OPERATION AND MAINTENANCE PLAN SNPE-VDM CORRECTIVE ACTIONS

VANDEMARK CHEMICALS – LOCKPORT, NEW YORK ORDER ON CONSENT: R9-20080205-5

SUBMITTED TO:

SNPE, INC.
103 CARNEGIE CENTER, PRINCETON, NJ 08540

VANDEMARK CHEMICALS INC.
ONE NORTH TRANSIT RD, LOCKPORT, NY 14094

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
270 MICHIGAN AVE, BUFFALO, NY 14203

PROJECT NO.: GL21452459.001
DATE: REVISED JUNE 2022

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1 INTRODUCTION

SNPE Inc. (SNPE) in close cooperation with VanDeMark Chemical Inc. (VDM), the Site owner, has prepared this Operations and Maintenance Plan (OMP) for the VDM Lockport facility. The OMP describes the activities that will be undertaken on a routine basis to maintain and monitor the effectiveness of the remedial system that was implemented at the VDM site along a portion of VDM's property adjacent to the north bank of Eighteen Mile Creek Bank (hereafter referred to as the "Creek Bank Area") and associated groundwater/DNAPL impacts at VDM's manufacturing facility in Lockport, New York. The VDM facility is located in the north central sector of the City of Lockport city limits, as shown on Figure 1.

The general provisions for the development of this OMP are contained in Item I.C of the New York State Department of Environmental Conservation's (NYSDEC) Order on Consent (File No. 08-10 R9-20080205-5, November 30, 2011) executed with both VDM (as Site owner) and SNPE (as a responsible party) under the Resource Conservation and Recovery (RCRA) program that also included the requirements for Corrective Action remedial efforts which were summarized in the Corrective Measures Implementation Construction Closeout Report (Golder, January 2013).

The purpose of the constructed corrective measures was twofold: create a barrier to restrict and contain the migration of dense non-aqueous phase liquid (DNAPL) consisting of coal tar residuals that have been exiting the fractured bedrock formation at, or near, the toe of the Creek Bank area slope; and promote the collection of the DNAPL in a defined permeable trench for subsequent mechanical removal, if required. This OMP will monitor and document the extent to which these objectives are being met based on the following primary activities:

- Semi-annual visual inspections for presence of DNAPL in the passive upgradient permeable collection trench installed along the grout cutoff wall alignment;
- Semi-annual visual inspections for presence of DNAPL along the Eighteen Mile Creek bank areas where coal tar residuals have previously been observed;
- Annual groundwater sampling of the four piezometers installed upgradient and downgradient of the grout cutoff wall;
- Annual sampling of the water discharge from the collection trench Filter Sump overflow chamber;
- Annual groundwater sampling of two representative monitoring wells located within the VDM Plant at the top of the Niagara Escarpment;
- Removal and replacement of the Filter Sump media (i.e., filter sand and activated carbon) and cleanout of the sump chamber, if required, based on visual observations;
- Removal and disposal of accumulated DNAPL residuals from the passive collection trench, if necessary; and
- Restoration of the collection trench permeable stone media and DNAPL observation sumps, if required, as a result of DNAPL removal activities.

Figure 3 shows the locations of the areas both within the active VDM facility and to the south along the Eighteen Mile Creek Bank Area (Creek Bank Area) that will be monitored as part of this OMP.

The following sections of the OMP will present details on the frequency and proposed methodologies to be employed for the inspection, monitoring and maintenance activities described above. The proposed documentation and reporting associated with these activities will also be described.

2 SEMI-ANNUAL MONITORING AND INSPECTIONS

2.1 PASSIVE DNAPL COLLECTION TRENCH

Semi-annual inspections will be performed on the DNAPL collection trench. Evidence of DNAPL accumulation will be collected based on visual inspection of the four, 4-inch diameter PVC DNAPL observation sumps. In addition to inspection of the sumps, three small test holes will be manually dug in the collection stone at the following approximate locations:

- one in the lower Creek Bank trench alignment (approximately 20 feet east of the effluent vault);
- one in the middle Creek Bank trench alignment: and,
- one in the upper portion of the Creek Bank trench alignment.

