Geosyntec consultants

10220 Old Columbia Road, Suite A
Columbia, Maryland 21046
PH 410.381.4333
FAX 410.381.4499
www.geosyntec.com

8 July 2011

Mr. Mark Granger
Remedial Project Manager, Cortese Landfill Site
USEPA Region II
NY/Caribbean Superfund Branch II
290 Broadway, 20th Floor
New York, NY 10007-1866

Subject: Remedial Design Work Plan, Rev. 1
Operable Units 3 and 4
Cortese Landfill Site
Narrowsburg, New York

Dear Mr. Granger:

On behalf of the Cortese Landfill PRP Group (Group), Geosyntec Consultants (Geosyntec) is pleased to submit Revision 1 of the Remedial Design Work Plan for Operable Units 3 and 4 for the Cortese Landfill Site located in Narrowsburg, New York (the Site). This revision was prepared to address your verbal review comments on June 29 and July 7, 2011 to the undersigned, and is based on the draft Statement of Work for Remedial Design that is currently being finalized. The RDWP revision will serve as the basis for preparation of the Remedial Design that is currently underway.

If you have any questions or comments regarding this work plan, please do not hesitate to contact Mr. Mark Snyder of the Group at (585) 223-6922 or Mr. Bob Glazier of Geosyntec at (410) 381-4333.

Sincerely,

Robert M Glazier

Robert Glazier, P.G.
Associate

Attachment: Remedial Design Work Plan, Rev. 1

Copies: USEPA (3 paper copies and 1 electronic via email)
USEPA ORC (1 paper copy)
NYSDEC (1 paper copy and 1 electronic via email)
Cortese PRP Group (electronic via email)
Geosyntec (1 copy)

Prepared for

Cortese Landfill Respondents
c/o SCA Services, Inc.
425 Perinton Parkway
Fairport, NY 14450

REMEDIAL DESIGN WORK PLAN (Rev. 1)
OPERABLE UNITS 3 AND 4
CORTESE LANDFILL SITE
NARROWSBURG, NEW YORK

Geosyntec consultants

10220 Old Columbia Road, Suite A
Columbia, Maryland 21046

Project Number MR0562B
Document Number MD11300

JULY 8, 2011

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

On behalf of the Cortese Landfill Respondents (the Respondents), Geosyntec Consultants (Geosyntec) has prepared this Remedial Design Work Plan (RDWP) for Operable Units 3 and 4 at the Cortese Landfill Site (the Site) in Narrowsburg, New York. Operable Unit 3 involves the groundwater contamination at and downgradient of the landfill and Operable Unit 4 addresses the source contamination present below the water table beneath former source areas.

The previous source control requirements of the 1994 Record of Decision (ROD) comprise Operable Unit 1 (drum removal) and Operable Unit 2 (landfill cap) and were implemented pursuant to a 1995 Consent Decree for Remedial Design/Remedial Action (U.S. Environmental Protection Agency [USEPA], 1995) as Remedial Work Element I (RWE I). RWE I source control measures included excavation of intact drum disposal areas (IDDAs) and construction of a low permeability cap, installation of storm water management, gas management, and security fence systems, institutional controls, long-term groundwater and surface monitoring, and long-term maintenance of the cap. Construction of RWE I was completed by 1998 and environmental monitoring has continued to date.

The remedy for Operable Units 3 and 4 was presented as Alternative 3 in the Former Source Areas Feasibility Study (Geosyntec, 2010a) and selected in the 2010 ROD/ROD Amendment (USEPA, 2010). It is intended to accomplish in situ treatment of the source materials located at and below the groundwater table, along with existing natural attenuation processes in groundwater downgradient from the landfill. In situ source treatment will begin with air sparge/soil vapor extraction (AS/SVE) to remove the more volatile constituents of concern (COCs) and to biodegrade some of the other less volatile COCs. Other amendments such as ozone will be used to treat the more recalcitrant constituents during the final phase of AS/SVE operation and will be followed by a period of stabilization. In situ chemical oxidation (ISCO) may be required after stabilization to further remediate the COCs that are not adequately treated by AS/SVE. The remedy includes the following components which are also summarized in **Table 1**:

- AS of the source areas for approximately seven years to remove and/or biodegrade a significant quantity of hydrocarbons and other volatile organic compounds (VOCs);
- SVE to recover vapors containing COCs for discharge to the atmosphere after aboveground treatment, if necessary;
- Amendment additions to the AS/SVE, such as ozone, for the final phase of the AS/SVE period to treat less volatile and less biodegradable COCs;

- Cessation of the AS/SVE/ozone sparging campaign with subsequent subsurface re-equilibration/stabilization and monitoring for a period up to five years;
- Subsequent application of ISCO, if necessary, potentially including a surfactant enhancement, to address the remaining more recalcitrant source materials;
- Monitored natural attenuation (MNA) of the groundwater downgradient from the landfill perimeter; and
- Long-term monitoring.

Remedial Design for Operable Units 3 and 4 will begin pursuant to an Administrative Consent Order (ACO) that is currently being prepared by USEPA Region 2, and then the Remedial Design and Remedial Action will proceed pursuant to an upcoming amendment to the 1995 Consent Decree. The Respondents have implemented an AS/SVE Pilot Test Work Plan (Geosyntec, 2010b) in advance of the ACO for remedial design.

The remainder of this RDWP is organized into the following sections:

- Section 2 – Site Background;
- Section 3 – Remedial Approach;
- Section 4 – Design Approach;
- Section 5 – Access and Approvals Plan;
- Section 6 – Deliverables;
- Section 7 – Schedule; and
- Section 8 – References.

This RDWP utilizes previously-approved support plans for the Site prepared for RWE I to the extent practicable (Golder, 1996, 1997, 2007).

2. SITE BACKGROUND

2.1 Site Location

The Site is located in Narrowsburg, Sullivan County, New York (see **Figure 1**). The landfill is located on the floodplain of the Delaware River and is bounded to the northeast by a steep bedrock escarpment and to the southwest by a railroad embankment (see **Figure 2**). The northern edge of the landfill lies approximately 70 feet south of the Narrowsburg Waste Water Treatment Plant. The Delaware River is approximately 400 feet southwest of the landfill, separated from the Site by the railroad embankment. Seven residences are located along the river across the railroad embankment from the Site.

The Site property boundary encompasses approximately 3.75 acres of land owned by Mr. John Cortese and another 1.53 acre parcel along the northern margin of the Cortese property owned by the Town of Tusten (Town), which purchased the property from Mr. Cortese in 1973. The locations of the source areas targeted for treatment are shown on **Figure 3**.

2.2 Geology/Hydrogeology

2.2.1 Site Geology

The geology and hydrogeology of the Site and surrounding areas were presented in the Phase III RI Report (Golder 1994b), updated with additional data and information collected since 1994, and is summarized below. In the vicinity of the Site, a deep channel has been incised by the Delaware River into the Upper Devonian sandstone bedrock of the Catskill Formation. The Delaware River Member of the Catskill Formation outcrops along the Delaware River in the Site vicinity (Davis, 1979). It is composed of cyclic sequences of gray, planar-bedded and cross-bedded, fine- to medium-grained sandstone with some thin red siltstone and clay stone layers. The Delaware River Member is up to 2800 feet thick. Joints in the rock are common. The Catskill Formation outcrops observed along the edge of the escarpment closely match the regional description of the Delaware River Member of the Catskill Formation. Specifically, gray, cross-bedded, medium-grained sandstone was noted with abundant joints, bedding plane partings, steep slopes, and flagstone-shaped talus. Depth to bedrock ranges from 0 feet to 138 feet below ground surface (bgs).

Pleistocene sediments of glacial origin were deposited and reworked in the river valley, resulting in channel, bar and over bank deposits typical of this depositional environment. The resulting lithofacies consist of unconsolidated, densely packed sands with intervals and lenses locally rich in either silty clay or gravel. A thin mantle of silt, resulting from post-glacial flooding of the valley, overlies the coarser deposits at the present land surface.

At the Site, the surficial clayey silt layer averages less than 10 feet in thickness and might have been locally removed during initial landfill trench and fill operations (see **Figure 5**). This silt layer is underlain by sands and gravels/river cobbles to a depth of approximately 30 to 40 feet bgs, forming the 'upper sand and gravel unit' described in the Phase I RI report (Golder, 1987). These deposits are generally underlain by discontinuous intervals (facies) of "intermediate" fine sands and silty clay. Additional sand and gravel units occur between the intermediate sands/silty clay, and the top of bedrock (see cross sections in the Phase III RI Report, Golder, 1994b).

Hydrogeological cross-sections near the former IDDA 1b source area are presented on **Figures 4 and 5** based on the *Source Characterization Report* (Golder, 2008). The locations of the cross-sections and borings are shown on **Figure 6**. The uppermost unit encountered during drilling within the limits of the landfill consisted of waste (typically plastic, glass, metal, paper, cloth, carpet, and/or wood) and reddish brown silty fine sand and silt backfill in the former IDDA 1b excavation to a depth of between approximately 14 feet and 25 feet bgs. The uppermost unit encountered during drilling of the borings located outside of the landfill (B-4 and B-5) consisted of reddish brown sandy silt to a depth of approximately 15 feet bgs, interpreted to be floodplain silts.

The upper sand and gravel unit, encountered in all the borings, varied from approximately 9 feet to 22 feet in thickness. The upper sand and gravel unit was encountered at its shallowest depth in boring B-11/MW-14 at approximately 14 feet bgs, and extended to a maximum depth of approximately 41 feet bgs in boring B-12. Within the upper sand and gravel unit, there were many individual layers of varying proportions of silty sand, sandy silt, fine to coarse sand, fine to coarse gravel and cobbles (trace). The individual layers ranged in thickness from 0.2 to 7.5 feet. In general fine-grained lenses (silty clay and clayey silt) were not observed within the upper sand and gravel unit. The transition from the upper sand and gravel unit to the deeper fine sand and silt unit varied from a sharp contrast in some borings to a more gradual transition zone in others. The deeper fine sand and silt unit was encountered in all the borings except B-12. Bedrock was encountered at depths ranging from 38 feet to 78 feet bgs in the vicinity of former IDDA 1b.

2.2.2 Site Hydrogeology

Results from the aquifer pumping tests conducted during the Phase II RI hydrogeologic characterization (Golder, 1988) indicate that the overburden deposits in the study area behave as a single hydrogeologic unit. Throughout the entire thickness of unconsolidated sediments, groundwater occurs under water table conditions, such that the unit acts as an unconfined aquifer. Bedrock forms a second, deeper hydrogeologic unit. Groundwater flows to the southwest toward, but oblique to, the Delaware River. Groundwater flows from the vicinity of former IDDA 1b toward monitoring well MW-6B near the Delaware River and from former IDDA 2 and the former septage lagoons toward MW-2B and the Delaware River embayment (see **Figures 2 and 3**). Horizontal hydraulic gradients between the landfill and the Delaware River are approximately 0.003 feet per foot, but have been as high as 0.009 feet per foot during previous monitoring. Vertical hydraulic gradients are variable with season and location within the valley, but are typically less than 0.1 ft/ft in both upward and downward directions (Golder, 2006). There are no bedrock piezometers at the Site. However, bedrock groundwater is expected to recharge in the hilltop above the Site, and discharge into the unconsolidated sediments in the river valley. From the results of falling head and rising head tests performed during the Phase II RI (Golder, 1988), hydraulic conductivities for all monitoring wells at the Site range from 9.9 x 10^{-2} centimeters per second (cm/sec) to 2.8 x 10^{-5} cm/sec, with a geometric mean of 2.4 x 10^{-3} cm/sec. Calculated hydraulic conductivities for monitoring wells screened exclusively in the upper sand and gravel unit range from 1.2 x 10^{-3} cm/sec to 8.6 x 10^{-2} cm/sec, with a geometric mean of 1.6 x 10^{-2} cm/sec. These values correspond well with the results of the aquifer pumping test on nearby Town of Tusten water supply well #1 (TTW-01) (Golder, 1988). Laboratory hydraulic conductivity tests performed on two Shelby tube samples of fine-grained sediments collected beneath the upper sand and gravel unit yielded hydraulic conductivities of 6.0 x 10^{-6} cm/sec and 6.4 x 10^{-5} cm/sec.

A conceptual groundwater flow system was developed for the Site area during the RI. Groundwater flows through fractures in the bedrock from the topographic highs (the escarpment) and discharges into the unconsolidated sediments of the Delaware River floodplain where it mixes with groundwater recharged along the floodplain, and then discharges at the topographic low (the river). Groundwater flow in the overburden sediments in the Site vicinity is predominantly horizontal toward the river, but may have a vertical component at some locations on a seasonal basis. The calculated average groundwater velocity is 165 feet per year based upon a hydraulic conductivity of 1.6 x 10^{-2} cm/sec, a horizontal gradient of 0.003 (but ranging up to 0.009), and an assumed porosity of 30 percent. Using the maximum horizontal gradient, groundwater flow velocities can be as high as 500 feet per year on a short-term basis.

2.3 <u>Nature and Extent of Contamination</u>

The source areas targeted for treatment are shown on **Figure 3** and include areas beneath the landfill at former IDDA 1b near the center of the landfill, and beneath the former septage lagoons and IDDA 2 southeast of the landfill. The nature and extent of contamination beneath the former IDDA 1b source area and in groundwater have been presented previously (Golder, 1994b, 2008, Geosyntec, 2009 and 2010b) and are summarized in the following sections. The former septage lagoons and IDDA 2 have not been characterized since their excavation as part of the 1995

Removal Action. Further characterization of source materials in that area are planned as part of the remedial system installation.

2.3.1 Source Beneath Former IDDA 1b

The source material below former IDDA 1b was identified in 2004 (Golder, 2004a) during analysis of soil samples collected at and below the groundwater table from two soil borings (S-1 and S-2). Its horizontal and vertical extents were characterized in 2007 by the installation of soil borings and monitoring wells through the existing geosynthetic landfill cap (Golder, 2008).

During the 2007 field investigations, soil borings and mobile laboratory VOC analyses were used to evaluate the horizontal and vertical extent of the IDDA 1b source area. Locations that were calculated to potentially contain non-aqueous phase liquid (NAPL) source material are targeted for treatment. Those locations are listed in **Table 2**.

Soil samples were calculated to contain NAPL source materials in borings B-1, B-2, B-3, B-4, B-7, B-8, B-9 and B-10 from 2007 and borings S-1 and S-2 from 2004. The plan view of the estimated source area for TCL VOCs is shown in **Figure 6**. The estimated source area at former IDDA 1b is approximately 21,000 square feet (0.5 acre).

The depth of the potential residual NAPL varies by boring. Aromatic hydrocarbons, chlorinated aromatics and chlorinated ethenes were the compound classes for which residual NAPL is most likely present based on the number of times compounds in those classes of compounds were predicted to be present as NAPL in comparison with the other classes of compounds. The depth interval where residual NAPL is likely to occur is from 15 feet to 40 feet bgs, primarily between 23 feet and 30 feet bgs.

Soil samples were collected from the soil boring for MW-16 in February 2009 and the homogenized samples were analyzed for TCL VOCs and total petroleum hydrocarbons (TPH) gasoline and diesel range organics (VeruTEK, 2009). The total TCL VOC concentration detected in the homogenized soil samples was 259,200 micrograms per kilogram (µg/kg). The most abundant VOCs detected were total xylenes (100,000 µg/kg), toluene (79,000 µg/kg), and tetrachloroethane (44,000 µg/kg). The TPH (gasoline range organics) concentration detected in the soil was 1,600,000 µg/kg. The TPH (diesel range organics) concentration detected in the soil was 3,000,000 µg/kg. TPH was not analyzed in the 2007 source characterization samples and therefore not included in the total source mass estimates. The TPH data for this sample suggest that TCL VOCs and SVOCs comprise a minor percentage of the total contaminant mass in the NAPL source material and therefore TPH must be accounted for in evaluating the design of any treatment technology.

2.3.2 Source Beneath Former Septage Lagoons and IDDA 2

The former septage lagoons and IDDA 2 were excavated in 1995 as part of the Removal Action. Soil samples collected from the bottom of the septage lagoon excavation suggested that residual material was likely to be present below the depth of excavation. No post-excavation soil samples were collected at IDDA 2. Post-excavation soil samples at the two former septage lagoons indicated that VOCs, particularly toluene, were present at the base of the excavation that extended to the groundwater table, at the eastern lagoon. Much lower concentrations of VOCs, which were below the soil cleanup standard for the lagoon excavations, were detected in post-excavation soil samples from the excavation of the western lagoon. Therefore, it is expected that the AS/SVE system in this area will focus upon the footprint of former IDDA 2 and the eastern lagoon. Investigation into the horizontal and vertical extent of source materials beneath the former septage lagoons and former IDDA 2 will be completed concurrent with AS/SVE system installation. At this time, it is planned that soil samples at and below the groundwater table will be collected during installation of AS wells in those areas and analyzed by a mobile laboratory. The results will be used to calculate whether NAPL source materials might be present in those areas. This approach will provide real-time information in the field during AS well installation to define the necessary horizontal and vertical extent of the AS system.

2.3.3 Groundwater

Groundwater samples were collected from monitoring wells at the Site during January 1987 (Phase I RI), October 1987 through January 1988 (Phase II RI), July 1989, April 1993 (Phase III RI), and three times per year beginning in October 1995 and continuing annually to date.

2.3.3.1 Former IDDA 1b

Wells S-1 and S-2 have been monitored three times per year (along with the other wells) since they were installed in 2004. The other wells installed at former IDDA 1b in 2007 (MW-11 through MW-15) were sampled in 2007. TCL VOCs and SVOCs have been detected in groundwater samples from within the source area beneath former IDDA 1b (Geosyntec, 2011). Some of these constituent concentrations also exceed Safe Drinking Water Act Maximum Contaminant Levels (MCLs). All of these data are summarized in tabular and graphic format in the most recent annual monitoring report, *2010 Annual Environmental Monitoring Report for Remedial Work Element I* (Geosyntec, 2011a).

