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SYSTEM ENHANCEMENT RECOMMENDATION REPORT
Former Nello Teer Quarry
5013 Denfield Street
Durham, North Carolina

Prepared for:

Hanson Aggregates
2300 Gateway Centre Boulevard
Morrisville, North Carolina 27560

Prepared by:

Quantum Environmental, Inc.
6001 Chapel Hill Road, Suite 108
Raleigh, North Carolina 27607

April 2000

Quantum Project No. 0013-94-012

Quantum

Quantum Environmental, Inc.

June 9, 2000

Mr. Eric Rice
NCDENR - Raleigh Regional Office
3800 Barrett Drive
Raleigh, North Carolina 27609

Re: Nello Teer Quarry Update
Quantum Project No. 0013-94-012
GW Incident No. 9357
Site Ranking 110B

It was a pleasure speaking with you today concerning the Nello Teer site. Quantum has completed most of the requested items mentioned in the System Enhancement Recommendation Report from April 2000, and we have just completed the semi-annual groundwater sampling activities.

Both proposed recovery wells have been completed and we have received the analytical results for the new deep well (RW-9) in the chlorinated plume area. The results of the 601 analysis for RW-9 indicate that three constituents exceeding the 2L Standards are present in the deep aquifer (vinyl chloride, 1,1 dichloroethene and trichloroethene). These results indicate that the deep aquifer's level of contamination is apparently not as severe as the shallow aquifer (261 ppb total CVOCs in RW-9 vs. 1309 ppb CVOCs in MW-25 (worst case shallow well) in December, 1999). The results of the most recent recovery well samples are summarized in the enclosed Table 5, and a copy of the December 1999 Monitoring Report has also been included for your review.

Per our conversation of today, we will be submitting the monitoring well samples in the chlorinated plume area for analysis using Method 601only. Recovery wells RW-8 and RW-9 have begun active groundwater recovery as of 6/2/00. Please review the enclosed materials and feel free to contact me if you have any questions concerning this site. We expect to have the semi-annual compliance monitoring report completed sometime in July, and we will keep you updated on any new developments.

Sincerely,

QUANTUM ENVIRONMENTAL, INC.

Charles C. Ross, P.G.
Project Hydrogeologist
L00-215:CCR

Attachment: Site Map, Table 5 Recovery Well Results, December '99 Monitoring Report, System Enhancement Report

6001 Chapel Hill Road Suite 108 Raleigh, North Carolina 27607 919.852.3595 919.852.1997 fax

System Enhancement Recommendation Report
Former Nello Teer Quarry
5013 Denfield Street
Durham, North Carolina
Durham County
GW Incident # 9357

Date of Report: April 18, 2000

Site Priority Ranking: 110B

Responsible Party: Nello Teer Company
5013 Denfield Street
Durham, NC 27560
(919) 477-2413

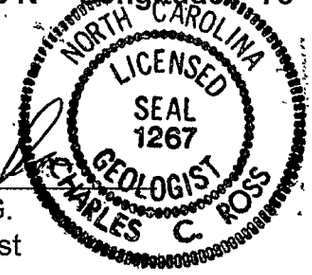
Current Owner: Hanson Aggregates
2300 Gateway Centre
Morrisville, NC 27560
(919) 380-2600

Consultant: Quantum Environmental, Inc.
2200 Gateway Center Boulevard, Suite 205
Morrisville, North Carolina 27560
(919) 469-9795
Quantum Project No. 0013-94-012

Release Information:

The soil and groundwater contamination by petroleum hydrocarbons appears to have originated from gasoline, diesel, and waste oil underground storage tanks (USTs) located at a former gas station on-site with multiple UST nests. Additional groundwater contamination, by chlorinated hydrocarbons, appears to have originated from an asphalt-testing laboratory formerly operated by the North Carolina Department of Transportation (NCDOT) associated with a former asphalt production facility.

