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Northern DNAPL Recovery System – Design and Specifications

Scajaquada Creek Remediation Project Buffalo, New York

Prepared by:

RETEC ENGINEERING, P.C.

Under Contract to:
ThermoRetec Consulting Corporation
1001 West Seneca Street, Suite 204
Ithaca, NY 14850-3342

ThermoRetec Project Number: NFGD1-02111-700

Prepared for:

National Fuel Gas Distribution Corporation
10 Lafayette Square
Buffalo, NY 14203

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Reviewed by:

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April 27, 2001

TABLE OF CONTENTS

Table of Contents

List of Figures

Statement of Limitations

Work for this project was performed, and this remedial design prepared, in accordance with generally accepted professional practices for the nature and condition of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of National Fuel Gas Distribution Corporation for specific application to the Scajaquada Creek Sediment Remediation Project in Buffalo, New York. No other warranty, express or implied, is made.

1 Introduction

This document presents the Remedial Design for the second (Northern) Dense Non-Aqueous Phase Liquid (DNAPL) recovery system to be installed as a component of the Scajaquada Creek Sediment Remediation Project in Buffalo, NY. This design is in accordance with the approved Final Preliminary Design/Remedial Action Work Plan of June 5, 1998 (RETEC, 1998).

1.1 Background

The Scajaquada Creek Sediment Remediation Project has removed coal tar DNAPL contaminated sediments from Scajaquada Creek, as described in the Final Engineering Report (RETEC, 2000). Additional removal of flowable DNAPL will be achieved in two locations following installation of DNAPL extraction pumps and wells (DNAPL recovery systems). The Southern System (constructed in 1999) is located northeast of the West Avenue bridge near Sta 0+75. The Northern System (herein proposed) is located south of the Conrail Railroad Bridge near Sta 9+95. These locations contain DNAPL-saturated gravelly sediments which, due to their depth, remained after the Sediment Remediation Project was completed.

Both Northern and Southern locations are underlain by a tight confining clay layer which provides natural collection points for DNAPL. The lowest elevation of the clay layer near the railroad bridge is approximately 555-feet (Great Lakes Datum, GLD) and is located at Sta 9+95 at the midpoint of the creek. The lowest elevation of the clay layer near the West Avenue bridge is also located at the midpoint of the creek except the clay layer slopes north to south throughout this area. The installation of the West Ave sheet pile wall barrier (at approximately Sta 0+70) formed a collection point for DNAPL with the clay layer elevation at approximately 554-feet GLD'.

The volume of DNAPL impacted sediments remaining below the constructed cap is an estimated 1,500 cubic yards at and around the proposed Northern System (Sta 9+95) and 1,200 cubic yards at and around the existing Southern System (Sta 0+75). Based on a previously calculated 3.37 gallons of DNAPL per in-situ cubic yard of impacted sediment, and an assumed 30% product mobility, the volume of free DNAPL available for recovery by the Northern and Southern systems is approximately 1 gallon per cubic yard, ie. 1,500 gallons and 1,200 gallons, respectively. Approximately 309 gallons of DNAPL product have been recovered by the Southern System to date.

The following specific remedial goals apply to the Scajaquada Creek DNAPL Recovery Systems as components of the Scajaquada Creek Sediment Remediation Project:

- Remove additional contaminant mass in two areas containing DNAPL in gravel zones,

- Avoid damage to existing structures and properties within and adjacent to the site, and

- Avoid short-term adverse effects of remediation activities on human health and the environment.

1.2 Project Overview

These Design Specifications apply to the Northern recovery system only.

The Recovery System will consist of a low-flow pump, a 4-inch-diameter HDPE casing with 20 feet of 0.040-slot stainless screen advanced 8 feet into the LCL, a flow rate controller, a DNAPL holding tank and a concrete vault.

This design provides for both direct-push and directional drilling techniques to advance the casing from the creek bank to the target location without penetrating the existing geosynthetic clay liner (GCL). As-built survey data of the installed GCL and constructed cap have been incorporated into this design.

Design constraints include the following:

- Location of the target area - Previous sediment borings indicate that the clay layer is at its lowest elevation at Sta 9+95, near the center of the creek. To maximize DNAPL recovery, the recovery well screen must penetrate this point.

- Proximity of the GCL - The western toe of the GCL at Sta 9+95 is conservatively extrapolated (based on as-built surveys) to be as shown on the attached figures (actual location may be further from the proposed well location). The placement of bentonite pellets to seal around the well casing is also intended to seal the GCL, should it be inadvertently punctured during well construction.

- Slope of the well - The well must be placed as steep as possible to minimize the depth of the eastern excavation (within the creek bank) and to raise the bottom elevation of the vault.

- Site access - Permission to place the recovery system west of the Bike Path, or east of the creek, has not been received from the respective property owners.

- Bank stability - Shoring and/or trench boxes will be required to protect site workers, the Bike Path, and the creek cap during excavation and construction. Loading on the bank, however, is expected to decrease as the vault (approximately 37 tons, with full tank) will displace approximately 47 tons (31.4 cubic yards) of soil. High tensile geofabric will be placed prior to backfill.