Chlorinated aliphatic hydrocarbons, chlorinated aromatic hydrocarbons, and non-chlorinated aromatic hydrocarbons (benzene, toluene, ethylbenzene and total xylenes, collectively referred to as BTEX) are the prevalent TCL VOCs in groundwater beneath the former source areas. In 2007, monitoring wells MW-12, MW-13, MW-15, S-1, and S-2 had the highest concentrations of VOCs at the Site (Golder, 2008). Monitoring wells S-1 and S-2 continue to be among the wells with the highest concentrations of VOCs (Geosyntec, 2011). TCL SVOCs are monitored at the former IDDA 1b source area wells EX-1, MW-1B, MW-1C, MW-10, MW-11, S-1, and S-2. SVOCs consistently detected in the source area wells are chlorinated benzenes, phenolic compounds (phenol and various methylphenol and dimethylphenol isomers), phthalate compounds, PAHs, and 1,4-dioxane. Monitoring wells EX-1, MW-1B, S-1, and S-2 had the highest total SVOC concentrations during the most recent monitoring (Geosyntec, 2011a).

2.3.3.2 Former Septage Lagoons and IDDA 2

Much lower concentrations of the same VOCs detected at former IDDA 1b were detected in groundwater samples from MW-9 in 2010 and from the 2001 transect of direct push groundwater samples at the former septage lagoons and IDDA 2. TCL SVOCs were not detected in groundwater samples from MW-9 located at the former septage lagoons and IDDA 2 prior to their removal in 1995. The data suggest that the source strength is lower in this area compared to former IDDA 1b. Seasonal fluctuation in VOC concentrations are similar to those at former IDDA 1b suggesting that there could be source material at and near the groundwater table that is seasonally inundated by the rising groundwater elevation in the spring, as occurs at former IDDA 1b.

2.3.3.3 Downgradient Areas

The types of TCL VOCs detected in groundwater samples downgradient of the Site include aromatic hydrocarbons, chlorinated aromatic hydrocarbons, chlorinated aliphatic hydrocarbons, and ketones. Chlorinated aliphatic hydrocarbons are the most prevalent VOCs in the downgradient wells (MW-2B, MW-6A, MW-6B, and MW-7B), with the highest VOC concentrations present in MW-6A. Chlorinated aromatic hydrocarbons and BTEX were also detected in downgradient wells but BTEX constitutes a smaller fraction of total VOCs compared to the source areas, likely due to anaerobic biodegradation. TCL SVOCs have not been detected at downgradient monitoring wells near the river (Golder, 1994a) and are not included on the list of analytes for these wells as part of the long-term environmental monitoring program for RWE I.

Target Analyte List (TAL) metals, including arsenic, iron and manganese, were detected at concentrations above ARARs in the same monitoring wells where VOCs and SVOCs were detected in both the source areas and downgradient of the landfill. Iron and manganese are more soluble under lower redox conditions, and are likely being mobilized from naturally occurring iron and manganese oxide minerals in the aquifer when lower redox conditions become established by municipal solid waste leachate constituents (Baedecker and Back, 1979) and/or petroleum hydrocarbons from the source materials beneath the landfill and the lagoons. Other TAL metals such as arsenic are adsorbed to the surfaces of these iron and manganese oxides

(Rose et al., 1979), and are therefore mobilized in groundwater when the iron and manganese oxides dissolve.

The concentrations of arsenic, iron and manganese have changed very little since the beginning of the annual monitoring program. The redox-induced mobilization of iron, manganese, and arsenic is not expected to change until most of the reduced organic carbon from MSW leachate and residual NAPL that is present in the sediments beneath the groundwater table at the source areas has been depleted. Although the concentrations of these metals decrease toward the river, they are still present at relatively high concentrations compared to the historical results from background well MW-4B and sidegradient wells MW-3A/B and MW-8A/B.

Monitoring data indicate that TCL VOCs and SVOCs occur in groundwater in an approximately 1,300-foot wide zone between the landfill and the Delaware River, but the direct-push hot spot groundwater investigation (Golder, 2001) indicated that much higher concentrations (i.e., greater than 1,000 µg/L total VOCs) were present in a 500-foot wide zone along the centerline of the affected area, directly downgradient from former IDDA 1b, between permanent monitoring wells MW-1B and MW-10 (**Figure 7**). Near the source areas, TCL VOCs and SVOCs are generally confined to shallow zones of the aquifer which also have a higher hydraulic conductivity compared to the deeper zones. Therefore, the overall extent of VOCs and SVOCs indicate that most of the mass flux of VOCs toward the Delaware River is within the upper sand and gravel unit near the source area. However, it should be noted that higher VOC concentrations were detected in samples from MW-6A, which is screened in the deeper portion of the saturated zone near the Delaware River, downgradient from former IDDA 1b. These higher concentrations might be due to stronger downward gradients in the vicinity of former IDDA 1b (compared to well nest MW-1A/1B/1C) and/or geologic heterogeneities that provide preferential migration pathways toward deeper zones at MW-6A.

2.3.4 Constituent Transport, Fate and Persistence

Former source areas in the unsaturated (vadose) zone at the Site (i.e., buried drums and the septage lagoon sediments) have been either removed or effectively contained by the low permeability landfill cap. COCs continue to be detected in the Site groundwater monitoring wells due to the source area detected at and below the groundwater table. Parent compounds (e.g., PCE, TCE, 1,1,1-TCA, and chloroform) have been detected in both soil and groundwater samples from S-1 and S-2, but are not detected at downgradient well EX-1, indicating very rapid attenuation (via anaerobic reductive dechlorination reactions) beneath the landfill. This interpretation is further supported by relatively high concentrations of the ultimate daughter products, ethane and ethene, in groundwater samples collected both before, and several years after landfill cap construction (Golder, 1997, 2000).

The upper sand and gravel unit was likely in a quasi-equilibrium steady state condition with respect to sorption prior to construction of the source control measures because the COC plume had reached the Delaware River by the late 1980s. There is currently an overall trend of declining COC mass in the shallow groundwater system (i.e., including both the groundwater and the aquifer solids) at the Site as constituents dissolve and desorb from source areas in the aquifer solids below the former source areas and are transported by groundwater advective flow toward the Delaware River. The absence of VOC detections in deep soil beneath the former IDDA 1b source area (boring B-1) and the detection of VOCs in soil at greater depths downgradient in soil at borings B-4 and B-5, and in groundwater at deep well MW-6A, indicate a diving flow path toward MW-6A is possible, but the source areas are at shallow depths.

Natural attenuation processes have caused significant mass reduction (approximately 99 percent) along the groundwater advective transport pathway prior to reaching the river. However, redox conditions do not rebound to background (aerobic) conditions prior to discharge of shallow groundwater to the Delaware River and some COCs, especially chlorinated aromatic hydrocarbons, persist in off-site groundwater. As summarized in the 2010 ROD, since completion of the 1994 ROD's landfill cap and drum removal components, surface water ARARs have been consistently attained in the Delaware River and the Site no longer poses a potential ecological risk. In addition, the vapor intrusion pathway to residences between the source areas and the Delaware River were determined by USEPA not to constitute a significant risk to human health or the environment.

3. REMEDIAL APPROACH

3.1 Remedial Action Objectives

Remedial action objectives (RAOs) for the landfill contents, groundwater and surface water were specified by the USEPA in the 1994 ROD (USEPA, 1994a) based on results of the risk assessment and the determination of applicable or relevant and appropriate requirements (ARARs) for the Site. Updated RAOs presented in the 2010 ROD (USEPA, 2010) that account for remedial actions taken to date and the source areas are to:

- Reduce or eliminate the potential for source areas to release contaminants to groundwater;
- Reduce or eliminate the potential for migration of contaminants downgradient of the landfill; and
- Restore the aquifer downgradient of the landfill as a potential source of drinking water by reducing contaminant levels to the Federal and State MCLs.

These RAOs will be achieved by phased implementation of the remedy components at the source areas followed by a period of stabilization and natural attenuation processes. ISCO might be applied after the stabilization period, if necessary. Interim performance measures to support the decision to transition between phases of the remedy will be developed as part of the Remedial Design. The active in situ treatment components of the remedy are not expected to achieve MCLs but rather accomplish a significant reduction in the concentration and/or mass flux of COCs to areas downgradient from the landfill. Natural attenuation processes will provide the “bridge” between those active in situ treatment steps and ultimately achieving all of the RAOs. There are no RAOs for soil and no post-treatment soil sampling is planned. The effectiveness of the in situ treatment steps will be evaluated based upon changes in groundwater quality and/or mass flux downgradient from the in situ treatment areas.

3.2 Applicable or Relevant and Appropriate Requirements

Chemical specific ARARs for groundwater are given in **Table 3** and ROD Groundwater Cleanup Levels are given in **Table 4**. Institutional controls and public water supply are in place downgradient from the landfill such that groundwater in that area is not used for drinking water and the potential exposure pathway is incomplete. However, restoration of groundwater downgradient from the landfill for potential future use is a goal of the remedy.

Location specific ARARs for the Site include:

- Wild and Scenic Rivers Act (36 Code of Federal Regulations [CFR] 297.4) since the reach of the Delaware River adjacent to the Site is a designated Federal Wild and Scenic River;
- Executive Order 11990 (Protection of Wetlands);
- Executive Order 11988 (Floodplain Management); and
- National Historic Preservation Act.

Of these, Executive Order 11990 is the most prominent because the septage lagoon/IDDA 2 area is within a wetland. Other than downgradient groundwater monitoring wells, the remedy is not located in the 100-year floodplain and the remediation systems should not adversely affect the river. Cultural resources at the landfill were investigated as part of RWE I and the remedy will not disturb any areas that were not previously disturbed during construction of RWE I.

Action specific ARARs include:

- Federal and State air regulations for process unit off gases (40 CFR Part 50 and 6 NYCRR Parts 212, 257, and 373).

Permit equivalencies to address these ARARs will be included in the Final Design Report where appropriate and measures to attain them are further described in Section 5.

3.3 Remedy Description

The components of the selected remedy are summarized in **Table** 1 and figures depicting the conceptual design are presented in **Figures 7 through 11**. AS/SVE will initially be used throughout the source areas to remove a significant component of the VOCs by volatilization, a physical treatment technology. Eighteen TCL VOCs prevalent in groundwater above the chemical-specific ARARs for groundwater have pure compound Henry's Law constants (at 10 degrees Centigrade (°C)) greater than 100 atmospheres and vapor pressures greater than 0.5 millimeters of mercury, making them potentially conducive to removal by AS/SVE. Of the remaining VOCs (chloroaromatics, ketones, naphthalene, chloroform, methylene chloride), most are expected to be conducive to aerobic bioremediation/co-metabolism. Air sparging will introduce oxygen into the groundwater at the source area which should promote these aerobic biodegradation processes at and near the source areas.

Air sparging consists of injecting air below the water table in order to volatilize dissolved VOCs and partition them into soil gas in the vadose zone. As VOCs are removed from the aqueous phase, dissolution of the source material is accelerated. It is likely that the extracted soil gas will be treated by passing it through vapor-phase granular activated carbon (VGAC) canisters prior to discharge to the atmosphere in order to be in compliance with Federal, State and local air emissions regulations. Other vapor control technologies that may be considered include catalytic oxidation and thermal oxidation. The final assessment of the need for emissions controls and the potential selection of a control technology will be made during Remedial Design based upon the AS/SVE pilot test.

Based on the use of AS/SVE at other VOC-impacted sites, air sparging (and concurrent aerobic biodegradation, a.k.a. biosparging) should treat BTEX and naphthalene (the most abundant TCL aromatic hydrocarbons in the source area), as well as some TCL chlorinated volatile organic compounds (e.g. TCE and chlorobenzene), the gasoline-range hydrocarbons, some of the diesel-range hydrocarbons, and possibly some of the heavier oil-range hydrocarbons. A treatment duration period of seven years has been assumed. However, it is possible that some of the hydrocarbons and chlorinated VOCs may not be adequately treated by air sparging alone. Therefore, addition of amendments such as ozone to the sparge gas has been included for the final phase of the sparging program. Pilot testing of ozone (or other amendment) injection, if necessary, will be conducted toward end of full-scale AS operation so that conditions are representative of those to be encountered during injection after the more volatile and biodegradable source components have been treated. Other amendments might be considered depending upon the types and concentrations of constituents detected in groundwater at that time. After active in situ source treatment for approximately seven years, assuming that interim performance metrics (to be developed as part of the Remedial Design) have been achieved, active treatment by AS will cease and the groundwater will be allowed to re-equilibrate/stabilize for up to five years. Then, if necessary, the area would be treated using ISCO to address the remaining more-recalcitrant source materials.

After completion of active remediation activities, MNA will be utilized as the final step to attain the cleanup objectives in groundwater, including back-diffusion from the aquifer solids.

4. DESIGN APPROACH

The Remedial Design will include the following components:

- Design of the AS/SVE infrastructure, including off-gas treatment systems, if necessary;
- Design of the amendment infrastructure for the final phase of AS/SVE period;;
- Design of the infrastructure for introduction of ISCO to the subsurface, if necessary;
- Development of plans and specifications for construction and performance monitoring of the effectiveness of the remedy with respect to compliance with ARARs, the need and effectiveness of SVE off-gas treatment, and long-term groundwater monitoring, including a stand-alone Quality Assurance Project Plan (QAPP), and specifications for a stand-alone Health and Safety Plan (HASP); and
- Development of a Green Remediation Plan (GRP).

In order to expedite the design process, as requested by the agencies and as presented in the ACO SOW, the design will proceed directly to a Draft Final (95 Percent) Design Report as the first submission to the agencies. If that design receives approval or contingent approval, it will become the Final Design. Alternatively, upon receipt of agency comments, the Final (100 Percent) Design will be prepared to address those review comments and submitted to the agencies for approval. The design will be more specific for the first steps in the remedy (i.e. AS/SVE). An initial design will be presented for subsequent steps in the remedy, including the necessary infrastructure, but those details will be subject to modification, if appropriate, if performance monitoring data for preceding steps in the remedy differ from the anticipated results upon which that design is based.

5. ACCESS AND APPROVALS

This section describes the property access agreements and regulatory approvals (other than USEPA) that are needed to implement the Remedial Design. This section describes how such approvals will be sought and the associated schedule. The access and approvals mainly relate to access for downgradient monitoring stations and approvals for off-Site facilities receiving waste materials and/or process residuals from the Site for treatment, storage, and/or disposal.

5.1 Access

The majority of the remedial system infrastructure will be on the two parcels that comprise the Site (Lots 55.2 and 55.6). Access to these parcels is a condition of the 1996 Consent Decree so no further access efforts are necessary for those parcels. However, a right-of -way for power supply to cross the Norfolk Southern railway will be needed. Discussions with Norfolk Southern will be initiated early in the design process.

Most of the current and planned downgradient groundwater monitoring wells are located within the public right-of-way for Delaware Drive and thus access to them is also provided as a condition of the Town's signature to the Consent Decree. The upriver surface water monitoring station is accessed via the Town's parcel at water supply well TTW-01. The only other access that is required for monitoring is to the downgradient monitoring wells MW-6A/MW-6B, and to Delaware River monitoring stations SW-12 (the embayment) and DRD (the downriver station. Existing access agreements will be used for those locations (monitoring wells MW-6A and MW-6B are on private property at Tax Lot 54.10; 512 Delaware Drive; Wolff residence and the downriver surface water stations SW-12 and DRD are on private property at Tax Lot 54.18 recently acquired by Kathy Michell). **Table 5** summarizes the parcels where access in necessary to implement the remedy.

5.2 Approvals

Federal, State, and local approvals may be required to implement the remedy. A permit equivalency might be needed from NYDEC for the treatment and discharge of off-gas from the SVE system. However, at this time, the ARARs for process off-gas appear to consider the planned operations "trivial" and a permit equivalency will not be required.

No wetlands permits are required for the planned construction in the isolated wetlands area at the septage lagoons because it is not in direct hydraulic connection with a water of the United States (U.S.) and therefore is not regulated by the U.S. Army Corps of Engineers. The State of New

York does not regulate wetlands smaller than 12.5 acres and therefore, does not have jurisdiction on those wetlands either.

Condensate from the SVE system and/or off gas treatment residuals (e.g. spent VGAC), if required, may be considered Resource Conservation and Recovery Act (RCRA) characteristic hazardous wastes. If over 10 cubic yards of material are generated, waste profiles and manifests may be required to transport, treat, store, and dispose of those residuals off-Site. Such activities would also need to comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) off-Site policy and any out of state shipments would require advance notification to USEPA and the State. Such notifications would include the name and location of the receiving facility, the type and quantity of the waste shipped, the proposed shipping schedule, and method of transportation.

Several local approvals may be required to construct and operate the remedy. These might include a local building permit, site plan approval, special permit, and occupancy permit for any process equipment buildings. The special permit would only be required for construction in a floodway, if the permit applies to the 500-year floodway. Local electrical and building/occupancy permits will be evaluated as part of the Remedial Design. Representatives of the Town will also be contacted early in the design process to identify building/occupancy permit requirements.

The approvals listed above are summarized in **Table 6**. Completed Federal and State environmental and land use permit equivalency applications for on-Site actions, and permit applications for off-Site actions such as off-site transportation, treatment, and disposal of process residuals, will be included in the Final Design Report to the extent practicable. Profiling of actual process residuals will be necessary before those approvals can be finalized. It is believed that the Respondents already have access agreements for the parcels where the source treatment systems will be located and for all downgradient monitoring wells but this will be verified during Remedial Design. USEPA will be notified to provide assistance if the Respondent’s best efforts to secure access are not successful.

