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Ford Motor Company

COMPREHENSIVE PHASE II SITE INVESTIGATION REPORT - SOIL ADDENDUM

Twin Cities Assembly Plant

St. Paul, Minnesota

August 2016

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota.

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ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,1,1-TCA	1,1,1-trichloroethane
Arcadis	Arcadis U.S., Inc.
BaP	benzo(a)pyrene
cis-1,2-DCE	*cis*-1,2-dichloroethene
DAF	dilution attenuation factor
DRO	diesel-range organics
ESA	environmental site assessment
eV	electron volt
Ford	Ford Motor Company
ft bgs	feet below ground surface
GRO	gasoline-range organics
IDW	investigation-derived waste
mg/kg	milligrams per kilogram
MPCA	Minnesota Pollution Control Agency
PAH	polynuclear aromatic hydrocarbon
PBP	Petroleum Brownfields Program
PID	photoionization detector
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PPE	personal protective equipment
ppm	parts per million
PRP	Petroleum Remediation Program
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental condition
SIR	Site Investigation Report
SLV	Soil Leaching Values

SRV	soil reference value
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
trans-1,2-DCE	*trans*-1,2-dichloroethene
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VIC	Voluntary Investigation and Cleanup
VOC	volatile organic compound
WI	Wisconsin

EXECUTIVE SUMMARY

This Comprehensive Phase II Site Investigation Report – Soil Addendum (SIR – Soil Addendum) was prepared by Arcadis U.S., Inc. (Arcadis) on behalf of Ford Motor Company (Ford) for the Twin Cities Assembly Plant (the Site). The objective of this report is to document the supplemental site soil investigation activities and corresponding analytical results that have been completed following submittal of the Comprehensive Phase II Site Investigation Report (SIR) in March 2016 to the Minnesota Pollution Control Agency (MPCA) consistent with Voluntary Investigation and Cleanup (VIC) Program and Petroleum Brownfields Program (PBP) guidance. The investigation results presented in the March 2016 SIR are not included in this report. Groundwater data collected during initial and supplemental investigation activities are not included in this report and will be reported under separate cover.

The geology at the Site consists of a relatively thin layer (approximately 5 to 15 feet thick) of unconsolidated overburden that is primarily sands, silts and clays. The unconsolidated overburden is underlain by a discontinuous shale layer (Decorah), a limestone/dolostone layer (Platteville), a continuous shale layer (Glenwood) and a sandstone layer (St. Peter). All activities described in this SIR – Soil Addendum were completed in the unconsolidated overburden.

The SIR identified several data gaps associated with investigations completed between 2007 and 2015 of recognized environmental conditions (RECs), historical RECs, and areas of interest identified during the Phase I Environmental Site Assessment completed in 2007. These areas were the focus of the supplemental delineation investigations completed between 2015 and 2016 and described in this report. In addition, an investigation of former Fill Areas A and B was completed in 2015 and 2016 to delineate impacted soil and potential residual waste both on-Site and to the south on the adjacent Canadian Pacific property.

Data collected during the investigation activities described in this report were compared to Soil Reference Values (SRVs) and Petroleum Remediation Program (PRP) Guidance Values for direct exposure to soil. As described in Section 5.0, Soil Leaching Values were not used as risk-based screening values in this Report as Ford has conducted a full groundwater investigation at the Site, to be reported under separate cover.

A summary of the compounds that have been detected at least once in soil at concentrations exceeding the screening values discussed above is shown in the table on the next page.

Compound	Soil > Tier I Residential SRVs Unconsolidated Overburden
Chlorinated volatile organic compounds	Yes
Non-chlorinated volatile organic compounds	Yes
Semivolatile organic compounds/polynuclear aromatic hydrocarbons	Yes
Metals	Yes
Gasoline-range organics	Yes
Diesel-range organics	Yes
Cyanide	No
Polychlorinated biphenyls	No

1 INTRODUCTION

This SIR – Soil Addendum was developed by Arcadis on behalf of Ford for the Twin Cities Assembly Plant. As requested by Ford's Environmental Quality Office staff, this report documents information collected during supplemental investigation activities conducted at the Site after submittal of the initial SIR. The purpose of the supplemental investigations was to provide lateral and vertical delineation of soil impacts that were identified in the SIR as well as provide delineation of impacted and residual waste around the suspected perimeter of Former Fill Areas A and B (southeast of the Main Assembly Building). This SIR - Soil Addendum includes an overview of the investigation methodologies, activities, and results of supplemental soil investigations in accordance with the MPCA VIC and PBP reporting guidelines. The investigation results presented in the March 2016 SIR are not included in this addendum report. Groundwater data collected during initial and supplemental investigation activities are not included in this SIR-Soil Addendum and will be reported under separate cover.

2 SITE BACKGROUND

The Site is located at 966 South Mississippi River Boulevard in St. Paul, Ramsey County, Minnesota at approximate Latitude (north) 44° 54' 50.8" and Longitude (west) 93° 11' 31.9" (Figure 1). The Site is located in a mixed industrial, commercial and residential use area on the eastern shore of the Mississippi River, along the east side of South Mississippi River Boulevard, south of Ford Parkway, and west of South Cleveland Avenue (Figure 2).

Former operations at the Site consisted of the assembly and painting of cars and trucks, using parts manufactured off site. During World War II, the plant was converted for a few years for the production of armored tanks and aircraft engines to support the war effort. From 1978 until plant closure in 2011, assembly operations were limited to light-duty trucks (Ford Ranger). Assembly processes included welding, metal cleaning, painting and curing, windshield and trim installation, and preparation of the vehicles for final delivery. Production buildings and several outbuildings comprised approximately 2,144,930 square feet within the property boundary. The primary production buildings consisted of the Main Assembly Building, which also included a Warehouse, and a Paint Building (Figure 2). In addition, a Wastewater Treatment Plant and Steam Plant west of Mississippi River Boulevard were associated with the former assembly operations (Figure 2). Manufacturing operations at the Site ceased on December 16, 2011.

2.1 Site History

The Site was vacant undeveloped land prior to construction of the assembly plant. Construction of the original portion of the Main Assembly Building began in 1923, with several additions, which occurred mainly between 1960 and 1978; these added 300,000 square feet to the original building footprint. The Paint Building was constructed in 1985 and was connected to the Main Assembly Building via a 625-foot bridge. The Steam Plant was constructed in 1923 and is approximately 10,400 square feet. A former coal gasification plant was located near the southeast corner of the Steam Plant, but was demolished prior to 1974. The Wastewater Treatment Plant is located adjacent to the Steam Plant, and was constructed in 1984. Additional details on the history of the Site are available in the Phase I Environmental Site Assessment (ESA; Arcadis 2007a).

2.2 Site Geology

The general geology of the Site, based on information identified during the Phase I ESA (Arcadis 2007a) and subsequent investigations is described below. Data collected to date were also used to develop representative geologic cross sections traversing the Site. The depth and thicknesses of the bedrock units and overburden geology described below, as interpreted from boring logs, are illustrated on geologic cross sections included in the SIR (Arcadis 2016a).

