DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name:	General Electric North Plant
Facility Address:	1000 Morgantown Industrial Park, Morgantown, West Virginia 26501
Facility EPA ID #:	WVD980552384

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ If data are not available skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

   _X_ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

   _____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

   _____ If unknown - skip to #8 and enter "IN" status code.

   Footnotes:

   [1]"Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

Rationale:

Organic Chemicals in North Plant Overburden Groundwater

Data from the Phase II RFI (2003), implementation of the Interim Measure (IM) (2007) and IM Pilot Scale (2009) field activities indicated the following organic compounds with concentrations greater than federal MCLs and/or West Virginia RBCs in North Plant overburden groundwater. Tables showing the sample identifications and concentrations are provided in Attachment 1. For groundwater sample locations, please see attached Figure 1.

- Tetrachloroethene was greater than the MCL and State RBC of 5 ug/L in 6 samples
- Trichlorethene was greater than the MCL and State RBC of 5 ug/L in 4 samples
- 1,2-dichloroethane was greater than the MCL and State RBC of 5 ug/L in 19 samples
- Vinyl chloride was greater than the MCL and State RBC of 2 ug/L in 10 samples
- Cis-1,2-dichloroethene was greater than the MCL and State RBC of 70 ug/L in 3 samples
- 1,2,4-trichlorobenzene was greater than the MCL and State RBC of 70 ug/L in 1 sample
- 1,4-dichlorobenzene was greater than the MCL of 75 ug/L and State RBC of 70 ug/L in 1 sample
- Toluene was greater than the MCL and State RBC of 1,000 ug/L in 2 samples
- Methylene Chloride was greater than the MCL and State RBC of 5 ug/L in 3 samples

Tentatively Indentified Compounds (TICs) were reported in the Phase II Due Diligence for Crompton Corporation. Limited volatile organic TICs were detected at monitoring wells NP-213 (total: 37.8b ug/l) and NP-214 (total 24.7 ug/l). Semivolatile organic TICs were reported for every perimeter well with the highest total concentrations observed at monitoring wells NP-213 (total 1250.8 ug/l) and NP-214 (total 2257 ug/l).

Inorganic Chemicals in North Plant Overburden Groundwater

Data from the Phase II RFI (2003), implementation of the IM (2007) and IM Pilot Scale (2009) field activities indicated the following inorganic compounds with concentrations greater than federal MCLs and/or West Virginia RBCs in North Plant overburden groundwater. Tables showing the sample identifications and concentrations are provided in Attachment 1. For groundwater sample locations, please see attached Figure 1.

- Arsenic was greater than the MCL and State RBC of 10 ug/L in 3 samples
- Iron was greater than the State RBC of 26,000 ug/L in 7 samples
- Manganese was greater than the State RBC of 1,700 ug/L in 9 samples
- Thallium was greater than the MCL and State RBC of 2 ug/L in 9 samples

Organic Chemicals in North Plant Bedrock Groundwater & Seeps

Data from the Phase II RFI (2003), implementation of the IM (2007) and IM Pilot Scale (2009) field activities indicated the following inorganic compounds with concentrations greater than federal MCLs and/or West Virginia RBCs for inorganic compounds in North Plant bedrock groundwater and greater than National Recommended Water Quality Criteria and USEPA Region III BTAG Screening Benchmark in North Plant seeps and surface water. Tables showing the sample identifications and concentrations are provided in Attachment 1. For groundwater sample locations, please see attached Figure 1.

Groundwater

- 1,2-dichloroethane was greater than the MCL and State RBC of 5 ug/L in 13 samples
- Vinyl chloride was greater than the MCL and State RBC of 2 ug/L in 3 samples

Seeps and Surface Water

- 1,2-dichloroethane was greater than one of the criteria in 4 samples
- Vinyl chloride was greater than one of the criteria in 5 samples

Inorganic Chemicals in North Plant Bedrock Groundwater & Seeps

Data from the Phase II RFI (2003), implementation of the IM (2007) and IM Pilot Scale (2009) field activities indicated the following inorganic compounds with concentrations greater than federal MCLs and/or West Virginia RBCs in North Plant bedrock groundwater and National Recommended Water Quality Criteria and USEPA Region III BTAG Screening Benchmark in North Plant seeps.

Seeps and Surface Water

- Arsenic was greater than one of the criteria in 3 samples
- Iron was greater than one of the criteria in 8 samples
- Manganese was greater than one of the criteria in 8 samples
- Cobalt was greater than one of the criteria in 2 samples
- Thallium was greater than one of the criteria in 1 sample

Reference(s):

Michael Baker Jr., Inc. 2003. *Ecological Work Plan.*
Michael Baker Jr., Inc. 2005. *Bedrock and Overburden Investigation*.
Michael Baker Jr., Inc. 2004. *Phase II RCRA Facility Investigation Report.*
Michael Baker Jr., Inc. 1996. *Phase I RCRA Facility Investigation Report.*
ARCADIS. 2008. *Interim Measures Pre-Design Report.*

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Footnotes:

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Rationale:

Stabilization of Groundwater:

As shown on the cross-section diagrams presented in the *Interim Measures Pre-Design Report* (ARCADIS, 2008) and attached to this document (Figures 5 and 6, the conceptual block-diagram (Figure 17), and the potentiometric surface maps (Figures 11, 13, 14, and 15), the North Plant Tributary and Monongahela River form the downgradient boundary for overburden and bedrock groundwater at the Site. The potential for vertical migration is limited by the low permeability of the bedrock hydrostratigraphic units and predominantly horizontal flow due to the horizontal bedding and associated bedding-plane fractures. This is further supported in that concentrations in deep bedrock are substantially lower than concentrations in overburden and shallow bedrock.

The bulk of the dissolved-phase 1,2-dichloroethane (1,2-DCA) mass associated with the 1,2-DCA Area of Concern (AOC) is present in the shallow overburden aquifer. Despite the elevated source concentrations, the lateral extent of 1,2-DCA impacts in this overburden aquifer is very limited and appears to be controlled by natural degradation. This is supported by the strongly anaerobic (methanogenic) conditions throughout the plume and elevated concentrations of anaerobic 1,2-DCA degradation intermediates including ethene and chloride (up to 23 and 1,500 mg/L, respectively).

At the 1,2-DCA source area near monitoring wells DAC-TW03 and DAC-TW05, overburden groundwater generally flows laterally to the east toward seeps NP-005-SE, NP-006-SE, and NP-007SE. Water samples from these seeps have not contained concentrations of 1,2-DCA greater than an estimated

concentration of 1.5 μg/L; however, these seeps have produced water samples with relatively high chloride concentrations. The chloride detected at these seeps is likely related to in situ degradation of 1,2-DCA upgradient in the overburden. Concentrations in perimeter monitoring wells downgradient of the 1,2-DCA AOC have been stable or decreasing and COPCs have been either non-detected or detected at concentrations below USEPA MCLs.

Bedrock groundwater primarily flows northeastward toward seeps NP-004-SE and NP-008-SE and the North Plant Tributary. Of these discharge zones, only seep NP-004-SE has provided samples with detectable 1,2-DCA. Groundwater containing COPCs discharges from seep NP-004-SE and intermittently may reach the North Plant Tributary (*EPA observed the seep when it discharged from the edge of a cliff and disappeared prior to reaching a water body*). 1,2-DCA was detected in two surface water samples collected in the North Plant Tributary at concentrations three orders of magnitude less than the surface water screening value (100 µg/L). Thus, 1,2-DCA is not migrating to surface water at concentrations that may impact ecological receptors. In addition, the concentrations of 1,2-DCA detected at seep NP-004-SE have decreased over time.

Concentrations of COPCs in bedrock groundwater at monitoring wells MW-NP-B01, MW-NP-B02, and MW-NP-B03 have been stable and/or decreasing. Historical concentration trends will be established for the recently installed bedrock monitoring wells (MW-NP-B03S, MW-NP-B04/B04S, MW-NP-B05/B05S, and MW-NP-B06; samples have only been collected in January 2008 and 3 baseline events in September and October 2009. The proposed approach for bedrock groundwater as part of the interim measure is to monitor for improvements in water quality as source mass is reduced in the overburden groundwater.

Reference(s):

ARCADIS. 2008. *Interim Measures Pre-Design Report.*

4. Does “contaminated” groundwater **discharge** into **surface water** bodies?

__X__ If yes - continue after identifying potentially affected surface water bodies.

_____ If no - skip to #7 (and enter a “YE” status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater “contamination” does not enter surface water bodies.

_____ If unknown - skip to #8 and enter “IN” status code

Rationale:

Groundwater Discharge Zones:

Groundwater in the overburden flows laterally and discharges to seeps NP-005-SE, NP-006-SE, and NP-007-SE on the eastern slope face of the hill side above the Monongahela River. These seeps then flow into Wetland Units 1 and 2 (see Figure 1). As detailed in the Ecological Risk Assessment to Support Phase II RCRA Facility Investigation and Interim Remedial Measures (Phase II Ecological Risk Assessment; Appendix G to the *Interim Measures Pre-Design Report* [ARCADIS, 2008]), the quality of habitat offered by both Wetland Units 1 and 2 is poor. For Wetland Unit 1, this is related in part to its size, proximity to the North Plant and the apparent lack of any permanent water features. In addition, Wetland

Unit 1 does not provide nesting, feeding or resting habitat for waterfowl or migratory birds, nor is it considered critical habitat for threatened or endangered species. For Wetland Unit 2, the size (0.051 acres) and low vegetative diversity attribute to its poor habitat.

