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New York State Department of Environmental Conservation

Division of Environmental Remediation
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Columbia Mills Site

Periodic Review Report

Site Number 7-38-012

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ARCADIS

Table of Contents

Tables

Figures

Appendices

1. Executive Summary

The Columbia Mills site is located in Minetto, New York and is the former location of a factory that generated and disposed of assorted industrial wastes. The factory was decommissioned and various remedial actions were performed. A landfill was constructed to contain wastes consolidated during the remedial efforts. Post-closure landfill monitoring activities are currently performed in accordance with a New York State Department of Environmental Conservation (NYSDEC)-approved Work Plan and recommendations presented in a draft Periodic Review Report. Existing Work Plan documents and monitoring data were reviewed to evaluate if the current operational and monitoring programs provided the appropriate levels of performance, effectiveness, and protectiveness for the remedy. Historical data were evaluated and field observations made provided additional information related to leachate discharge controls. Based on review the available data, Corrective Measures (CMs) are recommended to evaluate property restrictions, update site-related information, expand monitoring requirements, and replace existing Work Plan documents with a comprehensive Site Management Plan (SMP). A budget analysis indicates that approximately $52,000 in additional funds will be required to complete the remainder of the Work Assignment and implement the suggested CMs. A one year field-oversight Periodic Review (PR) evaluation is being recommended to assess the CMs and SMP activities.

2. Site Overview

2.1 Site Description

The Columbia Mills site is located on Route 48, Minetto, Oswego County, New York (Figure 1-1), across Route 48 from the western bank of the Oswego Canal. The former industrial site contains an inactive, closed, capped landfill.

2.2 Site History

Columbia Mills was a factory that manufactured vinyl window shades and coverlets. The company closed in 1977. Organic contamination and elevated levels of heavy metals were confirmed at the site. Several underground storage tanks were removed by August of 1988. Asbestos was found on site and the United States Environmental Protection Agency (USEPA) initiated an emergency response to remove it. The USEPA also removed an on-site chimney which was structurally unsound.

An Order for an Interim Remedial Measure (IRM) and a Remedial Investigation/Feasibility Study (RI/FS) was signed in March of 1989. The RI/FS was completed in early 1992. A Record of Decision (ROD) was signed on March 31, 1992. A copy of the ROD is provided in Appendix A. The ROD required consolidation and capping of wastes and site sediments in the drum disposal area, removal of sediments from the plant sewers, and treatment of groundwater near a former underground storage tank. The IRM consisted of three activities including, excavation and disposal of poly-chlorinated biphenyl (PCB) contaminated soil in the area of the former boiler house, treatment of solvent-contaminated soil from tank excavations, and remediation of contaminated soil near test pit No. 3. A Consent Order for a Remedial Design/Remedial Action (RD/RA) was signed and all RD work was completed. The site boundaries were reduced to encompass only the landfill.

3. Remedy Evaluation

As indicated in Section 2, all site work including IRM, RI/FS, and RD/RA has been completed and/or implemented in accordance with ROD. Post-closure landfill monitoring activities are currently performed by ARCADIS-US (formerly Malcolm Pirnie) in accordance with a NYSDEC-approved Work Plan (Malcolm Pirnie, 2007a). The Work Plan includes an Operation and Maintenance (O&M) program and Groundwater Monitoring Plan. Currently, no SMP exists for the Columbia Mills site.

In 2009, a draft Periodic Review Report (PRR) (Malcolm Pirnie, 2009a) was prepared. Based on the results of the PRR, most of the issues identified at the site could be rectified through administrative efforts and improved document retention practices and had no significant impact to the overall performance or effectiveness the remedy. However, historical data gaps resulted in a lack of basic information for the leachate collection system. In addition, leachate concentrations needed to be evaluated to confirm that the discharge was compliant with the criteria presented in the ROD. Therefore, the Columbia Mills site required certain Corrective Measures (CM) to ensure the appropriate level of protection to human health and the environment. Based on the recommendations in the draft PRR, and in consultation with NYSDEC, several CMs were implemented during the subsequent 2009 through 2011 site visits, including:

- Historical data review
- Leachate collection system evaluations
- Leachate characterization
- Sediment sampling
- Surface water sampling
- Expanded groundwater monitoring parameters

The results from the CM were summarized and submitted with the respective Quarterly Report and Annual Groundwater Monitoring Summaries. From these data, the landfill and leachate collection system components were documented and their protectiveness and effectiveness evaluated.

A schematic of the leachate collection system is provided in Figure 3-1. Figure 3-2 provides a process flow diagram of the leachate collection system. These data are based on the 2008 and 2009 site visits and observations and review of site documents and construction plans. As shown in Figure 3-2, a combination pore-pressure relief system (PPRS)/leachate collection system is located along the perimeter of the landfill cell. The system directs leachate by gravity to a 10,000 gallon sub-surface leachate collection tank, the Town sanitary sewer, or the amphibian breeding pond (ABP) (via the combination sampling sump). A valve located at the inlet to the collection tank controls flow into the tank. Valves located upgradient of the leachate collection tank can direct flow to the Town sewer or ABP.