At the surface of the Site, a mantle of unconsolidated sediments exists over bedrock terraces. Underlying the unconsolidated material are sedimentary bedrock units that were deposited during the middle of the Ordovician geologic period. The sedimentary units are, in descending order, Decorah Shale, Platteville Limestone/Dolostone, Glenwood Shale, and St. Peter Sandstone.

The unconsolidated overburden consists predominately of sandy clay and clayey sand, much of which has been disturbed or reworked over the years due to various construction and demolition activities at the Site. Weathered shale is common and 2 to 5 feet of peat was observed east of the former oil fill area. The weathered shale is a blue-gray clay with varying degrees of fracturing and relic structures associated with the structure of the bedrock. The total thickness of the unconsolidated overburden is variable but generally is between 5 and 15 feet, with the thinner deposits occurring in the eastern portion of the Site where the Decorah Shale subcrops.

The Decorah Shale is the uppermost bedrock unit encountered at the Site. The upper portion of the Decorah Shale, at the contact with the unconsolidated overburden, is highly weathered, but transitions to be a more competent rock unit with depth. The thickness of the Decorah Shale is variable and it appears to be discontinuous across the Site. In general, the Decorah Shale is more prevalent in the eastern portion of the Site and has been eroded away in the western portion of the Site. Underlying the Decorah Shale (or the unconsolidated overburden where the Decorah Shale is absent) is the Platteville Formation. The Platteville Formation, which ranges in thickness from 20 to 30 feet on the main parcel, generally acts as an aquitard that limits vertical flow, although it is known to exhibit secondary permeability due to the development of vertical and bedding plane fractures. The upper portion of the Platteville Formation is typically heavily fractured, the lower portion less so. Perched groundwater in the upper portion of the Platteville often emerges as seeps at the edge of the bluff. The Platteville Limestone/Dolostone lies on top of the Glenwood Shale formation and the contact appears to be gradational. The Glenwood Shale is composed of dark green to gray shale and sandy shale. The formation is thinly laminated and moderately fissile (cleavable) and is approximately seven feet thick in the areas investigated. Beneath the Glenwood Shale is the St. Peter Sandstone, which is encountered at the Site at approximately 60 to 80 feet below ground surface on the main parcel. The St. Peter Sandstone outcrops along the bluffs of the Mississippi River and continues below the elevation of the riverbed. The sandstone is composed of medium-grained, well-sorted and well-rounded quartzite. It is white to buff in color and is medium to weakly indurated (hardened). The St. Peter formation is as much as 150 feet thick in the Twin Cities area.

Additional information on the geology of the Site can be found in the Phase I ESA (Arcadis 2007a) and the Initial Phase II – Exterior Investigation Report (Arcadis 2007b).

3 SUMMARY OF INVESTIGATION ACTIVITIES

Several phases of supplemental subsurface investigations have been completed at the Site since submittal of the SIR in March 2016 (Arcadis 2016a). The objective of the supplemental investigations was to address data gaps identified during reporting of the previous investigations with a summary of the supplemental investigations included in Table 1.

Only soil analytical data collected from these investigations are included within the results discussion of this SIR - Soil Addendum. A discussion of the groundwater results will be presented under separate cover at a later date.

Discussion of the analytical data collected during previous investigations is included within the results section of the SIR (Section 6; Arcadis 2016a). However, the comprehensive soil analytical data from the investigations discussed in the SIR and in this SIR - Soil Addendum are included in the figures of this report in order to provide a complete picture of the areas in question. Investigation locations completed as part of this SIR – Soil Addendum are highlighted on the figures to differentiate them from previous investigations as reported in the SIR. Field notes from the supplemental subsurface investigations listed below are included in Appendix A.

3.1 Supplemental Former Brake Fluid UST Investigation – 2015

Arcadis conducted additional investigation near the Former Brake Fluid Underground Storage Tank (UST) in December 2015. This investigation included the installation of three additional borings (ASB-0933, ASB-0934 and ASB-0935) in order to delineate semi-volatile organic compound (SVOC) and diesel range organic (DRO) soil impacts observed at ASB-0906 during one of the Work Element 2 – 2014 to 2015 investigations (Arcadis 2016a). Results of this investigation are discussed in Section 6.

3.2 Supplemental North Parking Area Investigation – 2015 to 2016

Arcadis conducted additional investigations in the North Parking Area in December 2015 and March 2016. This investigation included the installation of five soil borings (ASB-0216B and ASB-0228 through ASB-0231) for two purposes: 1) collection of an unsaturated soil sample adjacent to original boring ASB-0216 (it was identified that the previous soil sample was collected from below the water table) and 2) delineation of impacted groundwater (ASB-0228 through 0231). Delineation boring ASB-0216 was completed in March 2015 during the Work Element 2 mobilization. A soil sample collected from six to eight ft bgs detected concentrations of VOCs and GRO above the Tier II Industrial SRVs. This data was reported in the SIR (Arcadis 2016a). Upon further review of the boring log for ASB-0216, it was identified that the soil sample was collected from below the perched water zone and was therefore potentially indicative of impacts in the perched groundwater rather than in the soil. Therefore, one additional soil boring (ASB-0216B) was completed adjacent to the original ASB-0216 location and a sample was collected from three to five ft bgs, which was immediately above the saturated interval of the perched groundwater.

Four additional soil borings (ASB-0228 through ASB-0231) were completed north and south of ASB-0216 for delineation of impacted groundwater only. Results of those borings will be discussed under separate cover.

3.3 Supplemental Former Coal Gasification Plant Investigation – 2015 to 2016

Arcadis conducted an additional investigation near the Former Coal Gasification Plant in March 2016. This investigation included the installation of three soil borings (ASB-1113, ASB-1114 and ASB-1115) to delineate SVOC impacts identified during Work Element 1 (January 2014) and Work Element 2 (April 2015) investigations (Arcadis 2016a).

One additional boring (AMW-21), completed as part of the Area C Investigation Work Plan, was also utilized to provide delineation of SVOC impacts. This boring was completed southwest of ASB-1113.

Results of these investigations are discussed in Section 6 below.

3.4 Former Fill Areas A and B Investigation – 2015 to 2016

Arcadis completed 12 test trenches through the overburden around the suspected perimeter and within the footprint of Former Fill Areas A and B (southeast of the Main Assembly Building) to delineate the lateral and vertical extent of impacted soil/potential residual waste both on-Site and to the south onto the adjacent Canadian Pacific property. Six of the 12 trenches were completed on-Site and six trenches were completed on the adjacent Canadian Pacific property. Field screening data as well as soil analytical samples were collected during trenching to characterize the materials present. Soil samples were also collected from native soil below the fill material and from the soil beyond the observed lateral extent of Former Fill Areas A and B to provide delineation of those impacts. Results of this investigation are discussed in Section 6 below.

4 GENERAL INVESTIGATION METHODOLOGY

This section provides a summary of the means and methods utilized during the investigations. Field logbook/documentation procedures and the field quality assurance program were implemented in accordance with the approved June 2007 Field Sampling Plan (Arcadis 2007c). An addendum to Field Sampling Plan Section 3: Location and Sample Nomenclature was completed for the supplemental investigations, and is included in Appendix B. Standard operating procedures used to complete this field work are included in Appendix C, when applicable. This section will also reference approved work plans when applicable.

