REMEDIAL ACTION WORK PLAN
CHARBERT FACILITY
ALTON, RHODE ISLAND

PREPARED FOR:
Charbert, a Division of NFA Corporation
Alton, Rhode Island

PREPARED BY:
GZA GeoEnvironmental, Inc.
Providence, Rhode Island

October 2007
File No. 32795.16

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

October 15, 2007
File No. 32795.16

Ms. Joan Taylor
Rhode Island Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, Rhode Island 02908

Re: Remedial Action Work Plan for Source Control
Charbert Facility
Alton, Rhode Island

530 Broadway
Providence
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401-421-4140
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Dear Ms. Taylor:

GZA GeoEnvironmental Inc. (GZA) is please to provide two of copies of the attached *Remedial Action Work Plan* (RAWP) on behalf of our client Charbert, a division of NFA. Corp. (Charbert), located at 299 Church Street in Richmond, Rhode Island (the "Site"). The Rhode Island Department of Environmental Management (RIDEM) has assigned Case No. 99-037 to the Site.

The RAWP was prepared to address the requirements of Section 9.00 of the RIDEM's Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases (DEM-DSR-01-93 Remediation Regulations) in accordance with RIDEM's January 17, 2007 Interim Remedial Decision Letter.

We look forward to the Departments approval of the proposed remedial measures. If you have any questions or comments, please do not hesitate to contact Ed Summerly at 401-421-4140 or by e-mail at Edward.summerly@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Steve Andrus
Project Engineer

John P. Hartley
Consultant/Reviewer

Edward A. Summerly, P.G.
Associate Principal

EAS/SA:mac

CC: Cynthia Gianfrancesco, RIDEM
Mary Morgan, Town of Richmond
Clark Memorial Library – Charbert Repository

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1.00 INTRODUCTION

GZA GeoEnvironmental Inc. (GZA) has developed this *Remedial Action Work Plan* (RAWP) for Charbert, a division of NFA. Corp. (NFA), located at 299 Church Street in Richmond, Rhode Island (the "Site"). The Rhode Island Department of Environmental Management (RIDEM) has assigned Case No. 99-037 to the Site. A Site *Locus Plan* created from a USGS Topographic Map (Carolina, RI Quadrangle) is presented as Figure 1.

The is a source control RAWP and was prepared to address the applicable requirements of Section 9.00 of the RIDEM's Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases (DEM-DSR01-93 Remediation Regulations). The RAWP is based on our understanding of site conditions as presented in the following documents. Each of these documents has also been provided to the Richmond Town Hall and Town Library.

- GZA's August 7, 2006 *Old Lagoon 5 Sediment Sampling Supplemental Site Investigation Report;*
- GZA's April 28, 2006 *Additional Sediment Sampling Supplemental Site Investigation Report;*
- *GZA's* on March 27, 2007 *Sanitary Sewer and Process Water Cross-Connection Evaluation*;
- GZA's March 15, 2006 *Bedrock Aquifer Evaluation Work Plan;*
- GZA's January 9, 2006 *Supplemental Site Investigation Report;*
- GZA's June 2, 2005 *Phase II Site Investigation Report, 299 Church Street, Richmond, Rhode Island;*
- *Interim Site Investigation Report*, dated May 13, 2004, by Clayton Group Services;
- *Sampling and Analysis Plan* dated February 17, 2004 by Clayton Group Services;
- *UIC Issues at Alton Operating/Charbert Facility,* dated March 19, 1997 by Clayton Group Services;
- *Preliminary Site investigation Results*, dated August 6, 1996 by Fuss and O'Neil; and
- *Environmental Audit/Phase I Investigation,* dated August 8, 1991 by Rizzo Associates, Inc.

Additional site information was provided in the following Site related projects reports:

- *Soil Stockpile Evaluation and Reuse Plan* (GZA);
- Residential Well Treatment System Design & Installations (GZA);
- ISDS Replacement Design and Installation (GZA);
- Residential well testing programs (RIDEM, RIDOH and Town of Richmond); and
- Quarterly UIC Monitoring Program (Charbert).

This RAWP was prepared on behalf of NFA and is subject to the limitations presented in Section 13.00 and Appendix A.

2.00 BACKGROUND

The following sections provide a brief description of the Site and surrounding area, its environmental setting, and known conditions of environmental concern. The reader is referred to the above-referenced reports for additional Site-specific information.

2.10 SITE DESCRIPTION

The ±114 acre Charbert property (consisting of Plat 11A, Lot 6) is located at the confluence of the Wood and Pawcatuck Rivers, at 299 Church Street, in the Town of Richmond, in an area referred to as the Village of Alton, Rhode Island (see Figure 1, Site *Locus Map*). The North American Datum (NAD) 1983 Rhode Island State Plane coordinates at the approximate center of the property are 129,015 feet north, and 267,645 feet east (latitude 41° 26'14.0" north, longitude 070° 43' 14.0" west). The facility's standard industrial classification (SIC) code is 2259 (Knitting Mills).

The Site has been the location of a textile mill since the mid-1800s and the current facility conducts dyeing and finishing operations of synthetic fabrics. The facility has employed as many as 125 workers running three shifts per day, five to six days per week. Charbert also employs approximately 50 workers in Peace Dale, Rhode Island, at their knitting facility, which supplies fabric to the Alton dyeing operation.

The northwestern portion of the Site is currently developed with 12 inter-connected buildings, forming one, 2-story manufacturing plant. The building was originally constructed in approximately 1860 with various renovations occurring throughout the years and the last building was constructed in 1979. The subsequent additions to the main building have resulted in approximately 107,500 square-feet of manufacturing, storage, and office space. In addition to the main manufacturing building, the northern portion of the Site is also developed with an industrial waste water pump house, a potable water well pump house, a fire water tower, three process water tanks, three bunkered oil storage areas and two outdoor chemical storage areas, and four process water supply wells (designated EW-1 to EW-4). There are two paved employee parking areas; one is located immediately east of the manufacturing area and is used for employee and visitor parking. The second employee parking lot is located to the east of the manufacturing building, across River Street. Figure 2, *Existing Conditions Site Plan,* shows the general location of relevant site features and Figure 3, *Areas of Environmental Concern,* provides additional detail.

The southern portion of the Site consists of undeveloped forested areas and wetlands associated with the Wood and Pawcatuck Rivers. Within this area of the Site are three active waste water treatment lagoons (Lagoons 1, 2, and 3) and one currently inactive temporary waste water holding pond (Lagoon 4). The three active lagoons have an approximate total leaching area of 142,835 square feet (3.29 acres), and the holding pond has an approximate leaching area of 22,600 square feet (0.51 acres).

2.20 TOPOGRAPHY AND DRAINAGE

The Site is located at the confluence of the Wood and Pawcatuck Rivers. The Wood River is a Class A water body and flows along the western property boundary from the northwest property corner at Church Street to the southern tip of the Site. The Wood River is dammed north of the Site across Church Street, which forms Alton Pond to the northwest of the property. The elevation of the pond at the dam is approximately 50 feet. The Pawcatuck River is a Class A water body flows along the eastern property boundary to the southern tip of the Site, where it converges with the Wood River. Wetland areas associated with the Wood River are located along the western and southwestern property boundaries. Cedar Swamp, a wetland area associated with the Pawcatuck River, is located along the southeastern portion of the Site.

According to an aerial topographical survey conducted by Aerotech International Digital Photogrammetric Mapping dated December 1, 2004, the majority of the Site surface lies at an altitude between approximately 45 feet and 65 feet above the NVGD 29 (National Vertical Geodetic Datum – 1929). Overall, the Site is generally flat and slopes slightly to the northwest. Surface elevations slope more steeply down to an elevation of approximately 40 feet along the banks of the Wood and Pawcatuck Rivers on the southern portion of the Site.

2.30 PUBLIC WATER SUPPLIES LOCATED WITHIN 2.0 MILES OF THE SITE

According to a Wellhead Protection Areas Map, dated June 1997, the Site is currently located within a Non-Community Wellhead Protection Area due to the presence of Charbert's own water supply well which is designated a non-community, non-transient public water supply by the Rhode Island Department of Public Health. According to the Wellhead Protection Program, the Town of Richmond depends significantly on private wells as the primary source of drinking water. Wellhead Protection Area Maps do not depict public drinking water supply reservoirs in the Town of Richmond, which includes the Village of Alton, or the neighboring Towns of Charlestown and Hopkinton.

In the vicinity of the Site, the average residential lot is approximately 0.5 acres and it is assumed that most lots have overburden wells for a potable water source. Most of the wells observed by GZA have either been shallow dug wells or shallow pushed steel well points. North of the Site, along the east edge of Alton pond, is a more recent residential development with larger building lots. The development to the west is minimal with few homes on the west side of the Wood River.

2.40 GROUNDWATER CLASSIFICATION/QUALITY

The Rhode Island Groundwater Protection Act requires the classification of the State's groundwater resources using a four-tier system including GAA, GA, GB, and GC. The Site is in the "Lower Wood" groundwater reservoir and is considered a critical recharge area. The northern and eastern portions of the Site are classified as "GAA." The GAA classification is reserved for areas in which the groundwater resources are known or presumed suitable for drinking water use without treatment, and posses superior aquifer characteristics. The remainder of the Site is classified as GA. Groundwater classified GA are groundwater resources, which like GAA, are known or presumed to be suitable for drinking water use without treatment. Most of the state, approximately 71% (761 square miles), overlies groundwater classified GA.

2.50 APPLICABLE REGULATORY CRITERIA

Based on the foregoing description of the Site and surrounding area, and our interpretation of the regulatory requirements provided in RIDEM's Remediation Regulations, March 2005 Rules and Regulations for Ground Water Quality (Groundwater Regulations), June 2006 Water Quality Regulations (Surface Water Regulations), and the Federal Safe Drinking Water Act we believe the following regulatory criteria apply to the Site:

POTENTIALLY IMPACTED MEDIA	APPLICABLE CRITERIA
Soils	Industrial/Commercial Direct Exposure Criteria[1] and GA Leachabilty Criteria
Groundwater	GA Groundwater Objectives and Preventative Action Limits (PALs)
Drinking Water	Final Federal Maximum Contaminant Limits (MCLs)
Surface Water	RIDEM's Ambient Water Quality Criteria (AWQCs)
Sediments	RIDEM has not yet developed numerical criteria for sediment quality

Notes: 1. This assumes that RIDEM accepts the Environmental Land Use Restriction proposed for portions of the Site.

3.00 SIR SUMMARY AND CONCLUSIONS

The June 2005 *Phase II Site Investigation* conducted at the Charbert Manufacturing Facility was performed to address the requirement for site investigation studies as presented in Section 7 of RIDEM's Remediation Regulations. The attached Site Plan (Figure 2) shows the location of each of the explorations conducted as part of the Site studies summarized below. Identified contaminant source areas are also shown on Figures 2 and 3, and are summarized below.

3.10 PHASE II SITE INVESTIGATION REPORT

The purpose of the investigation was to compile Site characterization information, further delineate previously identified areas of environmental concern, and provide a preliminary assessment of viable remedial alternatives. The study served to supplement the findings of previous Site assessments as identified in Section 1.00.

Based on GZA's evaluation of the project data, the following key conclusions were developed:

- The ±114 acre Charbert property consists of Plat 11A, Lot 6 and is located in a rural area in the Town of Richmond at the confluence of the Wood and Pawcatuck Rivers.

- The Site, which occupies the western approximately one-third of Plat 11A, Lot 6, has been the location of a textile mill since the mid-1800s.

