Forensic Environmental Services, Inc.
113 John Robert Thomas Drive
Exton, Pennsylvania 19341

Telephone: (610) 594-3940 Telecopier: (610) 594-3943

DATE: March 7, 2008

RECEIVED
NYSDEC
MAR 11 2008
Bureau of Hazardous Waste & Radiation Management
Division of Solid & Hazardous Materials

TO: Alicia Barraza, Environmental Engineer
NYS Dept. of Environmental Conservation
Division of Solid & Hazardous Materials
625 Broadway, Albany, NY 12233-7252

RE: Final RFI Report - Former Norton/Nashua Tape Products Facility
2600 Seventh Avenue, Watervliet, New York
EPA ID No. NYD 066829599
NYSDEC Index Number: CO 4-20001205-3375

We are sending you __X__ herewith ______ under separate cover
______ drawings ______ letters ______ other

If material received is not as listed, please notify us at once.

Quantity	Title	Action
1 ea.	Final Edits and Revised Section 10.0 RFI Report - Former Norton/Nashua Tape Products Facility	for your records

Please find enclosed the final edits and a complete copy of revised Section 10.0 of the final RCRA Facility Investigation (RFI) Report for the referenced project. An electronic copy of these documents will also be forwarded to you via e-mail. Copies of these edits are also being sent to the Regional Solid & Hazardous Materials Engineer, the Chief of the Bureau of Hazardous Waste Management, and the RCRA Enforcement Attorney (a copy of the transmittal letter is enclosed), and will be forwarded to all parties on the current project distribution list.

Very truly yours,

FORENSIC ENVIRONMENTAL SERVICES, INC.

Robert W. Zer, CPG
Sr. Project Manager

cc: (via e-mail)

Charlotte Bethoney, NYS Department of Heath
Paul Rappleyea, Saint-Gobain Abrasives, Inc.
Lauren Alterman, Esq., Saint-Gobain Corporation
Thomas S. West, Esq., The West Firm, PLLC
S. Joyner, Tyco International (U.S.), Inc.
Brian K. Helf, Cloverleaf Distribution, LLC
Russell Gregg, Esq., Liberty Mutual Insurance Co.
Ronald. L. Groves, P.E., Albany County Health Department
Robert S. Amrein, Esq., Nashua Corporation

Forensic Environmental Services, Inc.
113 John Robert Thomas Drive
The Commons at Lincoln Center
Exton, Pennsylvania 19341

Telephone: (610) 594-3940 Telecopier: (610) 594-3943

March 7, 2008

NYSDEC Regional Solid & Hazardous Materials Engineer
1150 N. Westcott Street
Schenectady, NY 12306

Chief, Bureau of Hazardous Waste Management
NYSDEC - Division of Solid & Hazardous Materials
625 Broadway, Albany, New York 12233-7252

Director, NYSDEC Division of Environmental Enforcement
(Attn: RCRA Enforcement Attorney)
625 Broadway, Albany, New York 12233-5500

RE: Final RCRA Investigation (RFI) Report
Former Norton/Nashua Tape Products Facility
2600 Seventh Avenue, Watervliet, New York
EPA ID No. NYD 066829599, NYSDEC Index Number: CO 4-20001205-3375

Forensic Environmental Services, Inc., on behalf of Saint-Gobain Corporation, submits the enclosed final edits and a complete copy of revised Section 10.0 of the RCRA Facility Investigation (RFI) Report for the above referenced Site. Electronic and paper copies of these documents were submitted to Ms. Alicia Barraza, the NYSDEC Site Environmental Engineer. Copies will also be sent to all parties on the current project distribution list. These documents have been prepared in accordance with NYSDEC Order on Consent Index No. CO 4-20001205-3375 dated June 4, 2002.

If you have any questions on this submittal, please contact me at (610) 594-3940.

Sincerely yours,

FORENSIC ENVIRONMENTAL SERVICES, INC.

Robert W. Zei, Ph.D., CPG
Sr. Project Manager

cc: Lauren Alterman, Esq., Saint-Gobain Corporation
Paul Rappleyea, Saint-Gobain Abrasives
Alicia Barraza, NYSDEC

SECTION 10.0

PRELIMINARY CORRECTIVE MEASURES STUDY (CMS) AND REMEDIAL ACTION TECHNOLOGY SCREENING

This Preliminary Corrective Measures Study (CMS) includes: 1) a statement of Corrective Measures objectives and remedial action performance goals; 2) identification of potential treatment areas; 3) identification, and preliminary screening/evaluation of potential treatment technologies; and 4) an outline of proposed feasibility testing necessary for the final Corrective Measure Study (CMS). Proposed response actions for the sanitary and storm sewers, also subject to subsequent NYSDEC review and approval, are also discussed.