4.1 Utility Clearance

A full utility clearance was performed prior to initiating any subsurface work at the Site. Activities included but were not limited to:

- Notification of Gopher One Call to mark all public utility lines servicing the Site,
- Utilizing a private utility locator in the areas identified for subsurface work, and
- Surficial inspection referencing available utility and historical operational maps for each proposed boring location, if available.

After removing any surficial debris (i.e., asphalt or concrete), a hand auger was used to 1) confirm the absence of utilities and 2) investigate the top 5 feet below ground surface if no utilities existed.

4.2 Soil Borings

Soil borings were advanced using hand augers and direct-push drill rigs in areas of suspected impacts. Each boring was logged continuously by an Arcadis field geologist and screened using a photoionization detector (PID) with an 11.7 electron volt (eV) lamp. Soil boring logs were created in the field to identify material encountered for each borehole to total depth using the United Soil Classification System. Digitized soil boring logs are provided in Appendix D.

One to three soil samples were collected at each borehole. As stipulated in the *Subsurface Investigation Work Plan – Work Element 2* (Arcadis 2014b), the total number of borings to be advanced, the depth of exploration, and analytical sampling requirements were developed based on results of previous investigations. Soil samples were collected from the interval exhibiting the highest PID reading or evidence of potential impacts through visual or olfactory observations. If the highest PID reading did not correspond with exceedances observed at the original borehole location, a soil sample was collected from the interval corresponding to the initially observed exceedances. Another soil sample was then collected from the interval below the observed exceedance to provide vertical delineation. Borings were advanced until the target depth was reached or refusal due to bedrock was encountered.

Soil samples were collected in laboratory supplied containers and placed on ice pending shipment to the laboratory following standard chain-of-custody procedures. All samples were submitted to TestAmerica Laboratories in North Canton, Ohio for analysis of one or more of the following analytes:

- VOCs using United States Environmental Protection Agency (USEPA) Method 8260,
- SVOCs using USEPA Method 8270,
- GRO using the Wisconsin (WI) Modified Method, and
- DRO using the WI Modified Method.

Additional details regarding the number of samples, bottles, preservation, etc. for each analytical method is included in Table 2. Upon completion, bentonite chips were used to abandon each unregulated borehole. If groundwater was encountered, then the borehole was sealed in accordance with Minnesota Department of Health guidelines and a Borehole Sealing Record was prepared. Copies of borehole sealing records are in Appendix E. The surface disturbance of each borehole was repaired to match surrounding materials.

4.3 Trenching

4.3.1 Field Screening

Soil excavated as part of the Former Fill Areas A and B investigation was screened in accordance with the *Former Fill Areas A and B Investigation Technical Memorandum* (Arcadis 2014a). These excavations targeted delineation of waste material (e.g., glass, brick, metal) identified during site decommissioning activities (Arcadis 2016b). Individual trenches were extended down to the top of the native blue-gray clay layer within the unconsolidated soil, which was interpreted to be undisturbed native soil. Trenches were also extended laterally until no waste materials were observed in the trench for a minimum of 10 lateral feet. All excavated soil was screened using a PID with an 11.7eV lamp at a minimum frequency of once per 10 cubic yards of soil. The excavated soil was also continuously screened for visual presence or olfactory indications of waste material. Excavated soil on Site was handled as follows:

- If PID readings were less than 10 parts per million (ppm) and soil did not show any visual or olfactory indications of impacts or waste material:
    - The soil was stockpiled for use to be placed back in the excavation following remedial action of the area, with no additional sampling requirements.
- If PID readings greater than 10 ppm and/or soil had any indications of visual or olfactory impacts or contained waste material:
    - Excavated soil was stockpiled for off-Site disposal in accordance with requirements of a Ford-approved and MPCA-permitted off-Site disposal facility. Excavated soil staged in stockpiles were placed on and covered by polyethylene sheets until removed from the Site.
    - Excavated soil on adjacent the adjacent Canadian Pacific property was handled as follows:
- If PID readings were less than 10 parts per million (ppm) and soil did not show any visual or olfactory indications of impacts or waste material:
    - The soil was stockpiled for use to be placed back in the excavation after trenching was complete, with no additional sampling requirements.

- If PID readings greater than 10 ppm and/or soil had any indications of visual or olfactory impacts or contained waste material:
    - Excavated soil was containerized for off-Site disposal in accordance with requirements of a Ford-approved and MPCA-permitted off-Site disposal facility. Excavated soil staged in roll-off containers were covered by polyethylene sheets until removed from the Site.

4.3.2 Analytical Sampling

Upon completion of each trench, soil analytical samples were collected at the terminus from both the brown silty/sandy clay and the underlying native blue-gray clay to determine whether soil was impacted beyond the extent of the waste materials. Samples were submitted for analysis of the following, per the Former Fill Areas A and B work plan:

- VOCs using USEPA Method 8260,
- SVOCs using USEPA Method 8270, and
- Target Analyte List (TAL) metals using USEPA Method 6010.

Analytical results for soil samples were compared to the MPCA Tier I Residential SRVs and MPCA Tier II Industrial SRVs for direct contact with soil.

In addition, if soil excavated from the trenches exhibited PID readings greater than 10 ppm, had visual or olfactory indications of impacts, or had waste material the impacted soil was sampled at approximately 100-foot lateral intervals for characterization and for off-Site disposal via the following:

- VOCs using USEPA Method 8260,
- SVOCs using USEPA Method 8270,
- Priority Pollutant metals using USEPA Method 6010,
- Polychlorinated biphenyls (PCBs) using USEPA Method 8082,
- Toxicity characteristic leaching procedure (TCLP) VOCs using USEPA Method 1311/8260,
- TCLP Resource Conservation and Recovery Act (RCRA) Metals using USEPA Method 1311/6010, and
- TCLP SVOCs using USEPA Method 1311/8270.

All stockpiles awaiting off-site disposal were sampled at the following frequency, which is consistent with MPCA PRP Guidance Document 4-04 Soil Sample Collection and Analysis Procedures (MPCA 2008):

Cubic Yards of Soil	Number of Grab Samples
Less than 50	1
51-500	2
501-1000	3
1001-2000	4
2001-4000	5
Each additional 2,000	One additional sample

All soil samples collected for analysis were transferred to laboratory-supplied containers and placed on ice pending shipment to the laboratory following standard chain-of-custody procedures. Samples were submitted to TestAmerica Laboratories in North Canton, Ohio for analysis. Additional details regarding the number of samples, bottles, preservation, and holding time for each analytical method listed above is included in Table 2.

After each trench was complete, Class 5 crushed concrete was used to backfill the excavations to grade. Trenches on the adjacent Canadian Pacific property were backfilled first with Class 5 crushed concrete, then topped to grade with the excavated soil from the same trench, as long as it met the field screening parameters defined in Section 4.3.1 and no visual or olfactory indications of impacts or waste material were observed.

