**RTN # 1 - Class A-2 RAO**
**(Several other releases/RTNs rolled in)**

**RTN # 2 - Class A-3 RAO with AUL**
**Asbestos in Soil**

SCANNED

# RESPONSE ACTION OUTCOME STATEMENT

**Class A-2, RTN # 1**

August 2003

August 2003

Department of Environmental Protection

Attention: Bureau of Waste Site Cleanup

Reference: Response Action Outcome Statement

Enclosed herewith is our Response Action Outcome (RAO) Statement for the disposal sites associated with releases of petroleum hydrocarbons, volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs) to which Massachusetts Department of Environmental Protection (DEP) assigned Release Tracking Number (RTN) # 1 and for the release of asbestos to which DEP assigned RTN # 2 The disposal sites are located on City property at Site Street. Several other parcels were incorporated into the final constructed buildings/area. Refer to the Project Location Plan, **Figure 1**, for the general property locus.

In summary, response actions were performed and the RAOs were prepared pursuant to the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act (MGL Chapter 21E) and pursuant to the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Based on the results of a Method 3 Risk Assessment, a permanent solution with a level of No Significant Risk has been achieved for RTN # 1 and RTN # 2 . Property conditions could not be restored to background, but no AUL is required and therefore a Class A-2 RAO applies to the disposal sites linked to RTN # 1 . Property conditions could not be restored to background and since an AUL has been recorded on the Property deed at the Registry of Deeds for the asbestos disposal site, a Class A-3 RAO applies to RTN # 2.

The impacted Property consists of five parcels of land that are now occupied by a municipal Middle School and Community Center. The parcels are referred to as: Areas 1, 2, 3, 4A (the primary site), 4B, Area 2-PCB, UST Area, and Asbestos Area. The three-story school building occupies most of the Property and is surrounded by paved walkways, driveways and parking areas. Landscaped areas are very limited in extent.

Prior to its acquisition by the City the Property had been the location of numerous small industries since about 1900. All buildings formerly located on the Property were demolished prior to construction of the school and community center.

Investigations of the Property identified the presence of eight (8) separate areas of soil and/or groundwater contamination. Extensive remediation was conducted to remediate the releases under two Immediate Response Actions (IRAs) and one Release Abatement Measures (RAM).

Seven releases of VOC, petroleum hydrocarbons and PCBs were linked under Parent RTN # 1 A Phase I report submitted to the DEP in March 2001 to meet the requirements of a Numerical Ranking and Tier Classification concluded that the releases linked to RTN # 1 were Tier II disposal sites. The results of later investigations did not change the Tier II classification of RTN # 1.

Underground and above ground storage tanks (USTs and ASTs), vaults, and other containers were removed under the IRA and RAM. A total of 12,276 cubic yards of VOC, petroleum hydrocarbon and/or PCB contaminated material were also removed under the RAM as documented in RAM reports. The results of chemical testing of soil samples obtained from the limits of all of the impacted areas across the Property indicated that levels of contamination had been reduced below the applicable risk-based cleanup standards. Results of groundwater testing after completion of the RAM indicated levels of VOC and petroleum hydrocarbons at or near the DEP's GW-2 and GW-3 cleanup standards. As a precautionary measure, installation of an impermeable vapor membrane was included in construction specifications and in a RAM Plan Modification submitted to the DEP for the part of the new building that was located in the area that had exhibited high VOC and/or petroleum levels prior to remediation. However, post RAM testing results indicated levels of VOC and petroleum hydrocarbons that were at least an order of magnitude below risk-based cleanup standards.

An eighth release, of asbestos to soils in one part of the Property, was addressed separately under RTN # 2. An IRA was performed with the approval of both the DEP's Bureau of Waste Site Cleanup (BWSC) and DEP's Bureau of Waste Prevention (BWP) to address the presence of asbestos-containing material (ACM) in soils. No asbestos impacts to air were identified during monitoring that was performed as part of the IRA activities. The area of ACM was demarcated and a total of 3,000 cubic yards of ACM was excavated, transported from the Property and disposed, as documented in the IRA Reports. After extensive sampling, excavation, and removal of soil from the demarcated asbestos area, material containing trace levels of asbestos was left in place in three localized areas at depths in excess of 6 feet where difficult access precluded additional excavation. The three locations are now isolated beneath the floor of the building, beneath a swimming pool that was constructed in the Community Center, and at a depth of 8 feet below the paved ground surface outside the building, respectively.

A Phase II Comprehensive Site Assessment Report was submitted to the DEP on April 2003 for the disposal sites linked to Parent RTN # 1, and for the asbestos disposal site (RTN # 2 ).

Therefore, and as documented in the RAM Status and Completion Reports, and in the IRA Status and Completion Reports, and as summarized in the Phase II Comprehensive Site Assessment Report, completion of the response actions has successfully removed all sources of oil or hazardous materials.

Pursuant to the provisions of the MCP, 310 CMR 40.0000, a Method 3 Risk Characterization was performed by subcontracted Risk Co. (RiskCo) to characterize the risk to health, public welfare and the environment at the disposal sites to which RTNs # 1 and # 2 apply. In summary, the results of RiskCo's Risk Assessment indicated that conditions at all of the disposal sites on the school Property present a condition of No Significant Risk to human health, welfare and the environment under current and forseeable future site conditions.

However, to conservatively manage the possible future disturbance of soils, an Activity and Use Limitation (AUL) has been recorded for the asbestos disposal site (RTN # 2 ) to inform current and future Property owners of consistent and inconsistent activities within the area subject to the AUL. A copy of the AUL is attached as Appendix D. Exhibit B of the AUL is a sketch showing the area of the Property to which the AUL is applicable.

Based on the completion of RAM and IRA actions, the requirements of a Class A-2 RAO under 310 CMR 40.1000 have been met for RTN # 1. The requirements of a Class A-3 RAO have been met for RTN # 2. Sources of release have been eliminated. A Level of No Significant Risk has been achieved for all of the identified releases, no exceedances of UCLs have been indicated by chemical testing, and no on-going operation, maintenance or monitoring is required.

We trust that the above is sufficient for your present requirements. Should you have any questions concerning the enclosed, please do not hesitate to call us

Very truly yours,

*LSP*

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Table 3: Soil Gas Results, April and June 2000

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**APPENDICES**


Appendix A: Limitations

Appendix B: Tank Removal Documents

Appendix C: **RiskCo's Method 3 Risk Characterization**

Appendix D: Copy of AUL for RTN # 2

**PURPOSE AND SCOPE**

The purpose of this report by **LSP Company (LSPCo.)** is to present documentation to support the RAO for the releases of VOCs, petroleum hydrocarbon and PCBs to which RTN **# 1** applies, and the RAO for the asbestos disposal site to which RTN **# 2** applies.

Refer to the Project Location Plan, **Figure 1**, for the general Property locus.

These services were performed and this report was prepared in accordance with the authorization of **the PRP Group.**

Response actions were performed and the RAOs were prepared pursuant to the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act (MGL Chapter 21E) and pursuant to the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Based on the results of a Method 3 Risk Assessment, a permanent solution with a level of No Significant Risk has been achieved for RTN **# 1,** and RTN **# 2.** Property conditions could not be restored to background, but no AUL is required and therefore a Class A-2 RAO applies to the disposal sites linked to RTN **# 1.** Property conditions could not be restored to background and since an AUL has been recorded on the Property deed at the Registry of Deeds for the asbestos disposal site, a Class A-3 RAO applies to RTN **# 2** .

**BACKGROUND AND REGULATORY STATUS**

The Property consists of five parcels of land that are now occupied by a new City Middle School and Community Center building. The parcels are shown on **Figure 2A**. Current Property conditions are shown on **Figure 2B**. Investigations conducted at the Property indicated the presence of distinct, and separate areas of soil and/or groundwater contamination on each of the five parcels. During the course of site remediation, three additional areas of contamination on

the Property resulting in a total of eight (8) releases of oil and/or hazardous materials being identified at the subject Property.
**Area 4A is the area associated with the primary RTN (1).**
Subsurface investigations performed prior to construction uncovered indications of underground storage tanks (USTs) in several parts of the Property. The tank uncovered in test pit TP-202 in Area 4A, located on the parcel at **Site** Avenue, indicated evidence of a release of oil and hazardous materials that required notification of the DEP. The release was reported to the DEP on March 2000 as a 72-hour release. DEP assigned RTN **# 1** to the release and approved performance of IRA. The IRA Completion Report concluded that neither Imminent Hazard conditions nor the presence of a Critical Exposure Pathway existed at the Property but that additional response actions were required to assess and remediate the release(s) of chlorinated solvents and petroleum hydrocarbons.

Subsurface investigations also indicated the presence of levels of Extractable Petroleum Hydrocarbons (EPH), Volatile Petroleum Hydrocarbons (VPH) and/or PCE above Reportable Concentrations on each of the other parcels. Our investigations indicated that these represented distinct and separate releases, therefore separate Release Notification Forms (RNFs) were submitted to the DEP on July 2000. The DEP assigned RTN **# 3** to the release of petroleum **at Area 3 other** hydrocarbons at **Area 4A on Site** Avenue, RTN **# 4** to the release of petroleum hydrocarbons and chlorinated solvents at **Area 2 on Site** Avenue and RTNs **#5 and** to the release of petroleum hydrocarbons at **yet another section of Site Avenue.**

A Phase I Report and Numerical Ranking Scoresheet indicating that the site was a Tier II site was submitted to DEP on March 2000. The four (4) additional releases that had been identified by that date (RTNs **# 3, # 4, # 5, and # 6 )** were linked to the first RTN, **# 1,** Subsequent subsurface investigations indicated the presence of a total of two (2) additional separate releases of VOCs, petroleum hydrocarbons and/or PCBs to soils and/or groundwater

on the school Property, and these releases were also linked to RTN # 1.

The additional releases did not change the Tier II classification.

**Area 2-PCBs was RTN # 7; two USTs in main area were RTN # 8.**

In December 2001, an additional, unsuspected, UST (Tank #1) was uncovered. **(RTN # 8). in the area of the primary site.** Chemical testing of soil samples obtained from the tank excavation indicated the presence of EPH above the DEP's RCS-1 thresholds. This release was therefore reported to the DEP on January 2002.

**All the releases except Asbestos were** linked to RTN # 1. . A RAM Plan Modification was also submitted to the DEP on January 2003 to include response actions for the new RTN under the RAM.

Response actions for the VOC and petroleum hydrocarbon releases were performed under a verbally approved IRA Plan and a RAM Plan and Modifications, and in accordance with DEP's Letter of Conditional Approval of the RAM Plan issued on April 2001. Remedial response actions for the releases under RTN # 1 were completed under a RAM Plan and subsequent modifications. Remediation was completed prior to the commencement of building construction.

The presence of discrete pieces of asbestos-containing materials (ACM) was reported to BWSC on May 2001 as "a release of any oil and/or hazardous material, in any quantity or concentration, that poses or could pose an Imminent Hazard..." The DEP assigned RTN # 2 to the asbestos release and verbally approved the performance of IRA activities to address the release. The asbestos release was addressed under an IRA Plan and subsequent modifications, and also under an Abatement Plan approved by BWP and in accordance with BWP's inspections.

An IRA Completion Report was submitted to the DEP on August 2002. As detailed in the IRA Completion Report, asbestos impacted soil was excavated, transported from the Property and disposed as ACM. No asbestos impacts to air were identified during monitoring that was performed during the IRA activities.

A Phase I Initial Site Investigation Report and a Tier II Classification for the asbestos disposal area (RTN # 2 ) were submitted to the DEP on May 10, 2002.

A Phase II Comprehensive Site Assessment Report for both RTN # 1 and RTN # 2 was submitted to the DEP on April 2003.

**SITE AND LOCUS DESCRIPTION**

The Property is bounded by **Site** Avenue to the west, **a** Playground to the north, railroad tracks to the east, and **another** Street to the south. The school Property is trapezoidal in shape and measures about 860 feet along **Site** Avenue, 290 feet along its boundary with **a city** Playground, 1060 feet along the existing railroad tracks, and 290 feet along **Adjacent** Street. The Property includes the **other five parcels as well.**

The ground surface across the project Property prior to construction was generally relatively level with surface grades varying from about Elevation +65 to Elevation +70. Former buildings on the Property have been demolished. With the approval of BWP, the former structures were crushed on-site and re-used as on-site fill material. Pre-construction activities included removal of subsurface structures concurrently with removal of contaminated soil from depths ranging from about six (6) to about fifteen (15) feet below existing grade. Excavations were backfilled with on-site material from obtained outside the release impacted areas, recycled on-site demolition debris as approved by BWP, and with material from off-site sources.

The Property and surrounding areas are serviced by municipal utilities including gas, water, sewer and electricity. A 25-foot wide **municipal** Water and Sewer Commission sewer easement was formerly located through the central portion of the Property parallel to **Site** Avenue and the railway. A "T" connection branched from the sewer easement on the

northern side of the existing building located at Site Avenue, and extended east under the railroad tracks. According to city Water and Sewer Commission Plans, the easement contained a 66-inch sewer, a 15 -inch sewer, and a water main. According to City "as-built" drawings, prior to Property reconstruction, the invert of the 66-inch sewer was located approximately 9 to 15 feet below the existing ground surface and the sewer flowed north to south.

The sewer and water lines were relocated during site preparation activities. The sewer and water lines are now located in a new easement along the eastern Property boundary .

Fill material from an off-site source was placed to a depth of at least 2 to 3 feet across the entire Property on completion of RAM excavations and of pre-construction preparation.

The new school and community center consist of a three story building. The southern half of the building has a 6-inch thick concrete slab on grade that is underlain by Preprufe 300R, an HDPE membrane. The northern half of the building has a 12-inch thick structural slab that is underlain by a 6 mil polyethylene vapor barrier. The top of the slab is at Elevation +70.25, referenced to the City Base.

The building covers most of the Property. Current site conditions are shown on **Figure 2B, Current Site Conditions.** Paved driveways, walkways and parking areas cover most of the remainder of the Property. In general, very limited landscaped beds and lawn areas are located adjacent to the walls of the building and along the outside Property margins. Final surface elevations outside the building typically range from Elevation +68 to +70.25. Given that at least 2 to 3 feet of off-site fill was placed over the entire Property, the top of the existing fill materials that were left in place is at or below about Elevation +66 to +68.

**SITE HISTORY**

The history of the Property was presented in the Phase I report for RTN #1 , submitted to the DEP on March 2001. In summary, it appears that the Property was undeveloped prior to about 1900. Much of the Property was the location of small industries from approximately 1900 to 2001. Businesses formerly located on the Property included a machine shop, a dye house, a bakery, a carburetor company and a wire company that manufactured cold rolled steel.

Between 1950 and 1989, the wire company buildings at **two locations on Site** Avenue were demolished and these parcels remained vacant until the commencement of site preparation for school construction. All other buildings on the school Property were demolished in 2001. The linked buildings at **the other part of Site** Avenue were formerly the location of the bakery and its garage, and the carburetor company. Most recently the buildings housed a variety of small businesses which appeared to use the building primarily for storage. **One business was already vacant when site preparation for school construction began.**

From 1933 to 1953, **one** building housed **a commercial** Dye House. Prior to pre-construction activities, the paved yard in front of **one of the** building was used by a school bus company for parking. Historical maps do not indicate any buildings on the parcel at the corner of **Site** Avenue and **adjacent** Street. The parcel was most recently used as a parking lot for the Dye House and **other** businesses.

**SITE HYDRO-GEOLOGICAL CHARACTERISTICS**

To investigate subsurface conditions at the Property prior to redevelopment, borings and test pits were completed on the Property during 2000. The following generalized description of subsurface conditions at the Property is based upon available information obtained from subsurface explorations and pre-construction activities.

**Subsurface Conditions**

Details of the subsurface conditions encountered in the borings and test pits completed prior to pre-construction activities are documented in the

boring and test pit logs that were included in the RAM Plan submitted to the DEP in February 2001.

The explorations documented the presence of five (5) stratigraphic units. The main strata identified below the brush vegetation or bituminous concrete pavement covering the Property were fill material including remnants of former buildings, peat, glacial outwash, glacial till and bedrock. The granular fill typically extended to about 1.5 to 11 feet below the existing ground surface. Below the fill, test pits at some locations encountered discontinuous horizons of organic silt/peat and/or a glacial outwash material. At other locations, the fill was underlain directly by a glacial till consisting of a compact to dense, grey, silty, gravelly sand with occasional cobbles and boulders.

The explorations indicated that the top of the glacial till deposit was present at depths ranging from about 2 to 14 feet below the existing ground surface, corresponding to about Elevation +52 to Elevation +65.

Bedrock was encountered at many locations. Where encountered, the surface of the bedrock was measured at depths ranging from 3 to 15.5 feet below the existing ground surface corresponding to Elevation +53.5 to Elevation +63. Bedrock consists of part of the Roxbury conglomerate formation.

Selected borings were completed as observation wells. Groundwater level monitoring during pre-construction activities indicated groundwater at levels ranging from 5.3 to 9.2 feet below the existing grade, corresponding to elevations ranging from about +57.4 to +61.8.

Well gauging prior to construction indicated groundwater flow in a west to east direction in the western half of the Property and from east to west in the eastern half of the Property. Generally, groundwater flowed towards the sewer easement that bisected the Property from north to south and then followed the sewer line in a southerly direction.

Pre-construction groundwater measurements also indicated that groundwater flow in bedrock on the Site Avenue and Adjacent Street parcels is to the south or southeast.

Areas excavated for construction and/or for remedial purposes were backfilled as required with fill material typically consisting of a fine sand with some silt and gravel. The fill material was obtained either from non-impacted on-site areas, from on-site crushing operations, or was imported from off-site sources. A minimum of 2 to 3 feet of imported fill material was spread across the surface of the Property.

**AREAS OF CONTAMINATION AND RESPONSE ACTIONS**

Details of the chemical test results obtained prior to performance of the RAM and the IRAs were included in the RAM and IRA reports and in the Phase I and II Reports submitted to the DEP.

In summary, a total of 91 samples of fill and underlying natural materials were chemically tested for the presence of VOCs, 17 samples were tested for the presence of VPH, and 34 samples were tested for the presence of EPH prior to the commencement of construction activities. In addition, eleven samples were tested for the presence of poly-aromatic hydrocarbons (PAH) and lead prior to construction. Testing indicated the presence of PAH in 5 out of 7 fill material samples and lead in 1 out of 6 samples of the fill material above the DEP's applicable reporting thresholds. The PAH and lead are attributable to the observed presence of ash and cinders in the fill material and were excluded from reporting in accordance with the MCP. Furthermore, the detected PAH and lead levels are generally consistent with DEP's background concentrations for soils containing coal ash and wood ash published in April 2002 and titled "Technical Update: Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soils"

Pre-RAM sampling locations are shown on **Figure 3** and chemical test results are summarized in **Table 1**. Results of pre-construction soil gas and groundwater testing for VOC and/or petroleum hydrocarbons are

summarized in **Tables 2** and **3**. Laboratory data was included with reports previously submitted to DEP.

In summary, eight releases of OHM identified on the Property were limited in both horizontal and vertical extent and emanated from different sources. All of the RTNs that have been assigned to the Property, and the response actions completed for the releases are summarized in the table below. Completion of the RAM and IRAs has successfully removed all sources of OHM.

## RESPONSE ACTION SUMMARY

| RTN | Address | Primary Contaminants of Concern | Area ID | Response Actions | Material Removed From Site[1] | Figure # |
|---|---|---|---|---|---|---|
| # 1 Parent RTN | 31 Site Avenue | EPH, VPH & chlorinated solvents in soil & groundwater | Area 4A | Assessment-only IRA & RAM | 7,688 | Figure 7 |
| # 3 Linked RTN | 33-35 Site Avenue | EPH & VPH in soil & groundwater | Area 3 | Additional Testing | 0 | Figure 6 |
| # 4 Linked RTN | 39-43 Site Avenue | EPH, TPH & tetrachloroethene in soil | Area 2 | RAM | 1,626 | Figure 5 |
| # 5 Linked RTN | 55 Site Avenue | TPH in soil | Area 1 | RAM | 172 | Figure 4 |
| # 6 Linked RTN | 48 Adjacent/ 31 Site | Chlorinated solvents in soil & groundwater | Area 4B | RAM | 2,773 | Figure 8 |
| # 7 Linked RTN | 39-43 Site Avenue | PCBs in soil | Area 2 | RAM | 17 | Figure 5 |
| # 8 Linked RTN | 55 Site Avenue | EPH in soil | UST #1 and #2 | Assessment | 0 | Figure 10 |
| # 2 Not Linked to Parent RTN | 39-43 & 55 Site Avenue | Asbestos in soil | Demarcated Asbestos Area | IRA | 3,000 | Figure 9 |

[1] Volumes are in cubic yards

1. Soils in Area 1, RTN# 5 - TPH (**Figure 4**), located on the parcel at 55 Site Avenue, were impacted by petroleum hydrocarbons released from USTs that were located in the center of the impacted area. The USTs, the surrounding concrete structure and impacted soils were removed under the RAM.

2. An unsuspected tank containing petroleum products was removed from the parcel at 55 Site Avenue during preparation for construction (RTN# 8-USTs ). Chemical testing of limit samples indicated an exceedance of reporting thresholds for C11-C22 aromatics in one sample, but results of testing of the remainder of the limit samples were all below applicable cleanup thresholds.

   Soil samples obtained at the limits of a second UST uncovered in this area did not indicate the presence of reportable levels of EPH.

3. Soils in Area 2, RTN#4 (mixed) located on the parcel at 39-43 Site Avenue, were impacted by petroleum hydrocarbons and VOC from a tank that was removed from the limits of this area (**Figure 5**), and also possibly from tanks that may have been removed from this area prior to the City's ownership, as indicated by the presence of unconnected fill pipes. Soils in the eastern half of Area 2 were impacted by petroleum hydrocarbons from a concrete vault and from a concrete-filled tank (**Figure 5**). The tanks, vaults and contaminated soil were removed under the RAM.

4. In addition, a small part of Area 2 on the parcel at 39-43 Site Avenue, was impacted by the presence of PCBs, RTN # 7 from an unknown source. The soils were removed under the RAM.

5. Soils in Area 3, RTN # 3 (**Figure 6**), located on the parcel at 33-35 Site Avenue, were believed to have been impacted by petroleum hydrocarbons from USTs. The USTs were removed

under the RAM. Chemical testing indicated that soils were below risk-based cleanup standards and therefore no contaminated soils were removed under the RAM.

6. Soils and groundwater in Area 4A. RTN # 1 (main) (**Figure 7**), located on the parcel at 31 Site Avenue, were impacted by VOC and petroleum hydrocarbons released from USTs as well as from historical use of petroleum products and chlorinated solvents. One UST was removed under the initial IRA; other USTs were removed under the RAM. Contaminated soils were removed under the RAM.

7. Soils and groundwater in Area 4B, RTN # 6 (**Figure 8**), located along the boundary between 48 Adjacent Street and 31 Site Avenue, were primarily impacted by VOC from an unknown source, but the VOC were likely related to historical use and surficial spills of chlorinated solvents. Contaminated soils were removed under the RAM.

8. ACM was identified in soils only on the parcels at 39-43 and 55 Site Avenue in the area identified as the Demarcated Asbestos Area on **Figure 9**. The source of the asbestos appears to have been building demolition debris that had been dumped on the northern end of the Property prior to the City's ownership. Some of the demolition materials from buildings formerly located in the northern part of the Property that were demolished prior to the City's ownership of the Property may also have contained asbestos. The asbestos impacted area, is shown on **Figure 9** as the Demarcated Asbestos Area.

   As requested by the DEP, air testing to assess the potential for an Imminent Hazard, and dust suppression activities were performed. No asbestos was identified in air samples during IRA activities.

   The IRA activities resulted in removal of asbestos impacted fill materials from the disposal site to the extent feasible. In addition,

air testing performed during IRA activities did not indicate the presence of asbestos fibers in air.

Details of the re-use or disposal of the excavated material from each disposal site were included in the RAM and IRA reports.

**OTHER RESPONSE ACTIONS**

As a precautionary measure, installation of an HDPE membrane was included in construction specifications for the part of the building that was located in the area that had exhibited high VOC and/or petroleum levels prior to remediation. Details of the specifications were also included in a Plan Modification submitted to the DEP on August 2001. However, post RAM testing results indicated levels of VOC and petroleum hydrocarbons that were at least an order of magnitude below risk-based cleanup standards.

During performance of the RAM and preparation for construction, dewatering was required for a period of approximately three months. As required under an EPA dewatering permit that had been obtained for the site, construction dewatering discharge was tested on a weekly basis for the presence of selected chlorinated solvents, for benzene, toluene, ethyl benzene and xylenes (BTEX) and for Total Petroleum Hydrocarbons. One exceedance of the permit limits of 5 micrograms per liter (ug/l) for tetrachloroethene was reported at the start up of dewatering discharge, but did not recur after the addition of a second carbon filter to the treatment system. No other permit exceedances were observed and no sheen was reported on any discharge sample.

**RESULTS OF RESPONSE ACTIONS**

**Post RAM Soil Conditions Across the Property--Petroleum Hydrocarbons, PCBs & VOCs**

As detailed in the RAM Completion Report and in the Phase II Report, and as summarized in **Table 4**, completion of the RAM resulted in non detectable or low levels of the compounds of concern at the horizontal and vertical limits of the excavations. No UCL exceedances were indicated by chemical testing of soils remaining at the Property. Limit

sampling locations for each release area are shown on **Figures 4, 5, 6, 7, 8** and **10**.

All soil sampling locations remaining upon completion of the RAM are shown on **Figure 10**. The locations shown on **Figure 10** include samples obtained at the side and bottom limits of the RAM excavations as well as locations that were outside the identified release areas.

As shown in **Table 4**, results of chemical testing of nineteen (19) samples of materials remaining at the Property for the presence of VPH indicated that average concentrations for all three VPH fractions were well below the cleanup thresholds.

As shown in **Table 4**, results of chemical testing of seventy-seven (77) samples of soils remaining at the Property for the presence of EPH indicated average concentrations well below the applicable cleanup standards.

In addition, **Table 4** indicates that the results of chemical testing of 124 samples of soils remaining at the Property indicated average VOC concentrations across the Property well below the lower of the risk based Method 1 S-1/GW-2 or S-1/GW-3 Cleanup Standards.

One soil sample from a stockpile of excavated material from Area 2 at 39-43 **Site** Avenue indicated the presence of 2.31 mg/kg of Aroclor 1242/1016. Six confirmatory samples were obtained from the limits of the excavation from which the stockpiled soil had been removed were tested for PCBs. Chemical testing of these samples indicated PCB levels below the laboratory's detection limits (0.21 mg/kg up to 0.28 mg/kg) and well below the DEP's PCB cleanup standard of 2 mg/kg. All of the PCB results are summarized in **Table 5**. The location of the limit samples is shown on **Figure 5**.

**Post RAM Groundwater Conditions**

As the pre RAM monitoring wells were destroyed during pre-construction preparation/remediation activities, 8 new monitoring wells were installed at the Property in April 2002. Post-RAM monitoring well locations generally correlated with pre-RAM monitoring well locations. Due to continued construction activity, post RAM monitoring wells GW-3 and GW-6 were destroyed. However, replacement monitoring wells GW-3 RPL and GW-6 RPL were subsequently installed as closely as possible to the original locations. Four rounds of groundwater testing were performed between April 2002 and February 2003, after completion of remediation activities.

Results of chemical testing of groundwater samples obtained from 7 monitoring wells installed after completion of excavation activities are summarized in **Table 6**.

In summary, results of groundwater testing performed after completion of the RAM indicate levels of VOCs, VPH and EPH in groundwater that are either close to or below the DEP's Method 1 risk based GW-2 Cleanup Standards and well below the GW-3 Cleanup Standards in 6 out of 7 wells. No exceedances of UCLs were identified. Samples obtained from monitoring well GW-3 or GW-3 RPL indicated exceedances of the Method 1 GW-2 cleanup standards for vinyl chloride, C9 - C18 aliphatic hydrocarbons, C9 - C12 aliphatics and C9 - C10 aromatics in one or more rounds of chemical testing.

As shown by a comparison of **Tables 3** and **6,** the remedial response actions have successfully reduced levels of groundwater contamination. Further, a comparison of the results of post RAM chemical testing performed in April and May 2002, in October/November 2002 and in February 2003 indicate that, in general, the levels have continued to decline since the removal of contaminated soils and other sources.

The location of monitoring wells installed at the completion of the RAM and construction activities are shown on **Figure 11**. Laboratory data for

post RAM groundwater sampling was included with the Phase II Comprehensive Site Assessment Report submitted to the DEP on April 2003.

Completion of a risk assessment indicates that remediation has achieved a condition of No Significant Risk. As indicated above, installation of an HDPE membrane was included as a precautionary measure in construction specifications for the part of the new building that was located in the area that had exhibited high VOC and/or petroleum levels prior to remediation. However, post RAM testing results indicated levels of VOC and petroleum hydrocarbons that were generally well below risk-based cleanup standards. Details of the impermeable membrane were included in the RAM Status Report and RAM Plan Modification submitted to the DEP on August 23, 2001

**Post RAM Soil Gas Conditions**

To assess post RAM conditions at residential properties located on the west side of **Site** Avenue, a soil gas investigation was performed by **Subcontractor** Associates, Inc. in January 2003. Results of the soil gas investigation are summarized in **Table 7A**. Soil gas sampling locations are shown on **Figure 11**, and **Subcontractor's** report was included with the Phase II Comprehensive Site Assessment Report submitted to the DEP on April 2003.

As detailed in the Phase II Report, soil gas results obtained under worst case conditions during winter when the ground is frozen indicated residual levels of chlorinated solvents in soil gas do not pose an indoor air concern.

In summary, results of testing of soil gas samples obtained beneath the sidewalk near the residential properties indicated no detectable levels of vinyl chloride, 1,1-dichloroethene, 1,1-dichloroethane, 1,1,1-trichloroethane, 1,2-dichloroethane or TCE. Testing indicated a trace of cis-1,2-dichloroethene (cis-1,2-DCE) at three locations, the presence of

trans 1,2-dichlorethene (trans-1,2-DCE) at one location, and PCE at two locations.

Predicted indoor air concentrations for the compounds of concern that were reported in soil gas were calculated using published attenuation coefficients for soil gas to indoor air concentrations.

Based on the calculations documented in the Phase II Report, the predicted indoor air concentrations of vinyl chloride, PCE and 1,2-DCE are well below risk thresholds. Indoor air predictions for vinyl chloride are shown on **Table 7B**. Indoor air predictions for PCE are shown on **Table 7C**. Indoor air predictions for trans-1,2-DCE are shown on **Table 7D**.

**Post IRA Asbestos Conditions**

Under the asbestos IRA, the Demarcated Asbestos Area was subdivided into 36 grid cells for sampling for the presence of asbestos in soil and debris piles. Results of testing of the samples were used to determine proper re-use or disposal options for the materials. Sampling of debris piles and soil within the grid cells, and also beneath any pieces of material suspected of containing asbestos was performed according to the procedures agreed between **the PRPs, LSP Co, RiskCo** and DEP.

Based on the sampling and testing plan that was approved by BWP and BWSC, a total of 3,000 cubic yards of ACM was removed from the Property, transported and disposed of off-site. Based on the results of Polarized Light Microscopy (PLM) testing, ACM impacted materials were excavated, transported and disposed as ACM. Materials that were reported as none detected (ND) for asbestos were re-used in accordance with the IRA Plan and Modifications, and the Asbestos Abatement Plan, and with periodic inspections by BWP. No asbestos impacts to air were identified during monitoring that was performed during the IRA activities.

A total of 117 samples were tested by PLM during performance of the IRA. Of the 117 samples, 86 samples were obtained from the grid cells, 6 samples were obtained from locations outside the grid cells where ACM was suspected, and 25 samples were obtained from the deeper excavation for the swimming pool. In addition, of the 117 samples, 88 samples were reported not to show the presence of asbestos, 27 samples indicated the presence of a trace of asbestos and 2 samples indicated 2 % and 3 % of asbestos respectively.

Eighty-eight non-impacted samples did not require removal under the IRA. Only 6 samples obtained from three localized areas were left in place on completion of the IRA because it was not feasible to remove them. The samples left in place indicated a trace of asbestos. Difficult access and the presence of subsurface concrete obstructions at the limits of the excavation precluded additional excavation in these localized areas. One area is isolated beneath the floor of the swimming pool, one area is located at a depth of six feet or more below the 12-inch thick concrete floor of the building, and one is located at a depth of 8 feet below the current paved ground surface

Results of asbestos testing are summarized in **Table 8**. Sample locations are shown on **Figures 13** and **14**.

**BACKGROUND FEASIBILITY EVALUATION**

In accordance with the provisions of the MCP, the feasibility of approaching or achieving background contaminant levels at the Property was evaluated. The MCP defines background as those levels of OHM that would exist in the absence of the disposal site which are ubiquitous and consistently present in the environment at and in the vicinity of the disposal site of concern. In evaluating the feasibility of reducing the above residual contaminant levels in Property groundwater and soils to below background levels, the MCP broadly defines five specific criteria including (i) the availability of individuals with appropriate expertise, (ii) the availability of off-site land disposal facilities, (iii) property access/control constraints (for off-site sources of contamination), (iv) technological feasibility, and (v) an evaluation of cost to benefit.

In general, completion of the RAM and IRA resulted in low or no detectable levels of VOC, petroleum hydrocarbon, PCBs or asbestos in soils and/or groundwater. As documented in RAM and IRA reports, uncontrolled sources of contamination were removed, including numerous USTs, ASTs, and vaults and more than 15,000 cubic yards of contaminated soil. As indicated above, remaining soils across the Property indicated very low or no detectable levels of the contaminants of concern, and also, where applicable, average concentrations well below the DEP's risk based cleanup standards. Contaminated groundwater was also removed from the excavation, treated to meet standards established by the EPA's discharge permit, and discharged into a storm drain. Levels of the contaminants of concern in groundwater have also been improved by the removal of sources of contamination. However, low levels of some of the contaminants of concern remain in groundwater at the Property in excess of background levels.

Given the extensive remedial response actions conducted and the removal of source areas and since Property conditions have already achieved a condition of No Significant Risk, additional excavation to reach background would result in no appreciable improvement in Property conditions.

**RISK CHARACTERIZATION SUMMARY**

Pursuant to the provisions of the MCP, a Method 3 Risk Characterization was performed by **RiskCo** to characterize the risk to human health, safety, public welfare and the environment at the Property.

In summary, **RiskCo** concluded that a condition of No Significant Risk to human health, safety, public welfare and the environment has been achieved for the disposal sites to which RTN **# 1** and **# 2** apply under both current and foreseeable future use scenarios.

However, to conservatively manage the possible future disturbance of soils, an Activity and Use Limitation has been recorded on the property deed for the asbestos disposal site (RTN **# 2** ). The Notice of AUL

informs current and future Property owners of consistent and inconsistent activities within the area subject to the AUL.

A copy of the **RiskCo**Risk Characterization is attached in **Appendix C.** A copy of the AUL is included in **Appendix D.**

## SUMMARY AND CONCLUSIONS

The purpose of this report is to demonstrate that remediation of identified contaminants has achieved an RAO Statement for the petroleum hydrocarbon, VOC and PCB releases associated with RTN # **1** and also for the asbestos release, RTN # **2.**

The Property consists of five parcels of land that are now occupied by a new City **owned** Middle School and Community Center. The new building consists of a three story structure that occupies most of the Property together with paved walkways, driveways and parking areas. Landscaped areas are very limited in extent and cover less than 5 percent of the property. Prior to its acquisition by the City the Property had been occupied by numerous small industries since about 1900. All buildings formerly located on the Property were demolished.

Extensive subsurface investigations prior to and during preparation of the Property for construction of the new building indicated the presence of distinct, separate areas of soil and/or groundwater contamination across the five parcels. More than 20 potential sources of release, including USTs, ASTs, vaults and oil/water separators and 12,276 cubic yards of VOC, petroleum hydrocarbon and/or PCB contaminated materials were removed under an IRA Plan and a RAM Plan. Extensive remediation has been completed to address the releases.

The results of chemical testing of soil samples obtained from the limits of the impacted areas across the Property confirmed that contaminant levels had been reduced well below their applicable risk-based cleanup standards.

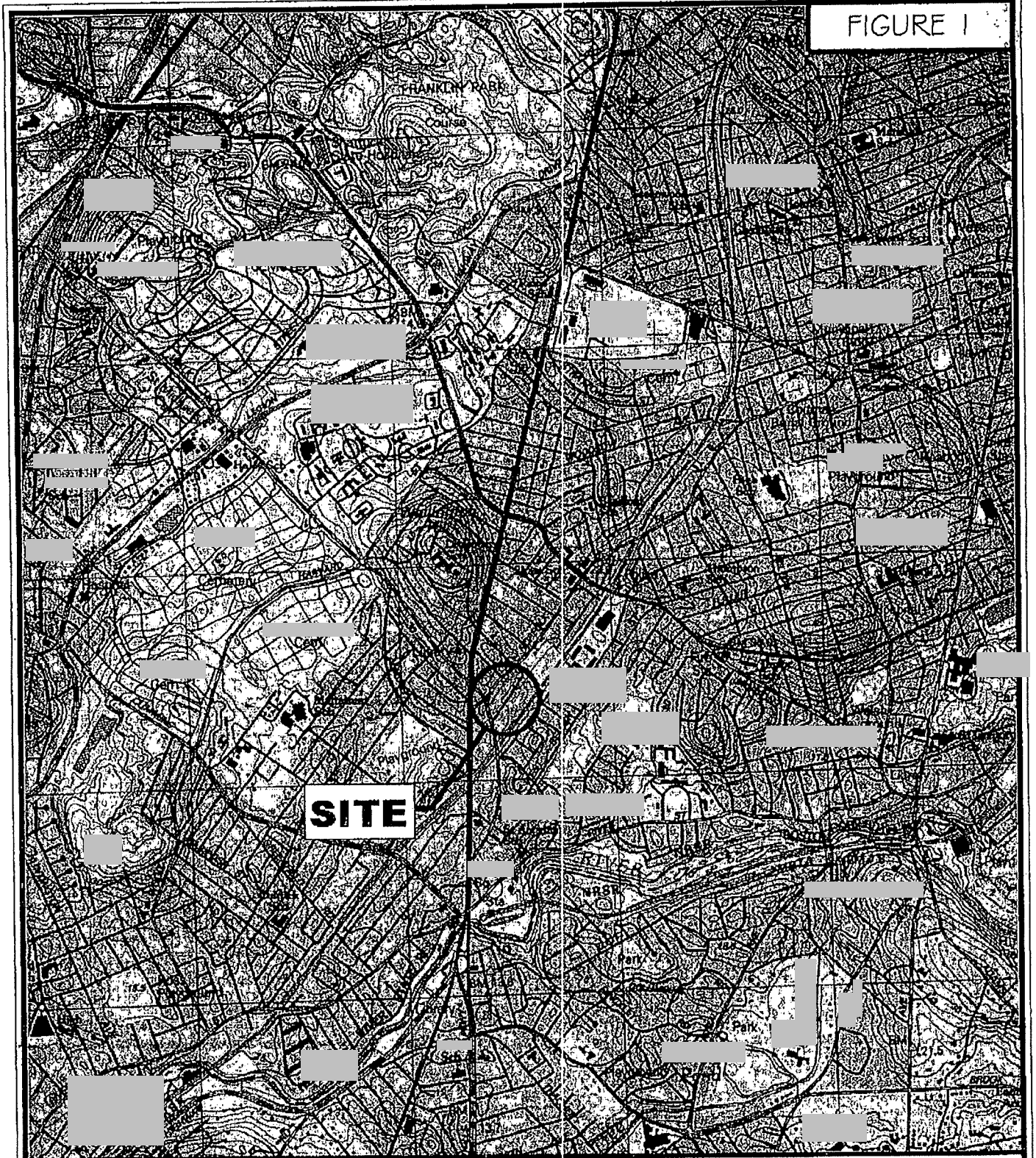
An asbestos release to soils in one part of the Property, was addressed under an IRA performed with the approval of both BWSC and BWP. No asbestos impacts to air were identified during the IRA activities. A total of 3,000 cubic yards of ACM was excavated, transported from the Property and disposed. Material containing trace levels of asbestos was left in place at three locations where difficult access precluded additional excavation. The remaining material is isolated beneath the floor of the building, beneath the floor of a swimming pool that was constructed in the Community Center, or is located at a depth of 8 feet below the paved ground surface outside the building.

Pursuant to the provisions of the MCP, 310 CMR 40.0000, a Method 3 Risk Characterization was performed to characterize the risk to health, public welfare and the environment at the Property from the releases to which RTN # 1 and # 2 apply. The Risk Assessment indicated that conditions at the disposal sites present a condition of No Significant Risk under current and foreseeable future conditions at the Property.

However, to conservatively manage the possible future disturbance of soils, an AUL has been recorded for the asbestos disposal site (RTN # 2 ) to inform current and future Property owners of consistent and inconsistent activities within the area subject to the AUL. A copy of the AUL is attached in **Appendix D**. The AUL includes Exhibit A-1, which defines the metes and bounds and Exhibit B, a Sketch Plan which depicts the portions of the Property which is subject to the AUL.

Based on the completion of RAM and IRA actions, the requirements of a Class A Response Action Outcome under 310 CMR 40.1000 have been met. Sources of release have been eliminated. A level of No Significant Risk has been achieved for all of the identified releases, no UCL exceedances exist, and no on-going operation, maintenance or monitoring is required. Remediation has met the requirements of a Class A-2 RAO for RTN # 1 Remediation of the asbestos release and the AUL subsequently recorded on the Property deed have met the requirements of a Class A-3 RAO.