- Groundwater at the Site is present at depths of approximately 4 to 18 feet below ground surface. Groundwater flow in the northern portion of the Site is generally westerly toward the Wood River with localized diversion of flow in the vicinity of the manufacturing building to the southwest, likely resulting from the influence of the on-Site process water supply wells. Groundwater flow in the southern portion of the Site is observed to be radial from the three infiltration lagoons subsequently flowing both east and west toward the Pawcatuck and Wood Rivers, respectively.

- The property has been assigned the groundwater classification GA/GAA which is consistent with the surrounding area. The area of the Site immediately surrounding the lagoons is a designated non-attainment area. [Note, RIDEM has subsequently discontinued the Non-attainment designation.]

- Strong downward vertical groundwater gradients were observed [in overburden wells] on the southern and eastern portions of the Site. These are likely due to the combined effect of low permeability soil strata between the shallow and deeper overburden aquifers, discharge from the lagoons to the shallow aquifer, and pumping of the process water supply wells. Vertical gradients were not observed in the immediate vicinity of the facility (i.e., well couplets GZ-7/GP-26 and GZ-8/GP-27A).

- Soils at the Site are characterized as loose to dense native sands with intermittent silt and gravel lenses. The sands generally become finer with increasing depth and overlie a dense to very dense Glacial Till layer that is believed to mantel the granitic bedrock present throughout the area. Glacial till was encountered at depth ranging from 36 to 88 feet below the ground surface. Bedrock was not encountered in our subsurface explorations. [Note: bedrock elevations across the Site were later confirmed as part of the ongoing Bedrock Aquifer Evaluation.]

- Four suspected former solid waste dumping areas, as shown on Figures 2 and 3, were identified based on interviews with facility personnel and our Site reconnaissance. Each area was evaluated by hand dug test pits. The areas were characterized by a thin veneer of solid waste (typically consisting of household trash, ceramics and glass, house wares, old bottles, cans, tin wares and scrap metal) visible at the ground surface. No solid waste was found at depths greater than 1.5-feet below the ground surface; typical depths were 0.5-feet or less. No evidence of hazardous, chemical or petroleum waste was encountered.

    - Area 1, located to the west of Lagoons 1 and 2, was estimated to contain approximately 250 cubic yards of buried and surficial solid waste.
    - Area 2 consists of a long berm of mixed solid waste and soil located to the east of the Temporary Holding Pond. The estimated volume of solid waste in this area was about 600 cubic yards.
    - Area 3 is located south of Myrtle Street and is near remnants of an old concrete floor slab. The area has sporadic surface solid waste consisting of sheet plastic, empty plastic drums, pressure treated wood scraps and piles of mixed soil, concrete block and brick. It estimated that this area contained 50 cubic yards of surficial solid waste. It should be noted that according to the 1991 Rizzo report, Charbert removed 13 truckloads of debris from this area in the 1980s.
    - Area 4 is located to the south of the current gravel borrow area. GZA personnel observed the area and noted several surficial piles of concrete and brick rubble and some sporadic scrap metal.

  Areas 1 and 2 are located partially within the 200 foot Riverbank wetland buffers of the Wood and Pawcatuck Rivers, respectively.

  [Note that Charbert has already substantially remediated these four areas as documented in a report entitled *Solid waste Areas Remediation and Wetland Restoration*, dated May 2007. The remaining work required to bring these areas to final closure in described in Section 6, below. All remedial work will be summarized in the final Remedial Action Completion Report.]

- Extensive laboratory testing of soil included synthetic precipitation leaching procedure (SPLP) Metals, volatile organic compounds (VOCs), total petroleum hydrocarbons/volatile petroleum hydrocarbons/extractable petroleum hydrocarbons (TPH/VPH/EPH), TPH Fingerprint Analysis, semi-volatile organic compounds (SVOCs), Pesticides and Polychlorinated Biphenyls (PCBs) provided only limited Method 1 exceedances. That is, only chlorinated compounds (perchloroethene - PCE, trichloroethene - TCE, cis-1,2-dichclorethene – DCE, and vinyl chloride) and petroleum-related compounds (naphthalene and total petroleum hydrocarbons) were detected at concentrations above the Residential and Industrial/Commercial Direct Exposure Criteria. The exceedances all occurred near the manufacturing facility and the maintenance area yard on the west-southwest side of the building.

- Of note, contaminant concentrations in soils decreased with increasing depth below ground surface. Samples collected from the outwash soil/till interface do not provide any indications that non-aqueous phase contaminants have migrated to the till or underlying bedrock.

A figure depicting the location and concentration all exceedances of applicable regulatory criterion for soils was developed for the SIR and is provided in Appendix B, attached for reference.

- Several rounds of groundwater monitoring have been completed at the Site, resulting in the collection and laboratory testing of samples from both existing and newly installed wells. The focus of the most current round of monitoring was to more fully characterize the suite of contaminants present at the Site and assess changes in the quality of groundwater with depth. We believe the current program achieved both goals.

  The associated analytical testing program included the following analysis:

  - TPH/VPH/EPH (Massachusetts DEP Protocol);
  - Volatile Organic Compounds (EPA Method 8260B);
  - Semi-volatile organic compounds (EPA Method 8270);
  - 13 Priority Pollutant Metals, Iron and Manganese (EPA Method 6010B/7470A);
  - Ammonia (SM 4500 –NH3);
  - Nitrate/Nitrite (EPA Method 353.2);
  - Total Organic Carbon (EPA Method 415.1);
  - Sulfate (EPA Method 4500), and
  - Methane (RSK 175).

The resultant data, when compared to RIDEM's GA Groundwater Objectives indicate that groundwater exceedances were limited to the following:

Analyte	GA (mg/L)	No. of Exceedances	Location of Exceedances	Range of Exceedances (mg/L)
Cis-1,2-Dichloroethene	0.070	9	GP-25, 26, 27A, 28; GZ-1; RIZ-3, 5; CB-1, 4	0.050 to 2.7
Tetrachloroethene	0.005	14	GP-26, 27A; GZ-3, 6; RIZ-3, 5, 13; CB-1, 2, 4, 5, 6, 7, 9	0.003 to 1.2
Trichloroethene	0.005	10	GP-26, 27A, 28; GZ-1, 2, 3, 7; RIZ-5; CB-1, 9	0.003 to 0.670
Vinyl Chloride	0.002	13	GP-25, 26, 27A, 28; GZ-1, 3; RIZ-3, 5; CB-1, 2, 4, 6, 9	0.0014 to 0.850
Chromium (Total)	0.1	10	CB-1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	0.25 to 19

Analyte	GA (mg/L)	No. of Exceedances	Location of Exceedances	Range of Exceedances (mg/L)
Bis(2-Ethylhexyl)Phthalate	0.006	1	GZ-1	0.012
Naphthalene	0.02	1	CB-1	0.03
Total Coliform (MPN/100ml)	ND	4	GZ-1, 2, 3, 4A	6 to 90
Fecal Coliform (MPN/100ml)	ND	4	GZ-1, 2, 3, 4A	2 to 13

As noted above in Section 6.36 of the Phase II Site Investigation, it was thought that the total chromium results were not representative of Site conditions and likely represent contamination from sampling method induced silts.

The exceedances are generally limited to shallow groundwater in areas below and immediately surrounding the facility, in known or suspected release areas. This is consistent with the distribution of observed soils contamination.

A figure depicting the location and concentration of all exceedances of applicable regulatory criterion for groundwater was developed for the SIR and is provided in Appendix B, attached for reference.

- The combined evaluation of the soils analytical results and groundwater monitoring well results provide no indication that dense or light non-aqueous phase liquids are present or have migrated to significant depth (i.e., within the glacial outwash deposits to depths of 86 feet below ground surface) within the aquifer. In fact, groundwater from the deepest wells installed within the identified source meets RIDEM's GA Groundwater Objectives. Note, that an evaluation of groundwater quality within the bedrock aquifer is ongoing.

- Residential well testing results from samples collected at 14, 16 and 18 River Street suggested that Site-related contamination could potentially impact groundwater conditions at these three properties. Charbert installed point-of-use water treatment systems for these three homes on January 26 and 27, 2005. Quarterly water quality testing initiated following the system's installation, and conducted in accordance with RIDEM and RI Department of Health (RIDOH) Requirements, indicates that the treated water meets drinking water quality standards for all target compounds.

- Testing conducted by RIDOH, RIDEM and the Town in 24 other area residential water supply wells along River, Church, Myrtle, Poplar and Riverview Streets showed primarily low to moderate levels of methyl-tert-butyl ether (MTBE - a gasoline additive) and lower levels of 1,1,1-trichloroethane (1,1,1-TCA), chloroform (potentially a breakdown product of 1,1,1-TCA or resulting from the household use of chlorine based cleaning and disinfection products). Based on the types of contaminants, the location of these residents' wells with respect to the facility, and the estimated west/south-westerly direction of groundwater flow, it does not appear that these contaminants are related to past releases at the Site.

3.20 SUPPLEMENTAL SITE INVESTIGATIONS

In response to RIDEM comments, additional field programs were completed by GZA on behalf of Charbert, to supplement the June 2, 2005 SIR. This work included the advancement of additional Geoprobes to collect soil samples for field screening and laboratory testing and surface water and sediment sampling for laboratory testing. These studies are described in a series of individual reports that GZA prepared at the completion of each phase of additional investigation (refer to Section 1.00). A description of each of these studies, and a summary of their conclusions, is set forth below.

3.21 January 9, 2006 Supplemental Site Investigation Report

Supplemental Geoprobe soil samples and well installations, surface water sample collection and initial sediment sampling was completed by GZA in October of 2005 and presented to RIDEM as the January 9, 2006 *Supplemental Site Investigation Report.* Based on GZA's evaluation of the resulting data, the following conclusions were developed:

- Although a cross-connection exists between the industrial waste water conveyance system and the newly installed ISDS system, no significant impact to the soils underlying the leach field was observed.
- As of this point in time the source of the cross-connections is being actively investigated by Charbert personnel, but has yet to be identified.
- The soil samples taken to delineate the western boundary of contamination in the rear maintenance yard yielded results similar to previous analysis in this area. The results did not expand the perimeter of the remediation area, as this area was previously known to contain low level chlorinated solvents (below GA Groundwater Objectives) in the groundwater and soil, and oil contamination in the soil.
- Samples taken from Former Lagoon 5 indicate that the current surface water quality does not appear to be impacted, yet the sediments appear to be impacted from past waste water disposal practices and accidental releases. The contaminants of concern are SVOCs, petroleum and metals. The metals are likely the result of past lagoon usage. The petroleum products may have migrated through the subsurface from the release area identified in the rear maintenance yard or may be the result of the 1975 bunker oil spill directly into the lagoon.

  Based on these results, GZA recommended that further sediment sampling be conducted using a deeper coring method so that both the lateral and vertical extents of the contamination can be delineated.