Demonstration of compliance with substantive permit requirements will be presented, to the extent practical, in the Pre-Final Design Report. Any demonstrations that cannot be completed at the time of the design (e.g. waste disposal profiling for full-scale process residuals such as gas condensate) will be completed during Remedial Action or during Operation and Maintenance (O&M).

6. DELIVERABLES

In accordance with the draft ACO, there will be one design submittal for the source treatment remedy components, the Pre-Final (95 Percent) Design Report, and possibly a revision in response to agency comments that would be the Final (100 Percent) Design Report. The Pre-Final Design Report will include basis of design text, drawings, technical specifications, design calculations, and permit equivalency applications. It will also present the results of the AS/SVE pilot test.

Both the Pre-Final (95 Percent) Design Report and the Final (100 Percent) Design Report will include the following materials:

- Discussion of design criteria and objectives;
- Results of the AS/SVE pilot test;
- Capacity and ability to meet the design objectives successfully;
- Drawings and Technical Specifications (including specifications for the construction contractor and O&M contractor health and safety plans, photographic documentation and a sign);
- Design analysis providing the rationale for the drawings and specifications;
- Design calculations;
- Schedule for construction;
- GRP;
- Construction Quality Assurance Plan (CQAP);
- Access and Approvals Report;
- Plan for construction and construction oversight, including method for selection of construction contractor(s); and
- Engineer's estimate of construction costs.

The QAPP for Remedial Action and O&M will be prepared as a stand-alone document as requested by USEPA in the draft ACO. The QAPP will describe the sampling, analysis and monitoring to be performed during the Remedial Action and O&M including operational monitoring, monitoring of natural attenuation processes, and remedy performance monitoring. The QAPP will also describe the objectives, procedures and methods for QA of the data collected during the Remedial Action and O&M. There will also be a separate MNA Plan.

In addition, the O&M Plan will be prepared following approval of the Pre-Final (95 Percent) Design Report and/or the Final (100 Percent) Design Report. The O&M Plan will describe the remedial equipment, controls, operations, corrective action, safety plans, monitoring, reporting, and personnel requirements for the intended operation of the Remedial Action. The description of the O&M of the amendment system (such as ozone) will not be included because it will be developed after performance monitoring indicates the need to transition to amendment addition and the specifications for the amendment system are completed.

7. SCHEDULE

The schedule for remedial design and remedial action is given in **Figure 12**. The schedule assumes that the Respondents proceed with the remedial design while the terms of the ACO for remedial design and the subsequent Consent Decree amendment are being finalized. Submission of the Pre-Final Design report to USEPA and NYSDEC is planned for late August 2011. Assuming approval, or contingent approval, of the Pre-Final Design by the end of September 2011, bids would be solicited from contractors during the winter such that construction of the remedy can begin in the Spring of 2012, culminating in a Preliminary Close Out Report (PCOR) targeted for September 2012. Operation of the remedy would continue after that time.

8. REFERENCES

American National Standards Institute, 1995. Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs, ANSI/ASQC E4-1994, January.

Baedecker, M.S. and W. Back, 1979. Hydrogeological Processes and Chemical Reactions at a Landfill, Groundwater, Vol. 17, pp. 429-37.

Davis, 1979. Davis, D. K., 1979. Groundwater Resources of Pike County, Pennsylvania, Pennsylvania Geological Survey, Water Resources Report 65, Harrisburg, PA.

Geosyntec, see Geosyntec Consultants, Inc.

Geosyntec Consultants, Inc., 2009. 2008 Annual Environmental Monitoring Report, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, May.

Geosyntec Consultants, Inc., 2010a. Former Source Areas Feasibility Study Report, Cortese Landfill Site, Narrowsburg, New York, September.

Geosyntec Consultants, Inc., 2011a. 2010 Annual Environmental Monitoring Report, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, February.

Golder, see Golder Associates Inc.

Golder Associates Inc., 1987. Final Report on Cortese Site Phase I RI, July.

Golder Associates Inc., 1988. Phase II Remedial Investigation, Cortese Landfill Site, Narrowsburg, New York, August.

Golder Associates Inc., 1994a. Final Feasibility Study Report, Cortese Landfill Site, Narrowsburg, New York, August.

Golder Associates Inc., 1994b. Revised Phase III Remedial Investigation Report, Cortese Landfill Site, Narrowsburg, New York, January.

Golder Associates Inc., 1994c. Transport of Soil Gas into Residential Structures Adjacent to the Cortese Landfill and Associated Maximum Potential Human Health Risks, February.

Golder Associates Inc., 1996. Remedial Design Work Plan, Cortese Landfill Site, Narrowsburg, New York, May.

Golder Associates Inc., 1997. Final (100 Percent) Design, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, March.

Golder Associates Inc., 1998. Remedial Construction Report, Remedial Work Element I, Construction and Management Services, Cortese Landfill Closure, Narrowsburg, New York, September.

Golder Associates Inc., 2000. 1999 Annual Operation and Maintenance Report, Remedial Work Element I, Cortese Landfill Site, Narrowsburg, New York, February.

Golder Associates Inc., 2001. Shallow Groundwater Hot Spot Investigation, Remedial Work Element II, Cortese Landfill Site, Narrowsburg, New York, September.

Golder Associates Inc., 2004. Results of Soil Boring Investigations at Former Intact Drum Disposal Area 1b, Cortese Landfill Site, Narrowsburg, New York, October.

Golder Associates Inc., 2007. Source Characterization Work Plan, Cortese Landfill Site, Narrowsburg, New York, June.

Golder Associates Inc., 2008. Source Characterization Report, Cortese Landfill Site, Narrowsburg, New York, January.

Leeson, A., P. C. Johnson, R. L. Johnson, C. M. Vogel, R. E. Hinchee, M. Marley, T. Peargin, C. L. Bruce, I. L. Amerson, C. T. Coonfare, R. D. Gillespie, and D. B. McWhorter, 2002. Air Sparging Paradigm. Battelle, 12 August.

New York State Department of Environmental Conservation, 1994. Division Technical and Administrative Guidance Memorandum 4046 (TAGM 4046): Determination of Soil Cleanup Objectives and Cleanup Levels, accessed at URL http://www.dec.ny.gov/regulations/2612.html, January.

NYSDEC, see New York State Department of Environmental Conservation

Rose, A.W., H.E. Hawkes, and J.S. Webb, 1979. Geochemistry in Mineral Exploration, Academic Press, New York.

U.S. Army Corp of Engineers, 2002. "Soil Vapor Extraction and Bioventing". Engineering Manual EM 1110-1-4001. June.

U.S. Army Corp of Engineers, 2008. "In-situ Air Sparging". Engineering Manual EM 1110-4004. January.

USACOE, see U.S. Army Corps of Engineers.

USEPA, see U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency, 1986. Superfund Remedial Design and Remedial Action Guidance, OSWER Directive 9355-0-4A, EPA/540/01, June.

U.S. Environmental Protection Agency, 1989. Region II CERCLA Quality Assurance Manual, Revision 1, October.

U.S. Environmental Protection Agency, 1990. Guidance on Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, OSWER Directive 9355.5-01, EPA/540/G-90-001, April.

U.S. Environmental Protection Agency, 1992. Evaluation of Metals Data for the Contract Lab Program, SOP #HW-2, Revision 11, January.

U.S. Environmental Protection Agency, 1994a. Record of Decision, Cortese Landfill, Village of Narrowsburg, New York, 30 September, EPA/ROD/R02-94/231.

U.S. Environmental Protection Agency, 1994b. Administrative Order on Consent for Removal Action, Cortese Landfill Site, Index No. II CERCLA-94-0209, July.

U.S. Environmental Protection Agency, 1995. Consent Decree for Remedial Design/Remedial Action, Cortese Landfill Site, August.

U.S. Environmental Protection Agency, 1996. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update III, December 1996.

U.S. Environmental Protection Agency, 2001a. EPA Requirements for Quality Management Plans, QA/R-2, EPA/240/B-01/002, March.

U.S. Environmental Protection Agency, 2001b. EPA Region II Contract Lab Program Organics Data Review and Preliminary Review, SOP #HW-6, Revision 12, March.

U.S. Environmental Protection Agency, 2005a. Uniform Federal Policy for Implementing Quality Systems (UFP-QS), EPA-505-F-03-001, March.

U.S. Environmental Protection Agency, 2005b. Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), Parts 1, 2 and 3, EPA-505-B-04-900A, B and C, March.

U.S. Environmental Protection Agency, 2010a. Record of Decision/Amendment to the Record of Decision, Cortese Landfill Superfund Site, Town of Tusten, Sullivan County, New York, October.

U.S. Environmental Protection Agency, 2010b. EPA Region 2 Clean and Green Policy, http://epa.gov/region2/superfund/green_remediation/policy.html, March 11.

U.S. Environmental Protection Agency, 2011. Draft Statement of Work, Remedial Design, Cortese Landfill Site, Operable Unit 4 – Source Areas, Narrowsburg, New York, draft subject to change, February.

VeruTEK, see VeruTEK Technologies. Inc.

VeruTEK Technologies, Inc., 2009. Phase II. LNAPL and Soil Phase Treatability Study, Cortese Landfill Superfund Site, Narrowsburg, New York, November.

TABLES

TABLE 1
REMEDY COMPONENTS AND FUNCTION

Cortese Landfill Site
Narrowsburg, New York

Remedy Step	Remedy Component	Remedy Component Function
1	Air Sparge (AS)	1. Physical removal of VOCs from source areas through volatilization. Accomplished by mass transfer of VOCs from shallow groundwater in the source area to the overlying vadose zone, which in turn increases the dissolution rate of the residual source materials. 2. In situ aerobic biodegradation of hydrocarbons by mass transfer of oxygen from sparge gas into groundwater.
1	Soil Vapor Extraction (SVE)	Collect VOCs transferred to the vadose zone by the AS process. The collected VOCs will be treated prior to discharge to the atmosphere, if necessary.
--	Decision Point No. 1, ORP Adjustment	Early in the AS operation, should redox adjustments be used (see rationale below)?
1	Redox Adjustments (if necessary)	If initial AS operation does not adequately raise the oxidation-reduction potential (ORP) of groundwater in the source area enough to stop the dissolution of iron from aquifer solids, which has the potential to affect AS/SVE operation by precipitation of iron oxides on or near the sparge wells, then measures to raise the ORP will be considered with the intent that continued air sparging operation will be able to maintain the higher ORP and hence terminate the iron dissolution process.
--	Decision Point No. 2, Amendment Addition (e.g. ozone)	Should amendment additions such as ozone to AS/SVE begin? The decision criteria will be developed during the Remedial Design (RD) and will likely consider factors such as significant declines in VOC concentrations in groundwater at, and downgradient from, the treatment areas and/or a significant reduction in VOC mass removal rates. The decision will also evaluate whether amendment addition is necessary in some or all areas based upon groundwater quality data.

TABLE 1
REMEDY COMPONENTS AND FUNCTION

Cortese Landfill Site
Narrowsburg, New York

Remedy Step	Remedy Component	Remedy Component Function
2	Implement Amendment Addition	Amendment addition (such as ozone sparging) will be used for in situ treatment of the less volatile and less biodegradable organic compounds in the source areas, after most of the VOC mass has been removed or biodegraded by the AS operation in Step 1.
--	Decision Point No. 3, Cessation of Sparging	Should sparging operation be terminated? The decision criteria will be developed during the RD and will likely consider factors such as significant declines in concentrations of Target Compound List (TCL) semi-volatile organic compounds (SVOCs) downgradient from the treatment area, or significant reductions in the constituent mass flux in groundwater to the point where it is similar to the natural attenuation degradation rates.
3	Stabilization	Upon termination of sparging and amendment addition operations, the source areas and downgradient groundwater will be allowed to re-equilibrate for a period of up to five years. Groundwater monitoring will be used to track the re-equilibration and evaluate concentrations relative to groundwater cleanup goals at the point of compliance.
--	Decision Point No. 4, ISCO	Should the ISCO step be invoked (see rationale below)?
4	ISCO Injection (if necessary)	If groundwater concentrations at the point of compliance exceed targets for this stage of the remedy (to be developed during the RD), then ISCO will be used to facilitate additional in situ treatment of the remaining source areas. The nature, dose, and delivery method for ISCO will be based upon the types and concentrations of constituents that exceed the interim targets in groundwater at the point of compliance.
--	Decision Point No. 5, Transition to MNA	Should Monitored Natural Attenuation (MNA) begin? Decision criteria for this point will be developed as part of the RD.

TABLE 1
REMEDY COMPONENTS AND FUNCTION

Cortese Landfill Site
Narrowsburg, New York

Remedy Step	Remedy Component	Remedy Component Function
5	Monitored Natural Attenuation (MNA)[1]	Intended to act as a "bridge" between active source treatment technologies and ultimate achievement of the final groundwater cleanup goals. Groundwater monitoring will track the further decline of constituent concentrations toward the final cleanup goals. The RD will include criteria for additional steps, if necessary, in the event that MNA does not perform as intended.
--	Decision Point No. 6, Evaluate Contingent Remedy	Should the Contingent Remedy be evaluated? This decision point would be evaluated based upon decision criteria to be developed in the RD.
--	Decision Point No. 7, Remedy Completion	Have the remedy cleanup goals been achieved? This would indicate that active remediation of the site is completed and the need for any further long-term environmental monitoring will be considered.

Notes:
1. Monitored natural attenuation is the remedy for groundwater in areas downgradient of the source areas.

TABLE 2
SOURCE AREA TARGETED FOR ACTIVE IN SITU TREATMENT AT IDDA IB

Cortese Landfill
Narrowsburg, New York

<table>
<tr><th></th><th></th><th>B-1</th><th>B-2</th><th>B-3</th><th>B-7</th><th>B-8</th><th>B-9</th><th>S-1</th><th>S-2</th></tr>
<tr><th>Top Depth (ft bgs)</th><th>Bottom Depth</th><th colspan="8">Likely NAPL?[2]</th></tr>
<tr><td>1</td><td>2</td><td rowspan="17"></td><td rowspan="14"></td><td rowspan="19"></td><td rowspan="9"></td><td rowspan="9"></td><td rowspan="9"></td><td rowspan="14"></td><td rowspan="14"></td></tr>
<tr><td>2</td><td>3</td></tr>
<tr><td>3</td><td>4</td></tr>
<tr><td>4</td><td>5</td></tr>
<tr><td>5</td><td>6</td></tr>
<tr><td>6</td><td>7</td></tr>
<tr><td>7</td><td>8</td></tr>
<tr><td>8</td><td>9</td></tr>
<tr><td>9</td><td>10</td></tr>
<tr><td>10</td><td>11</td><td rowspan="7">ND</td><td rowspan="5">ND</td><td rowspan="5">ND</td></tr>
<tr><td>11</td><td>12</td></tr>
<tr><td>12</td><td>13</td></tr>
<tr><td>13</td><td>14</td></tr>
<tr><td>14</td><td>15</td></tr>
<tr><td>15</td><td>16</td><td rowspan="5">No</td><td rowspan="8">ND</td><td rowspan="8">Yes</td><td rowspan="8">No</td><td rowspan="5">Yes</td></tr>
<tr><td>16</td><td>17</td></tr>
<tr><td>17</td><td>18</td><td rowspan="8">Yes</td></tr>
<tr><td>18</td><td>19</td><td rowspan="12">Yes</td></tr>
<tr><td>19</td><td>20</td></tr>
<tr><td>20</td><td>21</td><td rowspan="5">No</td><td rowspan="5">No</td><td rowspan="6">No</td></tr>
<tr><td>21</td><td>22</td></tr>
<tr><td>22</td><td>23</td></tr>
<tr><td>23</td><td>24</td><td rowspan="7">Yes</td><td rowspan="7">Yes</td><td rowspan="2">Yes</td></tr>
<tr><td>24</td><td>25</td></tr>
<tr><td>25</td><td>26</td><td rowspan="5">Yes</td><td rowspan="5">No</td><td rowspan="5">Yes</td><td rowspan="4">Yes</td></tr>
<tr><td>26</td><td>27</td><td rowspan="5">No</td></tr>
<tr><td>27</td><td>28</td></tr>
<tr><td>28</td><td>29</td></tr>
<tr><td>29</td><td>30</td><td rowspan="4">No</td></tr>
<tr><td>30</td><td>31</td><td rowspan="10">No</td><td rowspan="3">No</td><td rowspan="5">No</td><td rowspan="5">Yes</td><td rowspan="5">No</td><td rowspan="5">Yes</td></tr>
<tr><td>31</td><td>32</td><td rowspan="4">No</td></tr>
<tr><td>32</td><td>33</td></tr>
<tr><td>33</td><td>34</td><td rowspan="2">No</td><td rowspan="2">No</td></tr>
<tr><td>34</td><td>35</td></tr>
<tr><td>35</td><td>36</td><td rowspan="5">No</td><td rowspan="3">No</td><td rowspan="5">No</td><td rowspan="5">Yes</td><td rowspan="5">ND</td><td rowspan="5">No</td><td rowspan="3">No</td></tr>
<tr><td>36</td><td>37</td></tr>
<tr><td>37</td><td>38</td></tr>
<tr><td>38</td><td>39</td><td rowspan="2">ND</td><td rowspan="2">No</td></tr>
<tr><td>39</td><td>40</td></tr>
<tr><td>40</td><td>41</td><td rowspan="5">No</td><td rowspan="5">ND</td><td rowspan="40"></td><td rowspan="5">No</td><td rowspan="40"></td><td rowspan="40"></td><td rowspan="40"></td><td rowspan="40"></td></tr>
<tr><td>41</td><td>42</td></tr>
<tr><td>42</td><td>43</td></tr>
<tr><td>43</td><td>44</td></tr>
<tr><td>44</td><td>45</td></tr>
<tr><td>45</td><td>46</td><td rowspan="5">ND</td><td rowspan="35"></td><td rowspan="35"></td></tr>
<tr><td>46</td><td>47</td></tr>
<tr><td>47</td><td>48</td></tr>
<tr><td>48</td><td>49</td></tr>
<tr><td>49</td><td>50</td></tr>
<tr><td>50</td><td>51</td><td rowspan="5">No</td></tr>
<tr><td>51</td><td>52</td></tr>
<tr><td>52</td><td>53</td></tr>
<tr><td>53</td><td>54</td></tr>
<tr><td>54</td><td>55</td></tr>
<tr><td>55</td><td>56</td><td rowspan="5">ND</td></tr>
<tr><td>56</td><td>57</td></tr>
<tr><td>57</td><td>58</td></tr>
<tr><td>58</td><td>59</td></tr>
<tr><td>59</td><td>60</td></tr>
<tr><td>60</td><td>61</td><td rowspan="5">ND</td></tr>
<tr><td>61</td><td>62</td></tr>
<tr><td>62</td><td>63</td></tr>
<tr><td>63</td><td>64</td></tr>
<tr><td>64</td><td>65</td></tr>
<tr><td>65</td><td>66</td><td rowspan="5">ND</td></tr>
<tr><td>66</td><td>67</td></tr>
<tr><td>67</td><td>68</td></tr>
<tr><td>68</td><td>69</td></tr>
<tr><td>69</td><td>70</td></tr>
<tr><td>70</td><td>71</td><td rowspan="5">ND</td></tr>
<tr><td>71</td><td>72</td></tr>
<tr><td>72</td><td>73</td></tr>
<tr><td>73</td><td>74</td></tr>
<tr><td>74</td><td>75</td></tr>
<tr><td>75</td><td>76</td><td rowspan="5">ND</td></tr>
<tr><td>76</td><td>77</td></tr>
<tr><td>77</td><td>78</td></tr>
<tr><td>78</td><td>79</td></tr>
<tr><td>79</td><td>80</td></tr>
</table>