Construction of the system will consist of the following activities:

- Site preparation and alignment of drilling equipment.
- Advancing a directional drilling string to the target location.
- Advancing a 12-inch steel casing over the drill string.
- Removing the drill string, augering out the casing, and containerizing the augered soils.
- Installing the recovery well materials.
- Developing of the recovery well and containerizing the development water.
- Excavating for vault placement well head access.
- Installing the vault and collection tank.
- Installing the power source.
- Installing the piping, float switch, other wiring, and tank vent.
- Performing a mechanical and electrical check.
- Restoring the site to pre-construction conditions.

Selection and installation of the system pump will occur after initial shakedown and operations. Initial operations will use a variable speed peristaltic pump until actual recovery rates can be determined and an appropriate system pump sized.

The vault will house the exposed well head, the pump, the pump controller and the DNAPL collection tank. The primary intent of the vault is to provide security for the pump, well head and tanks against vandalism and freezing. It will also provide secondary containment. An elevated work platform inside the vault will prevent confined space entry (air monitoring and other OSHA hazardous waste operations will, however, be required).

DNAPL disposal options will be evaluated based on BTU/lb, % ash, % water, TCLP characteristics and/or other analyses as requested by the potential receiving facilities. It is currently assumed that the collected fluids will be disposed of as a D018 hazardous waste.

Documentation of the as-built systems will be included in a Final Report.

1.3 Project Responsibilities

The principal organizations involved in permitting, designing, and construction at the site will be NFG, NYSDEC, RETEC, and Subcontractors.

1.3.1 National Fuel Gas Distribution Corporation (NFG)

NFG is responsible to NYSDEC for the remedial design, construction, and evaluation, in accordance with the Consent Decree CIV-90-1324C of July 10, 1995 for this site. For protection of the public, NFG will arrange for closure of the bicycle pathway adjacent to the site for three or four days during construction. NFG has the authority to monitor and control the quality of construction and related activities to ensure conformance with the engineering design plans and specifications. NFG has the authority to select and dismiss contractors to assist them with fulfilling these responsibilities. NFG also has the authority to select and accept or reject design plans and specifications, and materials and workmanship of the contractors and subcontractors.

1.3.2 New York State Department of Environmental Conservation (NYSDEC)

NYSDEC will review NFG's remedial designs, plans, and specifications for substantial compliance with the agency's regulations. Any substantial deviations from the requirements or approved design plans and their potential effect on the schedule must be approved by NYSDEC.

1.3.3 ThermoRetec Consulting Corporation, Inc. (RETEC)

RETEC is the General Contractor responsible to NFG for the remedial design and construction. RETEC Engineering, P.C., a subcontractor to RETEC, will provide professional engineering services.

1.3.4 Subcontractors

The Subcontractors referred to in this Work Plan will be selected by RETEC from among qualified companies. The Subcontractors will be responsible for the performance of the work in accordance with the specifications incorporated in this design.

The following Subcontractors are referred to in this document:

- Excavation Subcontractor
- Drilling Subcontractor
- Concrete Subcontractor

- Electrical Subcontractor
- Surveying Subcontractor
- Waste Handling and Transport Subcontractor
- Fencing Subcontractor
- Site Restoration Subcontractor
- Professional Engineering Subcontractor

Delineation of underground utilities and protection of existing facilities shall be the responsibility of the Drilling Subcontractor.

2 General Requirements

This section describes the general requirements for conducting the work.

2.1 Health and Safety

The approved Site Specific Health and Safety Plan (HASP) was most recently amended by RETEC in October, 2000. It satisfies the requirements of industry standards for work at hazardous waste sites (29 CFR 1910.120), standards for the construction industry (29 CFR 1926), general industry standards (29 CFR 1910), and standards for specific hazardous materials (29 CFR 1900.1000). Subjects covered in the HASP include:

- Health & Safety Risk Analysis
- Personal Protective Equipment
- Air Monitoring & Action Levels
- Site Control
- Decontamination
- Emergency Response Plan
- Lockout/Tagout
- Heavy Equipment Operations
- Excavation and Trenching
- Material Safety Data Sheets
- Health and Safety Records and Reports

Prior to the work, RETEC will make a copy of the HASP available to all Subcontractors for review and signature.

Prior to the work, Subcontractors shall provide to RETEC evidence (photocopies) of the following items for each person who will be entering potentially contaminated work zones, particularly during drilling and well development activities:

- Respirator fit test
- OSHA 40 hour training or 8 hour refresher training
- Annual physical

Persons without these items both on-file and up-to-date will not be allowed to enter the exclusion (contaminated) work zone. The exclusion zone will be delineated in the field by RETEC.

Hours of operation shall be daylight hours between 7 AM and 6 PM, Monday through Friday, unless otherwise allowed in writing by NFG.

2.2 Environmental Monitoring and Control

Environmental monitoring and mitigation procedures will be followed to manage impacts during construction and to control fugitive emissions.

2.2.1 Erosion and Sedimentation Control

The Drilling and Excavation Subcontractors shall comply with and ensure the following erosion and sedimentation control measures:

- All work will be conducted in such a manner as to minimize the disturbance of vegetated areas in order to prevent erosion.
- All erosion and sedimentation control will be continuously inspected and maintained.
- All disturbed areas will be graded to promote sheet flow of runoff water and to prevent erosion.
- Erosion caused by site work will be repaired immediately.
- Seeding and mulching will be completed soon after remediation is completed.