The holes will be dug into the stone media trench not less than 18-inches below grade surface to determine if there is any evidence of DNAPL residuals accumulation or evidence of a sheen on the shallow groundwater below the surface, if present, within the permeable stone media. The area upslope from the DNAPL collection trench will be visually inspected for DNAPL seeps during the semiannual inspections. Documentation of the location and amount, if any, of DNAPL observed in the observation sumps, area upslope from the DNAPL collection trench, and the test holes will be made by the inspector as the basis for a subsequent DNAPL removal action. The NYSDEC will be notified at least one week in advance of the planned date of each inspection.

2.2 CREEK BANK AREA

Semi-annual inspections will be performed along approximately 300 feet of the Creek Bank Area down gradient of the DNAPL collection trench. Evidence of DNAPL accumulation will be collected based on visual inspection of the Creek Bank soils indicating that any evidence of surficial DNAPL residuals have accumulated. Documentation of the location and amount, if any, of DNAPL observed along the Creek Bank will be made by the inspector as the basis for a subsequent DNAPL removal action. The NYSDEC will be notified at least one week in advance of the planned date of each inspection, it is anticipated these inspections will be performed in conjunction with the semi-annual DNAPL Collection Trench inspections.

2.3 COLLECTION TRENCH OVERFLOW FILTER SUMP STRUCTURE

Semi-annual inspections of the collection trench drainage/filtration system including the Filter Sump and gravel filled sump drain will be performed. The Filter Sump hatch will be opened and visual observations of the drainage sump filter media and any evidence of excessive solids accumulation, presence of DNAPL residuals or washout will be noted. Evidence of erosion or disturbance of the sump media that might impact its integrity or performance will be documented as action items. The functional condition and integrity of the Filter Sump access hatch and lock will also be noted.

The surface of the gravel drainage sump that the overflow of the Filter Sump drains into will also be inspected for any evidence of DNAPL or excessive sediment or soil accumulation.

2.4 INSPECTION DOCUMENTATION

All visual observations obtained during the inspections and monitoring activities described above will be recorded and summarized on daily written inspection reports. In addition, field instrument data (e.g., PID measurements, etc.) obtained and any photos taken during the inspections will be recorded or attached to the inspection reports. Copies of these reports will be included as part of the annual inspection and monitoring summary report that will be prepared for submittal to the Department.

3 ANNUAL GROUNDWATER MONITORING

3.1 INTRODUCTION

A total of four piezometers located in the Creek Bank Area and installed in 2012 and two bedrock monitoring wells located at the top of the escarpment within the VDM plant site and installed in 1999 and 2006 will be routinely monitored to assess groundwater quality trends at the site. Table 1 summarizes the piezometer, monitoring well and DNAPL Observation Sump (discussed in Section 2.1 above) installation information.

3.2 CREEK BANK PIEZOMETERS

Annual groundwater sampling has historically performed on the four (4) piezometers (PZ-1, PZ-2, PZ-3 and PZ-4) installed as part of the Creek Bank Corrective Measures in 2012 (refer to Figure 2). However, PZ-1 has been dry since sampling was initiated in 2013, therefore this piezometer has not contributed to the monitoring program. The 1.25-inch diameter piezometers were initially developed by bailing to remove drill cuttings and water introduced into the formation during installation. Development of the piezometers continued until field measured turbidity readings stabilized and further reductions were not observed in the extracted groundwater, and until pH, specific conductivity, dissolved oxygen and temperature as measured in the field stabilized. Piezometers development data, including the duration of the development

process, methods employed, and the volume of water removed, were included on the Sampling Well Logs. Water purged from the piezometers during the development process was collected in appropriate containers and discharged into VDM's process sewer manhole.

Groundwater samples will be collected from each of the piezometers to assess the general groundwater quality up gradient and down gradient of the grout wall and bedrock cutoff system. All groundwater samples will be analyzed for TCL Semi-volatile Organic Compounds (SVOCs) in accordance with USEPA Method 8270D and TCL Volatile Organic Compounds (VOCs) in accordance with USEPA Method 8260C.

