

Appendix H

Compliance Averaging Evaluations

- **H-1 Site 137 North Naphthalene**
- **H-2 Site 137 North Benzene**
- **H-3 Site 143 Antimony**

The Compliance Averaging Memoranda presented in this appendix are as approved by NJDEP by email on April 19, 2018 for Site 137 North and on May 24, 2018 for Site 143.

The Remedial Action Report (RAR) Tables and Figures from Site 137 North and Site 143 referenced in these memoranda are included in Appendix D of this Remedial Action Report, Site 137 North (AOC 137-1A and AOC 137-2A) and Site 143 (AOC 143-1) Soil.

The laboratory reports and data validation reports from Site 137 North and Site 143 referenced in these memoranda are included in Appendices E and F, respectively, of this *Remedial Action Report, Site 137 North (AOC 137-1A and AOC 137-2A) and Site 143 (AOC 143-1) Soil*.

Appendix H-1

Site 137 North Naphthalene

PPG Site 137 North
Compliance Averaging for Naphthalene in Soil (Revision 1)
PPG, Jersey City, New Jersey

ATTACHMENT 1

NJDEP Environmental Criteria for Naphthalene



New Jersey Department of Environmental Protection

Standards for Drinking Water, Ground Water, Soil and Surface Water

Naphthalene

CAS #: 91-20-3

Drinking Water Standards (μ g/l or ppb)

Standard: 300

Type: Primary

STATE MCL

Ground Water Quality Standards (μ g/l or ppb)

Standard: 300

Type: Specific

GW-Quality Criterion: 300

PQL: 2

Surface Water Quality Standards (μ g/l or ppb)

Fresh Water-

Human Health:

Aquatic-Acute:

Aquatic-Chronic:

Saline Water-

Human Health:

Aquatic-Acute:

Aquatic-Chronic:

Soil Standards (mg/kg)

Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 6

Effective: 6/2/2008 **Interim:**

Ingestion Dermal: 2,400

Inhalation: 6

Soil PQL: 0.2

Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 17

Effective: 6/2/2008 **Interim:**

Ingestion Dermal: 25,000

Inhalation: 17

Soil PQL: 0.2

Appendix H-2

Site 137 North Benzene

Memorandum

To Tom Cozzi, NJDEP
David Doyle, NJDEP
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David Spader, ERF5
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Subject PPG Site 137 North
Compliance Averaging for Benzene in Soil (Revision 1)

From Claire Hunt

Date March 7, 2018

This memorandum provides documentation of attainment of compliance for benzene in soil with the 2 milligram per kilogram (mg/kg) residential direct contact site remediation standard (RDCSRS) for a site-specific soil sample set from Site 137 North (137N) in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012, Version 1.0).

Background

Although benzene was not identified as an 'emanating-from' parameter as part of the 'emanating-from' evaluation (memorandum submitted to Tom Cozzi, NJDEP, from Kathleen Whooley, AECOM, entitled "Phase 3B Emanating from Evaluation", dated November 11, 2014), it was identified as part

of subsequent site investigation work performed under the Licensed Site Remediation Professional (LSRP) program as being co-located with naphthalene and manufactured gas plant (MGP) impacts and, therefore, potentially emanating from Site 114. Per the Administrative Consent Order (ACO) and Judicial Consent Order (JCO), PPG and PSEG are jointly responsible for the remediation of the MGP impacts emanating from Site 114.

On June 16, 2017, PPG/AECOM issued the Site 137N Remedial Action Report (RAR) Tables and Figures. On behalf of the NJDEP, Weston provided comments on the referenced document on August 7, 2017 via email. Weston's comments indicated that PPG should evaluate the emanating-from compound exceedances remaining in soil at Site 137N using the NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria.

Introduction

This memorandum provides documentation of attainment of compliance for benzene with the 2 mg/kg RDCSRS for a site-specific soil sample set that includes benzene exceedances in two samples collected at Site 137N:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Benzene (mg/kg)
W20A	137-W20A-PB	137-W20A-PB-18.8-19.3	18.8 - 19.3	-6.3 - -6.8	3.58 J
X20A	137-X20A-PB	137-X20A-PB-17.2-17.7	17.2 - 17.7	-5.5 - -6.0	12.6 J

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988

Figure 1 shows borings with remaining benzene data at Site 137N, the site boundary, and the location of the samples exceeding the benzene RDCSRS. The remaining-data benzene results for Site 137N are provided in Table 5-4 of the Site 137N RAR Tables and Figures (Revision 2), March 7, 2018. For delineation purposes, the remaining-data benzene results for Halladay Street South are provided in Table 5-3 of the Halladay Street South RAR Tables and Figures (Revision 0 submittal), October 31, 2017.

Delineation

The delineation of benzene was implemented during the Remedial Investigation (RI) activities by PPG and PSEG, as documented in the following deliverables:

- Remedial Investigation Report, Halladay Street Gas Works, Jersey City, New Jersey, PSEG Services Corporation, December 2007 (PSEG RIR)
- Remedial Investigation Report – Soil, Garfield Avenue Group Non-Residential Chromate Chemical Production Waste Sites 114, 132, 133, 135, 137, 143 and 186, Jersey City, New Jersey, AECOM, February 2012 (2012 RIR)

The Site 137N RAR Tables and Figures (Revision 2), March 7, 2018, reflect relevant sampling points and data collected and validated through the most recent soil investigations at Site 137N.

Horizontal delineation was further refined during remedial action by the samples listed on the following table and shown on **Figure 1**.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Lab SDG	Benzene Result (mg/kg)	Direction
T20A	137-T20A-PB	19.7 - 20.2	-6.2 - -6.7	02/06/2015	JB87834	0.00060 J	West
V21A	137-V21A-PB	20.0 - 20.5	-7.3 - -7.8	03/11/2015	JB89742R	0.178 J	West
X20A	133-X20A-PB	17.0 - 17.5	-5.3 - -5.8	09/29/2015	JC4999	0.121 J	East
X21A	133-X21A-PB	16.7 - 17.2	-5.4 - -5.9	09/29/2015	JC4999	0.244 J	East
X22A	133-X22A-PB	15.9 - 16.4	-4.6 - -5.1	10/8/2015	JC5740A	< 0.00031 UJ	South

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 SDG Sample Delivery Group
 UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Delineation to the north is not required as the benzene is emanating from Site 114 onto Site 137N.

The samples of concern (137-W20A-PB-18.8-19.3 and 137-X20A-PB-17.2-17.7) were collected in the top interval of meadow mat (MM) encountered below historic fill. Each of the samples used for horizontal delineation was collected in the first interval of MM or undisturbed native deposit (UND) below historic fill. In the event that multiple samples were collected at a single location, the greater of the two results is shown above. Laboratory reports and data validation reports for the samples from Grids T20A and T21A were included with the Site 137 North Tables and Figures (Revision 0) submittal, June 16, 2017. Laboratory reports and data validation reports for the samples from Grids X20A, X21A and X22A were included with the Halladay Street South Tables and Figures (Revision 0) submittal, October 31, 2017.