Latitude: 36° 3.45'N Longitude: 78° 53.10'W



Charles C. Ross, P.G.
Project Hydrogeologist

Thomas W. Davis, P.G.
Project Hydrogeologist

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FIGURES:

1.0 INTRODUCTION

The Durham Quarry is a former aggregate mining and processing facility located on Denfield Street (State Road 1641) north of Durham in Durham County, North Carolina (Figure 1). The property had been in operation as a crushed stone quarry and asphalt plant since the 1940s. Groundwater contamination found in former water supply well W-1 prompted the issuance of a Notice of Violation from the North Carolina Division of Environmental Management (NCDEM) under the North Carolina Groundwater Standards (15 NCAC 2L) in November 1993.

1.1 Site History

Soil and groundwater contamination by petroleum hydrocarbons appears to have originated from gasoline, diesel, and waste oil underground storage tanks (USTs) located at a former gasoline station on site with multiple UST nests (Figure 2). Additionally, chlorinated hydrocarbon groundwater contamination appears to have originated from an asphalt-testing laboratory operated by the North Carolina Department of Transportation (NCDOT) which was associated with a former asphalt production facility at the site. A Comprehensive Site Assessment Report, submitted by Geonetics, Inc. in 1993, indicated a large volume of contaminated soil and groundwater existed at the site. However, many of Geonetics' conclusions were based on field organic vapor analyzer results only and were not confirmed with laboratory analysis.

Quantum performed confirmation analyses of the areas of soil and groundwater contamination designated by Geonetics and determined that the soil contamination was not as extensive as reported. Quantum submitted a revised Corrective Action Plan (CAP) for soil and groundwater remediation along with applications for a permit to land-apply hydrocarbon contaminated soils and a discharge permit (NPDES) to treat groundwater. The permits were issued and work on the land application of contaminated soil was completed in 1997. Quantum completed construction and start up of a groundwater remediation system in October 1997. The remediation system consists of an oil-water separator, an air stripper, and two activated carbon drums for final polishing of treated water. Remediated groundwater is discharged under a NPDES permit to an unnamed tributary of the Eno River. To date, more than 5.5 million gallons of groundwater have been recovered and successfully treated by this remediation system.

There are currently nine monitoring wells for the shallow (water table) aquifer and 11 monitoring wells for the deep (semi-confined) aquifer at the site. Semi-annual groundwater sampling has historically been conducted on 15 monitoring wells and the results submitted to the NCDENR. This sampling network has recently been reduced to nine monitoring wells.

There are seven recovery wells in place at the site. Recovery wells RW-2, 3, and 4 are

located near the old gasoline station on the southern portion of the site and recovery wells RW-5, 6 and 7 are located near the old asphalt plant on the northern portion of the site. Deep recovery well RW-1 is located between the two sources. The well locations are shown in Figure 2.

System influent and effluent have been sampled monthly and quarterly for laboratory analysis since groundwater recovery was initiated. These results have been reported to the NCDENR as part of the NPDES requirements.

A December 1999 shallow groundwater potentiometric map is included as Figure 3, and a December 1999 deep aquifer potentiometric map is included as Figure 4.

2.0 Remedial System Status

2.1. Petroleum Plume

The locations of recovery wells RW-1, 2, 3, and 4 were planned using computer modeling as documented in the Front Royal Environmental Services Inc. (now Quantum Environmental, Inc.) CAP Addendum dated September, 1995. As these recovery wells have now operated for some time, they can be evaluated for their effectiveness and projections can be made to determine whether or not these wells are adequately remediating the site in a timely manner.

Currently, monitoring wells MW-23 and MW-15I are the only monitoring wells in the vicinity of the former gasoline USTs that continue to contain BTEX compounds at concentrations above the NCAC 2L Standards. For several years both of these wells have consistently contained low levels of total BTEX and MTBE compounds. In December 1997, MW-15I contained 12.0 parts per billion (ppb) total BTEX plus MTBE. When sampled in December 1999, MW-15I contained total BTEX plus MTBE of 10.5 ppb. MW-23 contained 83 ppb total BTEX plus MTBE in December 1997 and 45.3 ppb total BTEX plus MTBE in December 1999. Both of these monitoring wells are 60 feet deep or less.