Notes:

1. Table adapted from Table 8 in *Source Characterization Report, Cortese Landfill Site, Narrowsburg, New York* , Golder Associates, Inc., (January., 2008).
2. Methods used to calculate the potential presence of NAPL are presented in Appendix F of the *Source Characterization Report*

ND: VOCs Not Detected
Yes: Residual product is likely in this sample (see Section 2.6 of the *Source Characterization Report* for details)
No: Residual product is not likely in this sample (see Section 2.6 of the *Source Characterization Report* for details)

TABLE 3
CHEMICAL SPECIFIC GROUNDWATER ARARs AND TBCs

Cortese Landfill Site
Narrowsburg, New York

Constituent Information		Federal Safe Drinking Water Act			New York State Water Quality Standards for Class GA (Groundwater)	New York Public Water Supply Regulations	Preliminary Remediation Goal(1)	Maximum Concentration Greater than Preliminary Remediation Goal ?
Parameter	Range of Detections in Groundwater Since 2000	MCL	SMCL	MCLG	NYCRR, Title 6 Part 701-703	NYCRR, Title 10 Part 5-1		
VOCs								
1,1,1-Trichloroethane	ND-7300	200		200	5 (POC)	5 (POC)	5	Y
1,1,2,2-Tetrachloroethane	ND-31				5 (POC)	5 (POC)	5	Y
1,1,2-Trichloroethane	ND-28	5		3	1	5 (POC)	1	Y
1,1-Dichloroethane	ND-98000					5 (POC)	5	Y
1,1-Dichloroethene	ND-600	7		7		5 (POC)	5	Y
1,2,4-Trichlorobenzene	ND-8000	70		70	5 (POC)	5 (POC)	5	Y
1,2-Dichlorobenzene	ND-9400	75		75	3	5 (POC)	3	Y
1,2-Dichloroethane	ND-3600	5		zero	0.6	5 (POC)	0.6	Y
1,2-Dichloropropane	ND-1100	5		zero	1	5 (POC)	1	Y
1,3-Dichlorobenzene	ND-4000				3	5 (POC)	3	Y
1,4-Dichlorobenzene	ND-31000	600		600	3	5 (POC)	3	Y
1,4-Dioxane	ND-530					50 (UOC)	50	Y
2-Butanone	ND-69000					50 (UOC)	50	Y
2-Hexanone	ND-300					50 (UOC)	50	Y
4-Methyl-2-pentanone	ND-12000					50 (UOC)	50	Y
Acetone	ND-12000					50 (UOC)	50	Y
Benzene	ND-11000	5		zero	1	5 (POC)	1	Y
Carbon disulfide	ND-21					50 (UOC)	50	Y
Carbon tetrachloride	ND-120	5		zero	5	5 (POC)	5	Y
Chlorobenzene	ND-27000	100		100	5 (POC)	5 (POC)	5	Y
Chloroethane	ND-43000				5 (POC)	5 (POC)	5	Y
Chloroform	ND-3900				7	5 (POC)	5	Y
Chloromethane	ND-1.6				5 (POC)	5 (POC)	5	Y
cis-1,2-Dichloroethene	ND-120000	70		70	5 (POC)	5 (POC)	5	Y
Dichlorobromomethane	ND-5.5					5 (POC)	5	Y
Ethyl benzene	ND-50000	700		700	5 (POC)	5 (POC)	5	Y
Methylene Chloride	ND-12000	5		zero	5 (POC)	5 (POC)	5	Y
Tetrachloroethene	ND-10000	5		zero	5 (POC)	5 (POC)	5	Y

TABLE 3
CHEMICAL SPECIFIC GROUNDWATER ARARs AND TBCs

Cortese Landfill Site
Narrowsburg, New York

Constituent Information		Federal Safe Drinking Water Act			New York State Water Quality Standards for Class GA (Groundwater)	New York Public Water Supply Regulations	Preliminary Remediation Goal[1]	Maximum Concentration Greater than Preliminary Remediation Goal ?
Parameter	**Range of Detections in Groundwater Since 2000**	**MCL**	**SMCL**	**MCLG**	**NYCRR, Title 6 Part 701-703**	**NYCRR, Title 10 Part 5-1**		
Toluene	ND-550000	1000		1000	5 (POC)	5 (POC)	5	Y
Total Xylenes	ND-130000	10,000		10,000	5 (POC)	5 (POC)	5	Y
trans-1,2-Dichloroethene	ND-140	100		100	5 (POC)	5 (POC)	5	Y
Trichloroethene	ND-67000	5		zero	5 (POC)	5 (POC)	5	Y
Vinyl chloride	ND-22000	2		zero	2	2	2	Y
SVOCs								
2,4,5-Trichlorophenol	ND-1					5 (POC)	5	N
2,4-Dichlorophenol	ND-1.9				1	5 (POC)	1	Y
2,4-Dimethylphenol	ND-4000				1	5 (POC)	1	Y
2-Chlorophenol	ND-1.2					5 (POC)	5	Y
2-Methylnaphthalene	ND-5000					50 (UOC)	50	Y
2-Methylphenol	ND-3000					50 (UOC)	50	Y
3,3'-Dichlorobenzidine	ND-0.4				5 (POC)	5 (POC)	5	N
4-Chloro-3-methylphenol	ND-800					5 (POC)	5	Y
4-Chloroaniline	ND-10				5 (POC)	5 (POC)	5	Y
4-Methylphenol	ND-4000					50 (UOC)	50	Y
4-Nitroaniline	ND				5 (POC)	5 (POC)	5	N
4-Nitrophenol	ND-1					5 (POC)	5	Y
Acenaphthene	ND-18					50 (UOC)	50	Y
Acenaphthylene	ND-0.3					50 (UOC)	50	N
Anthracene	ND-19					50 (UOC)	50	N
Benzo(a)anthracene	ND-0.47					50 (UOC)	50	N
Benzo(a)pyrene	ND-0.2	0.2		zero	zero	50 (UOC)	0.2	N
Benzo(b)fluoranthene	ND-0.08					50 (UOC)	50	N
Benzo(g,h,i)perylene	ND-0.2					50 (UOC)	50	N
Benzo(k)fluoranthene	ND-0.09					50 (UOC)	50	N
Benzoic acid	ND-2800					50 (UOC)	50	Y
Benzyl alcohol	ND-21					50 (UOC)	50	N

TABLE 3
CHEMICAL SPECIFIC GROUNDWATER ARARs AND TBCs

Cortese Landfill Site
Narrowsburg, New York

Constituent Information		Federal Safe Drinking Water Act			New York State Water Quality Standards for Class GA (Groundwater)	New York Public Water Supply Regulations	Preliminary Remediation Goal[(1)]	Maximum Concentration Greater than Preliminary Remediation Goal ?
Parameter	**Range of Detections in Groundwater Since 2000**	**MCL**	**SMCL**	**MCLG**	**NYCRR, Title 6 Part 701-703**	**NYCRR, Title 10 Part 5-1**		
bis(2-Chloroethyl) ether	ND-45				1	5 (POC)	1	Y
bis(2-Ethylhexyl) phthalate	ND-82				5	50 (UOC)	5	Y
Carbazole	ND-15					50 (UOC)	50	N
Chrysene	ND-6					50 (UOC)	50	N
Dibenzofuran	ND-5					50 (UOC)	50	N
Diethylphthalate	ND-2000					50 (UOC)	50	Y
Dimethylphthalate	ND-45					50 (UOC)	50	N
Di-n-butylphthalate	ND-10000					50 (UOC)	50	Y
Di-n-octylphthalate	ND-10000					50 (UOC)	50	Y
Fluoranthene	ND-6					50 (UOC)	50	N
Fluorene	ND-8					50 (UOC)	50	N
Hexachlorobenzene	ND-1	1		zero	0.04	1	0.04	Y
Hexachlorobutadiene	ND-2				0.5	5 (POC)	0.5	Y
Isophorone	ND-380					50 (UOC)	50	Y
Naphthalene	ND-17000					50 (UOC)	50	Y
N-Nitrosodiphenylamine/Diphenylamine	ND-2					5 (POC)	5	N
Pentachlorophenol	ND-11	1		zero	1	1	1	Y
Phenanthrene	ND-12					50 (UOC)	50	N
Phenol	ND-110				1	5 (POC)	5	Y
Pyrene	ND-4					50 (UOC)	50	N
Metals								
Arsenic	ND-131	10		zero	25	10	10	Y
Iron	ND-126,000		300[(2)]		300	300	300	Y
Iron and Manganese	211-135,540				500	500	500	Y
Manganese	161-37,900		50[(2)]		300	300	300	Y
Wet Chemistry								
Alkalinity	ND-543,000						NA	NA
Ammonia	ND-18,300				2,000		2,000	Y

TABLE 3
CHEMICAL SPECIFIC GROUNDWATER ARARs AND TBCs

Cortese Landfill Site
Narrowsburg, New York

Constituent Information		Federal Safe Drinking Water Act			New York State Water Quality Standards for Class GA (Groundwater)	New York Public Water Supply Regulations	Preliminary Remediation Goal[(1)]	Maximum Concentration Greater than Preliminary Remediation Goal ?
Parameter	Range of Detections in Groundwater Since 2000	MCL	SMCL	MCLG	NYCRR, Title 6 Part 701-703	NYCRR, Title 10 Part 5-1		
Ammonia Nitrogen	ND-13,200				2,000		2,000	Y
Biochemical Oxygen Demand	ND-78,400						NA	NA
Chemical Oxygen Demand	ND-647,000						NA	NA
Chloride	ND-72,500		250,000				NA	NA
Hardness	40,000-270,000						NA	NA
Nitrate	ND-4,100	10,000		10,000	10,000	10,000	10,000	N
Nitrate-Nitrite	ND				10,000	10,000	10,000	N
Sulfate	ND-83,600		250,000		250,000	250,000	250,000	N
Total Dissolved Solids	38,000-265,000		500,000		500,000		500,000	N
Total Organic Carbon (TOC)	ND-105,000						NA	NA
Total Organic Carbon, Dissolved	ND-43,200						NA	NA

Notes:
(1) Preliminary Remediation Goal is the most stringent of the ARARs listed.
(2) Secondary MCLs are non-enforceable guidance to the states in setting state regulations and may be based on criteria other than health risk (such as aesthetics).
ARARs - Applicable or Relevant and Appropriate Requirements
All values are given in µg/L.
MCL - maximum contaminant level, Federal standard unless indicated otherwise
MCLG - maximum contaminant level goal
ND - Non-Detect
NYCRR - New York Codes, Rules, and Regulations
POC - principal organic contaminant
SMCL - secondary maximum contaminant level
SVOCs - semi-volatile organic compounds
UOC - unspecified organic contaminant
VOCs - volatile organic compounds
µg/L - micrograms per liter
TBC - to be considered

TABLE 4
GROUNDWATER CLEANUP LEVELS

Cortese Landfill Site
Narrowsburg, New York

Chemical of Concern	Cleanup Level	Basis for Cleanup Level
Benzene	1 µg/L (ppb)	New York State Water Quality Standards [1]
1,4-Dichlorobenzene	3 µg/L (ppb)	New York State Water Quality Standards [1]
Tetrachloroethylene	5 µg/L (ppb)	Federal MCL
Trichloroethylene	5 µg/L (ppb)	Federal MCL
Vinyl chloride	2 µg/L (ppb)	Federal MCL
Arsenic	10 µg/L (ppb)	Federal MCL
Manganese	300 µg/L (ppb)	New York State Water Quality Standards [1]

Notes:
MCL – maximum contaminant level, Federal Safe Drinking Water Act
ppb – parts per billion
µg/L – micrograms per liter

[1] New York State Water Quality Standards for Class GA (Groundwater), New York Codes, Rules, and Regulations (NYCRR), Title 6, Part 701-703.

TABLE 5
PROPERTY ACCESS REQUIREMENTS

Cortese Landfill Site
Narrowsburg, New York

Parcel	Owner	Access Need
47	Norfolk Southern	Potenetial access route for electrical power from Delaware Drive.
54.10	Joseph Wolff	Access to groundwater monitoring wells MW-6A and MW-6B
54.18	Kathy Michell	Access to surface water monitoring station SW-12
55.2	John Cortese Construction Company	Installation of remedy infrastructure
55.3	Town of Tusten, Narrowsburg Sewer Dist	Access to site area
55.6	Town of Tusten	Access across landfill to former IDDA 1b infrastructure
55.7	John Cortese Construction Company	Access to groundwater monitoring wells, former septage lagoons, and former IDDA 2
N/A	Town of Tusten	Access to downgradient groundwater monitoring wells installed in public right of way along Delaware Drive

TABLE 6
PERMIT EQUIVALENCIES AND APPROVALS

Cortese Landfill Site
Narrowsburg, New York

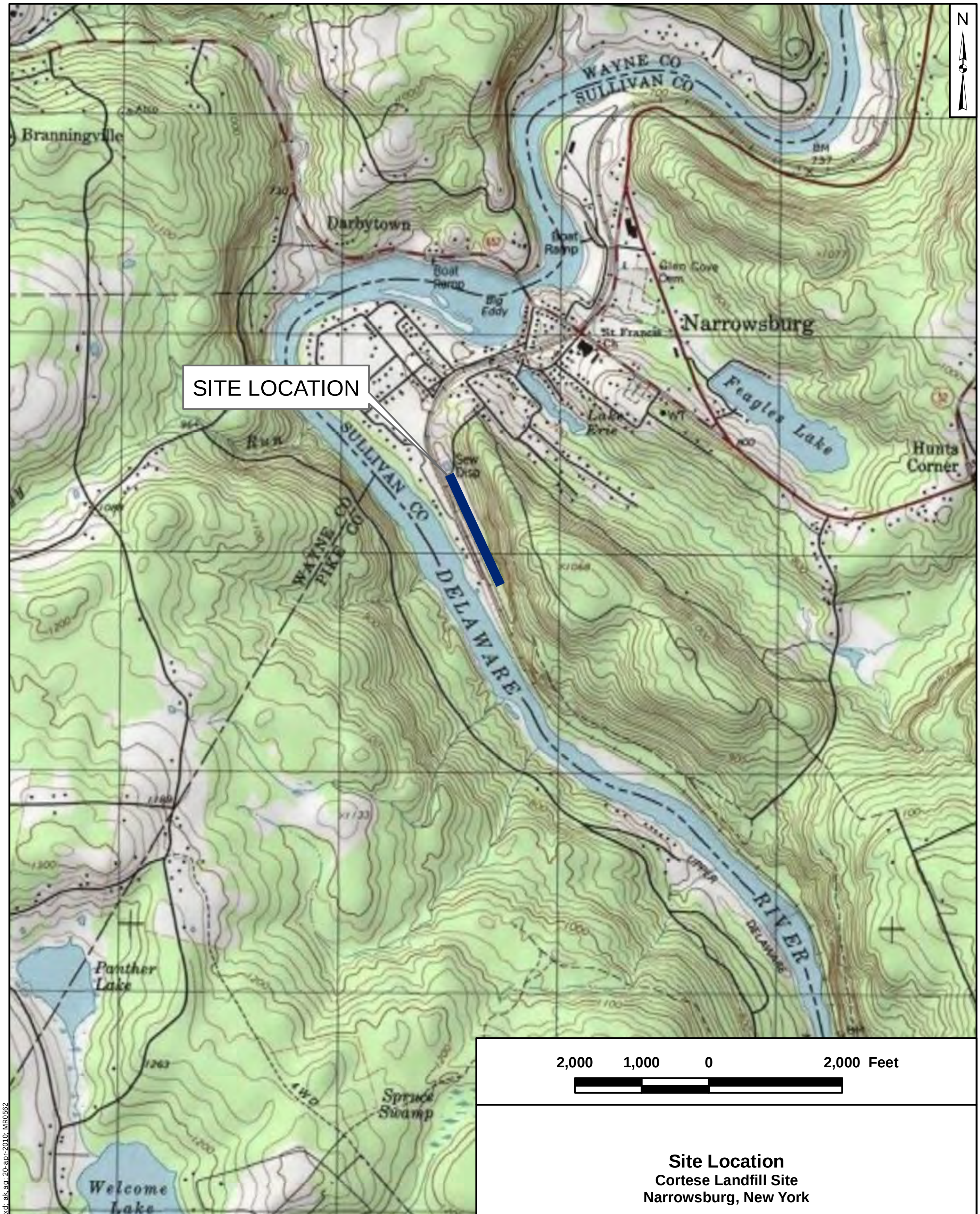
Potential Permit Equivalency or Approval	Description
Federal	
Underground Injection Control (UIC)	Permit equivalency provided by U.S. Environmental Protection Agency, if needed, for source treatment
Hazardous Waste Manifest	Required if process residuals such as gas condensate or spent activated carbon are shipped off-site for treatment and disposal are a RCRA characteristic hazardous waste
CERCLA Off-Site Policy Notification	Approval required from U.S. Environmental Protection Agency and the receiving state if waste materials are shipped from the site to out of state treatment, storage, and disposal facilities. Approval is contingent upon compliance status of the receiving facility.
Wetlands	Notification to U.S. Environmental Protection Agency required for compliance with Executive Order 11990.
Floodplains	Notification to U.S. Environmental Protection Agency required for compliance with Executive Order 11988.
State	
Soil Vapor Extraction System Process Off-Gas Treatment and Discharge	Preliminary evaluation indicates permit equivalency will not be required because the process is defined as "trivial" in 6 NYCRR Parts 212, 257, and 373
Endangered species	Notifications to state to inquire about potential presence of habitat for threatened or endangered species in the project area.
Historic resources	Notification to state historic preservation officer to inquire about potential presence of resources in the project area. No further action anticipated since no new disturbance beyond prior landfill closure project area are contemplated.