With respect to vertical delineation, benzene was not analyzed for in soil beneath the locations where exceedances remain at Site 137N. Vertical delineation has deviated from guidance since single-point compliance was not achievable. Vertical delineation is based on the lines of evidence presented below:

- The PSEG RIR for MGP-related constituents (at the source site, Phase 2A) indicates that vertical delineation of benzene, toluene, ethylbenzene, and xylenes has been achieved and benzene is found no deeper than 59 feet below ground surface.
- Data from soil borings/samples in Site 114 Phase 2B-4, located between the source area (i.e., Site 114 Phase 2A, where the MGP was located) and Site 137N, indicate that benzene in soil was found no deeper than elevation (El.) -7.4 feet North American Vertical Datum of 1988 (NAVD88).

- On Site 137N, benzene concentrations in soil are not detected or are less than the most stringent standard at the following locations that are very close to the locations with exceedances, as shown on Figure 1 and Table 5-4 of the Site 137N Remedial Action Report Tables and Figures (Revision 2) submittal, March 7, 2018:
 - Grid W21A – Sample 137-W21A-PB (El. -8.2 - -8.7 feet NAVD88)
 - Grid X21A - PSEG-SB56 in sample NJD981084668-11/20/2006-SB56_30 (El. -7.0 - -7.5 feet NAVD88)
 - Grid V21A – 137-V21A-PB (El. -7.3 - -7.8 feet NAVD88)

As a result of these lines of evidence, there is sufficient current data to conclude that benzene in soil at Site 137N has been vertically delineated between El. -7.4 and -8.7 feet NAVD88.

Functional Area

The benzene RDCSRS is based on the inhalation pathway (**Attachment 1**). The functional area for the inhalation pathway is limited to 0.5 acre for residential use. The extent of the functional area within the site boundary is shown in **Figure 1**. The shape is generally square, but conforms to the site boundary. Remaining samples within the functional area extents were collected from below 2 feet below ground surface and are considered a part of the functional area for the calculation.

Compliance Averaging

Compliance with the benzene RDCSRS is demonstrated through spatial averaging. Theissen polygons were created within the functional area as shown in **Figure 1**. The sample selection process is as follows:

1. All of the samples for benzene with a sample status of remaining that fall within the functional area horizontally and vertically are identified (backfill samples are excluded).
2. The maximum concentration is selected at each sample location for use in the weighted average. The maximum of the concentration for detections or the Method Detection Limit (MDL)/Reporting Limit (RL) for non-detects is selected.

Laboratory reports and data validation reports for the samples were included with the Site 137 North RAR Tables and Figures (Revision 0) submittal, June 16, 2017.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Date Collected	Maximum Benzene Result (mg/kg)	Area (sf)	Area x Maximum Benzene Result (sf *mg/kg)
S21A	137-P3B-S21A	19.0 - 19.5	-5.2 - -5.7	8/8/2013	0.0093	3,738	35
U22A	137-RI-U22A	19.9 - 20.4	-6.4 - -6.9	3/13/2015	0.0098	2,855	28
T19A	137-T19A-PB	18.2 - 18.7	-4.9 - -5.4	1/23/2015	0.051 J	1,197	61
T20A	137-T20A-PB	19.7 - 20.2	-6.2 - -6.7	2/6/2015	0.0006 J	2,179	1
U19A	137-U19A-PB	18.8 - 19.3	-5.8 - -6.3	2/4/2015	0.15 J	1,363	204
U23A	137-U23A-PB	19.6 - 20.1	-6.2 - -6.7	3/24/2015	0.0135 J	4,186	57
V21A	137-V21A-PB	20.0 - 20.5	-7.3 - -7.8	3/11/2015	0.178 J	2,409	429
W20A	137-W20A-PB	18.8 - 19.3	-6.3 - -6.8	2/11/2015	3.58 J	777	2,782
W21A	137-W21A-PB	20.4 - 20.9	-8.2 - -8.7	4/20/2015	0.0634 J	640	41
X20A	137-X20A-PB	17.2 - 17.7	-5.5 - -6.0	2/11/2015	12.6 J	325	4,095
X21A	137-X21A-PB	17.8 - 18.3	-6.5 - -7.0	4/21/2015	0.208	355	74
X21A	PSEG-SB56	19.0 - 19.5	-7.0 - -7.5	11/20/2006	0.019	1271	24
Total:						21,295	7,831

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 sf square feet

Weighted Average Concentration = 7,831 sf x mg/kg / 21,295 sf = 0.4 mg/kg

Conclusion

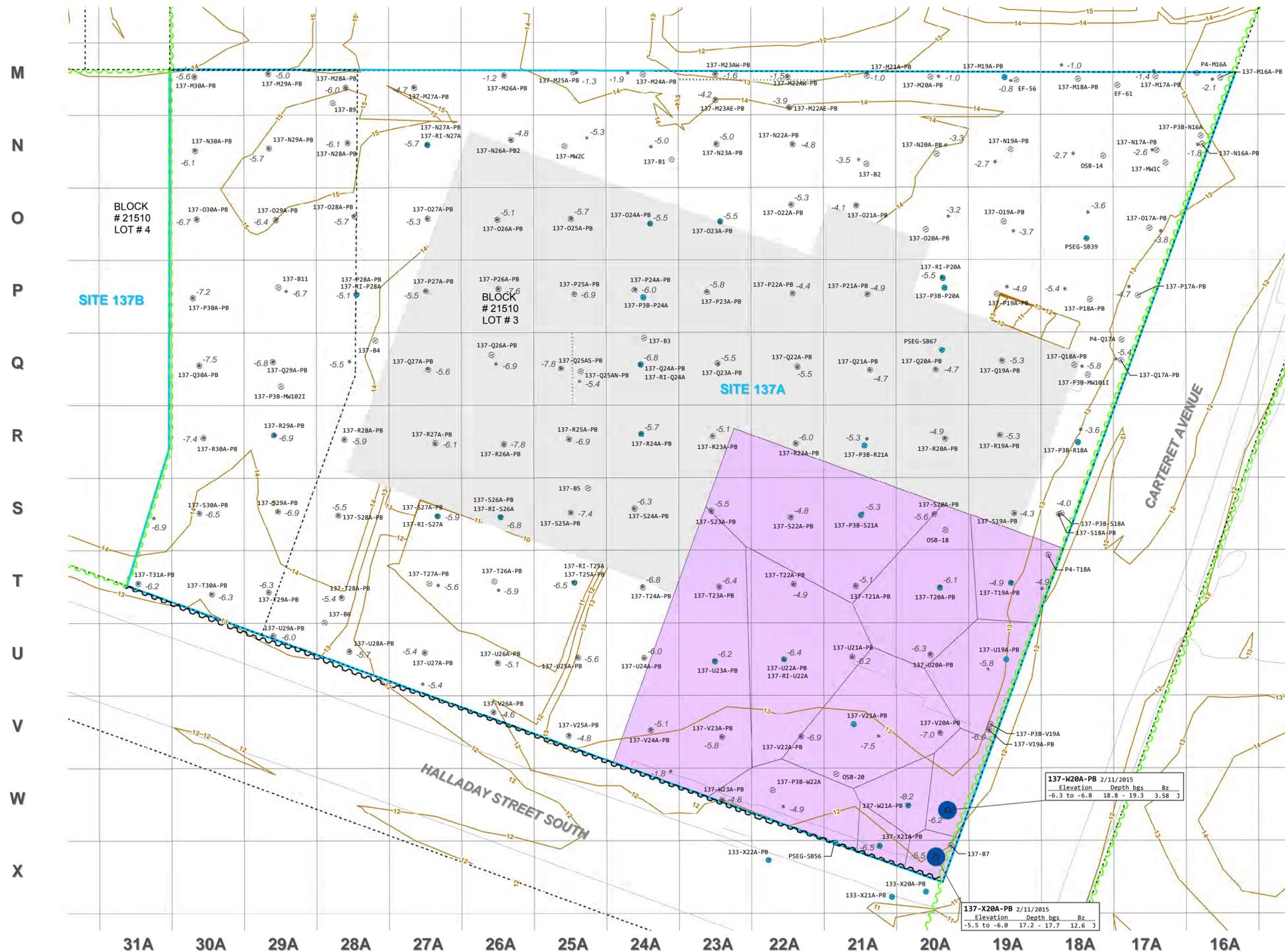
Based on the residential exposure scenario, the spatially weighted average benzene concentration within the study area at 137-W20A-PB-18.8-19.3 and 137-X20A-PB-17.2-17.7 is 0.4 mg/kg, which is compliant with the 2 mg/kg RDCSRS.