Pre-sampling activities will include determining the well's water elevation, a well-maintenance check, organic vapor monitoring, and non-aqueous phase liquid (NAPL) determination. After completion of these pre-sampling activities, the wells will be purged of three well volumes (or until dry). A sample of the third well volume will be measured for the following field parameters: pH, temperature, dissolved oxygen, and specific conductivity. Groundwater samples will then be collected for chemical analysis using a disposable or dedicated high density polyethylene bailer. The groundwater samples will be delivered to a New York State Department of Health ELAP certified laboratory within 24 hours of collection. Water purged from the piezometers during the sampling activities will be collected in appropriate containers and discharged into VDM's process sewer manhole.

At the conclusion of each annual the sampling event, the physical condition of the piezometers and protective casings/locks will be noted and any recommended repairs or maintenance required will be documented on the sampling logs.

3.3 PLANT MONITORING WELLS

Annual groundwater sampling will be performed on two (2) existing monitoring wells, MW-3D and MW-7D, located within the operational portion of the VDM facility at the top of the escarpment. MW-3D was installed in 1999 by Dames and Moore as part of a voluntary site investigation associated with the sale of the facility. MW-7D was installed in 2006 by Benchmark Environmental Engineering & Science as part of a supplemental site investigation. Refer to Figure 3 for their location.

Groundwater samples will be collected from MW-3D and MW-7D to assess the general groundwater quality at these up gradient locations on the top of the escarpment. All groundwater samples will be analyzed for TCL Volatile Organic Compounds (VOCs) in accordance with USEPA Method 8260B and TCL Semi-volatile Organic Compounds (SVOCs) in accordance with USEPA Method 8270C.

Pre-sampling activities will include measuring the well's water elevation, a well-maintenance check, organic vapor monitoring, and non-aqueous phase liquid (NAPL) determination. After completion of these pre-sampling activities, the wells will be purged of three well volumes (or until dry). A sample of the third well volume will be measured for the following field parameters: pH, temperature, dissolved oxygen and specific conductivity. Groundwater samples will then be collected for chemical analysis using a disposable or dedicated high density polyethylene bailer. The groundwater samples will be delivered to a New York State Department of Health ELAP certified laboratory within 24 hours of collection. Water purged

from the wells during the sampling activities will be collected in appropriate containers and discharged into VDM's process sewer manhole.

At the conclusion of each annual the sampling event, the physical condition of the monitoring wells and protective casings or covers will be noted and any recommended repairs or maintenance required will be documented on the sampling logs.

4 MAINTENANCE AND CLEAN-OUT ACTIVITIES

4.1 PASSIVE DNAPL COLLECTION TRENCH

If the results of the semi-annual inspections described in Section 2.1 indicate that the passive DNAPL collection trench has accumulated quantities of DNAPL residuals that are deemed to be significant in quantity (as determined by the inspecting professional and in consultation with NYSDEC representatives), arrangements will be made to retain a qualified contractor for excavation and disposal of the accumulated DNAPL residuals and impacted stone fill.

The removal of accumulated DNAPL and impacted stone will be performed based on visual observations using a rubber-tired backhoe or equivalent to minimize impacts to the Creek bank access road and to the site in general. Removal of DNAPL residuals and impacted trench stone will be pursued to a maximum depth of five feet if they are observed to be present at the base of the initial excavation. The contractor will also be directed to continue the excavation laterally either east or west along the trench alignment to remove any DNAPL impacted material, if observed. All excavated residuals will be direct loaded and transferred to roll-off containers or dump trailer trucks for permitted off-site disposal. It is anticipated that off-site disposal profiles and approvals obtained for the Creek Bank Corrective Measures project will be applicable for these materials. If temporary staging of excavated DNAPL residuals is required, it will be placed and covered with plastic sheeting, if required for overnight storage, prior to loading for off-site disposal.

Subsequent to removal of impacted residuals, clean, washed coarse aggregate meeting the following gradation requirements will be used to backfill the trench to match existing grades:

Opening or Sieve Size	% Passing by Weight
1 -1 ½ inch	100
1 inch	90-100
200	0-10

Geotextile damaged during the excavation activities shall be removed and replaced at a depth of 6 inches below the top of stone across the 2 feet width of the trench. The geotextile shall be a 6-oz non-woven needle punched polypropylene or polyester fabric with a minimum thickness of 90 mil.