3.22 April 28, 2006 Additional Sediment Sampling Report

As recommended by GZA in the January 9, 2006 *Supplemental Site Investigation Report,* RIDEM requested that additional sediment samples be collected from Old Lagoon 5. The sampling was performed on March 17, 2006 and reported to RIDEM in an April 28, 2006 *Additional Sediment Sampling Report.* Based on our evaluation of the results from the sediment sampling GZA developed the following conclusions:

- The combination of field observations, analytical results (displayed in Table 1 [of the original report]) and review of historic photographs have allowed us to adequately delineate and characterize the area of contamination in Former Lagoon 5.
- The sediments in the former sluiceway channel area appear to be impacted from past process waste-water disposal practices and accidental petroleum releases. The metals concentrations are likely the result of past usage as a process water holding pond. The petroleum products may have migrated through the subsurface from past releases in the rear maintenance yard. The PAHs are typical constituents of weathered petroleum products.
- Former Lagoon 5 has not been connected to the Wood River since 1978. Photographs taken of the closure of the canal leading from the facility to the Wood River and the grading of the bottom surface of Former Lagoon 5 show the sluiceway channel area to be deeper than the western portions of the former lagoon. Field observations confirm the channel portion extends from the eastern bank approximately 25 feet west from the facility southward toward the Wood River. The water is 3 to 4 feet deeper in this area than the remaining portion of the former lagoon.
- This deeper channel area has apparently formed a break that has limited contaminants from migrating into the western portion of Former Lagoon 5 or the contaminated sediments in this area were removed as part of the 1978 closure activities.
- The sluiceway channel area of Former Lagoon 5 exceeds ecological risk-based screening criteria (reference) for PAHs and metals and Method 1 Residential Direct Exposure criteria for petroleum products and will require remediation and/or encapsulation to reduce exposure to contaminants. The western portion of the lagoon does not exceed criteria for any of the analysis performed and will not require remediation.

3.23 April 28, 2006 Submission Comments and Responses

RIDEM's review of the April 28 submission yielded two comments:

1. Were materials excavated from the western portion of the former lagoon or covered with clean soil?
2. If materials were excavated where were they disposed of?

GZA responded to the RIDEM's comments in a letter dated August 7, 2006, that stated the following:

"Discussion with plant personnel, a review of documents available at the facility, and old Polaroid photos of the closing of Old Lagoon 5 revealed the following:

- After the infiltration lagoons [Lagoons 1 to 3] were opened in the late 1970s, the pond now called Old Lagoon 5 was closed by Charbert personnel and contractors in response to a RIDEM request.
- The lagoon was drained, pumped out, and the sediments were dredged with a bulldozer and a track mounted excavator.

- The sediments removed from the lagoon were then deposited on-site and buried, likely in the vicinity of the 2001/2004 soil stockpiles, located south of the facility. Two sets of analytical results of the sediments were generated. The results show there were no metals detected above current RIDEM soil quality criteria, although the testing was limited to total and TCLP metals.

With this information it was concluded that the western portion of Old Lagoon 5 has been remediated by excavation not filling over of potentially contaminated sediments, and the sediments removed from the lagoon were buried on-site in the southern gravel pit area."

4.00 REMEDIAL DECISION LETTER, REMEDIAL OBJECTIVES AND POINTS OF COMPLIANCE

The following subsections present a summary of RIDEM's January 17, 2007, *Interim Remedial Decision Letter*, and the remedial objectives and points of compliance developed by GZA for the proposed remedial measures.

4.10 SUMMARY OF RIDEM'S INTERIM REMEDIAL DECISION LETTER

As described above, the Site Investigation Report identified and proposed remedial measures to address each of these. RIDEM issued an *Interim Remedial Decision Letter* on January 17, 2007, concurring with GZA's recommended remedial approach for overburden soils. These remedial measures are as follows:

1. Treatment of chlorinated hydrocarbon and petroleum hydrocarbon source areas through soil vapor extraction and air sparging and/or enhanced reductive dehalogenation;
2. Installation of point-of-use water treatment systems at 14, 16 and 18 River Street;
3. Source elimination of contaminant discharge to the on-site lagoons through the installation of a waste water treatment facility, subject to the ability to obtain suitable permitting;
4. Management of residual groundwater contamination through groundwater containment and monitored natural attenuation; and
5. Implementation of and Environmental Land Use Restriction (ELUR) on the title of the property.

RIDEM's approval included the following three stipulations:

A. Charbert must evaluate the location of, and characterize, the Old Lagoon 5 sediments through a test pit and analytical program as described in Section 5, below.

B. Charbert must provide a schedule for the implementation of the work described in stipulation A and provide quarterly updates on the progress of environmental activities associated with this work.
C. Perform the required and applicable public notice requirements.

4.20 REMEDIAL OBJECTIVES AND ASSOCIATED POINTS OF COMPLIANCE

Remedial objectives prescribed by the regulations for each of the contaminated media identified at the Site are discussed below.

4.21 Soil

The objective of the soil remedial program will be to reduce contaminant concentrations in the unsaturated zone to levels complaint with RIDEM's Industrial/Commercial Direct Exposure Criteria or GA Leachabilty Criteria, whichever is lower. This will be accomplished through the treatment of chlorinated aliphatic hydrocarbons (CAHs) and petroleum hydrocarbons (PHCs) within the identified unsaturated source areas in the vicinity of the facility and beneath the facility, as shown on Figures 4 and 5, using a combination of in-situ soil vapor extraction (bioventing) and air sparging methods. A limited amount of direct soil removal and off-site disposal will also employed.

Compliance will be demonstrated through the implementation of a confirmatory sampling and analytical program meeting the requirements of Section 8.10 of the Remediation Regulations. Confirmatory sampling for direct removal actions will be conducted immediately following any removal actions in accordance with the schedule provided in Section 10, below. While clean-up confirmation sampling associated with the bioventing process will be conducted after a sufficient period of fulltime operation of the SVE/Sparge treatment systems. We anticipate that these initial confirmatory soil samples will be collected 24 to 36 months from system start-up.

4.22 Groundwater

The objective of the groundwater remedial program will be to reduce volatile organic compound levels to GA Groundwater Objectives at the downgradient points of compliance, and provide drinking water meeting Federal Safe Drinking Water Act requirements (i.e., MCLs) to residents at 14, 16 and 18 River Street. This will be accomplished by: (1) treating identified CAH and PHC source areas via air sparging and treatment of the unsaturated source soils via soil venting; (2) Reducing the risk to residents from the consumption of contaminated groundwater at 14, 16 and 18 River Street through the continued operation and maintenance of the point-of-use water treatment systems until ambient groundwater quality is compliant with drinking water standards; (3) source reduction of contaminant discharge to the on-Site lagoons; (4) management of residual overburden groundwater contamination through groundwater containment and monitored natural attenuation.

The points of compliance for the source control remedy are the downgradient Charbert property boundaries along the Wood and Pawcatuck Rivers, and along River Street. Contaminant concentrations at the points of compliance will be reduced to RIDEM's GA Groundwater Objectives. A groundwater residual zone will be established between the identified source areas and the compliance boundaries. Compliance with RIDEM's GA Groundwater Objectives will be demonstrated through the implementation of a routine groundwater sampling and analytical program conducted in a downgradient monitoring well network to be selected following completion of the bedrock aquifer evaluation and bedrock SIR estimated to be completed in 9 to 12 months.

Compliance with the remedial objective for the three point-of-use groundwater treatment systems will be assessed through routine monitoring of tap water at the three residents with water treatment systems. As noted below, these systems were installed and are maintained by subcontractors (Culligan Water Conditioning of Warwick, Rhode Island) on behalf of Charbert.

4.23 Surface Water and Sediment

No exceedances of RIDEM's ambient water quality criteria were observed during the site investigation. As such, the objective is to prevent the degradation of surface water quality during and following the implementation of the Lagoon 5 remedial program described in Section 6, below. Compliance with this objective will be evaluated through pre- and post-remedial surface water analysis within the lagoon limits.

The upper layer of sediment in the eastern portion Old Lagoon 5 was found to exceed ecological risk-based screening criteria (New Jersey DEP sediment criteria Lowest Effects Levels) for PAHs and metals and Method 1 Residential Direct Exposure criteria for petroleum products. The remedial objective for sediments is thus to remove sediments exceeding these criteria to a depth of 24 inches below existing sluiceway bottom and install a physical barrier (geotextile and petroleum cutoff trench) to the future migration of contaminants into the clean soils to be replaced in the sluiceway.

Contaminated materials removed from the lagoon channel will be properly disposed of at an off-Site facility. Contact with remaining residual contaminants will be prevented by the installation of an engineered control (permeable barrier) at the base of the excavated sediments, and future migration of residual petroleum contamination to the lagoon area will be controlled through the installation of a cutoff trench immediately adjacent to the lagoon.

Exposure to residual contaminants in soils, groundwater and sediments will also be controlled through the implementation of an Environmental Land Use Restriction (ELUR). The ELUR, as described in detail in Section 5, will restrict future Site use industrial/commercial activities and place limitations on the use of on-Site groundwater.

4.24. Air

No exceedances of RIDEM's air quality standards were noted during the performance of the Site Instigation Program. Prior occurrences of off-site odors allegedly emanating from Lagoon 1 to 3 were addressed in 2004 by Charbert through the installation of a lagoon aeration system.

The objective of the current remedial program with respect to air quality is to prevent soil and groundwater contamination mobilized by the air sparging system from adversely impacting indoor air quality in the manufacturing facility and in surrounding homes. A soil vapor extraction system has been installed outboard of the sparge points below the facility and will be used to control vapor migration. A sparge curtain has also been proposed along the Wood River just west of the facility. Groundwater discharge to the river and the significant distance to the any buildings and homes will prevent vapor from this sparge curtain from causing a violation of RIDEM's air toxics standards as provided in Air Pollution Control Regulation #22.

5.00 PROPOSED REMEDIAL ACTIONS

In accordance with Section 9.00 of the Remediation Regulations, in response to RIDEM's comments and RIDEM's January 17, 2007 *Interim Remedial Decision Letter*, this RAWP addresses remediation of all impacted media exclusive of bedrock groundwater, which is being addressed as part of a separate ongoing study. Relevant areas of concern and Site features are shown on Figures 2 and 3, attached.

The following sections describe the remedial programs developed to address the remedial objectives described in Section 4.00. The recommended alternative, as described in GZA's June 2005 SIR, involves a combination of active remedial measures and institutional controls, which address the requirements of applicable regulatory programs.

Note that the goal of this remedial program is mitigation of the identified contaminant source areas. Residual contamination that has migrated from source areas will be addressed through implementation of engineered controls, a groundwater residual zone and monitored natural attenuation. Contamination identified in the bedrock aquifer between the facility and Lagoon 5 is being evaluated as part of a separate ongoing investigation.

5.01 CONTRACTORS AND/OR CONSULTANTS

The following table provides a list of the Contractors and Consultants involved in the project design and permitting, and implementation of the remedy.

Firm	Role	Contacts	Address	Phone Number
Charbert	Project Oversight, Planning and Coordination	Michael Healey	299 Church Street	401-364-7751
GZA	Environmental Engineering, SVE/Sparge System Installation, Field Oversight, QA/QC Monitoring	Ed Summerly Todd Green Stephen Andrus	140 Broadway Providence, RI 02903	401-421-4140
NE GeoTech	Drilling of Sparge/SVE Wells	Dan Regan	P.O. Box 91 Jamestown, RI 02835	401-560-0600
Marshall Environmental	Excavation, Concrete Work, Materials T&D	Peter Marshall	10 Dawn Lane Building B, Unit 3 Warwick, RI 02886	401-639-3714
Robar Excavation	Excavation, SVE Trench Installation	Mark Robar	71 Oakland Rd Richmond, RI 02892	401-539-7171
Northeast Water Solutions	Quarterly Maintenance of Potable Water Treatment Systems	Larry Anderson Glenn Albee	54 Vermont Ave. Warwick, RI 02888	401-737-4070

Note that contractors have not yet been selected for all phases of the work. As additional contractors are brought into the project, GZA will provide RIDEM with the required contact information.

