



**Sonoco Products Company**

**Technical Memorandum:  
Proposed Change in Selected Remedy  
in the Former Varnish UST Area**

*Greif, Inc. Facility  
Town of Tonawanda, Erie County, New York  
NYSDEC Voluntary Cleanup Program #V00334-9*

*August 2010*

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## **ACRONYMS AND ABBREVIATIONS**

AOC	Area of Concern
ASTM	American Society for Testing and Materials
bgs	below ground surface
DER	Division of Environmental Remediation
ERM	Environmental Resources Management
DGI	Data Gap Investigation
DNAPL	Dense Non-Aqueous Phase Liquid
1,2-DCA	1,2-Dichloroethane
cis 1,1-DCE	cis 1,1-Dichloroethene
eV	Electron Volts
FFS	Focused Feasibility Study
FID	Flame Ionization Detector
FDSA	Former Drum Storage Area
GAC	Granular Activated Carbon
GWRAOs	Ground Water Remedial Action Objective
HASP	Health & Safety Plan
IRM	Interim Remedial Measure
ISTT	In-Situ Thermal Treatment
kW	Kilowatts
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	Milligram per Kilogram
MNA	Monitored Natural Attenuation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SCGs	Standards, Criteria, & Guidance
SRAOs	Soil Remedial Action Objective
SSD	Sub-Slab Depressurization
SVOCs	Semivolatile Organic Compounds
TAGM	Technical and Administrative Guidance Memorandum

TCE	Trichloroethene
1,1,1-TCA	1,1,1-Trichloroethane
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
VMPs	Vacuum Monitoring Points
VOCs	Volatile Organic Compounds
w.c.	water column
UST	Underground Storage Tank

Based on new information, Environmental Resources Management (ERM), on behalf of Sonoco Products Company (Sonoco), proposes to modify the original selected remedy in the Former Varnish Underground Storage Tank (UST) Area at the Greif, Inc. (Greif) Facility located at 2122 Colvin Boulevard in the Town of Tonawanda, Erie County, New York State (the Site). Remediation is being performed at the Site by Sonoco under the oversight of the New York State Department of Environmental Conservation (NYSDEC) through its Voluntary Cleanup Program (VCP). The Site has been identified by the NYSDEC as VCP Site Number V00334-9.

The Site consists of an active manufacturing building located on approximately 25-acres of land in the Town of Tonawanda, Erie County, New York. The Site is located in a mixed industrial, commercial, and residential area approximately 0.25-mile south of Exit 2 of Interstate Highway I-290. Adjoining property use is as follows:

- North – vacant land (wooded area and parking) and residential apartments further to the north;
- South – commercial office space and a park (Walter M. Kenney Field) further to the south;
- East – Colvin Boulevard with single family/duplex homes further to the east; and
- West – a recently-constructed commercial building (Danforth) with active railroad lines further to the west.

The building is surrounded by paved parking areas, storage areas, and landscaped areas. The Site is currently used for the manufacture of fiber drums, equipment maintenance, and administrative activities. The north, west and east sides of the Site are enclosed with a chain-link fence to restrict access. There are two main gates on the east side of the Site where employees and visitors routinely enter.

The manufacturing facility was constructed in 1948 and has been in use since then for the manufacture of fiber drums and associated maintenance, support, and administrative activities. Volatile organic compounds (VOCs) were released into soil and ground water at the Site primarily as a result of varnishing and degreasing operations. These activities were discontinued in May 1995. The current use of the Site and the contemplated future use of the Site is for commercial purposes.

Environmental assessments were conducted at the Site during a property transfer in 1998 and several Areas of Concern (AOCs) were identified. The environmental assessments identified several VOCs and semivolatile organic compounds (SVOCs) that were present in soil and ground water in some AOCs at the Site at concentrations above then applicable NYSDEC standards, criteria, and guidance (SCGs). The primary VOCs include 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and xylenes. All three VOCs were also detected at concentrations above applicable SCGs in a Former Drum Storage Area located on the south side of the facility.

A Remedial Investigation (RI) and a follow-up Data Gap Investigation (DGI) were conducted between 2000 and 2003 to further refine the extent of affected soil and ground water at the Site. Based on the results of the RI and DGI, two Interim Remedial Measures (IRMs) were conducted between 2004 and 2008 in the Former Varnish Pit Area (DNAPL Recovery IRM) and the Former Drum Storage Area (Soil Excavation IRM) to address identified source areas and reduce the mass, toxicity, and mobility of contaminants identified during environmental investigations at the Site. These IRMs were successfully completed with the approval of the NYSDEC.

Subsequent to the completion of the IRMs, a detailed analysis of remedial alternatives was completed in 2009 to further address affected soil and ground water in the following AOCs:

- the Varnish Pit Area; and
- the Former Varnish UST Area.

The results of the detailed analysis of remedial alternatives were presented in a Focused Feasibility Study (FFS) Report (ERM, 2009a). Upon receipt of NYSDEC approval of the FFS Report, a Remedial Action Work Plan (RAWP) was prepared in 2009 outlining the details and approach to implement the NYSDEC-approved remedy for the Site (ERM, 2009b). The approved remedy outlined in the RAWP contained three main components:

- construction of a sub-slab depressurization (SSD) system for the main building;
- in-situ thermal treatment (ISTT) of affected soil in the Former Varnish UST Area; and
- monitored natural attenuation (MNA) of Site ground water.

The proposed change in the selected remedy described in this Technical

Memorandum applies only to the ISTT of affected soil and ground water in the Former Varnish UST Area. Additional sections of this Technical Memorandum are therefore confined to discussion of the Former Varnish UST Area. Details outlining the necessity of changing the selected remedy in the Former Varnish UST Area and the proposed new remedy for this AOC are presented for review.

## **1.1 STATEMENT OF PURPOSE**

Based on ERM's review of data available at the time of preparation of the FFS Report as well as discussions with the NYSDEC regarding subsurface conditions in the Former Varnish UST Area, the following three remedial alternatives were originally evaluated in the FFS Report (ERM, 2009a):

- Alternative 1: No Action.
- Alternative 2: Excavation and Off-Site Disposal of Soil and Monitored Natural Attenuation (MNA) of Ground Water.
- Alternative 3: In-Situ Thermal Treatment (ISTT) of Soil and MNA of Ground Water.

Alternative 1 was dismissed as non-protective of human health and the environment. Alternatives 2 and 3 were determined to be equally protective of human health and the environment and equally address compliance with SCGs. Both alternatives were readily implementable and provide long term effectiveness essentially by eliminating source areas and monitoring natural attenuation processes. It was determined based on the apparent depth of the contamination that Alternative 3 was less obtrusive to ongoing manufacturing operations at the Site, had fewer short term impacts, and was less costly than Alternative 2. Therefore, the remedial alternative originally recommended and approved for the Former Varnish UST Area was Alternative 3 (ISTT).

ERM conducted pre-remediation soil and ground water sampling in the Former Varnish UST Area in early 2010 at the beginning of the ISTT remedial construction project. Review of data generated during the ISTT pre-remediation characterization effort indicated that the area requiring remediation was shallower and lower in VOC concentration than originally thought based on the results of previous investigations at the Site. An updated remedial assessment of the ISTT pre-remediation characterization results was performed and it was determined that the originally-proposed Alternative 2 is less obtrusive to ongoing manufacturing operations at the Site, has fewer short term impacts, and is less costly than Alternative 3. Therefore, the appropriate remedial

alternative for Former Varnish UST Area soil based on new information is Alternative 2 (excavation and off-site disposal).

## **1.2**      *Retained RAWP Components*

ERM proposes to retain the following remedial actions originally proposed in the 2009 RAWP:

- construction of a sub-slab depressurization (SSD) system for the main building; and
- monitored natural attenuation (MNA) of Site ground water.

## **1.3**      *Amended RAWP Components*

ERM proposes to amend the 2009 RAWP with the following:

- replace the ISTT remedial technology for affected soil in the Former Varnish UST Area with excavation and off-Site disposal.

Based on information provided by Greif and ERM's review of Site plans, the building at the Site was originally constructed in 1948. From 1948 to 1985, the Site was owned and operated by Continental Fiber Drum and Continental Can Corporation. Historical manufacturing operations at this time consisted of the production of fiber drums but also included production of the metal lids and rims used in the fiber drums.

Sonoco acquired the Fiber Drum Division in 1985. The major existing manufacturing operations reportedly continued generally unchanged until the early 1990s. In 1995, the varnishing and degreasing processes on the metal lids and rims used in the fiber drums were discontinued. Greif subsequently acquired the Site in May 1998. The Site continues to be used for the manufacture of fiber drums and associated products. Secondary operations include equipment maintenance and administrative activities.

Surface water bodies are not present at or bordering the Site. Site topography is relatively flat with an average elevation of approximately 586-feet above mean sea level. The Site is situated approximately 3.5-miles east of the Niagara River and 1.1-miles south of Ellicott Creek in the Erie-Ontario Lowlands physiographic province of western New York State. Topographic relief within one-half mile of the Site is minimal (approximately 15-feet). Ground water is typically encountered at depths ranging from 8- to 15-feet below ground surface.

Remedial construction of the ISTT portion of the remedy began in January 2010. An asphalt cap was installed over the Former Varnish UST Area to provide a stable work area, act as a barrier to vapor migration, and increase the effectiveness of the planned soil vapor extraction (SVE) component of the ISTT remedy. Eight remediation wells designated APW-1 through APW-8 were installed to facilitate placement of radiofrequency antennas for heating at the corners of two planned treatment cells. Soil and ground water samples were collected from these eight wells and submitted to the project laboratory for analysis of VOCs to characterize pre-remediation subsurface conditions in the Former Varnish UST Area. These data are presented and discussed in Section 4.1. Review of data generated during the ISTT pre-remediation characterization effort indicates that the area requiring remediation is shallower and lower in VOC concentration than originally thought based on the results of previous investigations at the Site. Therefore, remedial construction activities in the Former Varnish UST Area are currently on hold pending review of new data presented in this Technical Memorandum with the NYSDEC.

A Temporary SSD System was previously installed to depressurize the sub-slab in the vicinity of the former varnish pit. A Pilot SSD System has been installed and is currently operating to expand depressurization of the sub-slab across the building. Pilot testing of the SSD System was completed in July 2010 and the results are under review. A written evaluation is being prepared that will document the Pilot SSD System testing results and identify modifications, if any, that may be required to further expand depressurization of the slab beneath the main building.

## 4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

### 4.1 NEW INFORMATION

ERM conducted pre-remediation soil and ground water sampling in the Former Varnish UST Area in January and February 2010 at the beginning of the ISTT remedial construction project. Eight soil borings were installed for the installation of remediation wells designated APW-1 through APW-8. The locations of these soil borings are shown in Figures 1 through 8.

Soil samples were collected at several depths from soil borings APW-1 through APW-8 in the Former Varnish UST Area in January 2010 and sent to the project laboratory for analysis of VOCs to characterize pre-remediation concentrations of VOCs in the area to be remediated. The results of the pre-remediation soil sampling effort are summarized in Table 1. VOCs were not detected in soil samples at concentrations above NYSDEC Restricted Commercial Soil Cleanup Objectives (SCOs). However, detected concentrations of xylenes are consistent with a source area in the vicinity of soil borings APW-4, APW-5, and APW-8.

The increased number of samples collected during the pre-remedial characterization effort has facilitated a more thorough mapping of the depth and extent of affected soil in the Former Varnish UST Area. Xylene concentrations in soil were mapped in plan view across three different vertical intervals to evaluate the extent of the source area as estimated by soil sample laboratory analytical data (Figure 1 through Figure 3). Total xylenes in soil at depths ranging from 4- to 8-feet bgs are presented in Figure 1. Total xylenes in soil at depths ranging from 9- to 12-feet bgs are presented in Figure 2. Total xylenes in soil at depths ranging from 14- to 17-feet bgs are presented in Figure 3. Review of Figures 1 through 3 reveal that xylene concentrations in soil greater than 100 mg/kg are limited to the depth interval from 4- to 8-feet bgs. The highest detected concentration of xylenes in soil occurs at location APW-4. This location is consistent with the location of the highest detected concentration of xylenes in soil during the remedial investigation at location GB-2.

The detected concentration of xylenes at location GB-2 in 1998 at a depth of 12- to 16-feet bgs was 2900 mg/kg. Remediation well APW-4 was intentionally installed at the same location as GB-2 based on this previous analytical result in order to place a remedial heating antenna at the location of the highest detected concentrations. The detected concentration of xylenes in soil at APW-4 in 2010 at a similar depth of 14-

to 17-foot bgs was 0.005 mg/kg. This concentration is several orders of magnitude lower than the detected concentration in the sample from soil boring GB-2 collected in 1998. Possible reasons for the difference in detected concentrations include biodegradation, soil heterogeneity, and/or sample collection, labeling, and/or laboratory analytical or reporting error during the 1998 sampling event.