TABLE 6
PERMIT EQUIVALENCIES AND APPROVALS

Cortese Landfill Site
Narrowsburg, New York

Potential Permit Equivalency or Approval	Description
Local (Town of Tusten)	
Building Permit	Potentially needed to construct infrastructure
Site Plan	Potentially needed to construct infrastructure
Special Permit	Required for construction in floodway, only required if applicable to 500-year floodway in former septage lagoon area
Occupancy Permit	Required for process building

FIGURES



Site Location
Cortese Landfill Site
Narrowsburg, New York

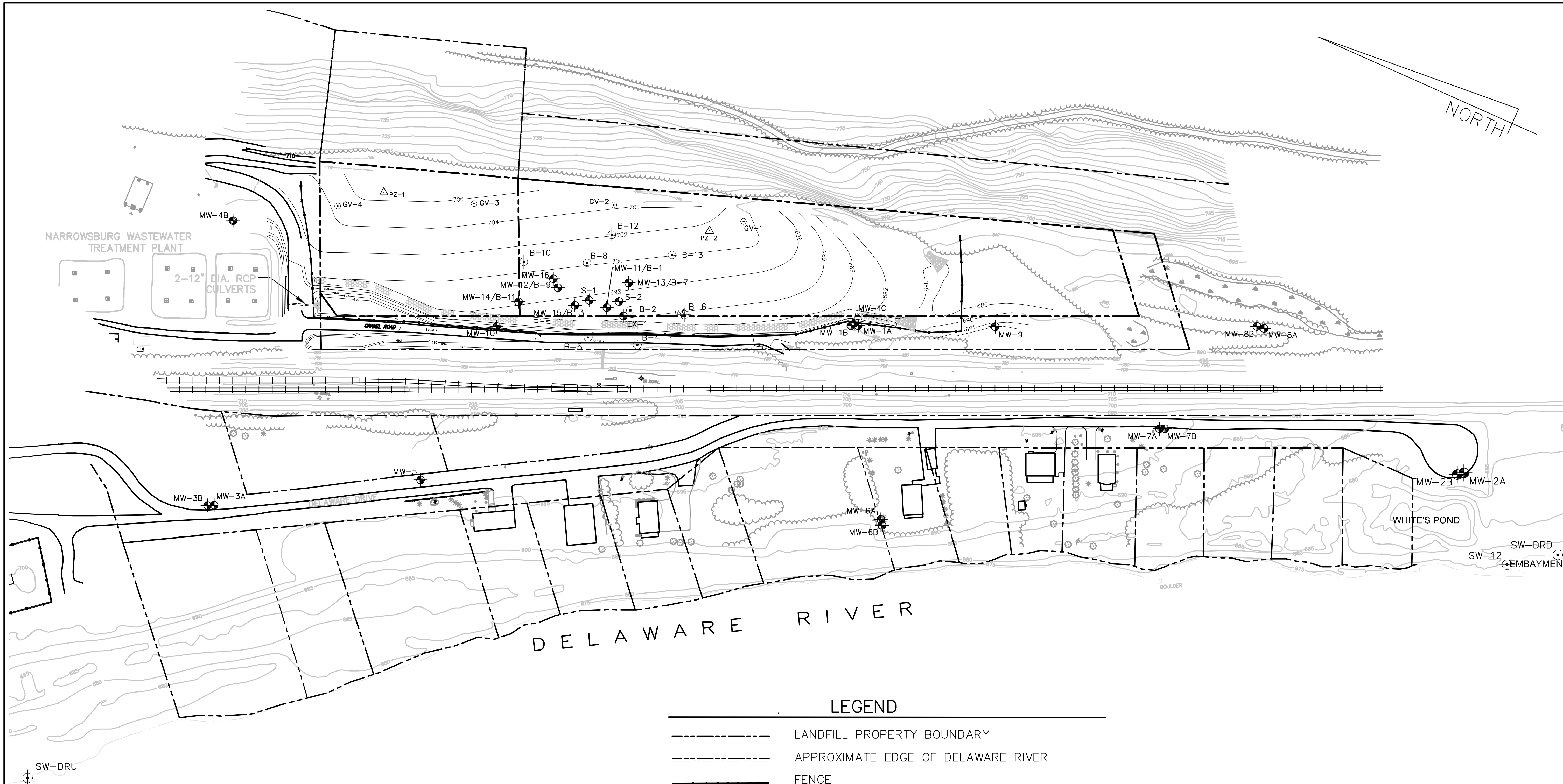
Notes
USGS 7.5' Topographic Quadrangle Narrowsburg, New York

Geosyntec consultants

Columbia, Maryland | September 2010

Figure 1

P:\GIS\MR0562\SiteLocationMap.mxd; ak,ag; 20-apr-2010; MR0562



LEGEND

LANDFILL PROPERTY BOUNDARY

APPROXIMATE EDGE OF DELAWARE RIVER

FENCE

LANDFILL COVER ELEVATION CONTOUR

PRE-EXISTING TOPOGRAPHY ELEVATION CONTOUR

GV-1 PASSIVE GAS VENT

MW-10 MONITORING WELL

SW-DRU SURFACE WATER SAMPLE POINT

PZ-1 PIEZOMETER

150 75 0 150

SCALE: 1" = 150'

NOTES

1.) ALL COORDINATES SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN DATUM 1983 (NAD 83) AS DERIVED USING THE NATIONAL GEODETIC SURVEY SHIFT OF N 05°05'25" AND E A DISTANCE OF 426,246.03' AS APPLIED TO THE NATIONAL GEODETIC SURVEY DATUM OF 1927 (NAD 27). ALL ELEVATIONS SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN VERTICAL DATUM OF 1988, AS DERIVED USING THE NATIONAL GEODETIC SURVEY SHIFT OF −0.5479' AS APPLIED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.

2.) TOPOGRAPHY AND SURFACE FEATURES EAST OF DELAWARE DRIVE WERE ORIGINALLY PREPARED BY FIELD METHODS BY OM P. POPLI P.E., L.S. P.C. CONSULTING ENGINEERS & SURVEYORS, ROCHESTER, NEW YORK, MARCH 1995. TOPOGRAPHY CHANGES SINCE MARCH 1995 PREPARED BY ENVIRONMENTAL RESEARCH, INC. ON DECEMBER 12, 1996. PROPERTY LINES EAST OF DELAWARE DRIVE WERE DETERMINED FROM A SURVEY MAP ENTITLED "CORTESE LAND FILL SITE" DATED MAY 7, 1985, PREPARED BY GARY PACKER, P.L.S. AND "TAX MAP, TOWN OF TUSTEN, SULLIVAN COUNTY, NY," DATED 11/20/92. LANDFILL PROPERTY BOUNDARY TAKEN FROM BASELINE-PROPERTY BOUNDARY-CONTROL, CORTESE LANDFILL SITE, TOWN OF TUSTEN, SULLIVAN COUNTY, NY, MAY 7, 1985, BY GARY PARKER, P.L.S. TOPOGRAPHY AND SURFACE FEATURES WEST OF DELAWARE DRIVE WERE DIGITIZED FROM AN ELECTRONICALLY SCANNED FILE OF THE TOPOGRAPHIC BASE MAP PREPARED BY ROBINSON AERIAL SURVEYS, INC., BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPH TAKEN APRIL 18, 1985.

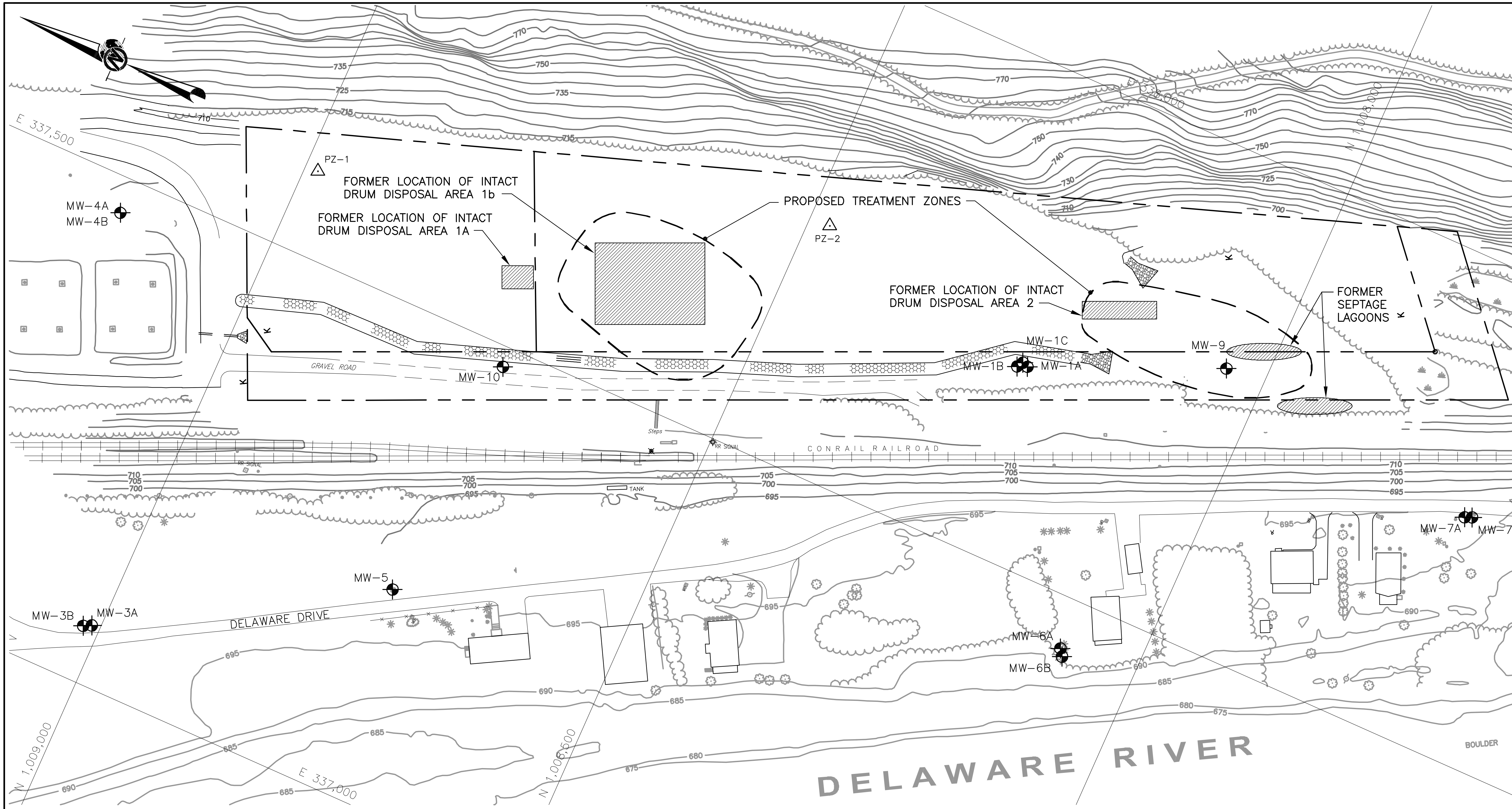
3.) REFERENCE: DRAWING DEVELOPED FROM FIGURE 2, "SITE PLAN" OF THE SOURCE CHARACTERIZATION REPORT BY GOLDER ASSOCIATES, INC., DATED 24 JANUARY 2008.

SITE PLAN
CORTESE LANDFILL SITE
NARROWSBURG, NEW YORK

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f252
FIGURE NO.	2



LEGEND

LANDFILL PROPERTY BOUNDARY

750 TOPOGRAPHIC CONTOUR

MW-10 MONITORING WELL

PZ-1 PIEZOMETER

100 0 100
SCALE FEET

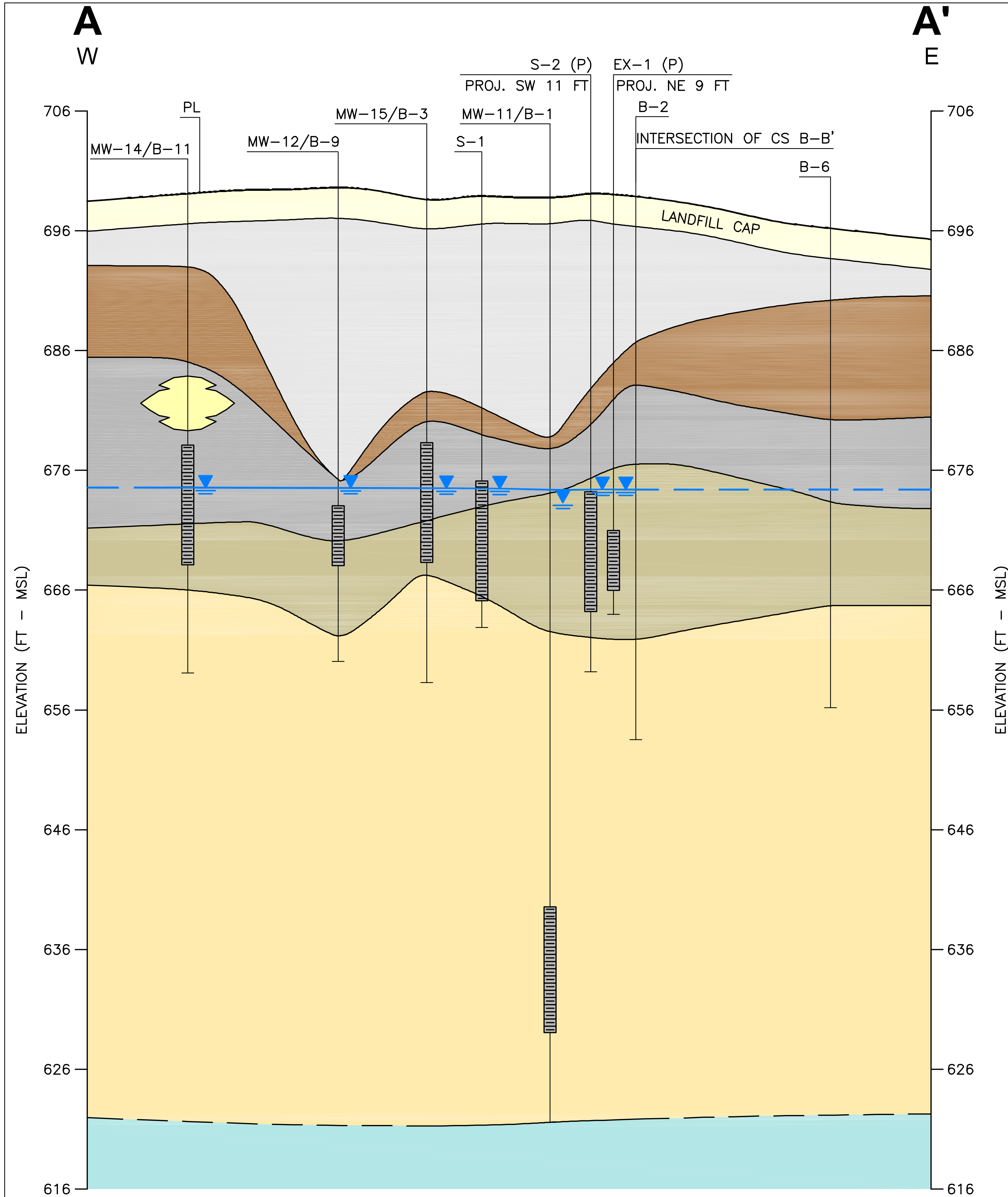
NOTES

REFERENCE: FIGURE DEVELOPED FROM FIGURE 4A OF THE SHALLOW GROUNDWATER HOT SPOT INVESTIGATION, REMEDIAL WORK ELEMENT II, CORTESE LANDFILL SITE, NARROWSBURG, NEW YORK (GOLDER ASSOCIATES, INC.; 2001).