4.2 CREEK BANK AREA

If the results of the semi-annual inspections described in Section 2.2 indicate that the Creek Bank Area has accumulated quantities of DNAPL residuals that are deemed to be significant in quantity (as determined by the inspecting professional and in consultation with NYSDEC

representatives), arrangements will be made to retain a qualified contractor for excavation and disposal of the accumulated DNAPL residuals and associated impacted soils. Smaller localized accumulations of DNAPL residuals may require removal by manual methods due to accessibility issues or to avoid destabilizing the creek bank. A determination of the most appropriate removal approach will be made in conjunction with the NYSDEC.

The removal of accumulated DNAPL and any impacted soils will be performed based on visual observations using a rubber-tired backhoe or manual techniques to minimize impacts to the Creek bank access road and to the site in general. Removal of DNAPL residuals and impacted surrounding soils will be pursued to a maximum depth feasible that will not destabilize the integrity of the creek bank slope to the extent that DNAPL residuals are observed to be present at depth in the area of the surficial accumulation. The contractor will also be directed to continue the excavation laterally in the vicinity of the accumulation based on visual observation of the excavation to remove any DNAPL impacted material. All excavated residuals will be direct loaded and transferred to drums, roll-off containers or dump trailer trucks for permitted off-site disposal. It is anticipated that off-site disposal profiles and approvals obtained for the Creek Bank Corrective Measures project will be applicable for these materials. If temporary staging of excavated DNAPL residuals is required, it will be placed and covered with plastic sheeting, if required for overnight storage, prior to loading for off-site disposal.

Subsequent to removal of impacted residuals, topsoil imported from a virgin off-site source will be placed in the area of the excavation to restore the area to pre-excavation grades and tested to meet DER-10 criteria for importation of clean materials to the site. If the depth of the excavation extends greater than three feet below grade surface, a source of select backfill will be identified by the contractor and tested to meet DER-10 criteria for importation of clean materials to the site.

4.3 FILTER SUMP

If the results of the semi-annual inspections described in Section 2.2 indicate that the Filter Sump filter media has accumulated excess solids or appears to have been flushed out or otherwise significantly eroded, arrangements will be made to retain a qualified contractor for removal and replacement of the filter media and cleanout of any accumulated solids in the overflow chamber.

If the activated carbon and filter sand require replacement, the replacement materials shall meet the following specifications:

Activated Carbon: Calgon Carbsorb 30 or equal exhibiting a minimum hardness of 90, a minimum iodine number of 900 mg/g with less than 4 % by weight passing through a 30-mesh sieve.

Filter Sand: Coarse washed sand with an effective particle size (D10) of 0.3 to 0.5 mm, a uniformity coefficient (UC) of <4 with no more than 4% by weight passing through a 30-mesh sieve.

If any repairs to the Filter Sump access hatch or lock are required, they will be performed as required.

4.4 PIEZOMETERS, MONITORING WELLS AND DNAPL OBSERVATION SUMPS

Repairs to the piezometer and monitoring wells are not anticipated but if damage is observed to the protective casings, locks or the monitoring well or piezometer risers themselves, a qualified drilling subcontractor will be retained to perform the repairs to restore functionality.

If any of the 4-inch diameter PVC DNAPL observation sumps or protective caps are damaged it will be replaced to match the original installation in accordance with the original design and location as presented in Table 1.

5 NOTIFICATIONS AND REPORTING

NYSDEC and VDM representatives will be notified at least one week in advance of the planned schedule for the semi-annual inspections and annual groundwater monitoring events described in Sections 2 and 3. If the results of the inspections or monitoring events indicate that immediate corrective actions may be warranted (i.e., through the maintenance or clean-up activities described in Section 4), NYSDEC and VDM representatives will be notified with 24 hours of the inspection/monitoring event to review and coordinate recommended maintenance or DNAPL clean-up activities and a proposed schedule for the work. After consultation with the NYSDEC, if the quantity and rate of DNAPL accumulation is determined to not warrant immediate removal, a proposed schedule and plan for further monitoring of these areas of accumulation will be include in the annual report.