4.4 Decontamination Procedures

Drilling and sampling equipment (e.g., drill rig, drill casings, rods, sample barrel, hand augers, stainless steel spatulas) and any piece of equipment that could have potentially come into contact (directly or indirectly) with impacts were decontaminated on-site. Decontamination protocols were followed per the Field Sampling Plan between boreholes and before leaving the site at the end of the project.

Drilling and sampling equipment were disassembled and immersed in a 2-percent solution of laboratory-grade detergent (e.g., Alconox) and city water. The equipment was then scrubbed to remove any adhering particles and rinsed with distilled water. The clean equipment was then handled with clean disposable gloves to avoid potential contamination. The 2 percent solution of laboratory-grade detergent and city water was changed daily or more frequently after drilling at highly impacted locations.

Hand augers and stainless steel spatulas were rinsed with a solution of laboratory-grade detergent (e.g., Liquinox) and distilled water. The equipment was then scrubbed to remove any adhering particles and rinsed with distilled water. The clean equipment was then handled with clean disposable gloves to avoid potential contamination.

All decontamination water was containerized as investigation-derived waste (IDW) and disposed of as described in Section 4.5.2.

4.5 Investigation-derived Waste

4.5.1 Boring IDW

Soil cuttings generated during the subsurface investigations were staged in 55-gallon drums. Soil cuttings were segregated in the field prior to disposal pursuant to field screening results using the following segregation parameters:

- Zero to <100 parts per million on a PID,
- Greater than 100 parts per million on a PID.

As discussed in the SIR, waste characterization samples were collected from the 2013 to 2014-generated soil cuttings to develop a site-specific waste characterization profile for subsequent subsurface investigation soil cuttings IDW. The waste characterization samples consisted of composite samples collected from 12 of the 30 soil IDW 55-gallon drums. The site-specific waste characterization profile was used for off-site disposal of all non-hazardous soil cuttings generated during the site investigation activities described in this report. The off-site disposal was facilitated through Waste Management Inc. and transported to the Spruce Ridge Facility in Glencoe, Minnesota.

4.5.2 Decontamination Water IDW

Decontamination water generated during investigation activities was containerized in 55-gallon drums for off-site disposal. A site-specific waste characterization profile was also generated for the decontamination water IDW in 2014, and was used for off-site disposal of IDW generated during the site investigation activities described in this report. The off-site disposal was facilitated through Waste Management Inc. and transported to the Spruce Ridge Facility in Glencoe, Minnesota.

4.5.3 PPE and Disposable Sampling Equipment IDW

PPE (Personal Protective Equipment) and disposable sampling equipment were placed in 55-gallon drums and disposed of off-site after review of subsurface investigation results. A site-specific waste characterization profile was also generated for the PPE and disposable sampling equipment in 2014 based on analytical results for the soil and purge water and decontamination water IDW. The off-site disposal was facilitated through Waste Management Inc. and transported to the Spruce Ridge Facility in Glencoe, Minnesota.

4.5.4 Trench IDW

Soil excavated on-Site was staged in stockpiles placed on and covered by polyethylene sheets. Soil excavated on the adjacent Canadian Pacific property was staged in roll-off containers and also covered by polyethylene sheets. Samples collected for off-Site disposal were analyzed per requirements of the Ford-approved and MPCA-permitted disposal facility. MPS Group developed all soil waste profiles pertaining to Former Fill Area A and B trench IDW, based on the analytical results, and coordinated transportation and disposal with the disposal facility. Waste Manifests for off-Site disposal are included in Appendix F.

4.6 Surveying

Soil borings were surveyed for X, Y, and Z (ground surface) coordinates referencing the National Geodetic Vertical Datum of 1929 and North American Datum of 1983 (NAD83) by Sunde Land Surveying, LLC, a professional Minnesota-certified land surveyor, at the completion of each investigation event.

Trench sampling and terminus locations were collected for X and Y coordinates referencing the World Geodetic System of 1984 using a mobile global positioning system unit and converted to NAD83 coordinates at the completion of each trench.

5 RISK-BASED SCREENING LEVELS

Results of the investigation activities described above were compared to risk-based screening values developed and propagated by the MPCA. These risk-based levels are only a preliminary screening tool and are not intended to indicate areas of the Site where remediation may be required. Final remediation action levels will be included as part of a Response Action Plan. The risk-based values that will be included in the screening include:

- MPCA SRVs for direct contact with soil,
- MPCA PRP Guidance Values for direct contact with petroleum impacted soil, and
- Soil Leaching Values (SLVs) for potential risk to groundwater from soil concentrations of VOCs.

Each of these risk-based screening levels are discussed in more detail below.

5.1 Soil Reference Values

SRVs are a screening tool used to evaluate potential human health risks from direct soil exposure. SRVs were derived by the MPCA using the USEPA Superfund methodology. As stated above, SRVs are intended to be a screening tool to identify areas where additional investigation or remediation should be considered. SRVs have been developed for two soil land use categories, residential/recreational and commercial/industrial. Soil analytical data included in Section 6 will be compared against both soil land use categories because a final land use has yet to be determined for the Site.

5.2 Petroleum Remediation Program Guidance Values

The PRP has provided guidance values for preliminary screening of soil impacted with GRO and DRO. The soil guidance value of 100 milligrams per kilogram for GRO and DRO is presented in the document titled Best Management Practices for the Off-Site Reuse of Unregulated Fill (MPCA 2012).

5.3 Soil Leaching Values

SLVs are a compound-specific, risk-based screening tool commonly used by the VIC program to evaluate risk posed to groundwater by soil leaching. SLVs are calculated using an analytic model based on a soil partitioning equation and a dilution attenuation factor (DAF). This process was derived from the EPA Soil Screening Guidance (EPA 1996a, EPA 1996b). However, for older soil releases, such as those at the Ford site, the presence or absence of target compounds in groundwater at concentrations of concern is the more telling evidence of the significance of the soil leaching pathway. A complete groundwater investigation was completed at this Site, therefore SLVs are not an applicable risk-based screening value for this Site.

6 SOIL INVESTIGATION RESULTS

A comprehensive list of the compounds that exceed a screening value (as discussed in Section 5) for each contaminant class is provided in Table 3. Contaminant classes are divided into the following: chlorinated VOCs, non-chlorinated VOCs, SVOCs/PAHs, metals, PCBs, and GRO/DRO which are shown on Figures 3 through 8 respectively. For the purposes of this report, the term "chlorinated VOCs" refers to the following compounds:

- 1,1-Dichloroethane (1,1-DCA)
- 1,1,2-Trichloroethane
- 1,1,1,2-Tetrachloroethane
- 1,1,1-Trichloroethane (1,1,1-TCA)
- 1,2-Dichloroethane (1,2-DCA)
- Chloroethane
- 1,1,2,2-Tetrachloroethane
- 1,1-Dichloroethene (1,1-DCE)
- *cis*-1,2-Dichloroethene (cis-1,2-DCE)
- Tetrachloroethene (PCE)
- *trans*-1,2-Dichloroethene (trans-1,2-DCE)
- Trichloroethene (TCE)
- Vinyl chloride.