Final Corrective Measures objectives are to achieve New York State soil clean-up standards and ground-water standards/guidelines at all on-site and off-site SWMUs and AOCs. These objectives will be met through a combination of aggressive short-term remedial actions and longer-term monitoring.

10.1 Corrective Measures Performance Goals

The principal Corrective Measures goals for the former Norton/Nashua Site include: 1) to the extent practicable, remove residual toluene source mass present in the soil column and floating FPP in the area of the former tank farm; 2) accelerate the reduction of dissolved-phase toluene concentrations beneath the on-site buildings; 3) prevent future off-site movement of dissolved-phase toluene; and 4) monitor off-site wells to evaluate the natural decay of toluene. Although there are generally overall declining trends in dissolved toluene concentrations at the former Norton/Nashua Site, more aggressive remedial technologies are proposed as a short-term remedial action to address localized areas of residual source mass in the overburden (both vadose and saturated zones) with the intent of accelerating the long-term reduction of dissolved ground-water concentrations via natural attenuation.

A summary of all on-site and off-site AOCs/SWMUs and corresponding COCs for each area is presented in Table 10-1. As discussed elsewhere in this Report and summarized in Table 10-1, although other VOC and SVOCs exceed their corresponding soil and/or ground-water standards in spatially limited areas at the former Norton/Nashua Site, the primary on-site COC, and the only off-site COC, is toluene. Selected remedial actions for toluene may also be effective at addressing minor concentrations of the other COCs present at the Site. However, the focus of this preliminary CMS is toluene.

At this time, insufficient data are available to establish numerical performance target concentrations. Following NYSDEC approval of the preliminary technology screening proposed herein, pilot and or bench-scale testing will be conducted to determine remedial performance target concentrations, which will be presented as part of the final CMS Report. If these remedial performance target concentrations are not achieved via the selected Corrective Measures, the final CMS Report will also include contingencies to address this condition, but it would be premature to attempt to discuss the need for or scope of contingency alternatives in detail before the collection of additional data.

One of the principal Corrective Measures goals is the removal of residual source mass. Based on site conditions and preliminary technology screening, any short-term remedial action is unlikely to fully achieve this goal. Therefore, monitored natural attenuation (MNA) will be an integral component of the site remedy. The final CMS will include details for an MNA program with contingencies that will ensure that no adverse risk to human health, safety, public welfare, and the environment occurs.

Interim Corrective Measures (ICMs) are not necessary because there is no imminent hazard to human health or the environment. Sampling performed in association with the RFI demonstrates that: 1) the distribution of free-phase, residual soil, and dissolved-phase toluene is stable and there is no ongoing off-site migration via ground water (or the sewer systems); 2) on-site and off-site toluene concentrations are stable or decreasing; and 3) there is no complete exposure pathway for off-site residents (potable water is provided via the local municipal water supply system).

Current (and anticipated future) activities, do not result in a complete exposure pathway for on-site workers with the possible exception of indoor air in the area of the on-site offices. The previous on-site indoor air investigation was limited to the warehouse area (see Section 8.2). At the request of the NYSDOH, an indoor air investigation will be conducted in the office area (details will be presented in the CMS Workplan) to eliminate that potential exposure pathway. On-site potable water is provided via the local municipal water supply system.

Eliminating potential exposure pathways during the implementation of the Corrective Measures will be achieved, in part, through the use of institutional controls. Some local institutional controls are already in place. For example, a Town of Colonie ordinance prohibits the use of a potable well at a property that is connected to municipal water. All residential properties within the Off-Site AOC are currently connected to municipal water and there are no known potable wells; therefore, the residential drinking water pathway is eliminated.

Potential off-site exposure is still possible (although remote) via the installation of a "garden" well or deep excavation of soils on residential properties. Saint-Gobain will contact the property owners in the Off-Site AOC (the four homes previously identified for subslab and indoor air sampling; see Figure 2-3) in writing annually and ask them to provide voluntary notification of such activities until DEC approves or provides closure for off-site issues. The notification will clearly state that if any additional soil and/or ground-water sampling is determined to be necessary in the Off-Site AOC, Saint-Gobain will perform these activities at no cost to the residents. Identification of formal institutional controls to eliminate potential on-site and off-site exposure pathways is ongoing, and will be reviewed in the final CMS Report.