Attachments:

Figure 1 Functional Area for Compliance Averaging

Attachment 1 NJDEP Environmental Criteria for Benzene

SITE 132



ABBREVIATIONS:
 bgs - below ground surface
 Bz - benzene
 ft - feet
 mg/kg - milligrams per kilogram
 NAVD88 - North American Vertical Datum of 1988
 NRDCSRS - New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standard
 RDCSRS - New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard

QUALIFIERS:
 J - The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.

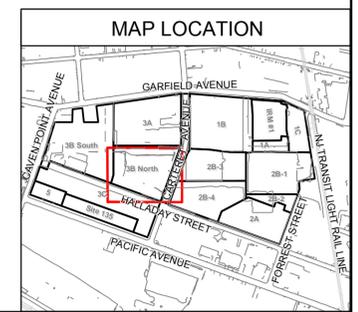
GENERAL NOTES:
 G1. The benzene data associated with the sample locations shown on this figure are provided in Table 5-4. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes for each outlier sample are provided in the specific notes in Table 5-4.
 G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.
 G3. Elevation vertical datum is NAVD88, in U.S. survey ft.
 G4. Results are reported in mg/kg.
 G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: <http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon>).
 G6. Site 137 North is comprised of Site 137A and the northern portion of Site 137B, and generally coincides with Phase 3B North.
 G7. This figure presents data for locations within the Site boundary that have samples remaining in place. Three remaining samples from Halladay Street South are also shown for delineation of benzene.

SPECIFIC NOTES:
 S1. Property lines and pre-construction topographical contours are sourced from the "Boundary & Topographical Survey, PPG Site, Lot 5, Block 21510, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated May 30, 2014 and the "Boundary & Topographical Survey, PPG Sites 132 and 143, Lots 1 and 2, Block 21510, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated September 4, 2014.
 S2. Post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Site 133 & 135, Phase 3A," produced by Maser Consulting P.A., dated 03/17/2017.
 S3. In Grids N27A, Q24A, P28A, S26A, S27A, T25A, and U22A, two sample locations are located adjacent therefore the sampling location symbols overlap on the figure.
 S4. The pit bottom sample and as-built TEE for Grid W21A were inadvertently collected and measured at the edge of Grid W20A.
 S5. The following grids are partially located within the Site 137 North boundary, however the as-built TEE applies to the entire grid: M16A, M17A, M18A, M19A, M20A, M21A, M24A, M25A, M26A, M27A, M28A, M29A, and M30A.

LEGEND

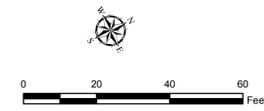
- SAMPLING LOCATION (REMAINING SAMPLES)
- REMAINING SAMPLES NOT ANALYZED FOR BENZENE
- RESULT IS BELOW THE MOST STRINGENT STANDARD
- RESULTS EXCEED THE MOST STRINGENT STANDARD, BUT ARE IN COMPLIANCE WITH REMEDIATION OBJECTIVES
- BENZENE (Bz)
- POST-EXCAVATION ELEVATION SURVEY POINT REPRESENTING AS-BUILT TERMINAL EXCAVATION ELEVATION ACROSS GRID, UNLESS OTHERWISE NOTED (FT NAVD88)
- APPROXIMATE LOCATION OF GRID SPLIT
- IN PLACE SHEET PILE (AS OF MARCH 2018)
- REMOVED SHEET PILE
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PROPERTY LINE
- FORMER BUILDING SLAB (AVERAGE ELEVATION 13.9 FT NAVD88)
- GRID LAYOUT
- SITE 137 NORTH BOUNDARY
- THEISSEN POLYGON

Soil Remediation Standards (mg/kg)		
Analyte	RDCSRS	NRDCSRS
BENZENE	2	5



PPG
 SITE 137 NORTH
 GARFIELD AVENUE GROUP
 JERSEY CITY, NEW JERSEY

SAMPLE MAP FOR BENZENE
 COMPARED TO SOIL REMEDIATION STANDARDS
 AND FUNCTIONAL AREA



DATE: 03/07/2018

FIGURE 1

PPG Site 137 North
Compliance Averaging for Benzene in Soil (Revision 1)
PPG, Jersey City, New Jersey

ATTACHMENT 1

NJDEP Environmental Criteria for Benzene



New Jersey Department of Environmental Protection

Standards for Drinking Water, Ground Water, Soil and Surface Water

Benzene

CAS #: 71-43-2

Drinking Water Standards (μ g/l or ppb)

Standard: 1

Type: Primary

STATE MCL

Ground Water Quality Standards (μ g/l or ppb)

Standard: 1

Type: Specific

GW-Quality Criterion: 0.2

PQL: 1

Surface Water Quality Standards (μ g/l or ppb)

Fresh Water-

Human Health: 0.15(hc)

Aquatic-Acute:

Aquatic-Chronic:

Saline Water-

Human Health: 3.3(hc)

Aquatic-Acute:

Aquatic-Chronic:

Soil Standards (mg/kg)

Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 2

Effective: 6/2/2008

Interim:

Ingestion Dermal: 3

Inhalation: 2

Soil PQL: 0.005

Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 5

Effective: 6/2/2008

Interim:

Ingestion Dermal: 14

Inhalation: 5

Soil PQL: 0.005

Appendix H-3

Site 143 Antimony

Memorandum

To Tom Cozzi, NJDEP
David Doyle, NJDEP
Prabal Amin, WESTON Solutions
Laura Amend Babcock, WESTON Solutions
David Spader, ERFS
Bhavini Doshi, City of Jersey City
James D. Ray, MDMC-Law
Nancy Colson, MDMC-Law

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Aimee Ruitter, AECOM
Jennifer Atkins, AECOM

Subject PPG Site 143
Compliance Averaging for Antimony in Soil (Revision 0)

From Claire Hunt

Date February 5, 2018

This memorandum provides documentation of attainment of compliance for antimony in soil with the 31 milligram per kilogram (mg/kg) Residential Direct Contact Site Remediation Standard (RDCSRS) for a site-specific soil sample set from Site 143 in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012, Version 1.0).