Groundwater in bedrock beneath the North Plant discharges to seeps NP-004-SE and NP-008-SE on the hill side (Figure 1). The area of the North Plant Tributary, which discharges to the Monongahela River, downgradient of seeps NP-004-SE and NP-008-SE is a bedrock scoured channel with at least a 45-degree descent that does not provide adequate aquatic habitat. The water emanating from NP-004-SE intermittently may reach the North Plant Tributary (*EPA observed the seep when it discharged from the edge of a cliff and disappeared prior to reaching a water body*). In addition, even if water reached the North Plant Tributary, there is little potential for the North Plant Tributary to impact the Monongahela River due to dilution. Typical Monongahela River flow at the nearest USGS Gauging Station (Station 03072655) is 1,910 cubic feet per second (cfs). Though flow rate data are not available for the North Plant Tributary, the flow in the North Plant Tributary is insignificant compared to that of the Monongahela River.

The Interim Measures Pre-Design Report presents key aspects of the updated conceptual site model for the North Plant, including the hydrogeology, bedrock fracture data, hydraulic conductivity, and concentrations of 1,2-DCA and chloride in groundwater. VOCs (particularly 1,2-DCA) appear to have migrated downward with groundwater from the overburden zone into the underlying bedrock zone. However, based on the observed water level differences between wells of different depths, and the presence of predominantly near-horizontal fractures, the potential for vertical groundwater flow within the bedrock is believed to be limited. The only known point of groundwater discharge with detectable 1,2-DCA concentrations is seep NP-004-SE, which is a significant bedrock groundwater discharge zone.

Reference(s):

Michael Baker Jr., Inc. 2005. *Bedrock and Overburden Investigation*.
Michael Baker Jr., Inc. 2004. *Phase II RCRA Facility Investigation Report.*
Michael Baker Jr., Inc. 1996. *Phase I RCRA Facility Investigation Report.*
ARCADIS. 2008. *Interim Measures Pre-Design Report.*

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

   ___ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting:

   1) the maximum known or reasonably suspected concentration[3] of <u>key</u> contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and

   2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

__**X**__ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of <u>each</u> contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Footnotes:

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

Rationale:

At the 1,2-DCA source area near monitoring wells DAC-TW03 and DAC-TW05, overburden groundwater flows downward to some extent, but also laterally toward seeps NP-005-SE, NP-006-SE, and NP-007SE. Water samples from these seeps have not contained concentrations of 1,2-DCA greater than an estimated concentration of 1.5 µg/L (significantly less than 100 times the National Recommended Water Quality Criteria, water and organism of 0.38 ug/L).

The highest detected 1,2-DCA concentration in bedrock groundwater samples at the North Plant was collected at intermediate bedrock well MW-B05S, which is near the intersection of two mapped fracture traces (potential fracture zones). At the MW-B05S location, intermediate bedrock groundwater flows northeastward toward seeps NP-004-SE and NP-008-SE and intermittently may reach the North Plant Tributary. Of these discharge zones, only seep NP-004-SE has provided samples with detectable 1,2-DCA. VOC compounds analyzed in seeps during the 2009 IM Pilot Scale field activities were non-detect or at estimated concentrations below 2 µg/L, with the exception of 1,2-DCA. 1,2-DCA was detected in sample NP-004-SE at a maximum concentration of 3,700 µg/L, which is greater than 100 times the National Recommended Water Quality Criteria - Water and Organism of 0.38 ug/L .

Inorganic compounds detected in seeps include arsenic, iron, manganese, cobalt and thallium. The maximum detected arsenic concentration (48.2 µg/L at NP-007-SE) is greater than 100 times the National Recommended Water Quality Criteria - Water and Organism of 0.018 ug/L. The most elevated iron concentration (53,400 µg/L at NP-005-SE) is greater than 100 times the National Recommended Water Quality Criteria - Water and Organism (Non-Priority Pollutant) of 300 ug/L; however, recent results from 2009 IM Pilot Scale field activities indicate significantly decreased detections of iron from RFI activities to concentrations below 10 times the National Recommended Water Quality Criteria - Water and Organism (Non-Priority Pollutant) (ranging from 490 to 903 ug/L). Detections of manganese are greater than 100 times the National Recommended Water Quality Criteria - Water and Organism of 50 ug/L.

Reference(s):

Michael Baker Jr., Inc. 2005. *Bedrock and Overburden Investigation*.
Michael Baker Jr., Inc. 2004. *Phase II RCRA Facility Investigation Report.*
Michael Baker Jr., Inc. 1996. *Phase I RCRA Facility Investigation Report.*
ARCADIS. 2008. *Interim Measures Pre-Design Report.*

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

   _X_ If yes - continue after either:

   1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR

   2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

   _____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

   _____ If unknown - skip to 8 and enter "IN" status code.

   Footnotes:

   [4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

   [5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

   Rationale:

   Groundwater in the overburden flows laterally and discharges to seeps NP-005-SE, NP-006-SE, and NP-007-SE on the eastern slope face of the hill side above the Monongahela River. The most recent arsenic data (RFI Results) indicate concentrations at seeps NP-005-SE and NP-007-SE greater than 100 times the National Recommended Water Quality Criteria - Water and

Organism. These seeps then flow into Wetland Units 1 and 2 (see Figure 1). As detailed in the response to Question 4, the quality of habitat offered by both Wetland Units 1 and 2 is poor. In addition, as the Wetland Units 1 and 2 are not drinking water sources and do not contain any fish, surface water criteria for human ingestion of water and organisms are not applicable.

Groundwater in bedrock beneath the North Plant discharges to seeps on the hill side to seeps NP-004-SE and NP-008-SE (Figure 1). Recent data (IM Pilot Test Results) indicate concentrations of 1,2-DCA and manganese over 100 times the National Recommended Water Quality Criteria - Water and Organism criteria at seep NP-004-SE. As detailed in the response to Question 4, the water emanating from NP-004-SE intermittently may reach the North Plant Tributary (*EPA observed the seep when it discharged from the edge of a cliff and disappeared prior to reaching a water body*), which discharges to the Monongahela River. The area of the North Plant Tributary downgradient of seeps NP-004-SE and NP-008-SE is a bedrock scoured channel with at least a 45-degree descent that does not provide adequate aquatic habitat. The North Plant Tributary was evaluated for organic chemical impact in 2008 (*Interim Measures Pre-Design Report* [ARCADIS, 2008]). Only 1,2-DCA was detected, at a low (estimated) concentration of 0.78 ug/L, which is significantly below 10 times the National Recommended Water Quality Criteria - Water and Organism of 0.38 ug/L. However, as the North Plant Tributary is not drinking water source and does not contain any fish, surface water criteria for human ingestion of water and organisms are not applicable. Furthermore, as detailed in the response to Question 4, even if water reached the North Plant Tributary, there is little potential for the North Plant Tributary to impact the Monongahela River due to dilution. Typical Monongahela River flow at the nearest USGS Gauging Station (Station 03072655) is 1,910 cubic feet per second (cfs). Though flow rate data are not available for the North Plant Tributary, the flow in the North Plant Tributary is insignificant compared to that of the Monongahela River.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

   __X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

   _____ If no - enter "NO" status code in #8.

   _____ If unknown - enter "IN" status code in #8.

Rationale:

Overburden Groundwater:

Interim measure pilot testing activities are currently being implemented at the facility to reduce concentrations of 1,2-DCA in groundwater, in accordance with the Interim Measures Design and Pilot Scale Implementation Work Plan (IM Design Work Plan). As part of the pilot testing activities, a comprehensive baseline sampling program was conducted from August to October 2009. In addition, operational and performance monitoring data are being collected.

Upon completion of the pilot testing activities, an IM Design and Pilot-Scale Implementation Results Report (Results Report) will be issued documenting the results, and providing recommendations for scale-up to a full interim measure or final remedy for the 1,2-DCA AOC, as appropriate. This Results Report will contain recommendations for continued monitoring of groundwater to document that concentrations have been reduced and that groundwater contamination is not increasing.

Bedrock Groundwater:

The proposed approach for bedrock groundwater as part of the interim measure is to monitor for improvements in water quality as source mass is reduced in the overburden groundwater. In accordance with the IM Design Work Plan, a comprehensive baseline sampling program was conducted from August to October 2009. These baseline data served to confirm the results of the initial (January 2008) sampling event for all of the recently installed bedrock wells and established a baseline set of data for comparison to future bedrock groundwater data sets, which will be designed to evaluate whether monitored natural attenuation (MNA) can be a viable strategy. Based on an assessment of the analytical results of the baseline sampling events, a subset of bedrock monitoring wells and seeps will be selected to be monitored quarterly for 2 years following implementation of the IM for overburden groundwater. The proposed bedrock monitoring well and seeps monitoring network will be presented in the IM Design and Pilot-Scale Implementation Results Report. The results of the 2 years of quarterly monitoring will used to assess the need for additional, longer-term monitoring.