As indicated in the SIR, iron results are not included on Figure 6 because iron detections above residential SRVs are ubiquitous across the Site including background samples, which indicates residential SRVs are not an appropriate screening tool (Arcadis 2016a). Site-specific remedial action values for naturally occurring metals that have been detected at the Site will be calculated as part of a Remedial Action Plan.

Analytical results of detected compounds from each contaminant class are included in Table 4. A comprehensive list of soil analytical results is included in Appendix G. Laboratory analytical reports are included in Appendix H.

6.1 Supplemental Former Brake Fluid UST Investigation

Three additional soil borings (ASB-0933, ASB-0934 and ASB-0935) were advanced to delineate SVOC and DRO impacts identified in soil at ASB-0906 during investigation of the former brake fluid UST at the southwest corner of the Main Assembly Building. One soil sample was collected from each supplemental location. Due to some topographical relief in this area, the sample depth was adjusted in the field to match the vertical elevation of the sample collected from ASB-0906. SVOCs were detected in all three soil samples, but did not exceed their respective residential SRVs. DRO was detected at ASB-0933

(delineation location directly west of ASB-0906), but did not exceed the PRP Guidance Value of 100 milligrams per kilogram (mg/kg). DRO was not detected in either of the other two locations. These results confirm delineation has been completed to the west of ASB-0906. Delineation to the east, north, and south was completed during previous investigations (Arcadis 2016a).

A list of the SVOC and DRO detections is included in Table 4. A complete list of the analytical results is included in Appendix G. A summary of comprehensive SVOC results is illustrated on Figure 5. A summary of comprehensive DRO results is illustrated on Figure 8.

6.2 Supplemental North Parking Area Investigation

As indicated in Section 3.2 above, the soil sample collected at ASB-0216 was collected from below the water table in the perched aquifer, and therefore not indicative of soil impacts. As a result, an additional co-located soil boring (ASB-0216B) was completed to evaluate soil conditions above the perched groundwater table at ASB-0216. One soil sample was collected at the interval just above the groundwater table and analyzed for VOCs and GRO. The analyses did not detect concentrations of chlorinated VOCs, non-chlorinated VOCs, or GRO. These results confirm that impacts identified in the original ASB-0216 boring are indicative of impacts associated with groundwater and not soil, and provides delineation of the soil impacts for ASB-0202S and the North Parking Area.

Analytical results for VOC and GRO detections are included in Table 4. A complete list of the analytical results is included in Appendix G. A summary of comprehensive chlorinated VOC results is illustrated on Figure 3. A summary of comprehensive non-chlorinated VOC results is illustrated on Figure 4. A summary of comprehensive GRO results is illustrated on Figure 8.

6.3 Supplemental Former Coal Gasification Plant Investigation

Three soil borings (ASB-1113, ASB-1114, and ASB-1115) were completed surrounding the Former Coal Gasification Plant to delineate SVOC impacts that were previously identified in this area. In addition, one soil boring (AMW-21), completed as part of the separate Area C Investigation Work Plan, was also utilized to delineate the identified SVOC impacts and was located west of ASB-1113. The depth of the samples were selected to match the elevation of impacts identified at nearby borings. Three samples were collected from ASB-1113 at depths of 2 to 4 ft bgs, 6 to 8 ft bgs and 28 to 30 ft bgs. Two samples were collected from ASB-1115 at depths of 2 to 4 ft bgs and 11 to 13 ft bgs. No samples were collected from ASB-1114 because the target sample depths were 18 to 20 ft bgs and 33 to 35 ft bgs to match the elevation of impacts identified at ASB-1106 and the direct push drilling rig hit refusal due to bedrock at 17 ft bgs, before the impacted interval would have been encountered. Three samples were collected from AMW-21 at depths of 5 to 10 ft bgs, 16 to 20 ft bgs, and 32 to 35 ft bgs.

The sample collected from ASB-1113 from 6 to 8 ft bgs detected benzo(a)pyrene (BaP) equivalents at a concentration of 2.94 mg/kg which is greater than the Tier 1 Residential SRV of 2 mg/kg. Additional delineation to the east was limited by the access road and limited to the south by a steep slope. The sample collected from AMW-21 from 16 to 20 ft bgs detected benzo(a)pyrene (BaP) equivalents at a concentration of 2.16 mg/kg which is greater than the Tier 1 Residential SRV of 2 mg/kg. Existing borings (e.g., ASB-193, ASB-195, ASB-198, ASB-1103, ASB-1104 and ASB-1110) and analytical results from

AMW-21 provide enough analytical data to the north and west to sufficiently characterize SVOC impacts in this area.

The two samples from ASB-1115 did not detect SVOCs exceeding their applicable residential SRVs. These results provide delineation to the north of the SVOC impacts identified at ASB-1107, ASB-1108, and ASB-1111.

The sample collected at AMW-21 from 16 to 20 ft bgs also detected DRO at 120 mg/kg which is greater than the PRP Guidance Value of 100 mg/kg. The analyte was also detected in the method blank at a concentration above the method detection limit but below the reporting limit. As a result, the detection of DRO within the 16 to 20 ft bgs sample at AMW-21 is considered an estimate. Additional delineation to the west, south, and east was limited by the steep slope. Existing boring ASB-198 provides analytical data to the north to characterize DRO impacts in this area.

Analytical results for SVOC and DRO detections are included in Table 4. A complete list of the analytical results is included in Appendix G. A summary of SVOC results is illustrated on Figure 5. A summary of DRO results is illustrated on Figure 8.

6.4 Former Fill Areas A and B Investigation

The trench investigation around the suspected perimeter of Former Fill Areas A and B was conducted to delineate impacted soil and potential residual waste in the overburden. Twelve trenches were completed to confirm the lateral and vertical extent of Former Fill Areas A and B; six were completed on Site (Trench 1 through Trench 6) and six were completed on the adjacent Canadian Pacific property (Trench 7 through Trench 12).

Individual trenches were excavated down to the native blue-gray clay, with the exception of Trench 12, and extended horizontally at least 10 feet beyond observed waste/fill materials. At Trench 12, no native blue-gray clay was detected at the maximum depth that could be reached with the on-site equipment (13 ft bgs). Additional details are provided below.

As described in Section 4.3.2 above, two soil samples (one sample from the brown silty/sandy clay and one from the underlying native blue-gray clay below the brown silty/sandy clay) were collected to characterize the soil within the extent of waste materials. Additional samples were collected if the lateral extent of waste materials exceeded approximately 100 lateral feet or if the observed impacts (waste materials, elevated PIDs, and/or olfactory impacts) changed. Samples were also collected at the terminus of each trench to determine whether soil was impacted beyond the extent of the observed waste materials.

Analytical results and field observations from the trenching activities indicate the impacted soil is limited to the brown silty/sandy clay overburden, and does not extend vertically into the native blue-gray clay. Additionally, the lateral extent of Former Fill Area A and B is generally limited to the extent of visual impacts, however, three trenches (Trench 1, Trench 9, and Trench 11) exhibited metals impacts in the samples collected at the end of the trench that exceeded either Tier I Residential or Tier II Industrial SRVs. The location, approximate extent of waste material, and sample analytical locations and exceedances for each of the trenches is illustrated on Figure 9. Analytical results of detected compounds from each contaminant class are included in Table 4. The observations and analytical results discussed below are also summarized in Table 5.