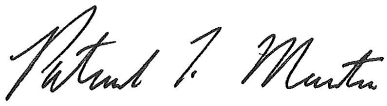
The results of the semi-annual inspections and annual monitoring events will be summarized in an annual report for submittal to the NYSDEC within two months of the completion of the final semi-annual inspection. The report will also provide summary of any DNAPL collection trench, Creek Bank Area cleanup and drainage sump filter media replacement activities that may have been performed based on the inspections conducted. The report will also identify corrective actions, if any that may be necessary at the site to address damage to the corrective measures due to erosion, accumulation of storm debris or other factors that may impact their overall effectiveness and integrity.

6 REFERENCES

1. Golder Associates Inc., SNPE-VanDeMark Chemical Creek Bank Corrective Measures Implementation, Corrective Measures Closeout Report, prepared for SNPE Inc., April 2013.
2. Golder Associates Inc., Operation & Maintenance Plan, SNPE-VDM Corrective Actions, prepared for SNPE Inc. and VanDeMark Chemical Inc., April 2013.

WSP USA INC.

Joshua Vernold
Associate Consultant, Geologist



Patrick T. Martin, PE, BCEE
Director, Chemical Engineer

JMV/PTM/dml

TABLES

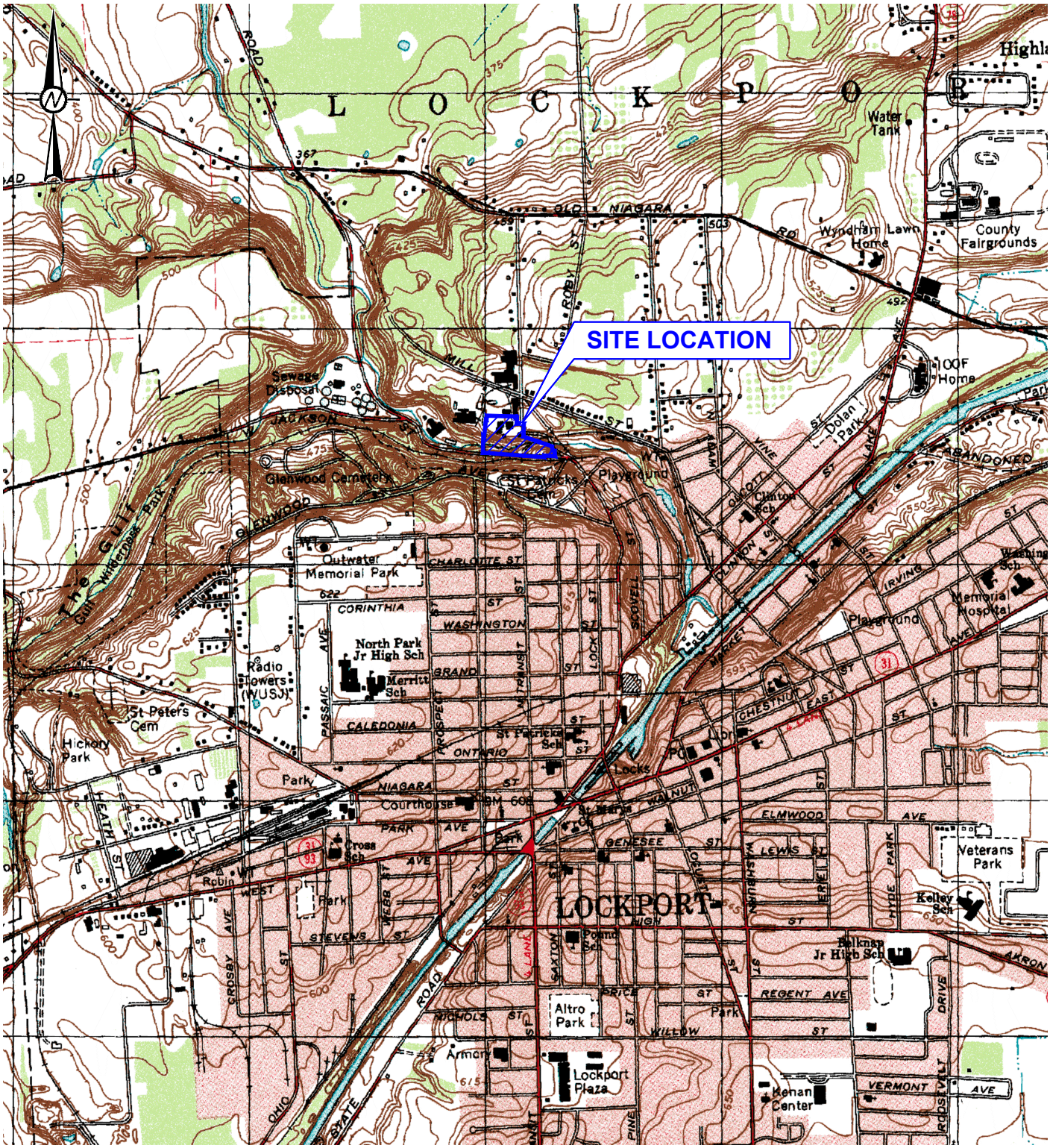
TABLE 1
SUMMARY of MONITORING POINTS
OPERATION AND MAINTENANCE PLAN
SNPE-VANDEMARK CHEMICAL
LOCKPORT, NEW YORK