FIGURE 1




N

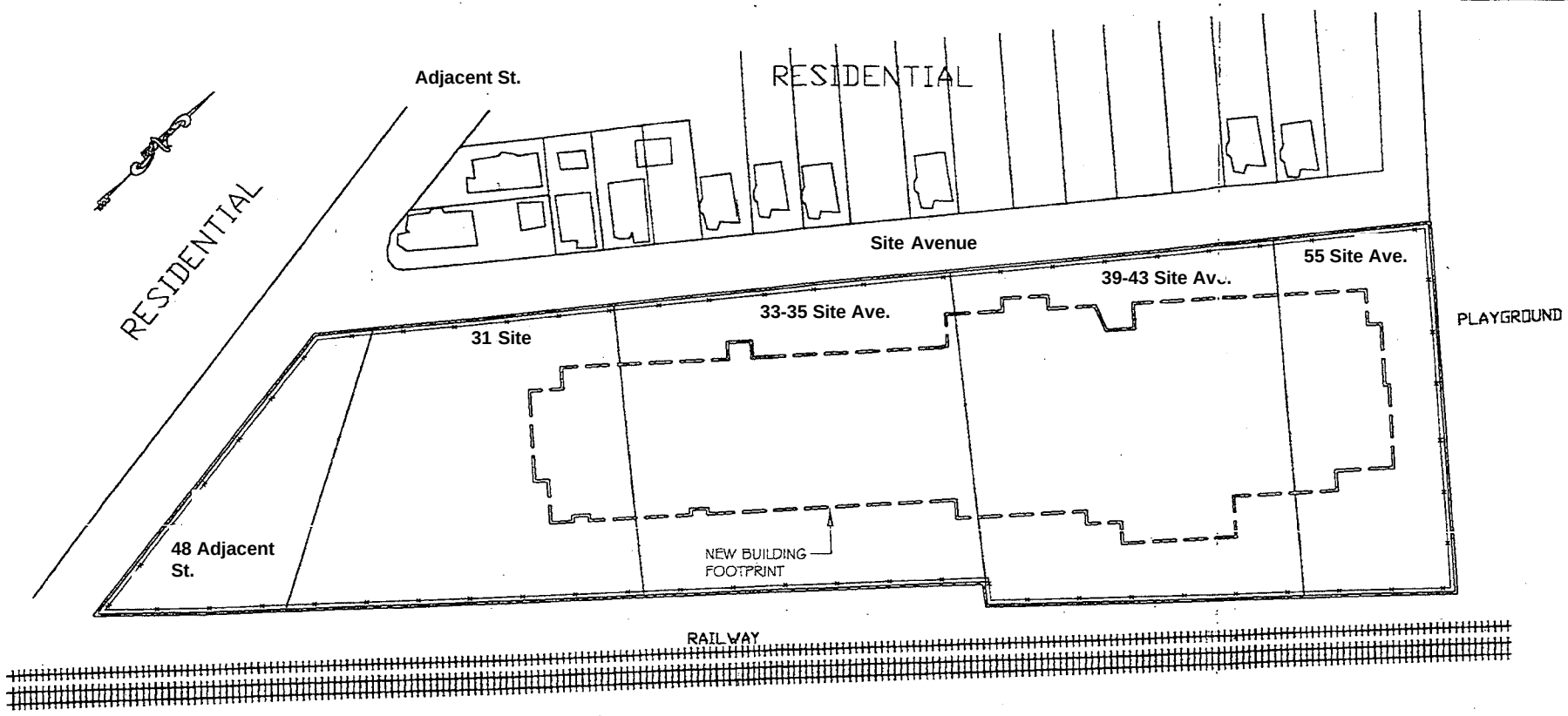
SCALE 1:25,000

# PROJECT LOCATION PLAN

27

MASSACHUSETTS

FIGURE 2A




LEGEND

PROPERTY BOUNDARIES

RAILWAY

FENCE

RESIDENTIAL

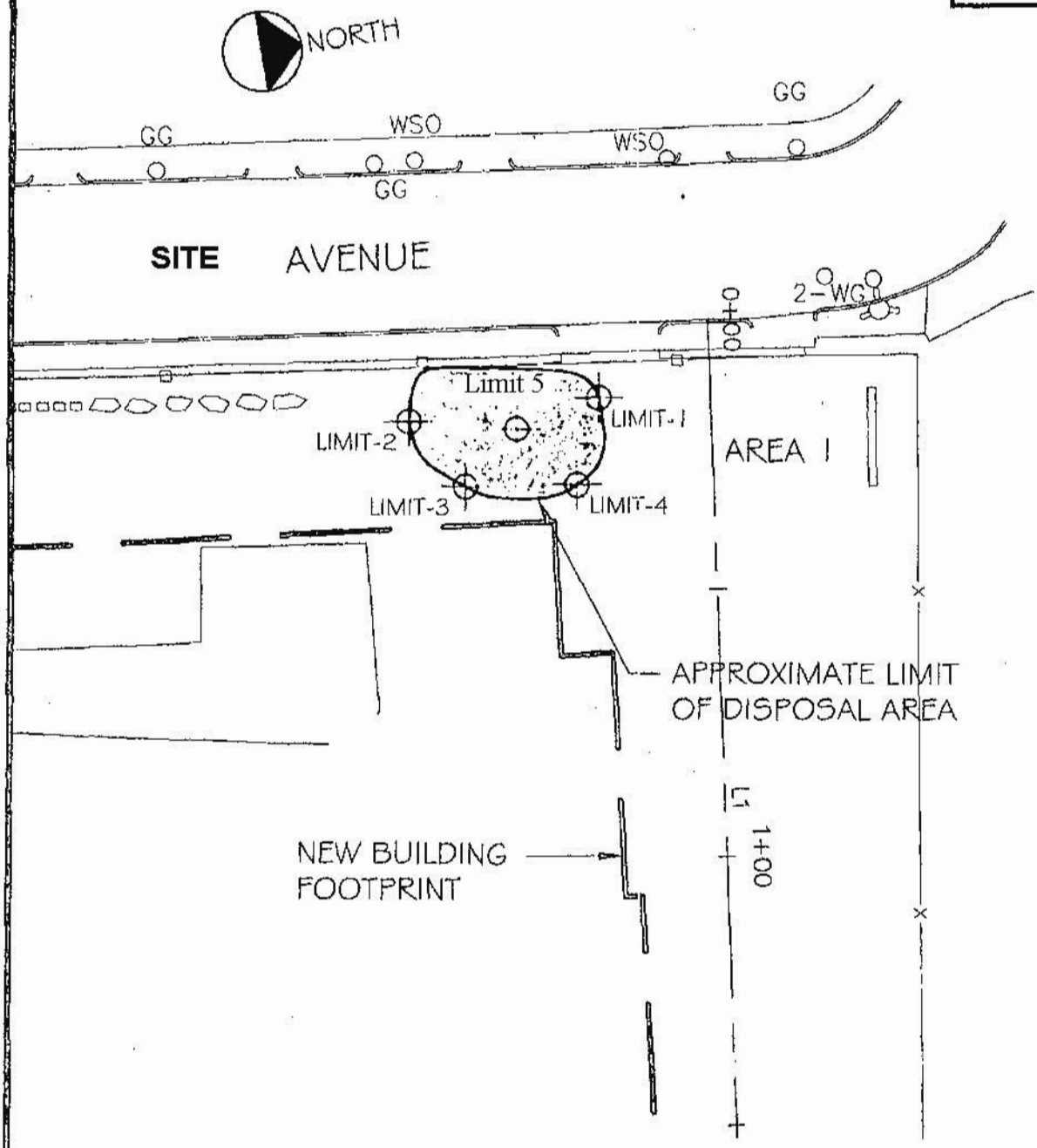
REFERENCE: THIS PLAN WAS PREPARED FROM A DRAWING ENTITLED "SITE PLAN" DATED SEPTEMBER 1999

MIDDLE SCHOOL PROPERTY
MASSACHUSETTS
AREA PLAN

Date: AUGUST 2003 | Scale: N.T.S.
Project No: 3590

FILE NAME: 3590-RAOP02A

FIGURE 4




LEGEND

— SAMPLES COLLECTED ON AUGUST 7, 2001

PROPERTY; RTN

MASSACHUSETTS

LIMIT SAMPLE LOCATION PLAN - AREA 1

FOR

AREA 1

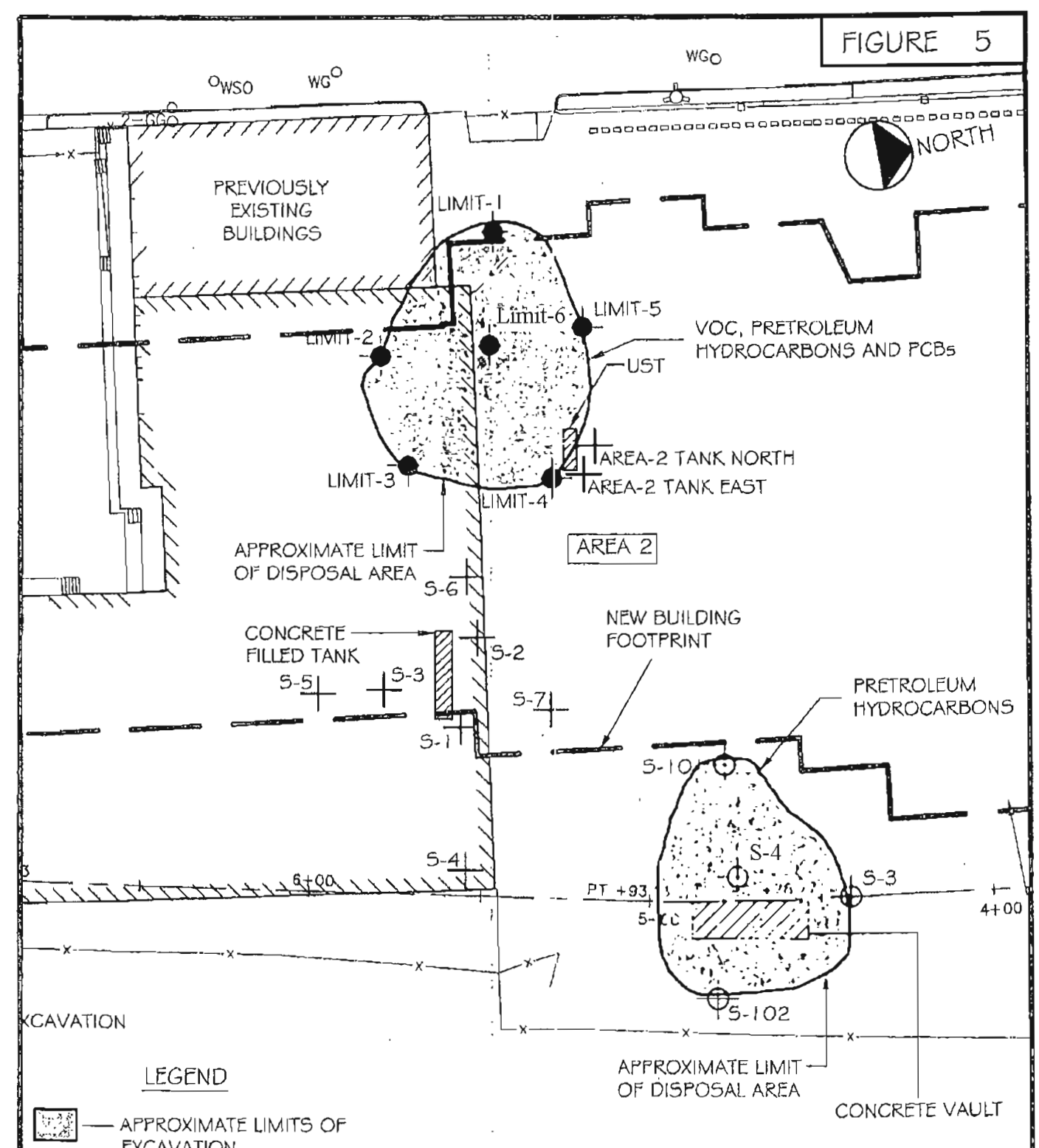
29

Date: AUGUST 2003

Scale: 1" = 40'

Project No: 3590

FIGURE 5




LEGEND

- APPROXIMATE LIMITS OF EXCAVATION
- SAMPLES COLLECTED IN MAY 25, 2001
- SAMPLES COLLECTED IN OCT. - SEPT. 2001
- SAMPLES COLLECTED ON SEPTEMBER 4, 2001

PROPERTY, RTN
# 1 MASSACHUSETTS

LIMIT SAMPLE LOCATION PLAN - AREA 2

AREA 2

30

Date: AUGUST 2003

Project No: 3590

Scale: 1" = 40'

FILE NAME: 3590-RAQ105

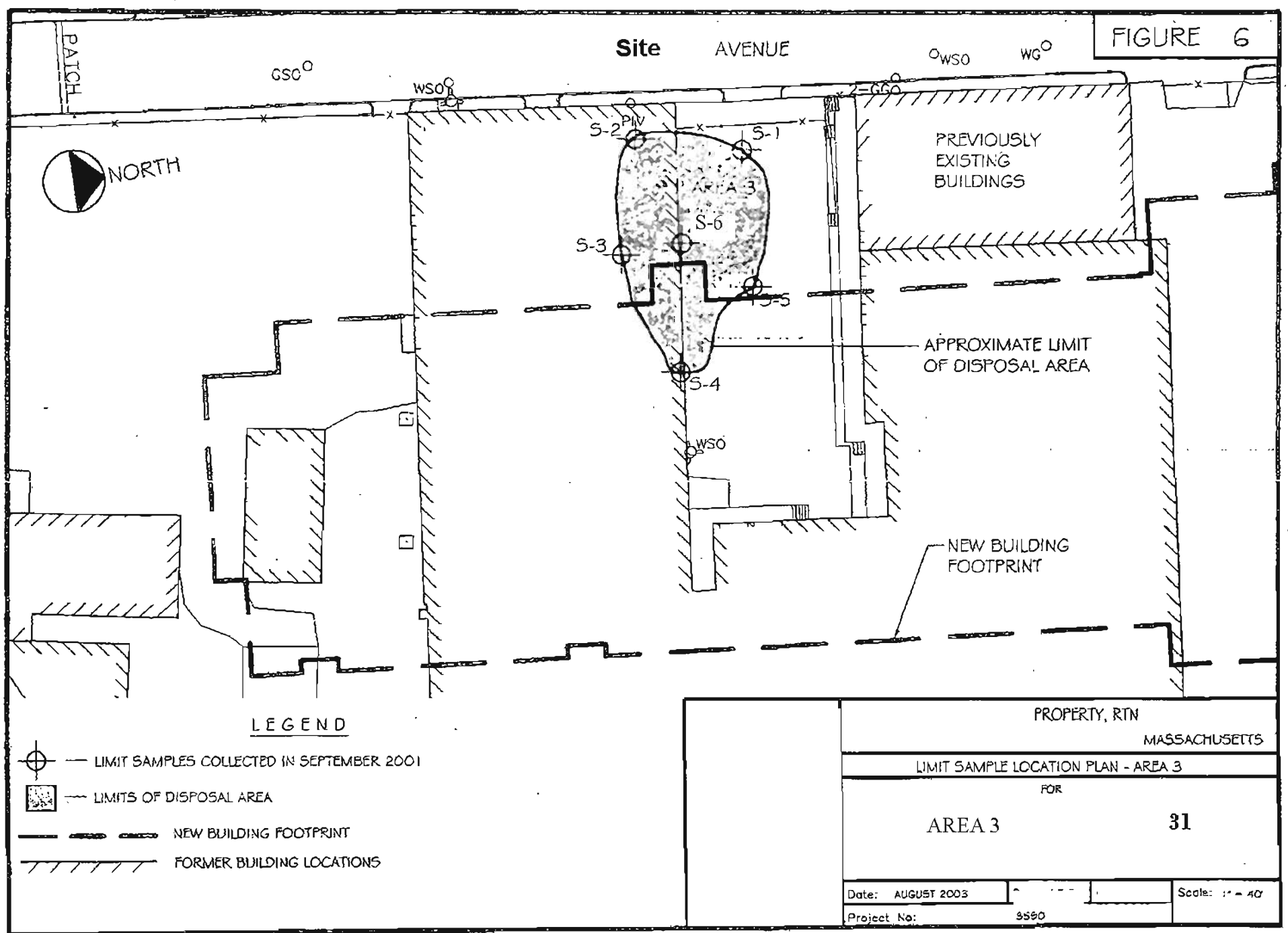
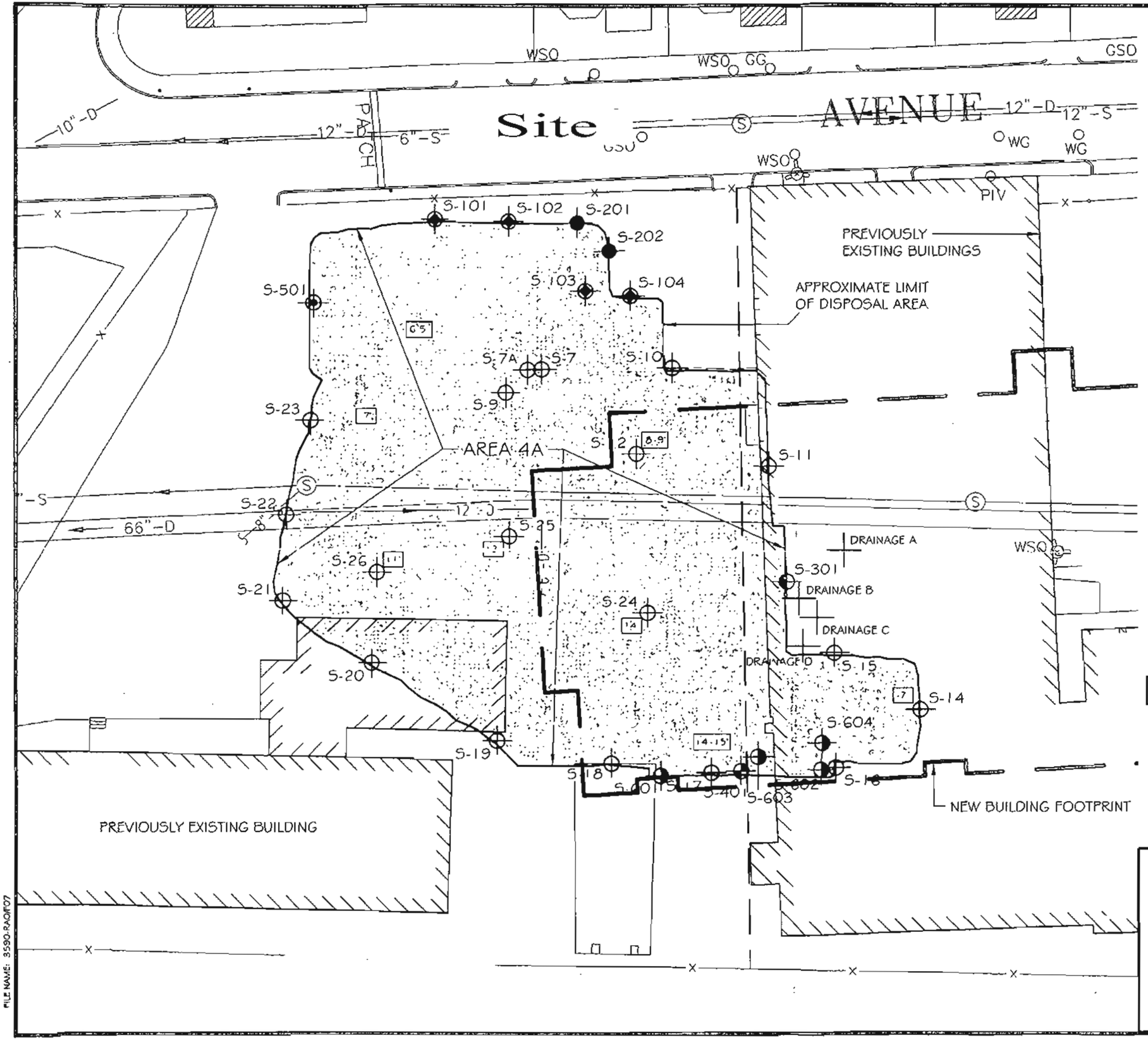


FIGURE 6
Site
AVENUE
PATCH
GSO
WSO
WSO
WG
GGO
NORTH
S-2
PIV
S-1
AREA 3
S-6
S-3
S-5
S-4
WSO
PREVIOUSLY EXISTING BUILDINGS
APPROXIMATE LIMIT OF DISPOSAL AREA
NEW BUILDING FOOTPRINT
LEGEND
LIMIT SAMPLES COLLECTED IN SEPTEMBER 2001
LIMITS OF DISPOSAL AREA
NEW BUILDING FOOTPRINT
FORMER BUILDING LOCATIONS
PROPERTY, RTN
MASSACHUSETTS
LIMIT SAMPLE LOCATION PLAN - AREA 3
FOR
AREA 3
31
Date: AUGUST 2003
Project No:
9590
Scale:

FIGURE 7




LEGEND

- — LOCATION OF LIMITS SAMPLES COLLECTED IN SEPTEMBER 2001
- — LOCATION OF LIMITS SAMPLES COLLECTED IN SEPTEMBER 2001
- — LOCATION OF LIMITS SAMPLES COLLECTED IN SEPTEMBER 2001
- — LOCATION OF LIMITS SAMPLES COLLECTED ON SEPTEMBER 28, 2001
- — LOCATION OF LIMITS SAMPLES COLLECTED ON OCTOBER 1, 2001
- — LOCATION OF LIMITS SAMPLES COLLECTED ON OCTOBER 2, 2001
- — LOCATION OF LIMIT SAMPLES COLLECTED ON OCTOBER 5, 2001
- — LOCATION OF SOIL SAMPLES COLLECTED IN OCTOBER 2001
- — APPROXIMATE LIMIT OF EXCAVATION

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000

Site AVENUE PROPERTY, RTN #1

MASSACHUSETTS

LIMIT SAMPLE LOCATION PLAN - AREA 4A

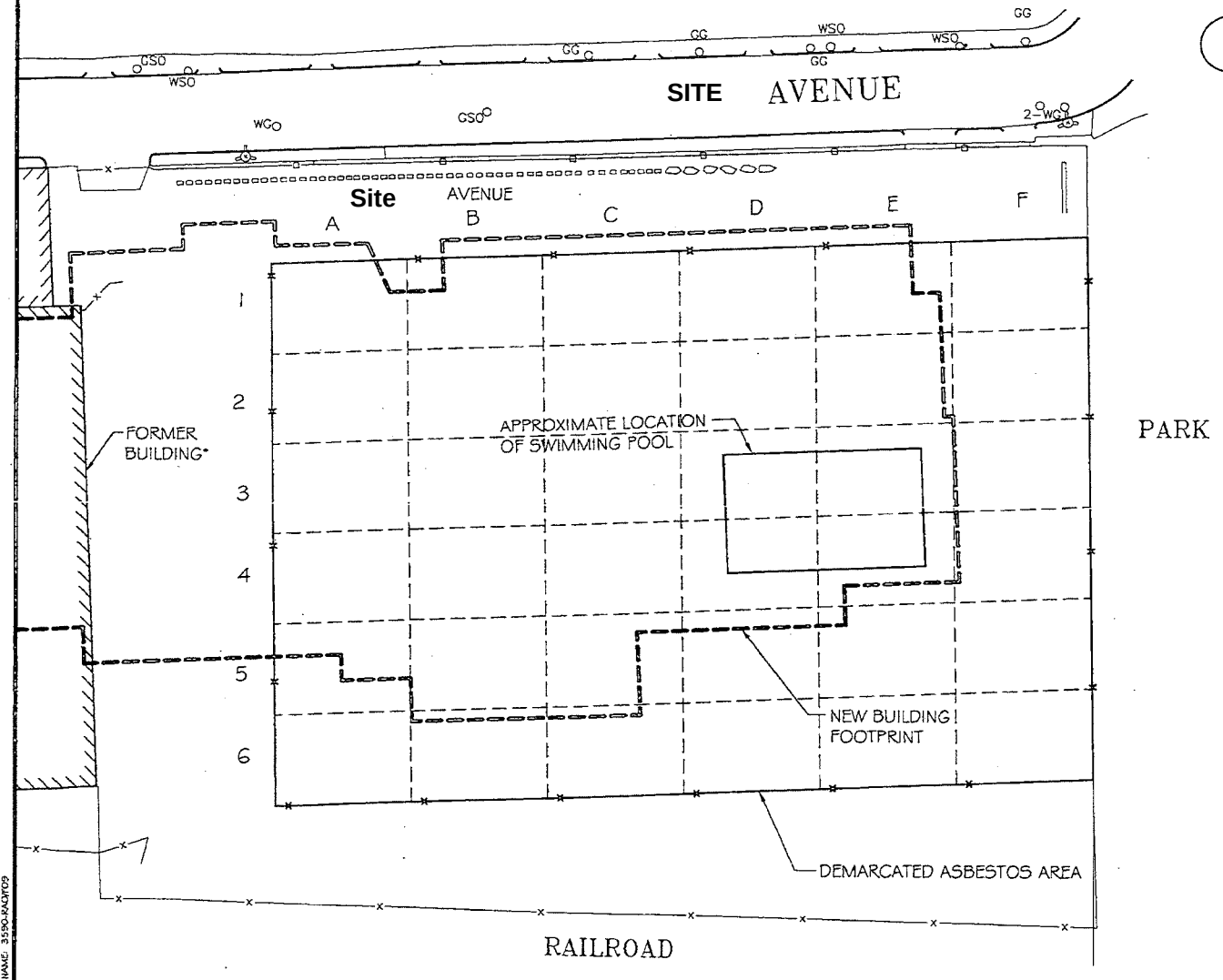
# AREA 4A

Date: AUGUST 2003 | Scale: 1" = 30'

Project No:

FILE NAME: 3590-RAOF07

FIGURE 9




NORTH

LEGEND

FOOTPRINT OF NEW SCHOOL BUILDING

LIMIT OF DEMARCATED ASBESTOS AREA

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000

*DEMOLISHED DURING SITE PREPARATION

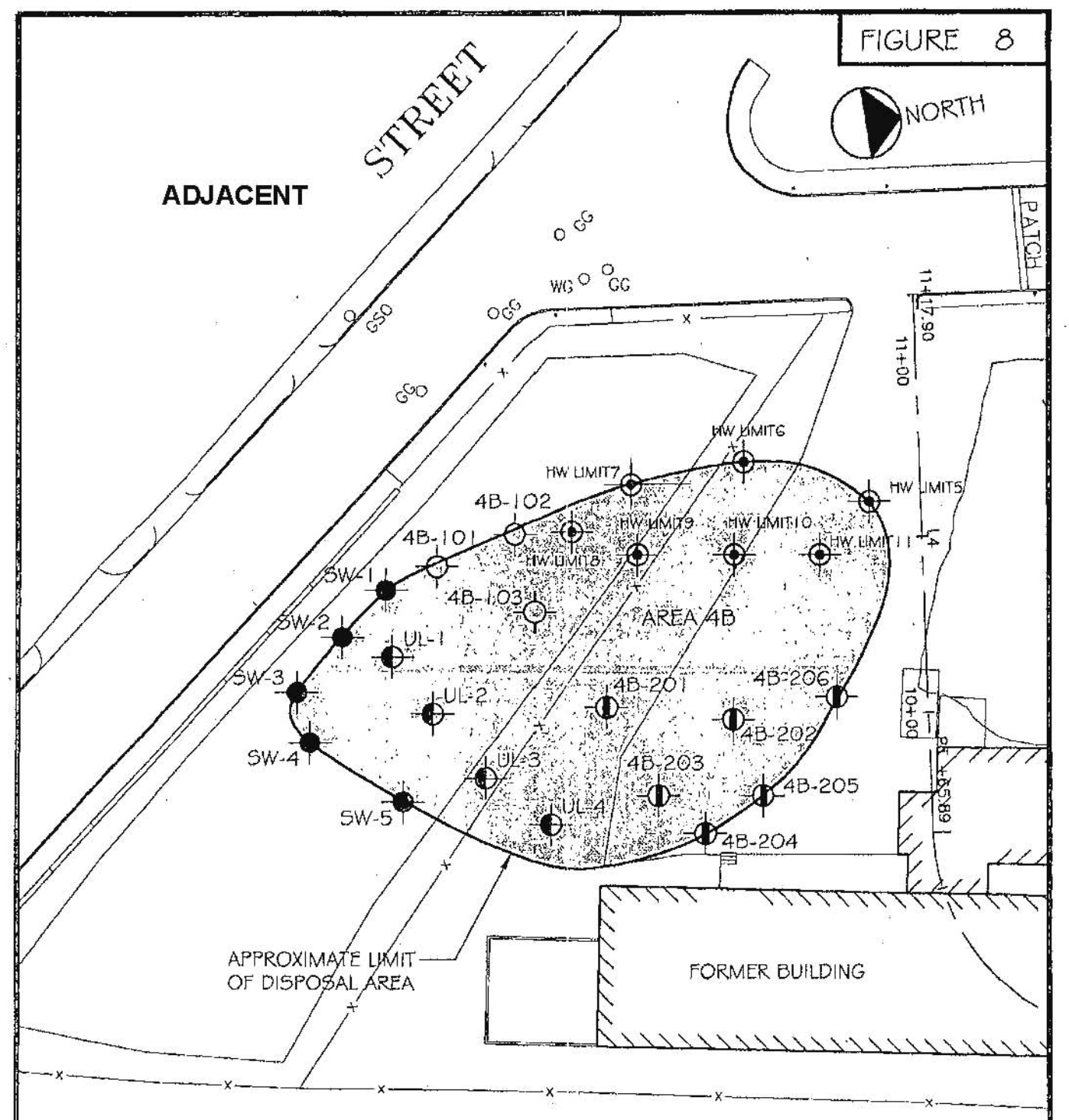
39 - 43 & 55 **SITE** AVENUE, RTN# **2**
MASSACHUSETTS

DEMARCATED ASBESTOS AREA

Date: AUGUST 2003 | Scale: 1" = 40'
Project No: 3590

FILE NAME: 3590-RAKYTO9

FIGURE 8




LEGEND

- SAMPLES COLLECTED ON MAY 17, 2001
- SAMPLES COLLECTED ON JULY 26, 2001
- SAMPLES COLLECTED ON JULY 12, 2001

PROPERTY, RTN # 1

MASSACHUSETTS

LIMIT SAMPLE LOCATION PLAN - AREA 4B

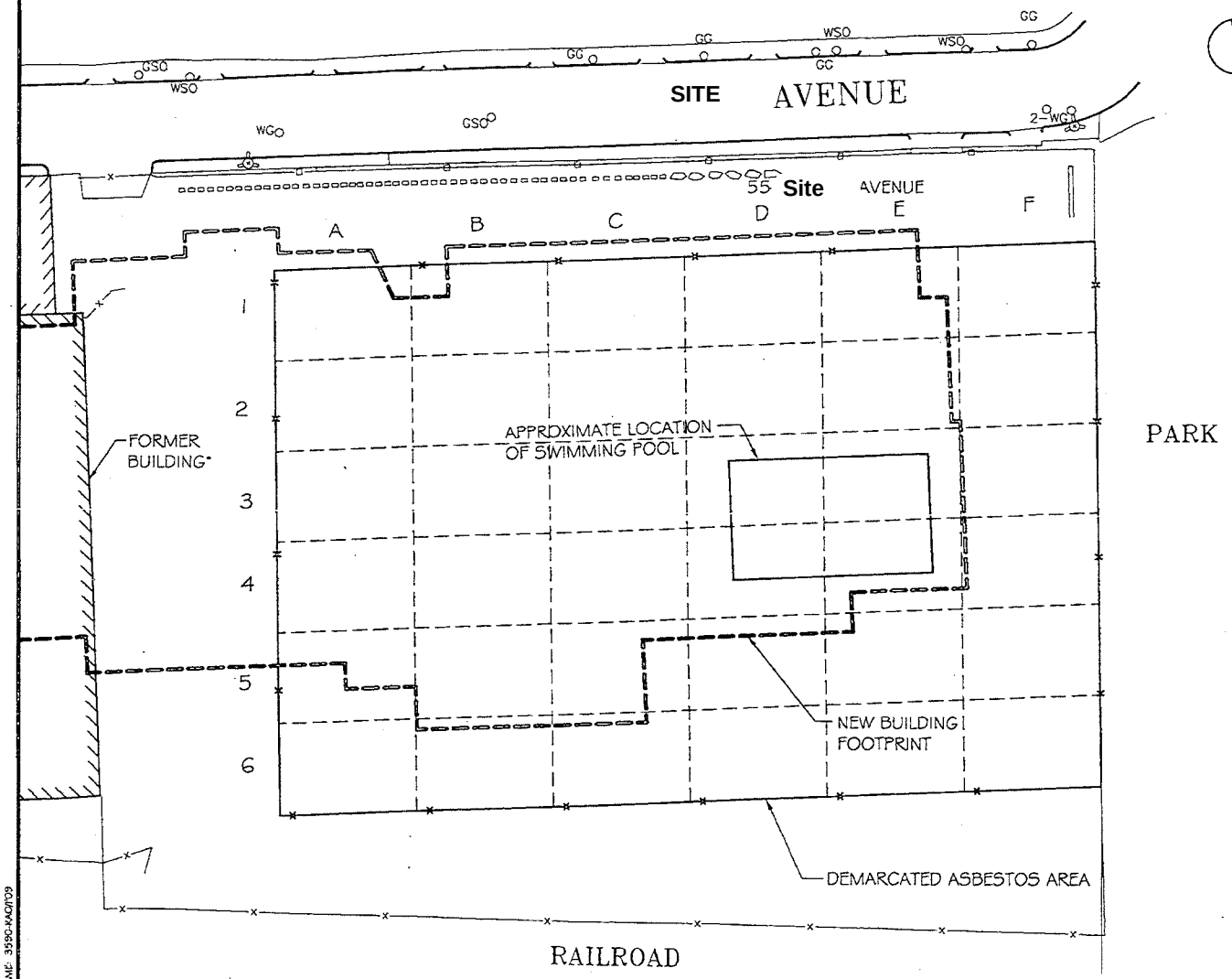
FOR

AREA 4B BY 34

| Date: AUGUST 2003 | Dwn: | Chkd | Scale: 1" = 40' |
|---|---|---|---|
| Project No: 3590 | | | |

FILE NAME: 3590-RAO.DGN

FIGURE 9




NORTH

LEGEND

FOOTPRINT OF NEW SCHOOL BUILDING

LIMIT OF DEMARCATED ASBESTOS AREA

*DEMOLISHED DURING SITE PREPARATION

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000

RTN # 1

MASSACHUSETTS

DEMARCATED ASBESTOS AREA

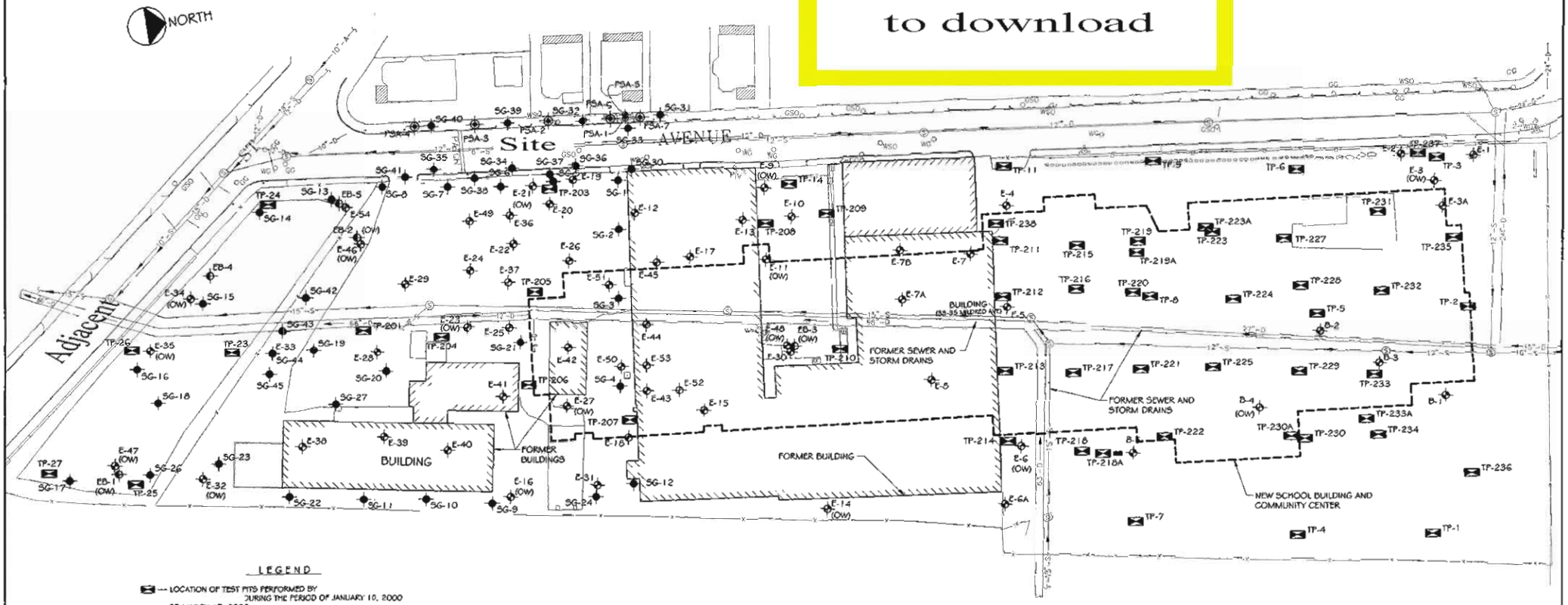
FOR

BY

| Date: AUGUST 2003 | Dwn | Chkd | Scale: 1" = 40' |
|---|---|---|---|
| Project No: 3590 | | | |

FILE NAME: 3590-KA09F09

Full-Scale (LARGE)version is available to download




LEGEND

- — LOCATION OF TEST PITS PERFORMED BY [illegible] DURING THE PERIOD OF JANUARY 10, 2000 TO MARCH 17, 2000
- — LOCATION OF SOIL BORINGS PERFORMED BY [illegible] DURING THE PERIOD OF APRIL 18 TO APRIL 26, 2000, JULY 12 TO JULY 18, 2000, AUGUST 2 TO AUGUST 15, 2000 & SEPTEMBER 12 TO SEPTEMBER 15, 2000
- — LOCATION OF ROCK WELLS PERFORMED BY [illegible] DURING THE PERIOD OF AUGUST 3 TO AUGUST 10, 2000 & SEPTEMBER 12 TO SEPTEMBER 15, 2000
- — LOCATION OF SOIL GAS PROBE PERFORMED BY DURING THE PERIOD OF APRIL 21, 2000 TO JUNE 25, 2000
- — LOCATION OF TEMPORARY MICROWELL BORINGS PERFORMED BY ON AUGUST 10 & 24, 2000

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED 'TOPOGRAPHIC PLAN' DATED FEBRUARY 15, 2000

Site

MASSACHUSETTS

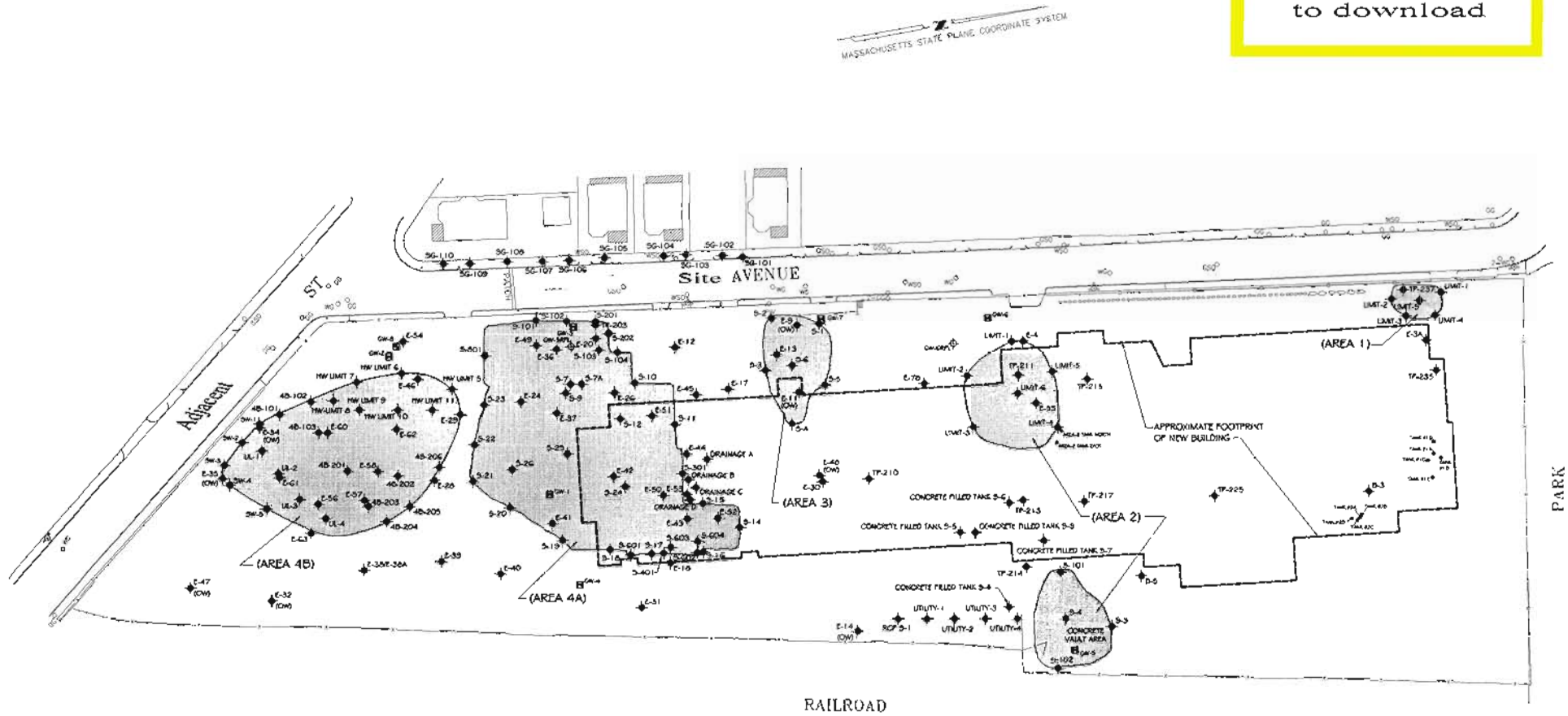
PRE RAM SAMPLING LOCATION PLAN

Date: AUGUST 2003 | Scale: 1" = 80'

Project No: | FIGURE 3

FILE NAME: 3590-RACAP03

Full-Scale (LARGE)version is available to download




LEGEND

- ⊠ — LOCATION OF GROUNDWATER MONITORING WELL PERFORMED BY DURING APRIL 2002
- ⊠ — LOCATION OF BEDROCK GROUNDWATER MONITORING WELL PERFORMED BY DURING APRIL 2002.
- ✦ — SOIL SAMPLING LOCATIONS JANUARY 2000 - DECEMBER 2001

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000 BY

# Site RTN#1

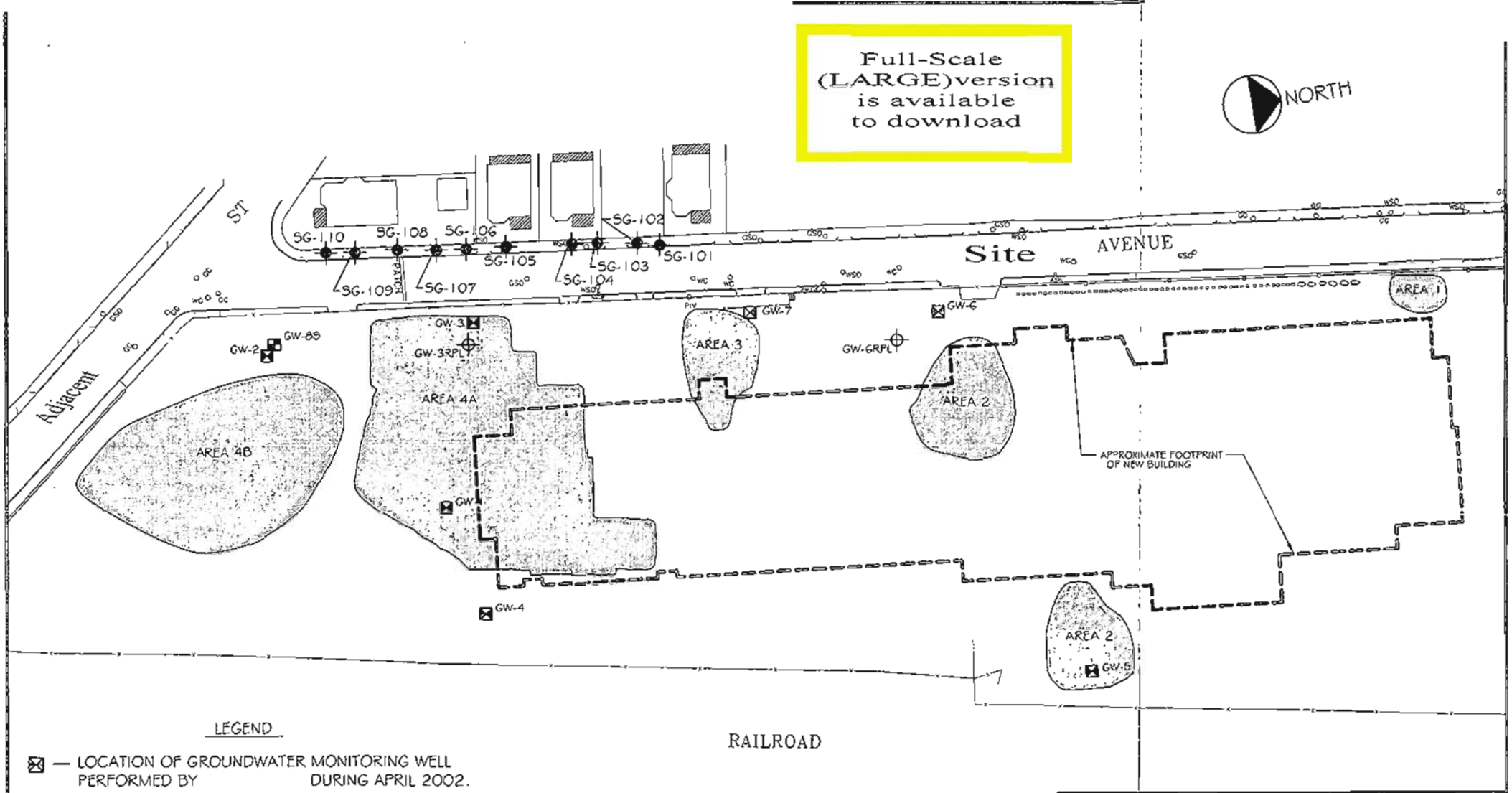
POST REMEDIATION SAMPLING LOCATION PLAN

FOR

Date: AUGUST 2003 | Scale: 1" = 30'

Project No. | FIGURE 10

Full-Scale (LARGE)version is available to download




LEGEND

- ⊠ — LOCATION OF GROUNDWATER MONITORING WELL PERFORMED BY DURING APRIL 2002.
- ⊠ — LOCATION OF BEDROCK GROUNDWATER MONITORING WELL PERFORMED BY DURING APRIL 2002.
- ⊕ — LOCATION OF GROUNDWATER MONITORING WELL PERFORMED BY ON NOVEMBER 28, 2002.
- ⊕ — LOCATION OF SOIL GAS POINTS INSTALLED BY ON JANUARY 24, 2003.

APPROXIMATE LIMITS OF EXCAVATED AREAS.

REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000 BY

# Site RTN #1

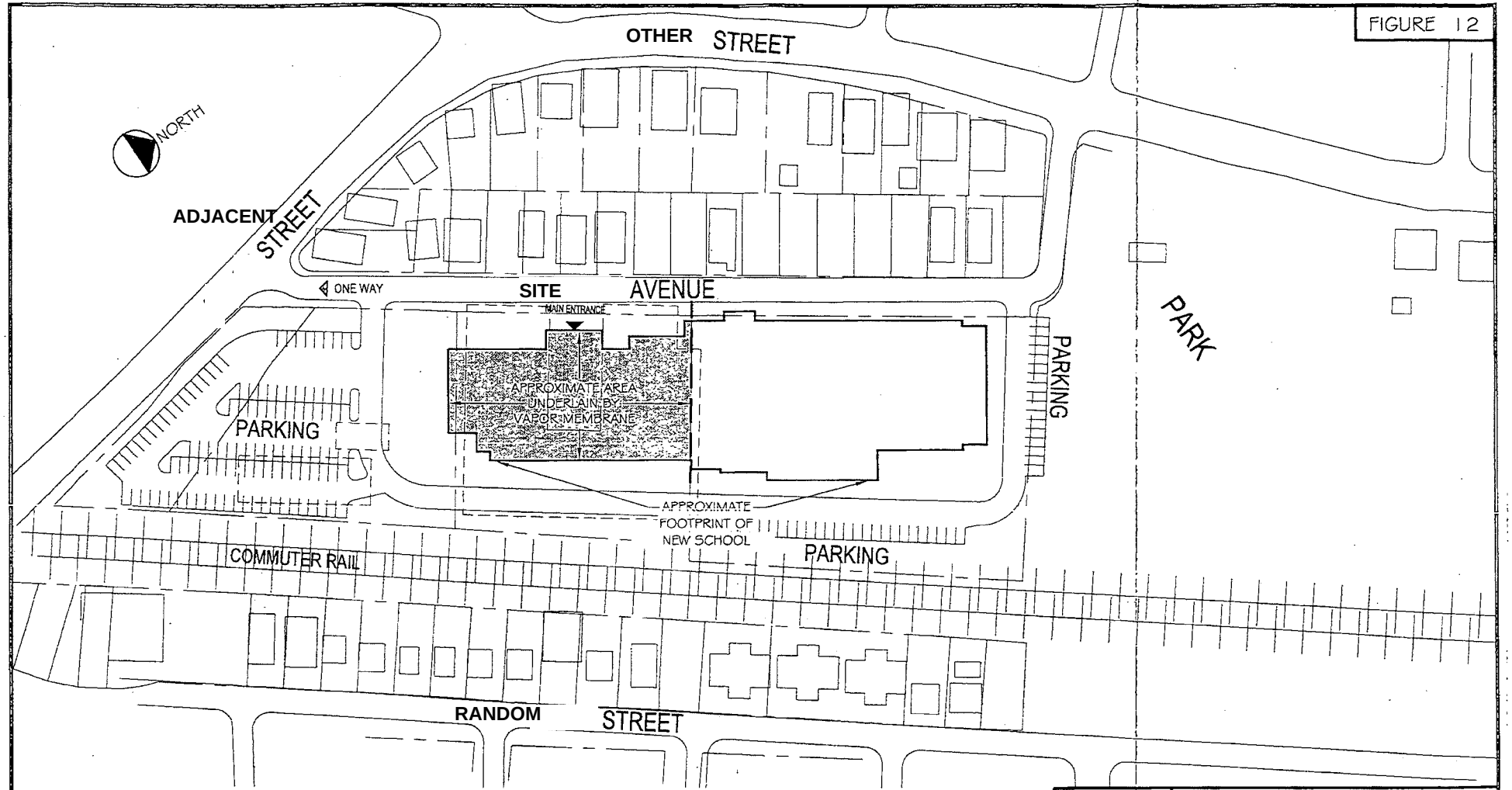
POST REMEDIATION MONITORING WELLS AND SOIL GAS POINTS

RCR

Date: AUGUST 2003 | Scale: 1" = 60'

Project No.

FIGURE 12




PROPERTY, RTN
MASSACHUSETTS

LOCATION OF VAPOR MEMBRANE

FOR

BY

Date: AUGUST 2003

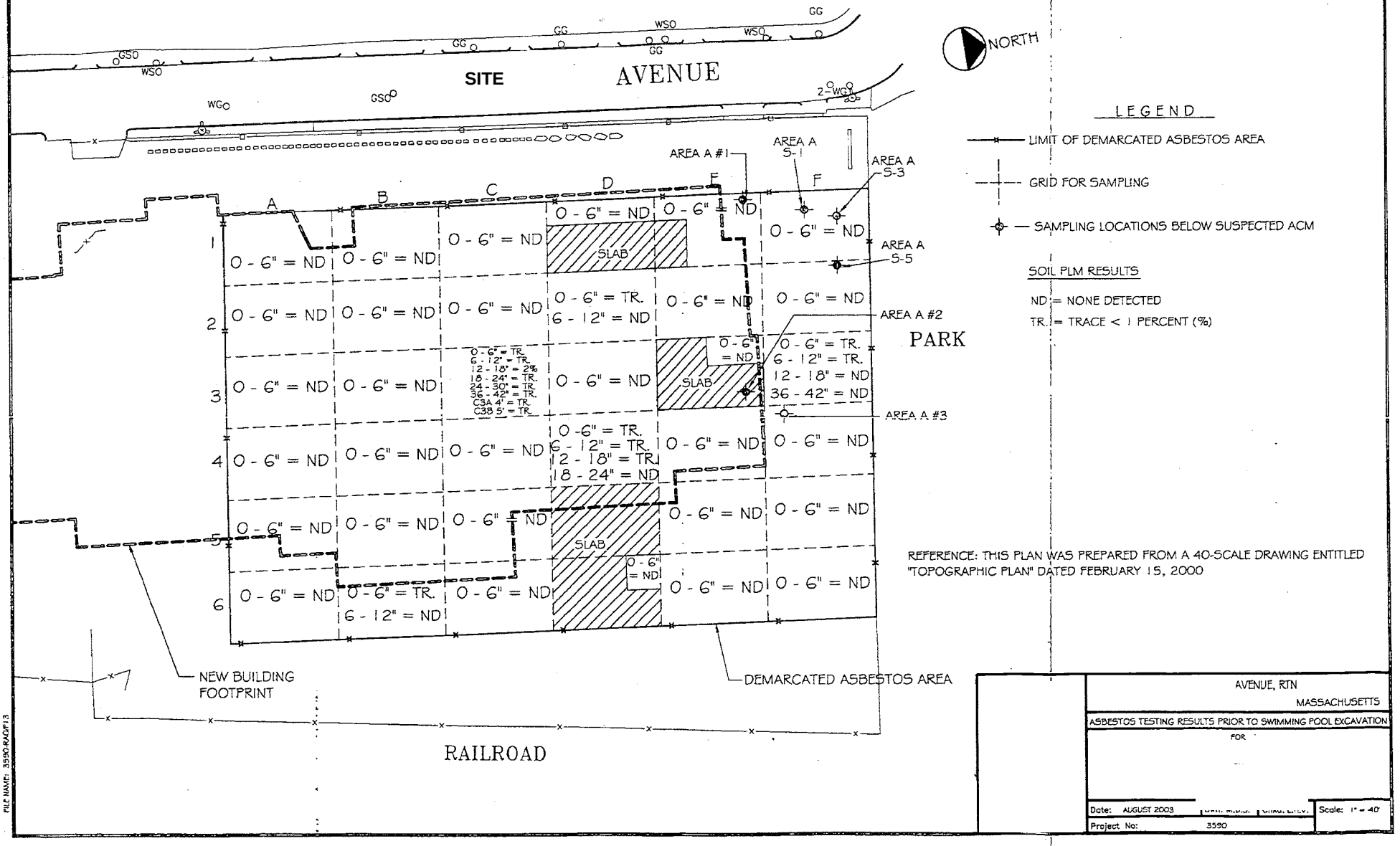
Scale: 1" = 100'

Project No: 3590



FILE NAME: 3590-RAOF12

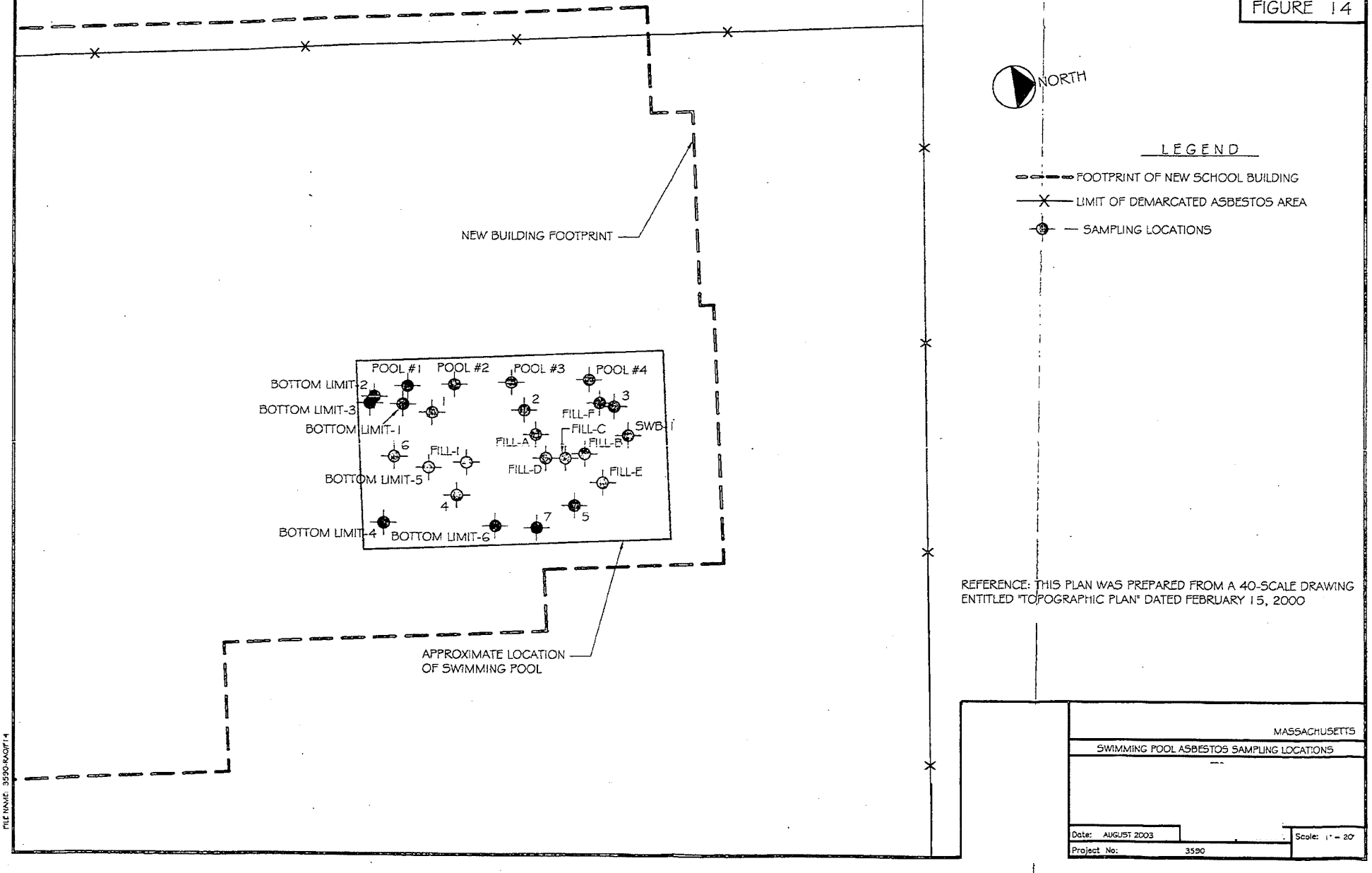
FIGURE 13




FILE NAME: 3590-RAOF13

40

FIGURE 14




REFERENCE: THIS PLAN WAS PREPARED FROM A 40-SCALE DRAWING ENTITLED "TOPOGRAPHIC PLAN" DATED FEBRUARY 15, 2000

MASSACHUSETTS

SWIMMING POOL ASBESTOS SAMPLING LOCATIONS

Date: AUGUST 2003

Scale: 1" = 20'

Project No: 3590

FILE NAME: 3590-RAOF14

TABLE 1
PRE-RAM CHEMICAL TEST RESULTS--SOIL SAMPLES
Site Avenue
Parent RTN

| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | B-3 S-9 | B-6 S-3 | E-11 S-5 | E-12 S-3 | E-13 S-5 | E-14 S-3 | E-17 S-4 | E-18 S-6 | E-20 S-5 | E-20 S-6 | E-24 S-4 | E-24 S-6 | E-26 S-4 | E-26 S-7 | E-28 S-5 | E-28 S-5 | E-29 S-3 | E-29 S-3 | E-30 S-4 | E-31 S-4 | E-32 S-4 | E-33 S-3 | E-34 S-5 | E-35 S-5 | E-36 S-2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth | | 10-12 | 10-12 | 9-11 | 5-7 | 9-10.25 | 10-12 | 7-9 | 11-12.2 | 9-11 | 11-13 | 7-9 | 11-12.2 | 7-9 | 13-13.75 | 9-9.75 | 9-9.75 | 7-9 | 7-9 | 7-9 | 7-9 | 7-8.5 | 5-7 | 9-11' | 10-11.3' | 3-5' |
| MATERIAL | | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Fill | Fill | Natural | Fill |
| **Detected Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 20,000 | ND | ND | | 460 | ND | ND | | ND | ND | NO | 780 | 210 | ND | NO | ND | ND | NO | ND | | 720 | ND | 25,000 | 470 | NO | 23,000 |
| Benzene | 40,000 | ND | NO | | ND | ND | ND | | ND | NO | NO | ND | ND | ND | NO | ND | ND | ND | ND | | ND | ND | ND | ND | NO | ND |
| Toluene | 500,000 | ND | ND | | ND | ND | ND | | ND | NO | ND | ND | ND | ND | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| Ethylbenzene | 500,000 | ND | ND | | ND | ND | ND | | ND | 1,000 | NO | ND | ND | 100 | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| Vinyl chloride | 300 | ND | ND | | ND | ND | ND | | ND | NO | ND | ND | ND | ND | NO | ND | ND | ND | ND | | ND | ND | NO | ND | ND | ND |
| Trichloroethene | 20,000 | ND | ND | | ND | ND | ND | | ND | ND | ND | 3,200 | ND | ND | NO | ND | ND | NO | ND | | ND | ND | NO | ND | ND | 390 |
| p/m-Xylene | 500,000 | ND | ND | | ND | ND | ND | | NO | 3,000 | ND | ND | ND | 260 | NO | ND | ND | ND | ND | | ND | ND | NO | ND | ND | ND |
| o-Xylene | 500,000 | ND | ND | | ND | ND | ND | | ND | ND | ND | ND | ND | NO | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | 100,000 | ND | ND | | ND | ND | ND | | ND | ND | ND | 650 | ND | ND | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| n-Butylbenzene | No Standard | ND | ND | | ND | ND | ND | | ND | 11,000 | NO | ND | ND | NO | NO | ND | ND | NO | ND | | ND | ND | ND | ND | ND | ND |
| sec-Butylbenzene | No Standard | ND | ND | | ND | ND | ND | | ND | 4,800 | ND | 690 | ND | 710 | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| tert-Butylbenzene | No Standard | ND | ND | | ND | ND | ND | | ND | ND | ND | ND | ND | 350 | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| Isopropylbenzene | No Standard | ND | ND | | ND | ND | NO | | ND | 2,400 | NO | ND | ND | 390 | NO | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| p-Isopropyltoluene | No Standard | ND | ND | | ND | ND | ND | | ND | 6,400 | ND | ND | ND | 950 | ND | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| Naphthalene | 100,000 | NO | ND | | NO | ND | NO | | ND | 5,300 | ND | ND | ND | 1,200 | NO | ND | ND | ND | ND | | ND | ND | NO | ND | ND | 1,200 |
| n-Propylbenzene | No Standard | ND | ND | | ND | ND | ND | | ND | 5,800 | ND | ND | ND | 810 | ND | ND | ND | ND | ND | | ND | ND | ND | ND | ND | ND |
| 1,3,5-Trimethylbenzene | No Standard | ND | ND | | NO | ND | ND | | ND | 25,000 | 380 | NO | ND | 4,300 | ND | ND | ND | ND | ND | | ND | ND | ND | ND | ND | NO |
| 1,2,4-Trimethylbenzene | No Standard | ND | ND | | ND | ND | ND | | ND | 61,000 | 920 | ND | ND | 8,200 | ND | ND | ND | ND | NO | | ND | ND | ND | ND | ND | ND |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | 47.4 | | | | | | | | | | ND | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | 790 | | | | | | | | | | ND | | | | | | |
| C9-C10 Aromatics | 100 | | | | | | | | | 494 | | | | | | | | | | ND | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Petroleum Hydrocarbons (mg/kg)** | 800 | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | ND | | 16.7 | | ND | ND | ND | ND | 906 | | | | | | | | | | ND | | | | | | |
| C19-C36 Aliphatics | 2,500 | 178 | | ND | | ND | 19.9 | ND | ND | ND | | | | | | | | | | ND | | | | | | |
| C11-C22 Aromatics | 800 | 129 | | ND | | ND | ND | ND | ND | 13 | | | | | | | | | | ND | | | | | | |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

ND--Not detected above laboratory detection limit
Blank--not analyzed

TABLE 1
PRE-RAM CHEMICAL TEST RESULTS--SOIL SAMPLES

# Site RTN#1

| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | E-36 S-5 | E-37 S-3 | E-37 S-5 | E38 S-1 | E38 S-1 | E38A S-1A | E38A S-1A | E39 S-3 | E-3A S-2 | E-4 S-3 | E-40 S-3 | E-41 S-5 | E-42 S-2 | E-42 S-5 | E43 S-2 | E43 S-5 | E44 S-7 | E45 S-7 | E-46 S-3 | E-46 S-3 | E-46 S-9 | E-47 S-6 | E-48 (OW) S-4 | E-49 S-2 | E-49 S-6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth | | 10-11.3' | 5-7' | 10-10.75' | 5-7' | 5-7' | 6-7' | 6-7' | 9-10.25' | 5-7' | 10-12' | 10-12' | 9-11' | 3-5' | 9-10' | 3-5' | 9-11' | 13-15' | 13-14.25' | 4-5.75' | 4-5.75' | 16-18' | 11-13' | 7-9' | 3-5' | 11-13' |
| MATERIAL | | Natural | Fill | Natural | Fill | Fill | Natural | Natural | Natural | Glacial Till | Glacial Till | Natural | Natural | Fill | Natural | Fill | Natural | Natural | Natural | Natural | Fill | Natural | Natural | Natural | Till | Fill | Natural |
| Detected Volatile Organic Compounds (ug/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 20,000 | 88 | 1,300 | 56 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | 27,000 | ND | ND | 100 | 18,000 | 18,000 | ND | ND | 5.2 | 230,000 | 720 |
| Benzene | 40,000 | ND | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Toluene | 500,000 | ND | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Ethylbenzene | 500,000 | ND | ND | 950 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Vinyl chloride | 300 | ND | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Trichloroethene | 20,000 | ND | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | 26,000 | ND | ND | ND | 320 | 320 | ND | ND | ND | 2,400 | ND |
| p/m-Xylene | 500,000 | ND | ND | 130 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| o-Xylene | 500,000 | ND | ND | 140 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | 100,000 | 250 | 500 | 670 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | 4,600 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| n-Butylbenzene | No Standard | 530 | ND | 5,100 | ND | ND | ND | ND | ND | | | ND | 3,400 | 24,000 | 1,100 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| sec-Butylbenzene | No Standard | 540 | 2,800 | 3,200 | ND | ND | ND | ND | ND | | | ND | 1,800 | 21,000 | 840 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| tert-Butylbenzene | No Standard | ND | ND | 490 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Isopropylbenzene | No Standard | ND | ND | 2,200 | ND | ND | ND | ND | ND | | | ND | 1,200 | ND | 320 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| p-Isopropyltoluene | No Standard | ND | 4,200 | 690 | ND | ND | ND | ND | ND | | | ND | 2,600 | 33,000 | 1,000 | ND | ND | 320 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Naphthalene | 100,000 | ND | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | 750 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 12,000 | ND | ND |
| n-Propylbenzene | No Standard | ND | 2,500 | 5,300 | ND | ND | ND | ND | ND | | | ND | 2,600 | 31,000 | 830 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,3,5-Trimethylbenzene | No Standard | ND | 2,700 | ND | ND | ND | ND | ND | ND | | | ND | 15,000 | 380,000 | 9,300 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,2,4-Trimethylbenzene | No Standard | ND | 27,000 | 12,000 | ND | ND | ND | ND | ND | | | ND | 4,000 | ND | 1,200 | ND | ND | 1,100 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Volatile Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | 38.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | 1,280 | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | 505 | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (mg/kg) | 600 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | 47.7 | | 220 | | | | | | ND | ND | | | 1,000 | | | | | | | | | | | | | |
| C19-C36 Aliphatics | 2,500 | ND | | ND | | | | | | ND | ND | | | ND | | | | | | | | | | | | | |
| C11-C22 Aromatics | 600 | ND | | 13.6 | | | | | | 20.8 | ND | | | 37.9 | | | | | | | | | | | | | |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

ND--Not detected above laboratory detection limit
Blank--not analyzed

TABLE 1
PRE-RAM CHEMICAL TEST RESULTS--SOIL SAMPLES

# Site RTN#1

| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | E-50 S-2 | E-50 S-4 | E-50 S-6 | E-51 S-2 | E-51 S-5 | E-52 S-1 | E-52 S-4 | E-53 S-3A | E-54 S-5 | E-54 S-6 | E-54 S-7 | E-55 S-2 | E-55 S-3 | E-55 S-5 | E-56 S-1 | E-56 S-3 | E-56 S-5 | E-57 S-1 | E-57 S-3 | E-57 S-5 | E-58 S-3 | E-58 S-5 | E-59 S-1 | E-59 S-3 | E-60 S-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth | | 3-5' | 7-9' | 11-13' | 3-5' | 9-11' | 0.5-2.5 | 6.5-8.5 | 5.5-6.5 | 9-10.25 | 11-12.1 | 13-14.5' | 5-7 | 7-9' | 2-4 | 0-2' | 4-6' | 8-10' | 0.5-2.5' | 4.5-6.5' | 8.5-10' | 4.5-6.5' | 8.5-10.5' | 0-2' | 4-5' | 4.5-6.5' |
| MATERIAL | | Fill | Natural | Natural | Fill | Natural | Fill | Till | Till | Till | Till | Till | Fill | Fill | Fill | Fill | Fill | Till | Fill | Till | Till | Fill | Till | Fill | Fill | Fill |
| Detected Volatile Organic Compounds (ug/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 20,000 | 880 | 58 | | 4000 | 120 | 22000 | 270 | 370 | ND | ND | ND | ND | ND | ND | 78,000 | 39,000 | 260 | 190,000 | 13,000 | 210 | 17,000 | 140 | 800,000 | 150,000 | 16,000 |
| Benzene | 40,000 | ND | ND | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Toluene | 500,000 | ND | ND | | 91 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Ethylbenzene | 500,000 | ND | 580 | | ND | 2900 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Vinyl chloride | 300 | ND | ND | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Trichloroethene | 20,000 | 65 | ND | | 140 | ND | 4700 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 260 | ND | 11,000 | ND | 440 |
| p/m-Xylene | 500,000 | 82 | 2800 | | 170 | 9800 | 840 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| o-Xylene | 500,000 | ND | 510 | | 52 | 940 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | 100,000 | ND | ND | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 80 |
| n-Butylbenzene | No Standard | ND | 5,300 | | ND | 600 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| sec-Butylbenzene | No Standard | ND | 2,600 | | ND | 450 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| tert-Butylbenzene | No Standard | ND | ND | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Isopropylbenzene | No Standard | ND | 1,500 | | ND | 930 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| p-Isopropyltoluene | No Standard | ND | 3,800 | | ND | 480 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Naphthalene | 100,000 | ND | 2,900 | | ND | 320 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| n-Propylbenzene | No Standard | ND | 3,600 | | ND | 1100 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,3,5-Trimethylbenzene | No Standard | ND | 12,000 | | 410 | 2400 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| 1,2,4-Trimethylbenzene | No Standard | 400 | 16,000 | | 930 | 4800 | ND | ND | ND | ND | ND | ND | ND | 0.46 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Volatile Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Petroleum Hydrocarbons (mg/kg) | 800 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | ND | | ND | | | | | | | | | | | | | | | | | | | | |
| C19-C36 Aliphatics | 2,500 | | | ND | | ND | | | | | | | | | | | | | | | | | | | | |
| C11-C22 Aromatics | 800 | | | ND | | 14.6 | | | | | | | | | | | | | | | | | | | | |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dibenz (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

ND--Not detected above laboratory detection limit
Blank--not analyzed

TABLE 1
PRE-RAM CHEMICAL TEST RESULTS--SOIL SAMPLES

# Site RTN#1

| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | E-60 S-5 | E-61 S-3 | E-61 S-5 | E-62 S-2 | E-62 S-4 | E-63 S-3 | E-63 S-3A | E-7B S-3 | E-9 (OW) S-4 | PSA-2 BS-2 | PSA-4 BS-4 | SS-1 S-1 | SS-2 S-3 | SS-3 S-1 | SS-4 S-5 | TANK @ 202 S-1 | TANK @ 202 S-5 | TANK @ 202 S-6 | TANK @ 202 S-7 | TANK @ 202 S-8 | TANK @ 202 S-9 | TP-201 S-1 | TP-202 S-3 | TP-203 S-4 | TP-204 S-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth | | 8.5-10.5' | 4.5-6.5' | 8.5-10.5' | 2.5-4.5' | 6.5-8.5' | 4-5' | 5-6' | 5-6.2 | 7-9 | 5-12' | 9-10' | 0-2' | 0-2' | 0-2 | 0-2' | 4.5 | 6 | 6 | 9 | 9 | 9 | 1.5 | 6.5 | 11.5 | 6.1 |
| MATERIAL | | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Glacial Till | Glacial Till | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Fill | Glacial Till | Fill |
| **Detected Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 20,000 | 470 | 28,000 | ND | 60,000 | 750 | 7,000 | 920 | | | ND | ND | ND | ND | ND | ND | | | 610,000 | | 5,900,000 | | | 89,000 | 860 | 7,500 |
| Benzene | 40,000 | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | ND | ND |
| Toluene | 500,000 | ND | 310 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 2,300 | ND | ND |
| Ethylbenzene | 500,000 | ND | 180 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 2,700 | ND | ND |
| Vinyl chloride | 300 | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 35,000 | ND | ND |
| Trichloroethene | 20,000 | ND | 12,000 | ND | 1,900 | ND | 420 | ND | | | ND | ND | ND | ND | ND | ND | | | 56,000 | | 120,000 | | | 700 | ND | 150 |
| p/m-Xylene | 500,000 | ND | 640 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 9,900 | ND | ND |
| o-Xylene | 500,000 | ND | 240 | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 2,600 | ND | ND |
| cis-1,2-Dichloroethene | 100,000 | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | 44,000 | | ND | | | 24,000 | ND | 150 |
| n-Butylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | ND | ND |
| sec-Butylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | 760 | ND |
| tert-Butylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | ND | ND |
| Isopropylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | ND | ND |
| p-Isopropyltoluene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | 1,100 | ND |
| Naphthalene | 100,000 | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | 3,000 | 920 | 440 | 3,700 | | | ND | | ND | | | 29,000 | ND | ND |
| n-Propylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | ND | 940 | ND |
| 1,3,5-Trimethylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 30,000 | 9,300 | ND |
| 1,2,4-Trimethylbenzene | No Standard | ND | ND | ND | ND | ND | ND | ND | | | ND | ND | ND | ND | ND | ND | | | ND | | ND | | | 11,000 | 5,500 | ND |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | 281 | 102 | 153 | 665 | 997 | 24.6 | | | | 5.13 |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | ND | ND | 34.7 | 576 | 1,050 | 172 | | | | 4 |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | ND | ND | 13.5 | 490 | 497 | 197 | | | | ND |
| Benzene | 40 | | | | | | | | | | | | | | | | ND | ND | | ND | | 0.165 | | | | ND |
| Toluene | 500 | | | | | | | | | | | | | | | | ND | ND | | ND | | ND | | | | ND |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | ND | ND | | ND | | 4.27 | | | | ND |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | ND | ND | | ND | | ND | | | | ND |
| o-Xylene | 500 | | | | | | | | | | | | | | | | ND | ND | | ND | | 2.33 | | | | ND |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | ND | ND | | ND | | ND | | | | ND |
| Naphthalene | 100 | | | | | | | | | | | | | | | | ND | ND | | ND | | ND | | | | ND |
| Total Petroleum Hydrocarbons (mg/kg) | 600 | | | | | | | | | | | | | | | | | | | | | | | 9,800 | ND | ND |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | | | | | ND | 1,140 | | | | | | | 60.7 | 17.2 | 66 | 6,420 | 3,710 | 655 | | 7,350 | | ND |
| C19-C36 Aliphatics | 2,500 | | | | | | | | ND | 775 | | | | | | | 2,490 | 325 | 3,260 | 1,500 | 1,260 | 871 | | 1,780 | | ND |
| C11-C22 Aromatics | 600 | | | | | | | | ND | 492 | | | | | | | 1,410 | 186 | 1,320 | 2,420 | 1,710 | 932 | | 4,460 | | ND |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | 830 | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | 3200 | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | 2800 | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Benzo (e) pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | 1800 | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | | 2400 | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | | 3300 | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | 500 | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | 6100 | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | 1800 | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | | ND | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | | 3600 | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | | 5800 | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | | 180 | | | |

Full-Scale (LARGE)version is available to download

ND--Not detected above laboratory detection limit
Blank--not analyzed

# Site RTN#1

| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | TP-205 S-2 | TP-206 S-1 | TP-207 S-3 | TP-208 S-3 | TP-210 S-1 | TP-211 S-3 | TP-213 S-2 | TP-214 S-2 | TP-215 S-1 | TP-215 S-3 | TP-217 S-2 | TP-225 S-1 | TP-225 S-2 | TP-234 S-1 | TP-235 S-1 | TP-235 S-2 | TP-237 S-3 | TP-238 S-3 | Number of Pre-RAM Samples | Average Value Pre-RAM | Maximum Value Pre-RAM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Depth | | 1.5 | 1.3 | 4 | 4.3' | 5' | 5 | 5' | 6.5 | 6 | 10.5 | 12.5 | 5.75 | 13.5 | 1.8 | 2 | 6.8 | 10 | 9.8 | | | |
| MATERIAL | | Fill | Fill | Glacial Till | Fill | Fill | Glacial Till | Glacial Till | Glacial Till | Fill | Glacial Till | Glacial Till | Fill | Glacial Till | Fill | Fill | Glacial Till | Glacial Till | Glacial Till | | | |
| **Detected Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 20,000 | ND | 20,000 | 17,000 | | | | | | | | | | | | | | | 14,000 | 91 | 160,249 | 5,900,000 |
| Benzene | 40,000 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | ND | ND |
| Toluene | 500,000 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 900 | 2,300 |
| Ethylbenzene | 500,000 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 1,070 | 2,700 |
| Vinyl chloride | 300 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 35,000 | 35,000 |
| Trichloroethene | 20,000 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 12,653 | 120,000 |
| p/m-Xylene | 500,000 | 2,400 | 3,400 | 6,000 | | | | | | | | | | | | | | | ND | 91 | 2,950 | 9,900 |
| o-Xylene | 500,000 | ND | ND | 1,200 | | | | | | | | | | | | | | | ND | 91 | 812 | 2,600 |
| cis-1,2-Dichloroethene | 100,000 | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 8,322 | 44,000 |
| n-Butylbenzene | No Standard | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 6,379 | 24,000 |
| sec-Butylbenzene | No Standard | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 3,333 | 21,000 |
| tert-Butylbenzene | No Standard | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 420 | 490 |
| Isopropylbenzene | No Standard | ND | ND | ND | | | | | | | | | | | | | | | ND | 91 | 1,277 | 2,400 |
| p-Isopropyltoluene | No Standard | 8,800 | ND | 7,400 | | | | | | | | | | | | | | | ND | 91 | 5,441 | 33,000 |
| Naphthalene | 100,000 | 12,000 | 7,700 | 8,200 | | | | | | | | | | | | | | | ND | 91 | 6,909 | 29,000 |
| n-Propylbenzene | No Standard | ND | ND | 6,800 | | | | | | | | | | | | | | | ND | 91 | 5,635 | 31,000 |
| 1,3,5-Trimethylbenzene | No Standard | 100,000 | ND | 76,000 | | | | | | | | | | | | | | | 8,300 | 91 | 45,006 | 380,000 |
| 1,2,4-Trimethylbenzene | No Standard | 170,000 | ND | 45,000 | | | | | | | | | | | | | | | ND | 91 | 21,591 | 170,000 |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | ND | | | | | | | | | | | | | | | 17 | 255 | 997 |
| C9-C12 Aliphatics | 1,000 | | | | 8.07 | | | | | | | | | | | | | | | 17 | 489 | 1,280 |
| C9-C10 Aromatics | 100 | | | | 4.32 | | | | | | | | | | | | | | | 17 | 314 | 506 |
| Benzene | 40 | | | | ND | | | | | | | | | | | | | | | 6 | 0.2 | ND |
| Toluene | 500 | | | | ND | | | | | | | | | | | | | | | 6 | ND | ND |
| Ethylbenzene | 500 | | | | ND | | | | | | | | | | | | | | | 6 | 4 | 4.3 |
| p/m-Xylene | 500 | | | | ND | | | | | | | | | | | | | | | 6 | ND | ND |
| o-Xylene | 500 | | | | ND | | | | | | | | | | | | | | | 6 | 2 | 2.3 |
| Methyl tert butyl ether | 100 | | | | ND | | | | | | | | | | | | | | | 6 | ND | ND |
| Naphthalene | 100 | | | | ND | | | | | | | | | | | | | | | 6 | ND | ND |
| **Total Petroleum Hydrocarbons (mg/kg)** | 800 | 8,500 | | 1,200 | 65 | | | | | | | | | | | | | 610 | 4,700 | 8 | 4,178 | 9,800 |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | 14,900 | | 232 | | | 166 | 672 | 210 | | | | | | | | | ND | 2,900 | 34 | 2,142 | 14,900 |
| C19-C36 Aliphatics | 2,500 | 316 | | 153 | | | 91.7 | 121 | 60.9 | | | | | | | | | 435 | 845 | 34 | 854 | 3,260 |
| C11-C22 Aromatics | 800 | 365 | | 86.9 | | | 117 | 442 | 76.2 | | | | | | | | | 102 | 1,630 | 34 | 768 | 4,400 |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | 410 | | | ND | | | | 1800 | ND | ND | ND | ND | 480 | 520 | ND | | | 11 | 603 | 1,800 |
| 2-Chloronaphthalene | N/A | | ND | | | ND | | | | ND | ND | ND | ND | ND | ND | ND | ND | | | 11 | ND | ND |
| 2-Methylnaphthalene | 500,000 | | 1300 | | | ND | | | | 2400 | ND | ND | ND | ND | 530 | 760 | ND | | | 11 | 1,248 | 2,400 |
| Acenaphthene | 1,000,000 | | ND | | | ND | | | | 11000 | ND | 79 | 550 | ND | 4200 | 1700 | ND | | | 11 | 3,506 | 11,000 |
| Acenaphthylene | 100,000 | | ND | | | ND | | | | 1200 | ND | 50 | ND | ND | 490 | ND | ND | | | 11 | 577 | 1,200 |
| Anthracene | 1,000,000 | | ND | | | ND | | | | 28000 | ND | 140 | 1200 | ND | 13000 | 4900 | ND | | | 11 | 8,012 | 28,000 |
| Benzo (a) anthracene | 700 | | ND | | | 370 | | | | 68000 | 32 | 330 | 4100 | ND | 32000 | 13000 | ND | | | 11 | 15,129 | 68,000 |
| Benzo (a) pyrene | 700 | | ND | | | 390 | | | | 52000 | 27 | 420 | 3800 | ND | 27000 | 12000 | ND | | | 11 | 12,305 | 52,000 |
| Benzo (b) fluoranthene | 700 | | ND | | | 310 | | | | 43000 | 24 | 340 | 3000 | ND | 22000 | 9700 | ND | | | 11 | 11,196 | 43,000 |
| Benzo (e) pyrene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | ND | | | 270 | | | | 27000 | ND | 270 | 2800 | ND | 15000 | 7300 | ND | | | 11 | 7,720 | 27,000 |
| Benzo (k) fluoranthene | 7,000 | | ND | | | 320 | | | | 44000 | 26 | 330 | 3200 | ND | 23000 | 9200 | ND | | | 11 | 10,310 | 44,000 |
| Chrysene | 7,000 | | 400 | | | 420 | | | | 62000 | 33 | 380 | 4300 | ND | 30000 | 13000 | ND | | | 11 | 12,648 | 62,000 |
| Dibenzo (a,h) anthracene | 700 | | ND | | | ND | | | | 8100 | ND | 78 | 550 | ND | 4400 | 1900 | ND | | | 11 | 2,605 | 8,100 |
| Fluoranthene | 1,000,000 | | ND | | | 400 | | | | 130000 | 48 | 730 | 8700 | ND | 65 | 28000 | ND | | | 11 | 21,758 | 130,000 |
| Fluorene | 1,000,000 | | ND | | | ND | | | | 12000 | ND | 96 | 510 | ND | 5200 | 2000 | ND | | | 11 | 3,960 | 12,000 |
| Indeno (1,2,3-cd) Pyrene | 700 | | ND | | | 270 | | | | 35000 | ND | 310 | 2700 | ND | 19000 | 8300 | ND | | | 11 | 9,626 | 35,000 |
| Naphthalene | 100,000 | | 7700 | | | ND | | | | 4100 | ND | ND | ND | ND | 1000 | 1500 | ND | | | 11 | 3,575 | 7,700 |
| Phenanthrene | 100,000 | | 390 | | | ND | | | | 91000 | 39 | 370 | 9000 | ND | 42000 | 19000 | ND | | | 11 | 20,300 | 91,000 |
| Pyrene | 700,000 | | 380 | | | 560 | | | | 110000 | 42 | 1000 | 8700 | ND | 54000 | 24000 | ND | | | 11 | 22,698 | 110,000 |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | 740 | | | 230 | | | | 120 | 23 | 7.2 | 82 | ND | 68 | 85 | 5.6 | | | 11 | 154 | 740 |

Full-Scale (LARGE)version is available to download

ND--Not detected above laboratory detection limit
Blank--not analyzed

TABLE 2
PRE-RAM CHEMICAL TEST RESULTS–GROUNDWATER SAMPLES

| Well ID | Method 1 GW-2 or GW-3 | E-3 (OW) | | E-6 (OW) | | E-9 (OW) | | E-11 (OW) | | | E-14 (OW) | | EB-3 (Bedrock) | E-48 (OW) Shallow Couplet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | UST AREA | | PCB Area | | Area 3 | | | | | | | | |
| Sampling Date | | 04/24/00 | 04/01/01 | 04/24/00 | 04/01/01 | 06/23/00 | 04/01/01 | 04/26/00 | 06/23/00 | 04/01/01 | 05/01/00 | 04/01/01 | 08/15/00 | 08/15/00 |
| **Detected Volatile Organic Compounds** | | | | | | | | | | | | | | |
| Tetrachloroethene | 3,000 | | | <3.8 | <1 | 75 | 82 | <7.5 | <5 | <1 | <1.5 | <1 | <1 | 1.4 |
| 1,1,2,2-Tetrachloroethane | 20 | | | <2.5 | <1 | <1 | <1 | <5 | <5 | <1 | <1 | <1 | <1 | <1 |
| Benzene | 2,000 | | | 3.3 | <1 | <1 | <1 | 11 | 6.7 | <1 | <1 | <1 | <1 | <1 |
| Toluene | 6,000 | | | 310 | <1.5 | <1.5 | <1.5 | 11 | <7.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Ethylbenzene | 4,000 | | | <2.5 | <1 | <1 | <1 | 220 | 160 | <1 | <1 | <1 | <1 | <1 |
| Vinyl chloride | 2 | | | <5 | <2 | <2 | <2 | <10 | <10 | <2 | <2 | <2 | <2 | <2 |
| Trichloroethene | 300 | | | <2.5 | <1 | 2.1 | 2.2 | <5 | <5 | <1 | <1 | <1 | 1.9 | 1.4 |
| o/m-Xylene | 6,000 | | | <2.5 | <1 | <1 | <1 | 350 | 270 | 1.3 | <1 | <1 | <1 | <1 |
| o-Xylene | 6,000 | | | <2.5 | <1 | <1 | <1 | 160 | 120 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | 30,000 | | | <2.5 | <1 | 2 | <1 | <5 | <5 | <1 | <1 | <1 | <1 | 1.2 |
| Isopropylbenzene | No Standard | | | <12 | <5 | <5 | <5 | 34 | 42 | <5 | <5 | <5 | <5 | <5 |
| p-Isopropyltoluene | No Standard | | | <12 | <5 | <5 | <5 | <25 | <25 | <5 | <5 | <5 | <5 | <5 |
| Naphthalene | 6,000 | | | <12 | <5 | <5 | <5 | 64 | 95 | <5 | <5 | <5 | <5 | <5 |
| n-Propylbenzene | No Standard | | | <12 | <5 | <5 | <5 | 59 | 67 | <5 | <5 | <5 | <5 | <5 |
| 1,3,5-Trimethylbenzene | No Standard | | | <12 | <5 | <5 | <5 | 120 | 100 | <5 | <5 | <5 | <5 | <5 |
| 1,2,4-Trimethylbenzene | No Standard | | | <12 | <5 | <5 | <5 | 620 | 740 | 16 | <5 | <5 | <5 | <5 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | <120 | <110 | <112 | | <140 | | 400 | 474 | 213 | | <111 | | <20 |
| C19-C36 Aliphatics | 20,000 | <120 | 975 | <112 | | <140 | | <133 | <117 | 189 | | <111 | | <20 |
| C11-C22 Aromatics | 30,000 | <120 | 115 | 258 | | <140 | | 254 | 365 | 271 | | <111 | | <20 |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | | <40 | | <40 | 21.4 | | | **2,690** | 205 | | | | <104 |
| C9-C12 Aliphatics | 1,000 | | <40 | | <40 | <20 | | | **5,360** | 237 | | | | <104 |
| C9-C10 Aromatics | 4,000 | | <40 | | <40 | <20 | | | 3,220 | 128 | | | | <104 |

