CCV4 **Continuing Calibration %Diff/Drift is below control limit (CD-).**
Hexatriacontane (C36) (32% @ 25%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **1903343-01 through 1903343-04**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	(X) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	(X) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(X) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	(X) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
(X) 6010 Metals CAM III A	(X) 6020 Metals CAM III D	(X) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	Yes ( ) No (X)
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	Yes (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	Yes (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: March 21, 2019

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-4
Date Sampled: 03/13/19 10:10
Percent Solids: N/A

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-01
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 200.7/6010BNoDigest

Dissolved Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (5.0)		6020A		1	BJV	03/15/19 17:50	10	10	CC91523
Barium	**101** (50.0)		6010C		1	KJK	03/15/19 15:09	10	10	CC91523
Cadmium	**1.2** (1.0)		6020A		1	KJK	03/20/19 14:09	10	10	CC91523
Chromium	ND (10.0)		6010C		1	KJK	03/15/19 15:09	10	10	CC91523
Lead	ND (1.0)		6020A		1	BJV	03/15/19 17:50	10	10	CC91523
Mercury	ND (0.20)		7470A		1	MKS	03/18/19 10:30	20	40	CC91537
Selenium	ND (5.0)		6020A		1	BJV	03/15/19 17:50	10	10	CC91523
Silver	ND (5.0)		6010C		1	KJK	03/15/19 15:09	10	10	CC91523

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-4
Date Sampled: 03/13/19 10:10
Percent Solids: N/A

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-01
Sample Matrix: Ground Water

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Hexavalent Chromium	**H** ND (10)		7196A		1	CCP	03/14/19 19:00	ug/L	CC91433
Total Cyanide	ND (5.00)		9014		1	EEM	03/15/19 14:15	ug/L	CC91505

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-4
Date Sampled: 03/13/19 10:10
Percent Solids: N/A
Initial Volume: 1070
Final Volume: 1
Extraction Method: 3510C

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-01
Sample Matrix: Ground Water
Units: ug/L

Prepared: 3/15/19 10:11

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	CAD	03/15/19 23:58	C9C0213	CC91403
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	CAD	03/15/19 23:58	C9C0213	CC91403
C11-C22 Unadjusted Aromatics1	ND (93.5)		EPH8270		1	VSC	03/15/19 17:52	C9C0228	CC91403
C11-C22 Aromatics1,2	ND (93.5)		EPH8270			VSC	03/15/19 17:52		[CALC]
2-Methylnaphthalene	ND (0.47)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Acenaphthene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Naphthalene	ND (0.47)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Phenanthrene	ND (0.47)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Acenaphthylene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Anthracene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Benzo(a)anthracene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Benzo(a)pyrene	ND (0.09)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Benzo(b)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Benzo(g,h,i)perylene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Benzo(k)fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Chrysene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Dibenzo(a,h)Anthracene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Fluoranthene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Fluorene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Indeno(1,2,3-cd)Pyrene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Pyrene	ND (0.19)		EPH8270SIM		1	VSC	03/15/19 15:04	C9C0240	CC91403
Preservative:	**pH <= 2**		MADEP-EPH			CAD			CC91403

	%Recovery	*Qualifier*	*Limits*
Surrogate: 1-Chlorooctadecane	*65 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*86 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*83 %*		*40-140*
Surrogate: O-Terphenyl	*83 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-3
Date Sampled: 03/13/19 11:05
Percent Solids: N/A

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-02
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 200.7/6010BNoDigest

Dissolved Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	**20.1** (5.0)		7010		1	KJK	03/19/19 18:37	10	10	CC91523
Barium	ND (50.0)		6010C		1	KJK	03/15/19 15:14	10	10	CC91523
Cadmium	ND (1.0)		6020A		1	BJV	03/15/19 17:56	10	10	CC91523
Chromium	ND (10.0)		6010C		1	KJK	03/15/19 15:14	10	10	CC91523
Lead	ND (1.0)		6020A		1	BJV	03/15/19 17:56	10	10	CC91523
Mercury	ND (0.20)		7470A		1	MKS	03/18/19 10:32	20	40	CC91537
Selenium	ND (5.0)		6020A		1	BJV	03/15/19 17:56	10	10	CC91523
Silver	ND (5.0)		6010C		1	KJK	03/15/19 15:14	10	10	CC91523