POINT ID#	INSTALL. DATE	NORTHING	EASTING	GROUND ELEV. (1)	PRO. CASING ELEV. (2)	CASING ELEV. (3)	BOREHOLE DEPTH (4)	TOP OF SCREEN (5)	BOTTOM OF SCREEN (6)	SANDPACK LENGTH (FT)	SEAL LENGTH (FT)
PZ-1	11/13/2012	5139.45	4762.79	140.50	143.58	143.14	9.0	5.00	9.00	5.0	2.0
PZ-2	11/13/2012	5159.78	4770.84	142.20	145.31	144.81	8.0	5.00	8.00	3.5	2.0
PZ-3	11/14/2012	5152.62	4585.68	122.70	125.35	124.82	10.0	7.00	10.00	4.0	2.5
PZ-4	11/14/2012	5165.71	4595.72	123.90	126.58	126.11	10.0	5.00	10.00	6.0	2.0
MW-3D	8/16/1999	Not Surveyed	Not Surveyed	201.0*	At Grade	200.9*	45.0	15.00	45.00	20.0	Unknown
MW-7D	11/16/2006	Not Surveyed	Not Surveyed	195.5*	At Grade	195.4*	50.0	20.00	50.00	32.0	17.0
OS-1	11/14/2012	5174.54	4579.58	122.50	NA	NA	5.0	NA	NA	NA	NA
OS-2	11/14/2012	5146.50	4639.05	126.90	NA	NA	5.0	NA	NA	NA	NA
OS-3	11/14/2012	5154.49	4739.93	141.09	NA	NA	5.0	NA	NA	NA	NA
OS-4	11/14/2012	5165.95	4815.00	143.35	NA	NA	5.0	NA	NA	NA	NA

NOTES:
MW = Monitoring Well location within VDM Plant
PZ = Performance moinitoring piezometer location
OS = DNAPL Collection Trench observation well location
NA = Not Applicable
(1) Ground Elevation is to Top of Surrounding Ground Surface (Site datum)
(2) Pro. Casing Elevation is to Top of Protective Steel Casing
(3) Casing Elevation is to Top of PVC Casing
(4) Ground Surface to Bottom of Boring (feet)
(5) Below Ground Surface (feet)
(6) Piezometers constructed of 1-1/4-inch Dia. Schedule 40 PVC
(7) Monitoring wells are constructed of 2-inch Dia. Schedule 40 PVC
(8) The DNAPL observation sumps (OS-1 through OS-4) are constructed of 4-inch Dia. Schedule 40 PVC
* Approximate grade elevation for In-plant monitoring wells based on 2010 Wendel Survey to top of escarpment

Table By: RJM
Date: 12/11/2012
Checked By: JMV
Date: 12/16/2021
Reviewed By: PTM
Date: 05/31/22

FIGURES



NOTE(S)

1.) BASE MAP TAKEN FROM U.S.G.S. 7.5 MINUTE QUADRANGLE OF LOCKPORT, NEW YORK DATED 1980.