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

TABLE 2
PRE-RAM CHEMICAL TEST RESULTS--GROUNDWATER SAMPLES

## Area 4A

| Well ID | Method 1 GW-2 or GW-3 | E-16 (OW) | | | | E-21 (OW) | | | | | | E-23 (OW) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | | | | | | | | | | | | | | | |
| Sampling Date | | 05/01/00 | 06/22/00 | 11/17/00 | 04/01/01 | 04/27/00 | 05/01/00 | 06/22/00 | 07/12/00 | 11/17/00 | 04/01/01 | 05/01/00 | 06/22/00 | 07/12/00 | 11/17/00 | 04/01/01 |
| **Detected Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Tetrachloroethene | 3,000 | 2.9 | 4.2 | 4 | 1.9 | 3100 | | 2000 | 1000 | 1400 | 1200 | 56 | 120 | 70 | 130 | 230 |
| 1,1,2,2-Tetrachloroethane | 20 | 5.6 | 6.3 | 4.6 | 6.5 | <50 | | <50 | <5.0 | <20 | <20 | <20 | <20 | <1.0 | <2.5 | <5 |
| Benzene | 2,000 | <1 | <1 | <1 | <1 | <50 | | <50 | <5.0 | <20 | <20 | <20 | <20 | 6.9 | 2.2 | <5 |
| Toluene | 6,000 | <1.5 | <1.5 | <1.5 | <1.5 | <75 | | <75 | <5.0 | <30 | <30 | <30 | <30 | 4.5 | <3.8 | <7.5 |
| Ethylbenzene | 4,000 | <1 | <1 | <1 | <1 | <50 | | <50 | 9.2 | <20 | <20 | 150 | 73 | 51 | 27 | <5 |
| Vinyl chloride | 2 | <2 | <2 | <2 | <2 | **<100** | | **<100** | **97** | **7.1** | **<40** | **<40** | **<40** | <2.0 | **17** | **<10** |
| Trichloroethene | 300 | 1.2 | 2.4 | 3.8 | <1 | 100 | | 92 | 230 | 150 | 66 | <20 | 33 | 15 | 66 | 30 |
| p/m-Xylene | 6,000 | <1 | <1 | <1 | <1 | <50 | | <50 | <5.0 | <20 | <20 | 160 | 86 | 58 | 24 | 10 |
| o-Xylene | 6,000 | <1 | <1 | <1 | <1 | <50 | | <50 | <5.0 | <20 | <20 | <20 | <20 | 9.1 | 2.1 | <5 |
| cis-1,2-Dichloroethene | 30,000 | <1 | <1 | 3.2 | <1 | 74 | | 110 | 410 | 310 | 69 | 27 | 23 | 28 | 97 | 24 |
| Isopropylbenzene | No Standard | <5 | <5 | <5 | <5 | <250 | | <250 | 14 | <100 | <100 | 100 | <100 | 58 | 21 | <25 |
| p-Isopropyltoluene | No Standard | <5 | <5 | <5 | <5 | <250 | | <250 | 18 | <100 | <100 | <100 | <100 | 110 | 20 | <25 |
| Naphthalene | 6,000 | <5 | <5 | <5 | <5 | <250 | | <250 | 14 | <100 | <100 | 120 | 140 | 150 | 57 | <25 |
| n-Propylbenzene | No Standard | <5 | <5 | <5 | <5 | <250 | | <250 | 21 | <100 | <100 | 160 | <100 | 77 | 31 | <25 |
| 1,3,5-Trimethylbenzene | No Standard | <5 | <5 | <5 | <5 | <250 | | <250 | 31 | <100 | <100 | 530 | 460 | 380 | 45 | 84 |
| 1,2,4-Trimethylbenzene | No Standard | <5 | <5 | <5 | <5 | <250 | | <250 | 110 | <100 | <100 | 1900 | 1300 | 1200 | 310 | 160 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | <106 | | <104 | | | | | | 1,740 | | | 3,790 |
| C19-C36 Aliphatics | 20,000 | | | | <106 | | <104 | | | | | | <196 | | | 540 |
| C11-C22 Aromatics | 30,000 | | | | 107 | | <104 | | | | | | 436 | | | 797 |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | | <20 | | | | | 571 | | | | | 1,070 | | | 350 |
| C9-C12 Aliphatics | 1,000 | | <20 | | | | | <100 | | | | | 5,000 | | | 2,480 |
| C9-C10 Aromatics | 4,000 | | <20 | | | | | <100 | | | | | 3,100 | | | 1,460 |

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

TABLE 2
PRE-RAM CHEMICAL TEST RESULTS--GROUNDWATER SAMPLES

# Area 4A

| Well ID | Method 1 GW-2 or GW-3 | E-27 (OW) | | | | E-35 (OW) | | EB-2 (Bedrock) | | | | E-46 (OW) Shallow Couplet | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | | | | | | | | | | | | | |
| Sampling Date | | 05/01/00 | 06/22/00 | 07/12/00 | 11/17/00 | 08/04/00 | 11/17/00 | 08/15/00 | 08/25/00 | 11/17/00 | 04/01/01 | 08/15/00 | 08/15/00 | 11/17/00 |
| **Detected Volatile Organic Compounds** | | | | | | | | | | | | | Re-analysis | |
| Tetrachloroethene | 3,000 | <30 | <20 | 350 | <20 | 71 | 49 | 2900 | / 3700 | . \ 3400 | \ / 3500 | / 160 | >200 | 210 |
| 1,1,2,2-Tetrachloroethane | 20 | <20 | <20 | <250 | <20 | <1.0 | <1 | <25 | <2 | <25 | <25 | <2 | <1 | <1 |
| Benzene | 2,000 | <20 | <20 | <250 | <20 | <1.0 | <1 | <25 | <2 | <25 | <25 | <2 | <1 | <1 |
| Toluene | 6,000 | <30 | <30 | <250 | <30 | <1.5 | <1.5 | <38 | <2 | <38 | <38 | <3 | <1.5 | <1.5 |
| Ethylbenzene | 4,000 | 55 | 34 | 570 | 92 | <1.0 | <1 | <25 | <2 | <25 | <25 | <2 | <1 | <1 |
| Vinyl chloride | 2 | **<40** | **<40** | **<500** | **<40** | <2.0 | <2 | <50 | 2 | <2 | <50 | <4 | <2 | <2 |
| Trichloroethene | 300 | <20 | <20 | <250 | <20 | <1.0 | <1 | 39 | 59 | 54 | 38 | 16 | 21 | 14 |
| p/m-Xylene | 6,000 | 270 | 150 | 2500 | 460 | <1.0 | <1 | <25 | <2 | <25 | <25 | <2 | <1 | <1 |
| o-Xylene | 6,000 | 23 | <20 | <250 | 50 | <1.0 | <1 | <25 | <2 | <25 | <25 | <2 | <1 | <1 |
| cis-1,2-Dichloroethene | 30,000 | 50 | 100 | 250 | 79 | <1.0 | <1 | <25 | 32 | 12 | <25 | 14 | 14 | 10 |
| Isopropylbenzene | No Standard | <100 | <100 | 1400 | <100 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| p-Isopropyltoluene | No Standard | <100 | <100 | 9900 | <100 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| Naphthalene | 6,000 | 310 | 320 | 11000 | 460 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| n-Propylbenzene | No Standard | 160 | 140 | 3200 | 160 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| 1,3,5-Trimethylbenzene | No Standard | 620 | 470 | 17000 | 700 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| 1,2,4-Trimethylbenzene | No Standard | 2700 | 2600 | 43000 | 2300 | <5.0 | <5 | <120 | <2 | <120 | <120 | <10 | <5 | <5 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | **1,370** | | | <114 | | | | | <109 | | | |
| C19-C36 Aliphatics | 20,000 | | <121 | | | <114 | | | | | <109 | | | |
| C11-C22 Aromatics | 30,000 | | 608 | | | 115 | | | | - | <109 | | | |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | | <400 | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | **12,900** | | | | | | | | | | | |
| C9-C10 Aromatics | 4,000 | | **8,100** | | | | | | | | | | | |

49

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

TABLE 2
PRE-RAM CHEMICAL TEST RESULTS--GROUNDWATER SAMPLES

# Area 4B

| Well ID | Method 1 GW-2 or GW-3 | EB-1 (Bedrock) | | | E-47 (OW) Shallow Couplet | | | | EB-4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | | | | | | | | | | |
| Sampling Date | | 08/15/00 | 11/17/00 | 04/01/01 | 08/15/00 | 08/15/00 | 11/17/00 | 04/01/01 | 09/20/00 | 09/20/00 | 11/17/00 |
| **Detected Volatile Organic Compounds** | | | | | Re-analysis | | | | Re-analysis | | |
| Tetrachloroethene | 3,000 | 90 | 110 | 170 | 450 | >200 | 370 | 6.8 | 540 | >200 | 730 |
| 1,1,2,2-Tetrachloroethane | 20 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | <5 | <1 | <5 |
| Benzene | 2,000 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | <5 | <1 | <5 |
| Toluene | 6,000 | <1.5 | <1.5 | <1.5 | <7.5 | <1.5 | <7.5 | <1.5 | <7.5 | <1.5 | <7.5 |
| Ethylbenzene | 4,000 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | <5 | <1 | <5 |
| Vinyl chloride | 2 | <2 | <2 | <2 | <10 | <2 | <2 | <2 | <10 | <2 | <2 |
| Trichloroethene | 300 | <1 | <1 | <1 | 5 | 6.9 | 5.4 | <1 | 20 | 18 | 24 |
| p/m-Xylene | 6,000 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | <5 | <1 | <5 |
| o-Xylene | 6,000 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | <5 | <1 | <5 |
| cis-1,2-Dichloroethene | 30,000 | <1 | <1 | <1 | <5 | <1 | <5 | <1 | 24 | 24 | 24 |
| Isopropylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| p-Isopropyltoluene | No Standard | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| Naphthalene | 6,000 | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| n-Propylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| 1,3,5-Trimethylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| 1,2,4-Trimethylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <25 | <5 | <25 | <5 | <25 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | | | | | | | |
| C19-C36 Aliphatics | 20,000 | | | | | | | | | | |
| C11-C22 Aromatics | 30,000 | | | | | | | | | | |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | |
| C9-C10 Aromatics | 4,000 | | | | | | | | | | |

50

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

TABLE 2
PRE-RAM CHEMICAL TEST RESULTS–GROUNDWATER SAMPLES

| Well ID | Method 1 GW-2 or GW-3 | E-34-OW | | | EB-5 | | | E-54 (OW) | | PSA-1 | PSA-2 | PSA-3 | PSA-5 | PSA-6 | PSA-7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | Area 4B | | | Area 4B | | | Area 4B | | Area 4A | | | | | |
| Sampling Date | | 08/04/00 | 09/20/00 | 11/17/00 | 09/20/00 | 09/20/00 | 11/17/00 | 09/20/00 | 11/17/00 | 08/11/00 | 08/11/00 | 08/11/00 | 08/24/00 | 08/24/00 | 08/24/00 |
| **Detected Volatile Organic Compounds** | | | | | | | | | | | | | | | |
| Tetrachloroethene | 3,000 | 130 | 120 | 210 | 340 | >200 | 160 | 1700 | 3000 | <1 | 7.3 | <1 | <1 | 6.2 | 3.7 |
| 1,1,2,2-Tetrachloroethane | 20 | <1 | <1 | <1 | <5 | <1 | <2 | <20 | <20 | <1 | <1 | <1 | <1 | <1 | <1 |
| Benzene | 2,000 | <1 | <1 | <1 | <5 | <1 | <2 | <20 | <20 | <1 | <1 | <1 | <1 | <1 | 5.3 |
| Toluene | 6,000 | <1.5 | <1.5 | <1.5 | <7.5 | <1.5 | <3 | <30 | <30 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| Ethylbenzene | 4,000 | <1 | <1 | <1 | <5 | <1 | <2 | <20 | <20 | <1 | <1 | <1 | <1 | <1 | <1 |
| Vinyl chloride | 2 | <2 | <2 | <2 | <10 | <2 | <2 | <40 | <2 | 6.2 | <2 | <2 | <2 | <2 | <2 |
| Trichloroethene | 300 | 1.8 | 2.7 | 2.2 | 22 | 20 | 12 | <20 | 52 | <1 | <1 | <1 | <1 | <1 | 1.5 |
| p/m-Xylene | 6,000 | <1 | <1 | <1 | <5 | <1 | <2 | <20 | <20 | <1 | <1 | <1 | <1 | <1 | <1 |
| o-Xylene | 6,000 | <1 | <1 | <1 | <5 | <1 | <2 | <20 | <20 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | 30,000 | 1.5 | 4.1 | 1.1 | 27 | 27 | 15 | <20 | 28 | 38 | <1 | <1 | 2.8 | 2.4 | 16 |
| Isopropylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| p-Isopropyltoluene | No Standard | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| Naphthalene | 6,000 | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| n-Propylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| 1,3,5-Trimethylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| 1,2,4-Trimethylbenzene | No Standard | <5 | <5 | <5 | <25 | <5 | <10 | <100 | <100 | <5 | <5 | <5 | <5 | <5 | <5 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | <130 | | | | | | | | | | | | | |
| C19-C36 Aliphatics | 20,000 | <130 | | | | | | | | | | | | | |
| C11-C22 Aromatics | 30,000 | <130 | | | | | | | | | | | | | |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 4,000 | | | | | | | | | | | | | | |

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

**TABLE 3**
**SOIL GAS RESULTS APRIL and JUNE 2000**

# Site RTN#1

| Location | Location Note | Benzene | Toluene | E-Benzene | m+p Xylenes | o Xylene | cis 1,2-DCE | trans 1,2-DCE | TCA | Vinyl Chloride | TCE | PCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv |
| SG1 | Corner of Building at | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 820 |
| SG2 | Side of Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 53 |
| SG3 | Side of Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 2,300 |
| SG4 | Side of Building | 34 | ND | ND | ND | ND | ND | ND | ND | ND | 1,200 | 5,800 |
| SG5 | Edge of 31 Site St. at sidewalk | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1,100 | 21,000 |
| SG6 | Edge of 31 Site St. at sidewalk | ND | ND | ND | ND | ND | ND | ND | ND | ND | 670 | 13,000 |
| SG7 | Edge of 31 Site St. at sidewalk | ND | ND | ND | ND | ND | 1,100 | ND | ND | ND | 7,600 | 36,000* |
| SG8 | Edge of 31 Site St. at sidewalk | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 3,800 |
| SG9 | Boundary between 31 Site St. and RR | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 140 |
| SG10 | Boundary between 31 Site St. and RR | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 93 |
| SG11 | Boundary between 31 Site St. and RR | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 200 |
| SG12 | Eastern corner of Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | 100 | 780 |
| SG13 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 3,600 |
| SG14 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 350 |
| SG15 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1,000 |
| SG16 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | 310 | ND | ND | ND |
| SG17 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 580 |
| SG18 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | 170 | ND | ND | 160 |
| SG19 | Along sewer line on 31 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 410 | 32,000* |
| SG20 | In front of Building | ND | ND | ND | ND | ND | ND | ND | 190 | ND | 2,300 | 39,000* |
| SG21 | In front of small Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | 36 | 1,300 |
| SG22 | Boundary between 31 Site St. and RR | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 720 |
| SG23 | South side of Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 7,200 |
| SG24 | At north end of concrete pad | ND | ND | ND | ND | ND | ND | ND | ND | ND | 28 | 900 |
| SG26 | 48 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 420 |
| SG27 | In front of Building | ND | ND | ND | ND | ND | ND | ND | ND | ND | 42 | 4,000 |
| SG-30 | 31 Site St. Sidewalk | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 39 |
| SG-31 | In front of 14 Site St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 23 |
| SG-32 | In front of 10 Site St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SG-33 | In road between 10 & 14 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 50 |
| SG-34 | In road in front of 31 Site St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 33,000* |
| SG-35 | In road in front of 31 Site St. | 9,600 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 340 |
| SG-36 | In road in front of 31 Site St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | 280 | 6,600 |
| SG-37 | 31 Site St. Sidewalk | ND | ND | ND | ND | ND | ND | ND | ND | ND | 930 | 21,000 |
| SG-38 | 31 Site St. Sidewalk | ND | ND | ND | ND | ND | 8,300 | ND | ND | ND | 2,200 | 3,700 |
| SG-39 | In front of garage at 26 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 510 |
| SG-40 | At side of 26 Adjacent St. | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 85 |
| SG-41 | In sidewalk in front of 31 Site St. gate | ND | ND | ND | ND | ND | 12,000 | ND | ND | ND | 7,700 | 4,200 |
| SG-42 | E-W across sewer | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1,800 | 22,000 |
| SG-43 | E-W across sewer | ND | ND | ND | ND | ND | ND | ND | ND | ND | 3,600 | 40,000* |
| SG-44 | E-W across sewer | ND | ND | ND | ND | ND | ND | ND | ND | ND | 340 | 39,000* |
| SG-45 | E-W across sewer | ND | ND | ND | ND | ND | ND | ND | ND | ND | 580 | 46,000* |
| Detection Limit | | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |

* = Detector saturated

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 46 Adjacent | 48 Adjacent | 48 Adjacent | 46 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 | Area 48 |
| Sample ID | | SW-1 | SW-2 | SW-3 | SW-4 | SW-5 | UL1 | UL2 | UL3 | UL4 | HW Limit 5 | HW Limit 6 | HW Limit 7 | HW Limit 8 | HW Limit 9 | HW Limit 10 | HW Limit 11 | 48-101 | 48-102 | 48-103 | 48-201 | 48-202 |
| Sample Depth | | 6' | 4.5' | 4.5' | 6' | 3' | 13' | 12' | 8' | 8' | 5' | 4.5' | 4.0' | 6' | 8' | 7.5' | 8' | 5.5' | 6.5' | 8' | 8' | 8' |
| MATERIAL | | Fill | Fill | Fill | Fill | Fill | Natural | Natural | Natural | Natural | Fill | Fill | Fill | Fill | Natural | Natural | Natural | Fill | Fill | Natural | Natural | Natural |
| Volatile Organic Compounds (ug/kg)* | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 36 | 28 | 46 | 29 | 39 | 0.56 | 0.385 | 0.495 | 37 | 0.65 | 35 | 75 | 33 | 38 | 41 | 42 | 33 | 50 | 35 | 34.5 | 25 |
| Toluene | 500,000 | 55 | 43 | 180 | 44 | 60 | 0.8 | 0.6 | 0.75 | 55 | 1.3 | 50 | 110 | 50 | 55 | 60 | 60 | 48.5 | 75 | 50 | 50 | 37.5 |
| Ethylbenzene | 500,000 | 36 | 28 | 46 | 29 | 39 | 0.56 | 0.385 | 0.495 | 37 | 0.65 | 35 | 75 | 33 | 38 | 41 | 42 | 33 | 50 | 35 | 34.5 | 25 |
| p/m-Xylene | 500,000 | 36 | 28 | 46 | 29 | 39 | 0.56 | 0.385 | 0.495 | 37 | 0.65 | 35 | 75 | 33 | 38 | 41 | 42 | 33 | 50 | 35 | 34.5 | 25 |
| o-Xylene | 500,000 | 36 | 28 | 46 | 29 | 39 | 0.56 | 0.385 | 0.495 | 37 | 0.65 | 35 | 75 | 33 | 38 | 41 | 42 | 33 | 50 | 35 | 34.5 | 25 |
| Tetrachloroethene | 20,000 | 15,000 | 600 | 1,600 | 1,100 | 710 | 5 | 120 | 29 | 37 | 140 | 4,400 | 1,000 | 2,800 | 3,300 | 730 | 1,500 | 350 | 4,600 | 550 | 2,600 | 1,900 |
| Vinyl chloride | 300 | 70 | 55 | 99 | 60 | 75 | 5.1 | 11 | 1 | 75 | 1.25 | 70 | 145 | 65 | 75 | 80 | 80 | 65 | 100 | 70 | 70 | 50 |
| Trichloroethene | 20,000 | 36 | 28 | 46 | 29 | 39 | 0.56 | 0.4 | 0.495 | 37 | 1 | 130 | 75 | 110 | 41 | 41 | 42 | 33 | 260 | 35 | 34.5 | 25 |
| cis-1,2-Dichloroethene | 100,000 | 36 | 28 | 46 | 29 | 39 | 0.65 | 0.4 | 0.495 | 37 | 0.65 | 35 | 75 | 33 | 38 | 41 | 42 | 33 | 50 | 35 | 34.5 | 25 |
| Volatile Petroleum Hydrocarbons (mg/kg) | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 300 | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| C19-C36 Aliphatics | 2,500 | | | | | | | | | | | | | | | | | | | | | |
| C11-C22 Aromatics | 500 | | | | | | | | | | | | | | | | | | | | | |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 200 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (g) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | 100 | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 30 | | | | | | | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| Mercury | 20 | | | | | | | | | | | | | | | | | | | | | |

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* Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent | 48 Adjacent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | | Area 48 | Area 48 | Area 48 | Area 48 | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM |
| Sample ID | Method 1 S-1/GW-2 or S-1/GW-3 | 48-203 | 48-204 | 48-205 | 48-206 | E-26 S-5 | E-29 S-3 | E-31 S-4 | E-32 S-4 | E-34 S-5 | E-35 S-5 | E-38 S-1 | E-38A S-1A | E-46 S-8 | E-47 S-6 | E-54 S-6 | E-54 S-6 | E-54 S-7 | E-56 S-5 | E-57 S-5 | E-58 S-5 | E-60DS-5 |
| Sample Depth | | 2.5' | 4' | 8' | 4.5' | 9-9.75' | 7-9' | 7-9' | 7-8.5' | 9-11' | 10-11.5 | 6-7 | 6-7 | 16-18 | 11-13 | 9-10.25' | 11-12.5' | 13-14.5' | 8-10' | 8.5-10' | 8.5-10.5' | 8.5-10.5 |
| MATERIAL | | Natural | Fill | Fill | Fill | Natural | Natural | Natural | Natural | Fill | Natural | Fill | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Fill |
| Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 60,000 | 48.5 | 25.3 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| Toluene | 500,000 | 50 | 44.5 | 42 | 27.5 | 36.5 | 36 | 49 | 41 | 41 | 41 | 40 | 32 | 42 | 45.5 | 43.5 | 41.5 | 47 | 48.5 | 42.5 | 50 | 50 |
| Ethylbenzene | 500,000 | 48.5 | 29.5 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| p/m-Xylene | 500,000 | 48.5 | 29.5 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| o-Xylene | 500,000 | 48.5 | 29.5 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| Tetrachloroethene | 20,000 | 8,000 | 140 | 28 | 3,900 | 36.5 | 36 | 720 | 41 | 470 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 26.0 | 210 | 140 |
| Vinyl chloride | 300 | 85 | 60 | 56 | 50 | 49 | 48 | 65 | 55 | 55 | 55 | 53 | 43 | 56 | 61 | 60 | 55 | 63 | 65 | 55 | 70 | 60 |
| Trichloroethene | 20,000 | 280 | 29.6 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| cis-1,2-Dichloroethene | 100,000 | 96 | 29.6 | 28 | 25 | 24.5 | 24 | 32.5 | 27 | 27 | 27.5 | 26.5 | 21.5 | 28 | 30.5 | 29 | 27.5 | 31.5 | 32.5 | 28 | 34 | 30.5 |
| Volatile Petroleum Hydrocarbons (mg/kg) | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| C19-C36 Aliphatics | 2,500 | | | | | | | | | | | | | | | | | | | | | |
| C11-C22 Aromatics | 800 | | | | | | | | | | | | | | | | | | | | | |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | 100 | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 30 | | | | | | | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| Mercury | 20 | | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

** Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 48 Adjacent | 48 Adjacent | 48 Adjacent | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM |
| Sample ID | | E-61 S-5 | E-62 S-4 | E-63 S-3A | E-12 S-3 | E-16 S-6 | E-20 S-6 | E-24 S-6 | E-25 S-7 | E-36 S-6 | E-37 S-5 | E-39 S-3 | E-40 S-3 | E-41 S-5 | E-42 S-5 | E-43 S-6 | E-44 S-7 | E-45 S-7 | E-49 S-6 | E-50 S-6 | E-51 S-6 | E-52DS-4 |
| Sample Depth | | 8.5-10.5 | 6.5-8.5' | 5-6' | 5-7 | 11-12.5' | 11-13' | 11-12.5' | 13-13.75' | 10-11.5' | 10-10.75' | 9-10.25' | 10-12' | 9-11' | 9-10' | 9-11' | 13-15' | 13-14.25' | 11-13' | 11-13' | 9-11' | 6.5-8.5' |
| MATERIAL | | Fill | Fill | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural |
| Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.5 | 27.5 | 28 | 30 | 27.5 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 24 | 29.6 |
| Toluene | 500,000 | 45.5 | 50 | 50 | 38.6 | 43.6 | 38 | 41 | 42 | 46 | 41.5 | 55 | 33 | 130 | 37 | 36 | 35 | 33 | 40.5 | | 35 | 44 |
| Ethylbenzene | 500,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.5 | 27.5 | 28 | 30 | 950 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 2,000 | 29.5 |
| p/m-Xylene | 500,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.6 | 27.5 | 28 | 30 | 180 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 10 | 29.6 |
| o-Xylene | 500,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.5 | 27.5 | 28 | 30 | 140 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 940 | 29.5 |
| Tetrachloroethene | 20,000 | 30.5 | 730 | 920 | 460 | 43.5 | 38 | 210 | 42 | 69 | 56 | 36 | 22 | 85 | 24.5 | 24 | 23 | 50 | 720 | | 120 | 270 |
| Vinyl chloride | 900 | 60 | 70 | 70 | 50 | 60 | 50 | 55 | 55 | 60 | 55 | 70 | 44 | 170 | 24.5 | 48 | 46.5 | 44 | 55 | | 47 | 60 |
| Trichloroethene | 20,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.5 | 27.5 | 28 | 30 | 27.5 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 24 | 29.5 |
| cis-1,2-Dichloroethene | 100,000 | 30.5 | 35 | 34.5 | 25.5 | 29 | 25.5 | 27.5 | 28 | 250 | 670 | 36 | 22 | 85 | 24.5 | 24 | 23 | 22 | 27 | | 24 | 29.5 |
| Volatile Petroleum Hydrocarbons (mg/kg) | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | | | 5.75 | | | | 47.7 | 220 | | | | | | | | | 5.56 | 5.4 | |
| C19-C36 Aliphatics | 2,500 | | | | | 5.75 | | | | 5.55 | 5.5 | | | | | | | | | 5.56 | 5.4 | |
| C11-C22 Aromatics | 800 | | | | | 5.75 | | | | 5.55 | 13.6 | | | | | | | | | 5.56 | 14.6 | |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | 100 | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 30 | | | | | | | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | | | | | | | | | | | | | | | | | | | | |
| Mercury | 20 | | | | | | | | | | | | | | | | | | | | | |

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Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
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# Site RTN#1

| STREET ADDRESS | | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Non RAM | Non RAM | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A |
| Sample ID | | B-53 S-3A | TP-203 S-4 | 4A-S-7 | 4A-S-7A | 4A-S-9 | 4A-S-11 | 4A-S-12 | 4A-S-14 | 4A-S-15 | 4A-S-16 | 4A-S-17 | 4A-S-18 | 4A-S-19 | 4A-S-20 | 4A-S-21 | 4A-S-22 | 4A-S-23 | 4A-S-24 | 4A-S-25 | 4A-S-26 | 4A-S-101 | 4A-S-102 |
| Sample Depth | | 5.5-6.5' | 11.5' | 9 | 6 | 10' | 9.5' | 8' | 10' | 7' | 8' | 9.5' | 9' | 7.5' | 10' | 10' | 9' | 9.5' | 14' | 13' | 11' | 6' | 6' |
| MATERIAL | | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Fill | Fill |
| Volatile Organic Compounds (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 27 | 65 | 350 | | 18 | 24 | 23 | 20 | 33 | 31 | 310 | 30 | 23 | 31 | 96 | 30 | 32 | 130 | 34 | 36 | 28.5 | 25.5 |
| Toluene | 500,000 | 40 | 95 | 500 | | 27 | 36 | 34 | 30 | 50 | 27 | 465 | 44 | 35 | 46 | 55 | 45 | 48 | 195 | 50 | 55 | 43 | 38 |
| Ethylbenzene | 500,000 | 27 | 65 | 700 | | 18 | 24 | 79 | 20 | 33 | 240 | 1,300 | 30 | 23 | 31 | 96 | 30 | 32 | 130 | 34 | 36 | 28.5 | 25.5 |
| p/m-Xylene | 500,000 | 27 | 65 | 2,600 | | 18 | 24 | 100 | 20 | 33 | 1,500 | 8,100 | 30 | 23 | 31 | 220 | 30 | 32 | 380 | 34 | 36 | 28.5 | 25.5 |
| o-Xylene | 500,000 | 27 | 65 | 350 | | 18 | 24 | 23 | 20 | 33 | 31 | 310 | 30 | 23 | 31 | 36 | 30 | 32 | 130 | 34 | 36 | 28.5 | 25.5 |
| Tetrachloroethene | 20,000 | 370 | 890 | 350 | | 280 | 24 | 540 | 220 | 33 | 95 | 310 | 30 | 23 | 120 | 3,100 | 130 | 32 | 540 | 280 | 4,800 | 3300 | 350 |
| Vinyl chloride | 300 | 56 | 190 | 700 | | 36 | 48 | 46 | 40 | 165 | 60 | 600 | 60 | 47 | 60 | 70 | 60 | 65 | 260 | 65 | 70 | 55 | 50 |
| Trichloroethene | 20,000 | 27 | 65 | 3,400 | | 120 | 24 | 48 | 20 | 33 | 69 | 310 | 30 | 23 | 31 | 700 | 30 | 84 | 130 | 34 | 490 | 28.5 | 25.5 |
| cis-1,2-Dichloroethene | 100,000 | 27 | 65 | 350 | | 18 | 24 | 56 | 20 | 33 | 1,300 | 310 | 30 | 23 | 31 | 300 | 68 | 32 | 130 | 34 | 140 | 28.5 | 25.5 |
| Volatile Petroleum Hydrocarbons (mg/kg) | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | 19 | | | | | | | | | | | | | | | 19 | | | |
| C9-C12 Aliphatics | 1,000 | | | | 396 | | | | | | | | | | | | | | | 396 | | | |
| C9-C10 Aromatics | 100 | | | | 248 | | | | | | | | | | | | | | | 248 | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Extractable Petroleum Hydrocarbons (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | | 16.9 | | 34.0 | 9.45 | 16.5 | 6.05 | 256 | 158 | | | | 5.75 | | 5.56 | | 224 | 82.1 | 144 | 5.9 | 5 |
| C19-C36 Aliphatics | 2,500 | | | 34.7 | | 27.8 | 13.2 | 50.8 | 20.2 | 99.2 | 128 | | | | 5.75 | | 16.8 | | 109 | 36.1 | 100 | 14.7 | 5 |
| C11-C22 Aromatics | 800 | | | 24.4 | | 27.9 | 15.3 | 38.5 | 91 | 94.9 | 116 | | | | 5.75 | | 17.6 | | 116 | 43.1 | 90.6 | 15.2 | 5 |
| PAH (ug/kg) | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (e) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | | | |
| Total Metals (mg/kg) | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | | | |
| Cyanide | 100 | | | | | | | 0.075 | | | | | | | | | | | | | | | |
| Arsenic | 30 | | | | | | | 2.3 | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | | | | | | 11 | | | | | | | | | | | | | | | |
| Mercury | 20 | | | | | | | 0.125 | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

** Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31 Site | 31/33 Site | 31/33 Site | 31/33 Site | 31/33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Area 4A | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM |
| Sample ID | | 4A-S-103 | 4A-S-104 | 4A-S-201 | 4A-S-202 | 4A-S-301 | 4A-S-401 | 4A-S-501 | 4A-S-601 | 4A-S-602 | 4A-S-603 | 4A-S-604 | DRAINAGE-A | DRAINAGE-B | DRAINAGE-C | DRAINAGE-D | TP-210 S-1 | E-9 S-4 | E-11 S-5 | E-13 S-5 | E-14 S-3 | E-17 S-4 | E-30DS-4 |
| Sample Depth | | 11' | 8' | 8.5' | 7.5' | 7' | 7.5' | 5' | 4' | 4' | 9' | 9' | 12' | 12' | 13' | 11' | 6' | 7-9' | 9-11' | 9-10.25' | 10-12' | 7-9' | 7-9' |
| MATERIAL | | Natural | Natural | Natural | Natural | Natural | Natural | Fill | Fill | Fill | Natural | Natural | Natural | Natural | Natural | Natural | Fill | Natural | Natural | Natural | Natural | Natural | Natural |
| **Volatile Organic Compounds (ug/kg)*** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 27 | | | | 32 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| Toluene | 500,000 | 41 | | | | 47.5 | | 65 | | | | | | | | | | | | 38 | 32.5 | | |
| Ethylbenzene | 500,000 | 27 | | | | 32 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| p/m-Xylene | 500,000 | 27 | | | | 63 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| o-Xylene | 500,000 | 27 | | | | 32 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| Tetrachloroethene | 20,000 | 27 | | | | 2000 | | 1200 | | | | | | | | | | | | 38 | 32.5 | | |
| Vinyl chloride | 300 | 55 | | | | 65 | | 85 | | | | | | | | | | | | 48 | 43 | | |
| Trichloroethene | 20,000 | 27 | | | | 170 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| cis-1,2-Dichloroethene | 100,000 | 27 | | | | 69 | | 43 | | | | | | | | | | | | 24 | 21.5 | | |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | 21.9 | 1.94 | 1.80 | | 78.80 | | 1.9 | 1.5 | 4 | 1 | 1.47 | 1.4 | 1.71 | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | 19.5 | 1.94 | 8.01 | | 743 | | 1.9 | 10.9 | 55.8 | 8.25 | 1.47 | 1.4 | 1.71 | | | | | | | | |
| C9-C10 Aromatics | 100 | | 9.9 | 1.94 | 1.80 | | 412 | | 1.9 | 30.8 | 238 | 10.5 | 1.47 | 1.4 | 1.71 | | | | | | | | |
| Benzene | 40 | | 0.05 | 0.10 | 0.09 | | | | 0.096 | 0.076 | 0.213 | 0.052 | | | | | | | | | | | |
| Toluene | 500 | | 0.05 | 0.10 | 0.09 | | | | 0.096 | 0.076 | 0.213 | 0.052 | | | | | | | | | | | |
| Ethylbenzene | 500 | | 0.05 | 0.10 | 0.09 | | | | 0.096 | 0.076 | 1.51 | 0.052 | | | | | | | | | | | |
| p/m-Xylene | 500 | | 0.05 | 0.10 | 0.09 | | | | 0.096 | 0.076 | 1.05 | 0.052 | | | | | | | | | | | |
| o-Xylene | 500 | | 0.05 | 0.19 | 0.09 | | | | 0.096 | 0.076 | 0.653 | 0.052 | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | 0.12 | 0.19 | 0.18 | | | | 0.192 | 0.152 | 0.425 | 0.104 | | | | | | | | | | | |
| Naphthalene | 100 | | 0.62 | 0.97 | 0.90 | | | | 0.96 | 0.76 | 7.14 | 0.52 | | | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | 5.55 | | | | | 1,050 | | | | | | 5.7 | 17.7 | 9.7 | 5.45 | | 1140 | 16.7 | 5.5 | 5.45 | 5.5 | 5 |
| C19-C36 Aliphatics | 2,500 | 5.55 | | | | | 558 | | | | | | 29.4 | 70.1 | 32.2 | 38.4 | | 775 | 5.6 | 5.5 | 19.9 | 5.5 | 5 |
| C11-C22 Aromatics | 800 | 5.55 | | | | | 409 | | | | | | 39.1 | 85.8 | 95.5 | 63.6 | | 492 | 5.6 | 5.5 | 6.45 | 5.6 | 5 |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | | | | | | 125 | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | | | | | | 125 | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | | | | | | 370 | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | | | | | | 390 | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | | | | | | 310 | | | | | | |
| Benzo (e) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | | | | | | 270 | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | | | | | | 320 | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | | | | | | 420 | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | | | | | | 400 | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | | | | | | 270 | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | | | | | | 125 | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | | | | | | 548 | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | 230 | | | | | | |
| Cyanide | 100 | | 0.105 | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 30 | | 3.5 | | | | | | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | 19 | | | | | | | | | | | | | | | | | | | | |
| Mercury | 20 | | 0.125 | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

* Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 33 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 38 Site | 38 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Non RAM | Area 3 | Area 3 | Area 3 | Area 3 | Area 3 | Area 3 | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 |
| Sample ID | | E-48 S-4 | 3-S-1 | 3-S-2 | 3-S-3 | 3-S-4 | 3-S-5 | 3-S-6 | TP-211 S-3 | TP-213 S-2 | TP-214 S-2 | TP-215 S-3 | TP-217 S-2 | E-4 S-3 | E-7B S-3 | E-55 S-2 | E-55 S-3 | B-5 S-3 | Limit-1 Area 2 | Limit-2 Area 2 | Limit-3 Area 2 | Limit-4 Area 2 | Limit-5 Area 2 |
| Sample Depth | | 7-9' | 10' | 12' | 11.5' | 12' | 10' | 14' | 5' | 5' | 6.5' | 10.5' | 12.5' | 10-12' | 5-6.2' | 5-7' | 7-9' | 10-12 | 10' | 8' | 7' | 8' | 7' |
| MATERIAL | | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Fill | Fill | Glacial Till | Fill | Fill | Fill | Fill | Fill |
| **Volatile Organic Compounds (ug/kg)**** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 26.5 | 27 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| Toluene | 500,000 | 0.65 | 39 | 37 | 38 | 37 | 40 | 150 | | | | | | | | 35 | 37 | 39.5 | 26 | 37 | 46 | 42 | 39 |
| Ethylbenzene | 500,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 86 | 27 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| p/m-Xylene | 500,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 250 | 150 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| o-Xylene | 500,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 26.5 | 70 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| Tetrachloroethene | 20,000 | 5.2 | 26 | 24.5 | 280 | 190 | 26.5 | 27 | | | | | | | | 23.5 | 24.5 | 39.5 | 24 | 25 | 32 | 28 | 26 |
| Vinyl chloride | 900 | 0.9 | 50 | 49 | 50 | 49 | 55 | 55 | | | | | | | | 47 | 49 | 50 | 48 | 49 | 60 | 55 | 50 |
| Trichloroethene | 20,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 26.5 | 27 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| cis-1,2-Dichloroethene | 100,000 | 0.445 | 26 | 24.5 | 25.5 | 24.5 | 26.5 | 27 | | | | | | | | 23.5 | 24.5 | 26 | 24 | 25 | 32 | 28 | 26 |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | 1.08 | | 1.13 | | 1.18 | | | | | | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | 9.00 | | 22.20 | | 22.1 | | | | | | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | 1.08 | | 6.01 | | 13.1 | | | | | | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | | 5.26 | 5.25 | 5.75 | 5.50 | 20.4 | 5.6 | 100 | 672 | 210 | 5.9 | | 5.9 | 5.55 | | | | 5.5 | 198 | 14.7 | 5.9 | 5.9 |
| C19-C36 Aliphatics | 2,500 | | 34.8 | 27.8 | 76.1 | 69.8 | 976 | 26.8 | 91.7 | 121 | 60.9 | 5.9 | | 5.9 | 5.55 | | | | 5.5 | 127 | 74.5 | 5.9 | 5.9 |
| C11-C22 Aromatics | 800 | | 16.5 | 5.4 | 56.5 | 80.4 | 644 | 18.7 | 117 | 442 | 76.2 | 5.9 | | 5.9 | 5.55 | | | | 5.5 | 344 | 48.7 | 5.9 | 5.9 |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | | 11 | 23.5 | | | | | | | | | | |
| 2-Chloronaphthalene | N/A | | | | | | | | | | | 11 | 23.5 | | | | | | | | | | |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | | 11 | 23.5 | | | | | | | | | | |
| Acenaphthene | 1,000,000 | | | | | | | | | | | 11 | 79 | | | | | | | | | | |
| Acenaphthylene | 100,000 | | | | | | | | | | | 11 | 50 | | | | | | | | | | |
| Anthracene | 1,000,000 | | | | | | | | | | | 11 | 140 | | | | | | | | | | |
| Benzo (a) anthracene | 700 | | | | | | | | | | | 32 | 330 | | | | | | | | | | |
| Benzo (a) pyrene | 700 | | | | | | | | | | | 27 | 420 | | | | | | | | | | |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | | 24 | 340 | | | | | | | | | | |
| Benzo (e) Pyrene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | | 11 | 270 | | | | | | | | | | |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | | 26 | 330 | | | | | | | | | | |
| Biphenyl | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | | | | | | | | | | 33 | 380 | | | | | | | | | | |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | | 11 | 78 | | | | | | | | | | |
| Fluoranthene | 1,000,000 | | | | | | | | | | | 49 | 730 | | | | | | | | | | |
| Fluorene | 1,000,000 | | | | | | | | | | | 11 | 90 | | | | | | | | | | |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | | 11 | 310 | | | | | | | | | | |
| Naphthalene | 100,000 | | | | | | | | | | | 11 | 23.5 | | | | | | | | | | |
| Perylene | N/A | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | | | | | | | | | | 39 | 370 | | | | | | | | | | |
| Pyrene | 700,000 | | | | | | | | | | | 42 | 1000 | | | | | | | | | | |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | 23 | 7.2 | | | | | | | | | | |
| Cyanide | 100 | | 0.19 | | | 0.1 | | | | | | | | | | | | | | | | 0.125 | 0.05 |
| Arsenic | 30 | | 2.8 | | | 4.8 | | | | | | | | | | | | | | | | 3.4 | 10 |
| Chromium | 1,000 | | 10 | | | 11 | | | | | | | | | | | | | | | | 10 | 7.7 |
| Mercury | 20 | | 0.77 | | | 0.135 | | | | | | | | | | | | | | | | 0.13 | 0.125 |

Full-Scale (LARGE)version is available to download

** Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS--SOIL SAMPLES

# Site RTN #1

| STREET ADDRESS | Method 1 S-1/GW-2 or S-1/GW-3 | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 39 Site | 55 Site | 55 Site | 55 Site | 55 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Area 2 | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM | Non RAM |
| Sample ID | | Limit -5 Area 2 | Limit -5 Area 2 | Area 2 Tank North | Area 2 Tank East | Concrete Vault S-3 | Concrete Vault S-4 | Concrete Vault S-101 | Concrete Vault S-102 | Concrete Filled Tank S-3 | Concrete Filled Tank S-4 | Concrete Filled Tank S-5 | Concrete Filled Tank S-6 | Concrete Filled Tank S-7 | RCP Excavation S-1 | UTILITY - 1 | UTILITY - 2 | UTILITY - 3 | UTILITY - 4 | TP-225 S-1 | TP-225 S-3 | TP-235 S-1 | TP-235CS-3 |
| Sample Depth | | 11' | 10' | 5.5' | 6' | 6' | 8' | 4.5' | 5' | 8' | 10' | 6.5' | 7.5' | 8' | 12' | 10' | 10' | 8' | 15' | 5.75 | 13.5 | 2 | 6.6 |
| MATERIAL | | Natural | Natural | Fill | Fill | Fill | Fill | Fill | Fill | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Fill | Natural | Fill | Glacial Till | Fill | Glacial Till |
| **Volatile Organic Compounds (ug/kg)** ** | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | 25 | | 45.5 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| Toluene | 500,000 | 37 | | 70 | 55 | 47.5 | 46 | | | | | | | | 2200 | | | | | | | | |
| Ethylbenzene | 500,000 | 25 | | 45.5 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| p/m-Xylene | 500,000 | 25 | | 280 | 37 | 26.5 | 30.5 | | | | | | | | 4200 | | | | | | | | |
| o-Xylene | 500,000 | 25 | | 110 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| Tetrachloroethene | 20,000 | 25 | | 45.5 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| Vinyl chloride | 300 | 49 | | 90 | 75 | 65 | 60 | | | | | | | | 2950 | | | | | | | | |
| Trichloroethene | 20,000 | 25 | | 45.5 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| cis-1,2-Dichloroethene | 100,000 | 25 | | 45.5 | 37 | 26.5 | 30.5 | | | | | | | | 1450 | | | | | | | | |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | 100,000 | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | 1.25 | 1.74 | | | | | | | | 1.39 | | | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | | | 1.25 | 1.74 | | | | | | | | 108 | | | | | | | | | | |
| C9-C10 Aromatics | 100 | | | 1.25 | 1.74 | | | | | | | | 64.1 | | | | | | | | | | |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | | | |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | | | |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | | | |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | 144 | | | | 391 | 762 | 1,100 | 89.8 | 683 | 5.75 | 3,100 | | 942 | 1350 | 6.45 | 56.1 | 255 | 43 | | | | |
| C19-C36 Aliphatics | 2,500 | 317 | | | | 681 | 1120 | 1,620 | 104 | 358 | 5.75 | 1,790 | | 114 | 2940 | 117 | 62.2 | 65.8 | 317 | | | | |
| C11-C22 Aromatics | 800 | 313 | | | | 620 | 717 | 1,120 | 89 | 582 | 16.7 | 2,870 | | 544 | 1290 | 86.2 | 85 | 239 | 309 | | | | |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | 93 | | | | | | | | | | | | | | | | | 160 | 100 | 520 | 12 |
| 2-Chloronaphthalene | N/A | | 11 | | | | | | | | | | | | | | | | | 160 | 100 | 235 | 12 |
| 2-Methylnaphthalene | 500,000 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 160 | 100 | 760 | 12 |
| Acenaphthene | 1,000,000 | | 46 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 550 | 100 | 1700 | 12 |
| Acenaphthylene | 100,000 | | 26 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 160 | 100 | 235 | 12 |
| Anthracene | 1,000,000 | | 43 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 1200 | 100 | 4900 | 12 |
| Benzo (a) anthracene | 700 | | 33 | | | | | | | | | | | | | 271.5 | 294 | 281 | 0.795 | 4100 | 100 | 13000 | 12 |
| Benzo (a) pyrene | 700 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 0.886 | 3800 | 100 | 12000 | 12 |
| Benzo (b) fluoranthene | 700 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 1.53 | 3000 | 100 | 9700 | 12 |
| Benzo (c) Pyrene | N/A | | 11 | | | | | | | | | | | | | | | | | | | | |
| Benzo (ghi) perylene | 1,000,000 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 0.639 | 2600 | 100 | 7300 | 12 |
| Benzo (k) fluoranthene | 7,000 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 1.01 | 3200 | 100 | 9200 | 12 |
| Biphenyl | 100,000 | | 11 | | | | | | | | | | | | | | | | | | | | |
| Chrysene | 7,000 | | 87 | | | | | | | | | | | | | 271.5 | 294 | 281 | 0.959 | 4300 | 100 | 13000 | 12 |
| Dibenzo (a,h) anthracene | 700 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 650 | 100 | 1900 | 12 |
| Fluoranthene | 1,000,000 | | 74 | | | | | | | | | | | | | 271.5 | 294 | 281 | 2.23 | 8700 | 100 | 28000 | 12 |
| Fluorene | 1,000,000 | | 180 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 510 | 100 | 2000 | 12 |
| Indeno (1,2,3-cd) Pyrene | 700 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 0.782 | 2700 | 100 | 8300 | 12 |
| Naphthalene | 100,000 | | 11 | | | | | | | | | | | | | 271.5 | 294 | 281 | 274.5 | 160 | 100 | 1500 | 12 |
| Perylene | N/A | | 49 | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 100,000 | | 400 | | | | | | | | | | | | | 271.5 | 294 | 281 | 1.78 | 6000 | 100 | 19000 | 12 |
| Pyrene | 700,000 | | 120 | | | | | | | | | | | | | 271.5 | 294 | 281 | 2.09 | 8700 | 100 | 24000 | 12 |
| PCBs (mg/kg) | 2 | | 0.10 | | | | | | | | | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | 82 | 4.95 | 82 | 6 |
| Cyanide | 100 | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 30 | | | | | | | | | | | | | | | | | | | | | | |
| Chromium | 1,000 | | | | | | | | | | | | | | | | | | | | | | |
| Mercury | 20 | | | | | | | | | | | | | | | | | | | | | | |