2.2.2 Dust, Vapor, and Odor Monitoring

In accordance with 29 CFR 1910.120(h), an on-site air monitoring program will be implemented by RETEC to identify and quantify airborne levels of hazardous substances to determine the appropriate level of employee protection required for personnel working on-site. Methods for monitoring work area air quality are addressed in RETEC's HASP.

In addition to the work area monitoring program, RETEC will monitor community air quality upwind and downwind of the work area to provide real-time estimates of total hydrocarbons, odor and particulate releases to the community as a result of remedial activities.

The results of the monitoring will be used by RETEC to ensure that all action levels outlined in the HASP are followed. As the remediation proceeds, it may be necessary for the Subcontractor(s), at RETEC's request, to control compounds or odors which are released due to the Subcontractor(s)' activities. Either the rate of excavation shall be reduced or engineering controls such as

vapor suppressing foam or polyethylene sheeting shall be used as necessary to cover the exposed materials.

2.2.3 Monitoring and Control of Water Turbidity and Sheen

We do not anticipate any disturbance to Scajaquada Creek or impact to stream water quality. As an extra precaution, stream water quality will be visually monitored by RETEC. If a downstream sheen or increased turbidity is noted, the Subcontractor(s) shall modify their construction methods prior to proceeding with the work.

The Excavation and Drilling Subcontractor(s) shall have a 3-inch pump on standby for excavation dewatering and well development. Excavation water (which is not anticipated to be NAPL impacted) will be discharged overland through silt fence and then to the Creek. Should such control prove impractical in the field, excavation water may be containerized and disposed offsite, in consultation with NYSDEC. All well development fluids are anticipated to be NAPL impacted and will, therefore, be containerized and disposed offsite. Prior to transport and disposal, containerized fluids will be tested by RETEC according to the acceptance criteria of the receiving facility.

2.2.4 Mobilization, Demobilization, Decontamination

The Subcontractor(s) shall confine their operations to areas designated by NFG.

During the remedial activities, the work areas shall be secured and barricaded (temporary fencing, cones and caution tape) by the Drilling Contractor to ensure the safety of project personnel and the public.

Each Subcontractor shall not disrupt or hinder the work of others.

All work shall be conducted in accordance with all OSHA and local regulations.

Trucking of all materials both onto and off of the site shall be done in accordance with applicable DOT standards. Trucks hauling materials to and from the site shall use only haul routes designated by NFG.

Equipment and personnel which come in contact with impacted materials shall be cleaned prior to leaving the site. Equipment decontamination procedures shall consist of a high pressure hot water wash to RETEC's satisfaction on a lined decontamination pad with a sump.

All decontamination water shall be containerized on-site. Prior to transport and disposal, the water shall be tested by RETEC according to the acceptance criteria of the receiving facility.

Soil collected on the decontamination pad shall be field screened and, if necessary, disposed off-site.

Small quantities of visibly contaminated PPE, plastic and miscellaneous materials shall be containerized and shipped off-site to the receiving facility.

2.3 Project Reporting

Upon completion of the remedial activities, RETEC will prepare an addendum to the Final Engineering Report of August 30, 2000. The following items will be included in the addendum:

- A description of all field work,
- As-built drawings,
- All pertinent analytical results,
- Copies of the bills of lading and manifests from the disposal of materials,
- Status of the site upon completion,
- A post-remedial Operations and Maintenance Plan, and
- Certification of the activities completed to date.

During the course of the work, the Subcontractor(s) shall regularly provide to RETEC:

- Daily field logs,
- Weekly progress reports,
- Equipment and material testing records, including analytical results,
- Weigh tickets,
- Surveyor's records, and
- Record drawings.

2.4 Site Security

Each Subcontractor shall be responsible for the security (against vandalism and theft) of their own equipment. Each Subcontractor shall be responsible for protection of their work.

The Drilling and Excavation Subcontractor(s) shall be responsible for protecting existing structures and utilities (especially the overhead expressway and the City Bicycle Pathway), and protecting public pedestrian and bicycle traffic through and around the work area. The Subcontractor's proposed methods and materials must be approved by RETEC and NFG prior to site mobilization.

Each Subcontractor shall be aware of potential requests by local labor unions that union labor be utilized. Any costs associated with property damage or project delays due to labor disputes shall be borne by the associated Subcontractor.

3 Construction Specifications

The Construction Drawings of the Northern DNAPL Recovery System are presented in the attached Figures.

3.1 Excavation

Excavation, shoring and maintenance of excavation sidewalls shall be the responsibility of the Drilling and Excavation Subcontractor(s).

Delineation and protection of existing facilities and underground utilities shall be the responsibility of the Drilling Subcontractor.

Clean excavated soils will be reused on site. Soils will be determined to be clean by RETEC using PID measurements and olfactory and visual observations in consultation with NYSDEC. Contaminated materials shall be excavated and direct-loaded into lined roll-off boxes or dump trucks for transport off-site.

Surplus excavated soils shall be graded to promote runoff away from vaults.

3.2 Well Installation

Drilling Subcontractor shall construct DNAPL Recovery Wells as shown in the Figures.

Drilling Contractor shall provide and install:

- 20 feet of 0.040 slot spiral wound stainless steel well screen, capped at the bottom end and fitted with NP threads at the top end.
- Minimum of 22 feet of sandpack, #3 Morie or equivalent.
- 80 feet of 4-inch diameter HDPE pipe.
- 10 feet (7 cu ft) of bentonite pellets.