Two geologic cross sections were prepared to further illustrate the vertical extent of xylenes in soil in the Former Varnish UST Area. Cross Section A-A' trends northwest to southeast through the Former Varnish UST Area. PID field screening data (Figure 4) and laboratory analytical data (Figure 5) were mapped along this line of section. Cross Section B-B' trends southwest to northeast through the Former Varnish UST Area. PID field screening data (Figure 6) and laboratory analytical data (Figure 7) were also mapped along this line of section. The proposed treatment depths outlined in the 2009 RAWP are indicated in Figure 5 through Figure 8. Review of these figures further demonstrates that the area requiring remediation is significantly shallower and lower in VOC concentration than originally thought based on the results of previous investigations at the Site. The area of highest VOC concentration (i.e., the source area) occurs at depths predominantly above the intended thermal treatment zone throughout the Former Varnish UST Area. The relatively shallow depth of the source area is more conducive to an excavation remedy rather than an in-situ thermal remedy.

Four-inch diameter wells constructed with chlorinated polyvinyl chloride (CPVC) were installed at locations APW-1 through APW-8 to facilitate the initially planned installation of remedial heating antennas. A ground water sample was collected from each antenna placement well in February 2010 to characterize pre-remediation concentrations of VOCs in ground water in the Former Varnish UST Area. The ground water analytical results from the February 2010 sampling event are summarized in Table 2.

At the request of the NYSDEC based on the results described above, additional ground water evaluation was performed in April 2010 to evaluate ground water gradient and concentration of VOCs in the Former Varnish UST Area and the adjacent area beneath the building (i.e., between the Former Varnish UST Area and the former varnish pit inside the building). Ground water samples were collected on 20 April 2010 from remediation wells APW-1 through APW-8 and from the following additional wells in the area of interest as approved by the NYSDEC:

- MW-12;
- MW-13;

- MW-19;
- MW-23;
- RW-5;
- VMP-5; and
- VMP-6.

Figure 8 presents shallow ground water contours based on data collected during the April 2010 ground water sampling event. The ground water table is generally flat in the vicinity of the former varnish pit with flow semi-radial away towards the northwest, north, or northeast. The overall general direction of ground water flow in the mapped portion of the Site is generally towards the north-northwest. The observed ground water contours and flow direction are generally consistent with shallow ground water flow direction previously mapped at the Site.

Laboratory analytical results from the April 2010 ground water sampling event are summarized in Table 3 and Figure 9. These results confirm that xylenes are typically the primary VOC in ground water in the Former Varnish UST Area while 1,1,1-trichloroethane (1,1,1-TCA) and trichloroethene (TCE) are the primary VOCs in ground water beneath the building.

An updated remedial assessment of the ISTT pre-remediation characterization results and the additional ground water evaluation conducted in April 2010 has been performed based on review of these new data. Review of new data confirms that the area requiring remediation is shallower and lower in VOC concentration than originally thought based on the results of previous investigations at the Site. Therefore, implementation of the originally proposed remedy of ISTT in the Former Varnish UST Area would result in treatment of an area which does not require treatment and would not address the area of highest concentrations (i.e., the source area). Revision of the proposed remedial approach is required to facilitate protection of human health and the environment.

It is ERM's technical opinion that the originally-proposed Alternative 2 is less obtrusive to ongoing manufacturing operations at the Site, has fewer short term impacts, and is less costly than Alternative 3. Therefore, the appropriate remedial alternative for Former Varnish UST Area soil based on new information is Alternative 2 (excavation and off-site disposal).

As discussed in Section 1.3 of the Remedial Action Work Plan (ERM, 2009b), identifiable sources of contamination are to be removed or addressed to the extent feasible. The approximate extent of the source

area in the Former Varnish UST Area has been estimated based on mapping of two areas:

- xylenes in soil  $\geq 100$  mg/kg; and
- xylenes in ground water  $\geq 4000$   $\mu\text{g}/\text{l}$ .

The extent of the proposed area for excavation is shown in Figure 10. Soil from ground surface to 3-feet bgs will be excavated and temporarily staged near the excavation for placement back into the excavation subsequent to removal of the source area beneath. Affected soil will be excavated in the depth interval from 3- to 9-feet bgs and live-loaded into dump trailers for off-Site transport and disposal as non-hazardous solid waste. The mapped extent of the source area suggests that the volume of affected soil requiring excavation and off-Site transport and disposal is approximately 700 cubic yards.

Eight confirmation soil samples will be collected from excavation walls and three confirmation soil samples will be collected from the floor of the excavation consistent with the approach outlined in Section 5.5 of the NYSDEC's Technical Guidance for Site Investigation and Remediation dated May 2010 (DER-10; NYSDEC, 2010). A chemical amendment consisting of calcium peroxide and sodium persulfate will be applied to the excavation walls and floors subsequent to the collection of confirmation soil samples to facilitate chemical oxidation and biodegradation of VOCs subsequent to the completion of excavation activities. The excavated area will be backfilled with select structural fill in the depth interval from 3- to 9-feet bgs and with excavated staged soil from ground surface to 3-feet bgs. The existing asphalt cap will be replaced subsequent to the completion of backfilling activities.

## 4.2

### ***COMPARISON OF CHANGES WITH ORIGINAL REMEDY***

Major components of the original remedy and the proposed change in remedy are summarized in Table 4. The significant difference of the proposed remedy for the Former Varnish UST Area compared to the remedy selected in the RAWP (ERM, 2009b) is that the scope of the remedial technology will be modified from ISTT to excavation and off-site disposal.

The performance of excavation and off-Site disposal will be the same compared to the ISTT system in that source area soil will be addressed to reduce toxicity, mobility, and volume of contaminants in the Former Varnish UST Area. The source area soil will be removed rather than

treated in place.

Excavation and off-Site disposal will result in a significant decrease in the cost of the remedy and the estimated time frame to complete the remediation in the Former Varnish UST Area.

The proposed modification is considered to be a significant change, but not a fundamental change, to the RAWP.

The overall objective of the remedial activities to be implemented at the Site is to remediate the affected Site soil and ground water under the conditions of the VCP Agreement. The remedial goals for VCP Sites as set forth in DER-10 (NYSDEC, 2010) are:

- to be protective of public health and the environment, given the intended use of the Site; and
- to include removal or elimination, to the extent feasible, of identifiable sources of contamination regardless of the presumed risk or intended use of the Site.

Remedial Action Objectives (RAOs) for the Site are media-specific targets that are aimed at protecting public health and the environment. As discussed in the Final FFS Report (ERM, 2009a), Site media of interest are soil and ground water as identified during investigation activities. Based on the evaluation discussed in the Final FFS Report and applicable NYSDEC guidance, the soil RAOs (SRAOs) for Site were identified as:

- SRAO1 – Prevent ingestion, direct contact with, and/or inhalation of soil that poses a risk to public health and the environment given the intended use of the Site;
- SRAO2 – Prevent inhalation of or exposure from compounds of potential concern volatilizing from soil that poses a risk to public health and the environment given the intended use of the Site; and
- SRAO3 – Prevent the potential for vapor intrusion into indoor air, if needed.

Based on the evaluation discussed in the Final FFS Report (ERM, 2009a) and applicable NYSDEC guidance, the RAOs for on-Site ground water (GWRAO) were identified as:

- GWRAO1 – Prevent exposure to affected ground water that poses a risk to public health and the environment given the intended use of the Site;
- GWRAO2 – Prevent or minimize further migration of the

- contaminant plume (plume containment); and
- GWRAO3 - Prevent or minimize further migration of contaminants from source materials to ground water (source control).

The proposed change in remedy in the Former Varnish UST Area is protective of human health and the environment and meets the above-stated goals originally defined in the NYSDEC-approved RAWP.

## 5.0

### *SCHEDULE*

An updated estimated project schedule is presented in Figure 11. Presuming receipt of approval of the proposed change in remedy from the NYSDEC by the end of September 2010, mobilization for the remedial soil excavation is anticipated to begin in early October 2010. ERM estimates that the remedial soil excavation, off-site transport and disposal of excavated soil, confirmation soil sampling, chemical amendment, backfilling of the excavation, and installation of monitoring wells can be completed in approximately four weeks of site work. It is anticipated that ground water sampling and analysis will occur in December 2010. The results of the remediation in the Former Varnish UST (and the other components of the RAWP) will be presented to the NYSDEC for review in the Final Engineering Report.

## 6.0

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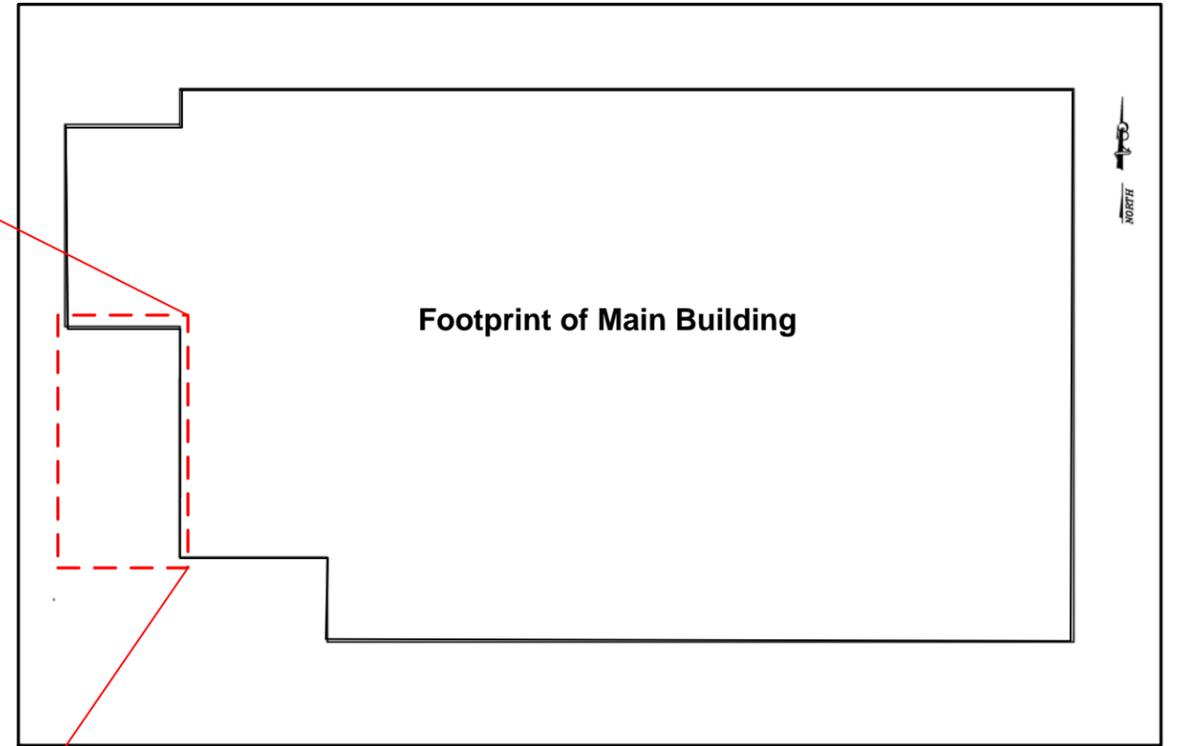
## *Figures*



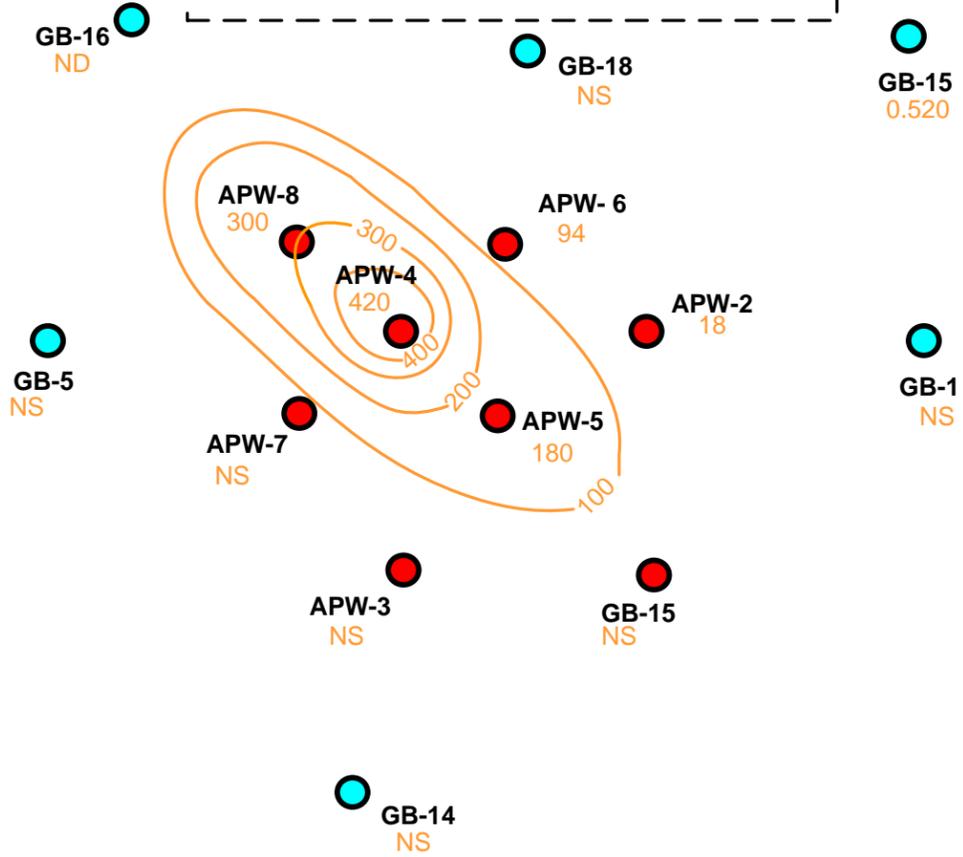
Concentration of total xylenes in soil 4 to 8 ft bgs.