5.02 SOIL VAPOR EXTRACTION/AIR SPARGE

The testing date indicates that residual CAH contamination is present below the buildings and between the facility and the "Former Lagoon." This contamination is believed to exist both above and below the water table which has been observed to fluctuate approximately 4 feet in this area on a seasonal basis. In the SIR, GZA recommended that these ongoing source areas be addressed through the use of either a Soil Vapor Extraction System (SVE) coupled with a shallow Groundwater Air Sparging system, or reductive dehalogenation (RD) enhanced through the injection of an organic carbon source.

As a Limited Design Evaluation, GZA conducted a SVE/Air Sparge Pilot Test within the building area on April 13, 2007 and between the facility and the Old Lagoon 5 area on May 15 and 17, 2007. The profile of the Pilot Test areas with soil vapor extraction wells, injection wells and monitoring points are shown on Drawings A and B of Appendix C. The objective of the pilot tests was to evaluate the effectiveness of the SVE/AS technology, and estimate the approximate radius of influence for a vent and sparge system to address identified contaminant source areas.

The pilot tests provided data on the flow rates and the areas of influence of individual vacuum extraction/vent wells and air sparging points. We interpret this information to mean:

-1- SVE Vacuum, Flow and Radius of Influence: The SVE test well area within the building (GP-112) yielded soil vapor flows of 10 to 20 scfm at applied vacuums of 2 to 5 inches of water (W.C.). A vacuum response of approximately 0.01 inch W.C. is estimated to have occurred at radial distances of approximately 20 to 25 feet.

The SVE test well area between the facility and Old Lagoon 5 (boring GP-101), yielded soil vapor flows of 3.5 scfm at applied vacuums of 20 inches W.C. A vacuum response of approximately 0.01 inch W.C. is estimated to have occurred at a radial distance of approximately 20 feet.

Refer to Appendix C for copies of the vent pilot test and radius of influence data.

-2- Air Sparging Pressure, Flow and Radius of Influence: The air sparge (AS) test monitoring well within the building (GP-113) was set with the slotted section of screen between 25 and 30 feet below grade, at approximately 17 feet below the groundwater table. The air was injected into the saturated zone at a rate of 1.8 scfm at an applied pressure of 8.2 pounds/square inch-gas (psig). During this test, helium (to serve as a tracer) was injected with the sparge air at approximately 32 to 39% of the air flow. The soil vapor extraction test, resulted in 100% recovery of the helium injected with the sparge air during the pilot test.

The air sparge test monitoring well between the facility and the Old Lagoon 5 (GP-102) was set with the slotted section of screen between 25 and 30 feet below grade, at approximately 20 feet below the groundwater table. The air was injected into the saturated zone at a rate of 1.4 scfm at an applied pressure of 8.5 psig. During this test, helium was injected with the sparge air at approximately 17 to 24% of the air flow. The soil vapor extraction test resulted in 33% recovery of the helium injected with the sparge air during the pilot test. With detected helium in soil gas samples from shallow soil monitoring probes (with screened sections spanning the water table) at radial distances of up to 30 feet from the air sparge well. The relatively low helium recovery in the exterior test is not unexpected in that our monitoring and recovery probes were only located along one axis with respect to the sparge injection point. That is, we only had

approximately 25% coverage of the anticipated radius of air/helium injection influence. Refer to Appendix C for copies of the air sparge pilot test, helium tracer test and radius of influence data.

Although some heterogeneity is expected below the building and in the area between the facility and the Old Lagoon 5, based upon the pilot test results, we believe that a soil vapor extraction and air sparge system is a feasible and effective remedial approach.

The SVE/AS system within the building, as shown of Figure 4, has been designed to extract 10 scfm at a well spacing of 20 feet (i.e., a design radius of influence of 10 feet based on an applied factor of safety of 2), with an air injection flow rate of 2.0 scfm at a 20 foot spacing (i.e., a design radius of influence of 10 feet). In addition, sub-slab vent wells will be installed outside the contamination area, were the soil vapor extraction system is limited by the buildings foundations (that are assumed to be below the groundwater table), to collect any soil gas vapors introduced through the air sparge system. As shown on Figure 4 , a total of 16 soil vapor extraction wells, 16 air injection wells and 7 sub-slab vent wells will cover the roughly 2,500 square foot area, which was identified in the June 2, 2005 SIR as exhibiting the highest levels of contamination.

The SVE/AS system between the facility and the Old Lagoon 5, as shown on Figure 5, has been design to extract 3.5 scfm at 20 foot spacing, with an air injection flow rate of 1.5 scfm at a 20-foot spacing. Again, a factor of safety 2 was applied to the radius of influence observed during the pilot tests to develop a design radius of influence of 10 feet.

As shown on Figure 5, a total of 9 soil vapor extraction lines and 9 air injection wells will cover the roughly 10,000 square foot area, which was identified in the June 2, 2005 SIR as exhibiting the highest levels of CAH and TPH contamination. This is also immediately above bedrock in the rear facility yard. In addition, an air sparge curtain, consisting of 5 air sparge wells, will be installed along the Wood River, as shown on Figure 5, before the wood line to prevent vinyl chloride from reaching the Wood River via groundwater migration in the overburden aquifer.

Based upon groundwater concentrations beneath the building and the area between the facility and the Old Lagoon 5, the zone of saturated contamination is between 8 to 20 feet and 4 to 20 feet below grade, respectively. Therefore, the air injection wells will be installed with screened sections set to span approximately 25 to 30 feet below ground surface, which is believed to be below the zone exhibiting the highest levels of unsaturated zone contamination.

Granular activated carbon (GAC) will be used to remove CAHs and PAHs from the soil vapor extracted by the interior and exterior SVE systems. The unit will be sized to ensure that point source air discharges don't exceed air toxics thresholds provided in RIDEM's APC #22. Compliance with this criteria will be evaluated by GAC influent and effluent air quality testing. Once influent concentration are below the appropriate limits the GAC unit may be removed.

Installing and equipment details for the sparge wells, SVE vent wells and trenches and the associated adjustment and monitoring manifolds are provided on Figure 6. This figure also depicts a schematic overview of the process and instrumentation components for the SVE/Air Sparge System as well as the GAC treatment units.

5.02.1 SVE/Sparge System Performance Monitoring

The following subsections describe the weekly to monthly performance monitoring for the soil vapor extraction/air sparge system.

5.02.1.1 Soil Vapor Extraction System

Following its installation and initial performance evaluation, qualified environmental personnel will visit the Site on approximately a monthly basis to monitor the SVE system. During each visit, the following data will be measured at each of the vent wells:

1. Air flow rates;
2. Vacuum response in inches of water column (IW);
3. TVOC measurements using a PID equipped with a 10.6 eV lamp, and
4. O_2, CO_2 and Lower Explosive Limit (LEL) measurements will be collected utilizing a Land-Tech infrared gas meter.

5.02.1.2 Air Sparge System

Following its installation and initial performance evaluation, qualified environmental personnel will visit the site on a monthly basis to monitor the air sparge system. The following field monitoring parameters will be performed at each of the sparge points:

1. Air flow rates and,
2. Air pressures.

5.02.1.3 Reporting

The results of the monitoring and maintenance work described above will be reviewed with respect to:

- SVE TVOC PID, O_2 and CO_2 Levels;
- SVE flows and radius of influence;
- Air sparging flows and pressures;
- Oxygen introduction and consumption, and carbon dioxide generation; and estimated rates of hydrocarbon removal via biodegradation and physical venting to the GAC unit; and
- GAC unit maintenance.

As required in the Remediation Regulations, a monthly report of the remedial system monitoring will be provided to RIDEM including any required system adjustments or modifications.

5.03 REMEDIAL SYSTEMS OPERATING LOG

An Operating Log will be developed, maintained and be readily available at the Site during the period of active remediation and subsequent monitoring activities. Subsequent to this period, the log will be retained for a minimum period of three years.

In addition to the data recordings identified above, the Operating Log will include, at a minimum, the following information:

- Dates and time periods during which the remedial components described herein were ongoing;
- Records of any laboratory analysis and field screening performed as part of the remedial action;
- Description of instances under which the Contingency Plan was implemented; and
- Inspection reports detailing compliance with the remedial specifications described herein and the actions taken to address non-compliant practices/conditions.

A copy of the Operating Log will be provided to the Department at the completion of the project as part of the *Remedial Action Summary Report.*

5.04 RESIDENTIAL WELL TREATMENT SYSTEMS

In January of 2005, Charbert installed point-of-use water treatment systems at 14, 16 and 18 River Street as shown on Figure 3. The systems consist of four main components:

1) Water softening and iron removal;
2) Particulate filtration;
3) Carbon absorption to remove organic contaminants and
4) Ultraviolet disinfection to address bacteria either from the aquifer or from the treatment system components (e.g., carbon, ion exchange media).

Current post-treatment system monitoring consisting of VOC, VOC tentatively identified compounds (TICs), SVOCs, SVOC TICs, and total coliform bacteria. Charbert will continue to maintain these potable water treatment systems on the groundwater supply wells until the combination of the proposed remedial actions restores groundwater in the area of the supply wells to GA/GAA quality.

5.05 SOLID WASTE AREAS

The four solid waste areas described in the Section 3.10, above and shown on Figures 2 and 3, were substantially remediated in 2006 and a *Solid Waste Areas Remediation and Wetlands Restoration* report was presented to RIDEM in a May 29, 2007. The report

detailed the removal, segregation and disposal of the solid waste and recommended consideration of on-Site reuse of soils that passed the 1-inch screen during the segregation process. The report also describes the restoration of the solid waste areas, including the portions of two areas that were within the 200-foot riverbank offsets (wetlands).

In response to verbal comments received during a conference call on September 9, 2007, between GZA, Charbert and RIDEM, additional soils will be removed in the vicinity of sample A1-S13 in Solid Waste Area 1. Initial post-remedial confirmatory testing at this location yielded an elevated arsenic concentration of 22.4 mg/kg. The area of soil to be removed was later delineated by GZA as shown on Figure 3 with four additional samples collected on April 11, 2007. GZA will remove the clean soils applied during restoration from the approximately 100 square foot area and set these aside for reuse. The underlying approximately 1-foot of potentially arsenic contaminated soil will then be removed for management outside of the wetland area. Confirmatory soil samples will then be collected from the bottom of the excavation and analyzed for arsenic only. After the results of the sampling confirm soils in the area are below the 7 ppm RDEC for arsenic, the area will be restored. The soil removed from the excavation will be transported to the current soil stockpile area and placed on and covered with 10-mil polyethylene sheeting.

Also in response to RIDEM's September 9, 2007, comments, the soil excavated from the vicinity of sample A1-S13 and the soils that passed the 1-inch screen during the segregation process will be blended with the 1998 soil stockpile material that will be removed from the 200-foot wetland buffer. Once the materials have been blended, composite samples will be collected for laboratory analysis of lead and arsenic levels. Once the soil is confirmed to be below RIDEM RDEC or I/CDEC they will be reused outside the 200-foot wetland buffer as fill in the gravel borrow pit area. If the material meets the I/CDEC but not the RDEC, then it will be described in the ELUR and the location of the material will be clearly marked on the ELUR Class I survey. If the blended material is used in any lagoon closure, permission will also be obtained from the Underground Injection Control (UIC) section of the Office of Water Resources.

The areas within the wetlands were restored with clean soil and a grass mixture as required by RIDEM. Because the cleanup finished during the dry season, the planting of wetland trees and shrubs was not performed at that time. The planting of the wetland trees and shrubs will take place when the Holding Pond (Lagoon 4) is closed and the disturbed areas within the 200-foot riverbank buffer are restored.