Drilling Contractor shall:

- Place a drill string, by directional drilling, through the design target location into the lower confining clay layer as shown in the Figures.
- Install a 12-inch temporary iron casing, by direct push or other approved method, over the drill string.
- Remove the drill string and auger out the 12-inch casing. (All drill cuttings shall be assumed hazardous for TCLP benzene and shall be

containerized by the Drilling Contractor. All personnel performing this task shall be properly OSHA certified.)

- Install the well materials.
- Develop the well. (All development water shall be assumed hazardous for TCLP benzene and shall be containerized by the Drilling Contractor. All personnel performing this task shall be properly OSHA certified.)

Excavation Subcontractor shall:

- Excavate the bench for vault placement.
- Excavate a narrow trench to uncover 20 linear feet of the 12-inch iron casing.

Drilling Subcontractor shall then:

- Pull the 12-inch iron casing back approximately 65 feet to expose the HDPE pipe.
- Cut the HDPE pipe and pull it up as shown in the Figures to the satisfaction of the Engineer.

Excavation Subcontractor shall then:

- Backfill the narrow trench with compacted crushed stone.
- Place Geogrid fabric (material to be approved by Engineer based on field conditions) across the bench, followed, if necessary, by additional compacted crushed stone for vault subbase.

Concrete Subcontractor shall:

- Install vault as detailed below.

3.3 Holding Tank and Vault

The HDPE holding tank will be supplied to the site by RETEC. Tank dimensions shall be as shown in Figure 5.

Concrete Subcontractor shall provide and install the concrete vault with insidedimensions of 8-feet wide, by 10-feet long, by 8-feet high.

The vault may be site-built or pre-cast. If vault is site-built, Concrete Subcontractor shall provide proposed steel reinforcement details to RETEC for approval prior to start of work. In either case, steel reinforcement shall provide design loading as given in Figure 5.

Vault access hatch shall be supplied by the Concrete Subcontractor and shall conform to specifications given in Figure 5.

Note that no hot work is allowable near the well head due to fire hazard.

A tank vent and an electrical conduit (not shown in Figure 5) shall be installed by the Electrical Subcontractor in consultation with RETEC.

3.4 Electrical

Electrical Subcontractor shall provide and install:

- 115 volt, 20 amp service, from a location identified by the Electrical Subcontractor in consultation with NMPC and as approved by NFG and RETEC.
- Utility pole, with vandal- and weather-proof circuit breaker box and one GFI duplex outlet, conduit to the vault, 2-inch GI tank vent from the vault (materials supplied by RETEC).
- Explosion proof (Div 1 Class 2) NEMA enclosure (consult Engineer for size) mounted on pressure treated plywood, sized as necessary, anchored to interior vault wall.

Electrical Contractor shall employ licensed electricians as required. All electrical work shall comply with relevant codes and regulations.

Electrical Contractor shall anticipate the need for, confined space entry as defined by OSHA (29 CFR 1910.146). It is expected that most in-vault work will be completed prior to initiation of fluids-handling (and generation of potentially hazardous atmospheres).

Electrical Contractor shall test power supply and other components to the satisfaction of RETEC.

3.5 Site Restoration

Following vault placement, the excavation shall be backfilled and the site graded to promote runoff away from the vault.

A 3-inch layer of topsoil shall be added to all disturbed areas, or as directed by RETEC. The top soil shall be seeded, fertilized, mulched and maintained until a vegetative cover, comparable with existing vegetation, is established in the area.

Damaged trees and shrubs shall be replaced with like species and sizes.

Each Subcontractor shall repair all fence which had been damaged or temporarily removed during the course of their work.

The bicycle pathway surface shall be cleaned and the bicycle pathway shall be restored to pre-construction condition.

The Surveying Subcontractor shall provide as-built data in electronic (AutoCAD- 14 compatible) format to the satisfaction of RETEC.

4 Operations and Maintenance

Experience with similar DNAPL recovery systems indicates that a substantial quantity of DNAPL is often produced during the first weeks of operation, followed by a long period of lower production, and ending with progressively lower and lower rates of DNAPL recovery until further operations are not warranted by the small quantity recovered.

Given an anticipated total system flow of 6 to 10 gpd, the system will collect over 1800 gallons annually. An appropriately certified vac truck or tanker will be used for pickups under the supervision of an NFG representative/technician. Because of the low flow rate, the collected fluids are expected to contain a low percent of water. The volumes of DNAPL and water collected will be recorded.

Operation of the system will be conducted in two stages. In the first stage, the system will be operated with frequent checks by a technician and the production rate will be closely monitored. A temporary variable speed peristaltic pump will be used. The pump rate will be adjusted to maximize collected DNAPL volume and density. During this time an appropriately sized pump will be selected and installed for long-term operations.

In the second stage, the on-site labor time will be reduced and the system will be operated automatically. A high level shut off switch in the collection tank will prevent overfilling and spillage. The tank will then be emptied by a tanker or vac truck under technical supervision.