Below is a discussion of the observations as well as analytical results from the characterization and terminus samples of each trench.

On-Site Trenches

Trench 1

Total Trench Length (feet)	Fill/Waste Material Identified	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
90	0 to 80 linear feet 0 to 6 feet deep	brick, glass, concrete, cables, metal	non-chlorinated VOCs, SVOCs, and metals (No SRV exceedances)
		PID readings greater than 10 ppm	
		petroleum-like and solvent-like olfactory impacts	

The characterization sample collected from within the native blue-gray clay layer detected barium above the Tier I Residential SRV. Additional metals as well as SVOCs were detected within the native blue-gray clay layer, but did not exceed their respective residential SRV. VOCs and PCBs were not detected.

Two samples were collected at the terminus of Trench 1; one within the brown silty/sandy clay and one within the native blue-gray clay. The terminus soil sample from within the brown silty/sandy clay detected VOCs and SVOCs, but neither exceeded their respective residential SRVs. Antimony was detected above the Tier II Industrial SRV and barium was detected above the Tier I Residential SRV. The soil sample from within the native blue-gray clay had detections of VOCs, SVOCs, and metals, but did not have exceedances of their respective residential SRVs.

The analytical results for the native blue-gray clay confirm vertical delineation of both antimony and barium exceedances identified in the brown silty/sandy clay layer of the terminus samples, as well as lateral delineation of the barium exceedance identified in the native blue-gray clay layer of the characterization sample. Lateral delineation for both the antimony and barium within the brown silty/sandy clay layer at the terminus is confined by analytical results for ASB-0701E as well as ASB-261 (Figure 6).

These results, in addition to observations of waste materials noted above, delineate residual soil and waste impacts for Trench 1.

Trench 2

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Samples Analytical Detections (brown silty/sandy clay)
125	0 to 70 linear feet 0 to 6 feet deep	metal (e.g., aluminum, copper, steel, iron)	non-chlorinated VOCs, SVOCs, and metals (No SRV exceedances)
		PID readings greater than 10 ppm	
		petroleum-like and solvent-like olfactory impacts	

Characterization samples were collected from five lateral feet and 50 lateral feet from the start of the trench. Samples from above the native blue-gray clay layer at both distances detected non-chlorinated VOCs, SVOCs, and metals, but none exceeded their respective residential SRVs. Chlorinated VOCs were not detected in the samples. Only metals were detected in the native blue-gray clay layer sample from five lateral feet, but not at concentrations exceeding their applicable residential SRVs. PCBs were not detected in any of the samples from five or 50 lateral feet.

Two samples were collected from the terminus of Trench 2. No chlorinated VOCs or non-chlorinated VOCs were detected in either the brown silty/sandy clay or native blue-gray clay samples at the terminus. SVOCs and metals were detected in both samples, but did not exceed their respective residential SRVs.

None of the samples collected from Trench 2 (characterization or terminus) detected concentrations of VOCs, SVOCs, or metals exceeding their corresponding residential SRVs. These results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 2.

Trench 3

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Samples Analytical Detections (brown silty/sandy clay)
160	0 to 150 linear feet 0 to 12 feet deep	PID readings greater than 10 ppm	non-chlorinated VOCs, SVOCs (Tier I Residential and Tier II Industrial SRV exceedances)
		petroleum-like and solvent-like olfactory impacts	metals, PCBs (No SRV exceedances)

Characterization samples were collected from 20 and 100 lateral feet from the start of the trench. Two samples were collected at 20 lateral feet: one within the brown silty/sandy clay layer and one within the native blue-gray clay layer. The following non-chlorinated VOC constituents were detected in the brown silty/sandy clay layer above their respective Tier II Industrial SRVs: 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; ethylbenzene; naphthalene; n-butylbenzene; and total xylenes. Non-chlorinated VOC constituents detected in the brown silty/sandy clay layer above their respective Tier I Residential SRVs included n-propylbenzene and sec-butylbenzene. Naphthalene was also detected above its corresponding SVOC Tier II Industrial SRV. The SVOC constituent 2-methylnaphthalene was detected above its corresponding Tier I Residential SRV. Metals and PCBs were also detected but did not exceed their corresponding residential SRVs. Chlorinated VOCs were not detected. The native blue-gray clay layer at 20 lateral feet detected non-chlorinated VOCs, SVOCs and metals, but none exceeded their corresponding residential SRVs. This provided vertical delineation of VOC and SVOC exceedances detected in the brown silty/sandy clay layer at 20 lateral feet within Trench 3 noted in the table above.

One characterization sample was collected from 100 lateral feet within the native blue-gray clay layer as there was no brown silty/sandy clay layer. SVOCs and metals were detected, but did not exceed their applicable residential SRVs. VOCs were not detected. This provided lateral delineation of the native blue-gray clay layer.

One sample was collected from the native blue-gray clay layer at the terminus as there was no brown silty/sandy clay layer. No chlorinated VOCs or non-chlorinated VOCs were detected in the sample. SVOCs and metals were detected, but did not exceed their respective residential SRVs.

The VOC and SVOC exceedances identified in the brown silty/sandy clay layer characterization sample at 20 lateral feet was vertically delineated by the native blue-gray clay characterization sample at 20 lateral feet and laterally delineated by the blue gray clay characterization sample at 100 lateral feet. The native blue-gray clay layer terminus sample also provided lateral delineation at Trench 3. These results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 3.

Trench 4

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
85	0 to 75 linear feet 0 to 9 feet deep	debris	non-chlorinated VOCs, SVOCs (Tier I Residential and Tier II Industrial SRV exceedances) metals (No SRV exceedances)
		PID readings greater than 10 ppm	
		petroleum-like and solvent-like olfactory impacts	

Characterization samples was collected from the brown silty/sandy clay and native blue-gray clay layers at 40 lateral feet. The following non-chlorinated VOCs were detected in the brown silty/sandy clay layer above their respective Tier I Residential SRVs: 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; and total xylenes. Naphthalene was also detected above its corresponding VOC and SVOC Tier II Industrial SRVs. Metals were detected in the brown silty/sandy clay layer, but did not exceed their corresponding residential SRVs. The native blue-gray clay layer sample at 40 lateral feet detected non-chlorinated VOCs, SVOCs, and metals, but none exceeded their corresponding residential SRVs. This confirmed vertical delineation of impacts in the brown silty/sandy clay layer noted in the table above. Chlorinated VOCs and PCBs were not detected in either sample.

The terminus samples from both the brown silty/sandy clay and native blue-gray clay layers detected non-chlorinated VOCs, SVOCs, and metals, but did not exceed their respective residential SRVs. Chlorinated VOCs were not detected in either sample.

The VOC and SVOC exceedances identified in the brown silty/sandy clay layer characterization sample at 40 lateral feet was vertically delineated by the native blue-gray clay layer sample at 40 lateral feet and laterally delineated by the brown silty/sandy clay terminus sample at 85 lateral feet. These results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 4.