5.06 EXECUTION OF ELUR

An Environmental Land Use Restriction (ELUR) will be applied to the site to specify the restrictions and provisions to meet the appropriate Remedial Objectives as defined in the Remediation Regulations. The proposed ELUR area is shown on Figure 3.

The ELUR will serve to:

- Restrict the property's use from any residential activity;
- Prohibit the use of groundwater at the site for drinking water;
- Require RIDEM notification should soil excavation be planned in source areas and implementation of a soils management plan for this work;
- Provide for long-term maintenance, monitoring and other measures necessary to assure the integrity of the remedial action;
- Require prior notice to the RIDEM of the owner's intent to convey any interest in the property; and
- Grant RIDEM the right to enter the property for inspections and monitoring compliance with the remedial actions.
- Conduct annual inspections of the facility to assure that the ELUR requirements are met. These inspections will be performed by an appropriately qualified environmental professional. A report documenting the findings of the inspections will be provided to RIDEM following each inspection.

A draft ELUR as well as an accompanying Soil Management and Contingency Plan will be prepared by GZA and submitted to RIDEM for review and approval.

5.07 SOIL STOCKPILE REUSE

The April 13, 2005 *Soil Stockpile Evaluation and Reuse Plan* by GZA concluded that the soil stock piles, shown on Figure 3, contained no contaminants above the Method 1 RDEC or GA Leachability Criteria. It was proposed that Charbert reuse the approximately 7,600 yds^3 of stockpiled soils as backfill in the "Holding Pond" and Lagoons from which they were initially removed.

At the time of Holding Pond closure, the stockpiled soils will be excavated from the various facility yard areas and trucked to the Holding Pond for placement. They will be spread and compacted as needed based on Charbert's anticipated use of the area. Filling will then proceed to the Lagoons or other portions of the Site within the ELUR area but outside of environmentally sensitive areas.

The Solid Waste Areas Remediation Report also proposed the reuse of the soils that passed the 1-inch screen during segregation. As noted above in Section 5.50, these soils will be blended with the 1998 soil stockpiles, retested for arsenic and lead, and used in the vicinity of the lagoons and the Holding at the time of closure. It was estimated that a total of 600 yd^3 passed the 1-inch screen. This soil was stockpiled adjacent to the 2001 and 2004 soil stockpiles and seeded for erosion control.

Note that portions of the 1998 stockpiles are presently within the 200-foot river bank wetland buffer of the Pawcatuck River. Charbert will prepare a wetland restoration plan for RIDEM review prior to removing stockpiled soils from the river bank buffer areas. These areas will then be restored. A report that documents the final disposition of all the

stockpile soils will be prepared and submitted to RIDEM following completion of the wetland restoration project.

5.08 ISDS CROSS CONNECTION

As noted in the SIR, a cross-connection exists between the interior sewer lines of the manufacturing facility and the industrial waste water collection system. Charbert made several unsuccessful attempts to locate the cross connection and followed up the attempts with a letter report entitled *Sanitary Sewer and Process Water Cross-Connection Evaluation* on March 27, 2007. As the sewer line is located beneath the concrete floors of the facility, it was concluded that there was no reasonable method to verify the location of the cross-connection.

Charbert is currently pursuing the complete replacement of all the sewer lines located beneath the concrete floors of the facility, see Figure 3. Once the sewer lines have been replaced, the existing sewer line will be rerouted to the industrial wastewater collection system to allow the currently connected waste water to flow to the lagoons. A report that documents the new sewer line installation will be prepared and submitted to RIDEM following completion of the project.

5.09 OLD LAGOON 5 CHANNEL

To remediate the impacted "eastern channel" portion of Old Lagoon 5, the upper 2-feet of sediment will be removed from this area. A dewatering sump will be constructed in the vicinity of the eastern channel and the water will be pumped to the lagoons following appropriate treatment.

The existing chain-link fence will be temporarily removed and the eastern bank of the Old Lagoon will be stripped of vegetation. Old pipe work and debris will be removed from the bank of the lagoon and a dewatering area for the sediment will be constructed in the rear yard area prior to the start of the dredging.

Dredged soils will be stockpiled in the dewatering area until the water content of the soil has decreased to a level at which the soils can be stockpiled on 10-mil polyethylene without risk of excess water pooling. All soil stockpiles will be securely covered with 10-mil polyethylene sheeting on a daily basis. Samples for laboratory analysis will be collected of every 500 tons to characterize the excavated material. Once the soils have been characterized, they will be disposed of at an appropriate licensed facility.

The eastern channel will be restored as follows:

1. A subgrade permeable non-woven geotextile fabric will be installed over the excavated area,
2. A minimum of 2-feet of clean sand, from on-Site sources, will be placed over the geotextile material.

3. Clean topsoil will be placed along the eastern bank of the Old Lagoon and graded to match the surrounding area. The bank will then be seeded with a standard slope stabilization seed mixture, and mulched to prevent erosion.
4. Excavated sediments will be disposed of at an appropriately licensed off-site disposal facility.

5.10 PRODUCT RECOVERY TRENCH

An interceptor trench with product recovery wells will be installed parallel to the eastern channel of Old Lagoon 5 on the eastern side of the chain-link fence, see Figure 5. The purpose of the trench is to minimize the potential for further migration of petroleum products to the former lagoon.

As detailed on Figure 6, the trench will be excavated to a depth of 8-feet below ground surface and backfilled with 1 ½ to 3 inch clean crushed stone to 2-feet below ground surface. A layer of filter fabric will be placed over the top of the stone to act as a barrier to fine grained soil filling the voids in the stone below. Two 12-inch diameter product recovery wells will be installed in the trench to a depth of approximately 8-feet below ground surface. The product recovery wells will be covered with 24-inch manholes that can support H-20 loading. See Figure 6 for trench details.

A passive petroleum recovery system will be installed in each recovery well. These systems will consist of the ORS Filter Bucket, 4-Inch GeoSorb sock or similar equipment selected based on our evaluation of the volume and viscosity of the oil present in the wells.

Petroleum impacted soils generated during the construction of the trench will be stockpiled, on and covered with, 10-mil polyethylene sheeting. Samples will be collected for laboratory analysis and the soil will be disposed of at an appropriately licensed off-site facility. This work will be conducted concurrent with the proposed dredging of the eastern channel of Old Lagoon 5.

5.10.1 Passive Product Recovery Operations

Following its installation, qualified environmental personnel will visit the site on a monthly basis to monitor product recovery wells. The following field monitoring will be performed at each of the oil recovery wells:

3. Depth to Oil/Water from ground surface;
4. Oil thickness;
5. Status of passive recovery equipment
6. Volume of oil recovered.

Recovered petroleum will be stored inside in a 55-gallon drum with appropriate secondary containment. The drum fluid level will be checked each month, and when full the drums will be transported to a licensed off-site disposal facility under manifest. Copies of all disposal manifests will be maintained with the Site Operating Log.

5.11 OLD LAGOON 5 SCRAPINGS

When the 2001/2004 soil stockpiles are moved from their current location, as shown on Figures 2 and 3 an effort will be made to locate the Old Lagoon 5 sediments through a one day test pit exploration program. If the sediments are located, based on visual identification, samples will be collected for a suite of analysis including 13 Priority Pollutant Metals, SPLP Metals (substituted for TCLP metals), VOCs, SVOCs plus TICs, and TPH. Photographs of the removed sediments indicate that they were significantly discolored and will likely be visually distinct from natural soils in the rear facility yard. These photographs, and interviews with former facility personnel, suggest that these sediments were buried directly below the 2001/2004 Soil Stockpile Area shown on Figure 5, attached.

The results will be evaluated with respect to relevant RIDEM soil quality standards and appropriate remedial action will be taken, if necessary. At the conclusion of the test pitting program, a report will be issued to RIDEM detailing the test pit program, sample collection and analytical results.

5.12 OIL LINE RUPTURE AREA

The remediation of the southern end of the oil line (which was inadvertently broken during the installation of the piping to the new ISDS system in 2005) will be conducted concurrently with the remediation of the eastern channel of Old Lagoon 5. The area of impacted soils, as shown on Figure 5, will be excavated, stockpiled on, and covered with, 10-mil polyethylene sheeting. Samples will be collected for laboratory analysis and the soils will be disposed of at an appropriately licensed off-site facility.

One confirmatory sample will be collected from each of the sidewalls and one sample will be collected from the bottom of the excavation for laboratory analysis. The excavation will be backfilled with soil from the on-Site gravel borrow area once it has been demonstrated through laboratory testing that the I/CDEC and GA Leachability Criteria have been attained.

5.13 ENVIRONMENTAL MONITORING

A groundwater quality and piezometric monitoring program incorporating existing, and potentially new, monitoring wells will be instituted to monitor contaminant levels both within areas of active treatment and at the downgradient compliance boundaries. This groundwater monitoring program will be used to track the effectiveness of the active remedial measures and downgradient attainment of remedial objectives. The environmental monitoring plan will be submitted for RIDEM's review following completion of the bedrock aquifer assessment, and will include a schedule of milestones at which time the frequency and duration of the sampling will be evaluated.

6.00 CONTINGENCY PLAN

The following provides a listing of individuals/firms who will be contacted in the event of an unanticipated incident involving hazardous materials.

Firm/Entity	Contact	Address	Phone Number
Charbert Division of NFA	Michael Healey	299 Church St. Richmond, RI 02703	401-364-7751
GZA	Ed Summerly	140 Broadway Providence, RI 02903	401-421-4140
RIDEM, Office of Waste Management	Joan Taylor	235 Promenade Street Providence, RI 02908	401-222-2797
Marshall Environmental (Response Contractor)	Peter Marshall	10 Dawn Lane Warwick, RI 02886	401-639-3714

Given the types of contaminants, the historic nature of the releases at the facility and the remedial activities proposed, the risk of a new release that poses an immediate threat to human health or the environment is low. Best management practices and appropriate health and safety procedures will be followed during the implementation of all remedial measures.

7.00 POST-CLOSURE REQUIREMENTS

In conjunction with an ELUR that will be recorded on the title of the property, the owner will institute monitoring and maintenance procedures described in Section 5, above, including maintaining all remedial system (i.e., soil vapor extraction/sparge system components, oil recovery wells, potable water treatment systems, sediment barrier) in good condition. Procedures to be followed to notify contractors of existing site conditions in the event of utility repair or other activities that might disturb potentially contaminated soils or groundwater will also be in place as part of the *Soils Management Plan*.

The details of all remedial measures, system installations and start-up testing will be documented and submitted to RIDEM in quarterly progress reports and summarized in a final *Remedial Action Summary Report*. The system performance monitoring program will continue until the GA Groundwater Objectives are obtained in overburden monitoring wells installed at the points of compliance and maintained for a period of 24 months without rebound.

8.00 COMPLIANCE DETERMINATION

The remedial program will be considered complete when it is shown that the remedial objectives provided in Section 4 are achieved. We understand that RIDEM will issue a Letter of Compliance for the site once these conditions have been met. Charbert may request the issuance of an interim Letter of Compliance upon completion of the remedial activities.

To evaluate the Site's compliance status with respect to the ELUR, a qualified environmental professional will conduct a yearly evaluation of the property. The evaluation will include a reconnaissance of the property at which time the condition of the areas of concern at the Site will be documented. Additionally, the evaluation will include apparent changes in the nature of Site use and apparent changes to the physical condition of the property (with respect to alterations that may affect the integrity of the engineering modifications described in the RAWP and ELUR). The results of the evaluation will be presented to the RIDEM as annual reports.