Recovery well RW-4, with a total depth of 101 feet, has recovered a total of over 1.8 million gallons of groundwater in an area with low concentrations of petroleum residuals, as evidenced by the repeated analysis of water from within MW-15I. In spite of this, groundwater from well RW-4 was found to be clean when first analyzed in August 1999 and again in March 2000. This information indicates that recovery well RW-4 is probably having minimal influence on contaminated groundwater from depths of less than 60 feet. The pump in RW-4 is located at a depth of 95 feet and is probably mainly recovering water from a depth of greater than 60 feet.

2.2. Chlorinated Solvent Plume

In the vicinity of the former asphalt plant, the combination of recovery wells RW-5, 6 and 7 may not be capable of remediating the entire chlorinated solvent plume. These recovery wells were constructed to depths of 35 feet or less. No deep aquifer data exists from the area within or immediately adjacent to the former asphalt plant because no deep monitoring wells were ever installed in this area. Chlorinated solvent residuals at concentrations below the State 2L standards have been detected since 1993 at a depth of 50 to 65 feet in monitoring well MW-13, which is downgradient of the former asphalt plant. Quantum believes that chlorinated solvents in groundwater are also likely present in the fractured siltstone at depths greater than 35 feet within the former asphalt plant area. The deep aquifer is estimated to have a groundwater elevation approximately 45 feet below ground surface (bgs) in this area, which is deeper than all of the existing recovery wells in this area.

2.3 Groundwater Analytical Data

Quantum plans to conduct additional sampling of two monitoring wells and one recovery well in both plumes. At the present time, it would be beneficial to have updated analytical data from wells RW-5 and MW-20D. Quantum believes that MW-20D is now free of detectable petroleum constituents, and would like to confirm this prior to the June 2000 sampling event. MW-20D contained only benzene at 1.8 ppb when sampled in December 1999.

Groundwater recovery in RW-5 was restarted in July 1999, but operated intermittently until March 2000 because of chronic electrical problems. As of April 2000, RW-5 is operating consistently following extensive repairs and pump replacement. Sampling of RW-5 is needed to monitor the contaminant concentrations in the groundwater recovered in this well.

3.0 System Enhancement Recommendations

3.1 Petroleum Compound Plume

Since the pumping from recovery wells RW-3 and RW-4 is not expected to effectively remediate the shallow aquifer in the area around the former service station, including MW-23, Quantum recommends the installation of an additional recovery well in the approximate location of MW-23 (shown as RW-8 in Figure 5). This recovery well should be installed to a depth of approximately 75 feet and screened from 35-75 feet. This additional recovery well should help complete the remediation of the petroleum plume in this area more rapidly

than the existing recovery wells.

Quantum also recommends raising the pump in recovery well RW-4 to a depth that maximizes recovery of groundwater from within the uppermost fractured siltstone. Based on the information available, this depth is estimated to be approximately 50 feet below ground surface, although packer tests may be necessary to better identify the desired location of this formation.

Finally, Quantum recommends that recovery of groundwater from well RW-1 not be restarted at this time. The pump in this well was shut off after analytical sampling in February 2000 indicated that chlorinated solvent residuals had begun to appear in this well. While the levels of chlorinated solvents are less than North Carolina 2L Standards, this is a significant change since this well previously contained only petroleum compounds, specifically benzene, when sampled in August 1999. This well will be sampled during the next regularly scheduled semi-annual sampling event in June. If chlorinated compounds are again detected, Quantum recommends removing the pump from the well and using drilling subcontractors to seal the bottom of the well up to a depth of 115 feet. Pumping of groundwater from within the fractured siltstone at a depth of approximately 85 feet could then be initiated. This siltstone interval was determined by Remcor to be the most hydraulically conductive in adjacent test boring TB-1 during packer testing conducted in 1990.