10.2 Identification of Potential Corrective Measures

Based on available site data, potential Corrective Measures were identified and evaluated for implementation at the Site. The following methods were selected for initial screening and evaluation:

1. Ground-Water Extraction
   Also known as "pump-and-treat", ground-water extraction as a stand-alone technology can reduce source mass via removal of dissolved- and liquid-phase (FPP) components. Ground-water extraction is frequently used in conjunction with SVE (#2) to enhance vapor recovery, or vapor extraction may be used to enhance ground-water recovery directly (DPVE; #3).

2. Soil Vapor Extraction (SVE)
   Soil Vapor Extraction (SVE) utilizes vapor flow in the vadose zone to remove source mass via direct volatilization and indirectly via increased rates of biodegradation. Vapor extraction is accomplished via horizontal or vertical wells placed within the vadose zone.

3. Dual Phase Vapor Extraction (DPVE)
   The concurrent removal of ground water and vapors from extraction wells is known as Dual Phase Vapor Extraction (DPVE). Vapor recovery is enhanced by depressing the water table and exposing more soil column, and ground-water well yields are increased (at least temporarily) by applying a vacuum to the well.

4. In-Situ Air Sparging (IAS)
   In-situ air sparging (IAS) utilizes the injection of air into the ground water to stimulate direct volatilization (and associated biodegradation). Without concurrent SVE or DPVE, IAS has the potentially negative effect of inducing vapor migration in the subsurface. Pilot testing is required to demonstrate that vapor migration can be controlled. Air sparging may also cause localized ground-water mounding.

5. Excavation and Off-Site Treatment or Disposal
   Direct excavation is used to remove soils with elevated COC concentrations for on-site treatment, off-site treatment, or disposal at an approved facility. Excavated areas are returned to grade with clean backfill (or treated soils).

6. Passive FPP Recovery
   Passive FPP recovery devices (e.g.; absorbent "socks") are deployed in recovery wells to selectively remove mobile-phase FPP within the immediate location of the recovery well.

7. Enhanced Fluid Removal (EFR)
   This technique is essentially a portable version of DPVE (see #3). A high vacuum is applied to extract ground water within monitoring points via vacuum truck or other methods. This remedial activity is implemented on a periodic basis to address "hot-spots" and/or recurring FPP removal.

8. In-Situ Chemical Oxidation (ISCO)
   In-situ chemical oxidation (ISCO) technology utilizes injection points to introduce chemicals to the subsurface to oxidize (mineralize) COCs. Any excess reagents and catalysts are monitored and neutralized naturally or through the introduction of buffer solutions.

9. Enhanced/Augmented Bioremediation
   This alternative attempts to accelerate the in-situ biodegradation described in #10 by the addition of: 1) concentrated cultures of non-native microbes or concentrated native microbes cultured ex situ; 2) oxygen via hydrogen peroxide, proprietary products such as oxygen release compound (ORC), or sparging and diffusions; and/or 3) potentially limiting nutrients such as nitrogen and phosphorus.

10. Monitored Natural Attenuation (Intrinsic Remediation)
    Naturally occurring processes such as volatilization, dispersion, adsorption, chemical degradation, and biodegradation act to reduce contaminant concentrations in ground water. When implemented as a remedial alternative, monitored natural attenuation (MNA) is not a "no action" response. Monitoring and continuous evaluation are required for a prolonged period. A contingency plan needs to be developed in the event that monitoring indicates increased risk. Natural attenuation has proven to be a dynamic process ultimately contracting dissolved-phase plumes.

10.3 Target Treatment Areas

Soil and ground-water data collected as part of this investigation indicate that COC impact at the site is generally limited to the "smear zone" and shallow ground water (approximate depth eight to ten feet). Significant toluene residual mass is limited to deep vadose and saturated soils beneath the former tank farm. For purposes of screening potential Corrective Measures, three target treatment areas were identified at the Site (see Figures 2-2 & 2-3) based on toluene impact (distribution and magnitude) and accessibility for treatment: 1) vadose and saturated overburden beneath the former tank farm; 2) the vadose and saturated overburden beneath the floor of the main on-site buildings; and 3) off-site areas with dissolved-phase toluene impact. Note: potential treatment of the sewer SWMUs is considered separate and unique from soil/ground-water issues and is discussed in 10.10.

10.4 Initial Screening of Potential Corrective Measures

Each potential Corrective Measure was initially screened relative to its feasibility and effectiveness:

1. Ground-Water Extraction
   This technology is useful for: 1) establishing hydraulic control; 2) limited mass recovery; and 3) enhancing FPP recovery in the vicinity of extraction wells. Based on multiple rounds of ground-water monitoring, the potential for migration of dissolved toluene is presently extremely limited at the Site, so ground-water extraction is not necessary to maintain hydraulic control.