0 1000 2000
1" = 2000' FEET

CLIENT
SNPE - VANDEMARK

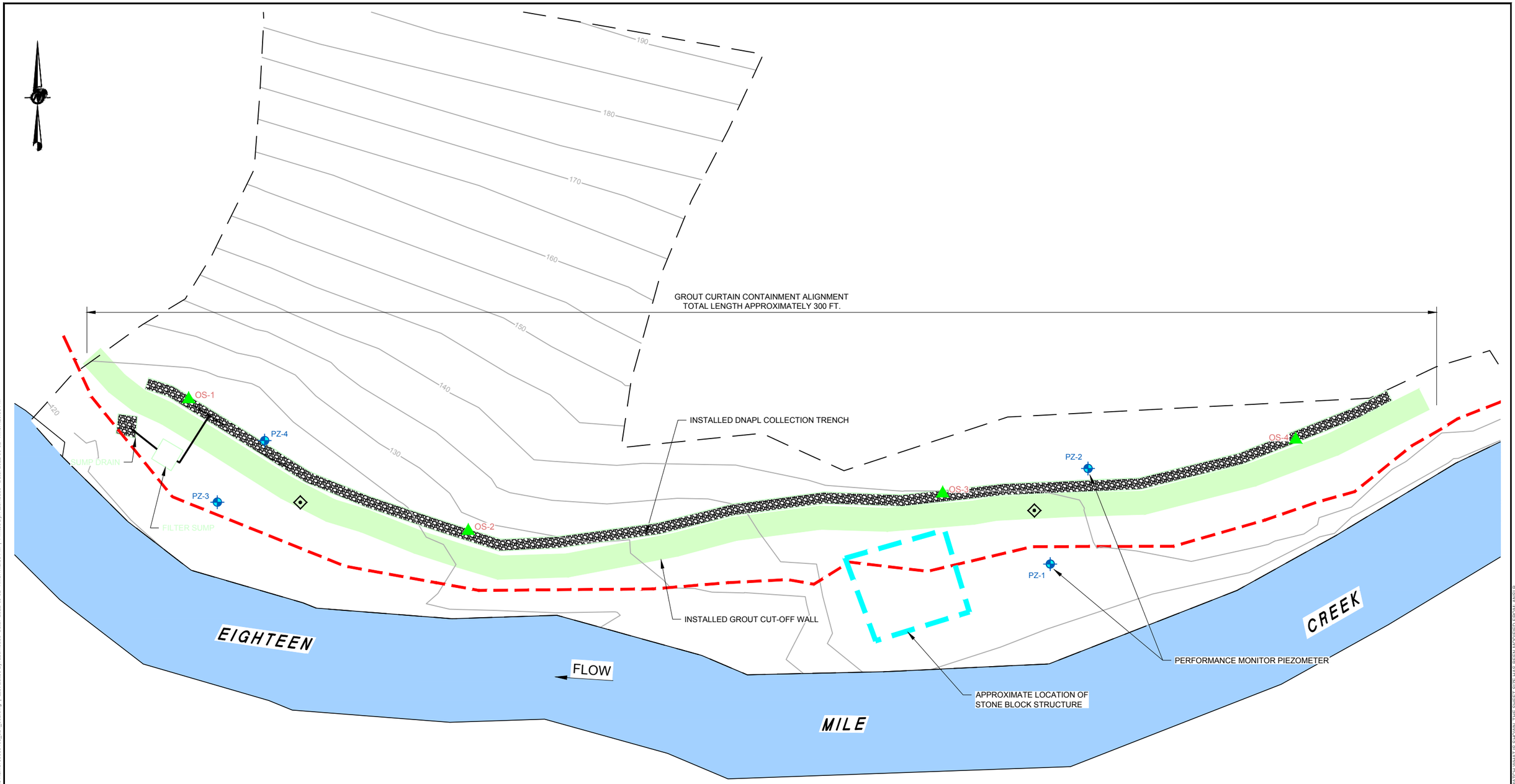
PROJECT
CREEK BANK AREA CORRECTION MEASURES PROJECT
LOCKPORT, NEW YORK

CONSULTANT
wsp

YYYY-MM-DD	2022-01-25
DESIGNED	PTM
PREPARED	MPB
REVIEWED	JMV
APPROVED	PTM

TITLE
SITE LOCATION MAP

PROJECT NO.	PHASE	REV.	FIGURE
GL21452459	001	0	1



0 10 20
1" = 20' FEET

LEGEND

- APPROXIMATE LOCATION OF EROSION CONTROL MEASURES (SILT FENCE, STRAW BALES, AND SAND BAGS). TO REMAIN IN PLACE UNTIL SPRING OF 2013
- PZ-1 — PERFORMANCE MONITORING PIEZOMETER
- OBSERVATION SUMPS
- IN-SITU GROUT WALL PERMEABILITY SAMPLE LOCATION
- FLOWABLE FILL AND CEMENT GROUT
- No. 2 WASHED STONE
- EIGHTEEN-MILE CREEK

REFERENCES

1.) TOPOGRAPHY SHOWN ON THIS PLAN WAS TAKEN FROM SURVEY FILE xve-vandemark base.dwg, DATED 06-21-2010.

2.) CORE LOCATIONS SHOWN ON THIS PLAN ARE APPROXIMATE.

3.) MAP DIGITIZED FROM HARD COPY OF FIGURE 1 ENTITLED "SITE PLAN," PREPARED BY BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC.

4.) CONCRETE VAULT, PIEZOMETERS, GRAVEL COLLECTION TRENCH, OBSERVATION SUMPS, AND FRENCH DRAIN FROM 121205 FIELD DATA REVISED.XLSX, PREPARED BY WENDEL IN NOVEMBER 30, 2012.

CLIENT
SNPE - VANDEMARK

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2020-02-21
DESIGNED	PTM
PREPARED	MPB
REVIEWED	AML
APPROVED	

PROJECT
CREEK BANK AREA CORRECTION MEASURES PROJECT