3.2 Chlorinated Solvent Plume

Quantum recommends constructing an 80-foot four-inch diameter monitoring well with a screen interval within the uppermost region of fractured siltstone, approximately 60-80 feet in depth, near the location of RW-5 (Figure 5). This well would initially be used to determine if chlorinated solvent residuals are present in the deep aquifer's fractured siltstone in this area. If solvents are detected in this new well, as predicted, recovery and treatment of groundwater could begin relatively quickly. If solvents are not detected, this monitoring well will be added to the existing monitoring schedule.

Both proposed recovery wells and associated piping will be constructed in accordance with North Carolina well construction standards, and similar to the existing components at the site, as described in the CAP Addendum.

Quantum also recommends repairing recovery well RW-7 so that active recovery of groundwater can be reinitiated. The PVC screen in this well was perforated at some time in the past, and sand entering the well permanently damaged the pump. Repairs to the well will consist of flushing to remove the sand that entered the well, followed by the installation of three-inch casing and screen. A three-inch recovery pump will then be installed and connected to the existing piping and electrical service. Reactivating this well

will greatly assist in remediating the chlorinated solvent plume.

4.0 Costs of System Enhancement

4.1 Subcontractor Costs

Subcontractors will be used to install the two new wells at the site. Additional subcontractors will be needed to provide power and piping to recovery well RW-8, and to monitoring well MW-27 if significant contamination is detected in this well, at which point the well would become recovery well RW-9. Power to this well can be accessed from existing recovery well RW-7 as a cost saving measure.

Estimated drilling costs for the installation and development of the two new wells and repairing RW-7 are approximately $15,500.00, including well materials and recovery well vaults. Installation of trenches and associated piping and electrical work are estimated to cost approximately $4,300.00.

Analytical costs are estimated to be approximately $700.00 for the analyses proposed herein.

4.2 Equipment Costs

Groundwater recovery pumps are estimated to cost a total of $2,500.00. An additional $1,000.00 in miscellaneous supplies is estimated to be required for the completion of this work. Other equipment expenses are included in drilling subcontractor and electrician expenses and are not included in this subsection as a separate cost item.

4.3 Labor Costs

Subcontractor labor is included in section 4.1 above. Quantum labor is estimated to be $5,000.00 for this scope of work.

4.4 Cost-Benefit Analysis

The total cost for completing the tasks presented in this report is approximately $29,000.00. The projected benefit for performing these tasks is an anticipated reduction in the length of the groundwater remediation project. While it is difficult to quantify the savings which are expected from completing these system enhancements, Quantum estimates that a reduction in the length of the operation of the remedial system of six to ten months is not unreasonable. Furthermore, Quantum estimates that operation of the remedial system costs approximately $9,100.00 per month, thus the benefit of

implementing these measures at a cost of $29,000.00 is a net cost savings of $25,600.00 to $62,000.00.

5.0 System Enhancement Summary

To summarize, Quantum recommends completion of the following additional groundwater monitoring and recovery well tasks:

1. Construction of RW-8 to 75 feet, with screen from 35 to 75 feet, adjacent to MW-23 for shallow aquifer petroleum contaminant recovery.

2. Construction of MW-27/RW-9 to 80 feet with screen from 60 to 80 feet, adjacent to RW-5 for deep aquifer chlorinated solvent residual monitoring and recovery if necessary.