Trench 5

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
125 (3 Sections)	none observed	none observed	brown silty/sandy clay not present

Trench 5 is comprised of three sections, with the final section terminus approximately 125 feet from the start, and is located on the east side of the former railroad track parallel to Trench 2 (Figure 9). The true terminus was determined to be within the center section, approximately 50 feet from the start. No waste material, PID readings above background (0.0 ppm), or olfactory impacts were encountered. As a result, no waste characterization sample was collected. In addition, there was no brown silty/sandy clay layer within the center section or south section. Thus, a sample was collected from the native blue-gray clay layer only within the center section (terminus). Non-chlorinated VOCs, SVOCs, and metals were detected in the sample, but did not exceed their respective residential SRVs. Chlorinated VOCs was not detected in the sample.

These results, in addition to no observations of waste materials noted above, delineates residual soil and waste impacts for Trench 5.

Trench 6

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
50	none observed	none observed	not present (no analytical sample collected)

Trench 6 was completed perpendicular to Trench 5 from the 125-foot terminus. The Trench 6 section extended east and started approximately 50 feet from Trench 5. Again, no waste material, PID readings above background, or olfactory impacts were encountered. Additionally, there was no brown silty/sandy clay layer within this section; therefore, a sample was collected from the native blue-gray clay layer only. Chlorinated and non-chlorinated VOCs was not detected in the sample. SVOCs and metals were detected in the sample, but did not exceed their respective residential SRVs.

These results, in addition to no observations of waste materials noted above, delineates residual soil and waste impacts for Trench 6.

Adjacent Canadian Pacific Property

Trench 7

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Samples Analytical Detections (brown silty/sandy clay)
330 (6 Sections)	0 to 320 linear feet 0 to 11 feet deep	metals, nails, glass PID readings greater than 10 ppm petroleum-like and solvent-like olfactory impacts	chlorinated/non-chlorinated VOCs, SVOCs (Tier I Residential and Tier II Industrial SRV exceedances) metals (No SRV exceedances)

Three sets of characterization samples were collected: at 10, 150, and 300 lateral feet from the start of the trench. No PCBs were detected in any of the six samples. VOCs, SVOCs, and metals were detected in all six samples. Only the brown silty/sandy clay layer exhibited detections above corresponding Tier I Residential and Tier II Industrial SRVs for each distance; the native blue-gray clay layer characterization samples did not have detections above any corresponding residential SRVs.

At 10 lateral feet in the brown silty/sandy clay layer, a chlorinated VOC (1,1,2-trichloroethane) was detected, but did not exceed its corresponding residential SRV. This same chlorinated VOC was detected at 150 lateral feet and exceeded the Tier II Industrial SRV. However, this constituent was not detected at 300 lateral feet, providing lateral delineation in addition to vertical delineation (as indicated in the paragraph above).

The brown silty/sandy clay layer sample at 150 lateral feet also detected the following non-chlorinated VOCs above their respective Tier II Industrial SRVs: 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; naphthalene; and total xylenes. The non-chlorinated VOC n-butylbenzene was detected above its corresponding Tier I Residential SRV. Naphthalene was also detected above its corresponding SVOC Tier II Industrial SRV. These same constituents were detected in the native blue-gray clay layer at this location, but did not exceed their corresponding residential SRVs and confirms vertical delineation. In addition, these same VOC constituents were not detected in the brown silty/sandy clay layer sample at 300 lateral feet which confirms lateral delineation. The SVOC constituent above was detected in the brown silty/sandy clay layer sample at 300 lateral feet, but did not exceed its corresponding residential SRV, which also confirms lateral delineation.

In addition, the brown silty/sandy clay layer sample at 300 lateral feet detected antimony above its corresponding Tier II Industrial SRV and lead above its corresponding Tier I Residential SRV. The sample within the native blue-gray clay layer at this location did not detect antimony and detected lead at a concentration that did not exceed the residential SRV. The sample within the native blue-gray clay layer confirms vertical delineation of antimony and barium.

The terminus samples detected non-chlorinated VOCs and metals in both the brown silty/sandy clay and native blue-gray clay layers, but none exceeded their respective residential SRVs. These analytical results confirm lateral delineation of the antimony and barium exceedances noted above. The terminus

sample from within the brown silty/sandy clay detected SVOCs as well, but did not have any exceedances of corresponding residential SRVs. Chlorinated VOCs were not detected in either sample.

These analytical results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 7.

Trench 8

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
65 (2 Sections)	0 to 45 linear feet 0 to 13 feet deep	metals pieces and wiring, nails, glass	non-chlorinated VOCs, SVOCs, PCBs (No SRV exceedances) metals (Tier II Industrial SRV exceedances)
		PID readings greater than 10 ppm	
		solvent-like olfactory impacts	

One set of characterization samples was collected at the start of the trench. Non-chlorinated VOCs and SVOCs were detected in both the brown silty/sandy clay layer and native blue-gray clay layer, but did not exceed their corresponding residential SRVs. Antimony was detected in the brown silty/sandy clay layer above the Tier II Industrial SRV, but was not detected in the blue-gray layer and thus confirmed vertical delineation. Other metals were detected in both layers, but did not exceed corresponding residential SRVs. PCBs were detected in the brown silty/sandy clay layer, but did not exceed residential SRVs. Chlorinated VOCs were not detected in either sample.

The soil samples collected from within the brown silty/sandy clay layer and native blue-gray clay layer at the terminus detected SVOCs and metals, but not at concentrations exceeding their respective residential SRVs. These analytical results confirm lateral delineation of the antimony exceedance noted within the characterization sample. Non-chlorinated VOCs were also detected in the brown silty/sandy clay layer at the terminus, but did not exceed their applicable residential SRVs. Chlorinated VOCs were not detected in this sample. VOCs were not detected in the native blue-gray clay sample.

These analytical results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 8.

Trench 9

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
40	0 to 20 linear feet 0 to 6 feet deep	metal pieces, nails, glass	non-chlorinated VOCs, SVOCs, PCBs (No SRV exceedances) metals (Tier I Residential SRV exceedances)
		solvent-like olfactory impacts	

One set of characterization samples was collected at the start of the trench. Non-chlorinated VOCs and SVOCs were detected in both the brown silty/sandy clay layer and native blue-gray clay layer, but did not exceed their corresponding residential SRVs. Antimony was detected in the brown silty/sandy clay layer above the Tier I Residential SRV, but not detected in the blue-gray layer and thus confirms vertical delineation. PCBs were not detected in either sample.

The terminus soil sample from within the brown silty/sandy clay detected SVOCs, but did not exceed their respective residential SRVs. Antimony was detected above the Tier I Residential SRV. No other metals detected in the sample exceeded their respective residential SRVs. No VOCs were detected in the sample. The soil sample from within the native blue-gray clay had detections of metals, but did not have exceedances of their respective residential SRVs. VOCs and SVOCs were not detected in this sample.