Active Fiber Drum Storage Area

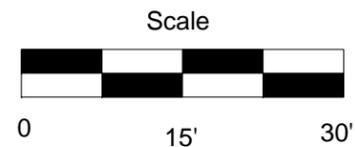


Footprint of Main Building



Legend

- APW-2 Antenna Placement Well
- GB-15 Soil boring from previous investigations
- 300 Concentration of total xylenes (mg/kg)
- Fence
- Isoconcentration of total xylenes, contour interval 100 mg/kg; dashed where inferred
- (ND) Not Detected above laboratory reporting limit of 10 µg/L
- (NS) Interval not sampled due to lower detections of VOC during field screen with a calibrated photoionization detector, or a different interval was sampled.



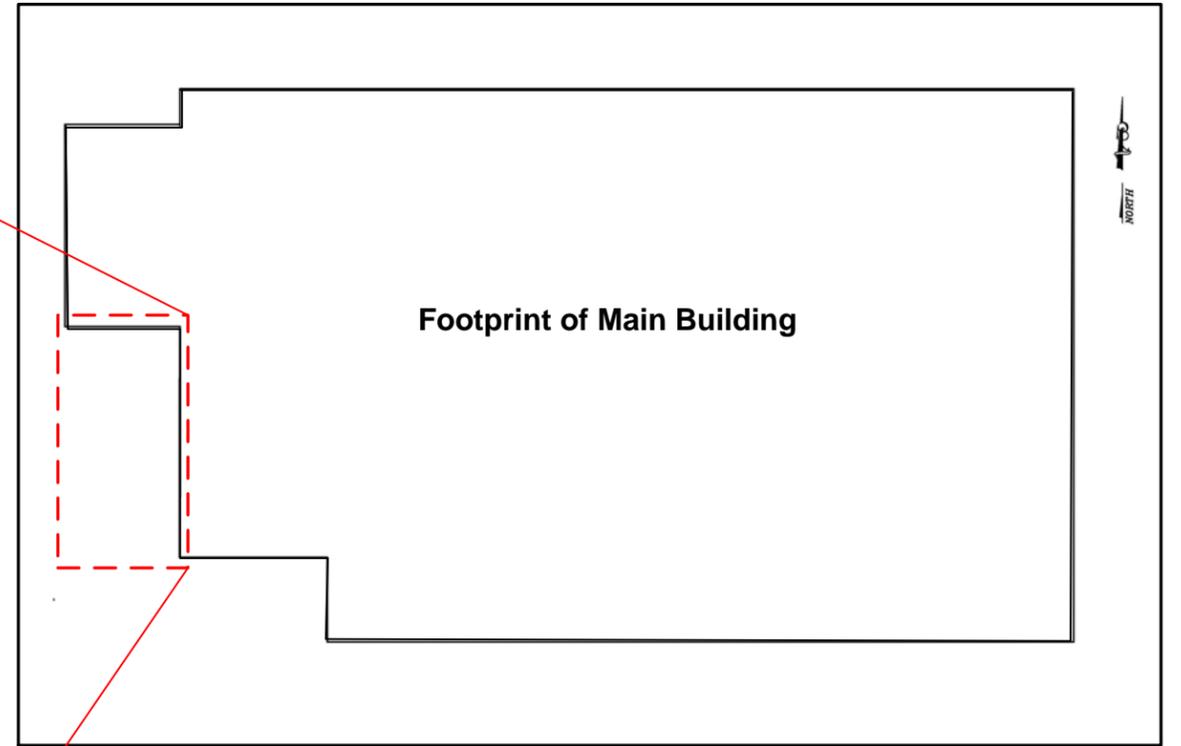
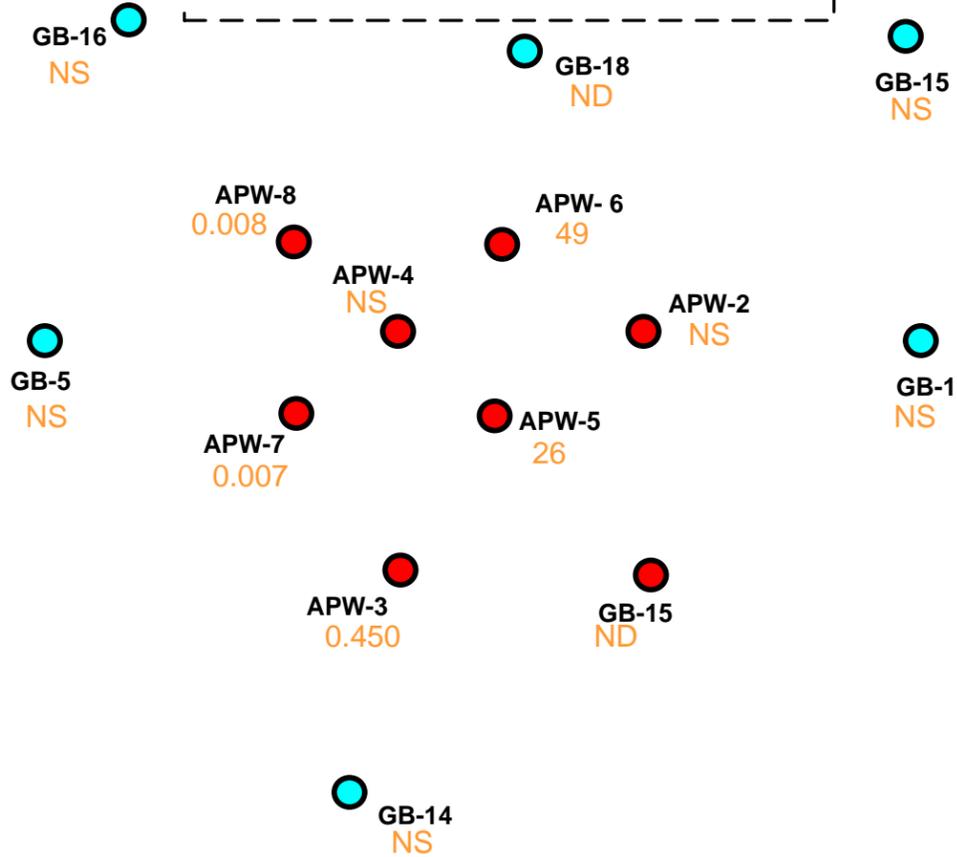
Total Xylenes in Soil 4 to 8 ft bgs- Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		
	Scale	Figure <b>1</b>
	Date	
	See Bar Scale	
	10 Mar 2010	



Concentration of total xylenes in soil 9 to 12 ft bgs.



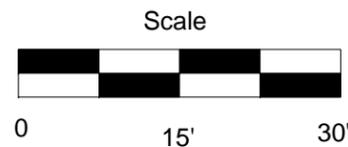
Active Fiber Drum Storage Area



Footprint of Main Building

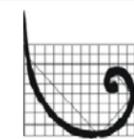
Legend

- APW-2 Antenna Placement Well
- GB-15 Soil boring from previous investigations
- 300 Concentration of total xylenes (mg/kg)
- Fence
- Isoconcentration of total xylenes, contour interval 100 mg/kg; dashed where inferred
- (ND) Not Detected above laboratory reporting limit of 10 µg/L
- (NS) Not sample as a shallower sample was collected at an interval with higher VOC concentration detected during field screening.



Total Xylenes in Soil 9 to 12 ft bgs- Former Varnish UST Area  
Greif Facility- Tonawanda, New York

Prepared For: Sonoco Products Company



ERM

Scale  
See Bar Scale

Date  
10 Mar 2010

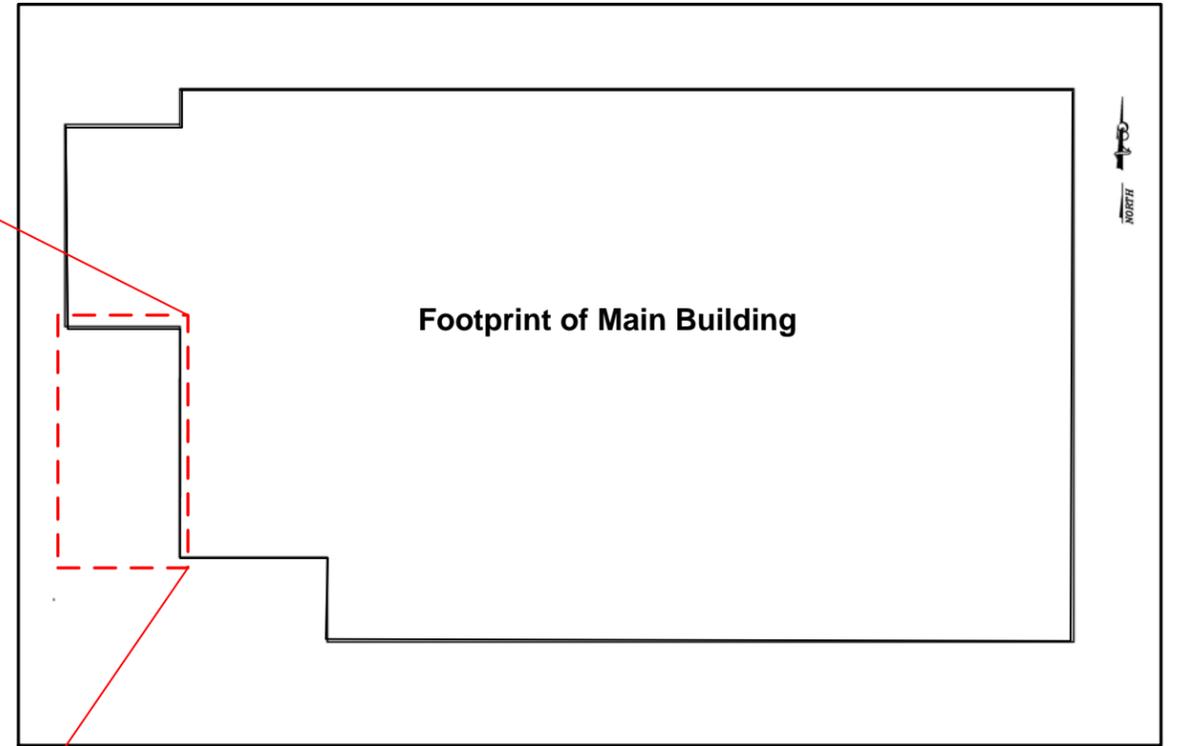
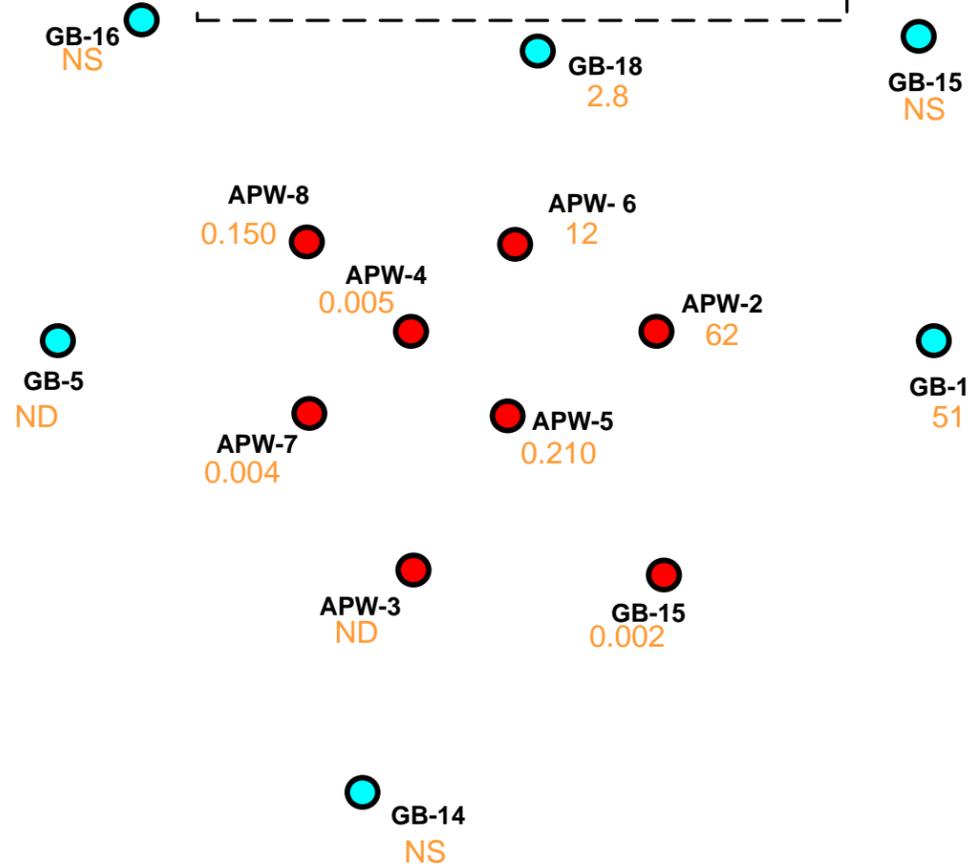
Figure  
2



Concentration of total xylenes in soil 14-17 ft bgs.