3. Repair of RW-7, including the installation of a new pump for the recovery of chlorinated solvents.

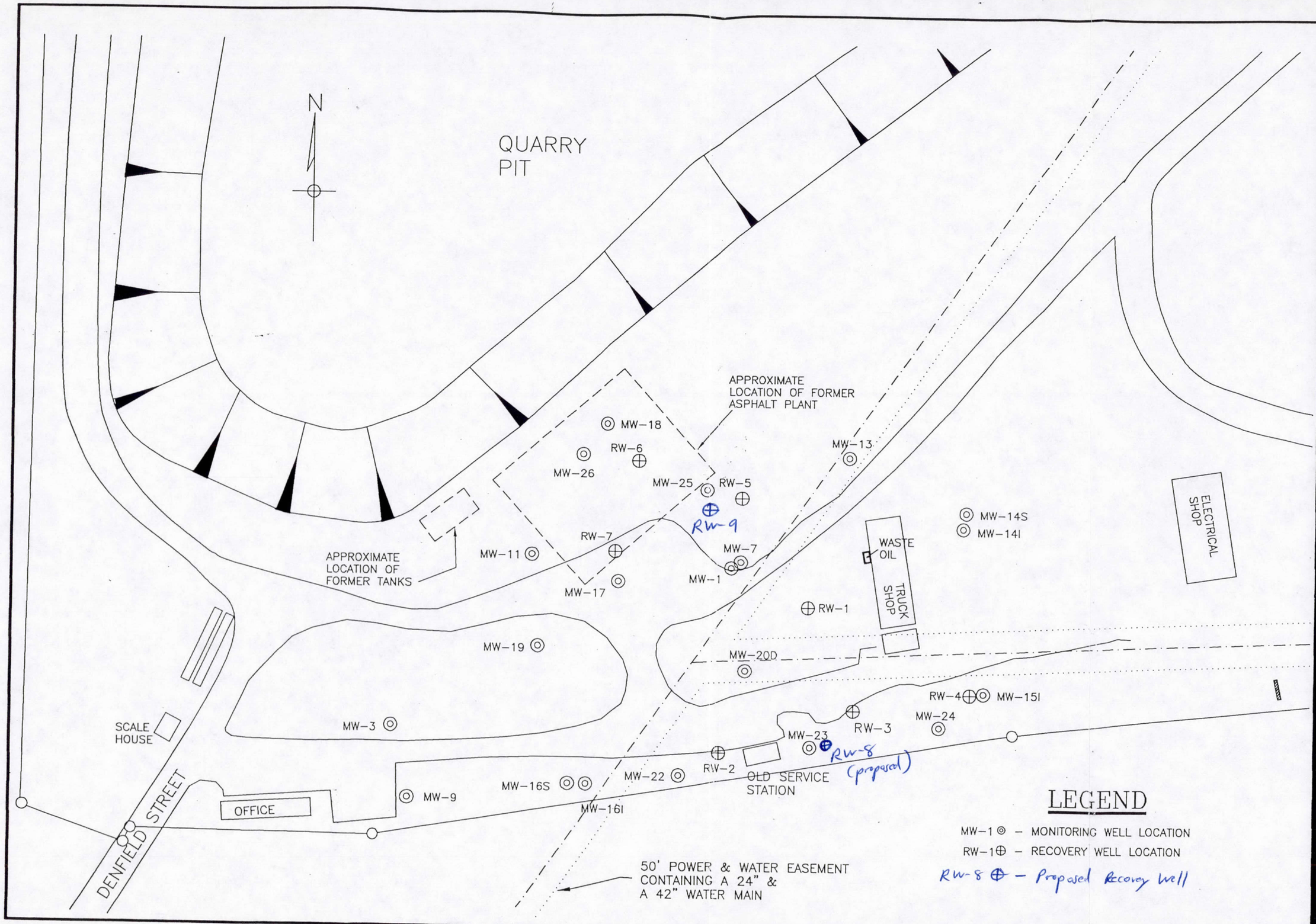
Quantum also recommends sampling the following three wells for analysis using EPA Methods 601 and 602:

1. MW-20D, to gauge the effect of the recent shut-down of recovery well RW-1.

2. RW-5, to gauge the effect of sustained groundwater recovery in this area following several years of intermittent recovery from this well.

3. New well MW-27/RW-9, to determine if chlorinated solvent residual contamination is present in the deep aquifer in the area nearest the former asphalt plant.

Figures



Quantum ENVIRONMENTAL, INC.

FIGURE 2

WELL LOCATION MAP
NELLO L. TEER
DURHAM QUARRY

Revisions

Project No.
0013-94-012

SCALE: 1"= 110'

DWN / DATE	CHK / DATE	CLIENT APPROVAL / DATE
5 / 97		