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-2
Date Sampled: 03/13/19 11:35
Percent Solids: N/A

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-03
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 200.7/6010BNoDigest

Dissolved Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (5.0)		6020A		1	BJV	03/15/19 18:13	10	10	CC91523
Barium	ND (50.0)		6010C		1	KJK	03/15/19 15:31	10	10	CC91523
Cadmium	ND (1.0)		6020A		1	BJV	03/15/19 18:13	10	10	CC91523
Chromium	ND (20.0)		6010C		1	KJK	03/15/19 15:31	10	10	CC91523
Lead	**1.9** (1.0)		6020A		1	BJV	03/15/19 18:13	10	10	CC91523
Mercury	ND (0.20)		7470A		1	MKS	03/18/19 10:34	20	40	CC91537
Selenium	ND (5.0)		6020A		1	BJV	03/15/19 18:13	10	10	CC91523
Silver	ND (5.0)		6010C		1	KJK	03/15/19 15:31	10	10	CC91523

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
Client Sample ID: MW-1
Date Sampled: 03/13/19 12:05
Percent Solids: N/A

ESS Laboratory Work Order: 1903343
ESS Laboratory Sample ID: 1903343-04
Sample Matrix: Ground Water
Units: ug/L

Extraction Method: 200.7/6010BNoDigest

Dissolved Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Arsenic	ND (5.0)		6020A		1	BJV	03/15/19 18:19	10	10	CC91523
Barium	ND (50.0)		6010C		1	KJK	03/15/19 15:35	10	10	CC91523
Cadmium	ND (1.0)		6020A		1	BJV	03/15/19 18:19	10	10	CC91523
Chromium	ND (20.0)		6010C		1	KJK	03/15/19 15:35	10	10	CC91523
Lead	ND (1.0)		6020A		1	BJV	03/15/19 18:19	10	10	CC91523
Mercury	ND (0.20)		7470A		1	MKS	03/18/19 10:40	20	40	CC91537
Selenium	ND (5.0)		6020A		1	BJV	03/15/19 18:19	10	10	CC91523
Silver	ND (5.0)		6010C		1	KJK	03/15/19 15:35	10	10	CC91523