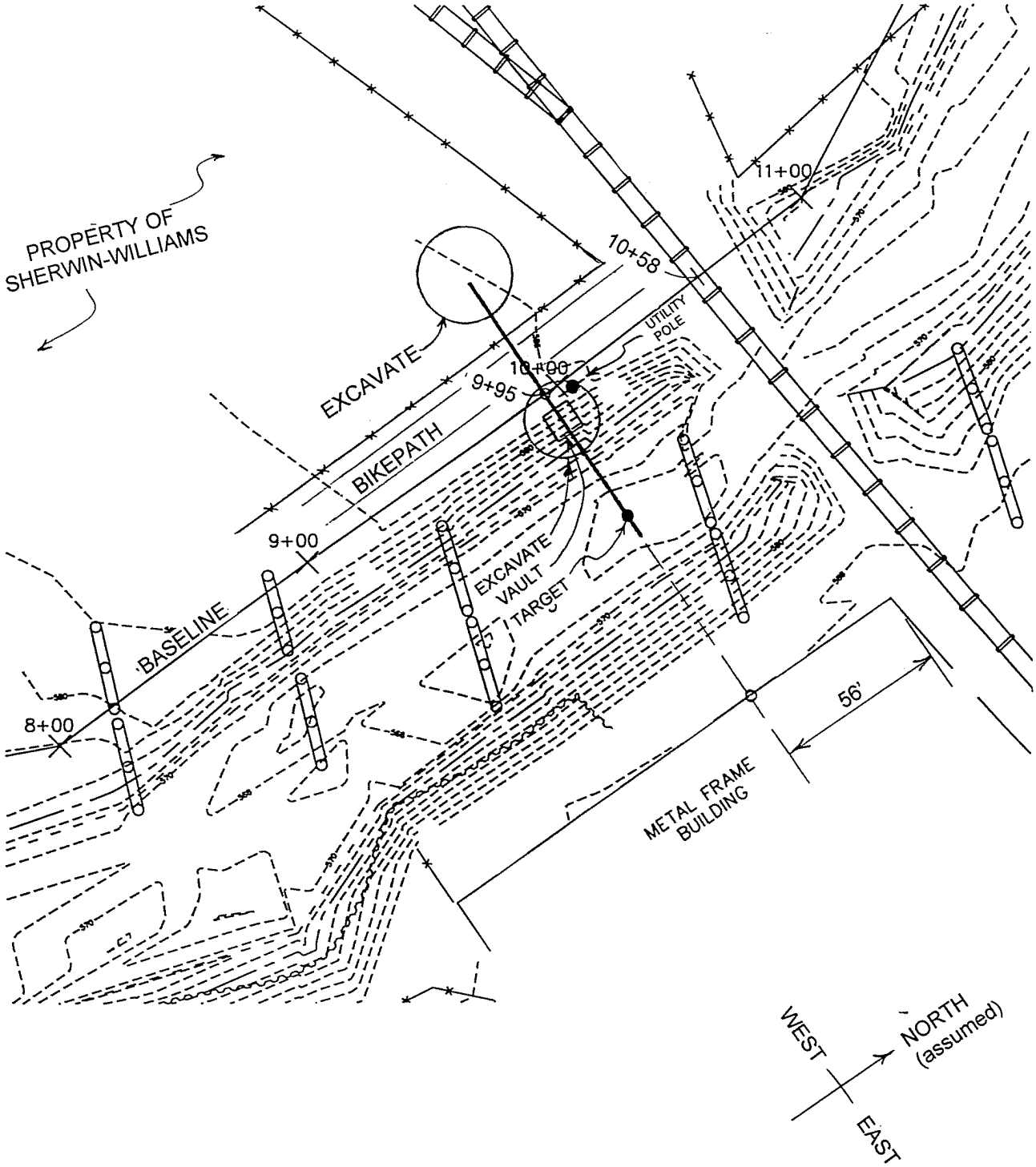
The first batch of recovered DNAPL will be sampled, analyzed and held on site. Based on the analyses of the DNAPL, an off-site recycling/disposal facility will be selected. Future sampling and analyses will be as per the requirements of the receiving facility. System production and analytical results will be documented and reported to NYSDEC in quarterly reports.

Experience with other DNAPL recovery systems indicates that the recovery period, and duration of operations, is dependent upon many site specific factors and that recovery performance is best estimated after actual recovery data are obtained.

5 References

RETEC, 1998. Final Preliminary Design/Remedial Action Work Plan, Scajaquada Creek Sediment Remediation, Buffalo, New York, RETEC Engineering, P.C. June 5, 1998.

RETEC, 2000. Final Engineering Report, Scajaquada Creek Sediment Remediation, Buffalo, New York, RETEC Engineering, P.C. August 30, 2000.



NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
1	MRH	2/28	Not For Construction	MRH	4/9		