   Free-phase product thickness (i.e., oil head) and achievable drawdown in the vicinity of the former tank farm may be insufficient to mobilize residual FPP trapped by capillary forces. Pump-and-treat is not a cost-effective means of mass recovery with respect to the dissolved toluene plume. Establishing hydraulic capture of the dissolved plume beneath the main building would require numerous wells and an extensive piping array within the building at high or prohibitive costs. Based on previous experience, system reliability is relatively poor.

2. Soil Vapor Extraction (SVE)
   This technology can be effective at removing VOCs from the vadose zone and the capillary fringe (especially with the addition of air sparging, see #4) via vapor-phase transport. However, subsurface conditions at the Site (sand with silt/clay and fill layers) are not conducive for the use of this technology. Due to a limited radius of influence, numerous wells and an extensive piping array would be required within the building to achieve vapor capture at high/prohibitive costs. Costs in other areas are considered average. System equipment may not be suitable for residential areas due to noise issues.

3. Dual Phase Vapor Extraction (DPVE)
   Because DPVE technology combines ground-water extraction (#1) and SVE (#2), it can potentially be effective at removing VOCs from both the vadose and saturated zones. However, given the silty/clay-rich soils present in the source area, it is likely that individual vertical DPVE wells would achieve a limited radius of influence, thereby requiring numerous wells and an extensive piping array. Provisions for vapor treatment would also be required, and the same drawbacks noted for ground-water extraction (relatively high equipment and treatment costs) and SVE (limited radius of influence) apply. As noted above, reliability is relatively poor for ground-water recovery systems. DPVE costs and treatment times are considered average to above average.

4. In-Situ Air Sparging (IAS)
   IAS/SVE is only effective in the saturated overburden where there is a direct pathway for sparged air to reach the residual toluene mass. Silt/clay-rich soils can limit IAS effectiveness and applicability of the requisite SVE component. IAS is not recommended unless: 1) pilot testing demonstrates that vapor migration can be controlled; and 2) all floating FPP has been removed from a site. Implementation costs are average.

5. Excavation and Treatment or Disposal
Excavation is the most direct method of source mass removal and can significantly reduce treatment/monitoring times. Excavation is readily implemented in shallow, accessible soils, and is cost-effective in limited target areas. Deeper and/or more saturated excavations, potentially requiring engineered shoring and dewatering, become much less cost-effective, and very expensive if the removed materials must be treated as hazardous waste as is the case at the former Norton/Nashua Site. Also, excavation activities can be disruptive to normal business operations, and access beneath the building is precluded. Soil excavation is not considered a stand-alone remedy because elevated dissolved toluene concentrations would remain in the saturated zone; therefore, a secondary treatment phase such as ISCO (#6), enhanced bioremediation (#9), or MNA (#10) will also be necessary.

6. In-Situ Chemical Oxidation (ISCO)
ISCO technology can be effective for toluene destruction, but ISCO is relatively expensive, and bench scale and pilot testing is required to determine site-specific effectiveness and reagent requirements. ISCO may not be effective in treating contamination above the water table or in clay-rich layers beneath the water table because channeling often limits contact between reagents and the impacted soils.

7. Enhanced Fluid Recovery (EFR)
This technique is often effective for wells with measurable thicknesses of FPP that are not otherwise utilized as recovery wells. This technology has the ability to enhance FPP recovery through removal of "stranded" FPP pockets via the development of preferred fluid pathways. Residual mass is also recovered from the vadose zone via vapor extraction. Disposal costs are relatively high, but risks and potential adverse impacts are low. This alternative is generally not intended to directly address dissolved-phase constituents.

8. Passive FPP Recovery
This technology can be a highly efficient and cost-effective means of local FPP capture and removal when there is mobile FPP present in the vicinity of the recovery well. However, the potential area of FPP capture is limited, and passive FPP recovery cannot capture residual FPP mass or dissolved constituents, and therefore, additional Corrective Measures are necessary.

9. Enhanced Bioremediation
Dissolved oxygen appears to be the key limiting factor for biodegradation at the Site. Regularly sampled wells beneath the main building have generally demonstrated significant decreases in toluene concentrations over time. This trend is likely a result of physical mixing (and oxygenation) of ground water near each sampling location. The addition of dissolved oxygen at selected wells may produce a similar effect on the overall aquifer beneath the building.

Previous projects attempting to utilize ORC via direct injection or placement of "socks" into wells, suggest this method of delivery is: 1) relatively ineffective at establishing elevated dissolved oxygen concentrations; 2) less successful in clay-rich soils; and 3) relatively expensive. A second technology, in-situ submerged oxygen curtain (iSOC), uses microporous fibers to introduce oxygen directly into ground water. Other field tests suggest that the iSOC technology may achieve the necessary dissolved oxygen concentrations with a higher degree of reliability and lower cost.