Introduction

This memorandum provides documentation of attainment of compliance for antimony with the 31 mg/kg RDCSRS for a site-specific soil sample set that includes an antimony exceedance in one sample collected at Site 143:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Antimony Result (mg/kg)
A'17A	143-A'17A-PB2	143-A'17A-PB-7.0-7.5	7.0 - 7.5	5.6 - 5.1	133

bgs below ground surface
 ft foot or feet
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988

Figure 1 shows borings with remaining antimony data, the site boundary, and the location of the sample exceeding the antimony RDCSRS. The in-place sample antimony results are provided in Table 5-2 of the Site 143 Remedial Action Report (RAR) Tables and Figures (Revision 1), February 5, 2018.

Delineation

Sample 143-A'17A-PB-7.0-7.5 is horizontally and vertically delineated by the samples listed on the following table and shown on Figure 1. Laboratory reports and data validation reports for these samples are included with the Site 143 RAR Tables and Figures (Revision 1) submittal, February 5, 2018.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Antimony Result (mg/kg)	Direction
A16A	143-P3A-A16A	8.0 - 8.5	6.4 - 5.9	8/28/2013	0.31 J	North
A'17A	143-B1	8.6 - 9.1	4.0 - 3.5	1/10/2007	1.3 UJ	Vertical
A'19A	143-B2	8.1 - 8.6	4.6 - 4.1	1/10/2007	1.3 UJ	South
C17A	143-B105	6.5 - 7.0	4.3 - 3.8	11/10/2014	0.56 J	East
A'18A	EF-34	7.5 - 8.0	4.9 - 4.4	4/25/2011	1.1 UJ	West

bgs below ground surface
 ft foot or feet
 J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

There are additional samples collected along on Garfield Avenue with antimony results less than the RDCSRS that further demonstrate horizontal delineation. The samples were collected from intervals above and below the elevation of the sample exceeding the antimony RDCSRS on Site 143. These sample results are listed below. The laboratory reports and data validation reports for these samples are included with the Site 143 RAR Tables and Figures (Revision 1) submittal, February 5, 2018.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Antimony Result (mg/kg)	Direction
A'15A	EF-35	2.5 - 3.0	9.6 - 9.1	4/21/2011	1.0 U	North
A'15A	EF-35	13.0 - 13.5	-0.9 - -1.4	4/22/2011	0.95 U	North
A'15A	EF-35	13.0 - 13.5	-0.9 - -1.4	4/22/2011	0.98 U	North

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Antimony Result (mg/kg)	Direction
A'15A	EF-35	16.0 - 16.5	-3.9 - -4.4	4/22/2011	1.1 U	North
A'15A	EF-35	20.0 - 20.5	-7.9 - -8.4	4/22/2011	0.97 U	North
C'16A	EF-36	2.5 - 3.0	11.5 - 11.0	4/22/2011	1.1 U	Northwest
C'16A	EF-36	7.5 - 8.0	6.5 - 6.0	4/25/2011	0.99 UJ	Northwest
C'16A	EF-36	7.5 - 8.0	6.5 - 6.0	4/25/2011	1.0 UJ	Northwest
C'16A	EF-36	12.0 - 12.5	2.0 - 1.5	4/25/2011	1.0 UJ	Northwest
C'16A	EF-36	15.5 - 16.0	-1.5 - -2.0	4/25/2011	0.92 UJ	Northwest
C'16A	EF-36	20.0 - 20.5	-6.0 - -6.5	4/25/2011	0.93 UJ	Northwest

bgs below ground surface
 ft foot or feet
 mg/kg milligram per kilogram
 N/A not available
 NAVD88 North American Vertical Datum of 1988
 SDG Sample Delivery Group
 U The analyte was not detected above the sample reporting limit shown.
 UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Functional Area

The antimony RDCSRS is a health-based criterion based on the ingestion-dermal pathway (**Attachment 1**). The functional area for the ingestion-dermal pathway is limited to 0.25 acre for residential use. The extent of the functional area within the Site boundary is shown in **Figure 1**. The shape is generally rectangular within the Site boundary. Remaining samples within the functional area extents were collected from deeper than 2 feet below ground surface and are considered a part of the functional area for the calculation.

Compliance Averaging

Compliance with the antimony RDCSRS is demonstrated through spatially weighted averaging. Theissen polygons were created within the functional area as shown in **Figure 1**. The selected samples and associated Theissen polygon areas are listed below. Compliance with the antimony RDCSRS is demonstrated through spatial averaging. Theissen polygons were created within the functional area as shown in **Figure 1**. The selected samples and associated Theissen polygon areas are listed below. The sample selection process is as follows:

- All of the samples for antimony with a sample status of remaining that fall within the functional area horizontally and vertically are identified (backfill samples are excluded).
- The maximum concentration is selected at each sample location for use in the weighted average. The maximum of the concentration for detections or the method detection limit (MDL) / reporting Limit (RL) for non-detects is selected.

Laboratory reports and data validation reports for the samples are included with the 143 RAR Tables and Figures (Revision 1) submittal, February 5, 2018.

Grid ID	Location ID	Sample Depth (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Maximum Antimony Result (mg/kg)	Area (sf)	Area x Maximum Antimony Result (sf*mg/kg)
A16A	143-P3A-A16A	10.0 - 10.5	4.4 - 3.9	8/28/2013	0.66 J	2,061	1,360
A'17A	143-A'17A-PB2	7.0 - 7.5	5.6 - 5.1	4/1/2014	133	854	113,582
A'17A	143-B1	5.0 - 5.5	7.6 - 7.1	1/10/2007	1.3 UJ	2,327	3,025
B15A	143-B104	6.5 - 7.0	4.2 - 3.7	11/10/2014	0.33 U	1,085	358
C17A	143-B105	6.5 - 7.0	4.3 - 3.8	11/10/2014	0.56 J	4,438	2,485
Total						10,765	120,811

bgs below ground surface
 ft foot or feet
 J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 sf square feet
 U The analyte was not detected above the sample reporting limit shown.
 UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Spatially Weighted Average Concentration = 120,811 sf x mg/kg / 10,765 sf = 11 mg/kg.