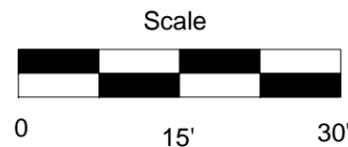
Active Fiber Drum Storage Area



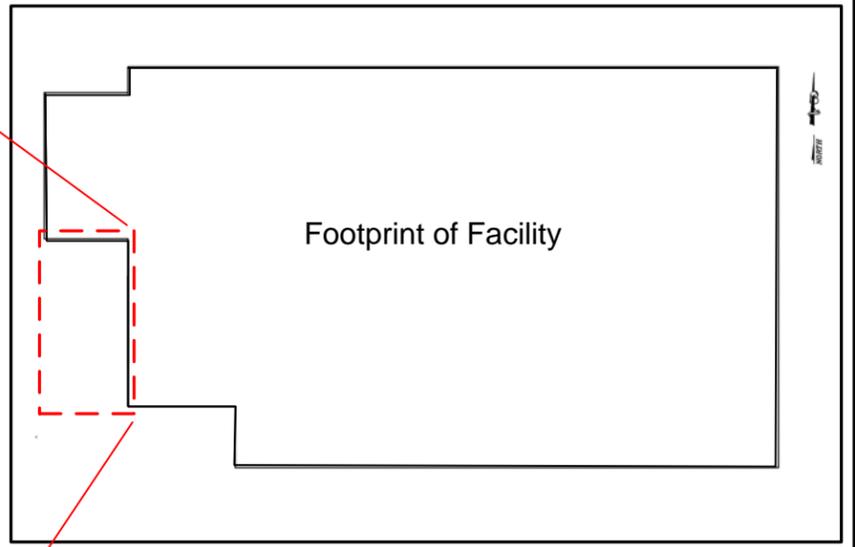
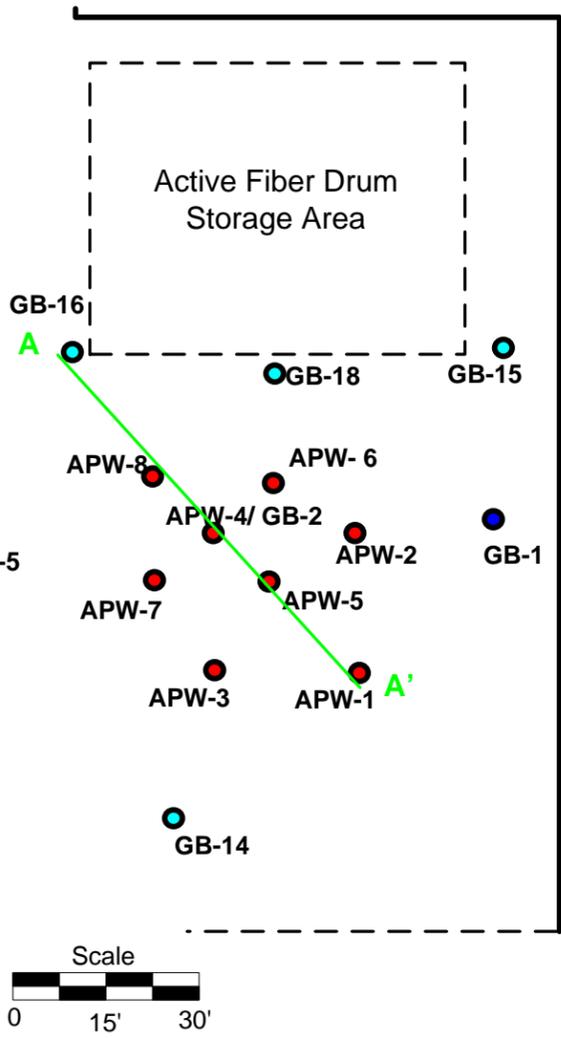
Footprint of Main Building

Legend

- APW-2 Antenna Placement Well
- GB-15 Soil boring from previous investigations
- 300 Concentration of total xylenes (mg/kg)
- - - Fence
- Isoconcentration of total xylenes, contour interval 100 mg/kg; dashed where inferred
- ND Not Detected above laboratory reporting limit of 10 µg/L
- NS Interval not sampled due to lower detections of VOC during field screen with a calibrated photoionization detector, or a different interval was sampled.

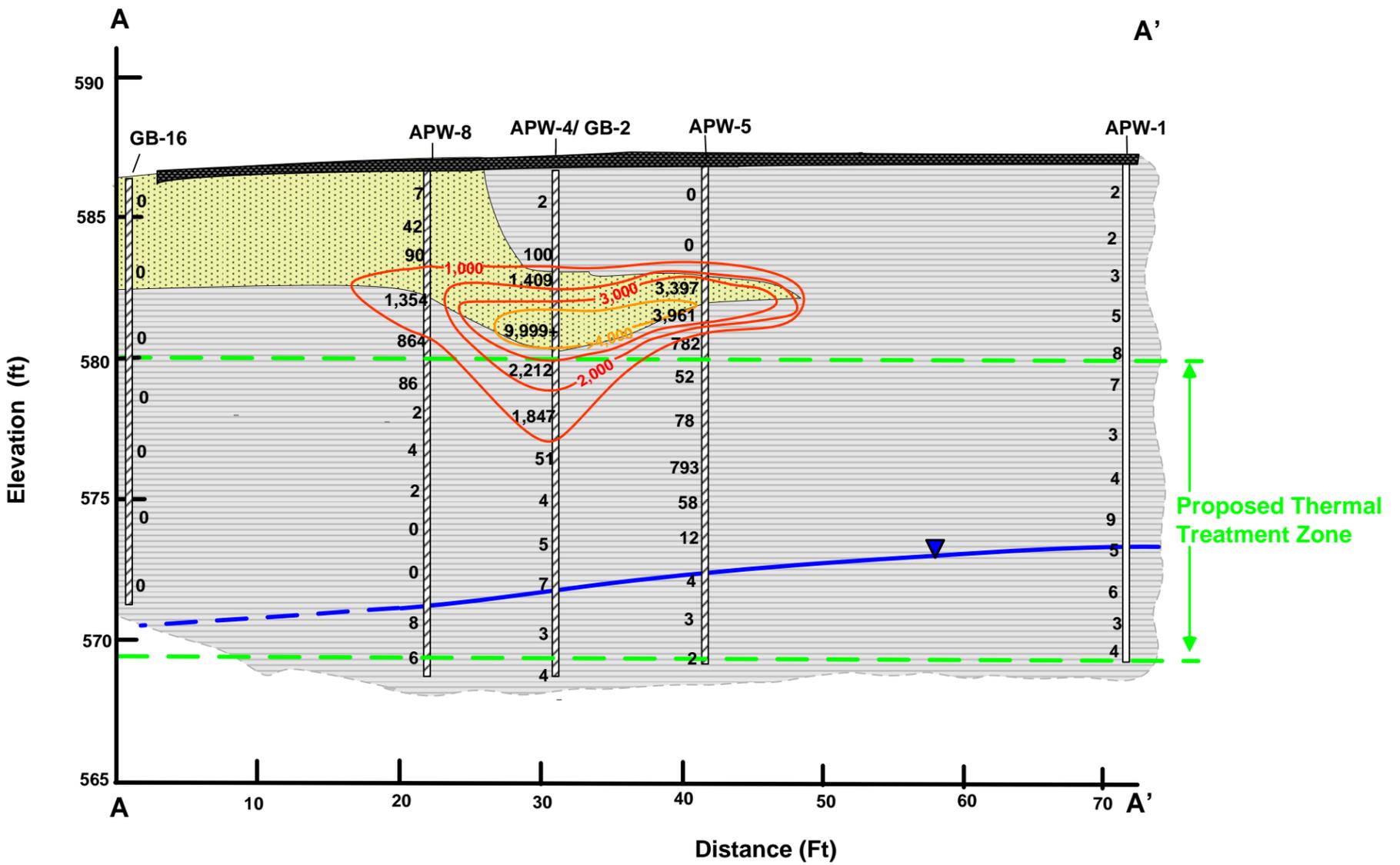


Total Xylenes in Soil 14 to 17 ft bgs- Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		
	Scale	Figure <b>3</b>
	See Bar Scale	
	Date	
	10 Mar 2010	



**Legend**

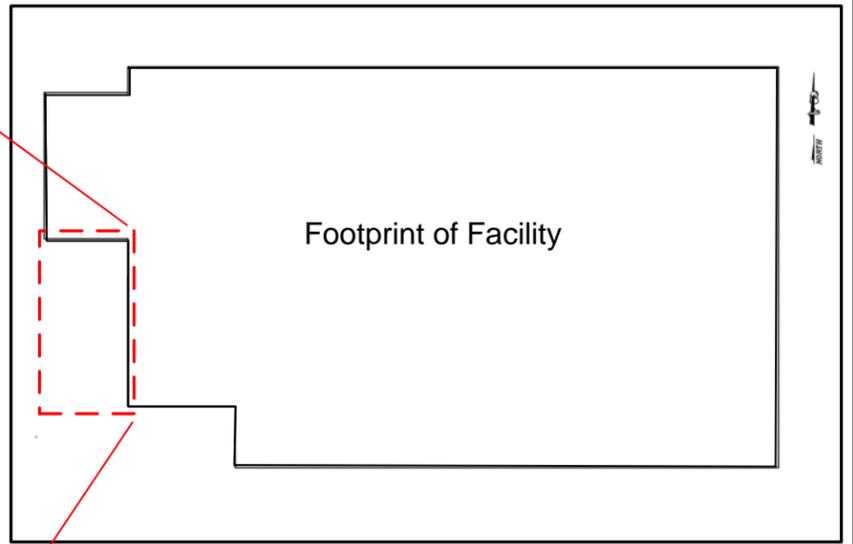
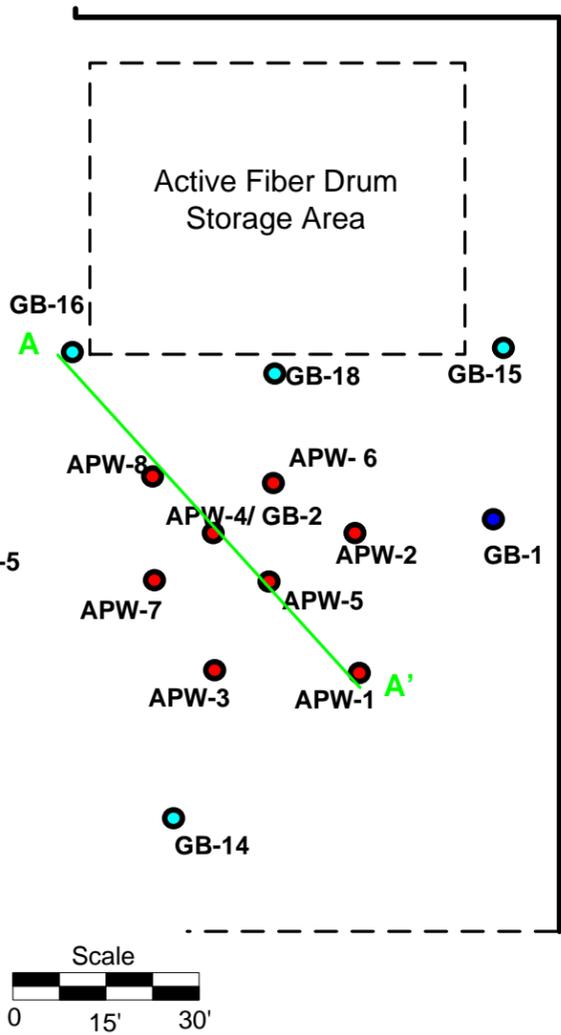
- Antenna Placement Well  
APW-1
- Soil Boring from Phase II Investigation  
GB-1
- Soil Boring from Phase III Investigation  
GB-15
- - - Fence