Observations of the waste materials noted above delineate residual waste impacts for Trench 9. Although the native blue-gray clay samples confirm vertical delineation of the antimony exceedance at both the characterization and terminus locations, lateral delineation for antimony was not confirmed.

Trench 10

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
60	0 to 10 linear feet	metal wiring, nails, glass	chlorinated/non-chlorinated VOCs, SVOCs (No SRV exceedances)
	0 to 5 feet deep	PID readings greater than 10 ppm	metals (Tier I Residential and Tier II Industrial SRV exceedances)

One set of characterization samples was collected at the start of the trench. VOCs (chlorinated and non-chlorinated) and SVOCs were detected within the brown silty/sandy clay layer, but did not exceed their corresponding residential SRVs. Antimony, arsenic, and lead were detected at concentrations exceeding their respective Tier II Industrial SRVs within the brown silty/sandy clay layer; this sample also detected cadmium and copper at concentrations exceeding their respective Tier I Residential SRVs. No metals were detected within the native blue-gray clay layer at concentrations exceeding their residential SRVs, which confirmed vertical delineation. No VOCs or SVOCs were detected in the native blue-gray clay layer. PCBs were not detected in either sample.

As debris was encountered until 10 lateral feet from the edge, the terminus samples were collected 20 lateral feet from the north end of the trench. Non-chlorinated VOCs, SVOCs, and metals were detected within the brown silty/sandy clay layer of the terminus sample, but did not exceed their respective residential SRVs. Chlorinated VOCs were not detected. SVOCs and metals were detected within the native blue-gray clay layer, but did not exceed their respective residential SRVs. VOCs were not detected.

Both samples within the terminus confirm lateral and vertical delineation of metal impacts identified in the shallow characterization sample. These analytical results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 10.

Trench 11

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (brown silty/sandy clay)
20 (2 Sections)	0 to 10 linear feet	metal wiring, nails, glass	non-chlorinated VOCs, SVOCs (No SRV exceedances)
	0 to 5 feet deep	PID readings greater than 10 ppm	metals (Tier I Residential SRV exceedance)

Two sections of 10-foot trench were completed for Trench 11. Each section of trench was completed on either side of existing railroad tracks. Debris was encountered in the north 10-foot section of the trench, but not within the south 10-foot section. One set of characterization samples was collected from the north section of the trench. Non-chlorinated VOCs and SVOCs were detected in both samples, but no constituents exceeded their corresponding residential SRVs. Antimony was detected at a concentration exceeding its Tier I Residential SRV in the brown silty/sandy clay layer, but did not exceed in the native blue-gray clay layer. The native blue-gray clay sample confirms vertical delineation. Chlorinated VOCs and PCBs were not detected in either sample.

Non-chlorinated VOCs were detected within both the brown silty/sandy clay layer and native blue-gray clay layer of the terminus sample, but did not exceed their respective residential SRVs. SVOCs were also detected in the brown silty/sandy clay layer, but did not exceed their corresponding residential SRVs. SVOCs were not detected in the blue-gray layer. Chlorinated VOCs were also not detected in either sample. Vanadium was detected in the brown silty/sandy clay layer at a concentration exceeding the Tier I Residential SRV, but not detected exceeding in the native blue-gray clay layer. The native blue-gray clay sample confirms vertical delineation. In addition, antimony was detected at concentrations below the residential SRV in both samples, confirming lateral and vertical delineation of the exceedance identified in the brown silty/sandy clay characterization sample. These analytical results, in addition to observations of waste materials noted above, delineates residual soil and waste impacts for Trench 11.

Trench 12

Total Trench Length (feet)	Fill/Waste Material Observed	Fill/Waste Material Type Identified	Characterization Sample Analytical Detections (black silt/clay)
40	0 to 30 linear feet	debris	SVOCs, metals (No SRV exceedances)
	0 to 3 feet deep	PID readings greater than 10 ppm	non-chlorinated VOCs (Tier I Residential and Tier II Industrial SRV exceedances)

The terminus of Trench 12 was approximately 40 feet from the start. Native blue-gray clay was not encountered by approximately 13 feet below ground surface throughout the trench. The trench was not extended deeper due to equipment limitations. The base throughout the trench was instead a black

silt/clay. One characterization sample was collected at the start of the trench from the black silt/clay interval. SVOCs and metals were detected within this sample, but not at concentrations exceeding their corresponding residential SRVs. One VOC (1,2,4-trimethylbenzene) was detected at a concentration exceeding its corresponding Tier II Industrial SRV, and two VOCs (naphthalene and sec-butylbenzene) were detected at concentrations exceeding corresponding Tier I Residential SRVs. Chlorinated VOCs and PCBs were not detected.

Non-chlorinated VOCs, SVOCs, and metals were detected within the black silt/clay layer of the terminus sample, but did not exceed their respective residential SRVs. This sample confirmed lateral delineation of the VOC exceedances identified in the characterization sample. Chlorinated VOCs and PCBs were not detected.

The depth to the native blue-gray clay is anticipated to be near the total trench depth (13 ft bgs) based on the elevation it was noted at in surrounding trenches. Within the first 30 lateral feet, waste material/debris was observed to a depth up to three ft bgs and elevated PID readings were observed to the base of the trench at 13 ft bgs. Between 30 and 40 lateral feet, no debris or elevated PID readings were observed. The analytical sample from the terminus at 40 lateral feet also did not detect any constituents (VOCs, SVOCs, or metals) exceeding their applicable residential SRVs. Based on these observations and analytical results, the vertical and lateral extent of residual soil and waste impacts has been sufficiently delineated at Trench 12.

7 SUMMARY AND CONCLUSIONS

7.1 Summary of Comprehensive Screening Value Exceedances

The purpose of the additional investigations as stipulated in the SIR was to supplement the existing soil dataset at the Site. As discussed in Section 6 above, these investigations included a supplemental Former Brake Fluid investigation, a supplemental North Parking Area investigation, and a supplemental Former Coal Gasification Plant investigation. In addition, the Former Fill Areas A and B investigation completed delineation of impacted soil and identified the extent of residual waste both on-Site and on the adjacent Canadian Pacific property. Each investigation provided sufficient characterization of the extent of impacts identified during previous investigations and the soil investigation at the Site is considered complete.

A comprehensive summary of the compounds that have been detected at least once in soil at concentrations exceeding the screening values discussed in the SIR and above is shown in the table below:

Compound	Soil > Tier I Residential SRVs
	Unconsolidated Overburden
Chlorinated VOCs	Yes
Non-chlorinated VOCs	Yes
SVOCs/PAHs	Yes
Metals	Yes
GRO	Yes
DRO	Yes
Cyanide	No
PCBs	No

7.2 Path Forward

Soil analytical data was compared to risk-based screening values developed and propagated by the MPCA only as a preliminary screening tool. The comparison to risk-based levels is not intended to indicate areas of the Site where remediation may be required. However, the results of the comprehensive soil subsurface investigations and Former Fill Areas A and B investigation will be utilized in conjunction with the comprehensive groundwater investigations, to be reported under separate cover, for development of a Remedial Action Plan for the Site. Final remediation action levels will be included as part of that Plan.

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