10. Monitored Natural Attenuation (Intrinsic Remediation)
MNA is a viable remediation strategy for treatment of residual dissolved-phase toluene at the site based on: 1) results demonstrating decreasing toluene concentrations at monitoring wells sampled during the RFI; and 2) bioattenuation sampling data suggesting that limited toluene biodegradation is occurring. Costs, risks, and ease of implementation are all favorable, especially in off-site areas where dissolved toluene concentrations are relatively low.

Although MNA will likely be a component of the final on-site remedy, it is not a viable stand-alone remedial alternative for the on-site area because the treatment time is too long. The effectiveness of MNA may be enhanced (see #9) to reduce treatment time or active source mass removal, via another remedial technologies is necessary prior to the implementation of MNA at on-site areas to reduce the total treatment time.

10.5 Remedial Action Alternative Evaluation Criteria

The Technology Screening Matrix used below is patterned after a U.S. EPA model (Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA; October 1989), but adds an evaluation of potential risks and certainty of outcome. Each remedial alternative was evaluated for its potential use as a remedial action in the three treatment areas of the Site.

Applicability/Effectiveness (A)

Corrective Measures were rated with respect to their ability to reduce toluene concentrations in the overburden. The following rankings were used:

- 0 = not applicable, available, or possible to implement
- 1 = probably not applicable and not widely used or difficult to implement
- 2 = may not be applicable and not widely used, or widely used but probably not applicable
- 3 = likely applicable but not widely used, or widely used but may not be applicable
- 4 = proven but not widely used, or widely used and probably applicable
- 5 = applicable, available, and widely used

Reliability/Risks (R)

Corrective Measures were rated with respect to their potential risk and the degree of certainty the alternative will achieve a Permanent Remedy as follows:

- 0 = very low certainty and very high degree of risk
- 1 = low certainty or high degree of risk
- 2 = high certainty and moderate risk, or moderate certainty and low risk
- 3 = high certainty and low risk

Ease of Implementation/Permissibility (P)

Corrective Measures were rated with respect to ease of implementation (excluding financial concerns) and potential access, permitting, and/or approval problems. The following rankings were used:

- 0 = not possible or not permissible
- 1 = very difficult to implement or permit
- 2 = minor difficulties
- 3 = easy to implement, no anticipated problems

Costs (C)

Corrective Measures were rated with respect to potential costs including design, installation, and operation, and environmental restoration. The following rankings were used:

- 0 = prohibitive
- 1 = very high relative to other alternatives
- 2 = high
- 3 = average
- 4 = low
- 5 = very low

Treatment Time (T)

Corrective Measures were rated according to anticipated length of time to meet remediation goals and potential operational impact to business or residences. The following rankings were used:

- 0 = prohibitive
- 1 = very long treatment time or adverse impact
- 2 = average treatment time, moderate impact
- 3 = very rapid treatment and no adverse impact

10.6 Detailed Evaluation of Corrective Measures

Each remedial action alternative was scored using the following formula:

Rating = A x R x P x (C + T), Maximum Rating = 5 x 3 x 3 x (5 + 3) = 360.

Scores above 150 were considered favorable for the Site, ratings between 75 and 150 were considered feasible, and scores below 75 were considered infeasible. Technology Screening Matrix results are presented in Table 10-2 for each proposed treatment area. A summary evaluation of each remedial action alternative is presented below.

1. Ground-Water Extraction
   This technology generally received average to below average ratings. As noted previously, mass removal (and applicability) is limited to dissolved-phase and mobile FPP. Extensive system infrastructure (piping/trenching network), capital equipment, and permitting requirements result in low cost and permissibility ratings. A total score of 11 indicates that this method is not a cost-effective or otherwise viable alternative for any proposed treatment areas at the Site.

2. Soil Vapor Extraction (SVE)
   This technology does not address toluene impact in the saturated zone, and pilot testing would be necessary to confirm the effectiveness of SVE in the vadose zone. Therefore, SVE receives low ratings for applicability and reliability. Extensive system infrastructure (piping/trenching network), capital equipment, and permitting requirements result in low cost and permissibility ratings. A total score of 41 ranks this as an unfeasible technology in all proposed treatment areas at the Site.

3. Dual Phase Vapor Extraction (DPVE)
   Similar to ground-water extraction, DPVE received low ratings for applicability, reliability, and treatment time because of its low effectiveness at overburden mass removal. Extensive system infrastructure (piping/trenching network), capital equipment, and permitting requirements result in low cost and permissibility ratings. A total score of 20 ranks this as an unfeasible technology in all proposed treatment areas at the Site.