FORMER SOURCE AREAS
CORTESE LANDFILL SITE
NARROWSBURG, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	
FILE NO.	0562f352 (2)
FIGURE NO.	3



LEGEND

B-6 — BORING/MONITORING WELL IDENTIFICATION

SCREEN INTERVAL

LANDFILL CAP

SAND / SILT FILL
REDDISH-BROWN SILTY FINE SAND AND SILT FILL

WASTE

UPPER SAND AND GRAVEL UNIT

SAND
BROWN TO GRAY SILTY, GRAVELLY, FINE TO COARSE SAND

SILT AND GRAVEL
BROWN TO LIGHT BROWN SANDY SILT AND GRAVEL

SAND AND GRAVEL
BROWN TO GREENISH GRAY SILTY, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL

SAND AND SILT
BROWN TO GREENISH GRAY FINE TO MEDIUM SAND AND SILT. SMALLSCALE, DISCONTINUOUS FACIES OF GRAVEL ARE ALSO PRESENT IN THIS UNIT BUT NOT SHOWN

BEDROCK

GROUNDWATER TABLE (DASHED WHERE INFERRED)

GROUNDWATER ELEVATION IN MONITORING WELLS – OCTOBER 18, 2007 (SEE NOTE 4)

E	EAST
FT	FEET
MSL	MEAN SEA LEVEL
NE	NORTHEAST
SW	SOUTHWEST
W	WEST

50 0 50
HORIZONTAL SCALE FEET
10 0 10
VERTICAL SCALE FEET
5X = VERTICAL EXAGGERATION

NOTES

1.) EX-1 (INSTALLED AUGUST 2003), S-1 AND S-2 (INSTALLED MAY 2004) WERE ADVANCED USING HOLLOW STEM AUGER DRILLING TECHNIQUES, THE BORING LOGS FOR THESE WELLS WERE NOT USED IN THE DEVELOPMENT OF THE CROSS-SECTION.

2.) ALL OTHER BORINGS/MONITORING WELLS (INSTALLED IN SEPTEMBER 2007) WERE ADVANCED USING ROTO-SONIC DRILLING TECHNIQUES.

3.) ALL EXISTING MONITORING WELLS AND ALL SOIL BORINGS COMPLETED IN SEPTEMBER AND OCTOBER 2007, WERE (RE)SURVEYED BY TECTONIC ENGINEERING OF MOUNTAINVILLE, NY. THESE LOCATIONS AND ELEVATIONS WERE TIED TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83) AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) UTILIZING GLOBAL POSITIONING SYSTEM (GPS) DATA. MINOR DISCREPANCIES NOTED BETWEEN PREVIOUS SURVEYS NAD 83 DATA AND THE NEW SURVEY NAD 83 DATA WERE RESOLVED BY ADJUSTING KNOWN FIXED POINTS FROM BOTH SETS OF DATA UNTIL THEY WERE ALIGNED. DISCREPANCIES WERE ALSO NOTED BETWEEN PREVIOUS SURVEYS NAVD 88 DATA AND THE NEW SURVEY NAVD 88 DATA. THE NEW SURVEY NAVD 88 DATA WAS USED TO DEVELOP THE GEOLOGIC CROSS SECTIONS IN THIS REPORT.

4.) REFERENCE: FIGURE TAKEN FROM FIGURE 4B, "HYDROGEOLOGIC CROSS SECTION A-A'," OF THE 2008 SOURCE CHARACTERIZATION REPORT BY GOLDER ASSOCIATES, INC.

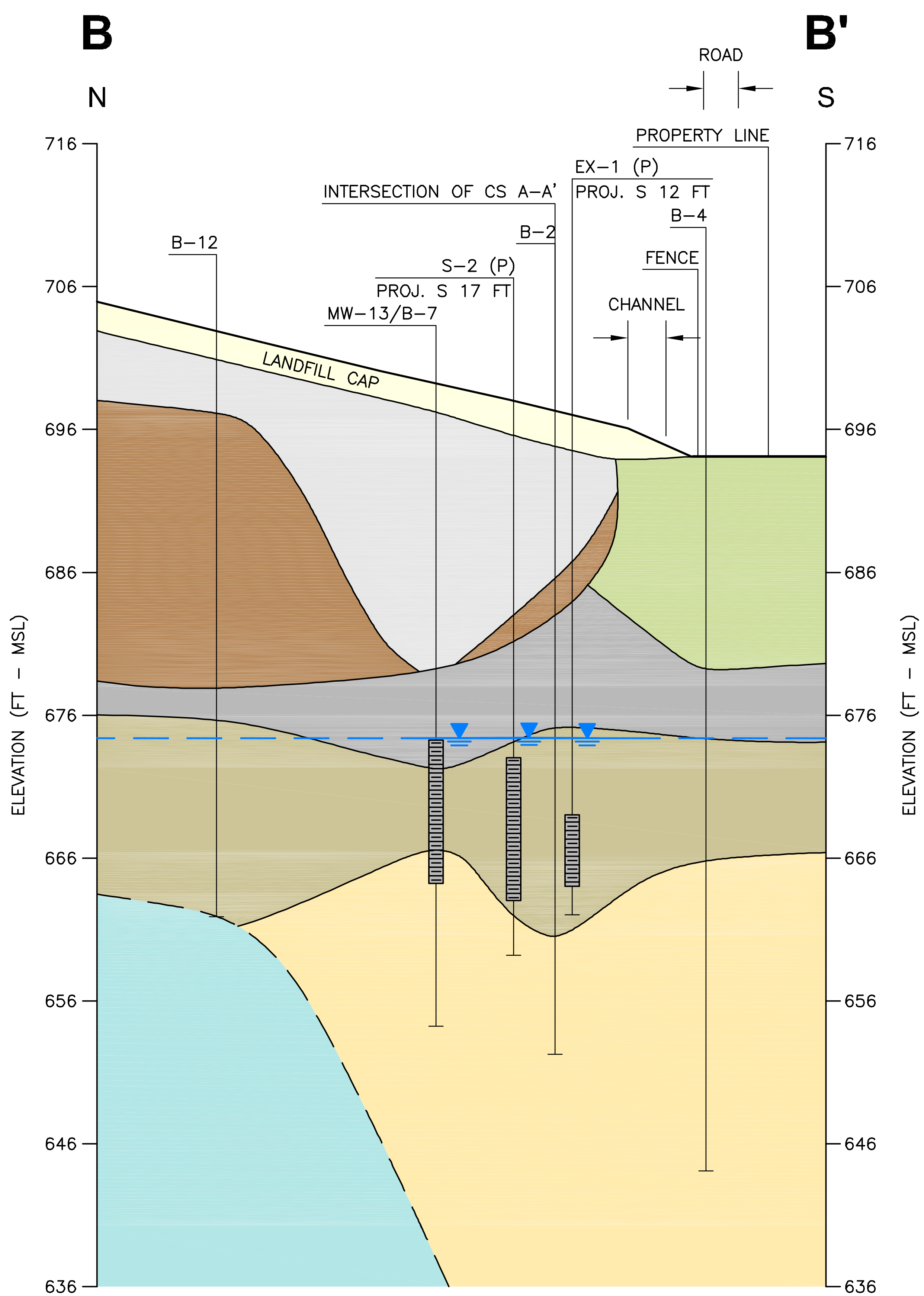
5.) VERTICAL AXES WERE ADJUSTED BY 6 FEET DUE TO DISCREPANCIES BETWEEN THE SURVEYED ELEVATIONS AND PREVIOUS SURVEYS DURING THE PHASE III RI INVESTIGATION.

6.) SEE FIGURE 6 FOR CROSS-SECTION LOCATION.

HYDROGEOLOGIC CROSS SECTION A–A'

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f254
FIGURE NO.	4



LEGEND

B–6 — BORING/MONITORING WELL IDENTIFICATION

SCREEN INTERVAL

LANDFILL CAP

SAND / SILT FILL
REDDISH–BROWN SILTY FINE SAND AND SILT FILL

WASTE

SILT
REDDISH–BROWN SANDY, CLAYEY SILT

UPPER SAND AND GRAVEL UNIT

SAND
BROWN TO GRAY SILTY, GRAVELLY, FINE TO COARSE SAND

SILT AND GRAVEL
BROWN TO LIGHT BROWN SANDY SILT AND GRAVEL

SAND AND GRAVEL
BROWN TO GREENISH GRAY SILTY, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL

SAND AND SILT
BROWN TO GREENISH GRAY FINE TO MEDIUM SAND AND SILT. SMALLSCALE, DISCONTINUOUS FACIES OF GRAVEL ARE ALSO PRESENT IN THIS UNIT BUT NOT SHOWN

BEDROCK

GROUNDWATER TABLE (DASHED WHERE INFERRED)

GROUNDWATER ELEVATION IN MONITORING WELLS – OCTOBER 18, 2007 (SEE NOTE 4)

FT FEET

MSL MEAN SEA LEVEL

N NORTH

S SOUTH

50 0 50
HORIZONTAL SCALE FEET

10 0 10
VERTICAL SCALE FEET

5X = VERTICAL EXAGGERATION

NOTES

1.) EX–1 (INSTALLED AUGUST 2003), S–1 AND S–2 (INSTALLED MAY 2004) WERE ADVANCED USING HOLLOW STEM AUGER DRILLING TECHNIQUES. THE BORING LOGS FOR THESE WELLS WERE NOT USED IN THE DEVELOPMENT OF THE CROSS–SECTION.

2.) ALL OTHER BORINGS/MONITORING WELLS (INSTALLED IN SEPTEMBER 2007) WERE ADVANCED USING ROTO–SONIC DRILLING TECHNIQUES.

3.) ALL EXISTING MONITORING WELLS AND ALL SOIL BORINGS COMPLETED IN SEPTEMBER AND OCTOBER 2007, WERE (RE)SURVEYED BY TECTONIC ENGINEERING OF MOUNTAINVILLE, NY. THESE LOCATIONS AND ELEVATIONS WERE TIED TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83) AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) UTILIZING GLOBAL POSITIONING SYSTEM (GPS) DATA. MINOR DISCREPANCIES NOTED BETWEEN PREVIOUS SURVEYS NAD 83 DATA AND THE NEW SURVEY NAD 83 DATA WERE RESOLVED BY ADJUSTING KNOWN FIXED POINTS FROM BOTH SETS OF DATA UNTIL THEY WERE ALIGNED. DISCREPANCIES WERE ALSO NOTED BETWEEN PREVIOUS SURVEYS NAVD 88 DATA AND THE NEW SURVEY NAVD 88 DATA. THE NEW SURVEY NAVD 88 DATA WAS USED TO DEVELOP THE GEOLOGIC CROSS SECTIONS IN THIS REPORT.

4.) REFERENCE: FIGURE TAKEN FROM FIGURE 4B, "HYDROGEOLOGIC CROSS SECTION B–B'," OF THE 2008 SOURCE CHARACTERIZATION REPORT BY GOLDER ASSOCIATES, INC.

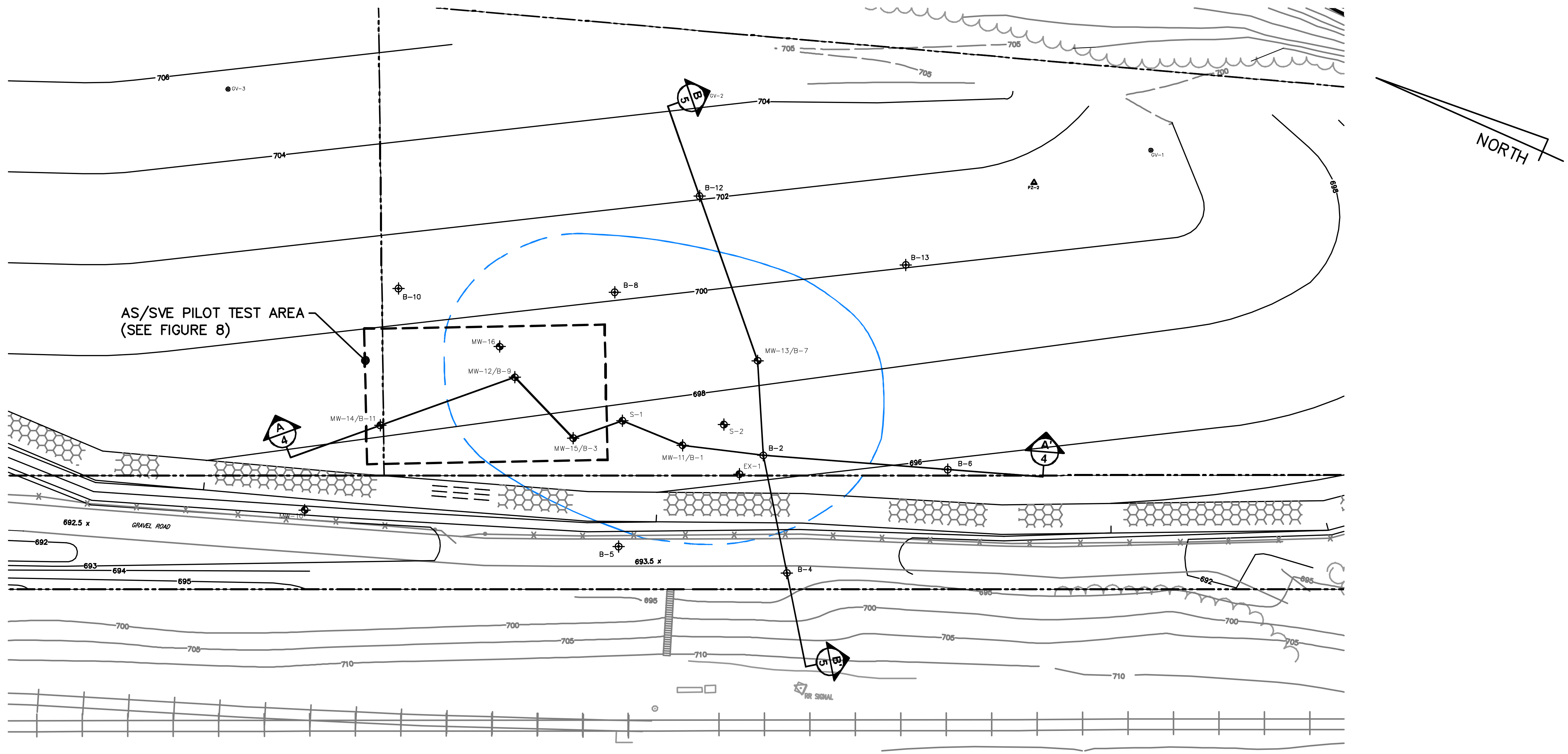
5.) VERTICAL AXES WERE ADJUSTED BY 6 FEET DUE TO DISCREPANCIES BETWEEN THE SURVEYED ELEVATIONS AND PREVIOUS SURVEYS DURING THE PHASE III RI INVESTIGATION.

6.) SEE FIGURE 6 FOR CROSS–SECTION LOCATION.

HYDROGEOLOGIC CROSS SECTION B–B'

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f255
FIGURE NO.	5



LEGEND

LANDFILL PROPERTY BOUNDARY (SEE REFERENCE 2)

APPROXIMATE LOCATION OF PROPERTY BOUNDARY (SEE REFERENCE 2)

FENCE

695 — LANDFILL COVER ELEVATION CONTOUR

700 — PRE-EXISTING TOPOGRAPHY ELEVATION CONTOUR

ESTIMATED SOURCE AREA (DASHED WHERE INFERRED)

W — DETAIL OR CROSS SECTION DESIGNATION

6 — FIGURE No. WHERE DETAIL OR CROSS SECTION IS PRESENTED

GV-1 PASSIVE GAS VENT

MW-10 MONITORING WELL

PZ-1 PIEZOMETER

B-10 BOREHOLE

NOTES

1.) ALL COORDINATES SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN DATUM 1983 (NAD 83) AS DERIVED USING THE NATIONAL GEODETIC SURVEY SHIFT OF N 05°05'25" AND E A DISTANCE OF 426,246.03' AS APPLIED TO THE NATIONAL GEODETIC SURVEY DATUM OF 1927 (NAD 27). ALL ELEVATIONS SHOWN ON THIS MAP REFLECT THE NORTH AMERICAN VERTICAL DATUM OF 1988, AS DERIVED USING THE NATIONAL GEODETIC SURVEY SHIFT OF -0.5479' AS APPLIED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.

2.) TOPOGRAPHY AND SURFACE FEATURES EAST OF DELAWARE DRIVE WAS ORIGINALLY PREPARED BY FIELD METHODS BY OM P. POPLI P.E., L.S. P.C. CONSULTING ENGINEERS & SURVEYORS, ROCHESTER, NEW YORK, MARCH 1995. TOPOGRAPHY CHANGES SINCE MARCH 1995 PREPARED BY ENVIRONMENTAL RESEARCH, INC. ON DECEMBER 12, 1996. PROPERTY LINES EAST OF DELAWARE DRIVE WERE DETERMINED FROM A SURVEY MAP ENTITLED "CORTESE LAND FILL SITE" DATED MAY 7, 1985, PREPARED BY GARY PACKER, P.L.S. AND "TAX MAP, TOWN OF TUSTEN, SULLIVAN COUNTY, NY," DATED 11/20/92. LANDFILL PROPERTY BOUNDARY TAKEN FROM BASELINE-PROPERTY BOUNDARY-CONTROL, CORTESE LANDFILL SITE, TOWN OF TUSTEN, SULLIVAN COUNTY, NY, MAY 7, 1985, BY GARY PARKER, P.L.S. TOPOGRAPHY AND SURFACE FEATURES WEST OF DELAWARE DRIVE WERE DIGITIZED FROM AN ELECTRONICALLY SCANNED FILE OF THE TOPOGRAPHIC BASE MAP PREPARED BY ROBINSON AERIAL SURVEYS, INC., BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPH TAKEN APRIL 18, 1985.