9.00 PROJECT MANAGEMENT AND IMPLEMENTATION

GZA, on behalf of Charbert, will provide oversight for the remedial activities, including:

- Installation, operation and maintenance of the soil vapor extraction and sparge systems,
- Monitoring the excavation of contaminated materials within the areas of concern,
- Logging the installation of the shallow groundwater sparging and vapor extraction wells,
- Collecting required samples and interpreting laboratory results,
- Evaluating the disposition of potentially contaminated materials,
- Interfacing with Charbert and RIDEM,
- Evaluating and proposing modifications to the work plan (if necessary),
- Preparing quarterly progress reports and annual inspection reports, and
- Providing a *Remedial Action Summary Report* to RIDEM.

The contact person for Charbert is:

Mike Healey, C.P.G., P.G.
Director of Environmental Affairs
299 Church Street
Alton, Rhode Island 02894
(401) 374-7751 ext. 127

The contact person for GZA is:

Ed Summerly, P.G.
Associate Principal
140 Broadway
Providence, Rhode Island 02903
(401) 421-4140 ext. 3133

10.00 PROJECT SCHEDULE

As described above, Charbert has already implemented many components of the remedial action plan. To be proactive and take advantage of a planned facility shut-down in July, Charbert and GZA began installation of the interior components of the SVE/AS systems on July 2, 2007. Upon receiving approval from RIDEM, Charbert will begin implementation of the remaining aspects of the RAWP.

The following table presents a tentative project schedule. Please note that this schedule is subject to change based on the availability of subcontractors, materials and other factors outside of Charbert's control.

Task	Estimated Completion (after receiving RIDEM approval)
Soil Vapor Extraction/Air Sparge System	Ongoing – October 31, 2007
Residential Well Treatment Systems	Installed, Monitoring Ongoing
Solid Waste Area Cleanup & Restoration	Completed in 2006 (exclusive of wetland plantings) as reported to RIDEM in May of 2007
Begin Groundwater Monitoring Program	December 2007
File ELUR	December 2007
Soil Stockpile Reuse	June 2008
ISDS Cross Connection	November 2007
Sediment Removal From Old Lagoon 5 Channel	August - September 2008
Oil Line Rupture Impacted Soils	August - September 2008
Product Recovery Trench	August - September 2008
Submit *Remedial Action Summary Report*	December 2008
Submit First ELUR annual status report	October 2008

11.00 REMEDIAL ACTION APPROVAL FEE

The Remedial Action Approval Fee in the amount of $1,000 issued by Charbert Division of NFA and made payable to the General Treasurer–State of Rhode Island has been provided under separate cover.

12.00 CERTIFICATIONS

To address Rule 9.19 of the Remediation Regulations, the following statements of certification are provided.

GZA GeoEnvironmental, Inc. certifies, to the best of its knowledge, that this Remedial Action Work Plan is complete and accurate.

Edward A. Summerly
Associate Principal
GZA GeoEnvironmental, Inc.

John P. Hartley
Project Reviewer
GZA GeoEnvironmental, Inc.

Charbert Division of NFA certifies, to the best of its knowledge, that this Remedial Action Work Plan is a complete and accurate representation of the Site and the release and contains all known facts surrounding the release.

Michael Healey, C.P.G.
Charbert Division of NFA

13.00 LIMITATIONS

This RAWP is based on field investigations, laboratory analysis, site observations and soil descriptions developed by GZA and others. In preparing this report, GZA has relied on this information and on information contained in the files of state and/or local agencies available to GZA. While GZA has no reason to question this information, we did not attempt to independently verify its accuracy or completeness. Note that the validity of our findings and conclusions are contingent upon the accuracy of that information.

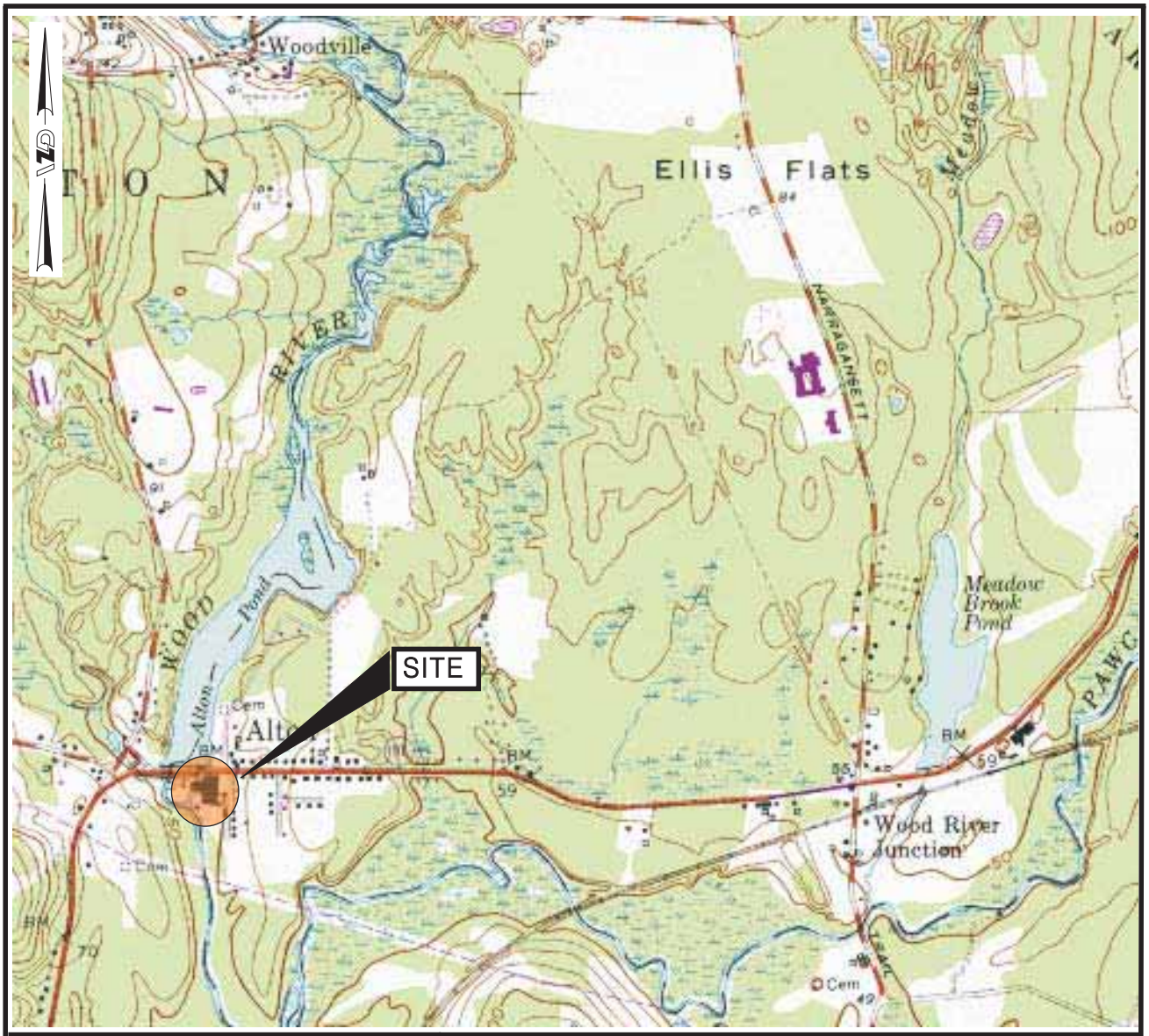
GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the data provided. No other warranty, express or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil or other latent condition beyond that provided to GZA.

This study and report have been prepared on behalf of and for the exclusive use of Charbert, a Division of N.F.A. Corporation and RIDEM. This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of GZA.

GZA's work was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and GZA observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. This work plan is also subject to the following specific limitations and those contained in Appendix A.

J:\ENV\32795-16.eas\32795 16 RAWP 10-11-07 REV EAS.doc

FIGURES



FROM USGS PROVIDENCE, RI QUADRANGLE MAP

(DIGITAL TOPOGRAPHIC MAPS PROVIDED BY MAPTECH, INC.)

(CONTOUR ELEVATIONS ARE IN METERS ABOVE NGVD, AT 3 METER INTERVALS)

APPROXIMATE SCALE IN FEET

0' 1200' 2400' 4800'