4. In-Situ Air Sparging
   As previously noted, IAS should be performed in conjunction with an operating SVE system. In the absence of pilot testing data, ratings for this technology are speculative. Extensive system infrastructure (piping/trenching network), capital equipment, and permitting requirements result in low cost and permissibility ratings. Further, in a worst-case scenario, this technology may present risks due to potential FPP migration in the former tank farm area. Total scores ranging from 20 to 30 in the three proposed treatment areas at the Site rank this as an unfeasible technology.

5. Excavation and Treatment or Disposal
This technology received relatively high ratings for applicability, risks, and treatment time. High costs and disruption to business activities make excavation infeasible beneath the building, and disruption to residents and the absence of concentrated source mass eliminate excavation as a feasible technology for off-site areas.

Assuming that a secondary technology is implemented to address residual aqueous-phase mass after excavation is completed; this technology is considered feasible in the former tank farm area. Relatively high costs for deeper and/or saturated soil conditions can be controlled by limiting excavation to the most easily accessible highly-impacted saturated soils and/or potential on-site treatment and reuse of soil. In the former tank farm area, this technology received a total screening score of 100, and is retained for further evaluation.

6. In-Situ Chemical Oxidation (ISCO)
ISCO technology received relatively high ratings for treatment time, average ratings for cost, and lower ratings for applicability and risk because it is not widely used and pilot testing would be required. Total screening scores ranged from 74 to 105; feasible but not favorable. The highest ranking of 105 was assigned to the area beneath the building, and this technology is retained for further evaluation.

7. Enhanced Fluid Removal (EFR)
Because this method is effective at FPP recovery and potentially effective at dissolved "hot-spot" locations, this technology received relatively high ratings for permissibility, but ratings for applicability, reliability, and costs were variable. Assuming that a secondary technology is implemented to address residual aqueous-phase mass, this technology is considered favorable for FPP recovery in the former tank farm area, and is feasible beneath the building for limited "hot spot" remediation. Fluid and vapor removal may also stimulate intrinsic remediation by circulating and oxygenating stagnant water. Due to the ease of implementation and low risk involved, this method is retained for future consideration for use on a trial basis in combination with another technology.

8. Passive FPP Recovery
This technology's applicability is limited to mobile-phase FPP in close proximity to a recovery well (this condition is found in the former tank farm area only) where it has variable reliability. High ratings were received for permissibility and costs. This alternative ranked third overall in the former tank farm area but it is not considered a "stand-alone" technology. Due to the ease of implementation and low cost and risk involved, this method is retained for future consideration in combination with another technology.

9. Enhanced Bioremediation
Enhanced bioremediation generally received slightly lower scores than monitored natural attenuation (MNA) due to higher costs and greater difficulty in implementation. For off-site areas, where dissolved toluene concentrations are generally low (ppm range or less), this technology had the second highest technology score of 195.

In areas with more elevated dissolved toluene concentrations (beneath the building), this technology received the highest rating of 195 and it is retained for future consideration. Treatment time, costs, ease of implementation, and applicability are all highly favorable for single well treatment systems (no/limited system infrastructure), but pilot testing will be required to confirm applicability.

In areas with FPP (former tank farm), Enhanced Bioremediation is not suitable as a stand-alone technology, and it was rated under the assumption that another technology would be used prior/concurrently for the removal of any FPP. With that assumption, applicability, risks, and costs ratings are highly favorable, and the rating for Enhanced Bioremediation was tied for first with a total score of 137.

10. Monitored Natural Attenuation (Intrinsic Remediation)
For off-site areas, where dissolved toluene concentrations are generally low, this technology received high ratings for applicability, reliability/risks, permissibility, and costs. The total score of 219 was the highest technology score for treatment of the off-site areas.

In areas with elevated dissolved toluene concentrations (beneath the building), MNA is less suitable because of its unfavorable treatment time, but the total score of 137 was the second highest and it is retained for future consideration. In areas with FPP (former tank farm), MNA is not feasible, and it was rated only as a secondary technology suitable for dissolved-phase constituents following more aggressive source removal. With that assumption, applicability, risks, and costs ratings are highly favorable, and the rating for MNA was tied for first with a total score of 137.

10.7 Selected Corrective Measure Alternatives

The following corrective measures alternatives were identified as feasible via the Technology Screening Matrix: 1) off-site areas (in descending order): MNA, enhanced bioremediation, ISCO; 2) beneath the main building: enhanced bioremediation, MNA, ISCO, EFR; and 3) the former tank farm: (a) FPP removal: passive FPP recovery, EFR; (b) primary treatment: enhanced bioremediation, soil excavation, ISCO; and (c) secondary treatment: MNA. The Corrective Measures Alternative(s) identified for each AOC are summarized in Table 10-3.