Scajaquada Creek
Northern DNAPL System
(Proposed)
Site Plan

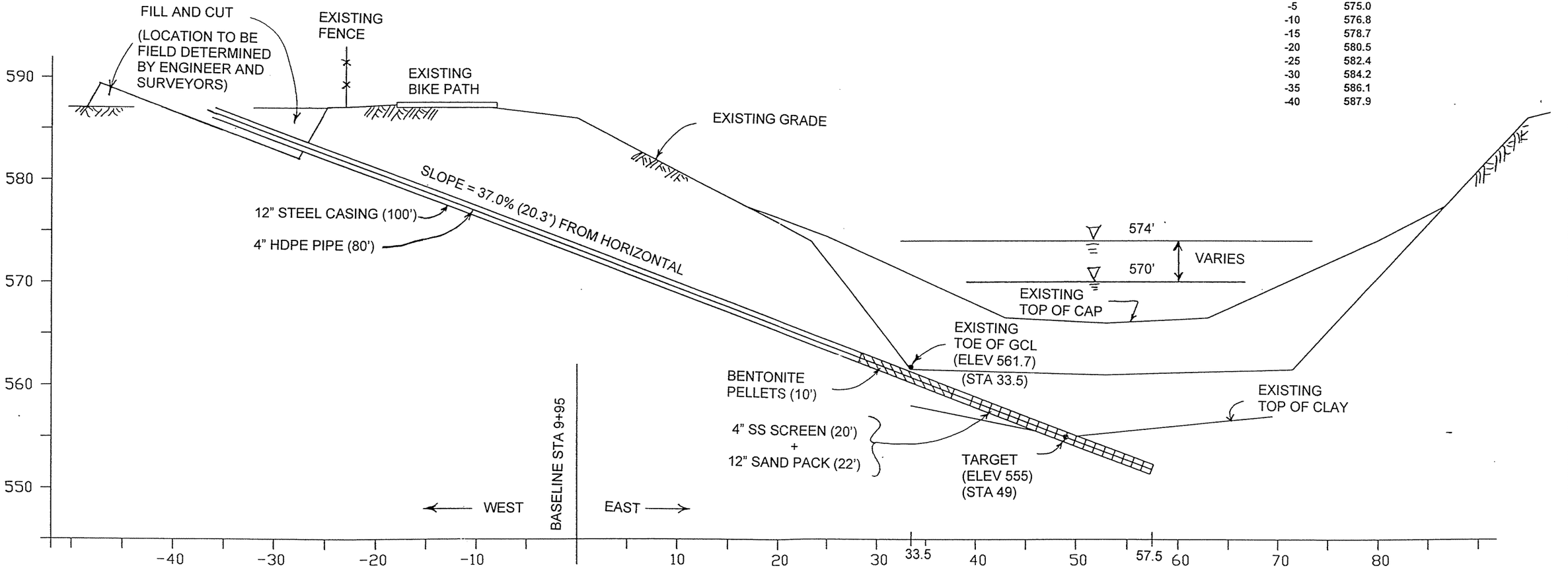
RETEC

RETEC ENGINEERING, P.C.

Date: 2/28/01 By: mrh

Figure 1

Horizontal Station	Pipe Elevation
57.5	551.9
49	555.0
45	556.5
40	558.3
35	560.2
33.5	560.7
30	562.0
25	563.9
20	565.7
15	567.6
10	569.4
5	571.3
0	573.1
-5	575.0
-10	576.8
-15	578.7
-20	580.5
-25	582.4
-30	584.2
-35	586.1
-40	587.9



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1	M.S.H	2/28/01	Not For Construction	M.P.H	4/9/01		

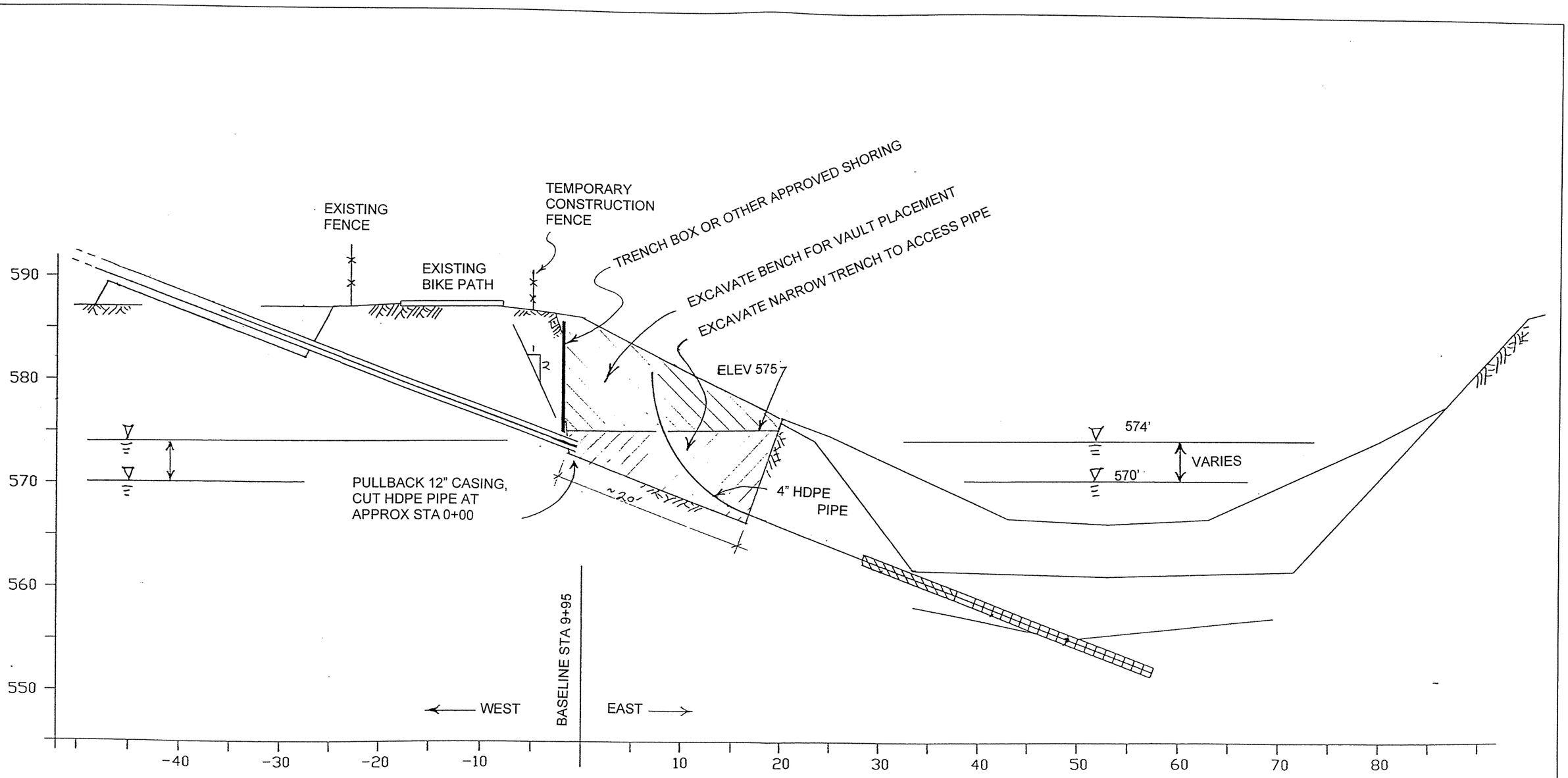
Scajaquada Creek
Northern DNAPL System
(Proposed)
Boring and Well Installation