CHARBERT FACILITY

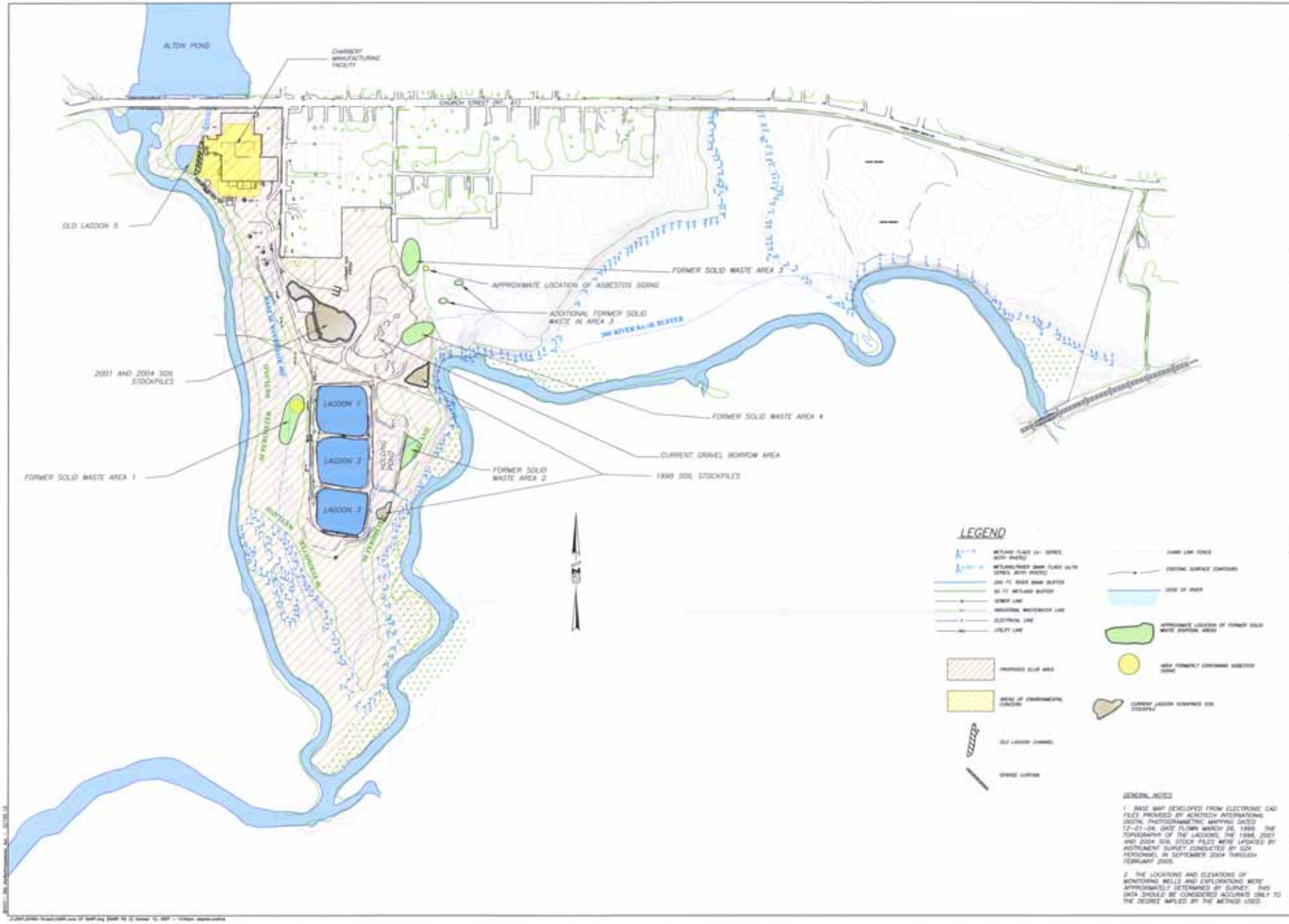
ALTON
RHODE ISLAND

LOCUS PLAN

JANUARY 2005

FIGURE NO. 1

FILE NO. 32795.00

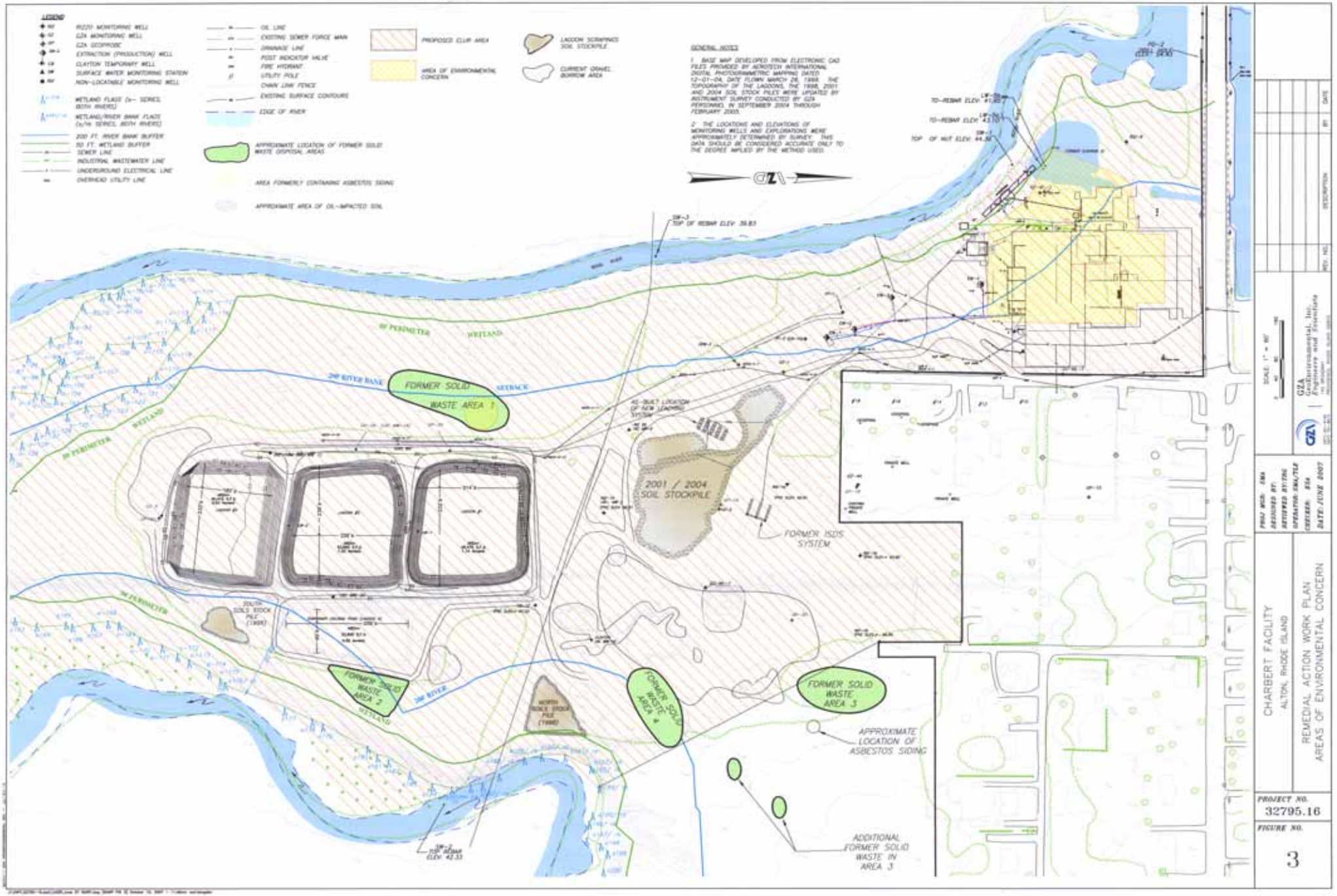


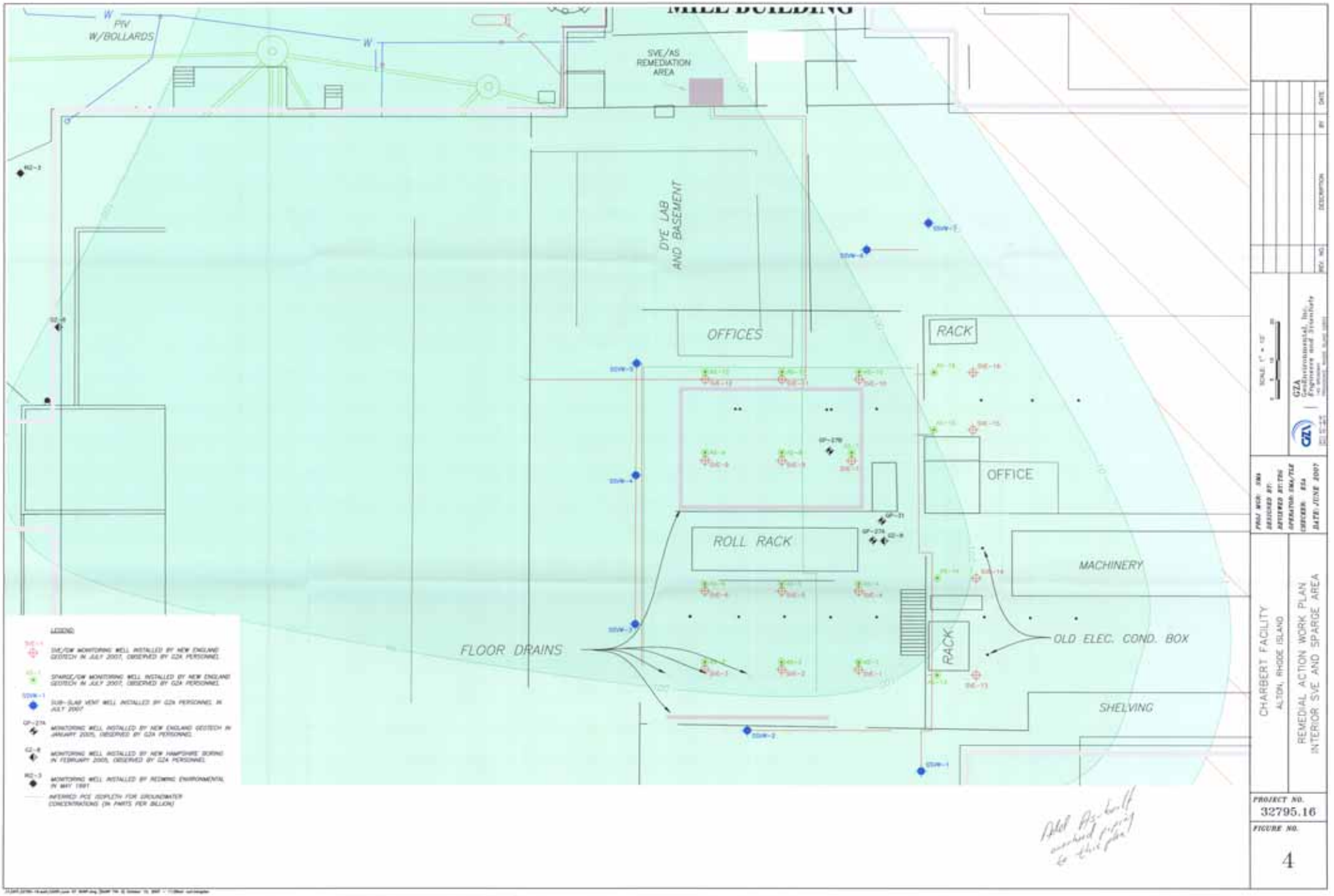
CHARBERT FACILITY
ALTON, RHODE ISLAND

REMEDIAL ACTION WORK PLAN
EXISTING CONDITIONS SITE PLAN

PROJECT NO.
32795.16

FIGURE NO.
2


LEGEND
RI/FS MONITORING WELL
GZA MONITORING WELL
GZA GEOPROBE
EXTRACTION (PRODUCTION) WELL
CLAYTON TEMPORARY WELL
SURFACE WATER MONITORING STATION
NON-LOCATABLE MONITORING WELL
WETLAND FLAGS (A-- SERIES, BOTH RIVERS)
WETLAND/RIVER BANK FLAGS (A/W SERIES, BOTH RIVERS)
200 FT. RIVER BANK BUFFER
50 FT. WETLAND BUFFER
SEWER LINE
INDUSTRIAL WASTEWATER LINE
UNDERGROUND ELECTRICAL LINE
OVERHEAD UTILITY LINE
OIL LINE
EXISTING SEWER FORCE MAIN
DRAINAGE LINE
POST INDICATOR VALVE
FIRE HYDRANT
UTILITY POLE
CHAIN LINK FENCE
EXISTING SURFACE CONTOURS
EDGE OF RIVER
APPROXIMATE LOCATION OF FORMER SOLID WASTE DISPOSAL AREAS
AREA FORMERLY CONTAINING ASBESTOS SIDING
APPROXIMATE AREA OF OIL-IMPACTED SOIL
PROPOSED CLUP AREA
AREA OF ENVIRONMENTAL CONCERN
LAGOON SEDIMENTS/ SOIL STOCKPILE
CURRENT GRAVEL BORROW AREA
GENERAL NOTES
1. BASE MAP DEVELOPED FROM ELECTRONIC CAD FILES PROVIDED BY AEROTECH INTERNATIONAL DIGITAL PHOTOGRAMMETRIC MAPPING DATED 12-01-04, DATE FLOWN MARCH 28, 1998. THE TOPOGRAPHY OF THE LAGOONS, THE 1998, 2001 AND 2004 SOIL STOCK PILES WERE UPDATED BY INSTRUMENT SURVEY CONDUCTED BY GZA PERSONNEL IN SEPTEMBER 2004 THROUGH FEBRUARY 2005.
2. THE LOCATIONS AND ELEVATIONS OF MONITORING WELLS AND EXPLORATIONS WERE APPROXIMATELY DETERMINED BY SURVEY. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
TOP OF REBAR ELEV. 39.83
TOP OF REBAR ELEV. 41.35
TOP OF REBAR ELEV. 42.10
TOP OF NUT ELEV. 44.36
100' WETLAND BUFFER
WETLAND
200' RIVER BANK BUFFER SETBACK
FORMER SOLID WASTE AREA 1
AS-BUILT LOCATION OF NEW LEACHING SYSTEM
2001 / 2004 SOIL STOCKPILE
FORMER ISDS SYSTEM
SOUTH SOILS STOCK PILE (1998)
FORMER SOLID WASTE AREA 2
200' RIVER
NORTH SOILS STOCK PILE (1998)
FORMER SOLID WASTE AREA 4
FORMER SOLID WASTE AREA 3
APPROXIMATE LOCATION OF ASBESTOS SIDING
ADDITIONAL FORMER SOLID WASTE IN AREA 3
TOP OF REBAR ELEV. 42.33
SCALE: 1" = 80'
GZA GeoEnvironmental, Inc.
Engineers and Scientists
CHARBERT FACILITY
ALTON, RHODE ISLAND
REMEDIAL ACTION WORK PLAN
AREAS OF ENVIRONMENTAL CONCERN
PROJECT NO.
32795.16
FIGURE NO.
3