The primary Corrective Measure for off-site areas is MNA. Overall decreasing concentration trends in the off-site areas during monitoring performed in conjunction with the RFI demonstrate that natural attenuation is actively reducing dissolved toluene. Although this technology has a fairly long treatment time, it is the least intrusive method to use in residential areas and there is currently no complete exposure pathway (see Section 8.3). If MNA sampling data indicate that off-site toluene concentrations are increasing or do not demonstrate continued decreasing trends then it will be necessary to evaluate more active technologies such as enhanced bioremediation or ISCO.

The primary remedial action alternative selected for dissolved plume areas under the building is enhanced bioremediation. Pilot testing is required to determine the effectiveness of this technology and to establish remedial performance target concentrations. If pilot testing indicates that enhanced bioremediation will not achieve the necessary remedial action performance target concentrations, ISCO technology will be pilot tested as a potential primary remedial technology. EFR will be evaluated on a pilot basis as an alternative primary or secondary remedial technology for dissolved plume areas under the building.

Passive FPP recovery (via petrophilic socks) with a contingency for EFR was selected as the proposed FPP removal technology in the former tank farm area. Passive FPP recovery is highly applicable for the maximum observed APTs in the former tank farm area (0.10 foot or less), and this technology will be applied on an interim basis while the CMS is finalized (see Section 11.0). If measurable APTs continue to occur after the deployment of the petrophilic socks, EFRs via vacuum truck extraction will also be performed as an interim remedial measure (see Section 11.0).

Soil excavation was rated as a feasible technology by the Technology Screening Matrix for the former tank farm area, but bench scale treatability testing and additional information from contractors must be obtained before the effectiveness of this technology can be fully evaluated. If soil excavation is conducted and post-excavation sampling indicates significant residual source mass remains in the former tank farm area, pilot testing will be necessary to evaluate an additional primary remedial action, such as enhanced bioremediation or ISCO, in the former tank farm area.

If soil excavation is not conducted, ISCO technology will be pilot tested as a potential primary remedial technology in the former tank farm area. Pilot testing data will also be used to establish remedial action performance target concentrations.

10.8 Feasibility of the Selected Corrective Measure Alternatives to Achieve the Clean-Up Objectives and Goals

The selected Corrective Measure alternatives are anticipated to be effective in achieving the general remedial action clean-up performance goals for the Site, which are: 1) remove residual toluene source mass present in the soil column and floating FPP, to the extent practicable; 2) accelerate the reduction of dissolved-phase toluene concentrations beneath the on-site buildings; 3) prevent future off-site movement of dissolved-phase toluene; and 4) monitor the natural decay of dissolved-phase toluene in off-site wells. Additional feasibility testing is required to establish performance-based target concentrations.

Overall decreasing concentration trends in the Off-Site AOC during monitoring performed in conjunction with the RFI demonstrate that natural attenuation is actively reducing dissolved toluene concentrations, and it is anticipated that the primary remedial action alternative selected for off-site areas, MNA, will ultimately achieve the ground-water clean-up objective of 5 μg/L. Although this technology has a fairly long treatment time, there is currently no complete exposure pathway (see Section 8.3), and toluene concentrations are below the Federal MCL and other target concentrations established by the USEPA and other States for direct and indirect exposure to toluene in ground water. Pilot testing is required to determine the effectiveness of enhanced bioremediation for treatment of the dissolved plume areas under the building, and to establish Corrective Measures performance target concentrations, which are likely to be in the ppm range. Pilot testing is also required to evaluate alternative technologies such as EFR and ISCO, which are likely to have similar performance target concentrations.

Regardless of the primary technology selected, a secondary remedial action, such as MNA, will probably be necessary to achieve the ground-water and soil clean-up objectives. Although MNA has a fairly long treatment time, there is currently no complete exposure pathway (see Section 8.2), and toluene concentrations beneath the building have demonstrated overall decreasing trends during monitoring performed in conjunction with the RFI.

Passive FPP recovery (via petrophilic socks) with a contingency for EFR should be effective at removing mobile FPP in the former tank farm. Soil excavation and/or ISCO will also remove significant residual soil mass, but the effectiveness of these technologies cannot be determined without treatability or bench testing. Corrective Measures performance target concentrations are likely to range in the tens of ppms for toluene following the primary remedial actions, and a secondary technology, such as enhanced bioremediation, may be necessary to achieve a performance objective in the ppm range for toluene.