3.) ALL EXISTING MONITORING WELLS AND ALL SOIL BORINGS COMPLETED IN SEPTEMBER AND OCTOBER 2007, WERE (RE)SURVEYED BY TECTONIC ENGINEERING OF MOUNTAINVILLE, NY. THESE LOCATIONS AND ELEVATIONS WERE TIED TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83) AND NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) UTILIZING GLOBAL POSITIONING SYSTEM (GPS) DATA. MINOR DISCREPANCIES NOTED BETWEEN PREVIOUS SURVEYS NAD 83 DATA AND THE NEW SURVEY NAD 83 DATA WERE RESOLVED BY ADJUSTING KNOWN FIXED POINTS FROM BOTH SETS OF DATA UNTIL THEY WERE ALIGNED. DISCREPANCIES WERE ALSO NOTED BETWEEN PREVIOUS SURVEYS NAVD 88 DATA AND THE NEW SURVEY NAVD 88 DATA. THE NEW SURVEY NAVD 88 DATA WAS USED TO DEVELOP THE GEOLOGIC CROSS SECTIONS IN THIS REPORT.

4.) SOURCE AREA INCLUDES BORINGS WITH GREATER THAN TEN TIMES (10X) THE NY TAGM SOIL SCREENING VALUES FOR GROUNDWATER PROTECTION (UG/KG). THE SOURCE AREA ONLY INCLUDES AREAS NEAR OR BELOW THE WATER GROUNDWATER TABLE AND AREAS WHICH WOULD BE TARGETED FOR SOURCE AREA REMEDIATION. BORING B-10 HAS CONCENTRATIONS GREATER THAN 10X TAGM BUT WAS NOT INCLUDED IN THE SOURCE AREA BECAUSE THE DETECTIONS EXCEEDING 10X TAGM WERE ABOVE THE WATER TABLE. BORING B-4 HAS CONCENTRATIONS GREATER THAN 10X TAGM BUT WAS NOT INCLUDED IN THE SOURCE AREA BECAUSE THESE DETECTIONS ONLY INCLUDED KETONES WHICH ARE NOT DETECTED IN DOWNGRADIENT WELLS AND WOULD NOT BE TARGETED FOR SOURCE AREA REMEDIATION.

5.) REFERENCE: FIGURE DEVELOPED FROM FIGURE 6G OF THE SOURCE CHARACTERIZATION REPORT, CORTESE LANDFILL SITE, NARROWSBURG, NEW YORK (GOLDER ASSOCIATES, JANUARY 2008).

50 25 0 50

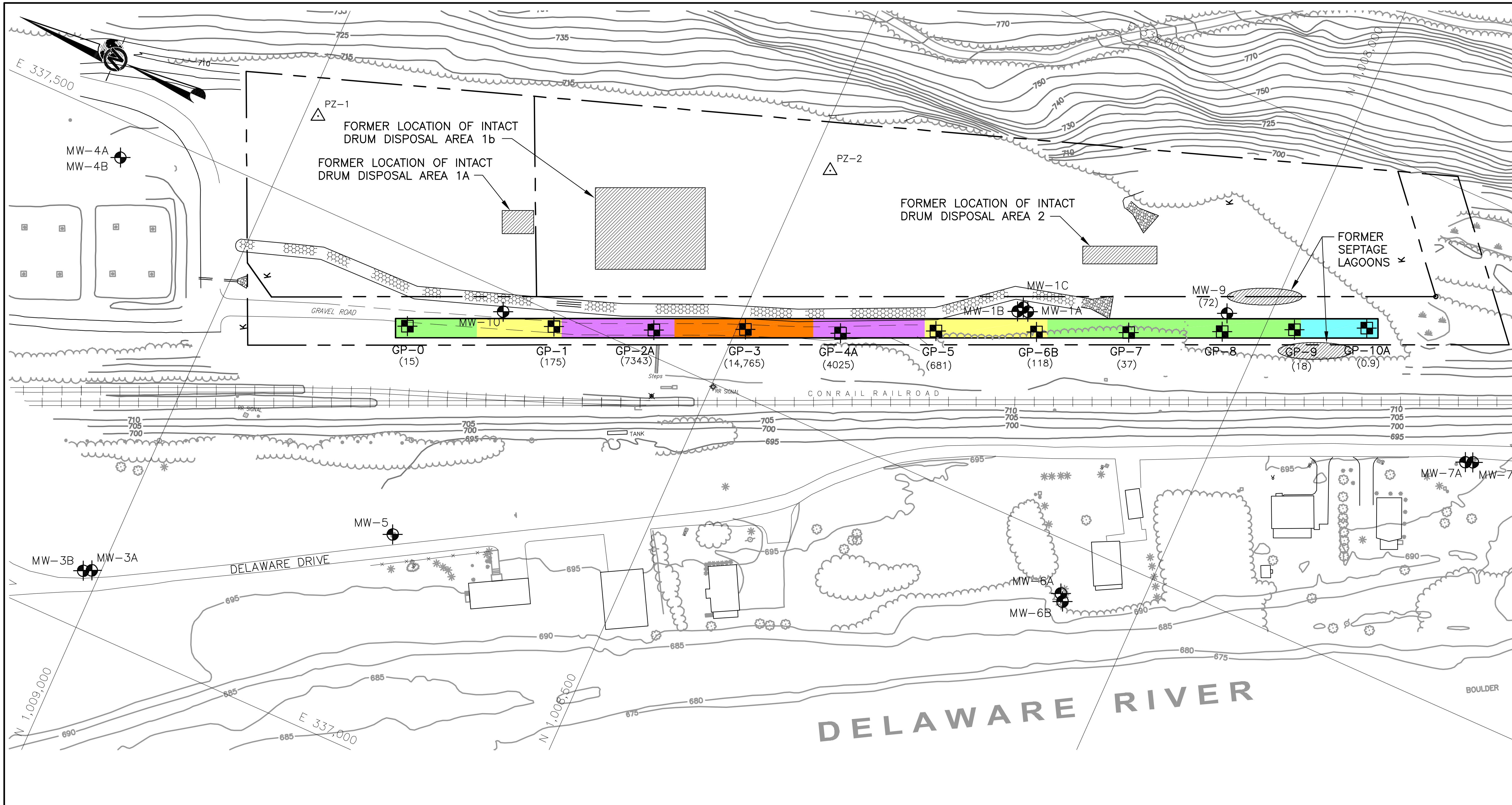
SCALE: 1" = 50'

ESTIMATED EXTENT OF FORMER IDDA 1b SOURCE AREA

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	SEPTEMEBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10316
FILE NO.	0562f306
FIGURE NO.	6



LEGEND

— — —	LANDFILL PROPERTY BOUNDARY
—750—	TOPOGRAPHIC CONTOUR
MW-10	MONITORING WELL
PZ-1	PIEZOMETER
GP-1	GEOPROBE BOREHOLE
(15.23)	TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION (μg/L)

- < 10 μg/L
- 11 μg/L to 100 μg/L
- 101 μg/L to 1000 μg/L
- 1001 μg/L to 10,000 μg/L
- > 10,001 μg/L

100 0 100

SCALE FEET

NOTES

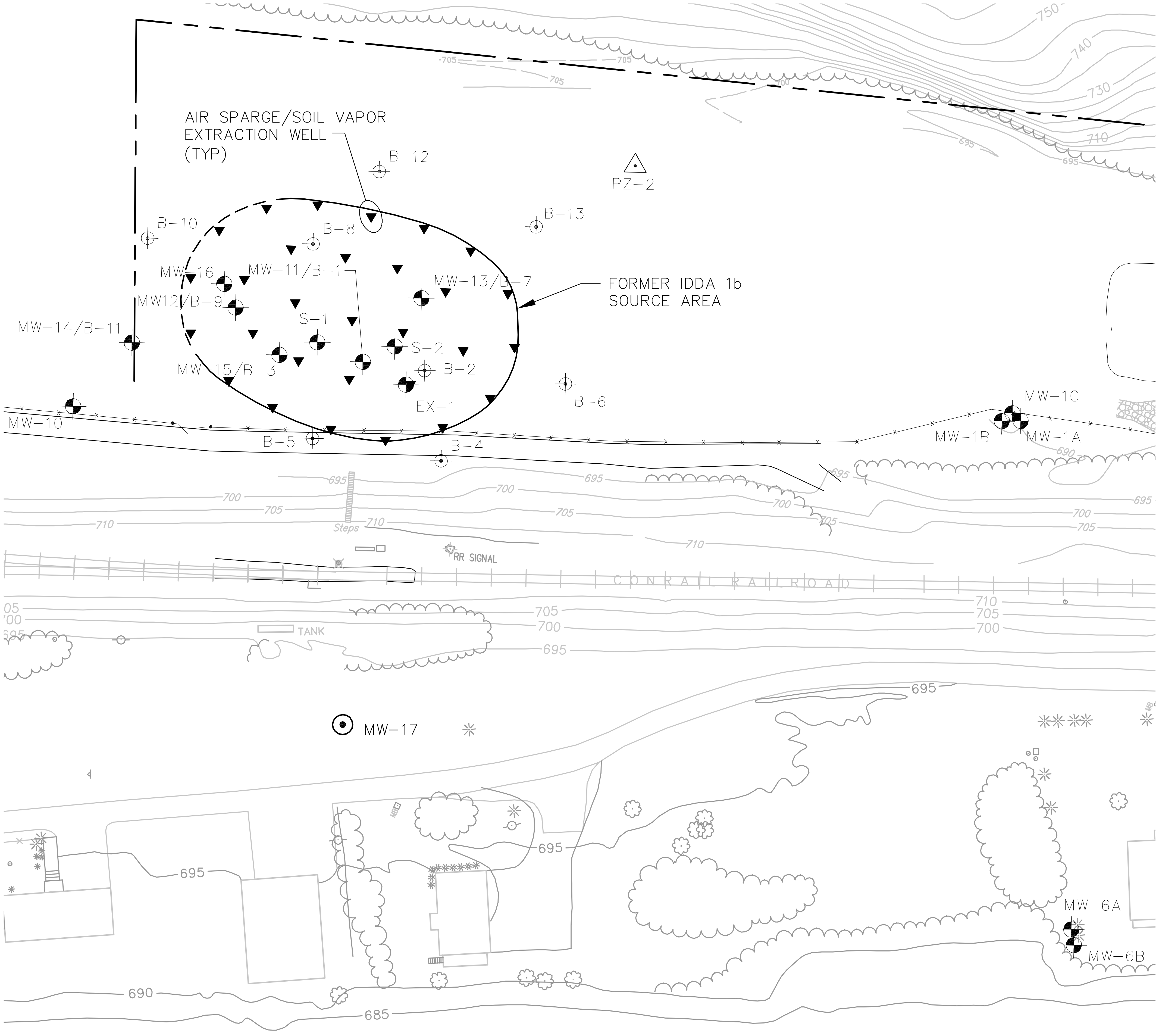
REFERENCE: FIGURE TAKEN FROM FIGURE 4A OF THE SHALLOW GROUNDWATER HOT SPOT INVESTIGATION, REMEDIAL WORK ELEMENT II, CORTESE LANDFILL SITE, NARROWSBURG, NEW YORK (GOLDER ASSOCIATES, INC.; 2001).

TOTAL GROUNDWATER VOC PROFILE
SHALLOW/MIDDLE ZONE
UPPER SAND AND GRAVEL UNIT

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f253-7
FIGURE NO.	7



NORTH

LEGEND

LANDFILL PROPERTY BOUNDARY

685 EXISTING TOPOGRAPHIC CONTOUR

MW-13 EXISTING MONITORING WELL

PZ-2 EXISTING PIEZOMETER

B-8 EXISTING SOIL BORING

PROPOSED AIR SPARGE/SOIL VAPOR EXTRACTION WELL

PROPOSED MONITORING WELL

NOTES

REFERENCE: EXISTING CONDITIONS FROM DRAWING ENTITLED "SITE PLAN, CORTESE LANDFILL CERCLA SITE, NARROWSBURG, NEW YORK" BY GOLDER ASSOCIATES, DATED 24 JANUARY 2008.

60 30 0 60

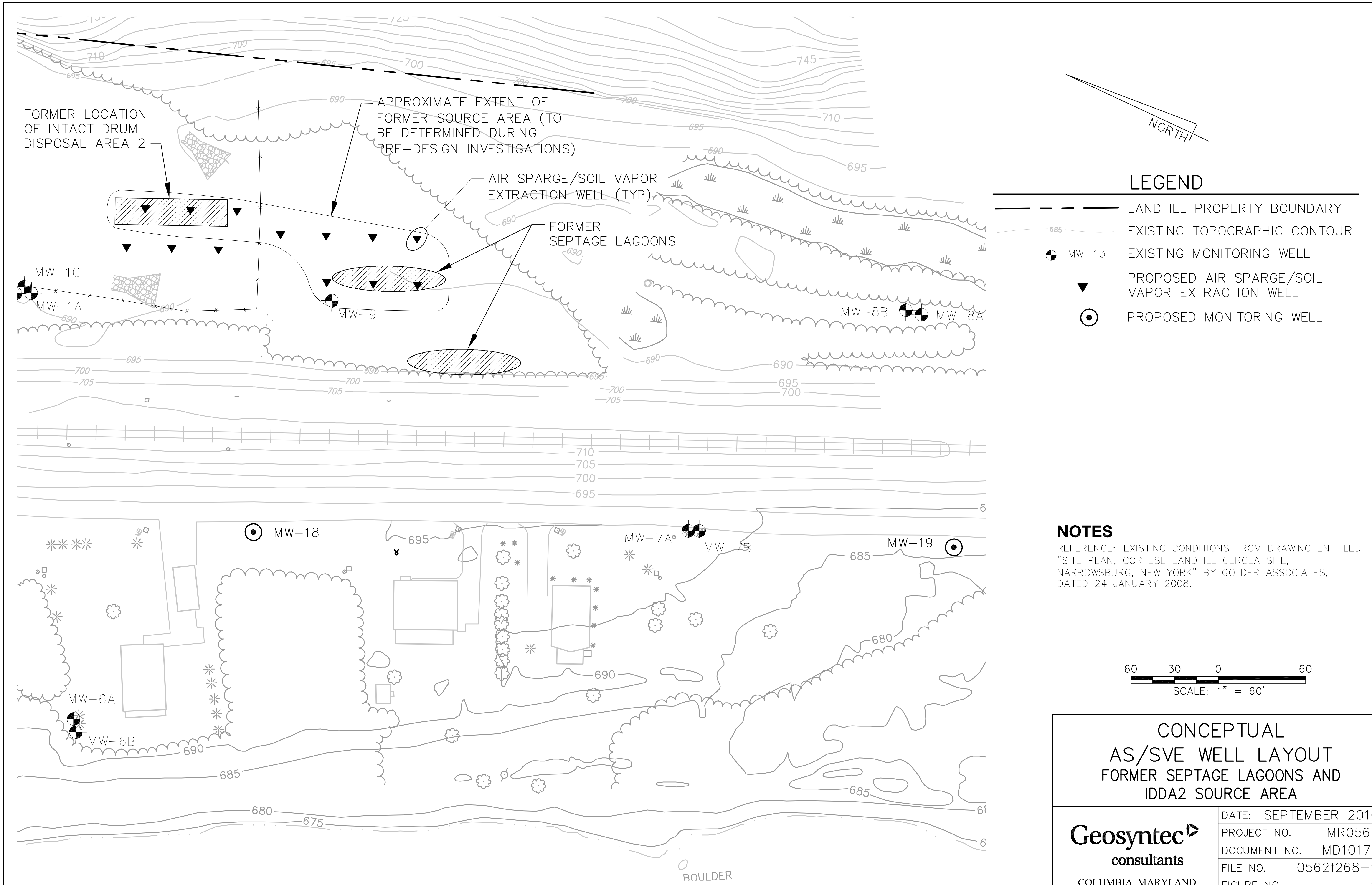
SCALE: 1" = 60'