Full-Scale (LARGE)version is available to download

** Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 4
SUMMARY OF POST-RAM RISK RESULTS–SOIL SAMPLES

# Site RTN#1

| STREET ADDRESS | | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | 55 Site | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONSTRUCTION AREA/LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | Non RAM | Non RAM | Non RAM | Area 1 | Area 1 | Area 1 | Area 1 | Area 1 | Area 1 | Area 1 | Tank 1 | Tank 1 | Tank 1 | Tank 1 | Tank 1 | non RAM | non RAM | non RAM | non RAM | No. of Samples | Average Concentration | Maximum Concentration | No. of Samples > Method 1 Cleanup Standards |
| Sample ID | | TP-237 S-3 | B-3 S-3 | B-3A S-2 | Area 1 Limit-1 | Area 1 Limit-2 | Area 1 Limit-3 | Area 1 Limit-4 | Area 1 Limit-5 | Area 1 Stockpile S-2 | Area 1 | Tank 1A | Tank 1B | Tank 1C | Tank 1D | Tank 1E | Tank 2A | Tank 2B | Tank 2C | Tank 2D | | | | |
| Sample Depth | | 10' | 10-12' | 5-7' | 9' | 8.5' | 9' | 7.5' | 11.5' | | | 10 | 9 | 9.5 | 8 | 8.5 | 8 | 7 | 7 | 7 | | | | |
| MATERIAL | | Natural | Natural | Natural | Natural | Fill | Natural | Natural | Natural | | | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | Natural | | | | |
| **Volatile Organic Compounds (ug/kg)**** | | | | | | | | | | | | | | | | | | | | | | | | |
| Benzene | 40,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 48 | 1,450 | 0 |
| Toluene | 500,000 | | 105 | | 45 | 45 | 40 | 29 | 55 | | | 75 | 100 | 76 | 115 | 125 | 42 | 45 | 42.5 | 31.5 | 124 | 74 | 2,200 | 0 |
| Ethylbenzene | 500,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 85 | 2,000 | 0 |
| p/m-Xylene | 500,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 174 | 8,100 | 0 |
| o-Xylene | 500,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 68 | 1,460 | 0 |
| Tetrachloroethene | 20,000 | | 105 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 380 | 28 | 30 | 31.5 | 21 | 124 | 701 | 15,000 | 0 |
| Vinyl chloride | 300 | | 140 | | 60 | 60 | 55 | 38 | 70 | | | 100 | 130 | 100 | 155 | 170 | 55 | 60 | 65 | 42 | 124 | 97 | 2,950 | 3 |
| Trichloroethene | 20,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 92 | 3,400 | 0 |
| cis-1,2-Dichloroethene | 100,000 | | 70 | | 30 | 30 | 26.5 | 19 | 35.5 | | | 50 | 65 | 49.5 | 80 | 85 | 28 | 30 | 31.5 | 21 | 124 | 70 | 1,450 | 0 |
| **Volatile Petroleum Hydrocarbons (mg/kg)** | 100,000 | | | | | | | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 100 | | | | | | | | | | | | | | | | | | | | 19 | 9 | 79 | 0 |
| C9-C12 Aliphatics | 1,000 | | | | | | | | | | | | | | | | | | | | 19 | 95 | 743 | 0 |
| C9-C10 Aromatics | 100 | | | | | | | | | | | | | | | | | | | | 19 | 68 | 412 | 4 |
| Benzene | 40 | | | | | | | | | | | | | | | | | | | | 7 | 0.10 | 0.21 | 0 |
| Toluene | 500 | | | | | | | | | | | | | | | | | | | | 7 | 0.10 | 0.21 | 0 |
| Ethylbenzene | 500 | | | | | | | | | | | | | | | | | | | | 7 | 0.28 | 1.51 | 0 |
| p/m-Xylene | 500 | | | | | | | | | | | | | | | | | | | | 7 | 0.22 | 1.05 | 0 |
| o-Xylene | 500 | | | | | | | | | | | | | | | | | | | | 7 | 0.17 | 0.65 | 0 |
| Methyl tert butyl ether | 100 | | | | | | | | | | | | | | | | | | | | 7 | 0.20 | 0.43 | 0 |
| Naphthalene | 100 | | | | | | | | | | | | | | | | | | | | 7 | 1.69 | 7.14 | 0 |
| **Extractable Petroleum Hydrocarbons (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | 5.6 | 15.6 | 5.5 | 5.4 | 5.5 | 5.6 | 11.1 | 145 | | | 5.7 | 6.3 | 5.8 | 5.95 | 28.2 | 5.3 | | 5.25 | | 77 | 182 | 3,100 | 5 |
| C19-C36 Aliphatics | 2,500 | 435 | 178 | 5.5 | 12.7 | 354 | 19.8 | 1,100 | 2,140 | | | 5.7 | 6.3 | 5.8 | 5.95 | 389 | 57.3 | | 5.25 | | 77 | 238 | 2,940 | 1 |
| C11-C22 Aromatics | 800 | 102 | 129 | 20.8 | 5.4 | 69.8 | 5.6 | 240 | 527 | | | 5.7 | 6.3 | 5.8 | 5.95 | 431 | 60.2 | | 29.6 | | 77 | 187 | 2,870 | 3 |
| **PAH (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-Methylnaphthalene | N/A | | | | | | | | | | 11 | | | | | | | | | | 9 | 117 | 520 | N/A |
| 2-Chloronaphthalene | N/A | | | | | | | | | | 11 | | | | | | | | | | 9 | 76 | 235 | N/A |
| 2-Methylnaphthalene | 500,000 | | | | | | | | | | 11 | | | | | | | | | | 13 | 180 | 760 | 0 |
| Acenaphthene | 1,000,000 | | | | | | | | | | 11 | | | | | | | | | | 13 | 289 | 1,700 | 0 |
| Acenaphthylene | 100,000 | | | | | | | | | | 11 | | | | | | | | | | 13 | 142 | 294 | 0 |
| Anthracene | 1,000,000 | | | | | | | | | | 85 | | | | | | | | | | 13 | 595 | 4,900 | 0 |
| Benzo (a) anthracene | 700 | | | | | | | | | | 160 | | | | | | | | | | 13 | 1,460 | 13,000 | 2 |
| Benzo (a) pyrene | 700 | | | | | | | | | | 110 | | | | | | | | | | 13 | 1,363 | 12,000 | 2 |
| Benzo (b) fluoranthene | 700 | | | | | | | | | | 100 | | | | | | | | | | 13 | 1,111 | 9,700 | 2 |
| Benzo (e) Pyrene | N/A | | | | | | | | | | 78 | | | | | | | | | | 2 | 45 | 78 | N/A |
| Benzo (ghi) perylene | 1,000,000 | | | | | | | | | | 52 | | | | | | | | | | 13 | 683 | 7,300 | 0 |
| Benzo (k) fluoranthene | 7,000 | | | | | | | | | | 100 | | | | | | | | | | 13 | 1,088 | 9,200 | 1 |
| Biphenyl | 100,000 | | | | | | | | | | 11 | | | | | | | | | | 2 | 11 | 11 | 0 |
| Chrysene | 7,000 | | | | | | | | | | 140 | | | | | | | | | | 13 | 1,485 | 13,000 | 2 |
| Dibenzo (a,h) anthracene | 700 | | | | | | | | | | 11 | | | | | | | | | | 13 | 309 | 1,900 | 1 |
| Fluoranthene | 1,000,000 | | | | | | | | | | 340 | | | | | | | | | | 13 | 3,019 | 28,000 | 0 |
| Fluorene | 1,000,000 | | | | | | | | | | 110 | | | | | | | | | | 13 | 328 | 2,000 | 0 |
| Indeno (1,2,3-cd) Pyrene | 700 | | | | | | | | | | 50 | | | | | | | | | | 13 | 970 | 8,300 | 2 |
| Naphthalene | 100,000 | | | | | | | | | | 11 | | | | | | | | | | 13 | 236 | 1,500 | 0 |
| Perylene | N/A | | | | | | | | | | 33 | | | | | | | | | | 2 | 41 | 49 | N/A |
| Phenanthrene | 100,000 | | | | | | | | | | 140 | | | | | | | | | | 13 | 2,080 | 19,000 | 0 |
| Pyrene | 700,000 | | | | | | | | | | 370 | | | | | | | | | | 13 | 2,749 | 24,000 | 0 |
| PCBs (mg/kg) | 2 | | | | | | | | | | | | | | | | | | | | 6 | 0.11 | 0.11 | 0 |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | |
| Lead | 300 | | | | | | | | | | | | | | | | | | | | 7 | 62 | 230 | 0 |
| Cyanide | 100 | | | | | | | | | 0.09 | 0.07 | | | | | | | | | | 8 | 0.10 | 0.19 | 0 |
| Arsenic | 30 | | | | | | | | | 3.0 | 2.9 | | | | | | | | | | 8 | 4 | 10 | 0 |
| Chromium | 1,000 | | | | | | | | | 7.0 | 8.1 | | | | | | | | | | 8 | 10 | 19 | 0 |
| Mercury | 20 | | | | | | | | | 0.13 | 0.13 | | | | | | | | | | 8 | 0.21 | 0.77 | 0 |

Full-Scale (LARGE)version is available to download

** Compounds not historically observed and with a low frequency of detection at low concentrations not shown

Blank--not analyzed
Half of detection limit used as value of compounds reported as not detected by the analytical laboratory

TABLE 5
SUMMARY OF PCB RESULTS

# Site RTN#1

| LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | Area 2 SP-1 | Area 2 SP-2 | Area 2 SP-3 | Area 2 SP-4 | Area 2 SP-5 | SP-101 | SP-102 | SP-103 | SP-104 | SP-2-201 | SP-2-202 | SP-2-203 | SP-2-204 |
| Location | | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site | Stockpile--removed from site |
| Sample Depth (ft) | | | | | | | | | | | | | | |
| PCBs (ug/kg) | | | | | | | | | | | | | | |
| Aroclor 1221 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |
| Aroclor 1232 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |
| Aroclor 1242/1016 | 2 | 0.11 | 0.11 | 2.31 | 0.11 | 1.01 | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |
| Aroclor 1248 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.14 | 0.14 | 0.13 | 0.13 | 0.74 | 0.14 | 0.14 | 0.14 |
| Aroclor 1254 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |
| Aroclor 1260 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.14 | 0.14 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |

| LOCATION | Method 1 S-1/GW-2 or S-1/GW-3 | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | 39-43 Site | No of Samples | Average Concentration | Maximum Concentration |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | Limit-1 Area 2 | Limit-2 Area 2 | Limit-3 Area 2 | Limit-4 Area 2 | Limit-5 Area 2 | Limit -6 Area 2 | | | |
| Location | | Limit of Excavation | Limit of Excavation | Limit of Excavation | Limit of Excavation | Limit of Excavation | Limit of Excavation | | | |
| Sample Depth (ft) | | 10' | 5' | 7' | 8' | 7' | 10' | | | |
| PCBs (ug/kg) | | | | | | | | | | |
| Aroclor 1221 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |
| Aroclor 1232 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |
| Aroclor 1242/1016 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |
| Aroclor 1248 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |
| Aroclor 1254 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |
| Aroclor 1260 | 2 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 6 | 0.11 | 0.11 |

Half of laboratory detection limit used as value of compounds reported as ND

TABLE 6
POST RAM CHEMICAL TEST RESULTS–GROUNDWATER SAMPLES

| Well ID | Method 1 GW-2 or GW-3 | GW-1 | | | | GW-3/GW-3 Rpl | | | | GW-4 | | | | GW-5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | Area 4A | | | | Area 4A | | | | Area 4A | | | | Area 2 | | | |
| Sampling Date | | 04/19/02 | 11/11/02 | 11/27/02 | 02/20/03 | 04/19/02 | 05/24/02 | 11/27/02 | 02/20/03 | 04/19/02 | 05/24/02 | 11/27/02 | 02/20/03 | 04/19/02 | 05/24/02 | 11/27/02 | 02/20/03 |
| **Volatile Organic Compounds (ug/l)**** | | | | | | [GW-3] | [GW-3] | [GW-3 Rpl] | [GW-3 Rpl] | Dry | Dry | Dry | Dry | Dry | Dry | | Dry |
| Benzene | 2,000 | 1 | <5 | 1.5 | <0.5 | <25 | <2 | <1.2 | <0.5 | | | | | | | <0.5 | |
| Ethylbenzene | 4,000 | <5 | <5 | 1.2 | <0.5 | <25 | <2 | <1.2 | <0.5 | | | | | | | <0.5 | |
| Toluene | 6,000 | 0.93 | <7.5 | 1.6 | <0.75 | <38 | <3 | <1.7 | 2.0 | | | | | | | <0.75 | |
| o-Xylene | 6,000 | 1 | <5 | 1.2 | 1.2 | <25 | <2 | 2.1 | <0.5 | | | | | | | <0.5 | |
| p/m-Xylene | 6,000 | 1.2 | <5 | 1.6 | 1.4 | <25 | <2 | <1.2 | <0.5 | | | | | | | <0.5 | |
| Naphthalene | 6,000 | 20 | <25 | 21 | 5.6 | <120 | 14 | <6.2 | <2.5 | | | | | | | <2.5 | |
| cis-1,2-Dichloroethene | 30,000 | 5.8 | 7.5 | 8.4 | 1.4 | 130 | 61 | 27 | 16 | | | | | | | 0.82 | |
| Tetrachloroethene | 3,000 | 43 | 54 | 59 | 22 | <25 | 34 | 54 | 69 | | | | | | | 1.6 | |
| 1,1,2,2-Tetrachloroethene | 20 | <5 | <5 | <0.5 | <0.5 | <25 | <2 | <1.2 | <0.5 | | | | | | | <0.5 | |
| Trichloroethene | 30 | 4.6 | <5 | 5 | 1.3 | <25 | 4.9 | 5.5 | 4.7 | | | | | | | <0.5 | |
| Vinyl chloride | 2 | **<10** | **<10** | <1 | <1 | **<50** | **19** | **8.4** | **5.0** | | | | | | | <1 | |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | <100 | <102 | | <100 | 1,040 | | <100 | 1,240 | | | | | | | | |
| C19-C36 Aliphatics | 20,000 | 284 | <102 | | 505 | <100 | | <100 | <100 | | | | | | | | |
| C11-C22 Aromatics | 30,000 | 148 | <102 | | 532 | 255 | | <100 | <100 | | | | | | | | |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | <200 | | | | <800 | 51.2 | <100 | 162 | | | | | | | | |
| C9-C12 Aliphatics | 1,000 | <200 | | | | 7,030 | 1,630 | 2,260 | 3,350 | | | | | | | | |
| C9-C10 Aromatics | 4,000 | <200 | | | | 4,780 | 1,140 | 1,400 | 4,110 | | | | | | | | |

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of
Cleanup Standards

TABLE 6
POST RAM CHEMICAL TEST RESULTS–GROUNDWATER SAMPLES

| Well ID | Method 1 GW-2 or GW-3 | GW-6/GW-6 Rpl | | GW-7 | | | GW-2 | | | GW-8B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Address | | Area 2 PCB area | | | | | Area 4B | | | | | | |
| Sampling Date | | 04/19/02 | 02/20/03 | 04/19/02 | 11/11/02 | 02/20/03 | 04/19/02 | 11/11/02 | 02/20/03 | 04/19/02 | 05/24/02 | 11/11/02 | 02/20/03 |
| **Volatile Organic Compounds (ug/l)**** | | [GW-6] | [GW-6 Rpl] | | | | | | | | | | |
| Benzene | 2,000 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <5 | <2.5 | <2 | <0.5 |
| Ethylbenzene | 4,000 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <5 | <2.5 | <2 | <0.5 |
| Toluene | 6,000 | <0.75 | <0.75 | <0.75 | <0.5 | <0.75 | <1.5 | <1.5 | 2 | <7.5 | <3.8 | <3 | <0.75 |
| o-Xylene | 6,000 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | < | <1 | <0.5 | <5 | <2.5 | <2 | <0.5 |
| p/m-Xylene | 6,000 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <5 | <2.5 | <2 | <0.5 |
| Naphthalene | 6,000 | <2.5 | <2.5 | <2.5 | <2.5 | <2.5 | <5 | <5 | <2.5 | <25 | <12 | <10 | <2.5 |
| cis-1,2-Dichloroethene | 30,000 | 0.75 | 37 | <0.5 | <0.5 | <0.5 | <1 | <1 | 0.64 | | 3.7 | <2 | 8.1 |
| Tetrachloroethene | 3,000 | 3.9 | 17 | <0.5 | <0.5 | 0.62 | 96 | 95 | 54 | 410 | 380 | 140 | 160 |
| 1,1,2,2-Tetrachloroethene | 20 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1 | <1 | <0.5 | <5 | <2 | <2 | <0.5 |
| Trichloroethene | 30 | 3.8 | 12 | <0.5 | <0.5 | <0.5 | 1.7 | 2 | 0.68 | 8.1 | 8.4 | 2.5 | 7 |
| Vinyl chloride | 2 | <1 | 3.4 | <1 | <1 | <1 | <2 | <2 | <1 | <10 | <5 | <2 | <1 |
| **Extractable Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | |
| C9-C18 Aliphatics | 1,000 | <40 | | <40 | | | <110 | | | 145 | | <101 | |
| C19-C36 Aliphatics | 20,000 | <40 | | <40 | | | <110 | | | <40 | | 172 | |
| C11-C22 Aromatics | 30,000 | <40 | | <40 | | | <110 | | | <40 | | 208 | |
| **Volatile Petroleum Hydrocarbons (ug/l)** | | | | | | | | | | | | | |
| C5-C8 Aliphatics | 1,000 | <102 | | <102 | | <40 | <40 | | <40 | <102 | | | 62.5 |
| C9-C12 Aliphatics | 1,000 | <102 | | <102 | | <40 | <40 | | <40 | <102 | | | <40 |
| C9-C10 Aromatics | 4,000 | <102 | | <102 | | <40 | <40 | | <40 | <102 | | | <40 |

All results in micrograms per liter (ug/l)
Bold numbers indicate exceedance of Cleanup Standards

# TABLE 7A
# SOIL GAS RESULTS JANUARY 2003

| Location | Location Note | Vinyl Chloride | 1,1-DCE | trans 1,2-DCE | 1,1-DCA | cis 1,2-DCE | 1,1,1-TCA | 1,2-DCA | TCE | PCE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv |
| SG101 | N side of vacant lot | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| SG101 Dup | N side of vacant lot | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| SG102 | N side of #14 Site Avenue | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| SG103 | S side of #14 Site Avenue | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| SG104 | N side of #10 Site Avenue | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| SG105 | S side of #14 Site Avenue | BDL | BDL | 80 | BDL | BDL | BDL | BDL | BDL | TR |
| SG106 | In front of 26 Adjacen Street garage | BDL | BDL | TR | BDL | TR | BDL | BDL | BDL | 60 |
| SG107 | S side of 26 Adjacent Street garage | BDL | BDL | TR | BDL | TR | BDL | BDL | BDL | 33 |
| SG107 Dup | S side of 26 Adjacen Street garage | BDL | BDL | TR | BDL | TR | BDL | BDL | BDL | 20 (est) |
| SG108 | N side of 26 Adjacent Street | BDL | BDL | TR | BDL | TR | BDL | BDL | BDL | TR |
| SG109 | Center of 26 Adjacent Street | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | TR |
| SG110 | South side of 26 Adjacent Street | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Detection Limit | | 2 | 10 | 10 | 10 | 10 | 5 | 20 | 5 | 5 |



BDL--Below Detection Limit
TR--Trace below detection limit
NA--No soil gas obtained

TABLE 7B
PREDICTED INDOOR AIR CONCENTRATIONS OF VINYL CHLORIDE

| Location | Location Note | Vinyl Chloride in Soil Gas* | Indoor Air Estimate (Proposed GW-2 Attenuation Coefficient of 8.27E-4) | Indoor Air Estimate (Current MADEP GW-2 Attenuation Coefficient of 5.0E-4) | MCP Background Indoor Air | Risk Based Target Indoor Air Level | AAL | TEL |
|---|---|---|---|---|---|---|---|---|
| | | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv |
| SG101 | N side of vacant lot | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG101 Dup | N side of vacant lot | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG102 | N side of #14 Site Avenue | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG103 | S side of #14 Site Avenue | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG104 | N side of #10 Site Avenue | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG105 | S side of #14 Site Avenue | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG106 | In front of 26 Adjacent Street garage | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG107 | S side of 26 Adjacent Street garage | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG107 Dup | S side of 26 Adjacent Street garage | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG108 | N side of 26 Adjacent Street | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG109 | Center of 26 Adjacent Street | 1 | 0.0008 | 0.0005 | NL | 0.10 | 0.15 | 1.36 |
| SG110 | South side of 26 Adiacent Street | NA | NA | NA | NL | 0.10 | 0.15 | 1.36 |

**Notes:** * Half of detection limit used for locations reported as ND and detection limit used for locations reported as TR

MCP Background Indoor Air Concentrations from DEP Indoor Air Contaminants Comparison Table, September 1998,

MCP Target Indoor Air Concentration and Proposed Attenuation Coefficient from Background Documentation for the Proposed Changes to the GW-2 Groundwater Standards, Presented to the Waste Site Cleanup Advisory Committee April 24, 2002

AALs and TELs from DEP's Revised Air Guidelines Memorandum, December 6, 1995.



NA: not available or not applicable
NL: not listed

## TABLE 7C
## PREDICTED INDOOR AIR CONCENTRATIONS of TETRACHLOROETHENE

| Location | Location Note | PCE Soil Gas* | Indoor Air Estimate (Proposed GW-2 Attenuation Coefficient of 7.28E-4) | Indoor Air Estimate (Current MADEP GW-2 Attenuation Coefficient of 5.0E-4) | MCP Background Indoor Air | Target Indoor Air Level | AAL | TEL |
|---|---|---|---|---|---|---|---|---|
| | | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv |
| SG101 | N side of vacant lot | 2.5 | 0.002 | 0.001 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG101Dup | N side of vacant lot | 2.5 | 0.002 | 0.001 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG102 | N side of #14 Site Avenue | 2.5 | 0.002 | 0.001 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG103 | S side of #14 Site Avenue | 2.5 | 0.002 | 0.001 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG104 | N side of #10 Site Avenue | 2.5 | 0.002 | 0.001 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG105 | S side of #14 Site Avenue | 5 | 0.004 | 0.003 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG106 | In front of 26 Adjacent Street garage | 60 | 0.044 | 0.030 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG107 | S side of 26 Adjacent Street garage | 33 | 0.024 | 0.017 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG107Dup | S side of 26 Adjacent Street garage | 20 (est) | 0.015 | 0.010 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG108 | N side of 26 Adjacent Street | 5 | 0.004 | 0.003 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG109 | Center of 26 Adjacent Street | 5 | 0.004 | 0.003 | 1.60 | 1.60 | 0.003 | 136.05 |
| SG110 | South side of 26 Adjacent Street | NA | NA | NA | 1.60 | 1.60 | 0.003 | 136.05 |

**Notes:** * Half of detection limit used for locations reported as ND and detection limit used for locations reported as TR

MCP Background Indoor Air Concentrations from DEP, Indoor Air Contaminants Comparison Table, September 1998,

MCP Target Indoor Air Concentration and Proposed Attenuation Coefficient from Background Documentation for the Proposed Changes to the GW-2 Groundwater Standards, Presented to the Waste Site Cleanup Advisory Committee April 24, 2002

AALs and TELs from DEP's Revised Air Guidelines Memorandum, December 6, 1995.



NA: Not Available or Not Applicable

TABLE 7D
PREDICTED INDOOR AIR CONCENTRATIONS OF trans 1,2-DICHLOROETHENE

| Location | Location Note | 1,2-DCE Soil Gas* | Indoor Air Estimate (Proposed GW-2 Attenuation Coefficient of 7.23E-4) | Indoor Air Estimate (MADEP GW-2 Attenuation Coefficient of 5.0E-4) | MCP Background Indoor Air | Target Indoor Air Level | AAL | TEL |
|---|---|---|---|---|---|---|---|---|
| | | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv | ppbv |
| SG101 | N side of vacant lot | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG101 Dup | N side of vacant lot | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG102 | N side of #14 Site Avenue | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG103 | S side of #14 Site Avenue | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG104 | N side of #10 Site Avenue | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG105 | S side of #14 Site Avenue | 80 | 0.058 | 0.040 | NL | 3.51 | 27.2 | 54.4 |
| SG106 | In front of 26 Adjacent Street garage | 10 | 0.007 | 0.005 | NL | 3.51 | 27.2 | 54.4 |
| SG107 | S side of 26 Adjacent Street garage | 10 | 0.007 | 0.005 | NL | 3.51 | 27.2 | 54.4 |
| SG107 Dup | S side of 26 Adjacent Street garage | 10 | 0.007 | 0.005 | NL | 3.51 | 27.2 | 54.4 |
| SG108 | N side of 26 Adjacent Street | 10 | 0.007 | 0.005 | NL | 3.51 | 27.2 | 54.4 |
| SG109 | Center of 26 Adjacent Street | 5 | 0.004 | 0.003 | NL | 3.51 | 27.2 | 54.4 |
| SG110 | South side of 26 Adjacent Street | NA | NA | NA | NL | 3.51 | 27.2 | 54.4 |

**Notes:**

* Half of detection limit used for locations reported as ND and detection limit used for locations reported as TR

MCP Background Indoor Air Concentrations from DEP, Indoor Air Contaminants Comparison Table, September 1998,

MCP Target Indoor Air Concentration and Proposed Attenuation Coefficient from Background Documentation for the Proposed Changes to the GW-2 Groundwater Standards, Presented to the Waste Site Cleanup Advisory Committee April 24, 2002

AALs and TELs from DEP's Revised Air Guidelines Memorandum, December 6, 1995.



NA: not available or not applicable
NL: not listed

**TABLE 8**
**SUMMARY OF SOIL ASBESTOS TESTING RESULTS**

| Sample ID | Sample Depth below pre-construction surface | Post Construction Elevation | % Asbestos | | Non Asbestos Percentage | | | | | SAMPLE LOCATION & ACTIONS FOR ASBESTOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Chrysotile | Amosite | Fiber glass | Mineral Wool | Cellulose | Other | Non Fibrous | |
| Row 1 | | | | | | | | | | |
| A1 | 0-6" | | ND | ND | | | 2 | | 98 | Below wood stockpile |
| A1 S-101 | 0-3" | | ND | ND | | | 3 | | 97 | Below ACM and associated soil |
| B1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| B1 S-101 | 0-3" | | ND | ND | | | 5 | | 95 | Below ACM and associated soil |
| C1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| C1 S-2 | 0-6" | | ND | ND | | | 5 | | 95 | Below stockpile SP-10 |
| D1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| E1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| E1 S-101 | 0-3" | | ND | ND | | | 5 | | 95 | Below ACM and associated soil |
| E1 S-2 | 0-6" | | ND | ND | | | 5 | | 95 | Below stockpile SP-1 |
| F1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| F1 S-2 | 0-6" | | ND | ND | | | 3 | | 97 | Below stockpile SP-1 |
| Row 2 | | | | | | | | | | |
| A2 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| B2 | 0-6" | | ND | ND | | | 2 | | 98 | |
| B2 S-101 | 0-3" | | ND | ND | | | 2 | | 98 | Below ACM and associated soil |
| C2 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| C2 S-1A | 0-3" | | ND | ND | | | 2 | TRACE | 98 | Below ACM and associated soil |
| D2 | 0-6" | | ND | TRACE | | | 2 | | 98 | Soil removed |
| D2 | 6-12" | | ND | ND | | | TRACE | | 100 | |
| D2 S-1A | 0-3" | | ND | ND | | | 2 | TRACE | 98 | Below ACM and associated soil |
| E2 S-2 | 0-6" | | ND | ND | | | 3 | | 97 | Below stockpile SP-2 |
| F2 S-2 | 0-6" | | ND | ND | | | 5 | | 95 | Below stockpile SP-1 |
| Row 3 | | | | | | | | | | |
| A3 | 0-6" | | ND | ND | | | 2 | | 98 | |
| B3 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| B3 S-101 | 0-3" | | ND | ND | | | 5 | | 95 | Below ACM and associated soil |
| C3 | 0-6" | | TRACE | ND | | | TRACE | | 100 | Soil removed |
| C3 | 6-12" | | TRACE | ND | | | TRACE | | 100 | Soil removed |
| C3 | 12-18" | | 2 | ND | TRACE | | 10 | 5 | 83 | Soil removed |
| C3 | 18-24" | | TRACE | TRACE | | | 2 | | 98 | Soil removed |
| C3 | 24-30" | | TRACE | ND | | | TRACE | | 100 | Soil removed |
| C3 | 36-42" | | TRACE | ND | | | TRACE | | 100 | Soil removed |
| C3A | 4' | + 64.0' | TRACE | ND | | | 2 | | 98 | Left in place |
| C3B | 5' | + 63.0' | TRACE | ND | | | 2 | | 98 | Left in place |
| D3 | 0-6" | | ND | ND | | | 2 | | 98 | Swimming Pool Area |
| D3 (10/12) | 0-6" | | ND | ND | | | 2 | | 98 | Swimming Pool Area |
| E3 | 0-6" | | ND | ND | | | TRACE | | 100 | Swimming Pool Area |
| E3 (10/15) | 0-6" | | ND | ND | | | TRACE | | 100 | Swimming Pool Area |
| F3 | 0-6" | | ND | TRACE | | | 2 | | 98 | Soil removed |
| F3 S-101 | 0-3" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| F3 | 6-12" | | TRACE | ND | | | TRACE | | 100 | Soil removed |
| F3 | 12-18" | | ND | ND | TRACE | | 5 | | 95 | Part of cell without a basement |
| F3.5 | 36-42" | | ND | ND | | | 2 | | 98 | Part of cell with a basement |
| Row 4 | | | | | | | | | | |
| A4 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| B4 | 0-6" | | ND | ND | | | 2 | | 98 | |
| B4 S-101 | 0-3" | | ND | ND | | | 3 | | 97 | Below ACM and associated soil |
| B4 S-102 | 0-3" | | ND | ND | | | 5 | | 95 | Below ACM and associated soil |
| C4 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| C4 (10/12) | 0-6" | | ND | ND | | | 2 | | 98 | |
| D4 | 0-6" | | TRACE | ND | | | TRACE | | 100 | Swimming Pool Area: soil removed for asbestos |
| D4 | 6-12" | | TRACE | ND | | | TRACE | | 100 | Swimming Pool Area: soil removed for asbestos |
| D4 | 12-18" | | TRACE | ND | 2 | | 5 | 3 | 90 | Swimming Pool Area: soil removed for asbestos |
| D4 | 18-24" | | ND | ND | | | 2 | | 98 | Swimming Pool Area |

ND--none detected
Bolded numbers indicate
ACM impacted soil left in place

TABLE 8
SUMMARY OF SOIL ASBESTOS TESTING RESULTS

| Sample ID | Sample Depth below pre-construction surface | Post Construction Elevation | % Asbestos | | Non Asbestos Percentage | | | | | SAMPLE LOCATION & ACTIONS FOR ASBESTOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Chrysotile | Amosite | Fiber glass | Mineral Wool | Cellulose | Other | Non Fibrous | |
| E4 | 0-6" | | ND | ND | | | 2 | | 98 | Swimming Pool Area |
| F4 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| Row 5 | | | | | | | | | | |
| A5 | 0-6" | | ND | ND | | | 5 | | 95 | Below wood pile |
| A5 S-103 | 0-3" | | TRACE | ND | | | 5 | | 95 | Below ACM-additional soil removed |
| A5-1 | 0-6" | | ND | ND | | | 2 | | 98 | Below stockpile SP-7 |
| B5 | 0-6" | | ND | ND | | | 3 | | 97 | Below part of rubble pile |
| B5 S-2 | 0-6" | | ND | ND | | | 2 | | 98 | Below rubble pile |
| C5 | 0-6" | | ND | ND | | | 2 | | 98 | Below stockpile SP-5 |
| D5 | 0-6" | | | | | | | | | No sample-concrete slab |
| E5 | 0-6" | | ND | ND | | | 5 | | 95 | |
| F5 | 0-6" | | ND | ND | | | 5 | | 95 | |
| Row 6 | | | | | | | | | | |
| A6 | 0-6" | | ND | ND | | | 3 | | 97 | Below stockpile SP-6 |
| B6 S-2 | 0-6" | | ND | ND | | | 2 | | 98 | Below small rubble pile |
| B6 S-101 | 0-6" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| B6 | 0-6" | | TRACE | TRACE | | | 2 | | 98 | Soil removed |
| B6 | 6-12" | | Concrete Slab | | | | | | | No sample-concrete slab |
| B6 | 6-12" | | ND | ND | | | TRACE | | 100 | Below small area of asphalt |
| C6 | 0-6" | | ND | ND | | | 2 | | 98 | Below stockpile SP-6 |
| C6 S-101 | 0-6" | | ND | ND | | | 2 | | 98 | Below ACM and associated soil |
| D6 | 0-6" | | ND | ND | | | 3 | | 97 | |
| E6 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| E6 S-101 | 0-6" | | ND | ND | | | TRACE | | 100 | Below stockpile SP-3 |
| F6 | 0-6" | | ND | ND | | | 3 | | 97 | |
| F6 S-101 | 0-3" | | ND | ND | | | 2 | | 98 | Below ACM and associated soil |
| F6 S-102 | 0-3" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| F6 S-103 | 0-3" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| F6 S-104 | 0-3" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| Stockpile Samples | | | | | | | | | | |
| SP-1 | 0-6" | | ND | ND | | | 2 | | 98 | |
| SP-2 | 0-6" | | ND | ND | | | TRACE | | 100 | |
| SP-3 | 0-6" | | ND | ND | | | 3 | | 97 | |
| SP-3 S-102 | 0-3" | | ND | ND | | | TRACE | | 100 | Below ACM and associated soil |
| SP-4 | 0-6" | | ND | ND | | | 2 | | 98 | |
| SP-5 | 0-6" | | ND | ND | | | 5 | | 95 | |
| SP-6 | 0-6" | | ND | ND | | | 2 | | 98 | |
| SP-7 | 0-6" | | ND | ND | | | 2 | | 98 | |
| SP-8 | 0-6" | | ND | ND | | TRACE | 3 | | 97 | |
| Soil Samples Below Pieces of Transite | | | | | | | | | | |
| Area A #1 | 0-6" | | TRACE | ND | | | TRACE | ND | 100 | Additional Soil Removed |
| Area A #2 | 0-6" | | ND | ND | | | TRACE | ND | 100 | |
| Area A #3 | 9' | | ND | ND | | | 2 | ND | 98 | |
| Deeper Soil Samples | | | | | | | | | | |
| **Area A S-1** | **6'** | **+ 62.0'** | **TRACE** | **ND** | | | **TRACE** | | **100** | **Left in Place** |
| Area A S-3 | 6' | | ND | ND | | | TRACE | | 100 | |
| Area A S-5 | 6' | | ND | ND | | | TRACE | | 100 | |
| Swimming Pool Samples | | | | | | | | | | |
| 1 | 8 | | ND | ND | | | 2 | | 98 | |
| 2 | 8 | | TRACE | TRACE | | | 2 | | 98 | Removed |
| **3** | **7.5** | **+ 60.5'** | **TRACE** | **ND** | | | **2** | | **98** | **Left in Place** |
| 4 | 7 | | TRACE | ND | | | 2 | | 98 | Removed |
| 5 | 7 | | ND | ND | | | 2 | | 98 | |
| 6 | 5 | | TRACE | ND | 2 | | 2 | | 96 | Removed |
| 7 | 5 | | TRACE | ND | | | 2 | | 98 | Removed |
| Pool #1 | 6 | | ND | ND | | | 2 | | 98 | |

ND--none detected
Bolded numbers indicate
ACM impacted soil left in place

TABLE 8
SUMMARY OF SOIL ASBESTOS TESTING RESULTS

| Sample ID | Sample Depth below pre-construction surface | Post Construction Elevation | % Asbestos | | Non Asbestos Percentage | | | | | SAMPLE LOCATION & ACTIONS FOR ASBESTOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Chrysotile | Amosite | Fiber glass | Mineral Wool | Cellulose | Other | Non Fibrous | |
| Pool #2 | 7 | | ND | ND | | | TRACE | | 100 | |
| Pool #3 | 8.5 | | TRACE | ND | | | TRACE | | 100 | Removed |
| Pool #4 | 10 | | TRACE | ND | | | TRACE | | 100 | Removed |
| Fill-1 | 10.25 | | 3 | ND | | TRACE | 40 | TRACE | 57 | Removed |
| SWB-1 | 8 | | ND | ND | | 8 | 40 | 2 | 50 | |
| Fill-A | 8 | | TRACE | ND | | | 20 | | 80 | Removed |
| Fill-B | 11 | | ND | ND | | | 20 | | 80 | |
| Fill-C | 9.5 | | ND | ND | | | 20 | | 80 | |
| Fill-D | 10.5 | | ND | ND | | 20 | 20 | | 60 | |
| **Fill-E** | **9.5** | **+ 56.5'** | **TRACE** | **ND** | | **20** | **20** | | **60** | **Left in Place** |
| Fill-F | 10 | | ND | ND | | 20 | 20 | | 60 | |
| **Bottom Limit-1** | **14.5** | **+ 53.5'** | **TRACE** | **ND** | | | **TRACE** | | **100** | **Left in Place** |
| Bottom Limit-2 | 15.5' | | ND | ND | | | TRACE | | 100 | |
| Bottom Limit-3 | 14.0' | | ND | ND | | | TRACE | | 100 | |
| Bottom Limit-4 | 13.0' | | ND | ND | | | TRACE | | 100 | |
| Bottom Limit-5 | 13.0' | | ND | ND | | | TRACE | | 100 | |
| Bottom Limit-6 | 13.0' | | ND | ND | | | TRACE | | 100 | |



ND--none detected
Bolded numbers indicate
ACM impacted soil left in place

# APPENDIX A

Limitations

## Limitations

The above observations were made under the conditions stated in this report. The conclusions presented above were based on these observations. If variations in the nature and extent of subsurface conditions between the widely spaced subsurface explorations become evident in the future, it will be necessary to re-evaluate the conclusions presented herein after performing on-site observations and noting the characteristics of any variations.

The conclusions submitted in this report are based in part upon test data obtained from analysis of soil and groundwater samples, and are contingent upon their validity. These data have been reviewed, and interpretations have been made in the text. It should also be noted that fluctuations in the types and levels of contaminants and variations in their flow paths may occur due to changes in seasonal water table, past practices used in disposal and other factors.

The purpose of this report is to summarize remedial actions performed to complete a Response Action Outcome Statement for the property located at 31, 33-35, 39-43 & 55 Site Avenue and 48 Adjacent Street in Massachusetts with regard to the releases of hazardous material or oil, as defined in Massachusetts General Laws Chapter 21E and the Massachusetts Contingency Plan 310 CMR 40.0000, to which Release Tracking Numbers #1 and #2 apply. The report also includes a Method 3 Risk Assessment for the the residual levels of hazardous materials and oil. No attempt was made to check on the compliance of present or past owners of the site with federal, state or local laws and regulations except as otherwise documented herein.

Chemical analyses and polarized light microscopy (PLM) analyses have been performed for specific constituents during the course of this site assessment, as described in the text. However, it should be noted that additional chemical constituents not searched for during the current study may be present in soil and/or groundwater at the site.

This study and report have been prepared on behalf of and for the exclusive use of The PRP Group for use in support of a Response Action Outcome Statement for both RTN #1 and RTN #2 . This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party nor used in whole or in part by any other party without prior written consent of LSP Co.

# APPENDIX B

## Tank Removal Documentation

# HAZ WASTE MANIFESTS

# UST REMOVAL PERMIT

# APPENDIX C

## Risk Analysis: Method 3 Risk Assessment

# Method III Risk Characterization

**Site** Avenue Middle School Site

Prepared for:

**LSP Co.**

Prepared by:

**RiskCo.** Risk Analysis, Inc.

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## 1.0 INTRODUCTION

Under the MCP, Risk Characterization is required for certain disposal sites where oil and/or hazardous materials have been detected. The Risk Characterization evaluates whether residual chemicals detected at a disposal site pose a risk of harm to human health, safety, public welfare, and the environment, or are only present at levels that pose No Significant Risk. A level of No Significant Risk exists if site concentrations are below applicable state standards established in the MADEP guidance (applicable standards do not include the MCP Method 1 standards) and if the cumulative cancer risk at the site does not exceed one in one hundred thousand ($10^{-5}$), the hazard index does not exceed one, and the site does not pose a risk to safety, public welfare, or the environment based on a consideration of site conditions and applicable standards. The results of the Risk Characterization are used as the basis for a decision as to whether or not additional remedial action is necessary at the site.

This characterization has been performed as a Method 3 Risk Characterization per section 40.0942(3) of the MCP. The purpose of this Method 3 Risk Characterization is to evaluate the potential for health and other risks associated with the residual oil and hazardous materials in soil and groundwater at the site of a City **owned** Middle School and Community Center on **Site** Avenue in Massachusetts. The primary chemicals of concern at the site are petroleum hydrocarbon constituents, chlorinated Volatile Organic Compounds (VOCs), and asbestos. This risk characterization describes chemical concentrations, the toxicology of chemicals of concern, potential exposure routes, and potential risks associated with current and potential future site conditions.

This section, the introduction, describes the basis for the risk characterization. Section 2 of the risk characterization contains information on the chemicals detected at the site and the exposure point concentrations that will be used for these chemicals. In Section 3, information is presented on the environmental fate and transport of the key site chemicals and on the key toxicological characteristics of these compounds. As part of the toxicological assessment section, health-based criteria, and other established criteria and guidance that may be helpful in assessing potential risks are identified. A human health exposure assessment, including a discussion of exposure pathways, a description of potential receptors, and a quantitative estimate of exposure, is presented in Section 4. Section 5 contains the human health risk characterization, in which information on the toxicity of the chemicals (from Section 3) is combined with the results of the exposure assessment (from Section 4) to determine if the site poses a risk to health. A discussion of the uncertainties in the human health risk assessment is also included in this section. Risks to the environment, public welfare, and safety are evaluated in Section 6. The conclusions of the risk characterization are presented in Section 7.

## 2.0 SITE CHARACTERISTICS

Detailed information on site features and on the oil and hazardous materials at the site is provided in the Release Abatement Measure (RAM) Plan prepared by LSP Co. and in the Response Action Outcome (RAO) Report. Information in these reports describes remedial measures taken at the site and the sampling and analysis that have been conducted.

### 2.1 Site Description

The Middle School property is located on Site Avenue in Massachusetts and includes 31 Site Ave., 33-35 Site Ave., 39-43 Site Ave., 55 Site Ave., and 48 Adjacent Street. The completed structure is a three story masonry structure with an indoor pool and an attached community center. The southern half of the building has a 6 inch thick concrete slab on grade and the northern half has a 12 inch thick concrete structural slab.

The 6-inch thick slab is underlain by a Preprufe 300R vapor membrane with a total thickness of 1.2 millimeters (mm), consisting of rubberized asphalt and 0.75 mm of cross-laminated high density polyethylene. Sheets of the membrane were overlapped, and joints were sealed with edging tape. According to the manufacturer, the membrane is impermeable to water, moisture, and vapor. The Preprufe 300R vapor membrane was installed according to the manufacturer's instructions.