Reference(s):

ARCADIS. 2008. Interim Measures Pre-Design Report.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

YES YES - "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Chemtura Corporation facility , EPA ID # WVD980552384, located at 1000 Morgantown Industrial Park, Morgantown, West Virginia. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Attachments:

Attachment 1 - Summary of Constituents with Concentrations Greater than MCLs or West Virginia RBCs

Figure 1 – Site Plan – North Plant

Figures from the IM Report:

Figure 5 – Cross Section B-B'
Figure 6 - Cross Section C-C'
Figure 17 – Conceptual Bedrock Groundwater Flow Paths – North Plant
Figure 11 – North Plant – Overburden Potentiometric Surface Map – July 9, 2008
Figure 13 – North Plant – Shallow Bedrock Potentiometric Surface Map – July 9, 2008
Figure 14 – North Plant – Intermediate Bedrock Potentiometric Surface Map – July 9, 2008
Figure 15 – North Plant – Deep Bedrock Potentiometric Surface Map – July 9, 2008

Completed by (signature) Diane Schott Date 1/3/11
(print) Diane Schott
(title) RCRA Project Manager

Supervisor (signature) Date 1/3/11
(print) Louis Pierno
(title) Associate Director, 3HC20
EPA Region III

Locations where references may be found:
EPA Region III Philadelphia Office, 1650 Arch Street, Philadelphia, Pennsylvania 19103
11th Floor

Contact telephone and email numbers:
Diane Schott
phone: 215-814-3430
email: schott.diane@epa.gov

ARCADIS

Attachment 1

Attachment 1
Summary of Constituents with Concentrations
Greater than MCLs or West Virginia RBCs
Migration of Contaminated Groundwater Under Control Environmental Indicator
General Electric North Plant
Morgantown, WV

Organic Chemicals in North Plant Overburden Groundwater

tetrachloroethene: Federal MCL and State RBC: 5 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW02	**240**	1.0 U	1,000 U
DAC-TW03	**2,500**	300,000 U	50,000 U
DAC-TW04	**81**	NA	NA
NP-GW05	**1,800/1,600**[1]	NA	NA
NP-GW06	**6,200**	NA	NA
NP-GW14	8	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed

trichloroethene: Federal MCL and State RBC: 5 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW02	**210**	1.0 U	1,000 U
DAC-TW04	**419**	NA	NA
DAC-TW05	**11,000**	20,000 U	12,000 U
NP-GW10	5.8[1]	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed

1,2-dichloroethane: Federal MCL and State RBC: 5 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW02	**92,000/5,200**[1]	**1,000**	**50,000**
DAC-TW03	**3,300,000**	**4,900,000**	**2,000,000**
DAC-TW04	**13,000**	NA	NA
DAC-TW05	**490,000/670,000**[1]	**560,000**	**560,000 B**
NP-GW01	12[1]	NA	NA
NP-GW02	**300,000**[1]	NA	NA
NP-GW04	**170**[1]	NA	NA
NP-GW07	23[1]	NA	NA
NP-GW08	**53**[1]	NA	NA
NP-GW12	16[1]	NA	NA
ERD-MW1	NA	NA	**340,000**
ERD-MW2	NA	NA	40
IW-1	NA	NA	**4,300**

[1] - Result from 2005 sampling event.
NA – Not Analyzed
B – Method blank contamination. The associated method bland contains the target analyte at a reportable level.

vinyl chloride: Federal MCL and State RBC: 2 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
1.23-TW01	**51/23[1]**	1.9	NA
1.35-TW01	**320**	**58**	NA
DAC-TW02	2,500 U	**34**	1,000 U
DAC-TW04	**170**	NA	NA
NP-GW08	**120[1]**	**NA**	NA
NP-GW10	**250[1]**	NA	NA
NP-GW12	6.6[1]	NA	NA
NP-GW13	**96[1]**	NA	NA
ERD-MW2	NA	NA	18

[1] - Result from 2005 sampling event. NA – Not Analyzed

cis-1,2-dichloroethene: Federal MCL and State RBC: 70 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW02	NA	160	260 J
NP-GW08	120[1]	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed
J - The compound was identified; however, the associated numerical value is an estimated concentration.

1,2,4-trichlorobenzene: Federal MCL: 70 ug/L, State RBC 70 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
NP-GW14	150[1]	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed

1,4-dichlorobenzene: Federal MCL: 75 ug/L, State RBC 70 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
NP-GW14	340[1]	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed

toluene: Federal MCL and State RBC: 1,000 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW03	2,900	160	50,000 U
DAC-TW05	1,800	NA	12,000 U

NA – Not Analyzed

acetone: State RBC: 5,500 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
NP-GW16	1,400[1]	NA	NA

[1] - Result from 2005 sampling event.
NA – Not Analyzed

methylene chloride: Federal MCL and State RBC: 5 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
DAC-TW03	5,200 B	**85,000 J**	50,000 U
DAC-TW05	13,000 U	**7,000 J**	12,000 U

B – Method blank contamination. The associated method bland contains the target analyte at a reportable level.

Notes:
1.) Data from the Phase I RFI (1996) and the Bedrock and Overburden Investigation (2005) are included, where applicable.
2.) For groundwater sample locations, please see attached Figure 1.
3.) Bolded values indicate an exceedance of 10 times the Federal MCL and/or State RBC (see Question 5).

Inorganic Chemicals in North Plant Overburden Groundwater

arsenic: Federal MCL and State RBC: 10 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved
NP-207	11.2[1]/13.3	17.2
NP-206	58.3[1]/5.1	NA

[1] - Result from 1992 sampling event

NA – Not Analyzed

iron: State RBC: 26,000 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved	IM Result (ug/L) - dissolved	IM Pilot Result (ug/L)
NP-205	50,600	49,100	63,500	NA
NP-207	34,800	33,800	81	NA
NP-210	16,400	15,900	NA	NA
DAC-TW03	NA	NA	NA	82,000
ERD-MW1	NA	NA	NA	42,000
IW-1	NA	NA	NA	60,000

NA – Not Analyzed

manganese: State RBC: 1,700 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved	IM Pilot Result (ug/L)
NP-205	7,310	7,290	NA
NP-206	962	813	NA
NP-207	1,140	1,110	NA
NP-208	**18,600**	13,900	NA
NP-210	1,750	1,760	NA
NP-211	1,320	1,310	NA
NP-212	1,510	1,510	NA
DAC-TW02	NA	NA	9,300
DAC-TW03	NA	NA	**38,000**
ERD-MW1	NA	NA	15,000
ERD-MW2	NA	NA	5,400
IW-1	NA	NA	**18,000**

NA – Not Analyzed

thallium: Federal MCL and State RBC: 2 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved
NP-204	NA	5.6
NP-205	NA	13.2
NP-206	3.7	NA
NP-207	17.3	4.7
NP-208	17.3	18.0
NP-210	NA	4.4
NP-212	NA	4.6

NA – Not Analyzed

Notes:
1.) Data from the Phase I RFI (1992) and the Bedrock and Overburden Investigation (2005) are included and noted where applicable.
2.) Bolded values indicate an exceedance of 10 times the Federal MCL and/or State RBC (see Question 5).

Organic Compounds in North Plant Bedrock Groundwater & Seeps

Monitoring Wells

1,2-dichloroethane: Federal MCL and State RBC: 5 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result[2] (ug/L)
MW-NP-B02	**5,500** [1]	**57**	NA
MW-NP-B03	**140** [1]	1.0 U	NA
MW-NP-B04S	NA	**520**	**110**
MW-NP-B04	NA	**80**	**88**
MW-NP-B05S	NA	**730**	**190**
MW-NP-B05	NA	31	5.6
MW-NP-B06	NA	**210**	9.2

[1] - Result from 2005 sampling event.

[2] - The most elevated result from the three 2009 Baseline Sampling Events is included.

NA – Not Analyzed

vinyl chloride: Federal MCL and State RBC: 2 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result[1] (ug/L)
MW-NP-B03S	NA	2.4	2.1 J
MW-NP-B04	NA	0.24 J	3.2 J

[1] - The most elevated result from the three 2009 Baseline Sampling Events is included.
J - The compound was identified; however, the associated numerical value is an estimated concentration.
NA – Not Analyzed

Seeps and Surface Water

1,2-dichloroethane:

National Recommended Water Quality Criteria:
water and organism: 0.38 ug/L
organism: 37 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[2]: 100 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
Seeps			
NP-004-SE	**3,000[1]/3,700**	**680**	**300**
Surface Water			
NP-Trib-01	NA	0.78 J	NA
NP-Trib-02	NA	1.0 U	NA

[1] - Result from 2005 sampling event
[2] – Source: CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003.
NA – Not Analyzed

vinyl chloride:

National Recommended Water Quality Criteria:
water and organism: 0.025 ug/L
organism: 2.4 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[3]: 930 ug/L

ID:	RFI Result (ug/L)	IM Result (ug/L)	IM Pilot Result (ug/L)
Seeps			
NP-004-SE	**7.8**	30 U	5.0 U
NP-005-SE	**2.7**	1.0 U	5.0 U
NP-006-SE	**13 [1]**	1.0 U	5.0 U
NP-007-SE	**5.9/7.8[2]**	**2.2**	5.0 U
Surface Water			
NP-Trib-01	NA	1.0 U	NA
NP-Trib-02	NA	1.0 U	NA

[1] - Result from 1992 sampling event.
[2] - Result from 2005 sampling event.
[3] – Source: Michigan DEQ (Department of Environmental Quality). 2002. Rule 57: Water Quality Values.
NA – Not Analyzed

Notes:
1.) In some cases, data from the Phase I RFI (1992) and the Bedrock and Overburden Investigation (2005) is included and noted where applicable.
2.) Bolded values indicate an exceedance of 10 times the Federal MCL and/or State RBC (groundwater) or National Recommended Water Quality Criteria and USEPA Region III BTAG Screening Benchmark (seeps and surface water) (see Question 5).