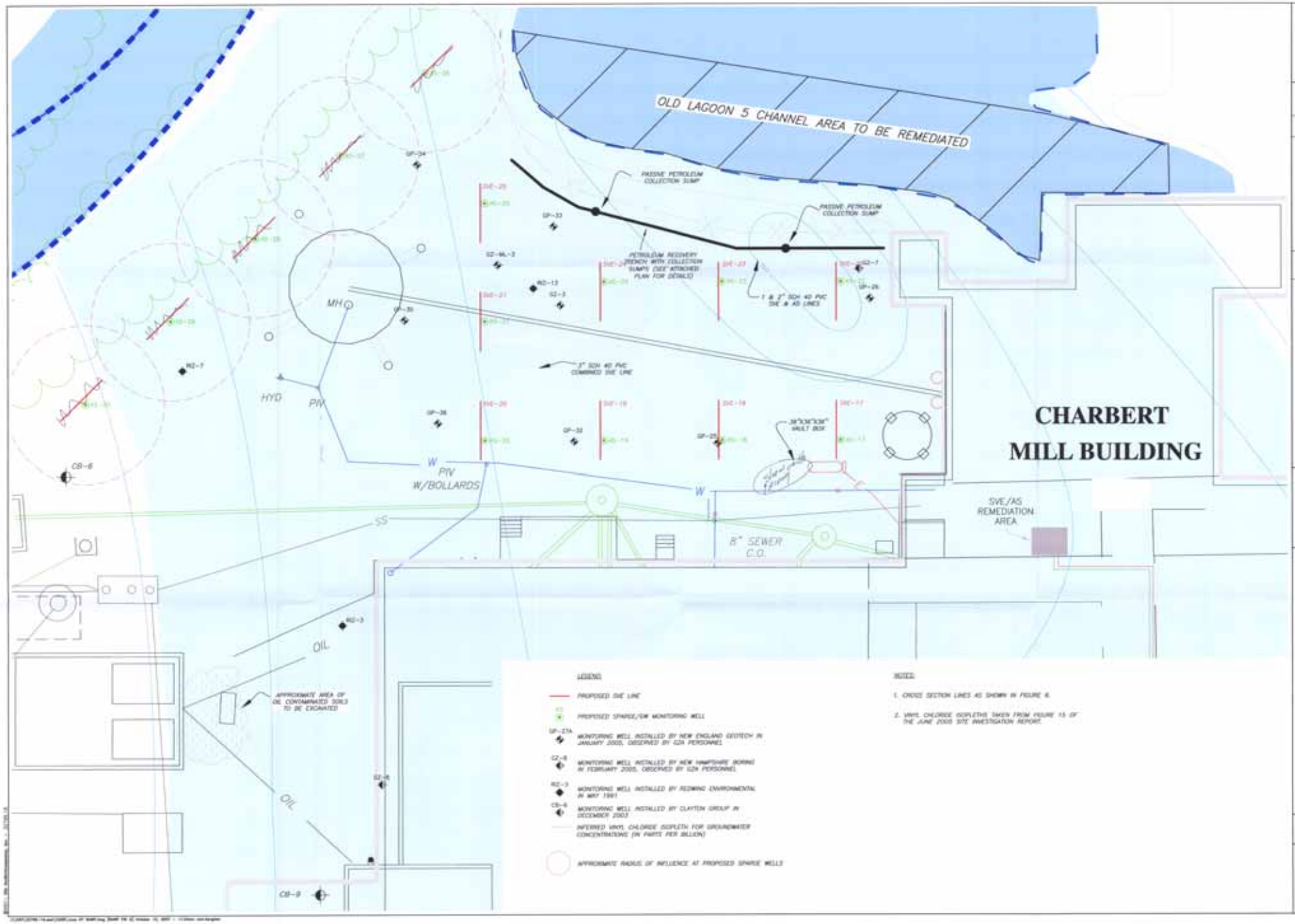


CHARBERT FACILITY
ALTON, RHODE ISLAND

REMEDIAL ACTION WORK PLAN
INTERIOR SVE AND SPARGE AREA

PROJECT NO.
32795.16

FIGURE NO.
4



NO.	DESCRIPTION	BY	DATE

SCALE: 1" = 10'

GZA GeoEnvironmental, Inc.
Engineers and Scientists

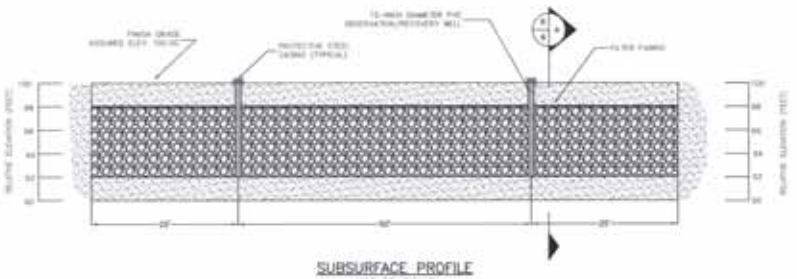
PROJ MGR: EMA
DESIGNED BY:
REVIEWED BY: TJM
OPERATOR: EMA/TLS
CHECKED: EMA
DATE: JUNE 2007

CHARBERT FACILITY
ALTON, RHODE ISLAND

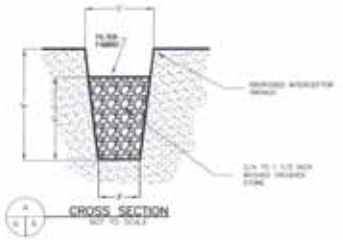
REMEDIAL ACTION WORK PLAN
EXTERIOR SVE/ SPARGE AREA AND PETROLEUM RELEASE AREAS

PROJECT NO.
32795.16

FIGURE NO.
5



SUBSURFACE PROFILE
NOT TO SCALE



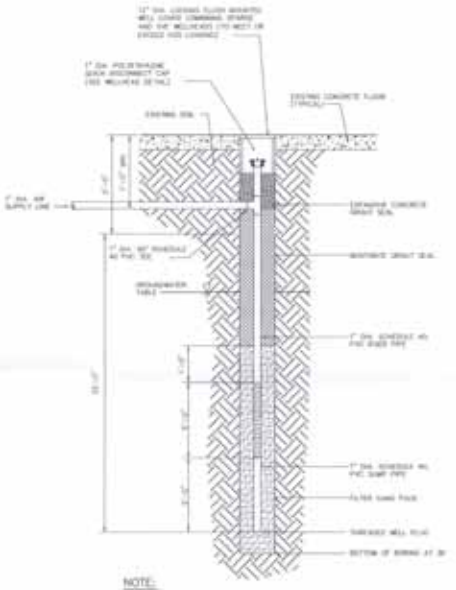
CROSS SECTION
NOT TO SCALE

NOTE:
1. REFER TO FIGURE 5 FOR PRODUCT RECOVERY TRENCH LOCATION

STRATA DESCRIPTIONS:

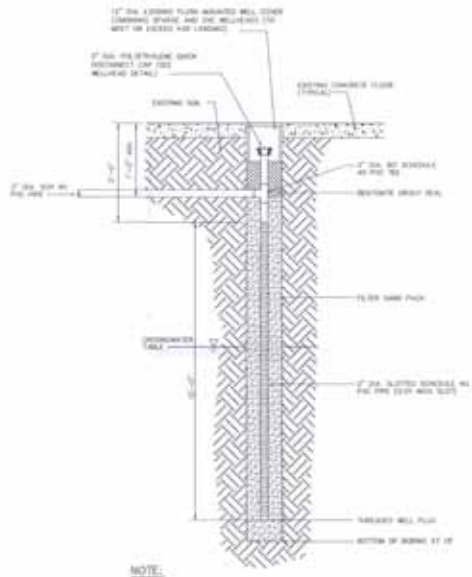
1/4 TO 1 1/2 INCH CRUSHED STONE (BACKFILL)

FILL



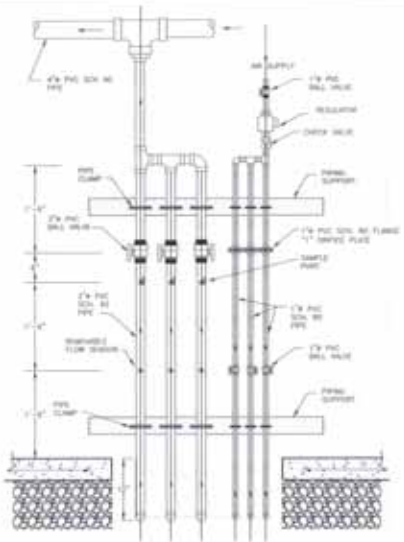
NOTE:

SPARGE WELL DETAIL
NOT TO SCALE

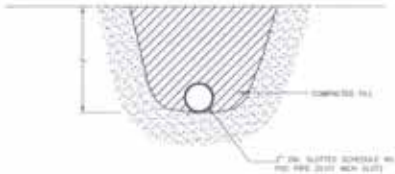


NOTE:

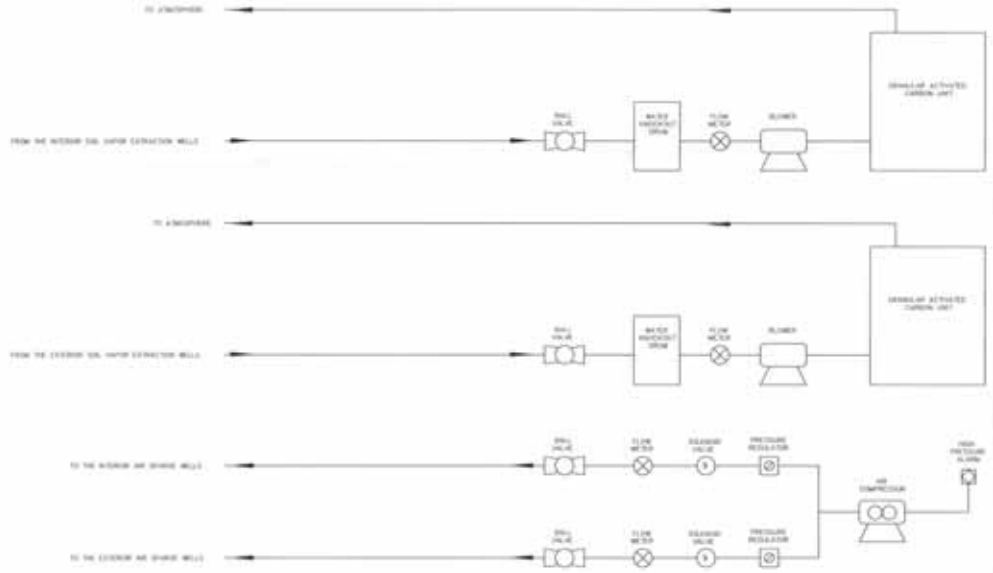
SVE WELL DETAIL
NOT TO SCALE



SVE/AS WALL DETAIL
NOT TO SCALE



HORIZONTAL SVE TRENCH
CROSS-SECTION
NOT TO SCALE



NO.	DESCRIPTION	BY	DATE

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROJ MGR.: EBA
DESIGNED BY:
REVIEWED BY:
OPERATOR: SMA/TLP
CHECKED: EBA
DATE: JUNE 2007

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REMEDIAL ACTION WORK PLAN
SVE AND SPARGE DETAILS

PROJECT NO.
32795.16

FIGURE NO.
6