Conclusion

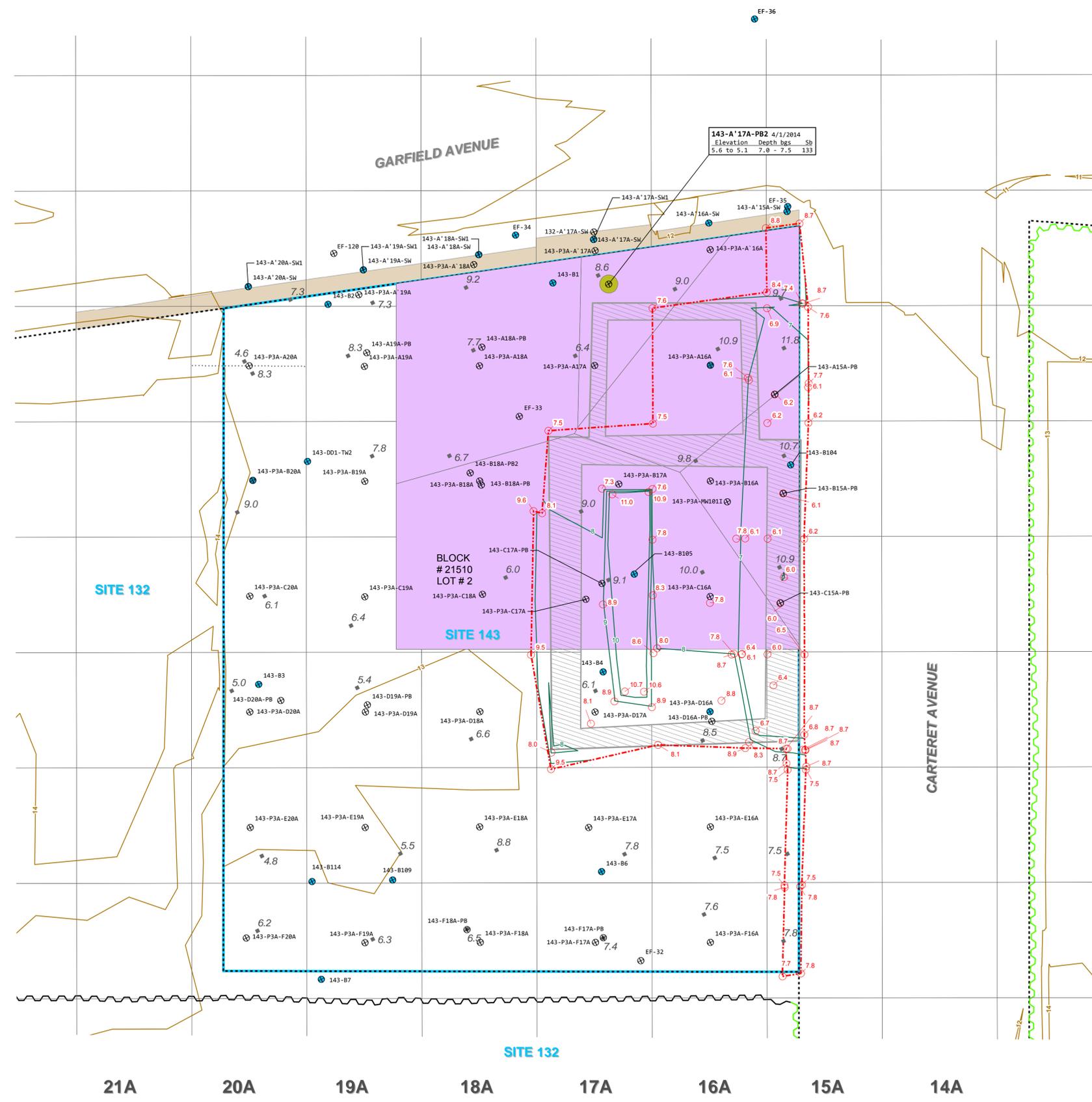
Based on the residential exposure scenario, the spatially weighted average antimony concentration within the functional area at sample 143-A'17A-PB-7.0-7.5 is 11 mg/kg, which is compliant with the 31 mg/kg RDCSRS.

Attachments:

Figure 1 Site 143 Sample Map for CCPW Metals Compared to Soil Remediation Standards and Functional Area

Attachment 1 NJDEP Environmental Criteria for Antimony

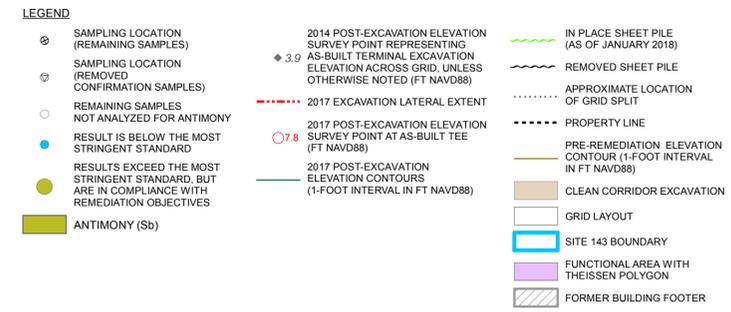
B'
A'
A
B
C
D
E
F



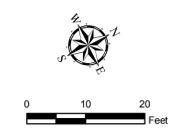
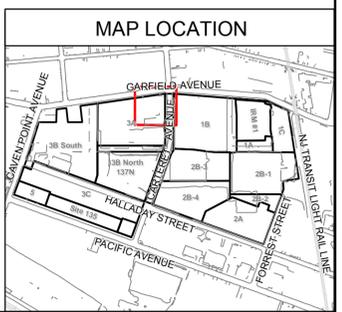
ABBREVIATIONS:
 bgs - below ground surface
 CCPW - Chromate Chemical Production Waste
 ft - feet
 mg/kg - milligrams per kilogram
 N/A - not applicable
 NAVD88 - North American Vertical Datum of 1988
 NRDCRS - New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standard
 RDCRS - New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard
 RDCRS-GAG - Residential Direct Contact Soil Remediation Standard - Garfield Avenue Group (alternative remediation standard approved by the New Jersey Department of Environmental Protection on December 28, 2016)
 Sb - antimony
 TEE - Terminal Excavation Elevation

GENERAL NOTES:
 G1. The antimony data associated with the sample locations shown on this figure are provided in Table 5-2. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes on how the New Jersey Department of Environmental Protection's remedial standards are being met and/or how remedial completion is being achieved/completed for each outlier sample are provided in the Specific Notes in Table 5-2.
 G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.
 G3. Elevation vertical datum is NAVD88, in U.S. survey ft.
 G4. Results are reported in mg/kg.
 G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: <http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon>).
 G6. This figure presents data for locations within the Site boundary that have samples remaining in place. In addition, locations from outside the Site boundary and/or removed samples may be shown to demonstrate compliance with the remediation objectives. The Specific Notes on Table 5-2 include discussion of these situations, if necessary.