Present data suggest that intrinsic attenuation is effectively managing the fringe of the dissolved toluene plume in the vicinity of the former tank farm. Reduction of source mass via the primary (and contingent secondary) remedial actions will result in diminished dissolved-phase toluene concentrations, and MNA will be used to achieve the ultimate project objectives.

Currently, there are no complete on-site exposure pathways (see Section 8.1), but toluene concentrations exceed the Federal MCL, and target concentrations established by the USEPA and other States for direct and indirect exposure to toluene in soil and ground water, so continued institutional controls (i.e., the presence of a concrete slab beneath the building and limitations on soil excavation) are necessary to prevent potential exposure.

10.9 Feasibility Testing

Based on the Corrective Measures evaluation presented above, alternatives were identified for each of the three treatment areas at the Site. Overall decreasing concentration trends in the off-site areas demonstrate that natural attenuation is actively reducing dissolved toluene concentrations and suggest the effectiveness of the selected Corrective Measure, MNA, can be tested by continuing performance of a ground-water monitoring program (see Section 11.0).

For the two on-site treatment areas, pilot testing will be required to: 1) validate the results of the Technology Screening Matrix; 2) determine appropriate design criteria for the development of remedial system equipment specifications, where applicable; and 3) establish Corrective Measures performance target concentrations. Currently, additional technical, financial, and logistical information is being obtained from contractors to: 1) complete a preliminary evaluation of soil excavation; and 2) determine the final scope of the pilot testing. Following NYSDEC approval of the Preliminary CMS evaluation, a bench-scale testing and/or pilot testing workplan, which will include details on proposed sampling locations and laboratory analyses, additional monitoring points, frequency of field measurements, and the duration and number of tests, will be developed and submitted to the NYSDEC for review and approval. The results of the bench-scale testing and/or pilot testing will be used to prepare the final CMS Report.

10.10 Sewer SWMUs Corrective Measures

As discussed in Section 5.7, the storm and sanitary sewer lines and associated bedding are not current pathways for the off-site transport of toluene, heptane, or other VOCs. PAHs exceeding corresponding standards were found in RFI sewer sediment samples and to a lesser degree sewer water samples.

Proposed Corrective Measures are limited to addressing the presence of PAHs in the storm sewer system as the presence of any PAHs in the sanitary sewers are ultimately treated by the POTW. The RFI data indicate that the source of the PAHs currently present in the sediments is most likely: 1) historical site activities; and/or 2) run-off from asphalt covered areas, e.g., parking lots and/or the roof of the main building (note: a large section of the roof was recently resealed/repaired).

Removing accumulated sediment from the storm sewer manholes may allow identification of the source of the PAH-impacted sediment. If the PAH-impacted sediments are associated with historical site activities, their removal will eliminate the potential migration of sediments from the site via the storm sewer system. If PAH-impacted sediments return after removal of the current sewer sediments, the source is more likely ongoing run-off to the storm sewer system, and thus unrelated to activities associated with NYSDEC Order on Consent Index No. CO: 4-20001205-3375.

The proposed preliminary Corrective Measure for the Storm Sewer SWMU is sediment removal via vacuum truck extraction. All visible sediment and standing water will be removed from each of the accessible on-site storm sewer manholes. Accumulated vacuum truck waste materials will be sent off-site for proper disposal. Following sediment removal, and at least two significant (greater than 0.5 inches) rainfall events or equivalent snow melts, a sewer inspection and sampling event will be performed.

If sewer sediment is present, sediment samples will be collected from five storm sewer manholes (MH-2, MH-3, MH-5, MH-6, MH-13 & MH-14). If no sediment is present at manholes MH-2 or MH-3, alternate locations upstream along the same sewer line will be assessed for possible substitution. Sampling will proceed upstream to avoid agitation of bottom sediments at succeeding sediment sample locations (see Figure 1-3). Sewer sampling will be performed according to the RFI sampling procedures documented in Section 5.5. Sewer sediment samples will be analyzed for SVOCs via EPA Method 8270 plus TICs. All analyses will include Category B laboratory deliverables.

Regardless of whether or not sewer sediment is present, sewer water samples will be collected from the same manholes listed above according to the RFI sampling procedures documented in Section 5.6. If a specific sewer manhole is dry, no samples will be collected, but alternate sampling locations upstream along the same sewer line will be assessed for possible substitution.

All sewer water samples will be analyzed for SVOCs via EPA Method 8270 plus TICs. All sewer sample analyses will include Category B laboratory deliverables.

Sewer sediment removal and sampling activities will begin following NYSDEC approval of the proposed Preliminary CMS activities. Sewer sampling results will be used to prepare the final CMS Report for the Storm Sewer SWMU.