**Legend**

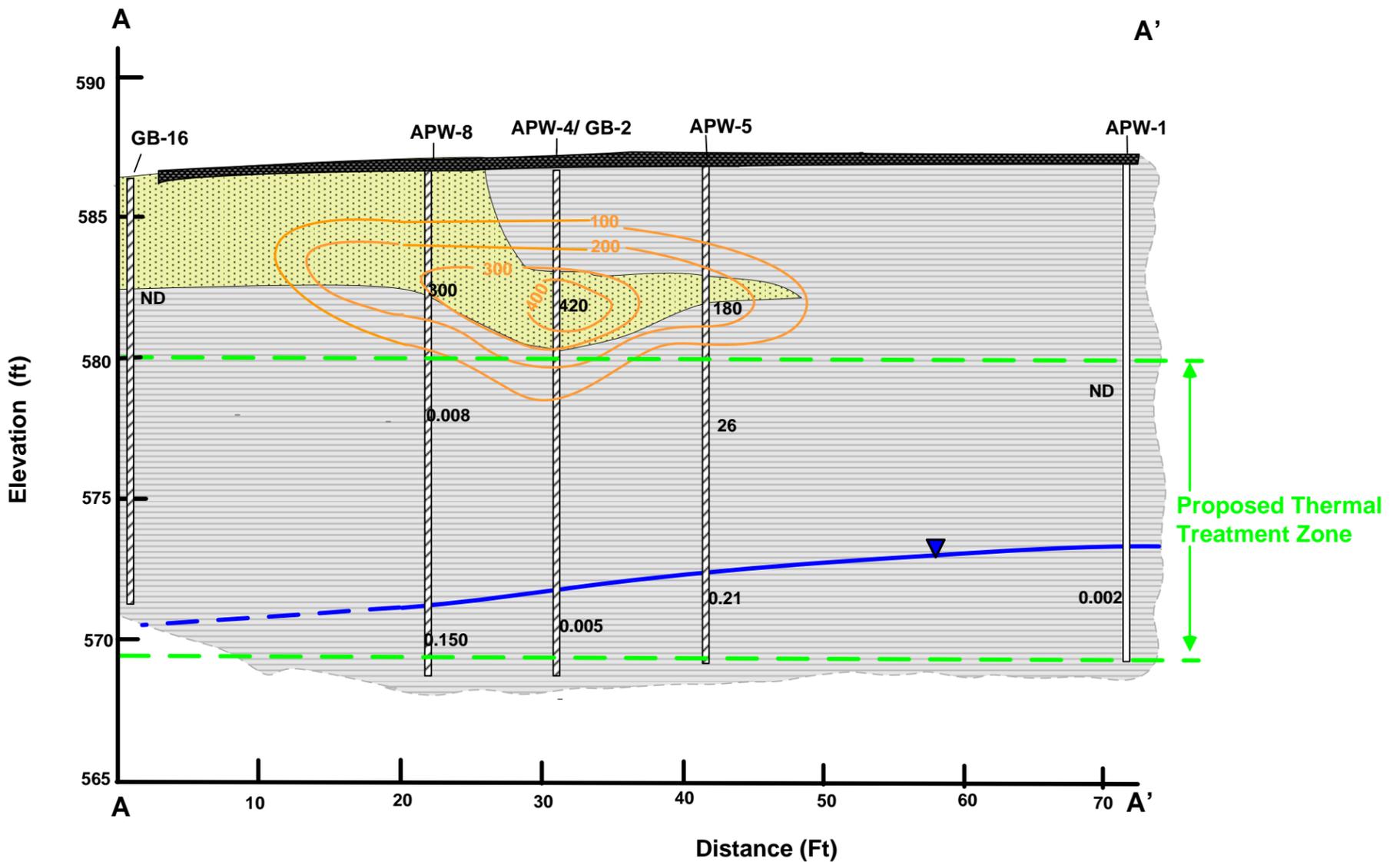
- Asphalt cap
- Silt and fine sand, with clay
- Clay and silt
- Vertical Exaggeration 2X
- ▼ Static ground water- 16 Feb 2010; inferred where dashed
- 4.9 VOC concentration detected during field screening of soil (ppm)
- Isoconcentration of VOCs detected during field screen of soil; contour interval=1,000 ppm
- Isoconcentration of VOCs detected during field screen of soil; contour interval= >4,000 ppm

PID Field Screening Results Cross Section A-A'-Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		
	Scale As Shown	4
	Date 19 July 2010	



**Legend**

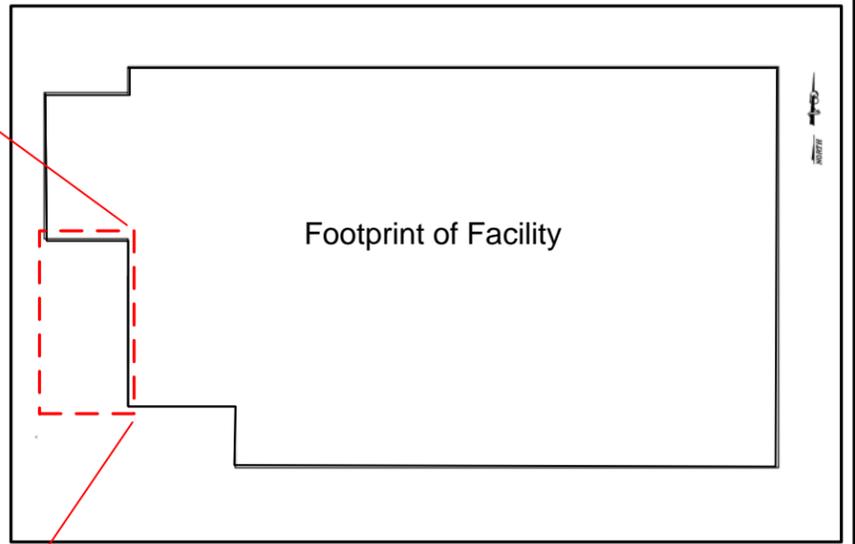
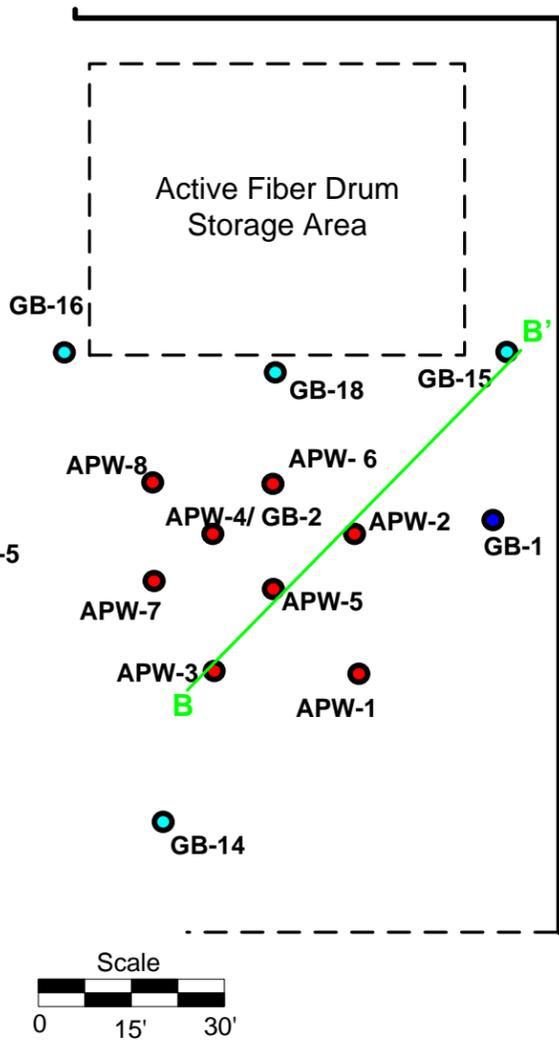
- Antenna Placement Well  
APW-1
- Soil Boring from Phase II Investigation  
GB-1
- Soil Boring from Phase III Investigation  
GB-15
- - - Fence



**Legend**

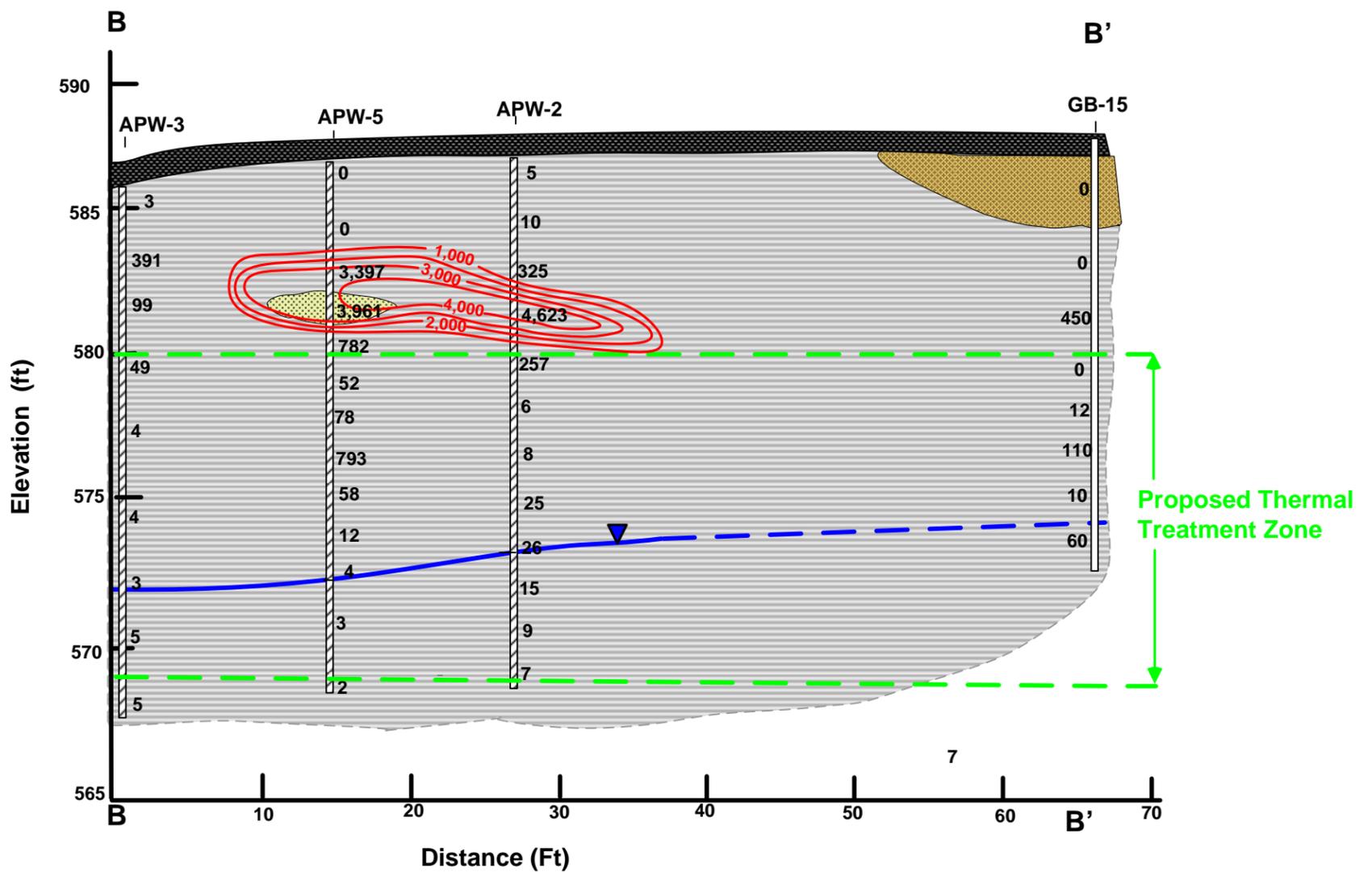
- Asphalt cap
  - Silt and fine sand, with clay
  - Clay and silt
  - ND Total xylenes not detected above the laboratory reporting limit
  - ▼ Static ground water- 16 Feb 2010; inferred where dashed
  - 4.9 Total xylenes concentration detected in soil sample (mg/kg)
  - Isoconcentration of total xylenes detected in soil; contour interval= 100 mg/kg
- Vertical Exaggeration 2X

Laboratory Analytical Results Cross Section A-A'-Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		
	Scale As Shown	<span style="font-size: 2em; font-weight: bold;">5</span>
	Date 19 July 2010	