The 12-inch thick structural slab is underlain by a 6-mil poly vapor barrier. The primary purpose of this vapor barrier is to restrict the migration of vapor into the building.

The property was formerly used as the location of several industrial companies. The property at 31 Site Ave. was owned by others... and previously by a dye company, . A bakery and a carburetor company were located at 33-35 Site Avenue. A wire company was located at 39-43 and 55 Site Avenue. Portions of the site have been used for parking over the years.

The property is trapezoidal in shape and covers an area of approximately 6 acres. A sewer easement bisects the site; the sewer has been relocated along the eastern edge of the site. Site Avenue bounds the site to the west, with residences located across Site Avenue. AdjacentStreet is located south of the site. Railroad tracks bound the site to the east and a city Park is located along the northern boundary of the site.

The site is not in an area considered as a potential source of groundwater (GW-1 area) or in an area designated by the EPA as a sole source aquifer. Groundwater at the site was encountered at depths from 5 to 9 feet in monitoring wells prior to construction. The most recent measurements in the monitoring wells installed post-construction indicated groundwater at depths ranging from about 8 to 10 feet below the ground surface.

Bedrock, glacial till, and underground structures are all considered to affect groundwater at the site. Groundwater flow at the site prior to relocation of the sewer that bisected the site was towards the sewer and then south. In general, groundwater is expected to be at a depth of 6-10 feet bgs and to flow in a southerly direction, with perched conditions occurring in certain portions of the site at certain times of year.

## 2.2 Nature and Extent of Contamination

Extensive investigations at the property have been conducted by LSP Co. and eight separate release tracking numbers (RTNs) have been assigned to this property. Most of these releases are associated with former underground storage tanks (USTs) associated with past industrial facilities on the property. A total of 22 USTs, vaults, and oil/water separators were discovered and removed from the property. Past spills during manufacturing almost certainly contributed to several of the releases. Finally, asbestos detected in site soil is apparently associated with demolition debris in the fill material. RTN # 2.

RTN # 1 was assigned to the 31 Site Avenue property based on the detection of over 100 parts per million (ppm) of total VOCs in headspace of soil samples collected from the vicinity of an UST. Chlorinated VOCs and extractable petroleum hydrocarbons were detected in soils and groundwater at concentrations above MADEP reporting standards, confirming the release. Soil gas samples also showed elevated concentrations of chlorinated VOCs and petroleum compounds in the immediate vicinity of the tank grave.

RTN # 3 was assigned to a portion of 33-35 Mildred Avenue based on the detection of petroleum residuals above reportable concentrations in soil samples from the vicinity of an UST. A groundwater sample from the area also contained Volatile Petroleum Hydrocarbon (VPH) at concentrations above GW-2 standards.

RTN # 4 was assigned to a portion of 39-43 Site Avenue in response to the presence of levles of TPH, EPH, and PCE in soils that exceed reportable concentrations. Soil samples detected polycyclic aromatic hydrocarbons (PAHs) at concentrations that exceeded reportable thresholds but based on the presence of ash and cinders, these are considered to be associated with fill and to not represent a reportable condition. However, the PAHs will nonetheless be evaluated as constituents of concern in the risk characterization.

RTN # 5 was assigned to a portion of the property at 55 Site Avenue to address a detection of total petroleum hydrocarbons at concentrations above reportable concentrations, even though analysis of the same sample for EPH did not indicate reportable concentrations of individual EPH fractions. PAHs were also detected in soil at concentrations exceeding reportable levels but are considered to be indicative of the fill nature of the site and to not represent a reportable condition. However, as indicated above, the PAHs will be evaluated in the risk characterization.

RTN #6 was assigned to a portion of 48 Adjacent Street and 31 Site Avenue based on the detection of chlorinated VOCs (tetrachloroethylene or PCE and vinyl chloride) in soil and groundwater. Surficial spills appear to be the source of these chlorinated VOCs.

RTN #2 was assigned to 39-43 and 55 Site Avenue based on the observation of asbestos-containing materials (ACM) during site clearing operations. Subsequent soil sampling confirmed the presence of ACM and indicated that the asbestos was present in soil over a portion of these properties. [All other RTNs were rolled into RTN # 1. ]

RTN #7 was assigned to a portion of 39-43 Site Avenue based on the detection of PCBs in a sample obtained from a stockpile of excavated soils. The results exceeded the reporting threshold.

RTN #8 was assigned to a part of 55 Site Avenue based on the detection of EPH above reporting thresholds in the vicinity of a previously unknown underground storage tank.

In summary, samples of environmental media from across the property were collected and analyzed for the presence of chemical constituents. Results of the sampling indicated that constituents were present in soils and groundwater across the site, consistent with the past use of the area for industrial purposes. Constituents detected at elevated concentrations included petroleum residuals (VPH and EPH fractions), PAHs (associated with the fill material), chlorinated VOCs, several metals, and asbestos. Based on the presence of these materials, several remedial actions have been conducted. Detected USTs have been removed for off-site disposal. Over 12,000 cubic yards of soil has been excavated from the property and shipped off site for appropriate disposal. A vapor barrier has been placed beneath the southern half of the school to prevent infiltration of soil vapors into indoor air in the building.

Over 120 soil samples were collected from across the site from borings and test pits, and analyzed for a range of compounds, including volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and other semi-volatile organic compounds (SVOCs), metals, and chlorinated VOCs. Soils across the site consist of fill overlying organic silt and peat in the western portion of the site and glacial till in the eastern portion of the site. The results of this sampling effort are summarized in Table 1. The table lists the number of samples and the average and maximum concentrations of all Contaminants of Concern at the site. All constituents are considered Contaminants of Concern unless they are present at a very low frequency or at very low concentrations, such that relative to other constituents, they have no potential to contribute significantly to risks at the site. Several constituents were detected at the site but are not considered Contaminants of Concern. The alkyl benzenes, including butylbenzene, isopropylbenzene, isopropyltoluene, propylbenzene, and the trimethylbenzenes are summarized as the C9-

C10 aromatic fractions of the VPH. Methyl tertiary butyl ether (MTBE), perylene, biphenyl, and benzo[e]pyrene were detected but only at low frequencies and concentrations and are not considered further per MADEP guidance. Excluding these constituents will not materially affect the risk characterization.

Asbestos was observed on the ground surface at the northern portion of the site and samples were collected on a grid pattern and analyzed for the presence of asbestos using Phase-Contrast Light Microscopy (PLM). A total of 118 soil samples were analyzed for asbestos. Asbestos was not detected in 90 of these samples, was present at "trace" levels (less than 1%) in 26 samples, and was detected at 2% in one sample and at 3% in another. Soil was removed from around all but five of the samples with a trace or more of asbestos detected. The sampling results indicated that the asbestos was limited to a fairly small area on the site surface. Soil with observable asbestos was removed. Further excavation, however, indicated that asbestos was present at depth in the fill soil.

Monitoring wells were installed at 26 locations across the site, including 5 bedrock wells and 6 temporary wells located on the west side of Site Avenue. Samples collected from these wells were analyzed for volatile organic compounds, VPH, and EPH. Groundwater was encountered in the monitoring wells at depths of approximately 5-9 feet below ground surface (bgs). Groundwater samples collected from the site revealed sporadic detections of constituents. Table 2 in this report summarizes the sample results for the wells by listing the maximum concentrations detected in monitoring wells from three separate areas, the property at 33-55 Site Avenue, the property at 31 Site Avenue, and the property at 48 Adjacent Street. Results for the most recent pre-remediation sampling event from each well (generally the results for April 2001) were compared and the maximum concentration listed, unless post-remediation results were higher. Eight wells were installed after the remediation (post-remediation wells) and samples were collected from these wells in April 2002, May 2002 (selected wells), November 2002 (selected wells) and February 2003. For several chemicals, specifically cis-1,2-dichloroethylene, vinyl chloride, C9-C12 aliphatics, and C9-C10 aromatics, the results for these wells exceed the pre-remediation sampling results. For these constituents, the post-remedation average from the well with the maximum concentration was used as the EPC. Several chemicals were detected at the site but not included as Contaminants of Concern based on their low frequency of detection and concentrations. Chloroform, chlorobenzene, dichlorobenzenes, trans-1,2-dichloroethylene, styrene, acetone, 2-butanone, and acrolein were all detected infrequently (1 or 2 samples) and inconsistently, such that they do not indicate any source of contaminant and these constituents were excluded. As noted above for soil, the alkyl benzenes are treated as the C9-C10 aromatics of the VPH fractions and the individual compounds are not addressed. Excluding these constituents will not materially affect the outcome of the risk characterization.

## 2.3 Background Concentrations

Certain materials, most notable the metals, are naturally occurring in the environment. Other constituents, such as certain organochlorine pesticides, have become ubiquitous in our environment as a result of their persistence in the environment and widespread use. Still other chemicals, including arsenic, lead, and the PAHs occur both naturally and as a result of widespread human use of the materials or of processes that generate the materials. Chemicals that are present at a site as a result of either a natural source or a ubiquitous anthropogenic source (e.g., arsenic, lead, or PAHs) are considered to be present at background levels. Under the MCP (and consistent with other regulatory guidance) the presence of chemicals at levels that are consistent with background levels does not pose a significant risk at the site.

PAHs

The PAHs can be present in the environment from natural sources. In addition, they may be present in the environment from widespread use by humans (i.e., the chemicals are ubiquitous). Distinguishing site-related contamination from non site-related background levels of these materials can be difficult.

As noted above, the polycyclic aromatic hydrocarbons (PAHs) are products of incomplete combustion, are present as components of petroleum products (fuel oils, diesel fuels, creosote, etc.), and are also produced naturally by some plants and microorganisms. Consequently, these materials are widespread in the environment. Many authors have measured environmental concentrations of the PAHs. Blumer et al (1977) measured levels of PAHs ranging from 4 mg/kg in an alpine meadow and 7 mg/kg in a Maine forest to 100 - 300 mg/kg in an urban area near a highway. Both lower and higher values have been reported by other authors (IARC 1983). In general, the lowest levels are seen in rural areas away from major highways (0.01 - 10 mg/kg; IARC 1983). Urban soils have somewhat higher levels (1 - 100 mg/kg; IARC 1983) and industrial areas have even higher levels (1 - >100 mg/kg; IARC 1983).

The Massachusetts Highway Department collected a large database (over 800 samples) of samples during excavation work on a large urban project. These samples and other data were analyzed by the MADEP for the presence of PAHs and metals. Data from this analysis are summarized in a technical update paper entitled: "Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (May 2002)." The samples from the site were evaluated to determine if the PAHs detected in the soil were site-related or likely to be present as a result of urban background conditions. A review of the samples indicated that although PAHs are present, it appears that the results are consistent with urban background PAH levels. This conclusion is further supported by the relative concentrations of the low to high molecular weight PAHs, with the essentially equal concentrations of individual constituents suggestive of a non-petroleum source.

Results from the MADEP analysis were compared to site samples to evaluate if the PAHs present at the site were site-related or were consistent with urban background. Table 3

presents concentrations expected by MADEP to be present in natural soils and in urban fill, and compares these values with site PAH levels. As can be seen from this comparison, maximum concentrations of a few of the PAHs at the site are above the expected urban fill concentrations. However, most samples were below these levels and below levels expected in natural soils. Ash and cinders and pieces of asphalt were documented in the fill, and the presence of ash or cinders would explain the findings. All PAH concentrations were well below maximum concentrations detected in urban soils. Consequently, the PAHs are considered to be present at the site only as a result of background (non site-related) conditions. However, the low molecular weight PAHs, which may also be components of petroleum products, are carried through the risk characterization process.

Metals and Cyanide

As noted above, metals can be present in soil naturally or as a result of release from anthropogenic sources. Natural metal concentrations are variable across Massachusetts. MADEP has calculated a 90$^{th}$ percentile value for metal levels in natural soils (formerly referred to as rural background) and in urban fill. Table 3 compares site concentrations with these background levels. All metals were below the urban fill background concentrations and are not considered further in this evaluation.

Cyanide was detected in site soils but only at very low concentrations. Background concentrations have not been developed for cyanide but it is understood that low levels of cyanide might be expected in urban fill soils, based on the prevalence of cyanide in urban industrial processes. The maximum cyanide concentration detected (0.2 mg/kg) is very low (two orders of magnitude below the most stringent Method 1 S-1 standard of 100 mg/kg) and may be derived from the urban fill and not from site constituents. Cyanide derived from industrial processes used at the site would be expected to be associated with much higher concentrations. Cyanide is considered to be a background constituent and is not considered further.

## 2.4 Exposure Point Concentrations

The concentration of a chemical constituent in a medium to which an individual is exposed is termed the exposure point concentration or EPC. As noted in the MCP (310 CMR 40.0926; as amended in October 1999), "the objective [of the EPC] shall be to identify a conservative estimate of the arithmetic mean concentration which represents the average concentration contacted by a receptor at the Exposure Point over the period of exposure." The EPC therefore should be conservative (health protective) and representative of concentrations that may be encountered at the site. The MCP also notes that the purpose of the assessment can influence the selection of EPCs. Maximum concentrations detected at a site may be used for screening purposes to show that a pathway clearly does not pose a risk. In this section, EPCs are developed for the chemicals in soil and groundwater.

The MCP, as amended in October 1999, notes that maximum concentrations or an upper estimate of exposure is appropriate when the average is unlikely to represent the true mean or can be used as a conservative (health protective) estimate of site concentrations. For this site, maximum groundwater concentrations were used. The average concentrations were used as the EPC for constituents in soil, as the average is a better representative of concentrations that might be encountered on-site. This average is considered to represent a good estimate of the true mean for soil for these constituents because of the large number of samples collected and because concentrations appear to be reasonably well distributed across the site. For exposure to chemicals in soil, all areas of the site are considered equally accessible (most are under pavement, buildings, or landscaped areas) and soil samples from across the site were averaged to arrive at the EPCs for these chemicals in soil.

Table 1 contains the EPCs for soil. As noted, these EPCs are based on maximum concentrations for most constituents and average concentrations of PAHs in site-wide samples.

Asbestos was generally noted at trace concentrations (less than 1%), if detected. Trace concentrations, measured using PLM are not directly comparable to toxicity criterion, which have been developed more recently using the substantially more expensive, if more accurate, Transmission Electron Microscopy (TEM) methods. As a screening assessment, "trace" results can be converted to surrogate TEM results using a conservative approach similar to the approach used in the VPH/EPH guidance document for converting TPH results to EPH results. Samples collected from another site in Massachusetts by Berman (2000) showed no detectable asbestos fibers for most "trace" results obtained using PLM and a concentration of $2 \times 10^7$ structures per gram of soil (str/g) for a sample that showed 2% asbestos by PLM. This concentration of $2 \times 10^7$ str/g or 20 str/ug will be used as the EPC for asbestos to represent "trace" findings in subsurface soils.

For exposure to chemicals in groundwater, MADEP generally suggests that exposure at a single point (i.e., a well) be considered. As noted above, Table 2 in this report summarizes the sample results for the wells by listing the maximum concentrations detected in the most recent pre-remediation sampling event from monitoring wells from three separate portions of the site. These maximum values were then averaged to establish concentrations representative of groundwater concentrations under the building (GW-2 conditions). The maximum from any well was used as the concentration to assess impacts to off-site aquatic receptors (GW-3 considerations). An exception is that for the four constituents with higher concentrations detected in post-remediation wells, the average of the well with the highest concentration was used as the EPC for both GW-2 and GW-3 conditions. In both cases, these concentrations are considered likely to be substantial over-estimations of groundwater concentrations, as impacted groundwater only underlies a very small portion of the building.

In summary, for exposure to constituents in groundwater, the maximum constituent concentration in any well from these areas of the site were averaged to arrive at a GW-2 EPC and the maximum detected value in any well was used as the GW-3 EPC for groundwater. An exception is that for four compounds, higher concentrations were detected in post-remediation groundwater wells and these concentrations were used as EPCs. For soil, the average concentration of a compound in soil is used as the EPC. The EPCs based on average concentrations provide representative yet conservative estimates of concentrations to which receptors may be exposed at the site. The values based on maximum values provide overly conservative estimates of site concentrations but are adequate to ensure that health is protected.

## 3.0 CHARACTERISTICS OF KEY CHEMICALS

Information on the environmental behavior of petroleum hydrocarbons and metals is briefly described in this section. Human health toxicity information on these constituents is provided below and toxicity criteria for the Contaminants of Concern detected at the site are presented in Table 4.

### 3.1 Environmental Fate and Transport

The environmental fate and transport of constituents is dependent on their physical and chemical properties, the environmental transformation processes affecting them, and the properties of the environmental media through which they migrate (EPA 1979). The non-halogenated VOCs (such as benzene and toluene) tend to be relatively mobile in the environment. The semi-volatile compounds that make up the bulk of the petroleum fraction are not very mobile and tend to bind to site soil. The PAHs also generally behave in this manner. Soil parameters that must be considered in assessing the potential for migration of organic chemicals are clay content, fraction of organic matter, pH, and oxidation-reduction potential.

**Petroleum Hydrocarbons**
Petroleum hydrocarbons consist of a complex mixture of chemicals, and the environmental behavior of the mixture is based on the behavior of these individual components. The material at the site consists primarily of a mix of light hydrocarbons associated with gasoline. These constituents are moderately mobile in the environment. The compounds also tend to biodegrade, with lighter material more readily degradable than the heavier fraction. Future continued degradation of site constituents is expected to occur as a result of dilution and natural biodegradation.

**Polycyclic Aromatic Hydrocarbons (PAHs)**
The PAHs are a class of compounds consisting of substituted and unsubstituted polycyclic aromatic rings. The PAHs are formed by the incomplete combustion of organic materials and are ubiquitous in the environment. The environmental behavior of individual PAHs varies with size and shape. In general, water solubility and mobility of PAHs decreases with increasing molecular weight. Low molecular weight PAHs such as naphthalene, pyrene, and phenanthrene tend to be somewhat mobile in the environment. High molecular weight PAHs such as benzo[a]pyrene, chrysene, and the benzofluoranthenes tend to be tightly adsorbed to soils.

**Chlorinated VOCs**
The halogenated VOCs detected at the site include 1,1- and 1,2-dichloroethylene (1,1-DCE; cis- and trans-1,2-DCE), trichloroethylene (trichloroethene; TCE), tetrachloroethylene (perchloroethylene; tetrachloroethene; PCE), and vinyl chloride. These compounds tend to be relatively mobile in the environment. They are moderately water soluble, with water solubilities ranging from a low of 200 mg/liter for tetrachloroethylene to 6,000 mg/liter for

trans-1,2-dichloroethylene (EPA 1985; MADEP 1995). Consequently, they will tend to migrate with groundwater. The log octanol/water partition coefficients of these VOCs ranges from 0.7 for cis-1,2-DCA to 2.9 for tetrachloroethylene. Consequently, some of the heavier and more highly chlorinated of the chemicals will be adsorbed by organic carbon but will generally not be tightly bound. Compounds dissolved in the aquatic environment may be removed via volatilization from surface waters. If the compounds are present at concentrations above their solubility limit, they may exist as a slug of non-aqueous phase liquids (NAPLs). The specific gravity (density) of these VOCs ranges from 1.2 to 1.6 and therefore chlorinated VOC NAPLs tend to sink in aquatic environments and in subsurface groundwater. The exception is vinyl chloride, which has a density of 0.9 and in NAPL form would float on the water table.

Laboratory studies and field observations have shown that chlorinated aliphatic hydrocarbons such as TCE and PCE can undergo both biological and abiological (physicochemical) transformations in soil and groundwater. Degradation byproducts of these compounds include 1,1- and 1,2-dichloroethylene, 1,1-dichloroethane, vinyl chloride, and chloroethane. Vinyl chloride (VC) is of particular concern from the standpoint of risk assessment, as it is a known human carcinogen.

Transformation is dependent upon a variety of factors that may vary locally within the site. These factors include the bioavailability of organic chemicals; the presence of appropriate microorganisms, nutrients, and growth factors; toxicity, and inhibition. Under anaerobic conditions, some halogenated aliphatics have been found to undergo reductive dechlorination (Bouwer and McCarty 1983, Vogel and McCarty 1985). In addition, the aerobic degradation of trichloroethylene in the presence of methane has been shown to occur (Wilson and Wilson 1985). The transformation is sequential, with, for example, tetrachloroethylene yielding first trichloroethylene, then 1,2-dichloroethylene and, ultimately, vinyl chloride (Parsons et al. 1984, Cline and Viste 1984). 1,1,1-Trichloroethane, also, has been shown to undergo transformation to 1,1-dichloroethylene and then to vinyl chloride (Vogel and McCarty 1987). The presence of common degradation products suggests that transformation is occurring on site.

**Asbestos**

Asbestos is a collective mineralogical term applied to numerous fibrous mineral silicates. There are two major types of asbestos: serpentine (chrysotile) and amphibole (amosite, crocidolite, anthophyllite, tremolite, and actinolite). The chemical composition of different asbestos fibers varies widely but their environmental behavior is similar. Asbestos is stable and is not prone to significant chemical or biological degradation in the environment. Asbestos in the subsurface is not considered to be mobile. It can be entrained into the air as a component of dust from surface soils and its presence in air is of greatest concern from a health perspective.

## 3.2 Toxicity

Toxicity values (reference doses or RfDs for noncarcinogenic effects and cancer slope factors or CSFs for carcinogens) for each chemical are presented in Table 4. This table also includes the toxicity equivalency factors used to relate the carcinogenic potency of the carcinogenic PAHs to that of B[a]P. Toxicity profiles are presented below for key site chemicals.

### Petroleum Hydrocarbons

Petroleum-derived materials vary widely in use, refining history, and composition, and their toxicity reflects this variability. In general, most of the toxicity of the petroleum hydrocarbons is associated with the aromatic components. Much of the toxicity of the lighter or moderate fraction petroleum hydrocarbons such as gasoline is associated with the monocyclic aromatic compounds (BTEX) although the short chain alkanes (particularly hexane) are somewhat toxic. For heavier petroleum products such as fuel oils, the PAHs appear to be responsible for most of the toxicity. The toxicity of the alkanes appears to increase with increasing size up to about C8, at which point toxicity appears to diminish, apparently as a result of decreased bioavailability.

The Commonwealth of Massachusetts has developed an approach for quantifying the toxicity of petroleum hydrocarbons. This approach, termed the volatile petroleum hydrocarbon/extractable petroleum hydrocarbon (VPH/EPH) approach for the separate VPH and EPH fractions that are analyzed, involves measuring the concentrations of chemicals with similar properties (a fraction of the total petroleum present) and assuming that the entire fraction is equipotent to a surrogate compound. The reference dose for this chemical is used to estimate the effect of the group of chemicals and to estimate risks. For example, the concentration of alkanes with nine to 18 carbons is summed and n-nonane is used as a surrogate for this group. The reference dose for n-nonane of 0.6 mg/kg/day is used as the reference dose for the entire fraction of C9-C18 aliphatic hydrocarbons. MADEP established three surrogate compounds for the alkanes/cycloalkanes, generally corresponding to light, medium, and heavy range hydrocarbons. A single aromatic compound, pyrene, is used as a surrogate for both the C9-C10 and C11-C22 aromatics. These compounds and their toxicity weighting factors are:

| Alkanes/cycloalkanes | Surrogates | Reference Doses |
|---|---|---|
| C5 -C8 | n-hexane | 0.06 mg/kg/day |
| C9-C18 | n-nonane | 0.6 mg/kg/day |
| C19 - C32 | eicosane | 6 mg/kg/day |
| | | |
| Aromatics/Alkenes | | |
| C9 - C22 | pyrene | 0.03 mg/kg/day |

**Polycyclic Aromatic Hydrocarbons (PAHs)**

The PAHs consist of a large family of compounds with a rather large range of toxic potency (EPA 1993; IARC 1983). Several of the high molecular weight PAHs are rather potent carcinogens, producing tumors both at the site of application and systemically. On the other hand, many of the lighter PAHs such as acenaphthene, naphthalene, pyrene, and phenanthrene are generally not considered to be carcinogenic. For regulatory purposes, EPA and most regulatory agencies, including MADEP, generally separate the PAHs into two categories: carcinogenic and noncarcinogenic. This approach probably oversimplifies the situation, as some of the "carcinogenic" compounds are clearly more potent than others, and some of the "noncarcinogenic" compounds appear to have some weak carcinogenic activity or appear to act as cancer promoters or cocarcinogens.

Benzo[a]pyrene (B[a]P) is one of the more potent PAHs and has been relatively well studied in a variety of toxicity and carcinogenicity bioassays. Only limited information is available on most of the other PAHs. EPA calculated a cancer potency factor of 7.3 $(mg/kg/day)^{-1}$ for B[a]P based on studies by Neal and Rigdon (1967, in EPA 1993) and by Brune et al. (Poirier 1992). Recent studies suggest that this cancer slope factor may be too high but a detailed regulatory review has not been completed at this time and the previously derived value will be used in this evaluation.

The information that is currently available suggests that the effects of the PAHs are additive (Schmahl 1977; Pfeiffer 1977) and that almost all of the PAHs are less potent carcinogens than B(a)P. For these reasons, one approach used by EPA in the past for evaluating the potential effects of PAH mixtures was to assume that all the carcinogenic PAHs were as potent as B(a)P. This approach was assumed to be quite conservative but was acceptable from a regulatory viewpoint because it was unlikely to underestimate risks. Several authors have developed approaches for comparing the relative potencies (toxic equivalencies) of the PAHs in order to develop a better estimate of risks associated with exposure to PAH mixtures (Nisbet and LaGoy, 1992; Thorslund et al. 1986; Chu and Chen 1984). EPA has accepted the use of these approaches at several sites and has finally developed an Agency-wide approach that is described in the Provisional Guidance for Quantitiative Risk Assessment of Polycyclic Aromatic Hydrocarbons (EPA 1993). MADEP (1995) has developed interim guidance that uses portions of the work by both Nisbet and LaGoy (1992) and EPA (1993).

All of the Toxic Equivalency Factor (TEF) approaches, including the simplified approach of assuming that all carcinogenic PAHs are as potent carcinogens as B(a)P, are based on comparing the potency of the individual PAH to the potency of B(a)P. Thorslund et al. (1986) and Chu and Chen (1984) evaluated the available data on the carcinogenic potency of different PAHs and developed toxicity equivalence factors (TEFs) for the individual PAHs. Nisbet and LaGoy (1992) and EPA (1993), and MADEP (1995) modified these values slightly to provide a better indication of uncertainty. These TEFs indicate the carcinogenic potency of the compounds relative to B(a)P. Multiplying the measured

concentration of the individual PAH by the TEF indicates the concentration of chemical in terms of B(a)P-equivalents. For example, multiplying a benzo(a)anthracene concentration of 65 mg/kg by the TEF (0.1) gives a B(a)P-equivalent concentration of 6.5 mg/kg. TEFs prepared by various researchers are presented below. MADEP has developed TEFs for 7 PAHs that are commonly considered to be carcinogenic, and these TEFs, which are noted in bold, are used in this risk assessment.

Toxicity Equivalence Factors for the
Carcinogenic Polycyclic Aromatic Hydrocarbons

| Compound | Clement (1986) | EPA (1993) | Nisbet and LaGoy (1992) | MADEP (1995) |
|---|---|---|---|---|
| Benzo(a)pyrene | 1 | 1 | 1 | **1** |
| Dibenzo(ah)anthracene | 1.1 | 1 | 5 | **1** |
| Benzo(a)anthracene | 0.145 | 0.1 | 0.1 | **0.1** |
| Benzo(b)fluoranthene | 0.140 | 0.1 | 0.1 | **0.1** |
| Benzo(k)fluoranthene | 0.066 | 0.01 | 0.1 | **0.01** |
| Indeno(123-cd)pyrene | 0.232 | 0.1 | 0.1 | **0.1** |
| Anthracene | 0.32 | ND | 0.01 | ND |
| Benzo(ghi)perylene | 0.022 | ND | 0.01 | ND |
| Chrysene | 0.0044 | 0.001 | 0.01 | **0.01** |
| Acenaphthene | ND | ND | 0.001 | ND |
| Acenaphthylene | ND | ND | 0.001 | ND |
| Fluoranthene | ND | ND | 0.001 | ND |
| Fluorene | ND | ND | 0.001 | ND |
| Methyl Naphthalene | ND | ND | 0.001 | ND |
| Naphthalene | ND | ND | 0.001 | ND |
| Phenanthrene | ND | ND | 0.001 | ND |
| Pyrene | 0.081 | ND | 0.001 | ND |

**Chlorinated VOCs**

Toxicity information on the three chlorinated VOCs detected at the highest concentrations at the site and vinyl chloride, which is the most potent chlorinated VOC, is presented below. In general, these chemicals are liver toxicants. Many have been shown to produce liver tumors in animals studies.

cis-1,2-DICHLOROETHYLENE

There are no reports of carcinogenic or teratogenic activity by cis-1,2-dichloroethylene (cis-1,2-DCE) in animals or humans (USEPA 1985). cis-1,2-DCE has anesthetic properties and has been found to cause nausea, vomiting, weakness, and cramps in humans. Compound-specific information concerning toxicity of cis-1,2-DCE is not adequate, and health-based criteria are derived from data for 1,1-dichloroethylene. USEPA (1996) has derived an oral RfD of 0.01 mg/kg/day. A maximum contaminant level (MCL) of 0.07 mg/liter has been established (USEPA 1994).

TETRACHLOROETHYLENE

Exposure to tetrachloroethylene has been observed to result in a significantly increased incidence of hepatocellular carcinoma in mice (USEPA 1985). Inhalation exposure has also been observed to result in increased incidences of mononuclear cell leukemia and renal adenomas and carcinomas (combined) in rats. The principal toxic effects in humans and animals from both acute and chronic exposures include central nervous system depression and liver and kidney damage. USEPA (1996) has derived inhalation and oral cancer potency factors of $2 \times 10^{-3}$ $(mg/kg/day)^{-1}$ and $5.2 \times 10^{-2}$ $(mg/kg/day)^{-1}$. USEPA (1996) has also calculated an RfD of 0.01 mg/kg/day for noncarcinogenic effects. EPA's Office of Drinking Water has developed an MCL of 0.005 mg/liter (EPA 1994).

TRICHLOROETHYLENE

Trichloroethylene (TCE) is a central nervous system depressant following acute or chronic exposure, by both ingestion and inhalation. Industrial use of TCE may also result in dermatitis from exposure to vapors of concentrated solvent. In carcinogenicity studies on mice, an increased incidence of hepatocellular carcinomas was reported following oral administration of TCE (EPA 1992). EPA has derived cancer slope factors of $1.1 \times 10^{-2}$ $(mg/kg/day)^{-1}$ for oral exposure and $6 \times 10^{-3}$ $(mg/kg/day)^{-1}$ for inhalation exposure (EPA 1996). TCE has been classified in Group B2--Probable Human Carcinogen. EPA's Office of Drinking Water has promulgated a Maximum Contaminant Level (MCL) of 0.005 mg/liter (EPA 1994) for TCE in drinking water.

VINYL CHLORIDE

Short-term exposure of workers to vinyl chloride produces symptoms including dizziness, headaches, and narcosis. Long-term exposure is associated with central nervous system, cardiovascular, and gastrointestinal disturbances and hepatotoxicity (EPA 1985). Occupational exposure to vinyl chloride has been associated with an increased incidence of hepatic angiosarcoma. It has also been implicated in brain, lung, and hemolymphopoietic cancers in humans. Chronic inhalation and ingestion of vinyl chloride has been shown to induce cancer in the liver and other tissues in rats and mice (EPA 1992). Vinyl chloride has been classified by EPA's Carcinogen Assessment Group in Group A--Human Carcinogen--based on the weight of evidence for carcinogenicity. Vinyl chloride has been shown to be mutagenic in a variety of test systems. EPA (1996) reported cancer potency factors of 1.9 $(mg/kg/day)^{-1}$ for oral exposure and $3 \times 10^{-1}$ $(mg/kg/day)^{-1}$ for inhalation exposure. EPA's Office of Drinking Water has promulgated a Maximum Contaminant Level (MCL) of 0.002 mg/liter (EPA 1994).

**Asbestos**

The toxicity of asbestos depends on several factors, including the fiber length and diameter, the number of fibers, the form of the asbestos (the number of fibers that are available from the asbestos-containing material), and asbestos type. Asbestos is a recognized human carcinogen causing lung cancer and mesothelioma, a neoplasm of the lining of the pleural cavity in occupationally-exposed workers. Excesses of cancers of the gastrointestinal tract have also been observed but it is not clear if exposure occurred via ingestion or via the passage of phagocytized particles from the lungs. Long-term exposure to asbestos dust also causes asbestosis, a progressive, irreversible lung disease.

Asbestos is considered to pose most health risks via inhalation. Consequently, standards developed for this material typically focus on the amount of asbestos that may become airborne. A drinking water standard has been developed, however. The MADEP, on its website, noted that results for Phase-Contrast Light Microscopy (PLM) were not as useful for risk characterization purposes and recommends the use of Transmission Electron Microscopy for evaluating asbestos concentrations. The state has not established standards but indicated that 0.1% in soil might be appropriate as an interim S-1 soil standard and that 1% in soil might be an appropriate interim standard for S-2 and S-3 soils (with an AUL). These values are based on TEM, with PLM used only for screening purposes.

Berman (2000) calculated concentrations of asbestos in air that would be associated with a significant risk of $1 \times 10^{-5}$. Values were listed for two asbestos types (chrysotile and amphibole, with amphibole being more potent), for several exposure scenarios, for different particle sizes, for male and female smokers and non-smokers, and for different tumor types. For lifetime continuous exposure to amphibole asbestos, a concentration of $1 \times 10^{-6}$ structures per $cm^3$ of air ($str/cm^3$) was associated with a $10^{-5}$ risk for male and female smokers and non-smokers. This value can be used as a screening toxicity criterion for asbestos.

## 4.0 EXPOSURE ASSESSMENT

The objectives of the exposure assessment are to identify actual or potential exposure pathways, to characterize the potentially exposed populations, and to determine the extent of any exposure.

### 4.1 Exposure Pathways and Receptor Populations

An exposure pathway consists of four main elements: (1) a source and mechanism of chemical release to the environment; (2) an environmental transport medium for the released chemical; (3) a point of actual or potential contact by a receptor with the contaminated medium (referred to as the exposure point); and (4) a method of intake (e.g. ingestion, inhalation, dermal absorption) at the exposure point. If any one of these factors is absent, exposure cannot occur because the receptor will not be able to come into contact with the chemical. Establishing complete or potentially complete pathways and eliminating pathways that either will not occur or that would only pose risks well below those posed by other routes is a critical first step in exposure assessment. Possible exposure routes at the site are discussed below.

The Site Avenue Middle School consists of the school building, located on the central and northern portions of the property, and parking lots located on the southern portion of the site. Potential receptor populations for the site include students, teachers, and staff using the school, neighborhood residents using the community center, maintenance workers, utility workers or others working for a short period in subsurface soils, and construction workers who may in the future work for more extended periods of time in subsurface soils.

The site buildings and asphalt parking cover most of the area of the school site (virtually all (over 95%) of the site is paved or covered by the building) and this cover will serve to limit the potential for direct contact with site soil. Landscaped areas are minimal. Contact could occur to workers involved in installing or maintaining underground utilities beneath the building or across the grounds. These workers could also potentially contact soil containing asbestos, which would pose an inhalation exposure risk. Children using the play areas may also contact site soils if the grass cover is worn down by frequent use. Any future activities that involve regrading or construction may also result in more regular contact by construction workers. Groundskeepers at the site may also have regular contact with soil. An extensive cleanup was performed to locate and remove asbestos-impacted soil and in addition, 2-4 feet of clean soil was imported across the site. Consequently, children and groundskeepers are not anticipated to have the potential to contact asbestos-containing soil.

For groundwater, volatile constituents may migrate through vadose zone soil and into building air. Therefore, the potential for human exposure via inhalation of constituents volatilizing from groundwater is evaluated. A vapor membrane has been installed under the southern portion of the building, in the area impacted by chlorinated volatile organic compounds, however, so the potential for exposure via this pathway is limited. A poly vapor barrier was also placed beneath the northern portion of the building. This poly barrier is not specifically designed to preclude the migration of volatile constituents but will have some effect on the migration potential of subsurface constituents.

Evaluation of exposure pathways at a site must consider both current and potential future uses of the area. At present and in the foreseeable future, the property will be used as a school for middle school-aged children (11 - 13 years old) and as a community center. In order to address current and potential future exposures under a condition of unrestricted use, use of the site for the construction of a residential house is evaluated. This scenario is addressed in order to evaluate risks under an assumption of unlimited use of the property. Exposure and risks to school children during the school year will be no greater than risks associated with the residential use scenario. Any other uses of the property would pose risks lower than that associated with residential property use, and consequently, evaluation of the residential use scenario is protective of individuals engaged in other uses on the property. Under a scenario involving use of the property as a site for a residential house, exposure could potentially occur via direct contact with chemicals detected in site soil.

In summary, the school site is covered by a building and paving, with only limited landscaped areas but exposure under current site plans could include:

- Inhalation exposure by building occupants to chemicals that migrate from groundwater into building air. As noted above, this route is restricted by the presence of a vapor barrier under the building.
- Direct contact (ingestion and dermal absorption) exposure by utility workers and groundskeepers to constituents present in soil.
- Direct contact (ingestion and dermal absorption) exposure by school children to constituents present in soil.
- Inhalation exposure to asbestos by utility workers contacting subsurface soil.
-

Exposure in the future is likely to be similar. However, future use of the site could result in exposures that would include:

- Direct contact exposure by children and adults to chemicals present in site soil
- Direct contact exposure by construction workers to chemicals present in site soil

Other possible exposure scenarios at the site such as inhalation exposure or direct contact with soil by passersby or community center users under current conditions will be lower than estimated under the scenarios noted above.

## 4.2 Quantitative Exposure Assessment

Individuals are exposed to materials released into the environment in varying quantities and proportions via a wide variety of exposure routes. The actual amount of material to which an individual is exposed depends on the individual's frequency, extent, and duration of exposure, which in turn depend on many factors, including location of residence, age, body weight, sex, and activity patterns. Patterns of exposure are highly variable among individuals. This large potential variation in exposure to environmental contaminants implies that a certain amount of uncertainty is inherent in risk assessment. It also suggests that simplified approaches and assumptions be used in the process of exposure assessment. This exposure assessment uses standard approaches and assumptions that are designed to be health protective, e.g., they are designed to produce estimates of exposure that overestimate, rather than underestimate, actual exposure and risk.

The purpose of a quantitative exposure assessment is to estimate the Chronic Daily Intake (CDI) of each chemical of concern by an individual for each exposure route. For carcinogens, the CDI is averaged over the full lifetime (average of 75 years; MADEP 1994) and is termed the Lifetime Average Daily Dose or LADD. For noncarcinogens, the dose is only averaged over the period of exposure and is noted as the Average Daily Dose or ADD. MADEP notes that noncarcinogenic ADDs can be calculated for acute exposure (single day exposure; acute ADD), for short term exposure periods (generally less than 7 years; subchronic ADD) and for longer-term exposures (chronic ADD). Because no chemicals that are particularly acutely toxic are present, only a single ADD has been calculated for each chemical. This ADD will be compared with a reference dose (RfD; based on chronic exposures). The LADD is multiplied by the cancer slope factor (CSF) for the target chemical to estimate risk.

### 4.2.1 Current Exposure Scenarios

For the purpose of this risk characterization, it is assumed that school children, school staff, visitors to the community center, and utility workers may be exposed to constituents present in the groundwater and soil by inhalation and direct contact, respectively. These exposure scenarios are evaluated below. For the inhalation route, the actual exposure will be substantially lower than calculated, as the vapor barrier that has been placed beneath the southern half of the building will serve to greatly restrict or prevent infiltration of the volatile constituents into indoor air.

Inhalation Exposure

Inhalation exposure could occur as a result of the chemicals migrating from groundwater, through vadose zone soil and then into the school building. It is assumed for purposes of this assessment, that an employee spends an entire 8 hour workday in the building. It is further assumed that the individual breathes 10 $m^3$ of air per workday (Occupational Safety and Health Administration or OSHA), works 250 days per year (EPA 1989) and works at the school for 20 years. Children will have generally similar exposure, as they

breath slightly more per unit body weight than adults but will be at the site for a shorter period of time each day and for a shorter time each year and for a shorter number of years.

Research on the movement of chemicals from soil or groundwater into buildings suggests that soil conditions, depth to groundwater, building construction, and building ventilation will all influence chemical migration into buildings (Johnson and Ettinger 1991; Little et al 1992; Pignatello and Xing 1996; Garbesi et al 1993; Fischer et al 1996). Conditions at the property are consistent with conditions considered in developing the MADEP (1994) model for migration of chemicals from groundwater into buildings. Consequently, this model will be used at the site.

The exposure assumptions noted above are used together with the simple model presented in MADEP (1994; based on Johnson and Ettinger 1991) for transport of chemicals from groundwater to indoor air, after mathematically manipulating the model to solve for exposure dose. Henry's Law constants are listed on Table 4. For the VPH/EPH petroleum fractions in groundwater, research by Fischer et al. (1996) suggests that significant biodegradation occurs in vadose zone soil, with concentration decreases on the order of a factor of 1000. An additional modification factor of 10 (actually 0.1; MADEP) was used for the VPH/EPH fractions to account for this decrease. Finally, a factor of 10 (actually 0.1) is used to account for the decrease in potential exposure associated with the vapor barrier and passive ventilation system. This factor also accounts for the fact that EPCs were developed based on the well with the highest groundwater concentrations, and groundwater concentrations under the building will be influenced by groundwater from other areas of the site. Further discussion is provided in the uncertainty section (5.2). Using these values and values from MADEP (1994), exposure can be calculated using the equation:

$$\text{ADD/LADD} = \frac{\text{CGW} \times \text{EF} \times \text{ED} \times \text{IR} \times \alpha \times \text{d} \times \text{H} \times \text{C1} \times \text{m} \times \text{v}}{\text{BW} \times \text{AT} \times \text{C2}}$$

Where:

| | | |
|---|---|---|
| ADD | = | Average daily intake of the chemical (mg/kg/day), |
| LADD | = | Lifetime average daily dose (mg/kg/day), |
| CGW | = | Chemical concentration in groundwater (ug/liter), |
| EF | = | Frequency of contact (250 days/year), |
| ED | = | Exposure Duration (20 years; estimate), |
| IR | = | Inhalation rate (10 $m^3$/workday; OSHA), |
| BW | = | Body weight (70 kg; EPA 1989), |
| AT | = | Averaging Time (365 days x 20 (ADD) or 75 years (LADD)), |
| $\alpha$ | = | Attenuation factor (5 x $10^{-4}$; MADEP 1994), |
| d | = | Modification factor (0.1; MADEP 1994), |
| m | = | modification factor (0.1 for VPH/EPH; section 5.2) |
| v | = | vapor barrier factor (0.1; estimate) |
| H | = | Henry's Law Constant (dimensionless), |
| C1 | = | Conversion factor (1000 liter/$m^3$), and |
| C2 | = | Conversion factor (1000 ug/mg). |

Results of this assessment are provided in Table 5 for school children and staff exposed to groundwater concentrations at the site. A vapor membrane beneath the southern half of the building and a poly vapor barrier exists beneath the northern half o the building and these barriers will greatly restrict if not prevent infiltration of constituents into building air. As a conservative estimator of the effect of this barrier, it will be assumed that it affords only a 10-fold dilution and attenuation factor in limiting infiltration. This value is also provided in Table 5.

Soil Exposure - Utility Workers

Utility workers who dig into the subsurface soil may be exposed to chemicals present in the soil by direct contact and subsequent ingestion of contaminated soil or by dermal absorption of chemicals in soils adhering to the skin. Exposure to chemicals for these workers can be evaluated using the assumption that utility workers would be exposed for a time frame of 1 day per year for 10 years (MADEP 1995) and that the average worker weighs 70 kg.

Soil Ingestion: Utility workers in frequent contact with site soil are estimated to ingest 500 mg of soil per day (MADEP 1995). Using this assumption and the others noted above, the ADD and LADD for soil ingestion can be estimated using the formula:

$$\text{ADD/LADD} = \frac{\text{CS x IR x DAF x EF x ED}}{\text{BW x } 10^6 \text{ (mg/kg) x AT}}$$

Where:

| | | |
|---|---|---|
| ADD | = | Average daily intake of the chemical (mg/kg/day), |
| LADD | = | Lifetime average daily dose (mg/kg/day), |
| CS | = | Chemical concentration in soil (mg/kg), |
| IR | = | Soil ingestion rate (500 mg/day; MADEP 1995), |
| RAF | = | Relative absorption factor (1; MADEP 1994), |
| EF | = | Frequency of ingestion (1 day/year; MADEP 1995), |
| ED | = | Exposure Duration (10 years; MADEP 1995), |
| BW | = | Body weight ( 70 kg; EPA 1989), and |
| AT | = | Averaging Time (365 days x 10 (ADD) or 75 (LADD) years). |

The calculated ADDs for the chemicals detected in soil at the site based on this equation are provided in Table 6 for soil ingestion exposure to the site-wide average exposure point concentration.