LOCKPORT, NEW YORK

TITLE
CREEK BANK AREA SITE PLAN OPERATION & MAINENANCE PLAN

PROJECT NO.	PHASE	REV.	FIGURE
093-89168	024	0	2

LEGEND

- FENCE
- SILT FENCE
- STRAW BALES
- SAND BAGS
- FLOWABLE FILL AND CEMENT GROUT
- No. 2 WASHED STONE
- OS-2 — 4-INCH DNAPL OBSERVATION SUMP (IN COLLECTION TRENCH)
- PZ-1 — 1-INCH PERFORMANCE MONITORING PIEZOMETER
- 1999 INVESTIGATION BEDROCK MONITORING WELL
- 2006 BEDROCK MONITORING WELL
- MONITORING WELL (UNKNOWN INSTALLATION DATE)
- EIGHTEEN-MILE CREEK

REFERENCES

1.) TOPOGRAPHY SHOWN ON THIS PLAN WAS TAKEN FROM SURVEY FILE xve-vandemark base.dwg, DATED 06-21-2010.

2.) BOREHOLE AND CORE LOCATIONS SHOWN ON THIS PLAN ARE APPROXIMATE.

3.) MAP DIGITIZED FROM HARD COPY OF FIGURE 1 ENTITLED "SITE PLAN," PREPARED BY BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC.

4.) CONCRETE VAULT, PIEZOMETERS, GRAVEL COLLECTION TRENCH, OBSERVATION SUMPS, AND FRENCH DRAIN FROM 121205 FIELD DATA REVISED.XLSX, PREPARED BY WENDEL IN NOVEMBER 30, 2012.

0 20 40
1" = 40' FEET

CLIENT
SNPE - VANDEMARK

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2020-02-21
DESIGNED	PTM
PREPARED	MPB
REVIEWED	AML
APPROVED	

PROJECT
CREEK BANK AREA CORRECTION MEASURES PROJECT
LOCKPORT, NEW YORK

TITLE
OMP SITE PLAN -VDM PLANT & CREEK BANK AREA

PROJECT NO.	PHASE	REV.	FIGURE
093-89168	024	0	3