As shown in Figure 3-1 and 3-2, groundwater from separate PPRSs (north and south of the landfill cell, respectively) discharges into a pre-cast concrete combination sampling sump located on the west side of the landfill. Valves within the sampling sump control groundwater flow into the sump and through the PPRS. The valves can be closed if sampling indicates the presence of contamination in groundwater from the PPRS collection lines.

3.1 O&M Plan Compliance

The existing O&M program provides for verification of security and maintenance of the landfill (Figure 3-2). The O&M program includes an annual site inspection to verify the structural integrity of the landfill perimeter fencing, gates, and locks. In addition, the landfill cover is mowed by NYSDEC on an annual basis to reduce the potential for large, woody vegetation from compromising the integrity of the landfill cap system. No additional O&M activities are included in the current O&M Plan. In accordance with the Work Plan, the O&M activities are performed on a five quarter basis to evaluate seasonal fluctuations at the site.

3.1.1 O&M Plan Requirements and Compliance Status

The current O&M Plan was reviewed evaluate the performance, effectiveness, and protectiveness of the current remedy.

3.1.1.1 O&M Compliance Evaluation

Operation and Maintenance activities were conducted as specified in the existing O&M Plan during the 2007 through 2011 O&M periods. A discussion of the O&M activities is presented below.

2007 (Malcolm Pirnie, 2007b)

In 2007 no significant problems were encountered with the landfill system. In accordance with the existing O&M Plan, the only items that required attention in 2007 were related to the landfill perimeter fence. A section of perimeter fence was damaged by a fallen tree. The tree was removed and the fence was repaired by a fence contractor on September 27, 2007. In addition, at the request of NYSDEC, two new lockable gate hasps were installed to improve landfill security.

2008 (Malcolm Pirnie, 2009b)

Based on the 2007 site visit, through additional discussions with NYSDEC, and historical document reviews, a leachate collection system was verified at the site. This prompted the following additional site activities during the 2008 O&M period:

- Review of available site documents and landfill construction plans
- Field evaluation of the leachate collection system
- Collection and analysis of leachate samples
- Collection and analysis of sediment samples from the amphibian ABP.

A review of site documents and construction plans provided information regarding the leachate collection system. However, no As-Built drawings were available to document the final landfill configuration. In addition, no information was available regarding the status of the system in the Post Closure Plan (i.e. where flow from the PPRS and leachate collection tank is currently directed).

A site reconnaissance was conducted to evaluate the leachate collection system. Malcolm Pirnie verified the location of the leachate collection tank and perimeter collection system "cleanouts" and noted that several of the collection system cleanouts were damaged, apparently by mowing. The PVC cleanouts were repaired during the site visit, as needed. In addition, the location of the Town sanitary sewer manhole (one of the locations where the collection tank has the potential to discharge) was located. However, the locations of the combination sampling sump and discharge point to the ABP were not found.

Based on a visual inspection, the leachate level in the collection tank appeared to be above the top of the tank. The two overflow control valves were located adjacent to the leachate collection tank. Both valves were able to be operated; one valve was in the open position and one was in the closed position. The base of the Town sanitary sewer structure contained a 4-inch PVC pipe that is the apparent discharge point from the leachate collection tank. No flow was observed from the leachate discharge pipe. Therefore, based on the level in the collection tank and the fact that no flow was observed entering the sanitary sewer, it was presumed that the closed overflow valve controls flow to the Town's sewer and that leachate is being discharged from the leachate collection tank to the combination sampling sump and directly into the ABP through the open overflow control valve.

Leachate and sediment samples were collected in October 2008 to provide additional information on current site conditions. One sample was collected from the leachate tank using a polyethylene bailer to evaluate the potential presence of contaminants in the leachate. The sample was analyzed for VOCs, PCBs, and metals. The results of the analyses are provided in Table 3-1 (VOCs), Table 3-2 (metals), and Table 3-3 (PCBs). As shown in Tables 3-1 and 3-3, the sample did not contain any VOCs or PCBs greater than the applicable NYSDEC Class GA Standards. However, as indicated in Table 3-2, the sample contained sodium at a concentration of 26,300 ug/L. This result is greater than the NYSDEC Class GA Standard for sodium of 20,000 ug/L. Based on the effluent criteria presented in Table 2-4 of the Columbia Mills Landfill Final Remediation Report (Malcolm Pirnie, 1997), (Appendix B) the sample collected from the leachate tank in 2008 did not contain any of the specified analytes at concentrations greater than the corresponding effluent criteria.

Sediment samples were collected from the ABP in accordance with the Post- Closure Plan. Sediment was collected from four locations in the pond to provide a representative sample of the pond floor. A sediment aliquot from each grab sample location was transferred directly from the sampling device to a discrete sample container for analysis of VOCs. The remaining sediment collected at each location was homogenized in a stainless-steel bowl and transferred to the appropriate sampling containers for analysis of PCBs, and metals. The results of the sample analyses were compared to the NYSDEC Technical Guide for Screening Contaminated Sediments (NYSDEC Sediment Criteria) and are provided in Table 3-4 (VOCs), Table 3-5 (metals), and Table 3-6 (PCBs).