**Legend**

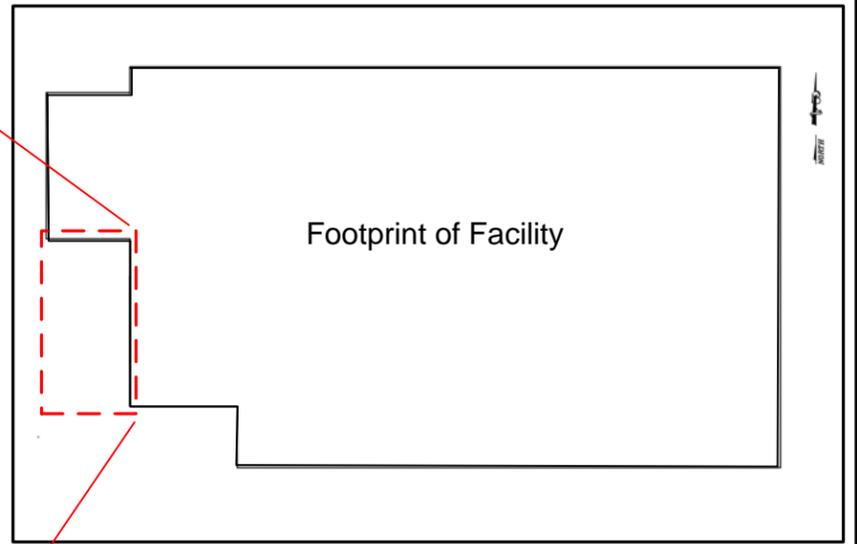
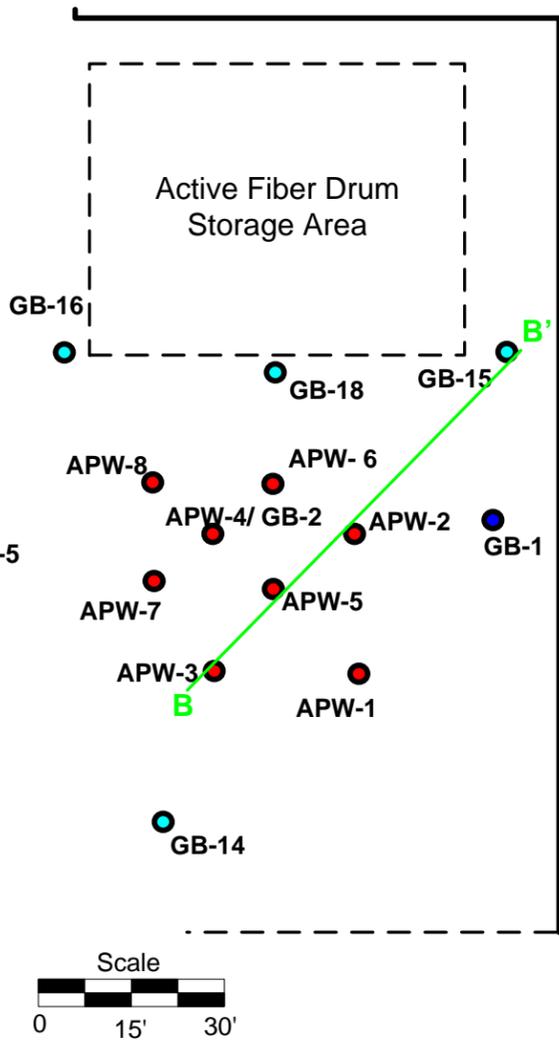
- Antenna Placement Well  
APW-1
- Soil Boring from Phase II Investigation  
GB-1
- Soil Boring from Phase III Investigation  
GB-15
- Fence



**Legend**

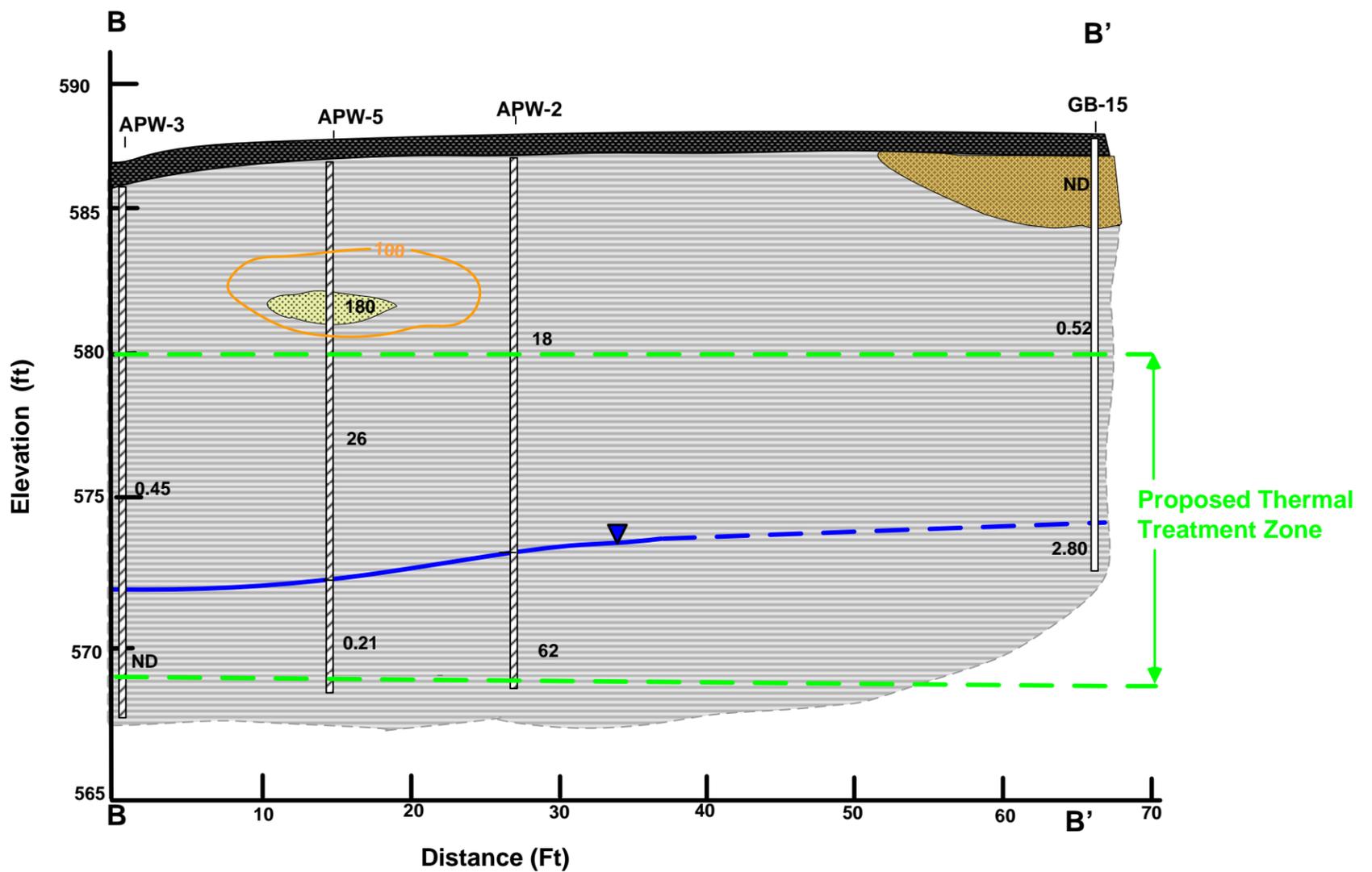
- Asphalt cap
  - Silt and fine sand, with clay
  - Clay and silt
  - Sand, some silt
  - ▼ Static ground water- 16 Feb 2010  
dashed where inferred.
  - 4.9 VOC concentration detected during field screening of soil (ppm)
  - Isoconcentration of VOCs detected during field screen of soil; contour interval=1,000 ppm
- Vertical exaggeration 2X

PID Field Screening Results Cross Section B-B'-Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For:		Sonoco Products Company
	Scale	As Shown
	Date	19 July 2010
		6



**Legend**

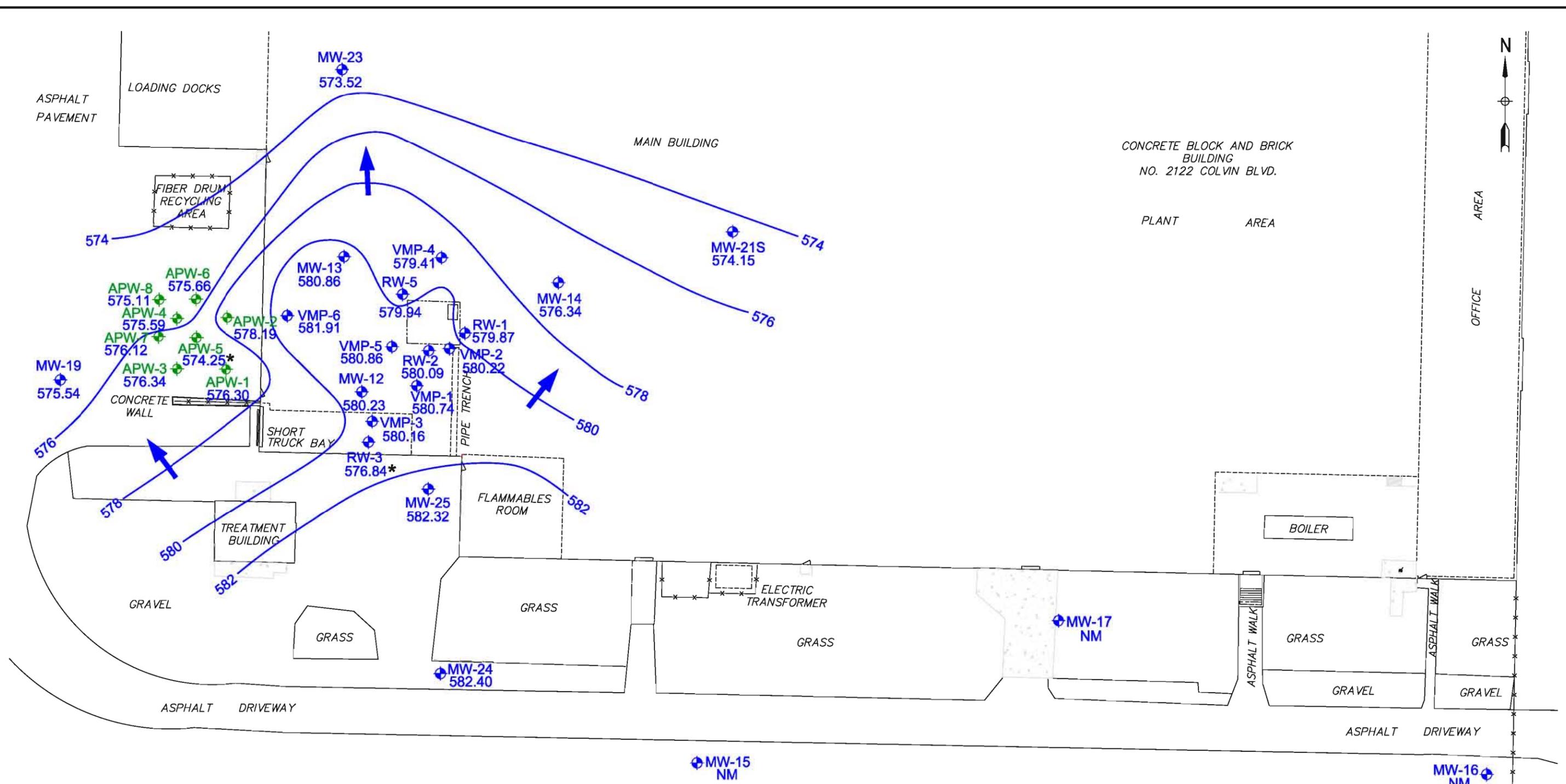
- Antenna Placement Well  
APW-1
- Soil Boring from Phase II Investigation  
GB-1
- Soil Boring from Phase III Investigation  
GB-15
- Fence



**Legend**

- Asphalt cap
  - Silt and fine sand, with clay
  - Clay and silt
  - Sand, some silt
  - ▼ Static ground water- 16 Feb 2010  
dashed where inferred.
  - 4.9 Total xylenes concentration detected  
in soil sample (mg/kg)
  - Isoconcentration of total xylenes detected  
in soil, contour interval 100 mg/kg;  
dashed where inferred.
- Vertical exaggeration 2X

Laboratory Analytical Results Cross Section B-B'-Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		
	Scale As Shown	Figure <b>7</b>
	Date 19 July 2010	



- LEGEND**
- Monitoring or Recovery Well Location
  - Antenna Placement Well Location
  - Possible Anomalous Ground Water Elevations not Considered in Contouring
  - Not Measured
  - Ground Water Contour (feet amsl)
  - Ground Water Flow Direction



Source: ERM, TOC elevations done by Wm. Schutt & Associates, P.C., 37 Central Ave, Lancaster, NY. Survey File: D:\01351\03, WSA Proj.#01351.