Dermal Contact: Dermal exposure to chemicals in soil can occur through direct physical contact with soil. The same assumptions as for soil ingestion are used, with the exceptions that in place of an ingestion rate, a soil adherence factor of 0.51 mg soil/$cm^2$ of skin, an exposed skin surface area of 5000 $cm^2$, and chemical-specific relative

absorption factors were used. Using these assumptions, the ADD and LADD can be estimated using the formula:

$$ADD/LADD = \frac{CS \times AD \times SA \times RAF \times EF \times ED}{BW \times 10^6 (mg/kg) \times AT}$$

Where:

| | | |
|---|---|---|
| ADD | = | Average daily intake of the chemical (mg/kg/day), |
| LADD | = | Lifetime average daily dose (mg/kg/day), |
| CS | = | Chemical concentration in soil (mg/kg), |
| AD | = | Soil adherence to skin (0.51 mg/cm$^2$; MADEP 1995), |
| SA | = | Exposed skin surface area (5000 cm$^2$; MADEP 1995), |
| RAF | = | Relative absorption factor (chemical specific; MADEP 1994), |
| EF | = | Frequency of contact (1 day/year), |
| ED | = | Exposure Duration (10 years), |
| BW | = | Body weight (70 kg; EPA 1989), and |
| AT | = | Averaging Time (365 days x 10 or 75 years). |

The calculated ADDs and LADDs for the chemicals in soil at the site based on this equation are provided in Table 7 for exposure via dermal contact to the site-wide average concentration detected in soil.

Inhalation Exposure - Asbestos

The constituents present in site soils are generally considered to pose substantially more risk via ingestion and dermal intake than via inhalation, with any additional risk added by inhalation being insignificant relative to the risks associated with ingestion and dermal contact exposure. An exception is asbestos, which will pose most risks via inhalation. Consequently, risks were estimated for inhalation exposure to asbestos by utility workers. It should be noted that an Activity and Use Limitation (AUL) has been placed in the area where asbestos was encountered and this AUL should restrict the potential for exposure. However, the potential risks associated with such exposure were still calculated.

The actual amount of asbestos-containing soil dust that becomes airborne will depend on several factors, including soil moisture, location, and windspeed. However, as a generic value, the MADEP (1995) has estimated that 60 ug/m$^3$ of site-related dust can be assumed to be present in the breathing space. As noted above, the EPC for asbestos in soil is 20 str/ug. This value can be multiplied by the soil-in-air concentration of 60 ug/m$^3$ and by a conversion factor to 1 cubic meter/$10^6$ cm$^3$ to arrive at an asbestos in air concentration of $1.2 \times 10^{-3}$/cm$^3$. Utility workers are assumed to breathe 10 m$^3$/workday and to work for 10 days out of a lifetime at the school. Using these values, a lifetime average daily exposure level can be calculated by multiplying the air concentration by (10 m$^3$/20 m$^3$) and by (10 days/(365 days x 70 years). The resulting lifetime average daily exposure is $2 \times 10^{-7}$str/cm$^3$.

Soil Exposure - Groundskeepers

Given the thickness of clean soil in the landscaped areas and given the very limited extent of the landscaped areas, direct contact soil exposure will be very limited. Groundskeepers or landscapers involved in property maintenance on site may be exposed to chemicals present in the soil by direct contact and subsequent ingestion of contaminated soil, and by dermal absorption of chemicals in soils adhering to the skin. Exposure to chemicals for these workers can be evaluated using the assumption that workers would be exposed for a time frame of 5 days per week for 6 months (130 days; MADEP 1995) over a 20-year working period at the school and that the average worker weighs 70 kg.

Soil Ingestion: As noted above, given the thickness of imported clean soil and the limited aerial extent of the landscaped areas, the potential for soil ingestion exposure will be very limited. Workers in frequent contact with site soil are estimated to ingest 100 mg of soil per day (MADEP 2002). Using this assumption and the exposure period noted above, the ADD and LADD for soil ingestion can be estimated with the same formula used for utility workers under the current use scenario. The calculated ADDs and LADDs for the chemicals detected in soil at the site based on this equation are provided in Table 8 for soil ingestion exposure to the site-wide average exposure point concentration.

Dermal Contact: Dermal exposure to chemicals in soil can occur through direct physical contact with soil. The same assumptions as for soil ingestion are used in calculating exposure, with the exceptions that in place of an ingestion rate, a soil adherence factor of 0.19 mg soil/$cm^2$ of skin, an exposed skin surface area of 5000 $cm^2$(MADEP 1994, 2002), and chemical-specific relative absorption factors were used. Using these assumptions, the ADD and LADD can be estimated with the same formula used for utility workers under the current use scenario. The calculated ADDs and LADDs for the chemicals detected in soil at the site based on this equation are provided in Table 9 for dermal absorption exposure to the site-wide average exposure point concentration.

Soil Exposure - School Children/Community Center Users

Given the thickness of clean soil in the landscaped areas and given the very limited extent of the landscaped areas, soil contact by children or community center users will be very limited. School aged children using the grounds may contact soil in areas where use has worn away the grass cover but the immediately underlying soil will consist of clean fill placed across the site. Use by children is likely to be limited to recess periods during the school day and to occasional use during other times of the day and year. Use by visitors to the community center is likely to be even lower. The potential exposure will be lower than that for a groundskeeper but children are potentially more sensitive. Exposure at the school will be less than what could occur at a residence, in that exposure will be less frequent and of shorter duration than is assumed for residential exposure. Therefore, a residential use scenario is evaluated below to assess the potential exposure and risks under a condition of unrestricted use of the property, include use by school children and community center visitors.

### 4.2.2 Future Residential Use Exposure Scenarios

In the unlikely event that the property was converted for single-family residential use, exposure to chemicals in soil could occur via ingestion of contaminated soil or via contact and subsequent dermal absorption of chemicals in soils adhering to the skin. As noted previously, direct contact could also occur to children playing in outdoor areas but such exposure would be lower than that estimated for residential site users. Construction workers could also be exposed to chemicals in soil and would also have a lower exposure potential than that associated with residential site use.

Soil Exposure - Residential Users

Residential site users may be exposed to chemicals by direct contact and subsequent ingestion of contaminated soil or dermal absorption of chemicals in soils that adhere to the skin. Exposure to chemicals for these residents can be evaluated using standard MADEP assumptions on residential exposure frequency and duration. Direct contact exposure to soil is of greatest concern for young children (1-8 years old), as this age group is most likely to ingest soil and to be in regular contact with soil (MADEP 1994). Older residents can also be exposed to constituents in soil while gardening or engaging in other outdoor activities, or as a result of contact with soil that has entered the house. Because exposure to noncarcinogens is only assumed to be of concern over the period of exposure, evaluation of exposure to children provides the most health protective scenario and will be used in calculating ADDs. For soil ingestion, it is assumed that children under the age of 8 years ingest a time weighted average of 3.1 mg soil/kg-day (MADEP 1994). For exposure to carcinogens, exposure throughout the lifetime is of concern. Consequently, the full period of exposure is considered. Residents are assumed to stay in the same house for 30 years and to ingest a time-weighted average of 0.41 mg soil/kg day (MADEP 1994). Using these assumptions, the ADD for soil ingestion can be estimated using the formula:

$$\text{ADD/LADD} = \frac{\text{CS} \times \text{TWIR} \times \text{RAF}}{10^6 \text{ (mg/kg)}}$$

Where:

ADD = Average daily intake of the constituent (mg/kg/day),
LADD= Lifetime average daily intake (mg/kg/day),
CS = Constituent concentration in soil (mg/kg),
TWIR = Time weighted ingestion rate (3.1 (ADD) or 0.41 (LADD) mg soil/kg day; MADEP 1994),
RAF = Relative absorption factor (1; MADEP 1994),

The calculated ADDs and LADDs for the chemicals detected in soil at the site based on this equation are provided in Table 10 for soil ingestion exposure to the exposure point concentrations.

Dermal exposure to constituents in soil can occur through direct physical contact with soil. The same assumptions as for soil ingestion are used, with the exceptions that in place of time-weighted ingestion rates, time weighted dermal contact rates of 28.5 mg soil/kg-day (ADD) and 7.3 mg soil/kg-day (MADEP 1994), are used. The time-weighted dermal absorption rates can be modified based on the data of Kissel and all, which indicate a dermal adherence factor of 0.35 mg/cm$^2$ rather than 0.51 mg/cm$^2$ (MADEP 2002). Adjusting the time weighted dermal contact rates by the ratio of these values (0.35/0/51) results in values of 19.6 mg soil/kg-day (ADD) and 5 mg soil/kg-day (LADD). Relative absorption factors for dermal absorption are generally lower than oral RAFs and values listed in MADEP 1994 were used to calculate exposure. Using these assumptions, the ADD and LADD can be estimated using the formula:

$$\text{ADD/LADD} = \frac{\text{CS x TWDC x RAF}}{10^6\ (\text{mg/kg})}$$

Where:

| | | |
|---|---|---|
| ADD | = | Average daily intake of the constituent (mg/kg/day), |
| LADD | = | Lifetime average daily intake (mg/kg/day), |
| CS | = | Constituent concentration in soil (mg/kg), |
| TWDC | = | Time weighted dermal contact (19.6 (ADD) or 5 (LADD) mg soil/kg day; MADEP 1994), |
| RAF | = | Relative absorption factor (chemical specific; MADEP 1994), |

The calculated ADDs and LADDs for the constituents in soil at the site based on this equation are provided in Table 11 for exposure via dermal contact to the EPCs in soil.

Soil Exposure - Construction Workers

Construction workers involved in building on site may be exposed to chemicals present in the soil by direct contact and subsequent ingestion of contaminated soil, and by dermal absorption of chemicals in soils adhering to the skin. Exposure to chemicals for these workers will be lower than that calculated for residents, and is not quantitatively evaluated. In addition, the AUL for the asbestos area will require that any excavation below a depth of approximately 5 feet be performed by workers who are adequately protected and trained, and implementing federal and state occupational health and safety requirements (e.g., 129 CFR 1910.120). The work will also need to be performed in accordance with all relevant federal and state regulations and policies that govern such construction activities.

## 5.0 HEALTH RISK EVALUATION

In this section, information on the potential levels of exposure to constituents of concern (presented in the exposure assessment) is combined with information on the toxicity of the constituents (presented in the toxicity criteria section) in order to determine the potential health risks to individuals living near the site under current conditions. For noncarcinogenic (systemic) effects, USEPA and MADEP assume that there is a level below which no effects will occur (a threshold no effect concentration). For carcinogens, however, it is assumed that any exposure has some probability of causing cancer and it is therefore assumed that there is no threshold no effect level. Because of these different assumptions, potential noncarcinogenic and carcinogenic health effects are evaluated separately. The cancer risk is obtained by multiplying the lifetime average daily dose (LADD) of the constituent under consideration (from the exposure assessment) by its cancer potency factor or slope factor (CSF; from the toxicity section). Cancer risks for individual constituents and for different pathways that could affect the same receptor are then summed to estimate the total cumulative risk posed by the site. EPA typically expresses cancer risk in terms of an upper-bound excess lifetime cancer risk level. For Method 3 risk characterizations, MADEP uses an upper-bound excess lifetime risk level of a one in one hundred thousand ($10^{-5}$) as a goal for total cumulative risk for carcinogens.

To evaluate possible risk from exposure to noncarcinogenic constituents, the average daily exposure dose (ADD) is divided by the reference dose (RfD). If the ADD:RfD ratio is less than one (i.e., if the daily intake is below the health criterion) the constituent is considered unlikely to pose a health hazard to individuals exposed under the given scenario. As suggested in the USEPA (1986) guidelines for Health Risk Assessment of Chemical Mixtures, the ADD:RfD ratios are summed to determine if combined exposure may pose a health concern. It should be noted that the summed ADD/RfD ratio (termed the hazard index or HI) is used only as an indication of possible hazard. ADD/RfD ratio summation is only valid if there are no synergistic or antagonistic interactions among the summed compounds and if they have the same mechanism and site of action.

A number of assumptions were used in deriving the ADDs, LADDs, and the RfDs and CSFs. Therefore, there is some uncertainty in interpreting the implications that the noncarcinogen CDI:RfD ratios have for risk. However, in the estimation of these factors, conservative (health protective) assumptions were made so that it is improbable that the CDI:RfD ratio would be less than one if there were any actual hazard at the site. A further discussion of the uncertainties in risk assessment is presented in section 5.2.

### 5.1. Health Hazards at the Site

Risks associated with exposure to site constituents under a scenario involving current site plans are presented in Tables 5-9. Risks associated with the hypothetical future use of the site for residential purposes are presented in Tables 10 - 11. A summary of the hazard

indices and cancer risk values is provided below. As indicated in this summary table, the ADD/RfD ratio for the noncarcinogenic effects is less than one for all current and potential future scenarios, indicating that systemic effects are unlikely. The cancer risk does not exceed the cumulative target risk level of $10^{-5}$ (1E-05) for all current and potential future scenarios evaluated quantitatively. The PAHs were determined to be present at background concentrations and by definition are not considered to pose a significant risk.

For asbestos, a screening-level evaluation indicated a potential exposure on a lifetime average daily dose basis for a utility worker of $2 \times 10^{-7}$ str/cm$^3$. This value can be compared with the concentration that would be associated with the target risk level ($10^{-5}$ risk) for lifetime exposure. The target risk level is $1 \times 10^{-6}$ str/cm$^3$, so exposure at the site does not exceed this value and consequently, does not pose a significant risk. It should be noted that several conservative assumptions were used in this evaluation to account for the use of PLM rather than TEM in the assessment.

Considering the chemicals detected and their locations, and using conservative (health protective assumptions, no chemicals were present at concentrations that exceeded target levels. Consequently, the conditions at the site present a condition of No Significant Risk to Human Health for current and future conditions.

Summary of Hazard and Risks
at the **Site** Avenue Middle School Site,

| Exposure Scenario | Pathway | Table | Hazard | Risk |
|---|---|---|---|---|
| Building Occupant | Inhalation | 5 | 0.01 | 4E-06 |
| Utility Worker | Soil ingestion | 6 | 0.0002 | 6E-10 |
| | Dermal contact | 7 | 0.0002 | 3E-10 |
| | Cumulative | | 0.0004 | 9E-10 |
| Groundskeeper | Soil ingestion | 8 | 0.005 | 3E-08 |
| | Dermal contact | 9 | 0.009 | 3E-08 |
| | Cumulative | | 0.01 | 6E-08 |
| Unrestricted Use Exposure (school or residential) | Soil ingestion | 10 | 0.03 | 9E-08 |
| | Dermal contact | 11 | 0.03 | 1E-07 |
| | Cumulative | | 0.06 | 2E-07 |

## 5.2 Uncertainties in the Human Health Risk Characterization

The procedures and inputs used to assess potential human health risks in this and most such evaluations are subject to a wide variety of uncertainties. In general, there are five main sources of uncertainty in the risk assessment of a reasonably well characterized site:

- Environmental chemistry sampling and analysis,
- Environmental parameter measurements,
- Fate and transport modeling,
- Toxicological data and dose-response extrapolations, and
- Errors through combinations of the above.

These sources of uncertainty as they pertain to this risk assessment are discussed below.

Environmental chemistry sampling and analysis error can stem from the error inherent in the procedures, from a failure to take an adequate number of samples to arrive at sufficient areal resolution, from mistakes on the part of the sampler, or from the heterogeneity of the matrix being sampled. Some sampling and analytical error is almost certainly present, but probably has a limited impact on the results of this risk assessment. A total of over 170 soil samples and over 80 groundwater samples were collected and analyzed.

Exposure estimation is another potentially large source of error in this risk assessment. Exposure estimates in many cases are highly dependent on the prediction of intake values, exposure frequency, exposure duration, and other exposure assumptions used in the assessment. For this site, the largest source of uncertainty is associated with the assumed future use of the facility for a residential house. As noted previously, such use is unlikely for economic reasons. Consequently, actual exposure at the site is likely to be much lower than predicted in the risk characterization.

As noted previously, estimation of volatilization rates from the subsurface soil and groundwater into buildings is subject to a considerable amount of uncertainty. Standard assumptions and equations were used to estimate the potential concentrations of chemicals in breathing zone air, with the exception of the use of an additional modification factor to account for biodegradation of petroleum hydrocarbons. These equations still do not account for the decrease in chemical concentrations that are likely to occur over time, particularly if the chemicals are, in fact, being released to the atmosphere. Air exchange rates in the school will be considerably higher than used in the model because of the nature of the building and this increased air exchange will serve to decrease the buildup of chemicals in building air. For petroleum compounds that are subject to biodegradation under aerobic conditions, Fischer et al (1996) noted that a substantial loss of various petroleum chemicals (100 - 1000 fold) occurred in the shallow subsurface, apparently as a result of natural (intrinsic) biodegradation. Because

biodegradation and increased air exchange were not accounted for in the model used, a modification factor of 100 was incorporated into the evaluation for the VPH/EPH chemicals only (these are subject to biodegradation). Considering these factors, and that the exposure parameters used in this exposure assessment were selected to ensure that exposure was overestimated rather than underestimated e.g., it is unlikely that the same individual would work at the school for 250 days/year for 20 years), actual exposure is likely to be lower than estimated in this risk characterization.

The results of animal studies were used to predict the potential health effects of a chemical in humans. Extrapolation of toxicological data from animal tests is probably one of the largest sources of uncertainty in any risk assessment. There may be important but unidentified differences in uptake, metabolism, and distribution in the body between the test species and man. Typically, the animals are administered high doses of a chemical in a standard diet while humans are generally exposed to much lower doses in a highly variable diet. Humans have a 75 year lifetime and may be exposed either intermittently or regularly for an exposure period ranging from months to a full lifetime. Because of these differences, it is not surprising that extrapolation error is a large source of uncertainty in risk assessment. Even if studies in humans are available, uncertainties can be large because the diet, activity patterns, exposure duration and frequency, and individual susceptibility may not be the same in the study populations as in the individuals exposed at the site.

Uncertainties from different sources will be compounded in the risk assessment. For example, if a CDI for a contaminant measured in the environment is compared to an RfD to determine potential health hazard, the uncertainties in the concentration measurement, exposure assumptions and the toxicology are all expressed in the result. In order to ensure that human health is adequately protected, the public health assessment incorporates conservative (unlikely to underestimate risk) approaches and uncertainty factors. Therefore, the actual risk associated with the exposure routes considered in this assessment is unlikely to be larger, but may be lower than that predicted.

## 6.0 RISKS TO THE ENVIRONMENT, PUBLIC WELFARE, AND SAFETY

As part of a Method 3 Risk Characterization, risks to public welfare, safety, and the environment must be evaluated. These risks are evaluated in this section for the Site Avenue Middle School Site

### 6.1 Risks to the Environment

A Method 3 Risk Characterization evaluates whether residual chemicals detected at a disposal site pose a risk of harm to the environment. The site is located at some distance from aquatic receptors. A very large River is located approximately 2000 feet to the south of the site and groundwater appears to flow towards the river. The potential for site constituents in groundwater to impact aquatic life in the river was evaluated by comparing concentrations of chemicals in groundwater with the lowest aquatic toxicity criteria identified by MADEP (1994), modified by a factor of 10 to account for dilution and attenuation in groundwater. Actual dilution and attenuation will be substantially greater given the distance to the river and the size of the river. This comparison is provided in Table 12. As can be seen from this table, all constituents are present at concentrations that are well below the adjusted AWQC values.

The site is covered with buildings, pavement, or landscaping and does not provide desirable habitat for terrestrial species and any future development is unlikely to modify habitat for terrestrial species. Consequently, no pathway exists for exposure by environmental receptors to site soil. Based on a consideration of both groundwater and soil, a level of No Significant Risk to the environment exists for current and future conditions at the site.

### 6.2 Risks to Public Welfare

Residual chemicals at the site do not present nuisance conditions (i.e., unpleasant odors or similar effects) and are unlikely to significantly impact property values. No chemical is present at a level that exceeds its UCL. Therefore, a level of No Significant Risk to welfare exists for current and future conditions at the site.

### 6.3 Risks to Safety

Several of the chemicals detected in site soils and groundwater are flammable and could pose an explosion hazard at high concentrations. However, the results of the modeling conducted as part of the human health risk characterization indicate that only very low airborne levels could occur, levels well below lower explosive limits for the compounds. The presence of these materials at low concentrations is unlikely to contribute to conditions that pose a safety risk. Consequently, the chemicals are considered to pose No Significant Risk to safety at the property.

## 7.0 CONCLUSIONS

A Method 3 Risk Characterization characterizes the risk of harm to health, public welfare, safety, and the environment. Risks to human health associated with the residual constituents present in soil and groundwater at the Site Avenue Middle School Site on Site Avenue were characterized using standard risk assessment procedures as developed by the USEPA and MADEP. In order to ensure that public health is adequately protected, conservative (unlikely to underestimate risk) assumptions were used in deriving both the exposure estimate and the toxicity values. Because of the use of these conservative (although not necessarily worst case) assumptions, it is likely that the actual potential for non-cancer and cancer risks is even lower than estimated in this report.

A condition of no significant risk of harm to human health exists or has been achieved if no standards are exceeded and cumulative cancer and non-cancer risks are below state target levels (310 CMR 40.993(7)). The EPCs at the site do not exceed applicable public health standards (standards do not exist for soil and are not applicable for groundwater). For both current and potential future use scenarios, the calculated Non-cancer Risks are below the Cumulative Receptor Non-cancer Risk Limit of an HI of 1 and the calculated Cumulative Cancer Risk does not exceed the Target Risk Level of a $10^{-5}$ risk for all quantified exposure scenarios. PAHs are present at the site at levels that are consistent with urban background and as such, do not pose a significant risk. Consequently, a condition of No Significant Risk to Human Health has been achieved at the site. It should also be noted that an AUL placed on the area where asbestos was detected will further limit the potential for exposure and risks in that area.

A Stage 1 Environmental Screening was conducted to evaluate risks to ecological receptors at the site. For soils, the buildings, pavement, and landscaping should limit the potential for adverse effects to terrestrial organisms. Concentrations of constituents in groundwater were compared with surface water quality criteria modified to account for dilution and attenuation associated with migration and all site concentrations were lower than these criteria. Therefore, the chemicals and the site are considered unlikely to pose a risk to ecological receptors, and, a level of No Significant Risk to the Environment exists at the site.

Risks to public welfare and safety were evaluated separately. The residual constituents are considered unlikely to pose a nuisance risk to workers or residents and are below upper concentration limits (UCLs). Therefore, a Condition of No Significant Risk to Public Welfare is considered to exist at the site. Finally, consideration of chemical characteristics and behavior indicate that the residual chemicals will not pose a risk to safety and a Condition of No Significant Risk to Safety exists at the site.

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Table 1
Exposure Point Concentrations for Soil

| ANALYTE | Number of Samples | Average | Max | EPC |
|---|---|---|---|---|
| **VOCs (mg/kg)** | | | | |
| Benzene | 131 | 0.048 | 1.45 | 0.048 |
| Ethylbenzene | 131 | 0.085 | 2.0 | 0.085 |
| Toluene | 131 | 0.074 | 2.2 | 0.074 |
| Xylene | 131 | 0.232 | 9.6 | 0.232 |
| cis-1,2-Dichloroethene | 124 | 0.070 | 1.5 | 0.070 |
| Tetrachloroethene | 124 | 0.70 | 15.0 | 0.70 |
| Trichloroethene | 124 | 0.092 | 3.4 | 0.092 |
| Vinyl chloride | 124 | 0.097 | 2.95 | 0.097 |
| **VPH (mg/kg)** | | | | |
| C5-C8 Aliphatics | 19 | 9.0 | 79.0 | 9.0 |
| C9-C12 Aliphatics | 19 | 95.0 | 743.0 | 95.0 |
| C9-C10 Aromatics | 143 | 68.0 | 412.0 | 68.0 |
| **EPH (mg/kg)** | | | | |
| C9-C18 aliphatics | 77 | 182 | 3100 | 182 |
| C19-C36 aliphatics | 77 | 238 | 2940 | 238 |
| C11-C22 aromatics | 77 | 187 | 2870 | 187 |
| **PAHs (mg/kg)** | | | | |
| 2-Methylnaphthalene | 13 | 0.18 | 0.76 | 0.18 |
| Acenaphthene | 13 | 0.29 | 1.7 | 0.29 |
| Acenaphthylene | 13 | 0.14 | 0.3 | 0.14 |
| Anthracene | 13 | 0.60 | 4.9 | 0.60 |
| Benzo(a)anthracene | 13 | 1.46 | 13.0 | 1.46 |
| Benzo(a)pyrene | 13 | 1.36 | 12.0 | 1.36 |
| Benzo(b)fluoranthene | 13 | 1.10 | 9.7 | 1.10 |
| Benzo(g,h,i)perylene | 13 | 0.88 | 7.3 | 0.88 |
| Benzo(k)fluorathene | 13 | 1.10 | 9.2 | 1.10 |
| Chrysene | 13 | 1.49 | 13.0 | 1.49 |
| Dibenzo(a,h)anthracene | 13 | 0.31 | 1.9 | 0.31 |
| Fluoranthene | 13 | 3.02 | 28.0 | 3.02 |
| Fluorene | 13 | 0.33 | 2.0 | 0.33 |
| Indeno(1,2,3-cd)pyrene | 13 | 0.97 | 8.3 | 0.97 |
| Naphthalene | 124 | 0.36 | 7.6 | 0.36 |
| Phenanthrene | 13 | 2.08 | 19.0 | 2.08 |
| Pyrene | 13 | 2.75 | 24.0 | 2.75 |
| **Inorganics (mg/kg)** | | | | |
| Arsenic | 8 | 4.0 | 10 | 4.0 |
| Chromium | 8 | 10.0 | 19 | 10.0 |
| Cyanide | 8 | 0.1 | 0.19 | 0.1 |
| Lead | 7 | 62.0 | 230 | 62.0 |
| Mercury | 8 | 0.2 | 0.77 | 0.2 |

Table 2
Groundwater Exposure Point Concentrations

| ANALYTE | Maximum Concentration/a 33-55 Site Ave. ug/liter | Maximum Concentration/a 31 Site Ave. ug/liter | Maximum Concentration/a 48 Adjacent St. ug/liter | GW-2 EPC ug/liter | GW-3 EPC ug/liter |
|---|---|---|---|---|---|
| **VOCs** | | | | | |
| Benzene | *0.5* | *10* | *10* | *7* | *10* |
| Ethylbenzene | *0.8* | *10* | *10* | *7* | *10* |
| Toluene | *0.5* | *15* | *15* | *10* | *15* |
| Xylene | 1.8 | 12.5 | *10* | 8 | 12.5 |
| Naphthalene | *2.5* | *50* | *50* | *34* | *50* |
| cis-1,2-Dichloroethene | *0.5* | 130 | 28 | 57 | 57 |
| Tetrachloroethene | 82.0 | 1200 | 3000 | 1427 | 3000 |
| 1,1,2,2-Tetrachloroethane | *0.5* | 6.5 | *10* | 6 | 6.5 |
| Trichloroethene | 2.2 | 66 | 52 | 40 | 66 |
| Vinyl chloride | *1.0* | *10* | *10* | 14 | 14 |
| **VPH** | | | | | |
| C5-C8 Aliphatics | 205 | 350 | | 278 | 350 |
| C9-C12 Aliphatics | 237 | 7030 | | 3568 | 3568 |
| C9-C10 Aromatics | 128 | 4780 | | 2858 | 2858 |
| **EPH** | | | | | |
| C9-C18 aliphatics | 213 | 3790 | *65* | 1356 | 3790 |
| C19-C36 aliphatics | 975 | 540 | *65* | 527 | 540 |
| C11-C22 aromatics | 271 | 797 | *65* | 378 | 797 |

a/Values listed are the maximum result for each constituent in each area from the most recent sampling event, generally April 2001, except for the post-remediation samples from GW-1 through GW-8B. Results for these wells were used as EPCs for cis-1,2-DCE, vinyl chloride, C9-12 aliphatics and C9-10 aromatics, and are averages for the maximum well for the past year; see text

b/Values underlined and in italics represent half the detection limit for chemical that were not detected in any sample for that date at that location.

# Table 3
## Comparison of Site Soil Concentrations with Background Levels in Massachusetts

| ANALYTE | Site Results | | Background Levels in MA | | |
|---|---|---|---|---|---|
| | Soil Average | Soil Maximum | Natural Soil | Fill Soil | Urban Maximum |
| **PAHs (mg/kg)/b** | | | | | |
| 2-Methylnaphthalene | 0.18 | 0.76 | 0.5 | 1 | 13 |
| Acenaphthene | 0.29 | 1.7 | 0.5 | 2 | 42 |
| Acenaphthylene | 0.14 | 0.3 | 0.5 | 1 | 10 |
| Anthracene | 0.60 | **4.9** | 1 | 4 | 130 |
| Benzo(a)anthracene | 1.46 | **13.0** | 2 | 9 | 250 |
| Benzo(a)pyrene | 1.36 | **12.0** | 2 | 7 | 230 |
| Benzo(b)fluoranthene | 1.10 | **9.7** | 2 | 8 | 270 |
| Benzo(g,h,i)perylene | 0.88 | **7.3** | 1 | 3 | 77 |
| Benzo(k)fluorathene | 1.10 | **9.2** | 1 | 4 | 150 |
| Chrysene | 1.49 | **13.0** | 2 | 7 | 240 |
| Dibenzo(a,h)anthracene | 0.31 | **1.9** | 0.5 | 1 | 39 |
| Fluoranthene | 3.02 | **28.0** | 4 | 10 | 490 |
| Fluorene | 0.33 | 2.0 | 1 | 2 | 79 |
| Indeno(1,2,3-cd)pyrene | 0.97 | **8.3** | 1 | 3 | 100 |
| Naphthalene | 0.36 | **7.6** | 0.5 | 1 | 28 |
| Phenanthrene | 2.08 | 19.0 | 3 | 20 | 480 |
| Pyrene | 2.75 | **24.0** | 4 | 20 | 440 |
| **Metals (mg/kg)/a** | | | | | |
| Arsenic | 4.0 | 10 | 20 | 20 | |
| Chromium | 10.0 | 19 | 30 | 40 | |
| Cyanide | 0.1 | **0.19** | ND | ND | |
| Lead | 62.0 | 230 | 100 | 600 | |
| Mercury | 0.2 | 0.77 | 0.3 | 1 | |

"Natural soil" represent soils from non-urban areas with no visible ash.

"Fill soils" represent soils that have visible coal or wood ash and are associated with fill.

Maximum values are the maximum detected in several studies

Background values derived from MADEP 2002 Technical update: Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil.

Values in bold exceed the "natural soil" background value.

ND - Not determined; a value was not calculated for cyanide

Table 4
Human Health Toxicity Criteria for Chemicals of Concern

| Chemicals Detected at the Site | Henry's Law Constant (dimensionless) | | Reference Dose Oral RfD mg/kg/day | | Cancer Slope Factor Oral CSF 1/(mg/kg/day) | | PAH TEFs |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| C9-C10 aromatics/a | 0.33 | a | 0.03 | M | | | |
| Benzene | 0.2 | a | 0.0017 | E/b | 0.029 | I | |
| Toluene | 0.3 | a | 0.2 | I | | | |
| Xylene | 0.2 | a | 2 | I | | | |
| cis-1,2-Dichloroethene | 0.6 | b | 0.01 | H | | | |
| Tetrachloroethylene | 0.08 | a | 0.01 | I | 0.052/0.2 | E/M | |
| 1,1,2,2-Tetrachloroethane | 0.02 | a | | | 0.2 | I | |
| Trichloroethene | 0.4 | a | 0.006 | E | 0.011 | W | |
| Vinyl chloride | 1 | a | | | 1.9/0.3 | H | |
| **EPH** | | | | | | | |
| C9-C18 aliphatics | 69 | a | 0.6 | M | | | |
| C19-C36 aliphatics | immobile | a | 6 | M | | | |
| C11-C22 aromatics | 0.03 | a | 0.03 | M | | | |
| **PAHs** | | | | | | | |
| Acenaphthene | 0.009 | a/a | 0.06 | I/b | | | |
| Acenaphthylene | 0.05 | a | | | | | |
| Anthracene | 0.003 | a | 0.3 | I | | | |
| Benzo(a)anthracene | | | | | | | 0.1 |
| Benzo(b)fluoranthene | | | | | | | 0.1 |
| Benzo(k)fluorathene | | | | | | | 0.01 |
| Benzo(g,h,i)perylene | | | | | | | |
| Benzo(a)pyrene | | | | | 7.3 | I | 1 |
| Chrysene | | | | | | | 0.01 |
| Dibenzo(a,h)anthracene | | | | | | | 1 |
| Fluoranthene | | | 0.04 | I | | | |
| Fluorene | 0.004 | a | 0.04 | I | | | |
| Indeno(1,2,3-cd)pyrene | | | | | | | 0.1 |
| 2-Methylnaphthalene | 0.01 | | | | | | |
| Naphthalene | 0.05 | | 0.02 | I | | | |
| Phenanthrene | 0.001 | a | | | | | |
| Pyrene | 0.0002 | a | 0.03 | I | | | |

a/An a indicates the value was obtained from MADEP 1994;
b indicates that the value was estimated or obtained from Howe et al 1986
b/Values indicate the source of the value: I-IRIS; H-HEAST; E-ECAO; M-MADEP

Table 5

Estimated Exposure and Risk for Building Occupants from Inhalation Exposure to Constituents in Groundwater

| Chemicals Detected in Groundwater | GW-2 EPC ug/liter | ADD mg/kg/day | LADD mg/kg/day | Inhalation RfD mg/kg/day | Inhalation CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| Benzene | 7 | 6.69E-07 | 1.78E-07 | 0.002 | 0.029 | 3.3E-04 | 5.2E-09 |
| Ethylbenzene | 7 | 6.77E-07 | | 0.1 | | 6.8E-06 | |
| Toluene | 10 | 9.95E-07 | | 0.2 | | 5.0E-06 | |
| Xylene | 8 | 7.93E-07 | | 2 | | 4.0E-07 | |
| Naphthalene | 34 | 1.67E-07 | | 0.009 | | 1.9E-05 | |
| cis-1,2-Dichloroethene | 57 | 1.67E-05 | | 0.01 | | 0.0 | |
| Tetrachloroethene | 1427 | 5.59E-05 | 1.49E-05 | 0.01 | 0.2 | 0.0056 | 3.0E-06 |
| 1,1,2,2-Tetrachloroethane | 6 | | 1.48E-08 | | 0.2 | | 3.0E-09 |
| Trichloroethene | 40 | 7.84E-06 | 2.09E-06 | 0.006 | 0.011 | 0.00 | 2.3E-08 |
| Vinyl chloride | 14 | | 1.83E-06 | | 0.3 | | 5.5E-07 |
| **VPH** | | | | | | | |
| C5-C8 aliphatics | 278 | 3.03E-05 | | 0.06 | | 5.1E-04 | |
| C9-C12 aliphatics | 3568 | 4.69E-04 | | 0.6 | | 7.8E-04 | |
| C9-C10 aromatics | 2858 | 3.69E-06 | | 0.03 | | 1.2E-04 | |
| **EPH** | | | | | | | |
| C9-C18 aliphatics | 1356 | 1.89E-04 | | 0.6 | | 3.1E-04 | |
| C19-C36 aliphatics | 527 | NA | | 6 | | | |
| C11-C22 aromatics | 378 | 4.43E-08 | | 0.03 | | 1.5E-06 | |
| | | | | | **SUM** | **0.01** | **4E-06** |

Table 6
Exposure and Risk for Soil Ingestion by Utility Workers

| ANALYTE | Soil EPC mg/kg | ADD mg/kg/day | LADD mg/kg/day | Oral RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| Benzene | 0.048 | 9.39E-10 | 1.25E-10 | 0.0017 | 0.029 | 5.5E-07 | 3.6E-12 |
| Ethylbenzene | 0.085 | 1.66E-09 | | 0.1 | | 1.7E-08 | |
| Toluene | 0.074 | 1.45E-09 | | 0.2 | | 7.2E-09 | |
| Xylene | 0.232 | 4.54E-09 | | 2 | | 2.3E-09 | |
| cis-1,2-Dichloroethene | 0.070 | 1.37E-09 | | 0.01 | | 1.4E-07 | |
| Tetrachloroethylene | 0.70 | 1.37E-08 | 1.83E-09 | 0.01 | 0.052 | 1.4E-06 | 9.5E-11 |
| Trichloroethene | 0.092 | 1.80E-09 | 2.40E-10 | 0.006 | 0.011 | 3.0E-07 | 2.6E-12 |
| Vinyl chloride | 0.097 | 1.90E-09 | 2.53E-10 | | 1.9 | | 4.8E-10 |
| **VPH** | | | | | | | |
| C5-C8 aliphatics | 9 | 1.76E-07 | | 0.06 | | 0.00000 | |
| C9-C12 aliphatics | 95 | 1.86E-06 | | 0.6 | | 3.1E-06 | |
| C9-C10 aromatics | 68 | 1.33E-06 | | 0.03 | | 0.0000 | |
| **EPH** | | | | | | | |
| C9-C18 aliphatics | 182 | 3.56E-06 | | 0.6 | | 5.9E-06 | |
| C19-C36 aliphatics | 238 | 4.66E-06 | | 6 | | 7.8E-07 | |
| C11-C22 aromatics | 187 | 3.66E-06 | | 0.03 | | 1.2E-04 | |
| **Noncarcinogenic PAHs** | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 3.52E-09 | | 0.04 | | 8.8E-08 | |
| Acenaphthene | 0.29 | 5.66E-09 | | 0.06 | | 9.4E-08 | |
| Acenaphthylene | 0.14 | 2.74E-09 | | 0.04 | | 6.8E-08 | |
| Anthracene | 0.60 | 1.16E-08 | | 0.3 | | 3.9E-08 | |
| Benzo(g,h,i)perylene | 0.88 | 1.72E-08 | | 0.04 | | 4.3E-07 | |
| Fluoranthene | 3.00 | 5.87E-08 | | 0.04 | | 1.5E-06 | |
| Fluorene | 0.33 | 6.46E-09 | | 0.04 | | 1.6E-07 | |
| Naphthalene | 0.36 | 7.05E-09 | | 0.02 | | 3.5E-07 | |
| Phenanthrene | 2.1 | 4.11E-08 | | 0.04 | | 1.0E-06 | |
| Pyrene | 2.7 | 5.28E-08 | | 0.03 | | 1.8E-06 | |
| | | | | | **SUM** | **0.0002** | **6E-10** |

Table 7
Exposure and Risk for Dermal Contact by Utility Workers

| ANALYTE | Soil EPC mg/kg | Dermal RAF | ADD mg/kg/day | LADD mg/kg/day | Oral RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | |
| Benzene | 0.048 | 0.08 | 3.83E-10 | 5.11E-11 | 0.0017 | 0.029 | 2.3E-07 | 1.482E-12 |
| Ethylbenzene | 0.085 | 0.1 | 8.48E-10 | | 0.1 | | 8.5E-09 | |
| Toluene | 0.074 | 0.12 | 8.86E-10 | | 0.2 | | 4.4E-09 | |
| Xylene | 0.232 | 0.12 | 2.78E-09 | | 2 | | 1.4E-09 | |
| cis-1,2-Dichloroethene | 0.070 | 0.1 | 6.99E-10 | | 0.01 | | 7.0E-08 | |
| Tetrachloroethylene | 0.70 | 0.1 | 6.99E-09 | 9.32E-10 | 0.01 | 0.052 | 7.0E-07 | 4.8E-11 |
| Trichloroethene | 0.092 | 0.1 | 9.18E-10 | 1.22E-10 | 0.006 | 0.011 | 1.5E-07 | 1.3E-12 |
| Vinyl chloride | 0.097 | 0.1 | | 1.29E-10 | | 1.9 | | 2.5E-10 |
| **VPH** | | | | | | | | |
| C5-C8 aliphatics | 9 | 0.5 | 4.49E-07 | | 0.06 | | 0.0000 | |
| C9-C12 aliphatics | 95 | 0.2 | 1.90E-06 | | 0.6 | | 3.2E-06 | |
| C9-C10 aromatics | 68 | 0.18 | 1.22E-06 | | 0.03 | | 0.0000 | |
| **EPH** | | | | | | | | |
| C9-C18 aliphatics | 182 | 0.2 | 3.63E-06 | | 0.6 | | 6.1E-06 | |
| C19-C36 aliphatics | 238 | 0.1 | 2.38E-06 | | 6 | | 4.0E-07 | |
| C11-C22 aromatics | 187 | 0.18 | 3.36E-06 | | 0.03 | | 1.1E-04 | |
| **Noncarcinogenic PAHs** | | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 0.1 | 1.80E-09 | | 0.04 | | 4.5E-08 | |
| Acenaphthene | 0.29 | 0.2 | 5.77E-09 | | 0.06 | | 9.6E-08 | |
| Acenaphthylene | 0.14 | 0.18 | 2.52E-09 | | 0.04 | | 6.3E-08 | |
| Anthracene | 0.60 | 0.29 | 1.72E-08 | | 0.3 | | 5.7E-08 | |
| Benzo(g,h,i)perylene | 0.88 | 0.18 | 1.58E-08 | | 0.04 | | 4.0E-07 | |
| Fluoranthene | 3.00 | 0.2 | 5.99E-08 | | 0.04 | | 1.5E-06 | |
| Fluorene | 0.33 | 0.2 | 6.59E-09 | | 0.04 | | 1.6E-07 | |
| Naphthalene | 0.36 | 0.1 | 3.59E-09 | | 0.04 | | 9.0E-08 | |
| Phenanthrene | 2.1 | 0.18 | 3.77E-08 | | 0.04 | | 9.4E-07 | |
| Pyrene | 2.7 | 0.2 | 5.39E-08 | | 0.03 | | 1.8E-06 | |
| | | | | | | **SUM** | **0.0002** | **3E-10** |

Table 8
Exposure and Risk for Soil Ingestion by Groundskeepers

| ANALYTE | Soil EPC mg/kg | ADD mg/kg/day | LADD mg/kg/day | Oral RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| Benzene | 0.048 | 2.44E-08 | 6.51E-09 | 0.0017 | 0.029 | 1.4E-05 | 1.9E-10 |
| Ethylbenzene | 0.085 | 4.32E-08 | | 0.1 | | 4.3E-07 | |
| Toluene | 0.074 | 3.77E-08 | | 0.2 | | 1.9E-07 | |
| Xylene | 0.232 | 1.18E-07 | | 2 | | 5.9E-08 | |
| cis-1,2-Dichloroethene | 0.070 | 3.56E-08 | | 0.01 | | 3.6E-06 | |
| Tetrachloroethylene | 0.70 | 3.56E-07 | 9.50E-08 | 0.01 | 0.052 | 3.6E-05 | 4.9E-09 |
| Trichloroethene | 0.092 | 4.68E-08 | 1.25E-08 | 0.006 | 0.011 | 7.8E-06 | 1.4E-10 |
| Vinyl chloride | 0.097 | 4.94E-08 | 1.32E-08 | | 1.9 | | 2.5E-08 |
| **VPH** | | | | | | | |
| C5-C8 aliphatics | 9 | 4.58E-06 | | 0.06 | | 0.00008 | |
| C9-C12 aliphatics | 95 | 4.83E-05 | | 0.6 | | 8.1E-05 | |
| C9-C10 aromatics | 68 | 3.46E-05 | | 0.03 | | 0.0012 | |
| **EPH** | | | | | | | |
| C9-C18 aliphatics | 182 | 9.26E-05 | | 0.6 | | 1.5E-04 | |
| C19-C36 aliphatics | 238 | 1.21E-04 | | 6 | | 2.0E-05 | |
| C11-C22 aromatics | 187 | 9.51E-05 | | 0.03 | | 3.2E-03 | |
| **Noncarcinogenic PAHs** | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 9.16E-08 | | 0.04 | | 2.3E-06 | |
| Acenaphthene | 0.29 | 1.47E-07 | | 0.06 | | 2.5E-06 | |
| Acenaphthylene | 0.14 | 7.12E-08 | | 0.04 | | 1.8E-06 | |
| Anthracene | 0.60 | 3.03E-07 | | 0.3 | | 1.0E-06 | |
| Benzo(g,h,i)perylene | 0.88 | 4.48E-07 | | 0.04 | | 1.1E-05 | |
| Fluoranthene | 3.00 | 1.53E-06 | | 0.04 | | 3.8E-05 | |
| Fluorene | 0.33 | 1.68E-07 | | 0.04 | | 4.2E-06 | |
| Naphthalene | 0.36 | 1.83E-07 | | 0.02 | | 9.2E-06 | |
| Phenanthrene | 2.1 | 1.07E-06 | | 0.04 | | 2.7E-05 | |
| Pyrene | 2.7 | 1.37E-06 | | 0.03 | | 4.6E-05 | |
| | | | | | **SUM** | **0.005** | **3E-08** |