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Dissolved Metals										
Batch CC91523 - 200.7/6010BNoDigest										
Blank										
Arsenic	ND	1.0	ug/L							
Arsenic	ND	5.0	ug/L							
Barium	ND	50.0	ug/L							
Cadmium	ND	1.0	ug/L							
Chromium	ND	10.0	ug/L							
Lead	ND	1.0	ug/L							
Selenium	ND	5.0	ug/L							
Silver	ND	5.0	ug/L							
LCS										
Barium	0.5		mg/L	0.5000		99	80-120			
Chromium	0.5		mg/L	0.5000		98	80-120			
Silver	0.2		mg/L	0.2500		98	80-120			
LCS										
Arsenic	20.7		ug/L	20.00		104	80-120			
Cadmium	20.8		ug/L	20.10		104	80-120			
Lead	20.2		ug/L	19.98		101	80-120			
Selenium	20.5		ug/L	19.98		103	80-120			
LCS										
Arsenic	25.7		ug/L	25.00		103	80-120			
Batch CC91537 - 245.1/7470A										
Blank										
Mercury	ND	0.20	ug/L							
LCS										
Mercury	6.17	0.20	ug/L	6.042		102	80-120			
LCS Dup										
Mercury	6.21	0.20	ug/L	6.042		103	80-120	0.7	20	
Classical Chemistry										
Batch CC91433 - General Preparation										
Blank										
Hexavalent Chromium	ND	10	ug/L							
LCS										
Hexavalent Chromium	0.5		mg/L	0.4998		100	90-110			
LCS Dup										
Hexavalent Chromium	0.5		mg/L	0.4998		99	90-110	0.6	20	
Batch CC91505 - TCN Prep										
Blank										
Total Cyanide	ND	5.00	ug/L							
LCS										
Total Cyanide	19.8	5.00	ug/L	20.06		99	90-110			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch CC91505 - TCN Prep										
LCS										
Total Cyanide	148	5.00	ug/L	150.4		99	90-110			
LCS Dup										
Total Cyanide	147	5.00	ug/L	150.4		98	90-110	0.6	20	
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC91403 - 3510C										
Blank										
C19-C36 Aliphatics1	ND	100	ug/L							
C9-C18 Aliphatics1	ND	100	ug/L							
Decane (C10)	ND	5	ug/L							
Docosane (C22)	ND	5	ug/L							
Dodecane (C12)	ND	5	ug/L							
Eicosane (C20)	ND	5	ug/L							
Hexacosane (C26)	ND	5	ug/L							
Hexadecane (C16)	ND	5	ug/L							
Hexatriacontane (C36)	ND	5	ug/L							
Nonadecane (C19)	ND	5	ug/L							
Nonane (C9)	ND	5	ug/L							
Octacosane (C28)	ND	5	ug/L							
Octadecane (C18)	ND	5	ug/L							
Tetracosane (C24)	ND	5	ug/L							
Tetradecane (C14)	ND	5	ug/L							
Triacontane (C30)	ND	5	ug/L							
Surrogate: 1-Chlorooctadecane	*40.8*		ug/L	*50.00*		*82*	*40-140*			
Blank										
C11-C22 Unadjusted Aromatics1	ND	100	ug/L							
Surrogate: 2-Bromonaphthalene	*44.4*		mg/L	*50.00*		*89*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*43.9*		mg/L	*50.00*		*88*	*40-140*			
Surrogate: O-Terphenyl	*44.5*		ug/L	*50.00*		*89*	*40-140*			
Blank										
2-Methylnaphthalene	ND	0.50	ug/L							
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.20	ug/L							
Benzo(a)pyrene	ND	0.10	ug/L							
Benzo(b)fluoranthene	ND	0.20	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.20	ug/L							
Chrysene	ND	0.20	ug/L							
Dibenzo(a,h)Anthracene	ND	0.20	ug/L							
Fluoranthene	ND	0.20	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC91403 - 3510C										
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.20	ug/L							
Naphthalene	ND	0.50	ug/L							
Phenanthrene	ND	0.50	ug/L							
Pyrene	ND	0.20	ug/L							
LCS										
C19-C36 Aliphatics1	361	100	ug/L	400.0		90	40-140			
C9-C18 Aliphatics1	205	100	ug/L	300.0		68	40-140			
Decane (C10)	24	5	ug/L	50.00		48	40-140			
Docosane (C22)	43	5	ug/L	50.00		86	40-140			
Dodecane (C12)	29	5	ug/L	50.00		58	40-140			
Eicosane (C20)	42	5	ug/L	50.00		85	40-140			
Hexacosane (C26)	43	5	ug/L	50.00		86	40-140			
Hexadecane (C16)	41	5	ug/L	50.00		82	40-140			
Hexatriacontane (C36)	51	5	ug/L	50.00		103	40-140			
Nonadecane (C19)	42	5	ug/L	50.00		85	40-140			
Nonane (C9)	18	5	ug/L	50.00		36	30-140			
Octacosane (C28)	43	5	ug/L	50.00		85	40-140			
Octadecane (C18)	42	5	ug/L	50.00		83	40-140			