<b>TITLE</b> SHALLOW GROUND WATER CONTOURS 20 APRIL 2010 GREIF FACILITY-TONAWANDA, NEW YORK NYSDEC VCP NUMBER V00334-9			
<b>PREPARED FOR</b> SONOCO PRODUCTS COMPANY			
Environmental Resources Management	SCALE	FIGURE	8
	1"=40'		
DATE	8/3/10		
<b>DRAWN:</b> EMF	<b>JOB NO.:</b> 0112477.01	<b>FILE NAME:</b> 0112477-01-006	

R:\projects\Sonoco\Tonawanda\CAD\0112477-01-006 Shallow GW.dwg (08/04/2010 - 11:32am Melville)



APW-8	
1,1,1-TCA	<4.1
TCE	<2.3
Xylenes	13

APW-6	
1,1,1-TCA	<4.1
TCE	2.6 J
Xylenes	9400

APW-2	
1,1,1-TCA	<4.1
TCE	<2.3
Xylenes	27,000

MW-23	
1,1,1-TCA	68,000
TCE	100,000
Xylenes	220

MW-13	
1,1,1-TCA	55,000
TCE	79,000
Xylenes	<3.3

APW-4	
1,1,1-TCA	4.4 J
TCE	3.8 J
Xylenes	9500

RW-5	
1,1,1-TCA	140,000
TCE	47,000
Xylenes	210

APW-7	
1,1,1-TCA	<4.1
TCE	<2.3
Xylenes	<3.3

VMP-6	
1,1,1-TCA	<4.1
TCE	<2.3
Xylenes	11,000

MW-19	
1,1,1-TCA	<4.1
TCE	<2.3
Xylenes	<3.3

VMP-5	
1,1,1-TCA	120,000
TCE	30,000
Xylenes	190

APW-5	
1,1,1-TCA	8.2
TCE	180
Xylenes	8.2 J

APW-3	
1,1,1-TCA	1100
TCE	<2.3
Xylenes	<3.3

APW-1	
1,1,1-TCA	2200
TCE	<2.3
Xylenes	<3.3

MW-12	
1,1,1-TCA	1900
TCE	1300
Xylenes	<3.3

ASPHALT PAVEMENT

LOADING DOCKS

FIBER DRUM RECYCLING AREA

MAIN BUILDING

CONCRETE WALL

SHORT TRUCK BAY

FLAMMABLES ROOM

ELECTRIC TRANSFORMER

GRAVEL

GRASS

GRASS

GRASS

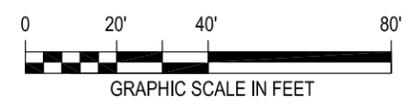
TREATMENT BUILDING

**LEGEND**

- Monitoring or Recovery Well Location
- Antenna Placement Well Location
- NS Not Sampled

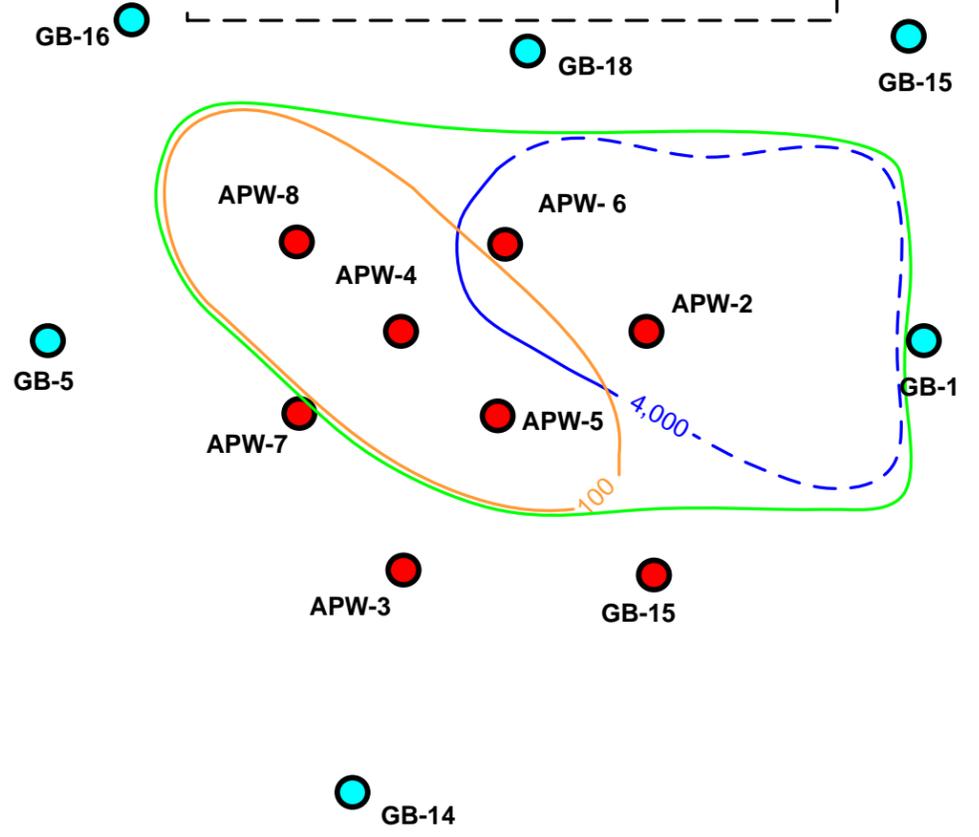
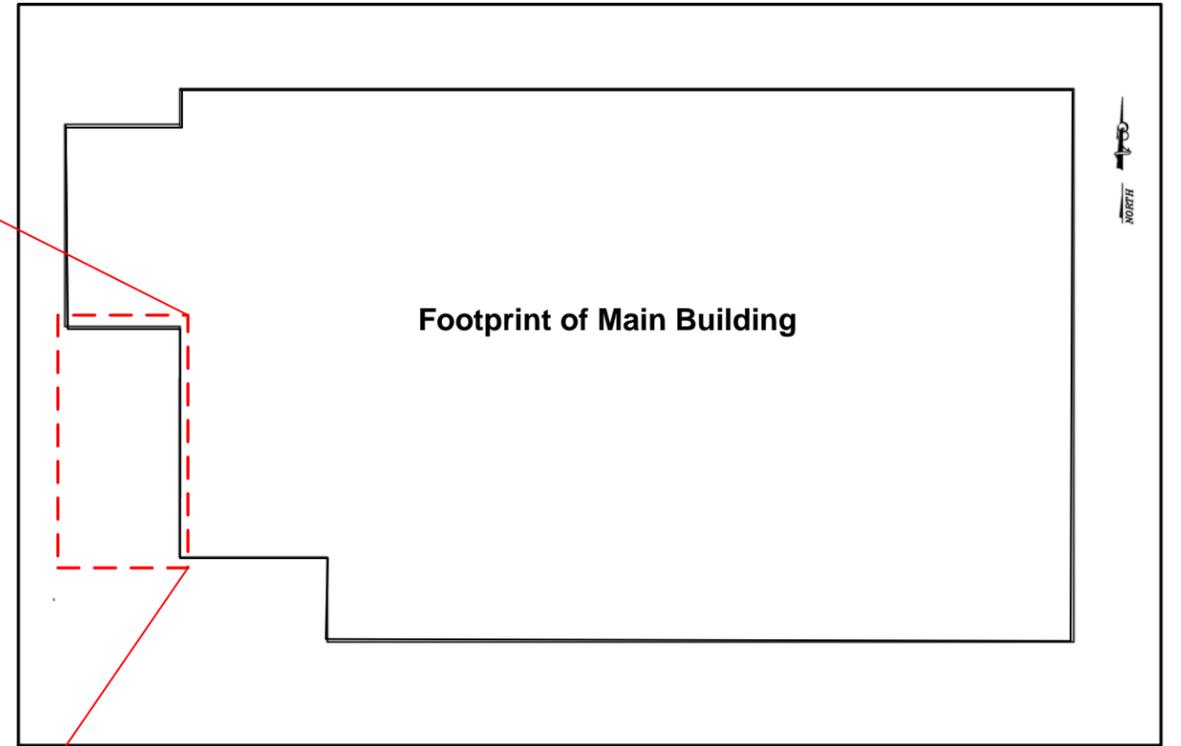
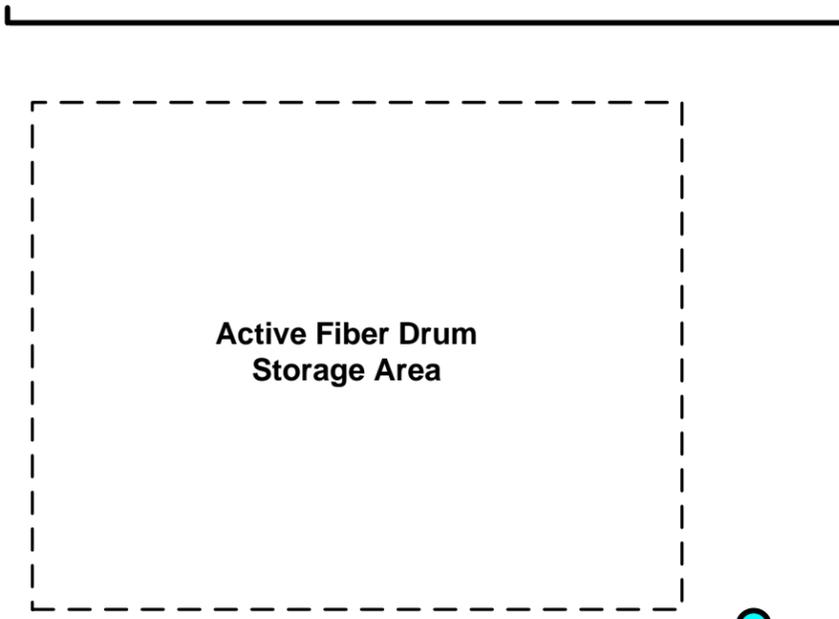
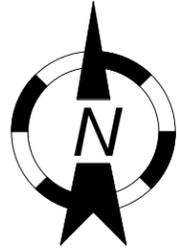
**NOTE**

All concentrations are in ug/L



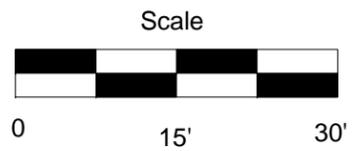
<p>TITLE</p> <p>1,1,1-TCA, TCE &amp; XYLENES IN GROUND WATER SELECTED WELLS - APRIL 2010 GREIF FACILITY-TONAWANDA, NEW YORK NYSDEC VCP NUMBER V00334-9</p>			
<p>PREPARED FOR</p> <p>SONOCO PRODUCTS COMPANY</p>			
Environmental Resources Management	SCALE	FIGURE	9
	DATE		
<p>DRAWN: EMF</p>	<p>JOB NO.: 0112477.01</p>	<p>FILE NAME: 0112477-01-005</p>	<p>8/3/10</p>

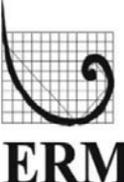
Source: ERM, TOC Elevations done by Wm. Schutt & Associates, P.C., 37 Central Ave, Lancaster, NY. Survey File: D/01351/03, WSA Proj.#01351.



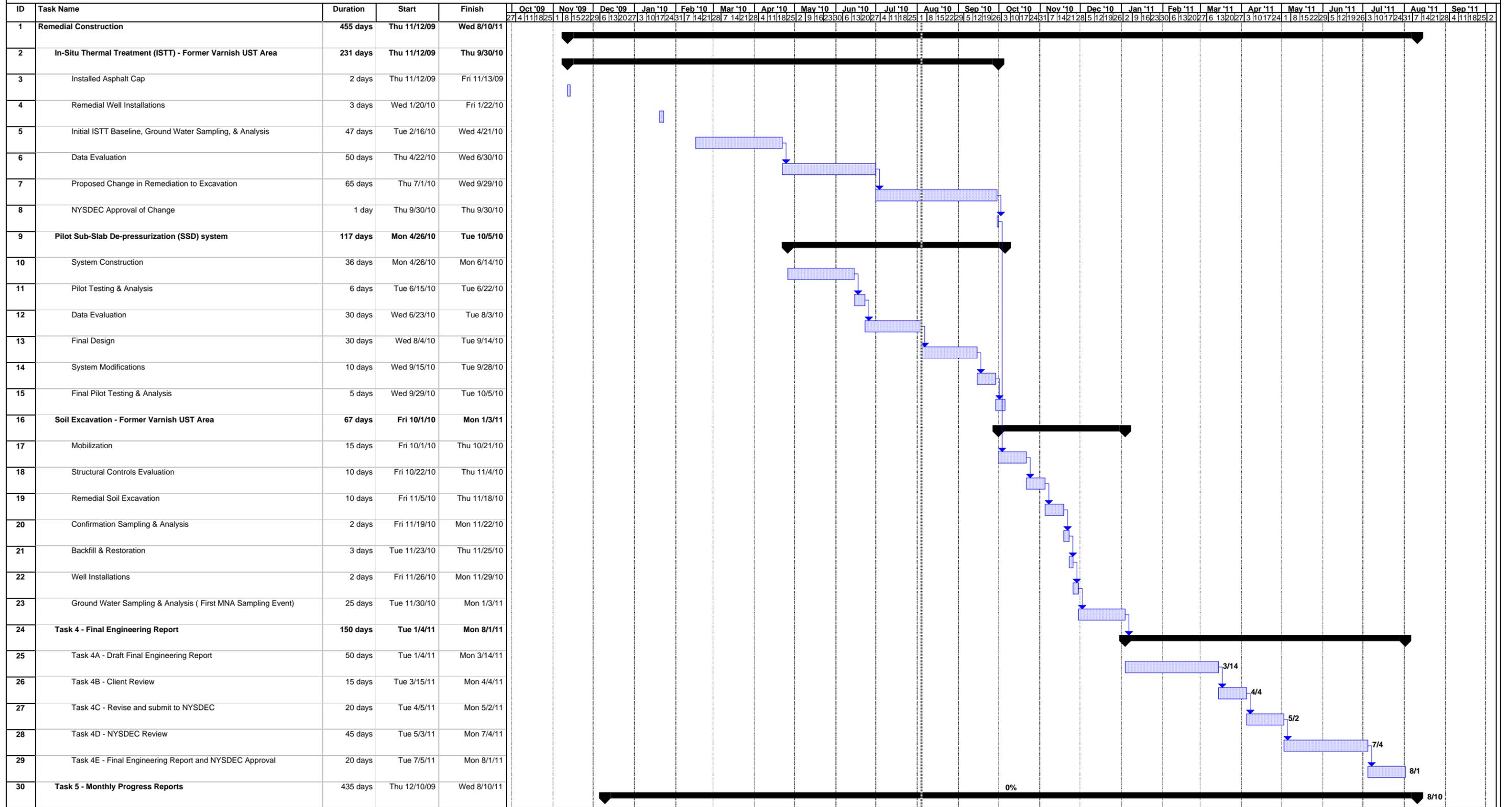
**Legend**

-  APW-2 Antenna Placement Well
-  GB-15 Soil boring from previous investigations
-  Fence
-  Isoconcentration of total xylenes in soil collected between 4-8 ft bgs, contour interval 4,000 mg/kg; dashed where inferred
-  Isoconcentration of total xylenes in Ground water, contour interval 4,000 µg/L; dashed where inferred
-  Proposed excavation area between 3-9 ft bgs, based on available analytical and field data.