SPECIFIC NOTES:
 S1. Property lines and pre-construction topographical contours are sourced from the "Boundary & Topographical Survey, PPG Sites 132 and 143, Lots 1 and 2, Block 21510, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated September 4, 2014.
 S2. 2014 post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Site 133 & 135, Phase 3A," produced by Maser Consulting P.A., dated 03/17/2017 with revisions.
 S3. 2017 as-built pit bottom elevations were taken from "Post Excavation Elevations Plan for ENTACT, LLC; PPG Site 143, Carteret Adjacent Excavation," produced by Maser Consulting P.A., dated 01/29/2018.
 S4. Grids A20A, B20A, C20A, D20A, E20A, F15A, F16A, F17A, F18A, F19A, and F20A are partially located within the Site 143 boundary; however, the as-built terminal excavation elevation applies to the entire grid.
 S5. Within the Site 143 boundary, Grids A'15A, A15A, A16A, B15A, B16A, B17A, C15A, C16A, C17A, D15A, D16A, D17A, and portions of Grids E15A and F15A were re-excavated during 2017. This figure shows the extent of the 2017 excavation activities, the post-excavation pit bottom survey points, and 1-ft post-excavation contours representing the 2017 as-built TEEs in these grids. As shown on this figure, excavation in Grid A'15A was extended to the Site 143 northern property line and to the proposed TEE. Excavation in Grids A15A, B15A, C15A, and D15A was extended to the Site 143 northern property line and to sufficient depths to remove observed CCPW material. Excavation in Grids E15A and F15A was extended to the Site 143 northern property line at their original as-built TEEs. Excavation was extended into Grids A16A, B16A, B17A, C16A, C17A, D16A, and D17A to determine the limits of, and remove, the former building footer. Portions of Grids B17A and C17A were not re-excavated below the original as-built TEEs from 2014, and the re-excavated portions of Grids D16A and D17A did not extend below the original as-built TEEs.



Soil Remediation Standards (mg/kg)			
Analyte	RDCRS	RDCRS-GAG	NRDCRS
ANTIMONY	31	N/A	450



PPG
 SITE 143
 GARFIELD AVENUE GROUP
 JERSEY CITY, NEW JERSEY
 DATE: 04/16/2018

SAMPLE MAP FOR ANTIMONY
 COMPARED TO SOIL REMEDIATION
 STANDARDS AND FUNCTIONAL AREA
 FIGURE 1

Memorandum

To Tom Cozzi, NJDEP
David Doyle, NJDEP
Prabal Amin, WESTON Solutions
Laura Amend Babcock, WESTON Solutions
David Spader, ERF5
Bhavini Doshi, City of Jersey City
James D. Ray, MDMC-Law
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Page 1

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Dorothy Laguzza, LeClairRyan
Carolyn Scott, AECOM
Aimee Ruitter, AECOM
Marybeth Hayes, AECOM

Subject PPG Site 137 North
Compliance Averaging for Naphthalene in Soil (Revision 1)

From Claire Hunt

Date March 7, 2018

This memorandum provides documentation of attainment of compliance for naphthalene in soil with the 6 milligram per kilogram (mg/kg) residential direct contact site remediation standard (RDCSRS) for a site-specific soil sample set from Site 137 North (137N) in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012, Version 1.0).

Background

Naphthalene is identified as a compound emanating from Site 114 onto the northeastern portion of Site 137N in the memorandum submitted to Tom Cozzi, NJDEP, from Kathleen Whooley, AECOM, entitled "Phase 3B Emanating from Evaluation," dated November 11, 2014. Naphthalene is identified as an off-site manufactured gas plant (MGP) impact from Site 114. Per the Administrative

Consent Order (ACO) and Judicial Consent Order (JCO), PPG and PSEG are jointly responsible for the remediation of the MGP impacts emanating from Site 114.

On June 16, 2017, PPG/AECOM issued the Site 137N Remedial Action Report (RAR) Tables and Figures. On behalf of the NJDEP, Weston provided comments on the referenced document on August 7, 2017 via email. Weston's comments indicated that PPG should evaluate the naphthalene exceedances remaining in soil at Site 137N using the NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria.

Introduction

This memorandum provides documentation of attainment of compliance for naphthalene with the 6 mg/kg RDCSRS for a site-specific soil sample set that includes naphthalene exceedances in three samples collected at Site 137N:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Naphthalene (mg/kg)
W20A	137-W20A-PB	137-W20A-PB-18.8-19.3	18.8 - 19.3	-6.3 - -6.8	80.6 J
X20A	137-X20A-PB	137-X20A-PB-17.2-17.7	17.2 - 17.7	-5.5 - -6.0	150 J
X21A	137-X21A-PB	137-X21A-PB-17.8-18.3	17.8 - 18.3	-6.5 - -7.0	24.2 J

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988

Figure 1 shows borings with remaining naphthalene data, the site boundary, and the location of the samples exceeding the naphthalene RDCSRS. The remaining-data naphthalene results are provided in Table 5-3 of the Site 137N RAR Tables and Figures (Revision 2), March 7, 2018.

Delineation

The delineation of naphthalene was implemented during the Remedial Investigation (RI) activities by PPG and PSEG, as documented in the following deliverables:

- Remedial Investigation Report, Halladay Street Gas Works, Jersey City, New Jersey, PSEG Services Corporation, December 2007 (PSEG RIR)
- Remedial Investigation Report – Soil, Garfield Avenue Group Non-Residential Chromate Chemical Production Waste Sites 114, 132, 133, 135, 137, 143 and 186, Jersey City, New Jersey, AECOM, February 2012 (2012 RIR)

The Site 137N RAR Tables and Figures (Revision 2), March 7, 2018, reflect relevant sampling points and data collected and validated through the most recent soil investigations at Site 137N.

Horizontal delineation was further refined during remedial action by the samples listed on the following table and shown on **Figure 1**.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Lab SDG	Naphthalene Result (mg/kg)	Direction
T20A	137-T20A-PB	19.7 - 20.2	-6.2 - -6.7	02/06/2015	JB87834	0.00060 J	West
V21A	137-V21A-PB	20.0 - 20.5	-7.3 - -7.8	03/11/2015	JB89742R	0.178 J	West
X22A	133-X22A-PB	15.9 - 16.4	-4.6 - -5.1	10/08/2015	JC5740A	< 0.00031 UJ	South
Y23A	133-SI-Y23A-PB	14.3 - 14.8	-2.7 - -3.2	10/08/2015	JC5783	0.202 J	South
AA21A	133-SI-AA21A-PB	14.3 - 14.8	-3.0 - -3.5	9/22/2015	JC4462	<0.023 UJ	South-east
AA23A	133-SI-AA23A-PB	14.8 - 15.3	-3.7 - -4.2	9/09/2015	JC3446R	< 0.029 U	East

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 SDG Sample Delivery Group
 U The analyte was not detected above the sample reporting limit shown.
 UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Delineation to the north is not required as naphthalene is emanating from Site 114 onto Site 137N.

The samples of concern (137-W20A-PB-18.8-19.3, 137-X20A-PB-17.2-17.7, and 137-X21A-PB-17.8-18.3) were collected in the top interval of meadow mat (MM) encountered below historic fill. Each of the samples used for horizontal delineation was collected in the first interval of MM or organic undisturbed native deposit (UNDorg) below historic fill. In the event that multiple samples were collected at a single location, the greater of the two results is shown above. Laboratory reports and data validation reports for the samples from Grids T20A and V21A were included with the Site 137 North Tables and Figures (Revision 0) submittal, June 16, 2017. Laboratory reports and data validation reports for the samples from Grids X22A and Y23A were included with the Halladay Street South Tables and Figures (Revision 0) submittal, October 31, 2017. Laboratory reports and data validation reports for the samples from Grids AA21A and AA23A were included with the Site 133 East Table and Figures (Revision 0) submittal, October 30, 2017.