Monitoring Wells

iron: State RBC: 26,000 ug/L

ID:	IM Result (ug/L)	IM Pilot Result[1] (ug/L)
MW-NP-B01	100 U	NA
MW-NP-B02	100 U	NA
MW-NP-B03	4,280	NA
MW-NP-B03S	NA	18,000
MW-NP-B04	NA	290
MW-NP-B04S	NA	51
MW-NP-B05	NA	400
MW-NP-B05S	NA	20,000
MW-NP-B06	NA	150

[1] - The most elevated result from the three 2009 Baseline Sampling Events is included.
NA – Not Analyzed

manganese: State RBC: 1,700 ug/L

ID:	IM Result (ug/L)	IM Pilot Result[1] (ug/L)
MW-NP-B03S	NA	3,000
MW-NP-B04	NA	11
MW-NP-B04S	NA	310
MW-NP-B05	NA	15
MW-NP-B05S	NA	7,700
MW-NP-B06	NA	120

[1] - The most elevated result from the three 2009 Baseline Sampling Events is included.
NA – Not Analyzed

Seeps and Surface Water

arsenic:

National Recommended Water Quality Criteria:
chronic continuous: 150 ug/L
water and organism: 0.018 ug/L
organism only: 0.14 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[2]: 5 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved
NP-005-SE	**19.5**[1]	NA
NP-005-SE	**10.8**	**11.8**
NP-007-SE	**48.2**	**43.3**

[1] - Result from 1992 sampling event.
[2] – Source: CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003.
NA – Not Analyzed

iron:

National Recommended Water Quality Criteria (Non-Priority Pollutant):
water and organism: 300 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[1]: 300 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved	IM Pilot Result (ug/L)
NP-004-SE	**53,400**	**49,800**	880
NP-005-SE	**28,300**	**26,600**	930
NP-006-SE	**8,790**	**5,660**	760
NP-007-SE	**48,300**	**41,800**	490

[1] – Source: CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003.

manganese:

National Recommended Water Quality Criteria (Non-Priority Pollutant):
water and organism: 50 ug/L
organism only: 100 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[1]: 120 ug/L

ID:	RFI Result (ug/L) - total	RFI Result (ug/L) - dissolved	IM Pilot Result (ug/L)
NP-004-SE	**6,360**	**6,160**	**7,500**
NP-005-SE	**3,240**	**3,250**	**960**
NP-006-SE	**2,550**	**2,480**	**1,800**
NP-007-SE	**2,010**	**1,940**	**990**

[1] – Suter, G.W. II, and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision.

cobalt:

USEPA Region III BTAG Screening Benchmark, Freshwater[1]: 23 ug/L

ID:	RFI Result – total (ug/L)	RFI Result – dissolved (ug/L)
NP-007-SE	49.9	51.1

[1] – Suter, G.W. II, and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision.

thallium:

National Recommended Water Quality Criteria:
Water and organism: 0.24 ug/L
Organism only: 0.47 ug/L

USEPA Region III BTAG Screening Benchmark, Freshwater[1]: 0.8 ug/L

ID:	RFI Result – total (ug/L)	RFI Result – dissolved (ug/L)
NP-004-SE	NA	**14.1**

NA – Not Analyzed
[2] – Source: CCME (Canadian Council of Ministers of the Environment). 2003. Canadian Environmental Quality Guidelines: Summary Table December 2003.

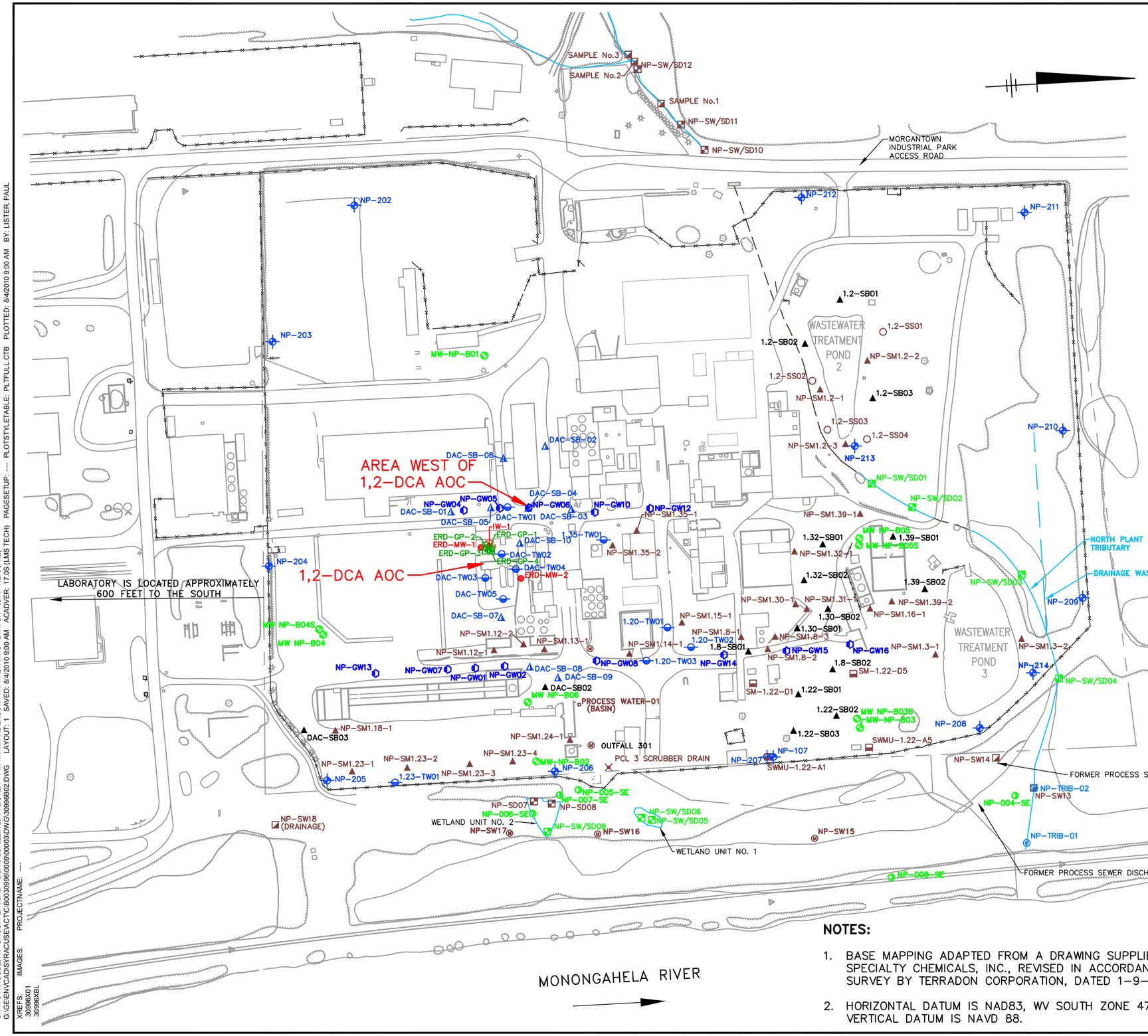
Notes:
1.) Bolded values indicate an exceedance of 10 times the Federal MCL and/or State RBC (groundwater) or National Recommended Water Quality Criteria and USEPA Region III BTAG Screening Benchmark (seeps and surface water) (see Question 5).

Reference(s):

Michael Baker Jr., Inc. 2003. *Ecological Work Plan.*
Michael Baker Jr., Inc. 2005. *Bedrock and Overburden Investigation*.
Michael Baker Jr., Inc. 2004. *Phase II RCRA Facility Investigation Report.*
Michael Baker Jr., Inc. 1996. *Phase I RCRA Facility Investigation Report.*
ARCADIS. 2008. *Interim Measures Pre-Design Report.*

ARCADIS

Figures



LEGEND:

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL LOCATION
- TEMPORARY OVERBURDEN MONITORING WELL LOCATION
- INJECTION WELL LOCATION
- BIOREMEDIATION PILOT TEST MONITORING WELL LOCATION
- PIEZOMETER LOCATION (2009)
- GROUNDWATER PROFILE LOCATIONS (2005 BEDROCK AND OVERBURDEN INVESTIGATION)
- SOIL BORING LOCATION (1995 PHASE I RFI)
- GPR SURVEY AND TEST PIT LOCATION (1996 PHASE I RFI)
- MANHOLE LOCATION (2003 PHASE II RFI)
- SOIL BORING LOCATION (2003 PHASE II RFI)
- SURFACE SOIL SAMPLE LOCATION (2003 PHASE II RFI)
- SURFACE WATER SAMPLE LOCATION (2003 PHASE II RFI)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (2003 PHASE II RFI)
- SEDIMENT SAMPLE LOCATION (2003 PHASE II RFI)
- SEEP SAMPLE LOCATION (2003 PHASE II RFI AND 2007 INTERIM MEASURES)
- SOIL BORING LOCATION (2007 INTERIM MEASURES)
- SURFACE WATER SAMPLE LOCATION (2007 INTERIM MEASURES)
- PCL 3 SCRUBBER DRAIN LOCATION
- UNDERGROUND CULVERT
- STREAM OR DITCH (DASHED WHERE INTERMITTENT)
- FENCE
- TREE LINE
- ROAD
- WETLAND AREA

0 160' 320'

GRAPHIC SCALE

NOTES:

1. BASE MAPPING ADAPTED FROM A DRAWING SUPPLIED BY G. E. SPECIALTY CHEMICALS, INC., REVISED IN ACCORDANCE WITH A SURVEY BY TERRADON CORPORATION, DATED 1-9-08.
2. HORIZONTAL DATUM IS NAD83, WV SOUTH ZONE 4701. VERTICAL DATUM IS NAVD 88.