Tetracosane (C24)	43	5	ug/L	50.00		86	40-140			
Tetradecane (C14)	36	5	ug/L	50.00		72	40-140			
Triacontane (C30)	43	5	ug/L	50.00		86	40-140			
Surrogate: 1-Chlorooctadecane	*38.6*		ug/L	*50.00*		*77*	*40-140*			
LCS										
C11-C22 Unadjusted Aromatics1	821	100	ug/L	850.0		97	40-140			
Surrogate: 2-Bromonaphthalene	*47.1*		mg/L	*50.00*		*94*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*45.3*		mg/L	*50.00*		*91*	*40-140*			
Surrogate: O-Terphenyl	*43.8*		ug/L	*50.00*		*88*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS										
2-Methylnaphthalene	3.69	0.50	ug/L	5.000		74	40-140			
Acenaphthene	4.65	0.20	ug/L	5.000		93	40-140			
Acenaphthylene	4.83	0.20	ug/L	5.000		97	40-140			
Anthracene	4.61	0.20	ug/L	5.000		92	40-140			
Benzo(a)anthracene	4.56	0.20	ug/L	5.000		91	40-140			
Benzo(a)pyrene	4.46	0.10	ug/L	5.000		89	40-140			
Benzo(b)fluoranthene	4.33	0.20	ug/L	5.000		87	40-140			
Benzo(g,h,i)perylene	4.11	0.20	ug/L	5.000		82	40-140			
Benzo(k)fluoranthene	5.06	0.20	ug/L	5.000		101	40-140			
Chrysene	5.17	0.20	ug/L	5.000		103	40-140			
Dibenzo(a,h)Anthracene	4.67	0.20	ug/L	5.000		93	40-140			
Fluoranthene	4.65	0.20	ug/L	5.000		93	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC91403 - 3510C										
Fluorene	4.66	0.20	ug/L	5.000		93	40-140			
Indeno(1,2,3-cd)Pyrene	4.36	0.20	ug/L	5.000		87	40-140			
Naphthalene	3.51	0.50	ug/L	5.000		70	40-140			
Phenanthrene	4.12	0.50	ug/L	5.000		82	40-140			
Pyrene	5.01	0.20	ug/L	5.000		100	40-140			
LCS Dup										
C19-C36 Aliphatics1	370	100	ug/L	400.0		93	40-140	2	25	
C9-C18 Aliphatics1	207	100	ug/L	300.0		69	40-140	1	25	
Decane (C10)	23	5	ug/L	50.00		47	40-140	2	25	
Docosane (C22)	44	5	ug/L	50.00		89	40-140	3	25	
Dodecane (C12)	29	5	ug/L	50.00		58	40-140	0.6	25	
Eicosane (C20)	44	5	ug/L	50.00		87	40-140	3	25	
Hexacosane (C26)	44	5	ug/L	50.00		88	40-140	3	25	
Hexadecane (C16)	42	5	ug/L	50.00		85	40-140	3	25	
Hexatriacontane (C36)	53	5	ug/L	50.00		105	40-140	3	25	
Nonadecane (C19)	44	5	ug/L	50.00		87	40-140	3	25	
Nonane (C9)	18	5	ug/L	50.00		35	30-140	3	25	
Octacosane (C28)	44	5	ug/L	50.00		88	40-140	3	25	
Octadecane (C18)	43	5	ug/L	50.00		86	40-140	3	25	
Tetracosane (C24)	44	5	ug/L	50.00		89	40-140	3	25	
Tetradecane (C14)	37	5	ug/L	50.00		74	40-140	3	25	
Triacontane (C30)	44	5	ug/L	50.00		88	40-140	3	25	
Surrogate: 1-Chlorooctadecane	*40.3*		ug/L	*50.00*		*81*	*40-140*			
LCS Dup										
C11-C22 Unadjusted Aromatics1	857	100	ug/L	850.0		101	40-140	4	25	
Surrogate: 2-Bromonaphthalene	*45.8*		mg/L	*50.00*		*92*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*44.5*		mg/L	*50.00*		*89*	*40-140*			
Surrogate: O-Terphenyl	*45.4*		ug/L	*50.00*		*91*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	
LCS Dup										
2-Methylnaphthalene	3.37	0.50	ug/L	5.000		67	40-140	9	20	
Acenaphthene	4.21	0.20	ug/L	5.000		84	40-140	10	20	
Acenaphthylene	4.48	0.20	ug/L	5.000		90	40-140	7	20	
Anthracene	4.29	0.20	ug/L	5.000		86	40-140	7	20	
Benzo(a)anthracene	4.25	0.20	ug/L	5.000		85	40-140	7	20	
Benzo(a)pyrene	4.34	0.10	ug/L	5.000		87	40-140	3	20	
Benzo(b)fluoranthene	4.24	0.20	ug/L	5.000		85	40-140	2	20	
Benzo(g,h,i)perylene	4.01	0.20	ug/L	5.000		80	40-140	3	20	
Benzo(k)fluoranthene	4.94	0.20	ug/L	5.000		99	40-140	2	20	
Chrysene	4.80	0.20	ug/L	5.000		96	40-140	8	20	
Dibenzo(a,h)Anthracene	4.51	0.20	ug/L	5.000		90	40-140	3	20	
Fluoranthene	4.37	0.20	ug/L	5.000		87	40-140	6	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch CC91403 - 3510C										
Fluorene	4.37	0.20	ug/L	5.000		87	40-140	7	20	
Indeno(1,2,3-cd)Pyrene	4.16	0.20	ug/L	5.000		83	40-140	5	20	
Naphthalene	3.34	0.50	ug/L	5.000		67	40-140	5	20	
Phenanthrene	3.82	0.50	ug/L	5.000		76	40-140	8	20	
Pyrene	4.64	0.20	ug/L	5.000		93	40-140	8	20	