With respect to vertical delineation, naphthalene was not analyzed for in soil beneath the locations where exceedances remain at Site 137N. Vertical delineation has deviated from guidance since single-point compliance was not achievable. Vertical delineation is based on the lines of evidence presented below:

- The PSEG RIR for MGP-related constituents (at the source site) indicates that vertical delineation of polycyclic aromatic hydrocarbons (PAHs) (including naphthalene) has been achieved and naphthalene is found no deeper than 50.5 feet below ground surface.
- Data from soil borings/samples in Site 114 Phase 2B-4, located between the source area (i.e., Site 114 Phase 2A, where the MGP was located) and Site 137N, indicate that

naphthalene in soil was found no deeper than elevation (El.) -12.4 feet North American Vertical Datum of 1988 (NAVD88).

- On Site 137N, naphthalene concentrations in soil are not detected or are less than the most stringent standard at the following locations that are very close to the locations with exceedances, as shown on Figure 1 and Table 5-3 of the Site 137N Remedial Action Report Tables and Figures (Revision 2) submittal, March 7, 2018:
 - Grid W21A – Sample 137-W21A-PB (El. -8.2 - -8.7 feet NAVD88)
 - Grid X21A - PSEG-SB56 in sample NJD981084668-11/20/2006-SB56_30 (El. -7.0 - -7.5 feet NAVD88)Grid V21A – 137-V21A-PB (El. -7.3 - -7.8 feet NAVD88)

As a result of these lines of evidence, there is sufficient current data to conclude that naphthalene in soil at Site 137N has been vertically delineated between El. -8.7 and -12.4 feet NAVD88.

Functional Area

The naphthalene RDCSRS is based on the inhalation pathway (**Attachment 1**). The functional area for the inhalation pathway is limited to 0.5 acre for residential use. The extent of the functional area within the site boundary is shown in **Figure 1**. The shape is generally square but conforms to the site boundary. Remaining samples within the functional area extents were collected from below 2 feet below ground surface and are considered a part of the functional area for the calculation.

Compliance Averaging

Compliance with the naphthalene RDCSRS is demonstrated through spatial averaging. Theissen polygons were created within the functional area as shown in **Figure 1**. The sample selection process is as follows:

1. All of the samples for naphthalene with a sample status of remaining that fall within the functional area horizontally and vertically are identified (backfill samples are excluded).
2. The maximum concentration is selected at each sample location for use in the weighted average. The maximum of the concentration for detections or the Method Detection Limit (MDL)/Reporting Limit (RL) for non-detects is selected.

Laboratory reports and data validation reports for the samples are included with the Site 137N RAR Tables and Figures (Revision 2), March 7, 2018.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Date Collected	Maximum Naphthalene Result (mg/kg)	Area (sf)	Area x Maximum Naphthalene Result (sf *mg/kg)
S21A	137-P3B-S21A	19.0 - 19.5	-5.2 - -5.7	8/8/2013	< 0.014	3,738	52
U22A	137-RI-U22A	19.9 - 20.4	-6.4 - -6.9	3/13/2015	< 0.017	2,855	49
T19A	137-T19A-PB	18.2 - 18.7	-4.9 - -5.4	1/23/2015	0.685	1,197	820
T20A	137-T20A-PB	19.7 - 20.2	-6.2 - -6.7	2/6/2015	< 0.014	2,179	31
U19A	137-U19A-PB	18.8 - 19.3	-5.8 - -6.3	2/4/2015	0.941	1,363	1,283
U23A	137-U23A-PB	19.6 - 20.1	-6.2 - -6.7	3/24/2015	< 0.017	4,186	71

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Date Collected	Maximum Naphthalene Result (mg/kg)	Area (sf)	Area x Maximum Naphthalene Result (sf *mg/kg)
V21A	137-V21A-PB	20.0 - 20.5	-7.3 - -7.8	3/11/2015	< 0.02	2,409	48
W20A	137-W20A-PB	18.8 - 19.3	-6.3 - -6.8	2/11/2015	80.6 J	777	62,626
W20A	137-W21A-PB	20.4 - 20.9	-8.2 - -8.7	4/20/2015	< 0.059	640	38
X20A	137-X20A-PB	17.2 - 17.7	-5.5 - -6.0	2/11/2015	150 J	325	48,750
X21A	137-X21A-PB	17.8 - 18.3	-6.5 - -7.0	4/21/2015	24.2 J	355	8,591
X21A	PSEG-SB56	30.5 - 31.0	-18.5 - -19	11/20/2006	<0.39	1271	496
Total:						22,295	122,855

bgs below ground surface
 ft foot or feet
 J The result is an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
 mg/kg milligram per kilogram
 NAVD88 North American Vertical Datum of 1988
 sf square feet