Proposed Excavation Area Based on Available Data Former Varnish UST Area Greif Facility- Tonawanda, New York		
Prepared For: Sonoco Products Company		Figure <b>10</b>
	Scale See Bar Scale	
	Date 10 Mar 2010	

**Figure 11 - Estimated Project Schedule**  
**Remedial Construction - Greif Facility, Tonawanda, New York**  
**NYSDEC VCP # V00334-9**



Project: EVEPH2\_0298drft.MPP  
 Date: Wed 8/4/10

Task: [Blue box] Milestone: [Black diamond] Rolled Up Task: [Blue box] Rolled Up Progress: [Black bar] Project Summary: [Grey bar] Rolled Up Split: [Grey bar] Deadline: [Green arrow]

Progress: [Black bar] Summary: [Black bar] Rolled Up Milestone: [White diamond] External Tasks: [Grey bar] Split: [Blue bar] External Milestone: [Black diamond]

## *Tables*

**TABLE 1**  
**SUMMARY OF VOCs IN SOIL**  
**FORMER VARNISH UST AREA**  
**GREIF FACILITY - TONAWANDA, NEW YORK**  
**NYSDEC VCP NUMBER V00334-9**

Sample Location	APW-1		APW-2		APW-3		APW-4		APW-5			APW-6			APW-7		APW-8			NYSDEC Restricted Commercial SCO
	Sample Depth (feet bgs)	9-11	15-17	6-8	15-17	9-11	15-17	4-6	15-17	4-6	9-11	15-17	4-6	9-11	15-17	9-11	15-17	4-6	9-11	
<b>VOCs (mg/kg)</b>																				
Acetone	----	0.043	----	0.12	----	----	0.43	0.01	0.069	----	0.014	0.024	----	----	----	0.0075	0.023	----	0.64	500
Benzene	----	----	----	----	----	----	----	----	0.0022	----	----	----	----	----	----	----	0.32	----	----	44
2-Butanone	----	----	----	----	----	----	0.0073	----	----	----	----	----	----	----	----	----	----	----	----	500
Chloroethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	NA
Chloroform	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	350
1,1-Dichloroethane	0.22	----	----	----	0.32	14	----	----	0.0069	----	----	----	----	----	----	----	----	----	----	240
1,2-Dichloroethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	30
1,1-Dichloroethene	4	----	----	----	1.6	----	----	----	0.0059	----	----	----	----	----	----	----	----	----	----	500
1,2-Dichloroethene (total)	----	----	----	----	----	----	0.017	----	1.0022	----	0.0083	0.0071	----	----	----	----	----	----	----	NA
cis-1,2-Dichloroethene	----	----	----	----	----	----	0.017	----	1	----	0.0083	0.0071	----	----	----	----	----	----	----	500
trans-1,2-Dichloroethene	----	----	----	----	----	----	----	----	0.0022	----	----	----	----	----	----	----	----	----	----	500
Ethylbenzene	----	----	3.9	18	0.12	----	69	0.0015	34	9.3	0.043	13	18	6.8	0.0015	----	83	0.0019	0.034	390
Methylene chloride	----	0.011	----	0.0059	----	----	0.0053	0.0052	0.0055	----	0.0044	0.005	----	----	0.0048	0.0053	0.0044	0.0056	0.0059	500
4-Methyl-2-pentanone	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	NA
Tetrachloroethene	----	----	----	----	----	----	0.0022	----	0.0017	----	----	0.0016	----	----	----	----	----	----	----	150
Toluene	----	----	----	0.065	----	----	0.1	----	0.29	----	0.0032	0.0091	----	----	----	----	0.024	----	----	500
1,1,1-Trichloroethane	12	----	----	----	5.8	----	0.0038	----	0.04	----	----	----	----	----	----	----	----	----	----	500
1,1,2-Trichloroethane	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	NA
Trichloroethene	0.15	----	----	----	----	----	----	----	3	----	0.011	----	----	----	----	----	0.0021	----	----	200
1,2,4-Trimethylbenzene	----	----	3.2	0.22	0.089	----	110	----	35	12	0.017	42	14	2.3	----	----	110	----	0.029	190
Vinyl Chloride	----	----	----	----	----	----	----	----	0.0016	----	----	----	----	----	----	----	----	----	----	13
Xylenes (total)	----	0.0023	18	62	0.45	----	420	0.0054	180	26	0.21	94	49	12	0.007	0.0041	300	0.0079	0.15	500

**NOTES:**

- All concentrations are reported in milligrams-per-kilogram (parts-per-million).
- Compounds listed include all compounds on the Site-specific VOC list contained in the NYSDEC-approved Remedial Action Work Plan.
- ---- = the compound was not detected at a concentration above the laboratory reporting limit for the analysis.
- SCO = Soil Cleanup Objective

TABLE 2  
SUMMARY OF VOCs IN GROUND WATER- 16 FEBRUARY 2010  
FORMER VARNISH UST AREA BASELINE GROUND WATER MONITORING  
GREIF FACILITY - TONAWANDA, NEW YORK  
NYSDEC VCP NUMBER V00334-9

Sample Designation	APW-1	APW-2	APW-3	APW-4	APW-DUP	APW-5	APW-6	APW-7	APW-8	Standard
<b>VOCs (µg/L)</b>										
Acetone	13 J	<b>52</b>	12 J	<b>58 J</b>	42	26	<b>76</b>	15 J	27	50
Benzene	----	<b>5</b>	----	----	----	----	----	----	----	1
2-Butanone	----	<b>13 J</b>	----	----	<b>7.2</b>	----	<b>15 J</b>	----	----	5
Chloroethane	----	----	<b>9.0</b>	----	----	----	----	----	----	5
Chloroform	----	----	----	----	----	----	----	----	----	7
1,1-Dichloroethane	<b>52</b>	----	<b>12,000</b>	----	----	3.0 J	----	----	----	5
1,2-Dichloroethane	----	----	<b>2.8 J</b>	----	----	----	----	----	----	0.6
1,1-Dichloroethene	<b>140</b>	----	<b>51</b>	----	----	----	----	----	----	5
cis-1,2-Dichloroethene	<b>13</b>	<b>32</b>	----	<b>13 J</b>	<b>13</b>	<b>75</b>	<b>4.0 J</b>	----	----	5
trans-1,2-Dichloroethene	----	----	----	----	----	----	----	----	----	5
Ethylbenzene	----	<b>2,400</b>	----	<b>500</b>	<b>460</b>	<b>16</b>	<b>360</b>	----	<b>17</b>	5
Methylene chloride	----	----	2.5 J	----	----	----	----	----	----	5
4-Methyl-2-pentanone	----	14 J	----	----	----	----	11 J	----	----	NS
Tetrachloroethene	----	----	----	----	----	----	----	----	----	0.7
Toluene	----	<b>36</b>	----	<b>54</b>	<b>50</b>	----	<b>6.8</b>	----	----	5
1,1,1-Trichloroethane	<b>660</b>	----	<b>350</b>	----	----	----	----	----	----	5
1,1,2-Trichloroethane	----	----	----	----	----	----	----	----	----	5
Trichloroethene	----	----	----	----	----	<b>29</b>	----	----	----	5
1,2,4-Trimethylbenzene	----	<b>570</b>	----	<b>27</b>	<b>32</b>	<b>7.6</b>	<b>180</b>	----	----	5
Vinyl chloride	----	----	<b>5</b>	----	----	----	----	----	----	2
Xylene (total)	----	<b>14,000</b>	----	<b>2,200</b>	<b>2,100</b>	<b>130</b>	<b>4,800</b>	----	<b>56</b>	5

**NOTES:**

All concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted.

---- = Compound was not detected above the laboratory reporting limit for this analysis.

**Bold** = Represents an exceedance of standard for non-estimated data.

J = Indicates an estimated value.

NS = Not Specified

**TABLE 3**  
**SUMMARY OF VOCs IN GROUND WATER - 20 APRIL 2010**  
**FORMER VARNISH UST AREA AND ADJACENT AREA BENEATH BUILDING**  
**GREIF FACILITY - TONAWANDA, NEW YORK**  
**NYSDEC VCP NUMBER V00334-9**

Sample Designation	APW-1	APW-2	APW-3	APW-4	APW-5	APW-6	APW-7	APW-8	MW-12	MW-13	MW-19	MW-23	RW-5	VMP-5	VMP-6	Standard
<b>VOCs (µg/L)</b>																
Acetone	----	----	----	----	----	30	----	----	----	----	----	350	6,700 J	490	----	50
Benzene	----	----	----	2.6 J	----	4.2 J	----	----	----	----	----	----	----	----	----	1
2-Butanone	----	----	----	----	----	----	----	----	----	----	----	18 J	1,600	220	----	5
Chloroethane	----	----	----	----	----	----	----	----	4.1	----	----	----	28	7.8	----	5
Chloroform	----	----	----	----	----	----	----	----	1.4	----	----	27	86	44	----	7
1,1-Dichloroethane	180	----	10,000	4.6 J	8.8	----	----	----	2,300	13,000	----	23,000	12,000	2,700	46 J	5
1,2-Dichloroethane	----	----	----	----	----	----	----	----	5.4	----	----	5.2	280	130	----	0.6
1,1-Dichloroethene	610	----	130	----	----	----	----	----	940	24,000	----	10,000	35,000	12,000	----	5
cis-1,2-Dichloroethene	53	----	----	40	460	10	----	----	3,300	15,000	----	2,600	86,000	6,300	----	5
trans-1,2-Dichloroethene	----	----	----	----	4.6 J	----	----	----	52	500	----	34	54	13	----	5
Ethylbenzene	----	2,900	----	460	----	960	----	----	----	----	----	63	47	34	4,200	5
Methylene chloride	----	----	----	----	----	----	----	----	----	----	----	3.0 J	20	7.8	----	5
4-Methyl-2-pentanone	----	----	----	----	----	----	----	----	----	----	----	----	62	19 J	----	NS
Tetrachloroethene	----	----	----	----	----	----	----	----	----	----	----	14	16	14	----	0.7
Toluene	----	----	----	68	----	13	----	----	----	----	----	130	37	21	----	5
1,1,1-Trichloroethane	2,200	----	1,100	4.4 J	8.2	----	----	----	1,900	55,000	----	68,000	140,000	120,000	----	5
1,1,2-Trichloroethane	----	----	----	----	----	----	----	----	1.1	----	----	3.2 J	26	20	----	5
Trichloroethene	----	----	----	3.8 J	180	2.6 J	----	----	1,300	79,000	----	100,000	47,000	30,000	----	5
1,2,4-Trimethylbenzene	----	1,000	----	380	----	400	----	----	----	----	----	280	17	15	450	5
Vinyl chloride	----	----	----	----	7.0	----	----	----	39	490 J	----	34	32	14	----	2
Xylene (total)	----	27,000	----	9,500	8.2 J	9,400	----	13	----	----	----	220	210	190	11,000	5

**NOTES:**

All concentrations are reported in micrograms per liter (parts per billion) unless otherwise noted.

---- = Compound was not detected above the laboratory reporting limit for this analysis.

**Bold** = Represents an exceedance of standard for non-estimated data.

J = Indicates an estimated value.

NS = Not Specified

**TABLE 4**  
**COMPARISON OF THE ORIGINAL REMEDY AND THE PROPOSED CHANGE IN REMEDY**  
**FORMER VARNISH UST AREA**  
**GREIF FACILITY - TONAWANDA, NEW YORK**  
**NYSDEC VCP NUMBER V00334-9**

ORIGINAL REMEDY (In-Situ Thermal Treatment)	PROPOSED CHANGE IN REMEDY (Excavation and Off-Site Disposal)
Estimated time to complete the remediation - 7 months	Estimated time to complete the remediation - 2 months
Mobilization of personnel, equipment, and supplies to the Site.	
Installation of antennae placement wells, vapor extraction wells, and asphalt vapor cap.	Installation of soil erosion and sedimentation control measures.
Pre-remediation soil and ground water sampling and analysis.	Installation of soil staging areas.
Installation of radiofrequency heating equipment, soil vapor extraction system, and vapor-phase treatment equipment.	
On Site training on operation of heat and soil gas treatment equipment; testing of telemetry and monitoring equipment.	
Start up of in situ heating, monitoring, operation and maintenance during heat of the treatment cell until the target temperature is achieved. Conduct confirmation soil sampling around the first treatment cell. Heat a second treatment cell if required.	Excavation of affected soil.
	Off-Site disposal of affected soil.
Post-remediation soil sampling and analysis.	
Dismantling and demobilization of heating equipment, soil vapor extraction system, and vapor-phase treatment equipment.	Backfill excavation and restoration of excavation area.
	Installation of monitoring wells in and hydraulically down gradient of the source area.
Ground water sampling and analysis for Site-specific VOC and MNA parameters.	
Preparation and submittal of a Final Engineering Report including an OM&M Plan.	