RETEC

RETEC ENGINEERING, P.C.

Date: 2/28/01 By: mrh

Figure 2



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1	MRH	2/28/01	Not For Construction	MRH	4/9/01		

Scajaquada Creek
Northern DNAPL System
(Proposed)
Excavation Detail

RETEC

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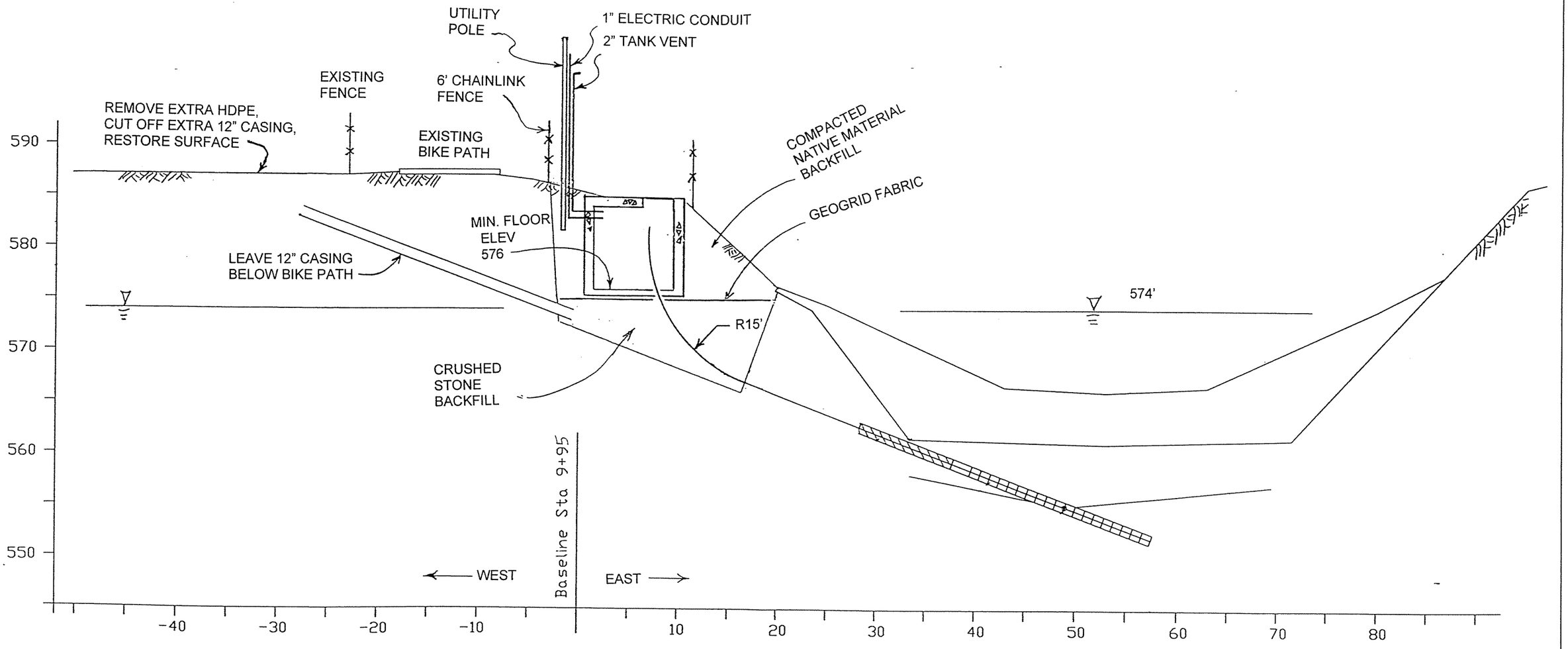
Date: 2/28/01 By: mrh

Figure 3



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1	MRH	2/28/01	Not For Construction	MRH	4/9/01		