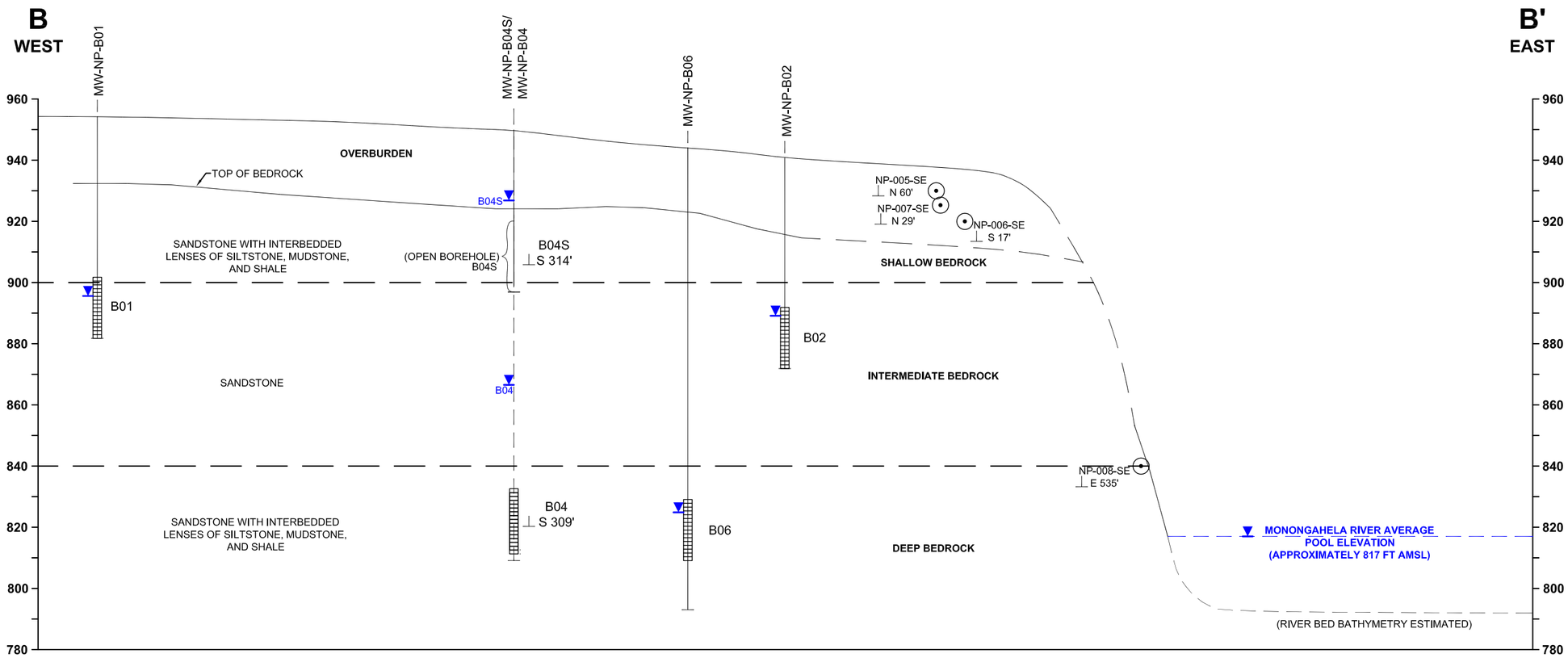
CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA

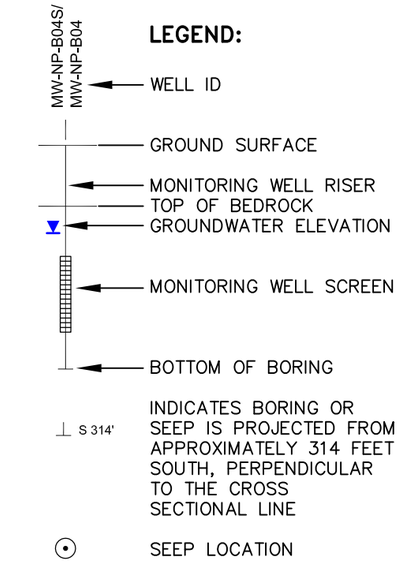
SITE PLAN - NORTH PLANT

ARCADIS

FIGURE 1

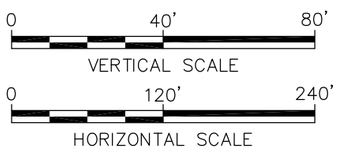
CITY: SYRACUSE, NY GROUP: ENVCAD DB: A. SCHILLING, P. LISTER PM/TM: R. ANDERSON TR: H. EVANKO LYR: ON=*;OFF=REF; (FRZ)
G:\GE\ENVCAD\SYRACUSE\ACTIC\B003096\0009\00003\DWG\30996B02.DWG LAYOUT: 1 SAVED: 8/4/2010 9:00 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ----
XREFS: 30996X01 30996XBL IMAGES: PROJECTNAME: ----
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/4/2010 9:00 AM BY: LISTER, PAUL





NOTE:

1. ALL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON JULY 9, 2008. AVERAGE RIVER STAGE INFORMATION FOR THE MORGANTOWN POOL WAS OBTAINED BY THE UNITED STATES ARMY CORP OF ENGINEERS AND WAS INTERPRETED TO BE APPROXIMATELY 817 FT. AMSL IN THE VICINITY OF THE NORTH PLANT.



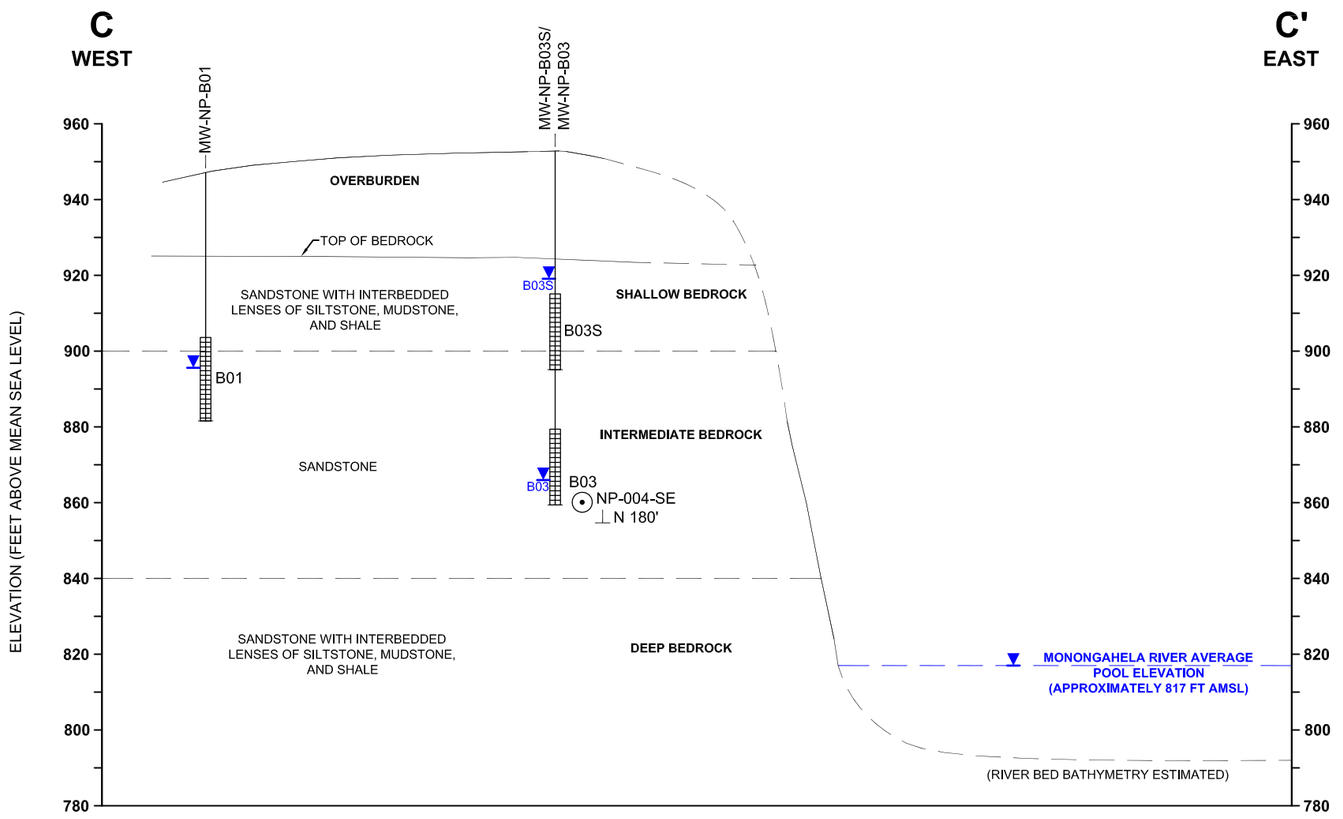
CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

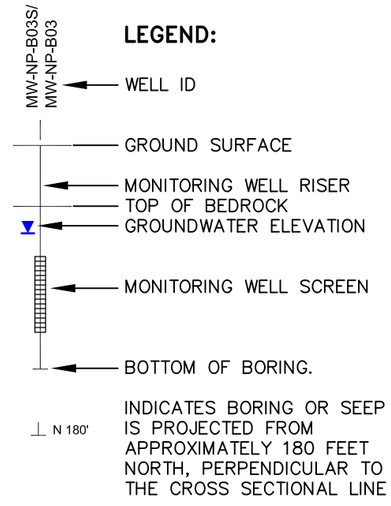
CROSS SECTION B-B'