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem
ESS Laboratory Work Order: 1903343

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
H	Estimated value. Sample hold times were exceeded (H).
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probably Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Tighe & Bond
Client Project ID: Gallows Hill Park Salem

ESS Laboratory Work Order: 1903343

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: Tighe & Bond - KPB/TB/MM

Shipped/Delivered Via: ESS Courier

ESS Project ID: 1903343
Date Received: 3/14/2019
Project Due Date: 3/21/2019
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No
    HEX Cr

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608.3 Pesticides)
01	323476	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
01	323477	Yes	NA	Yes	1L Amber - HCl	HCl	
01	323478	Yes	NA	Yes	1L Amber - HCl	HCl	
01	323479	Yes	NA	Yes	250 mL Poly - NaOH	NaOH	pH>12
01	323480	Yes	NA	Yes	250 mL Poly - Unpres	NP	
02	323475	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
03	323474	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	
04	323473	Yes	NA	Yes	250 mL Poly - HNO3	HNO3	

2nd Review
All containers scanned into storage/lab Initials:
Are barcode labels on correct containers? Yes / No
Are all necessary stickers attached? Yes / No

Completed By: Date & Time: 3/14/19 1747
Reviewed By: Date & Time: 3/14/19 1757
Delivered By: 3/14/19 1757

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston RI 02910
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab #	1903343
Turn Time	5 Days
Regulatory State	MA
Reporting Limits	RCGW-1 / GW-1 / GW-2 / GW-3 / RCS-2
Is this project for any of the following?:	○ CT RCP ☑ MA MCP ○ RGP
Electonic Deliverables	☑ Data Checker ☑ Excel ☐ Other (Please Specify →)

Company Name: Tighe + Bond	Project #: S-1759-020	Project Name: Gallows Hill Park, Salem	
Contact Person: Todd Kirton	Address: 446 Main Street		
City: Worcester	State: MA	Zip Code: 01608	PO #:
Telephone Number:	FAX Number:	Email Address: TDKirton@Tighebond.com	

Analysis: Dissolved RCRA metals; EPH; total cyanide; Hex Cr

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	Dissolved RCRA metals	EPH	total cyanide	Hex Cr
1	3/13/19	1010	G	GW	MW-4	X	X	X	X
2	↓	1105	↓	↓	MW-3	X			
3		1135			MW-2	X			
4		1205			MW-1	X			

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*
Number of Containers per Sample:

Laboratory Use Only
Cooler Present: ✓ ○ Drop Off
Seals Intact: ○ Pickup
Cooler Temperature: 0.2 Ice

Sampled by: KW

Comments: Please specify "Other" preservative and containers types in this space
Please use Gallows Hill Park Pricing
Metals samples were filtered in the field

Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)
3/14/19 900	3/14/19 12:37	3/14/19 17:09	3/14/19 1730
Relinquished by: (Signature, Date & Time)	Received By: (Signature, Date & Time)	Relinquished By: (Signature, Date & Time)	Received By: (Signature, Date & Time)

Tighe&Bond

APPENDIX D

City of Salem Inspection Report
Mansell Field at 50 Proctor Street, Salem, MA

FENCING

Is temporary fencing intact? Yes / No

If no, describe conditions and corrective actions taken:

SITE ACTIVITY

Are there any signs of unauthorized activity within the fenced area? Yes / No

If yes, describe conditions and corrective actions taken:

OTHER OBSERVATIONS

Note any other pertinent site observations:

Inspector Name: Tom Deutsch Title: Senior Planner

Signature: Date: 5/1/19

City of Salem Inspection Report
Mansell Field at 50 Proctor Street, Salem, MA

FENCING

Is temporary fencing intact? Yes / No

If no, describe conditions and corrective actions taken:

SITE ACTIVITY

Are there any signs of unauthorized activity within the fenced area? Yes / No

If yes, describe conditions and corrective actions taken:

OTHER OBSERVATIONS

Note any other pertinent site observations:

Inspector Name: Tom Deutsch Title: Senior Planner

Signature: Date: 5/8/19

Tighe&Bond

APPENDIX E

Regulatory Limitations

Each report and any and all work product provided in connection with the performance of each environmental site assessment is subject to the following conditions:

1. Each report is prepared on behalf of and for the exclusive use of the City of Salem (Client) and is subject to and issued in accordance with the Agreement and the provisions thereof. Each report and any findings contained therein shall not, in whole or in part, be provided to or used by any other person, firm, entity or governmental agency in whole or in part, without the prior written consent of Client and Tighe & Bond. However, Tighe & Bond acknowledges and agrees that, subject to the Limitations set forth herein and prior written approval by Tighe & Bond, a report may be provided to specific financial institutions, attorneys, title insurers, lessees and/or governmental agencies identified by Client at or about the time of issuance of a report in connection with the conveyance, mortgaging, leasing, or similar transaction involving the real property which is the subject matter of a report and any work product. Use of a report for any purpose by any persons, firm, entity, or governmental agency shall be deemed acceptance of the restrictions and conditions contained therein, these Limitations and the provisions of Tighe & Bond's Agreement with Client. No warranty, express or implied, is made by way of Tighe & Bond's performance of services or providing an environmental site assessment, including but not limited to any warranty with the contents of a report or with any and all work product.

2. In preparing a report, Tighe & Bond, Inc. may rely on certain information provided by governmental agencies or personnel as well as information and/or representations provided by other persons, firms, or entitites, and on information in the files of governmental agencies made available to Tighe & Bond at the time of the site assessment. To the extent that such information, representations, or files may be inaccurate, missing, incomplete or not provided to Tighe & Bond, Tighe & Bond is not responsible. Although there may be some degree of overlap in the information provided by these various sources, Tighe & Bond does not assume responsibility for independently verifying the accuracy, authenticity, or completeness of any and all information reviewed by or received from others during the course of the site assessment.

3. Unless otherwise noted, a survey (which includes observations, sampling and analysis) for the presence of asbestos-containing materials, mold and/or lead-based paint is not conducted as part of an assessment.

4. No attempt is made to assess the compliance status of any past or present Owner or Operator of a site with any Federal, state, or local laws or regulations, unless specifically indicated otherwise in writing.

5. Findings, observations, and conclusions presented in each report, including but not limited to the extent of any subsurface explorations or other tests performed by Tighe & Bond, are limited by the scope of services outlined in the Agreement, which may establish schedule and/or budgetary constraints for an environmental assessment or phase thereof. Furthermore, while it is anticipated that each assessment will be performed in accordance with generally accepted professional practices and applicable standards (such as ASTM, AAI, etc.) and then applicable state and Federal regulations, as may be further described in the report and/or the Agreement, Tighe & Bond does

not assume responsibility for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of its services.

6. The assessment presented in each report is based solely upon information obtained or received prior to issuance of the report, including a limited number of subsurface explorations (if performed) made on the dates indicated. If additional environmental or other relevant information is developed at a later date, Client agrees to bring such information to the attention of Tighe & Bond promptly. Upon evaluation of such information, Tighe & Bond reserves the right to recommend modification of this report and its conclusions.

7. If groundwater samples are collected for analysis or water level measurements are made in monitoring wells, such results/observations are provided as representative of conditions at the times stated in this report. Fluctuations in groundwater elevation may occur due to variations in precipitation cycle and multiple other factors, which may influence the concentrations of constituents present in the groundwater. Should additional data become available in the future, such data should be provided to Tighe & Bond for review and Tighe & Bond reserves the right to recommend modification of this report and its conclusions.

8. Except as may be noted specifically within the text of a report, no laboratory testing is performed as part of a site assessment. If such analyses have been conducted by an outside laboratory, Tighe & Bond may rely upon the analyses or data provided, and makes no representation that an independent evaluation of the reliability of such testing has been conducted, with the exception of reviewing standard quality assurance/quality control data that may have been provided with the test results.

9. Although chemical analyses may be performed for specific parameters at specific locations during the course of a site assessment, as described in a report, the results are not definitive regarding the presence of the parameters at other concentrations or the absence of the parameters at other locations on the site. Additional chemical constituents not included in the list of analyzed parameters for a study may be present in soil and/or ground water at a site, and Tighe & Bond assumes no responsibility for chemical constituents or parameters not analyzed.

10. If included, any database search is conducted under the Notice of Disclaimer/Waiver of Liability included in the database search report.