Scajaquada Creek
Northern DNAPL System
(Proposed)
Vault Placement

RETEC

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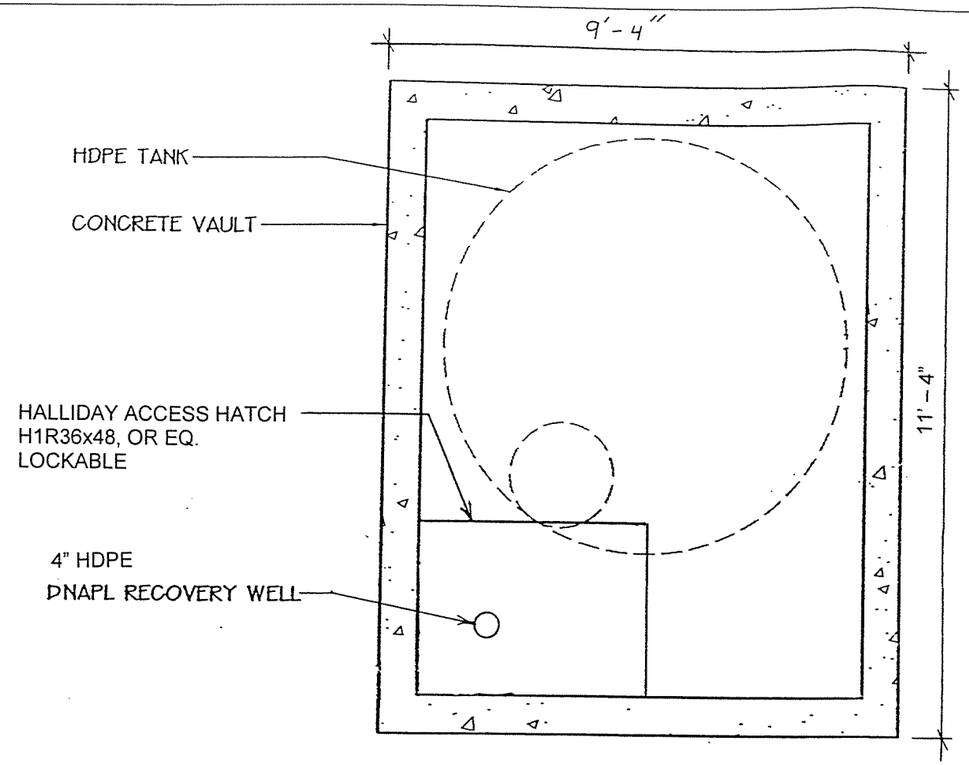
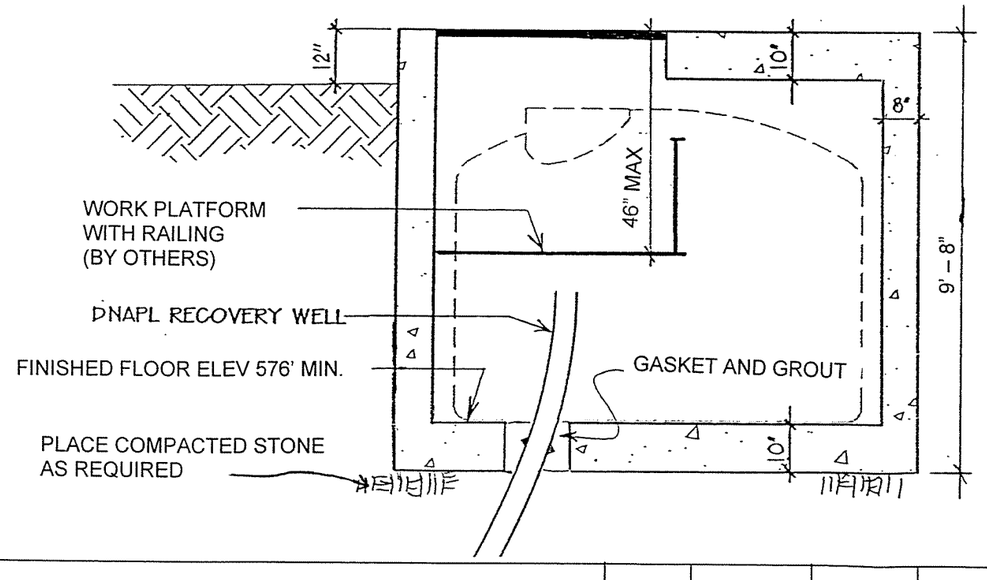
Figure 4



Note:

CONCRETE VAULT SHALL HAVE INTERIOR DIMENSIONS OF 8'-0" WIDE, 10'-0" LONG, 8'-0" HIGH. CONCRETE SHALL BE 4000 PSI @ 28 DAYS. STEEL REINFORCEMENT (NOT SHOWN) SHALL PROVIDE AASHTO HS-20-44 LOADING. 2 SIDEWALL OPENINGS (2"ϕ AIR VENT, 1"ϕ ELECTRICAL CONDUIT) SHALL BE LOCATED BASED ON SITE CONDITIONS. POLYPROPYLENE STEPS SHALL BE INSTALLED 12" O.C.

HDPE TANK SHALL BE SUPPLIED BY OWNER AND PLACED AS SHOWN BY CONTRACTOR. TANK DIMENSIONS SHALL BE 87" DIAMETER, 87" HIGH. TANK SHALL BE FITTED BY OWNER WITH FLOAT SWITCH, 1" INLET PORT, 2" VENT.



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Scajaquada Creek
Northern DNAPL System
(Proposed)
Vault Detail

RETEC

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Figure 5