ARCADIS

FIGURE
5

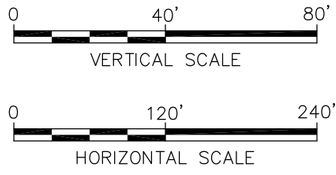
CITY: SYRACUSE GROUP: ENV+141 DB: AMS, PGL PM: S. WOLF TR: C. FOSTER LYR: ON=*;OFF=REF, (FRZ)
G:\CAD\GE-CAD\C-ACTIB\0030996\0000000041\DWG\MR30996V02.DWG LAYOUT: 5 SAVED: 10/23/2008 4:42 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/23/2008 4:42 PM BY: SCHILLING, ADAM
XREFS: IMAGES: PROJECTNAME: ---
30996XBL





NOTE:

1. ALL LOCATIONS ARE APPROXIMATE.
2. WATER LEVELS MEASURED ON JULY 9, 2008. AVERAGE RIVER STAGE INFORMATION FOR THE MORGANTOWN POOL WAS OBTAINED BY THE UNITED STATES ARMY CORP OF ENGINEERS AND WAS INTERPRETED TO BE APPROXIMATELY 817 FT. AMSL IN THE VICINITY OF THE NORTH PLANT.



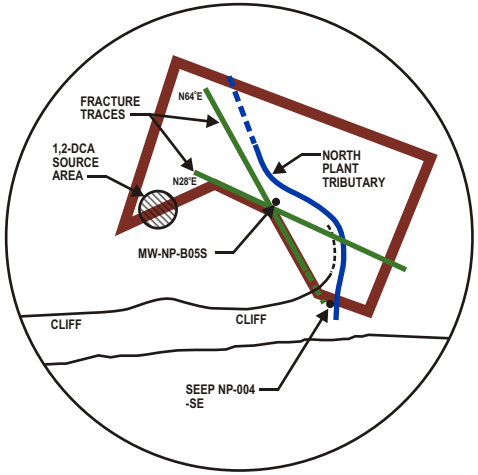
CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

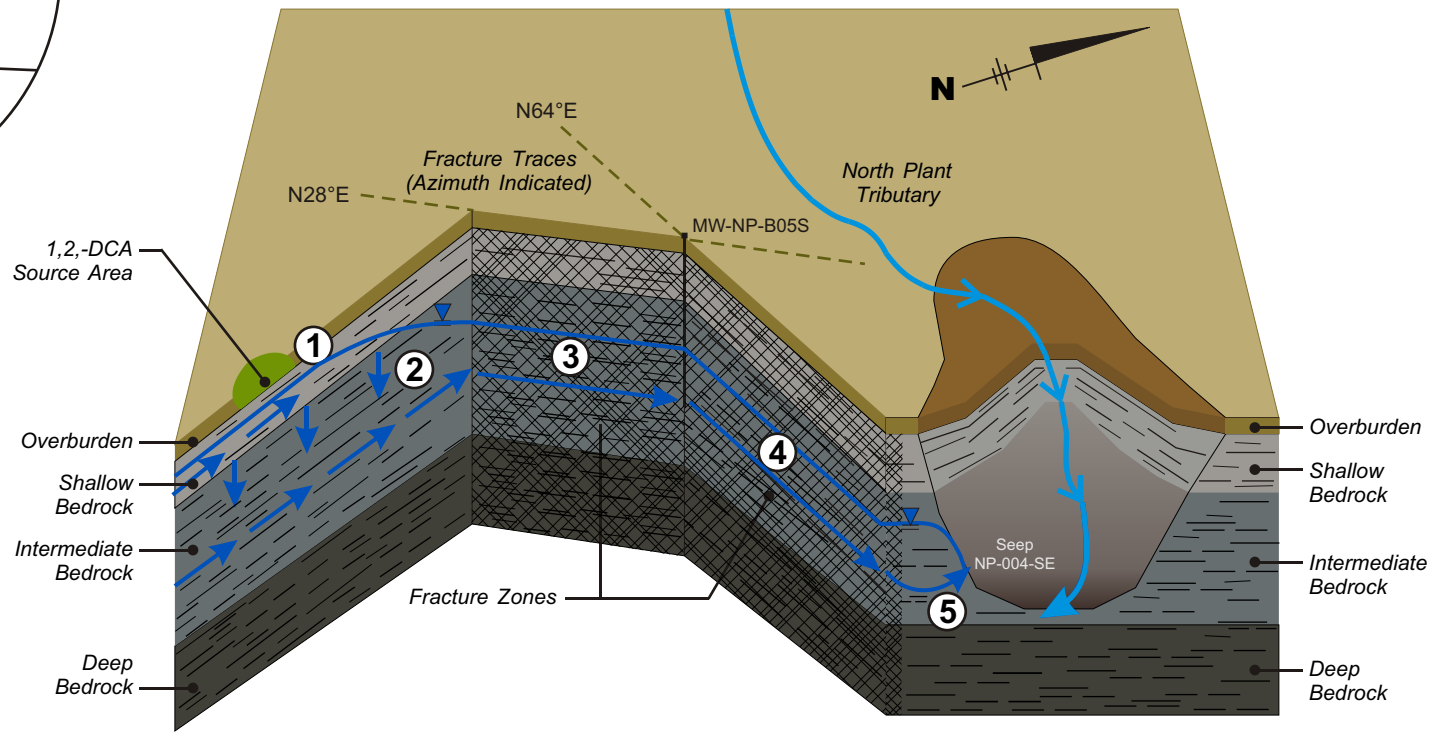
CROSS SECTION C-C'

ARCADIS

FIGURE
6

BLOCK DIAGRAM LOCATION REFERENCE MAP





KEY:

(1) = FLOW TOWARD NW IN SHALLOW BEDROCK

(2) = SATURATED ZONE IN SHALLOW BEDROCK PINCHES OUT

(3) = FLOW IN FRACTURE ZONE WITH N28°E AZIMUTH

(4) = FLOW IN FRACTURE ZONE WITH 64°E AZIMUTH

(5) = FLOW SHORT CIRCUITS TO SEEP 004 FROM FRACTURE ZONE WITH 64° AZIMUTH

CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA

INTERIM MEASURES PRE-DESIGN REPORT

CONCEPTUAL BEDROCK GROUNDWATER FLOW PATHS - NORTH PLANT

ARCADIS

FIGURE
17

MORGANTOWN INDUSTRIAL PARK ACCESS ROAD

WASTEWATER TREATMENT POND 2

WASTEWATER TREATMENT POND 3

NORTH PLANT TRIBUTARY

DRAINAGE WASH

OUTFALL 301

WETLAND UNIT NO. 1

WETLAND UNIT NO. 2

FORMER PROCESS SEWER DISCHARGE PIPE

MONONGAHELA RIVER

NP-202 954.26
NP-203 951.47
NP-204 943.05
NP-205 935.73
NP-206 930.87
NP-207 938.48
NP-208 922.85
NP-209 930.62
NP-210 942.08
NP-211 951.07
NP-212 950.29
NP-213 941.82
NP-214 914.70
NP-004-SE 925
NP-005-SE 930
NP-007-SE 925
NP-008-SE 920
NP-TRIB-01
NP-TRIB-02
DAC-TW01 947.02
DAC-TW02 946.46
DAC-TW03 945.79
DAC-TW04 NA
DAC-TW05 946.68
1.35-TW01 945.52
1.20-TW01 NA
1.20-TW02 942.94
1.20-TW03 942.54
1.23-TW01 936.54
MW-NP-B01
MW NP-B02
MW NP-B03
MW NP-B03S
MW NP-B04
MW NP-B04S
MW NP-B05
MW NP-B05S
MW NP-B06

952 954 950 948 946 944 942 940 938 936 934 932 930 928 926 924 922 920

LEGEND:

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL LOCATION
- TEMPORARY OVERBURDEN MONITORING WELL LOCATION
- SEEP LOCATION
- SURFACE WATER SAMPLE LOCATION (2007 INTERIM MEASURES)
- UNDERGROUND CULVERT
- STREAM OR DITCH (DASHED WHERE INTERMITTENT)
- FENCE
- TREE LINE
- ROAD
- WETLAND AREA
- 930.87 GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- 950 GROUNDWATER ELEVATION CONTOUR (FEET ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
- NA NOT APPLICABLE/NOT AVAILABLE
- DIRECTION OF HYDRAULIC GRADIENT

0 160' 320'
GRAPHIC SCALE

NOTES:

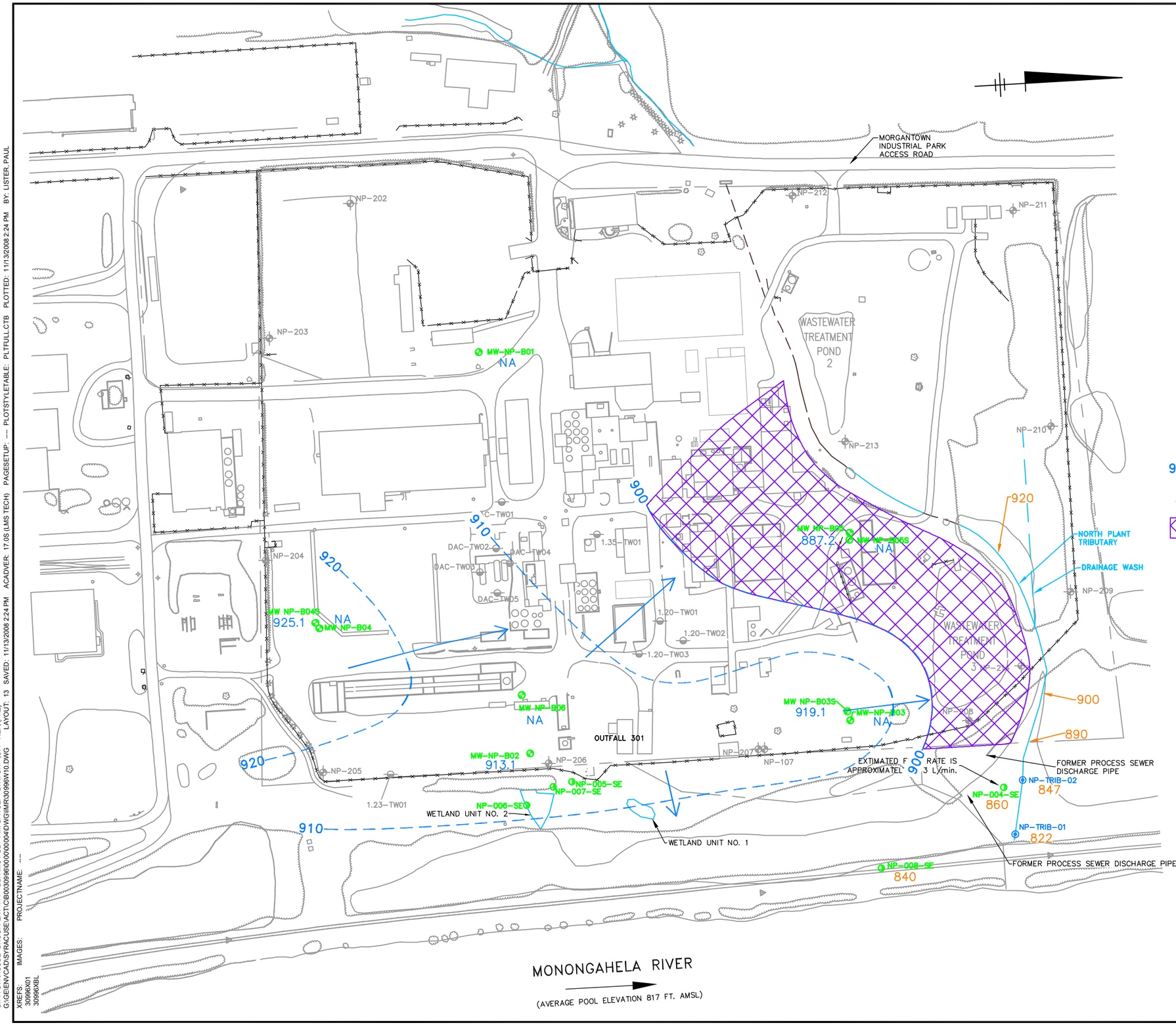
1. BASE MAPPING ADAPTED FROM A DRAWING SUPPLIED BY G. E. SPECIALTY CHEMICALS, INC., REVISED IN ACCORDANCE WITH A SURVEY BY TERRADON CORPORATION, DATED 1-9-08.
2. HORIZONTAL DATUM IS NAD83, WV SOUTH ZONE 4701. VERTICAL DATUM IS NAVD 88.

CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

NORTH PLANT - OVERBURDEN POTENTIOMETRIC SURFACE MAP JULY 9, 2008

ARCADIS

FIGURE
11



LEGEND:

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL LOCATION
- TEMPORARY OVERBURDEN MONITORING WELL LOCATION
- SEEP LOCATION
- SURFACE WATER SAMPLE LOCATION (2007 INTERIM MEASURES)
- UNDERGROUND CULVERT
- STREAM OR DITCH (DASHED WHERE INTERMITTENT)
- FENCE
- TREE LINE
- ROAD
- WETLAND AREA
- 919.1 CALCULATED POTENTIOMETRIC SURFACE ELEVATION (FEET ABOVE MEAN SEA LEVEL) (SEE NOTE NO. 3)
- 860 APPROXIMATE SEEP OR SURFACE WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- NA NOT APPLICABLE
- 900 GROUNDWATER ELEVATION CONTOUR (FEET ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
- DIRECTION OF HYDRAULIC GRADIENT
- UNSATURATED SHALLOW BEDROCK ZONE

NOTES:

1. BASE MAPPING ADAPTED FROM A DRAWING SUPPLIED BY G. E. SPECIALTY CHEMICALS, INC., REVISED IN ACCORDANCE WITH A SURVEY BY TERRADON CORPORATION, DATED 1-9-08.
2. HORIZONTAL DATUM IS NAD83, WV SOUTH ZONE 4701. VERTICAL DATUM IS NAVD 88.
3. GROUNDWATER ELEVATIONS MEASURED ON JULY 9, 2008 WERE CORRECTED FOR THE PRESENCE OF VERTICAL HYDRAULIC GRADIENTS AND PROJECTED TO AN ELEVATION OF 817 FEET ABOVE MEAN SEA LEVEL WHICH CORRESPONDS TO THE APPROXIMATE POOL ELEVATION OF THE MONONGAHELA RIVER.
4. GROUNDWATER ELEVATIONS MEASURED ON JULY 9, 2008 WERE CORRECTED FOR THE PRESENCE OF VERTICAL HYDRAULIC GRADIENTS AND PROJECTED TO AN ELEVATION OF 906.3 FEET ABOVE MEAN SEA LEVEL

0 160' 320'

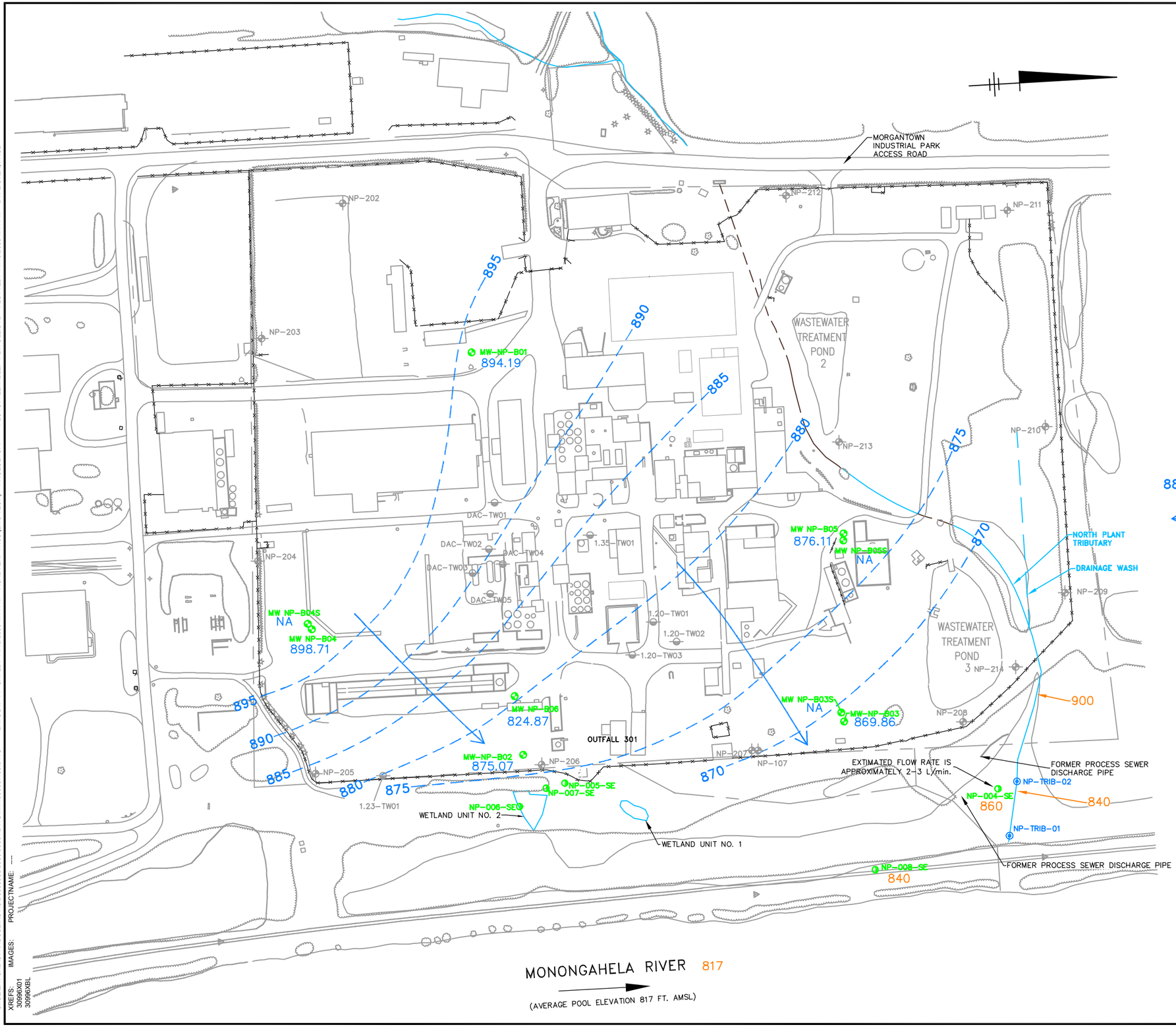
GRAPHIC SCALE

CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

NORTH PLANT - SHALLOW BEDROCK POTENTIOMETRIC SURFACE MAP JULY 9, 2008

ARCADIS

FIGURE
13



LEGEND:

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL LOCATION
- TEMPORARY OVERBURDEN MONITORING WELL LOCATION
- SEEP LOCATION
- SURFACE WATER SAMPLE LOCATION (2007 INTERIM MEASURES)
- UNDERGROUND CULVERT
- STREAM OR DITCH (DASHED WHERE INTERMITTENT)
- FENCE
- TREE LINE
- ROAD
- WETLAND AREA
- 889.15 — CALCULATED POTENTIOMETRIC SURFACE ELEVATION (FEET ABOVE MEAN SEA LEVEL) (SEE NOTE NO. 4)
- 860 — APPROXIMATE SEEP OR SURFACE WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- NA — NOT APPLICABLE
- 885 — GROUNDWATER ELEVATION CONTOUR (FEET ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
- DIRECTION OF HYDRAULIC GRADIENT

NOTES:

1. BASE MAPPING ADAPTED FROM A DRAWING SUPPLIED BY G. E. SPECIALTY CHEMICALS, INC., REVISED IN ACCORDANCE WITH A SURVEY BY TERRADON CORPORATION, DATED 1-9-08.
2. HORIZONTAL DATUM IS NAD83, WV SOUTH ZONE 4701. VERTICAL DATUM IS NAVD 88.
3. ELEVATION FOR SEEP NP-008-SE WAS OBTAINED FROM TOPOGRAPHIC CONTOUR LINES (INTERIM MEASURES WORK PLAN [BAKER, 2007]) AND IS ASSUMED APPROXIMATE.
4. GROUNDWATER ELEVATIONS MEASURED ON JULY 9, 2008 WERE CORRECTED FOR THE PRESENCE OF VERTICAL HYDRAULIC GRADIENTS AND PROJECTED TO AN ELEVATION OF 868.44 FEET ABOVE MEAN SEA LEVEL.

0 160' 320'

GRAPHIC SCALE

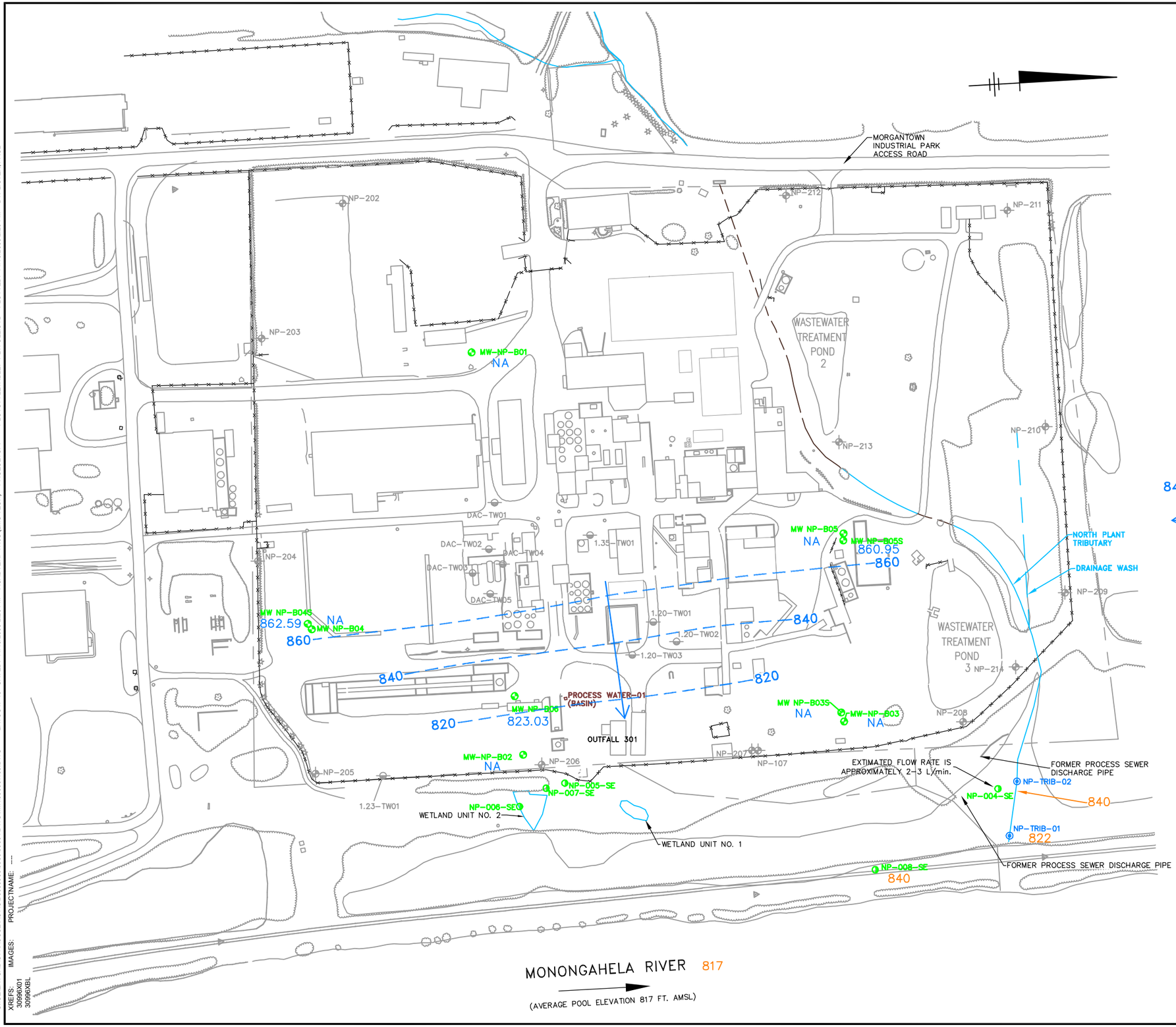
CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

NORTH PLANT - INTERMEDIATE BEDROCK POTENTIOMETRIC SURFACE MAP JULY 9, 2008

ARCADIS

FIGURE 14

CITY: SYRACUSE GROUP: ENV-141 DB: AMS PGL AMS PM: S. WOLF TR: C. FOSTER LYR: ON=*;OFF=*REF; (FRZ)
G:\GE\ENV\CAD\SYRACUSE\ACT\CB003096\0000\0004\DWG\MR030996W08.DWG LAYOUT: 14 SAVED: 11/13/2008 1:44 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/13/2008 1:44 PM BY: LISTER, PAUL
XREFS: 30996X01 30996XBL IMAGES: PROJECTNAME: ---



LEGEND:

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL LOCATION
- TEMPORARY OVERBURDEN MONITORING WELL LOCATION
- SEEP LOCATION
- SURFACE WATER SAMPLE LOCATION (2007 INTERIM MEASURES)
- UNDERGROUND CULVERT
- STREAM OR DITCH (DASHED WHERE INTERMITTENT)
- FENCE
- TREE LINE
- ROAD
- WETLAND AREA
- 860.95 CALCULATED POTENTIOMETRIC SURFACE ELEVATION (FEET ABOVE MEAN SEA LEVEL) (SEE NOTE NO. 3)
- 840 APPROXIMATE SEEP ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- NA NOT APPLICABLE
- 840 GROUNDWATER ELEVATION CONTOUR (FEET ABOVE MEAN SEA LEVEL) (DASHED WHERE INFERRED)
- DIRECTION OF HYDRAULIC GRADIENT

NOTES:

1. BASE MAPPING ADAPTED FROM A DRAWING SUPPLIED BY G. E. SPECIALTY CHEMICALS, INC., REVISED IN ACCORDANCE WITH A SURVEY BY TERRADON CORPORATION, DATED 1-9-08.
2. HORIZONTAL DATUM IS NAD83, WV SOUTH ZONE 4701. VERTICAL DATUM IS NAVD 88.
3. ELEVATION FOR SEEP NP-008-SE WAS OBTAINED FROM TOPOGRAPHIC CONTOUR LINES (INTERIM MEASURES WORK PLAN [BAKER, 2007]) AND IS ASSUMED APPROXIMATE.
4. GROUNDWATER ELEVATIONS MEASURED ON JULY 9, 2008 WERE CORRECTED FOR THE PRESENCE OF VERTICAL HYDRAULIC GRADIENTS AND PROJECTED TO AN ELEVATION OF 817 FEET ABOVE MEAN SEA LEVEL WHICH CORRESPONDS TO THE APPROXIMATE POOL ELEVATION OF THE MONONGAHELA RIVER.

0 160' 320'

GRAPHIC SCALE

CHEMTURA CORPORATION FACILITY
MORGANTOWN, WEST VIRGINIA
INTERIM MEASURES PRE-DESIGN REPORT

NORTH PLANT - DEEP BEDROCK POTENTIOMETRIC SURFACE MAP JULY 9, 2008

ARCADIS

FIGURE 15

CITY: SYRACUSE GROUP: ENV-141 DB: AMS PGL AMS PM: S. WOLF TR: C. FOSTER LYR: ON=*;OFF=*REF: (FRZ)
G:\GE\ENV\CAD\SYRACUSE\ACT\CB\00309960000000041DWG\IMR309996W09.DWG LAYOUT: 15 SAVED: 11/13/2008 2:23 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/13/2008 2:23 PM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
309960X01
309960XBL