Table 9
Exposure and Risk for Dermal Contact by Groundskeepers

| ANALYTE | Soil EPC mg/kg | Dermal RAF | ADD mg/kg/day | LADD mg/kg/day | Oral RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | |
| Benzene | 0.048 | 0.08 | 1.95E-08 | 5.21E-09 | 0.0017 | 0.029 | 1.1E-05 | 1.511E-10 |
| Ethylbenzene | 0.085 | 0.1 | 4.32E-08 | | 0.1 | | 4.3E-07 | |
| Toluene | 0.074 | 0.12 | 4.52E-08 | | 0.2 | | 2.3E-07 | |
| Xylene | 0.232 | 0.12 | 1.42E-07 | | 2 | | 7.1E-08 | |
| cis-1,2-Dichloroethene | 0.070 | 0.1 | 3.56E-08 | | 0.01 | | 3.6E-06 | |
| Tetrachloroethylene | 0.70 | 0.1 | 3.56E-07 | 9.50E-08 | 0.01 | 0.052 | 3.6E-05 | 4.9E-09 |
| Trichloroethene | 0.092 | 0.1 | 4.68E-08 | 1.25E-08 | 0.006 | 0.011 | 7.8E-06 | 1.4E-10 |
| Vinyl chloride | 0.097 | 0.1 | 4.94E-08 | 1.32E-08 | | 1.9 | | 2.5E-08 |
| **VPH** | | | | | | | | |
| C5-C8 aliphatics | 9 | 0.5 | 2.29E-05 | | 0.06 | | 0.0004 | |
| C9-C12 aliphatics | 95 | 0.2 | 9.67E-05 | | 0.6 | | 1.6E-04 | |
| C9-C10 aromatics | 68 | 0.18 | 6.23E-05 | | 0.03 | | 0.0021 | |
| **EPH** | | | | | | | | |
| C9-C18 aliphatics | 182 | 0.2 | 1.85E-04 | | 0.6 | | 3.1E-04 | |
| C19-C36 aliphatics | 238 | 0.1 | 1.21E-04 | | 6 | | 2.0E-05 | |
| C11-C22 aromatics | 187 | 0.18 | 1.71E-04 | | 0.03 | | 5.7E-03 | |
| **Noncarcinogenic PAHs** | | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 0.1 | 9.16E-08 | | 0.04 | | 2.3E-06 | |
| Acenaphthene | 0.29 | 0.2 | 2.94E-07 | | 0.06 | | 4.9E-06 | |
| Acenaphthylene | 0.14 | 0.18 | 1.28E-07 | | 0.04 | | 3.2E-06 | |
| Anthracene | 0.60 | 0.29 | 8.78E-07 | | 0.3 | | 2.9E-06 | |
| Benzo(g,h,i)perylene | 0.88 | 0.18 | 8.06E-07 | | 0.04 | | 2.0E-05 | |
| Fluoranthene | 3.00 | 0.2 | 3.05E-06 | | 0.04 | | 7.6E-05 | |
| Fluorene | 0.33 | 0.2 | 3.36E-07 | | 0.04 | | 8.4E-06 | |
| Naphthalene | 0.36 | 0.1 | 1.83E-07 | | 0.04 | | 4.6E-06 | |
| Phenanthrene | 2.1 | 0.18 | 1.92E-06 | | 0.04 | | 4.8E-05 | |
| Pyrene | 2.7 | 0.2 | 2.75E-06 | | 0.03 | | 9.2E-05 | |
| | | | | | | **SUM** | **0.009** | **3E-08** |

Table 10
Exposure and Risk for Soil Ingestion for Unrestricted Use

| ANALYTE | Soil EPC mg/kg | ADD mg/kg/day | LADD mg/kg/day | Oral RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | |
| Benzene | 0.048 | 1.49E-07 | 1.98E-08 | 0.0017 | 0.029 | 8.8E-05 | 5.8E-10 |
| Ethylbenzene | 0.085 | 2.64E-07 | | 0.1 | | 2.6E-06 | |
| Toluene | 0.074 | 2.29E-07 | | 0.2 | | 1.1E-06 | |
| Xylene | 0.232 | 7.19E-07 | | 2 | | 3.6E-07 | |
| cis-1,2-Dichloroethene | 0.070 | 2.17E-07 | | 0.01 | | 2.2E-05 | |
| Tetrachloroethylene | 0.70 | 2.17E-06 | 2.89E-07 | 0.01 | 0.052 | 2.2E-04 | 1.5E-08 |
| Trichloroethene | 0.092 | 2.85E-07 | 3.80E-08 | 0.006 | 0.011 | 4.8E-05 | 4.2E-10 |
| Vinyl chloride | 0.097 | 3.01E-07 | 4.01E-08 | | 1.9 | | 7.6E-08 |
| **VPH** | | | | | | | |
| C5-C8 aliphatics | 9 | 2.79E-05 | | 0.06 | | 0.00047 | |
| C9-C12 aliphatics | 95 | 2.95E-04 | | 0.6 | | 4.9E-04 | |
| C9-C10 aromatics | 68 | 2.11E-04 | | 0.03 | | 0.0070 | |
| **EPH** | | | | | | | |
| C9-C18 aliphatics | 182 | 5.64E-04 | | 0.6 | | 9.4E-04 | |
| C19-C36 aliphatics | 238 | 7.38E-04 | | 6 | | 1.2E-04 | |
| C11-C22 aromatics | 187 | 5.80E-04 | | 0.03 | | 1.9E-02 | |
| **Noncarcinogenic PAHs** | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 5.58E-07 | | 0.04 | | 1.4E-05 | |
| Acenaphthene | 0.29 | 8.96E-07 | | 0.06 | | 1.5E-05 | |
| Acenaphthylene | 0.14 | 4.34E-07 | | 0.04 | | 1.1E-05 | |
| Anthracene | 0.60 | 1.84E-06 | | 0.3 | | 6.1E-06 | |
| Benzo(g,h,i)perylene | 0.88 | 2.73E-06 | | 0.04 | | 6.8E-05 | |
| Fluoranthene | 3.00 | 9.30E-06 | | 0.04 | | 2.3E-04 | |
| Fluorene | 0.33 | 1.02E-06 | | 0.04 | | 2.6E-05 | |
| Naphthalene | 0.36 | 1.12E-06 | | 0.02 | | 5.6E-05 | |
| Phenanthrene | 2.1 | 6.51E-06 | | 0.04 | | 1.6E-04 | |
| Pyrene | 2.7 | 8.37E-06 | | 0.03 | | 2.8E-04 | |
| | | | | | **SUM** | **0.03** | **9E-08** |

Table 11
Exposure and Risk for Dermal Contact with Unrestricted Use

| ANALYTE | Soil EPC mg/kg | Dermal RAF | ADD mg/kg/day | LADD mg/kg/day | RfD mg/kg/day | Oral CSF 1/(mg/kg/day) | Hazard ADD/RfD | Risk LADD x CSF |
|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | |
| Benzene | 0.048 | 0.08 | 7.53E-08 | 9.98E-09 | 0.0017 | 0.029 | 4.4E-05 | 2.895E-10 |
| Ethylbenzene | 0.085 | 0.1 | 1.67E-07 | | 0.1 | | 1.7E-06 | |
| Toluene | 0.074 | 0.12 | 1.74E-07 | | 0.2 | | 8.7E-07 | |
| Xylene | 0.232 | 0.12 | 5.46E-07 | | 2 | | 2.7E-07 | |
| cis-1,2-Dichloroethene | 0.070 | 0.1 | 1.37E-07 | | 0.01 | | 1.4E-05 | |
| Tetrachloroethylene | 0.70 | 0.1 | 1.37E-06 | 3.50E-07 | 0.01 | 0.052 | 1.4E-04 | 1.8E-08 |
| Trichloroethene | 0.092 | 0.1 | 1.80E-07 | 4.60E-08 | 0.006 | 0.011 | 3.0E-05 | 5.1E-10 |
| Vinyl chloride | 0.097 | 0.1 | 1.90E-07 | 4.85E-08 | | 1.9 | | 9.2E-08 |
| **VPH** | | | | | | | | |
| C5-C8 aliphatics | 9 | 0.5 | 8.82E-05 | | 0.06 | | 0.0015 | |
| C9-C12 aliphatics | 95 | 0.2 | 3.72E-04 | | 0.6 | | 6.2E-04 | |
| C9-C10 aromatics | 68 | 0.18 | 2.40E-04 | | 0.03 | | 0.0080 | |
| **EPH** | | | | | | | | |
| C9-C18 aliphatics | 182 | 0.2 | 7.13E-04 | | 0.6 | | 1.2E-03 | |
| C19-C36 aliphatics | 238 | 0.1 | 4.66E-04 | | 6 | | 7.8E-05 | |
| C11-C22 aromatics | 187 | 0.18 | 6.60E-04 | | 0.03 | | 2.2E-02 | |
| **Noncarcinogenic PAHs** | | | | | | | | |
| 2-Methylnaphthalene | 0.18 | 0.1 | 3.53E-07 | | 0.04 | | 8.8E-06 | |
| Acenaphthene | 0.29 | 0.2 | 1.13E-06 | | 0.06 | | 1.9E-05 | |
| Acenaphthylene | 0.14 | 0.18 | 4.94E-07 | | 0.04 | | 1.2E-05 | |
| Anthracene | 0.60 | 0.29 | 3.38E-06 | | 0.3 | | 1.1E-05 | |
| Benzo(g,h,i)perylene | 0.88 | 0.18 | 3.10E-06 | | 0.04 | | 7.8E-05 | |
| Fluoranthene | 3.00 | 0.2 | 1.18E-05 | | 0.04 | | 2.9E-04 | |
| Fluorene | 0.33 | 0.2 | 1.29E-06 | | 0.04 | | 3.2E-05 | |
| Naphthalene | 0.36 | 0.1 | 7.06E-07 | | 0.04 | | 1.8E-05 | |
| Phenanthrene | 2.1 | 0.18 | 7.41E-06 | | 0.04 | | 1.9E-04 | |
| Pyrene | 2.7 | 0.2 | 1.06E-05 | | 0.03 | | 3.5E-04 | |
| | | | | | | **SUM** | **0.03** | **1E-07** |

Table 12
Comparison of Groundwater Concentrations with Aquatic Criteria

| Chemicals Detected in Groundwater | Groundwater EPC ug/liter | Aquatic/a Criteria x 10 ug/liter | Ratio EPC/Aquat |
|---|---|---|---|
| **VOCs** | | | |
| Benzene | *10* | 7000 | 0.0014 |
| Ethylbenzene | *10* | 4000 | 0.0025 |
| Toluene | *15* | 50,000 | 0.0003 |
| Xylene | 12.5 | 50,000 | 0.0003 |
| Naphthalene | *50* | 6000 | 0.0083 |
| cis-1,2-Dichloroethene | 57 | 50,000 | 0.0011 |
| Tetrachloroethene | 3000 | 4500 | 0.6667 |
| 1,1,2,2-Tetrachloroethane | 6.5 | 24,000 | 0.0003 |
| Trichloroethene | 66 | 20,000 | 0.0033 |
| Vinyl chloride | 14 | 50,000 | 0.0003 |
| **VPH** | | | |
| C5-C8 Aliphatics | 350 | 4000 | 0.0875 |
| C9-C12 Aliphatics | 3568 | 20000 | 0.1784 |
| C9-C10 Aromatics | 2858 | 4000 | 0.7145 |
| **EPH** | | | |
| C9-C18 aliphatics | 3790 | 18,000 | 0.2106 |
| C19-C36 aliphatics | 540 | 21,000 | 0.0257 |
| C11-C22 aromatics | 797 | 3000 | 0.2657 |

a/ Aquatic criteria are the lowest AWQC (MADEP 1994)

# APPENDIX D

Copy of AUL for RTN # 2

# Transmittal

# NOTICE OF AN ACTIVITY AND USE LIMITATION

**EXHIBIT C**

Reference:

This Activity and Use Limitation (hereinafter "AUL") Opinion is Exhibit C to a Notice of Activity and Use Limitation (hereinafter "Notice of AUL") recorded on the deed for the above property in accordance with the Massachusetts Department of Environmental Protection (DEP) requirements. The AUL Opinion is applicable to a portion of the property currently being developed as a new City Middle School (hereinafter "the AUL Area"). The Opinion is applicable to that part of the school property that is located on the parcels impacted by the release of asbestos The AUL Opinion and the AUL area is associated with asbestos contamination remaining above background concentrations in site soils which are located at depths of more than 5 feet below current surfaces. A summary of information relative to the documented release and remedial response activities is presented below.

This AUL Opinion and Notice of AUL have been prepared in conjunction with a Response Action Outcome (RAO) Statement and supporting documentation that are being submitted to the Massachusetts DEP for the school property with regard to the above RTNs.

This AUL Opinion pertains to the AUL Area and was prepared on behalf of the City in accordance with the provisions contained in the Massachusetts Contingency Plan (MCP), 310 CMR 40.1074.

**Site Description and Current Conditions**

**Activities and Uses Permitted by this AUL Opinion**

A condition of No Significant Risk of harm to human health, public safety, welfare and the environment (such condition being defined in the MCP, 310 CMR 40.0000) exists for any foreseeable period of time so long as any of the following activities and uses occur on the AUL Area:

1. All uses and activities that are consistent with uses and activities typically associated with a school and a community recreation center provided that such activities and uses do not include any disturbance of the soil within the limits of the AUL area that was in place prior to school construction and that is located below Elevation +64.25 referenced to the City Base. The top of the slab for the school building is at Elevation +70.25 and the slab is 12 inches thick, therefore the soil to be left undisturbed is 5 feet below the bottom of the slab. Paved areas and limited landscaped areas outside the building are approximately at Elevation +69.5, therefore the soil to be left undisturbed is also 5 feet below the paved and landscaped areas outside the building;

2. Any other use or activity which does not disturb the soil below Elevation +64.25 (5 feet below the slab of the school building) within the limits of the AUL Area;

3. Landscaping and maintenance of topsoil obtained outside the disposal site and brought to the AUL Area or other materials placed on the existing soil may be performed provided that there is no disturbance of the soil below Elevation +64.25 (5 feet below the slab of the school building or the ground surface);

4. Such other activities or uses of the AUL Area which, in the Opinion of an LSP, shall present no greater risk of harm to human health, safety, public welfare or the environment than the activities and uses set forth in this paragraph; and

5. Such other activities and uses not identified below as being Activities and Uses Inconsistent with the AUL.

**Activities and Uses Inconsistent with this AUL Opinion**

Activities and uses which are inconsistent with the AUL Opinion, and which, if implemented at the AUL Area may result in a significant risk of harm to human health, safety, welfare or the environment, are as follows:

1. Any use of the AUL Area for the growing of fruits and vegetables for human consumption; and

2. Any construction activity or any other activity in the soil below Elevation +64.25 (5 feet below the slab of the school building) within the AUL Area which is subject to the Notice of AUL, unless completed by workers who are adequately protected and trained, and implementing federal and state occupational, health and safety requirements (e.g. 129 CFR 1910.120), and unless performed in accordance with all relevant federal and state regulations and policies that govern

such construction activities. Any construction activity or any other activity in the soil below Elevation +64.25 must be performed under the oversight of a Licensed Site Professional, including the prior development and implementation of a Soil Management Plan and a Health and Safety Plan.

**Obligations and Conditions to Maintain a Condition of No Significant Risk**

1. These AUL apply to the AUL Area as described in **Exhibits A** and **A-1** and as depicted on **Exhibit B**;

2. It shall be the obligation of the AUL Area owner to maintain compliance with the conditions set forth in the AUL and prevent such activities and uses that are considered inconsistent with this AUL Opinion as enumerated above;

3. Pursuant to 310 CMR 40.1012, it shall be the obligation of the AUL Area owner to provide notice to holders of any interest(s) in the AUL Area or portion thereof (including, without limitation, owners, lessees, tenants, mortgagees, and holders of easement rights) of the existence of the AUL;

4. Pursuant to 310 CMR 40.1012, it shall be the obligation of the AUL Area owner to evaluate risks associated with proposed changes in Activities and Uses of the AUL Area, that could increase risk of harm to human health, safety, welfare and the environment and to perform additional response actions prior to any such changes in the AUL Area Activities and Uses, as required by 310 CMR 40.0000;

5. A Soil Management Plan must be prepared by a Licensed Site Professional prior to the commencement of any activity that is likely to disturb soil below Elevation +64.25;

6. All construction or other activity that is likely to disturb soil below Elevation +64.25 must be performed by properly trained and equipped personnel under a site-specific Health and Safety Plan in accordance with all relevant federal and state regulations and policies that govern such construction activities, including but not limited to federal and state occupational, health and safety requirements (e.g. 129 CFR 1910.120);

7. It shall be the obligation of the AUL Area owner to maintain the floor of the building, the concrete walkways, the asphalt pavement and/or landscaping materials in good repair and integrity such that access to soil located beneath the cover material and below Elevation +64.25 is prevented; and

8. It shall be the obligation of the AUL Area owner to record and/or register the Notice of Activity and Use Limitation as specified in 310 CMR 40.1074(3).

**Procedures To Be Followed Before AUL Area Use Is Changed**

If a change in usage of the AUL Area that is subject to the above AUL is proposed, the change shall be reviewed by an LSP, in accordance with 310 CMR 40.1080, to evaluate whether the proposed change in Activities and Uses may invalidate the existing condition of No Significant Risk of harm to human health, public safety, welfare and the environment.

If such evaluation determines that an amendment of the AUL is necessary to maintain a level of No Significant Risk for the new or alternative Activities and Uses, an Amendment of Activity and Use Limitations shall be prepared pursuant to 310 CMR 40.1081. If such evaluation indicates that additional response actions are required to maintain a condition of No Significant Risk, the procedures outlined in 310 CMR 40.1080(2) shall be followed.

**Time Frame For Which AUL Will Remain In Effect**

The AUL shall remain in effect in perpetuity or until amended in accordance with 310 CMR 40.1081 to reduce the time frame for which the AUL will remain in effect, or until terminated, in accordance with 310 CMR 40.1083.

**Limitations**

# EXHIBIT B
## Boundaries of AUL Area and of Disposal Site
## RTN #2

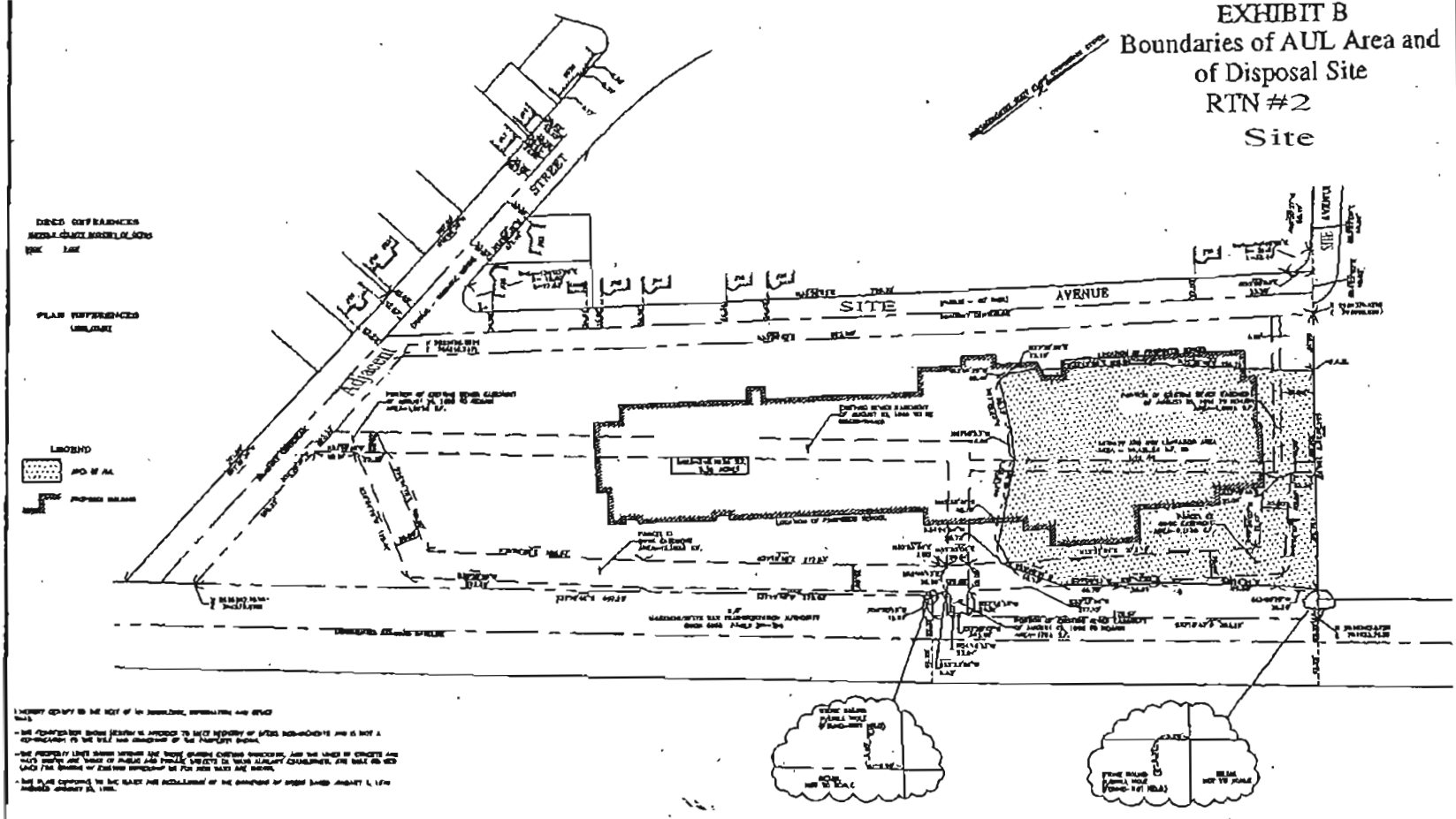


EXHIBIT C

January 2003

Reference: Massachusetts
Activity and Use Limitation Opinion
Massachusetts DEP Release Tracking Number (RTN)

This Activity and Use Limitation (hereinafter "AUL") Opinion is Exhibit C to a Notice of Activity and Use Limitation (hereinafter "Notice of AUL") recorded on the deed for the above property in accordance with the Massachusetts Department of Environmental Protection (DEP) requirements. The AUL Opinion is applicable to a portion of the property currently being developed as a new City Middle School (hereinafter "the AUL Area"). The Opinion is applicable to that part of the school property that is located on the parcels formerly identified as 39-43 and 55 Site Avenue and that was impacted by the release of asbestos to which RTN # 2 applies. The AUL Opinion and the AUL area is associated with asbestos contamination remaining above background concentrations in site soils which are located at depths of more than 5 feet below current surfaces. A summary of information relative to the documented release and remedial response activities is presented below.

This AUL Opinion and Notice of AUL have been prepared in conjunction with a Response Action Outcome (RAO) Statement and supporting documentation that are being submitted to the Massachusetts DEP for the school property with regard to the above RTNs.

This AUL Opinion pertains to the AUL Area and was prepared on behalf of the City
PRP Group in accordance with the provisions contained in the Massachusetts Contingency Plan (MCP), 310 CMR 40.1074.

**Site Description and Current Conditions**

The new Middle School property is bounded by Site Avenue to the west, a Playground to the north, by railroad tracks to the east, and by Adjacent Street to the south. The school site is trapezoidal in shape and, according to City Assessors' plans, measures about 850 feet along Site Avenue, 290 feet along its boundary with the Playground, 1040 feet along the existing railroad tracks, and 300 feet along Adjacent Street. The Middle School site includes the properties that were formerly identified as 48 Adjacent Street, 31 Site Avenue, 33-35 Site Avenue, 39-43 Site Avenue and 55 Site Avenue. The school property and the AUL area are shown on the plan identified as **Exhibit B** and titled "Boundaries of AUL Area and of Disposal Site, RTN # 2, 39-55 Site Avenue,

Prior to construction of the school, the ground surface across the school property was generally relatively level with surface grades varying from about Elevation +65 to Elevation +70. Elevations herein are referenced to the City Base. All buildings that were formerly located on the five parcels have been demolished and all demolition debris has been removed from the site. The demolition included removal of subsurface structures concurrently with removal of asbestos impacted soil to depths ranging from about five (5) to six (6) feet to more than fifteen (15) feet below the current ground surface across much of the asbestos disposal site. The subsurface structures and contaminated soil were replaced with on-site

material that had been chemically tested for the contaminants of concern or with material from off-site sources.

School construction is currently nearing completion. The floor slab of the school building is approximately at Elevation +70.25. Ground surface outside the school building is approximately at Elevation +69.5 within the asbestos release area.

The area impacted by asbestos containing material was bounded by **Site** Avenue to the west, **a** Playground to the north, by railroad tracks to the east, and by a parcel identified as 33-35 **Site** Avenue to the south. This area is approximately rectangular in shape, and measured about 300-feet parallel to **Site** Avenue and the railroad tracks, and 200-feet parallel to the boundary with **the** Playground and with 35 **Site** Avenue. The boundaries of the area subject to the AUL and of the disposal site to which RTN # 2 applies are shown on **Figure 1, Exhibit B.**

**Description of the Release and Remedial Activities for RTN # 2**

The presence of distinct pieces of asbestos-containing materials (ACM) on the parcels identified as 39-43 and 55 **Site** Avenue in the northern part of the Middle School property was reported to the DEP Bureau of Waste Site Cleanup (DEP-BWSC) on May 2001 as "a release of any oil and/or hazardous material, in any quantity or concentration, that poses or could pose an Imminent Hazard..." The DEP assigned release tracking number (RTN # 2) to the release and verbally approved the performance of Immediate Response Action (IRA) activities.

As requested by the DEP, air testing to assess the potential for an Imminent Hazard, and dust suppression activities were performed. No asbestos was identified in air samples during IRA activities.

Testing of soil samples by polarized light microscopy (PLM) was performed on samples obtained and composited from cells of a grid established across the impacted area to indicate the possible extent of the asbestos release.

Response actions to address the presence of asbestos in soils were performed in accordance with verbal approval received from DEP-BWSC on May 2001, the IRA Plan submitted to the DEP on June 2001, the Addendum to the IRA Plan submitted July 2001, the Supplemental Information submitted July 2001, and the Additional Supplemental Information submitted August 2001. An IRA Status Report was submitted to DEP-BWSC on September 2001. In addition, an IRA Plan Modification was submitted to the DEP on December 2001 to encompass additional excavation of possible asbestos-impacted soils in the area of a proposed swimming pool. A second IRA Status Report was submitted to DEP-BWSC on March 2002. Prior to the commencement of activities in the swimming pool area, a letter titled "Summary of Asbestos Abatement/Immediate Response Action (IRA) Activities in Swimming Pool Area" was submitted to BWSC on March 2002. Since remedial actions were also being performed under an Asbestos Abatement Plan, the documents were also submitted to the DEP Bureau of Waste Prevention (DEP-BWP).

Results of air and soil testing were submitted to the DEP with these documents. Air testing performed during IRA activities did not indicate the presence of asbestos fibers in air.

These documents were prepared and submitted based upon meetings and discussions between personnel of DEP-BWSC, DEP-BWP, **the PRP Group, the LSP from LSP Co.**

IRA activities associated with RTN # 2 were performed under the oversight of **the LSP** as the L.S.P.-of-Record and an Industrial Hygienist and with the approval of and with regular inspections by DEP-BWP.

A Phase I Initial Site Investigation Report and Tier II Classification for the asbestos disposal area was submitted to the DEP on May 2002.

In summary, and based on the results of polarized light microscopy testing, completion of the IRA removed virtually all asbestos-impacted fill materials from the disposal site. One hundred and nineteen soil samples, including twenty-five deeper samples from the swimming pool area, were tested for the presence of asbestos. Six samples of soils remaining in place were reported to show a "trace" of asbestos fibers by PLM testing. However, these soils are located at depths ranging from 6 to 16.5 feet below the finished ground surface and are isolated beneath the floor of the building, the concrete walkway, the paved driveway to the school or are located beneath the bottom of the swimming pool.

**Risk Characterization**

Pursuant to relevant provisions contained in the MCP, a Method 3 Risk Characterization was performed for the asbestos disposal site by **RiskCo** Risk Analysis since there are no Method 1 Cleanup Standards for asbestos in soils.

Based upon the results of the Risk Characterization, asbestos levels remaining in the soil upon completion of the IRA are at a level of No Significant Risk of harm to human health, public safety, welfare and the environment under current site conditions. The samples indicating the presence of trace levels of asbestos that were left in place are located at depths ranging from 6 to 16.5 feet below the floor slab of the building, below a paved area outside the building, or below the bottom of the pool. Therefore, under existing site conditions, the potential risks associated with exposure through inhalation of airborne dust, direct contact with soil or incidental ingestion of contaminated soil are considered to be insignificant.

However, in order to limit possible future exposure to asbestos remaining in soils, an AUL has been implemented for part of the northern portion of the school property. The AUL includes provisions to prevent disturbance of the potentially impacted soils remaining below the school building, paved areas and landscaped areas within the asbestos disposal site.

Accordingly, it is our opinion that a Permanent Solution has been achieved for the asbestos disposal site, and a Class A-3 Response Action Outcome is applicable to the subject disposal site under the MCP.

**Activities and Uses Permitted by this AUL Opinion**

A condition of No Significant Risk of harm to human health, public safety, welfare and the environment (such condition being defined in the MCP, 310 CMR 40.0000) exists for any foreseeable period of time so long as any of the following activities and uses occur on the AUL Area:

1. All uses and activities that are consistent with uses and activities typically associated with a school and a community recreation center provided that such activities and uses do not include any disturbance of the soil within the limits of the AUL area that was in place prior to school construction and that is located below Elevation +64.25 referenced to the City Base. The top of the slab for the school building is at Elevation +70.25 and the slab is 12 inches thick, therefore the soil to be left undisturbed is 5 feet below the bottom of the slab. Paved areas and limited landscaped areas outside the building are approximately at Elevation +69.5, therefore the soil to be left undisturbed is also 5 feet below the paved and landscaped areas outside the building;

2. Any other use or activity which does not disturb the soil below Elevation +64.25 (5 feet below the slab of the school building) within the limits of the AUL Area;

3. Landscaping and maintenance of topsoil obtained outside the disposal site and brought to the AUL Area or other materials placed on the existing soil may be performed provided that there is no disturbance of the soil below Elevation +64.25 (5 feet below the slab of the school building or the ground surface);

4. Such other activities or uses of the AUL Area which, in the Opinion of an LSP, shall present no greater risk of harm to human health, safety, public welfare or the environment than the activities and uses set forth in this paragraph; and

5. Such other activities and uses not identified below as being Activities and Uses Inconsistent with the AUL.

**Activities and Uses Inconsistent with this AUL Opinion**

Activities and uses which are inconsistent with the AUL Opinion, and which, if implemented at the AUL Area may result in a significant risk of harm to human health, safety, welfare or the environment, are as follows:

1. Any use of the AUL Area for the growing of fruits and vegetables for human consumption; and

2. Any construction activity or any other activity in the soil below Elevation +64.25 (5 feet below the slab of the school building) within the AUL Area which is subject to the Notice of AUL, unless completed by workers who are adequately protected and trained, and implementing federal and state occupational, health and safety requirements (e.g. 129 CFR 1910.120), and unless performed in accordance with all relevant federal and state regulations and policies that govern

such construction activities. Any construction activity or any other activity in the soil below Elevation +64.25 must be performed under the oversight of a Licensed Site Professional, including the prior development and implementation of a Soil Management Plan and a Health and Safety Plan.

**Obligations and Conditions to Maintain a Condition of No Significant Risk**

1. These AUL apply to the AUL Area as described in **Exhibits A** and **A-1** and as depicted on **Exhibit B**;

2. It shall be the obligation of the AUL Area owner to maintain compliance with the conditions set forth in the AUL and prevent such activities and uses that are considered inconsistent with this AUL Opinion as enumerated above;

3. Pursuant to 310 CMR 40.1012, it shall be the obligation of the AUL Area owner to provide notice to holders of any interest(s) in the AUL Area or portion thereof (including, without limitation, owners, lessees, tenants, mortgagees, and holders of easement rights) of the existence of the AUL;

4. Pursuant to 310 CMR 40.1012, it shall be the obligation of the AUL Area owner to evaluate risks associated with proposed changes in Activities and Uses of the AUL Area, that could increase risk of harm to human health, safety, welfare and the environment and to perform additional response actions prior to any such changes in the AUL Area Activities and Uses, as required by 310 CMR 40.0000;

5. A Soil Management Plan must be prepared by a Licensed Site Professional prior to the commencement of any activity that is likely to disturb soil below Elevation +64.25;

6. All construction or other activity that is likely to disturb soil below Elevation +64.25 must be performed by properly trained and equipped personnel under a site-specific Health and Safety Plan in accordance with all relevant federal and state regulations and policies that govern such construction activities, including but not limited to federal and state occupational, health and safety requirements (e.g. 129 CFR 1910.120);

7. It shall be the obligation of the AUL Area owner to maintain the floor of the building, the concrete walkways, the asphalt pavement and/or landscaping materials in good repair and integrity such that access to soil located beneath the cover material and below Elevation +64.25 is prevented; and

8. It shall be the obligation of the AUL Area owner to record and/or register the Notice of Activity and Use Limitation as specified in 310 CMR 40.1074(3).

**Procedures To Be Followed Before AUL Area Use Is Changed**

If a change in usage of the AUL Area that is subject to the above AUL is proposed, the change shall be reviewed by an LSP, in accordance with 310 CMR 40.1080, to evaluate whether the proposed change in Activities and Uses may invalidate the existing condition of No Significant Risk of harm to human health, public safety, welfare and the environment.

If such evaluation determines that an amendment of the AUL is necessary to maintain a level of No Significant Risk for the new or alternative Activities and Uses, an Amendment of Activity and Use Limitations shall be prepared pursuant to 310 CMR 40.1081. If such evaluation indicates that additional response actions are required to maintain a condition of No Significant Risk, the procedures outlined in 310 CMR 40.1080(2) shall be followed.

**Time Frame For Which AUL Will Remain In Effect**

The AUL shall remain in effect in perpetuity or until amended in accordance with 310 CMR 40.1081 to reduce the time frame for which the AUL will remain in effect, or until terminated, in accordance with 310 CMR 40.1083.

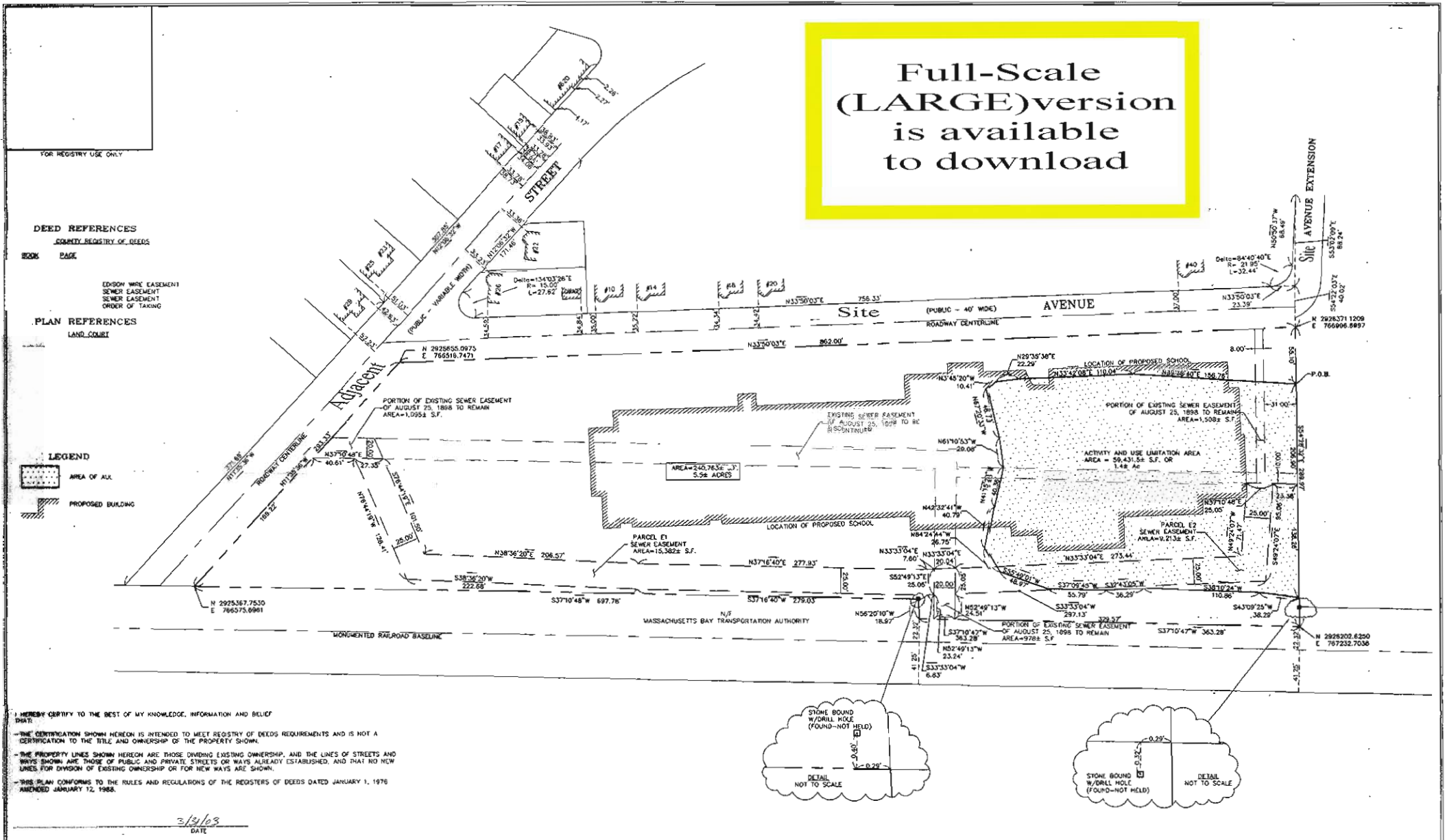
**Limitations**

**LSP Co.** represents herein that it performed the work for this Notice of Activity and Use Limitation and the AUL Opinion (**Exhibit C**) in a professional manner using the degree of skill and care exercised for similar projects under similar circumstances by reputable and competent environmental consultants at the time such services were performed. No other representation, expressed or implied, and no other warranty or guarantee is made with respect to this Notice of Activity and Use Limitation and associated AUL Opinion.

Very truly yours,

*LSP*

Full-Scale (LARGE)version is available to download




I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF THAT:

- THE CERTIFICATION SHOWN HEREON IS INTENDED TO MEET REGISTRY OF DEEDS REQUIREMENTS AND IS NOT A CERTIFICATION TO THE TITLE AND OWNERSHIP OF THE PROPERTY SHOWN.
- THE PROPERTY LINES SHOWN HEREON ARE THOSE DIVIDING EXISTING OWNERSHIP, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC AND PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.
- THIS PLAN CONFORMS TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS DATED JANUARY 1, 1976 AMENDED JANUARY 12, 1988.

3/31/03
DATE

GRAPHIC SCALE
40 20 0 40 80 120
1" = 40'

| REVISIONS | | |
|---|---|---|
| REV. | COMMENTS | DATE |
| | | |

DATE: MARCH 17, 2003 SCALE: 1" = 40'

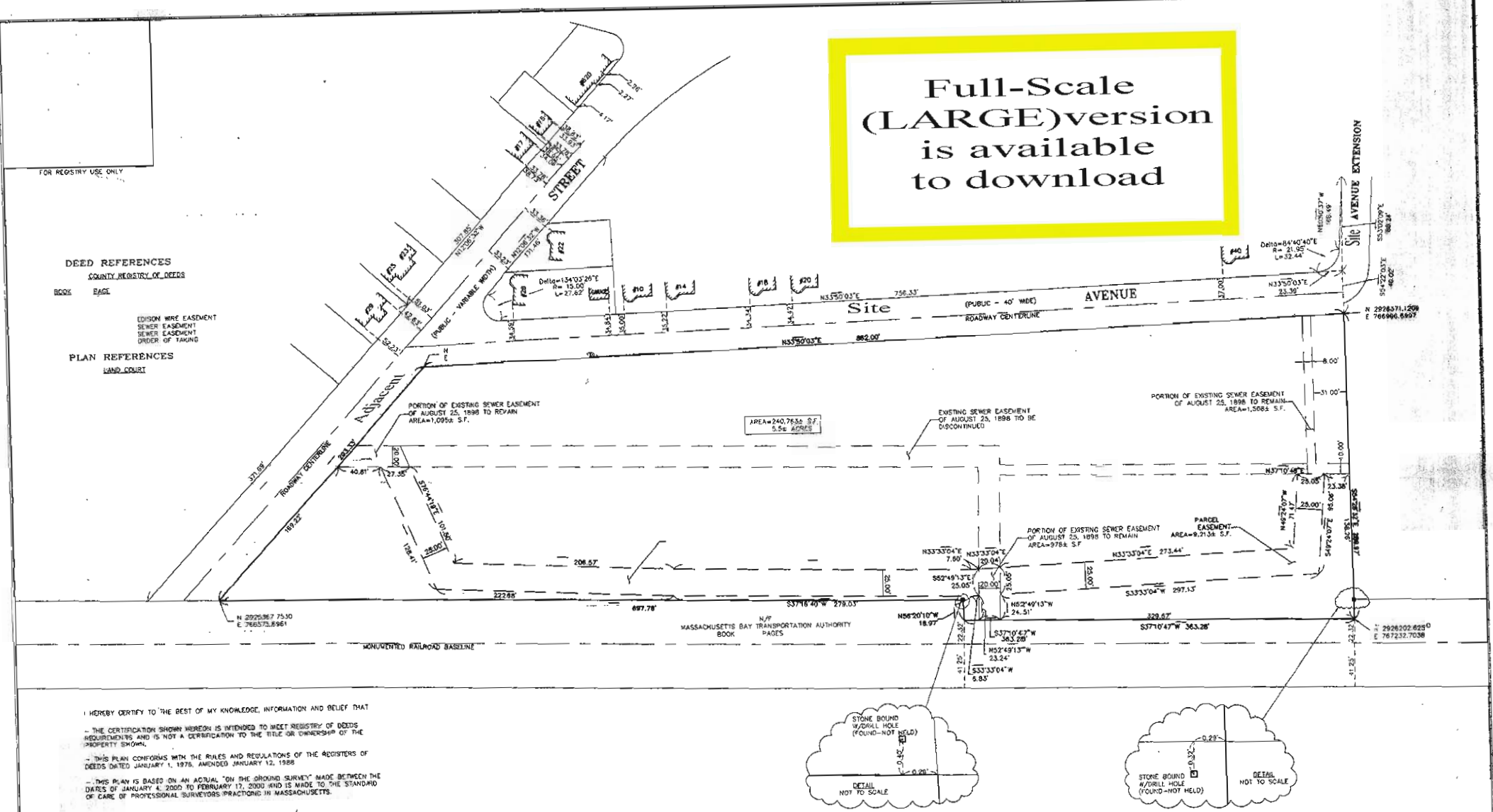
3/31/03

ACTIVITY AND USE LIMITATION PLAN

PREPARED FOR:

SHEET 1 OF 1
REV. 0

Full-Scale (LARGE)version is available to download




I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF THAT

- THE CERTIFICATION SHOWN HEREON IS INTENDED TO MEET REGISTRY OF DEEDS REQUIREMENTS AND IS NOT A CERTIFICATION TO THE TITLE OR OWNERSHIP OF THE PROPERTY SHOWN.

- THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS DATED JANUARY 1, 1975, AMENDED JANUARY 12, 1988

- THIS PLAN IS BASED ON AN ACTUAL "ON THE GROUND SURVEY" MADE BETWEEN THE DATES OF JANUARY 4, 2000 TO FEBRUARY 17, 2000 AND IS MADE TO THE STANDARD OF CARE OF PROFESSIONAL SURVEYORS PRACTICING IN MASSACHUSETTS.

3/31/03
REGISTERED PROFESSIONAL LAND SURVEYOR

GRAPHIC SCALE
40 20 0 40 80 120
SCALE 1"=40'

REVISIONS

| REV. | COMMENTS | DATE |
|---|---|---|
| | | |

DATE: DECEMBER 2, 2002 SCALE: 1"=40'

EASEMENT PLAN

PREPARED FOR:

SHEET S-1 OF 1 REV.