Weighted Average Concentration = 122,855 sf x mg/kg / 22,295 sf = 5.8 mg/kg

Conclusion

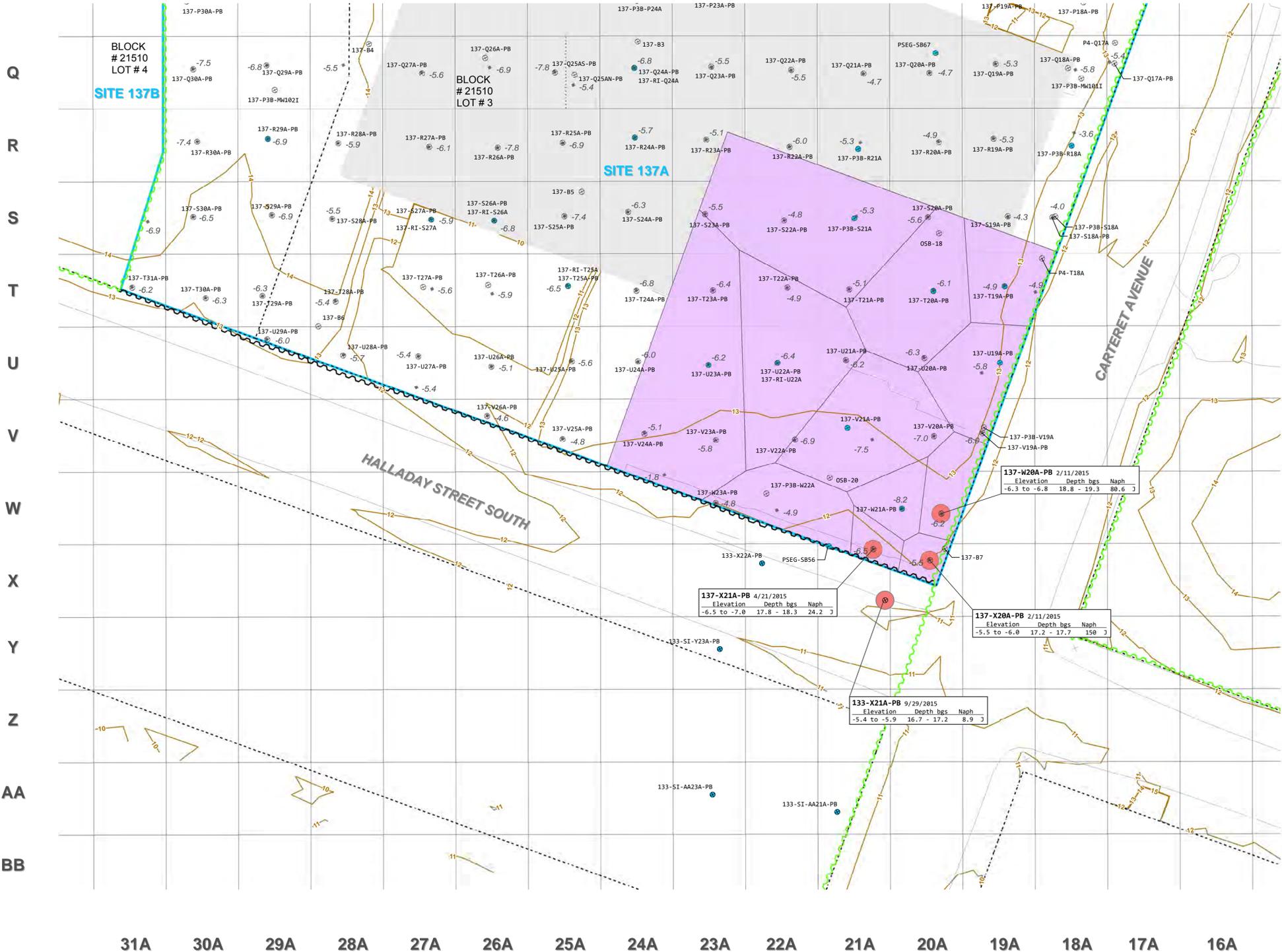
Based on the residential exposure scenario, the spatially weighted average naphthalene concentration within the study area at 137-W20A-PB-18.8-19.3, 137-X20A-PB-17.2-17.7 and 137-X21A-PB-17.8-18.3 is 5.8 mg/kg, which is compliant with the 6 mg/kg RDCSRS.

Attachments:

Figure 1 Functional Area for Compliance Averaging

Attachment 1 NJDEP Environmental Criteria for Naphthalene

SITE 132



ABBREVIATIONS:
 bgs - below ground surface
 ft - feet
 mg/kg - milligrams per kilogram
 Naph - naphthalene
 NAVD88 - North American Vertical Datum of 1988
 NJDEP— New Jersey Department of Environmental Protection
 NRDCSRS - New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standard
 PAHs - polycyclic aromatic hydrocarbons
 RDCSRS - New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard
 RDCSRS-GAG - Residential Direct Contact Soil Remediation Standard - Garfield Avenue Group (alternative remediation standard approved by the New Jersey Department of Environmental Protection on December 28, 2016)

QUALIFIERS:
 J - The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.

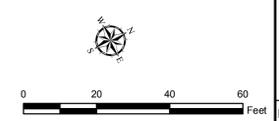
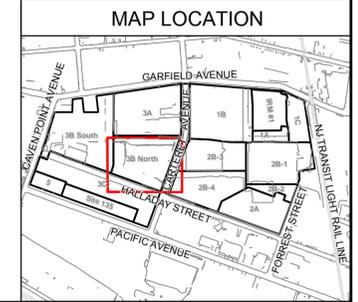
GENERAL NOTES:
 G1. The PAH data associated with the sample locations shown on this figure are provided in Table 5-3. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes for each outlier sample are provided in the Specific Notes in Table 5-3.
 G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.
 G3. Elevation vertical datum is NAVD88, in U.S. survey ft.
 G4. Results are reported in mg/kg.
 G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: <http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon>).
 G6. Site 137 North is comprised of Site 137A and the northern portion of Site 137B, and generally coincides with Phase 3B North.
 G7. This figure presents data for locations within the Site boundary that have samples remaining in place. Five remaining samples from Halladay Street South and Site 133 East are also shown for delineation of naphthalene.

SPECIFIC NOTES:
 S1. Property lines and pre-construction topographical contours are sourced from the "Boundary & Topographical Survey, PPG Site, Lot 5, Block 21510, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated May 30, 2014 and the "Boundary & Topographical Survey, PPG Sites 132 and 143, Lots 1 and 2, Block 21510, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated September 4, 2014.
 S2. Post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Site 133 & 135, Phase 3A," produced by Maser Consulting P.A., dated 03/17/2017.
 S3. In Grids Q24A, P28A, S26A, S27A, T25A, and U22A, two sample locations are located adjacent therefore the sampling location symbols overlap on the figure.
 S4. The pit bottom sample and as-built TEE for Grid W21A were inadvertently collected and measured at the edge of Grid W20A.
 S5. The selected PAHs on this figure and associated Table 5-3 are included at the request of the NJDEP, based on their October 10, 2014 e-mail assessing September 18, 2014 response to comments on the June 13, 2014 Phase 3B "Emanating from" Technical Memorandum.

LEGEND

⊙	SAMPLING LOCATION (REMAINING SAMPLES)	▲	POST-EXCAVATION ELEVATION SURVEY POINT REPRESENTING AS-BUILT TERMINAL EXCAVATION ELEVATION ACROSS GRID, UNLESS OTHERWISE NOTED (FT NAVD88)	■	FORMER BUILDING SLAB (AVERAGE ELEVATION 13.9 FT NAVD88)
○	REMAINING SAMPLES NOT ANALYZED FOR PAHS	⋯	APPROXIMATE LOCATION OF GRID SPLIT	□	GRID LAYOUT
●	RESULT IS BELOW THE MOST STRINGENT STANDARD	—	IN PLACE SHEET PILE (AS OF MARCH 2018)	▭	SITE 137 NORTH BOUNDARY
●	RESULTS EXCEED THE MOST STRINGENT STANDARD, BUT ARE IN COMPLIANCE WITH REMEDIATION OBJECTIVES	—	REMOVED SHEET PILE	▭	THEISSEN POLYGON
●	NAPHTHALENE (NAPH)	—	PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)	—	PROPERTY LINE

Soil Remediation Standards (mg/kg)		
Analyte	RDCSRS	NRDCSRS
BENZO(A)ANTHRACENE	5	17
BENZO(B)FLUORANTHENE	5	17
BENZO(K)FLUORANTHENE	45	170
INDENO(1,2,3-CD)PYRENE	5	17
NAPHTHALENE	6	17



PPG
 SITE 137 NORTH
 GARFIELD AVENUE GROUP
 JERSEY CITY, NEW JERSEY
 DATE: 03/07/2018

SAMPLE MAP FOR SELECT PAHS
 COMPARED TO SOIL REMEDIATION
 STANDARDS AND FUNCTIONAL AREA
 FIGURE 1