CONCEPTUAL AS/SVE WELL LAYOUT
FORMER IDDA 1b SOURCE AREA

Geosyntec consultants

COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f258-9
FIGURE NO.	8



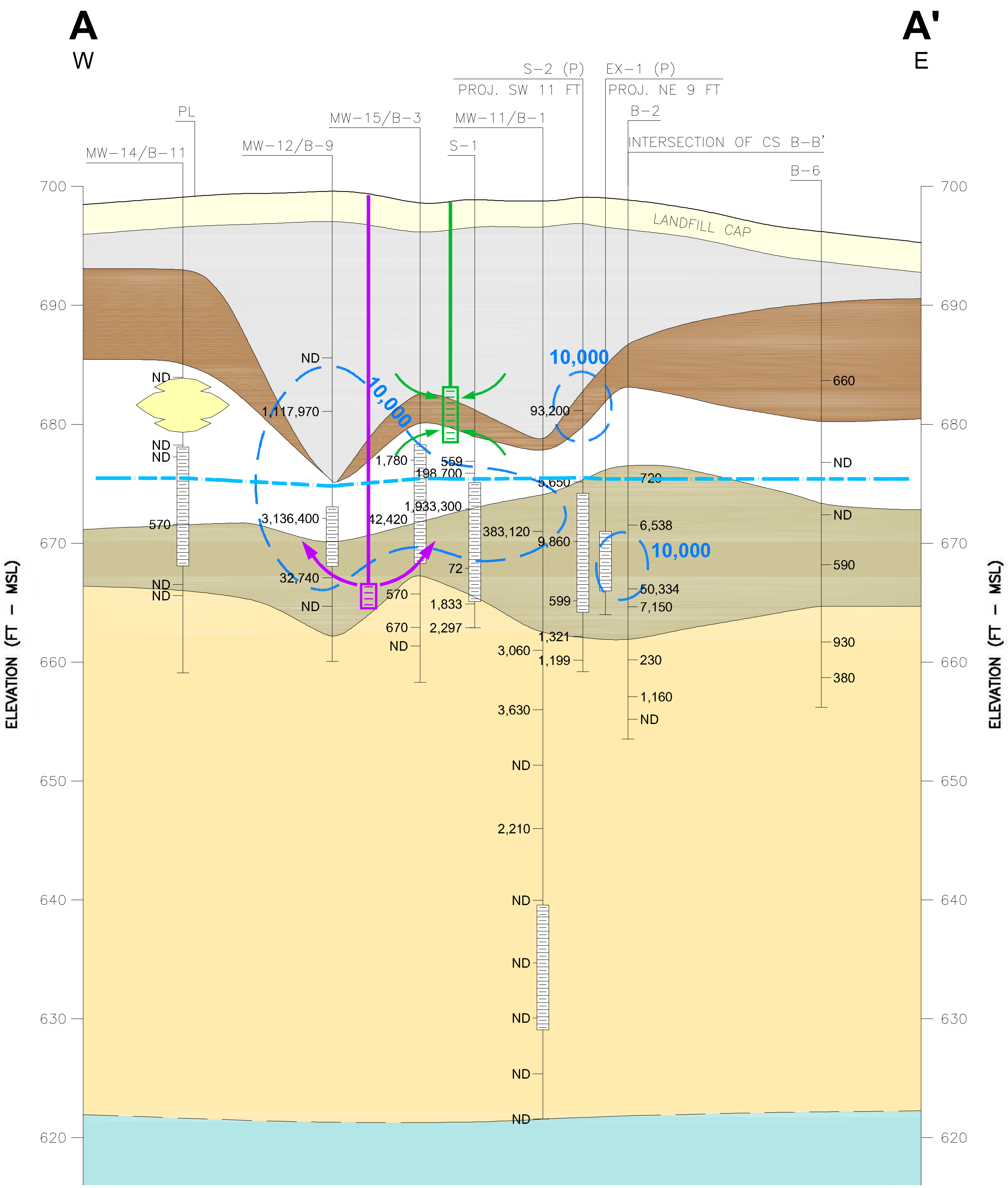
NOTES

REFERENCE: EXISTING CONDITIONS FROM DRAWING ENTITLED "SITE PLAN, CORTESE LANDFILL CERCLA SITE, NARROWSBURG, NEW YORK" BY GOLDER ASSOCIATES, DATED 24 JANUARY 2008.

CONCEPTUAL
AS/SVE WELL LAYOUT
FORMER SEPTAGE LAGOONS AND IDDA2 SOURCE AREA

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f268-9
FIGURE NO.	9



LEGEND

B-6 — BORING/MONITORING WELL IDENTIFICATION

SCREEN INTERVAL

—10,000— TOTAL DETECTED VOCs ISOCONCENTRATION CONTOUR (ug/kg)

675.2 TOTAL DETECTED VOCs (ug/kg) – MOBILE LAB RESULTS

LANDFILL CAP

SAND / SILT FILL
REDDISH-BROWN SILTY FINE SAND AND SILT FILL

WASTE

SVE WELL (TYP)

SPARGE WELL (TYP)

SOIL GAS FLOW

AIR FLOW

OCTOBER 2007 GROUNDWATER TABLE

UPPER SAND AND GRAVEL UNIT

SAND
BROWN TO GRAY SILTY, GRAVELLY, FINE TO COARSE SAND

SILT AND GRAVEL
BROWN TO LIGHT BROWN SANDY SILT AND GRAVEL

SAND AND GRAVEL
BROWN TO GREENISH GRAY SILTY, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL

SAND AND SILT
BROWN TO GREENISH GRAY FINE TO MEDIUM SAND AND SILT. SMALLSCALE, DISCONTINUOUS FACIES OF GRAVEL ARE ALSO PRESENT IN THIS UNIT BUT NOT SHOWN

BEDROCK

50 0 50
HORIZONTAL SCALE FEET
10 0 10
VERTICAL SCALE FEET
5X = VERTICAL EXAGGERATION

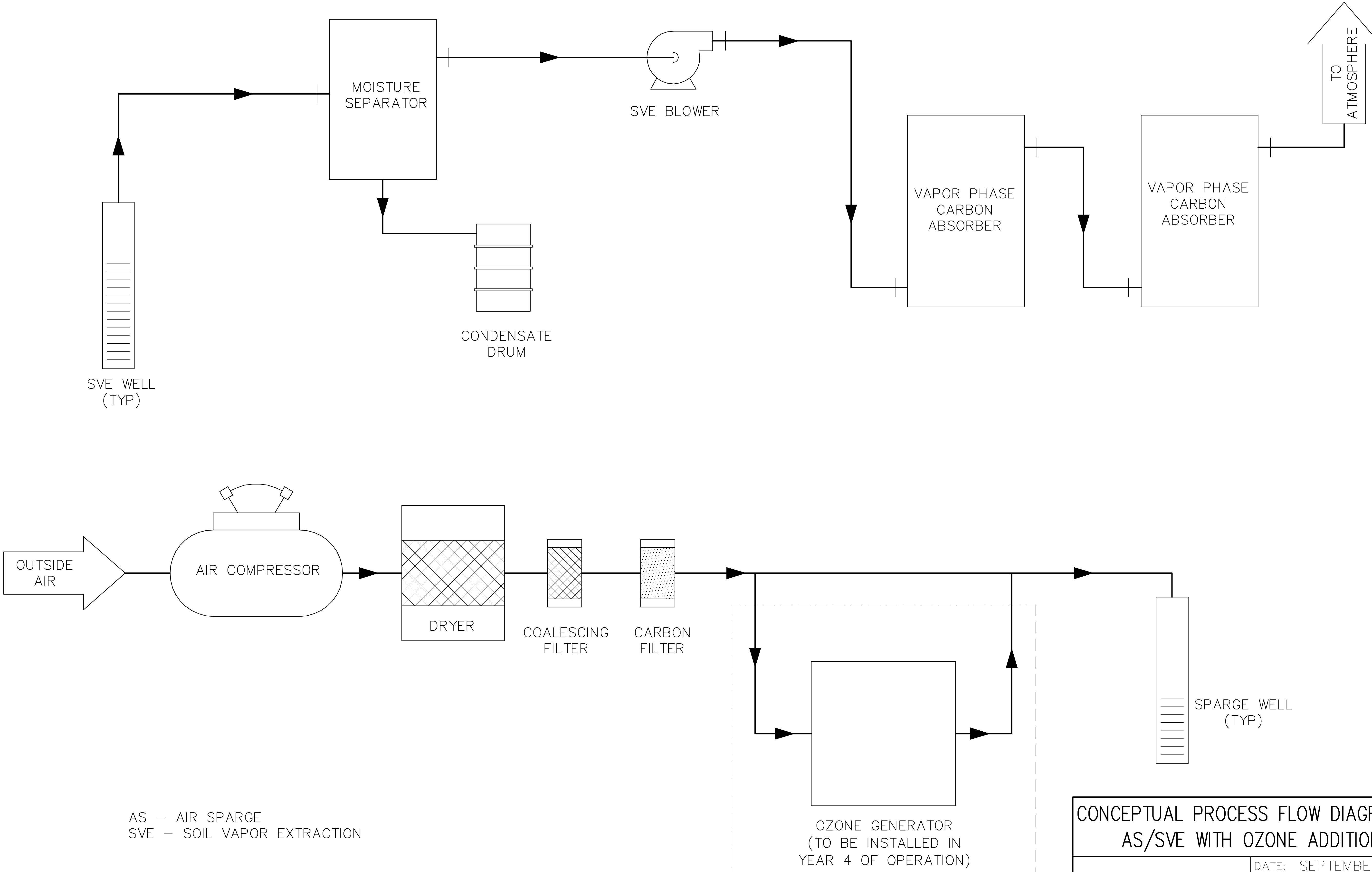
NOTES

REFERENCE: FIGURE DEVELOPED FROM FIGURE 5A, "GEOLOGIC CROSS SECTION A-A' WITH TOTAL DETECTED VOCs" OF THE 2008 SOURCE CHARACTERIZATION REPORT, CORTESE LANDFILL SITE, NARROWSBURG, NEW YORK BY GOLDER ASSOCIATES AND DATED 14 DECEMBER 2007.

CROSS-SECTION OF CONCEPTUAL AS/SVE WELL INSTALLATION FORMER IDDA 1b SOURCE AREA

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f2510-12
FIGURE NO.	10



AS – AIR SPARGE
SVE – SOIL VAPOR EXTRACTION

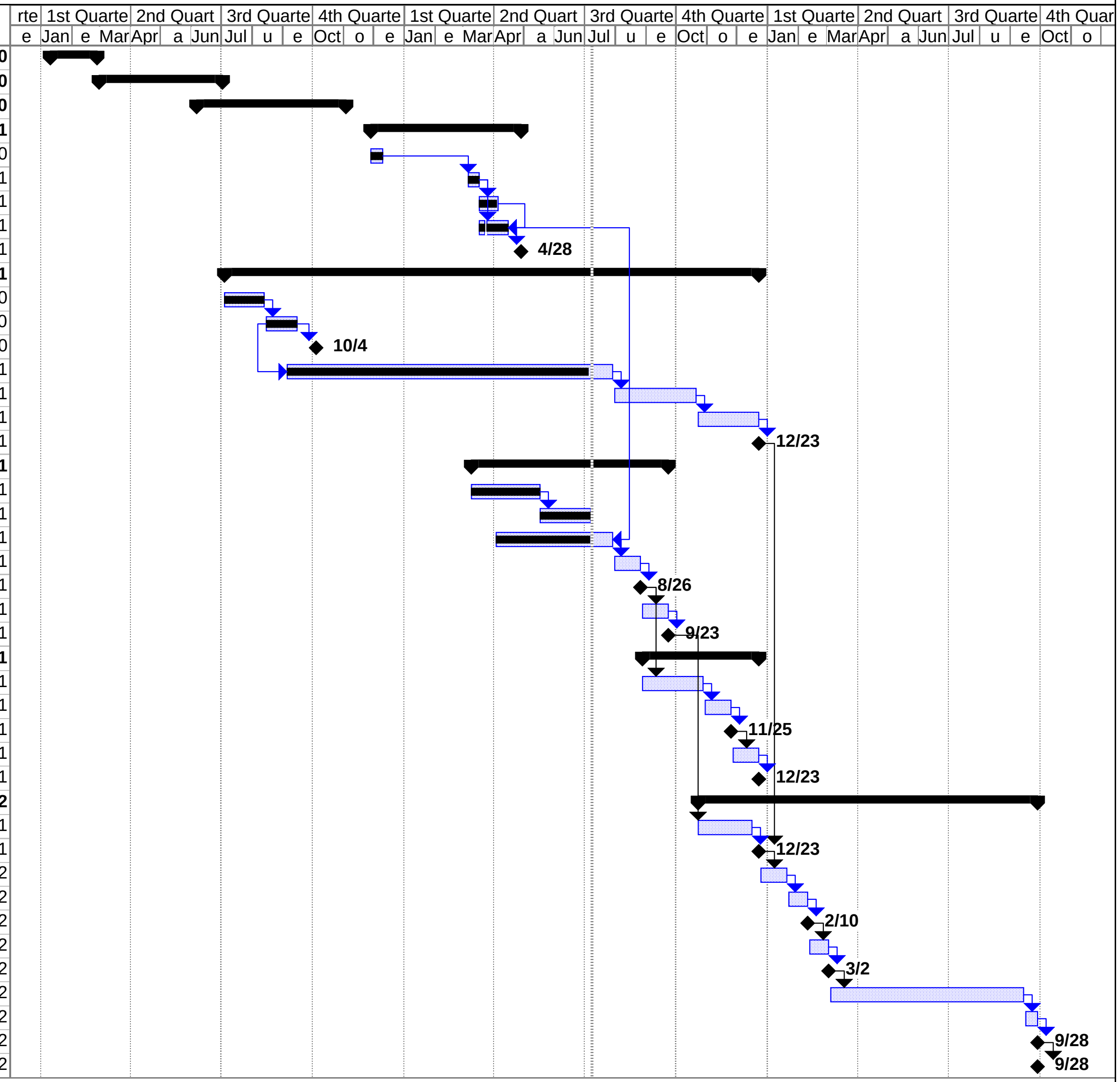
CONCEPTUAL PROCESS FLOW DIAGRAM – AS/SVE WITH OZONE ADDITION

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	SEPTEMBER 2010
PROJECT NO.	MR0562
DOCUMENT NO.	MD10172
FILE NO.	0562f2510-12
FIGURE NO.	11

Figure 12: Remedial Design/Remedial Action Schedule

ID	Task Name	Duration	Start	Finish
1	**Scoping**	**35 days**	**Mon 1/11/10**	**Fri 2/26/10**
5	**Focused Feasibility Study**	**90 days**	**Mon 3/1/10**	**Fri 7/2/10**
10	**Pilot Test Work Plan**	**108 days**	**Mon 6/7/10**	**Wed 11/3/10**
17	**Pilot Test**	**109 days**	**Mon 11/29/10**	**Thu 4/28/11**
18	Drilling	10 days	Mon 11/29/10	Fri 12/10/10
19	Pilot Test	9 days	Mon 3/7/11	Thu 3/17/11
20	Laboratory Analyses	13 days	Fri 3/18/11	Tue 4/5/11
21	Evaluate Pilot Test Results	19 days	Fri 3/18/11	Fri 4/15/11
22	PRP Group Update	0 days	Thu 4/28/11	Thu 4/28/11
23	**Remedy Change**	**385 days**	**Mon 7/5/10**	**Fri 12/23/11**
24	EPA Prepares PRAP	30 days	Mon 7/5/10	Fri 8/13/10
25	Public Comment	23 days	Mon 8/16/10	Wed 9/15/10
26	Source Area ROD Issued	0 days	Mon 10/4/10	Mon 10/4/10
27	Negotiate AOC	235 days	Mon 9/6/10	Fri 7/29/11
28	Negotiate CD	60 days	Mon 8/1/11	Fri 10/21/11
29	Lodge/Public Comment CD	45 days	Mon 10/24/11	Fri 12/23/11
30	Entry of CD	0 days	Fri 12/23/11	Fri 12/23/11
31	**Remedial Design**	**142 days**	**Thu 3/10/11**	**Fri 9/23/11**
32	Remedial Design Work Plan	49 days	Thu 3/10/11	Tue 5/17/11
33	EPA/NYSDEC Review and Approval	37 days	Wed 5/18/11	Thu 7/7/11
34	Prepare Design	85 days	Mon 4/4/11	Fri 7/29/11
35	PRP Group Review and Revision	20 days	Mon 8/1/11	Fri 8/26/11
36	Submit to EPA/NYSDEC	0 days	Fri 8/26/11	Fri 8/26/11
37	EPA/NYSDEC Review	20 days	Mon 8/29/11	Fri 9/23/11
38	EPA Approval of Design	0 days	Fri 9/23/11	Fri 9/23/11
39	**Support Plans**	**85 days**	**Mon 8/29/11**	**Fri 12/23/11**
40	Prepare Support Plans	45 days	Mon 8/29/11	Fri 10/28/11
41	PRP Group Review and Revision	20 days	Mon 10/31/11	Fri 11/25/11
42	Submit to EPA/NYSDEC	0 days	Fri 11/25/11	Fri 11/25/11
43	EPA/NYSDEC Review	20 days	Mon 11/28/11	Fri 12/23/11
44	EPA/NYSDEC Approval	0 days	Fri 12/23/11	Fri 12/23/11
45	**Remedial Action**	**245 days**	**Mon 10/24/11**	**Fri 9/28/12**
46	Procurement	40 days	Mon 10/24/11	Fri 12/16/11
47	Award Contract for Construction	0 days	Fri 12/23/11	Fri 12/23/11
48	Prepare RA Work Plan	20 days	Mon 12/26/11	Fri 1/20/12
49	PRP Group Review and Revision	15 days	Mon 1/23/12	Fri 2/10/12
50	Submit to EPA/NYSDEC	0 days	Fri 2/10/12	Fri 2/10/12
51	EPA/NYSDEC Review	15 days	Mon 2/13/12	Fri 3/2/12
52	EPA/NYSDEC Approval	0 days	Fri 3/2/12	Fri 3/2/12
53	Construction of AS/SVE	140 days	Mon 3/5/12	Fri 9/14/12
54	System Start Up	10 days	Mon 9/17/12	Fri 9/28/12
55	AS/SVE PCOR	0 days	Fri 9/28/12	Fri 9/28/12
56	Begin 7 Years AS/SVE O&M	0 days	Fri 9/28/12	Fri 9/28/12



Project: Cortese Schedule July 8 2011
Date: Fri 7/8/11

Task	Milestone	External Tasks
Split	Summary	External Milestone
Progress	Project Summary	Deadline

Schedule contingent on agency approval of deliverables on first submittal & entry of the Consent Decree prior to Construction Contract award. Agency reviews or CD entry greater than shown will delay successor tasks an equivalent amount of time.