As shown in Table 3-4, no VOCs (with the exception of acetone and methylene chloride, common laboratory contaminants) or PCBs were detected in the sediment samples. Table 3-5 shows that the concentrations of cadmium (0.65 mg/kg), manganese (1,080 mg/kg), and nickel (26.6 mg/kg) were greater than the corresponding NYSDEC Sediment Criteria "lowest effect level" of 0.6 mg/kg, 460 mg/kg, and 16 mg/kg, respectively. None of the samples contained metals concentrations greater than the NYSDEC Sediment Criteria "greatest effect level". Table 3-6 shows that no PCBs were detected in the sediment sample; however, as shown in Table 3-6, the laboratory reporting limits (RL) for each aroclor are two orders of magnitude greater than the indicated NYSDEC Sediment Criteria and the laboratory method detection limits (MDL) for each aroclor were one order of magnitude greater than the respective NYSDEC Sediment Criteria (Malcolm Pirnie, 2009b).

The following O&M activities were conducted as specified in the existing O&M Plan and based on the recommendations in the draft PRR (Malcolm Pirnie, 2009a).

2009 (Malcolm Pirnie 2010a)

The following observations were noted during the June 2009 inspection:

- The landfill cover appeared to be mowed just prior to the June 2009 site inspection.
- No woody vegetation was observed on the cover system.
- One cleanout pipe for the leachate collection system was damaged, apparently by mowing.
- No problems were noted with the condition of the perimeter fence or with the security of the landfill.

Malcolm Pirnie and NYSDEC representatives conducted site reconnaissance and dye tracer testing to provide additional details regarding the leachate collection system. A photograph log documenting the event is provided in Appendix C.

A concrete leachate discharge structure was located near the inlet to the amphibian breeding pond (ABP) (Photo 1). Flow was observed in the pipe discharging to the ABP. The combination sampling sump was located between the discharge structure and the leachate collection tank (Photo 2). Three inlets pipes and one discharge were noted in the structure. The ends of two of the inlet pipes were fitted with ball valves. Water was observed flowing into the structure from each inlet pipe. The combined flow was estimated at less than one gallon per minute (gpm). The level of water in the discharge structure was sufficient to allow flow into the structure discharge pipe, which was apparently discharging to the ABP.

On June 18, 2009, fluorescent dye was added to the leachate collection tank to provide a visual indicator of flow in the leachate collection system (Photo 3); however, no dye was observed in the inlets to the combination sampling sump or the discharge to the Town of Minetto sewer.

On June 19, 2009, covers were removed from cleanouts for the leachate collection pipes and PPRS. The bottom sides of the covers were identified as either "Leachate" or "Groundwater". Water with fluorescent dye was poured into respective cleanout pipes to evaluate flow through the system. When dye-trace water was added to a "Groundwater" cleanout, flow increased and dye was observed in one of the three pipes (designated North PPRS) flowing into the combination sampling sump. Water with fluorescent dye was then added to a "Groundwater" cleanout pipe located on the southern perimeter of the landfill and an increase in flow and the presence of tracer dye were observed in a second pipe (designated South PPRS) flowing into the combination sampling sump. Finally, water with fluorescent dye was added to a "Leachate" cleanout pipe and increased flow and tracer dye was observed in the remaining inlet to the combination sampling sump. The combined discharge to the ABP from the combination sampling sump was also confirmed by the presence of fluorescent dye. Flow was then diverted to the Town sewer via the flow control valves; tracer dye was subsequently observed discharging to the Town sewer.

As shown on Figure 3-1, the leachate collection tank has two manway openings. One manway opening provides access to the collection tank (tank access manway); the second opening provides access to the inlet pipe where it enters the top of the collection tank (inlet pipe manway). At the start of the evaluation, the level of water in each manway was approximately 12 feet higher than the elevation of the top of the tank and approximately one foot below the manway rims.

During the dye-trace testing discussed above, water was pumped from the manway opening that contains the tank connection to the inlet pipe (inlet pipe manway). As the water level in this manway opening dropped, the level in the second manway opening (tank access manway) also dropped. At the direction of NYSDEC, water from the tank access manway was pumped to the ground surface until the water level was approximately one inch below the top of the tank. Consequently, the water level in the opposing inlet pipe manway dropped, but only to approximately 2 inches above the bulkhead of the tank. The resulting water level in the inlet pipe manway corresponded to a PVC pipe fitting in the leachate inlet pipe. Based on this observation, a leak is expected in the leachate inlet pipe, providing a hydraulic connection between the tank access and inlet pipe access manway openings. With the water level in the inlet pipe manway reduced, a tank inlet control valve was observed in the manway (Photo 4). The valve did not have an operating handle so the position of the valve (open or closed) could not be confirmed.

As mentioned above, the initial head difference between the water level in the tank manways and tank inlet pipe was measured at approximately 12 feet. Based on the configuration of the collection system (an "open", gravity-flow system) and the observations recorded during the evaluation, it is presumed that leachate was being captured in the collection tank and the valves to the Town sewer and ABP were closed. The tank filled and the leachate level apparently rose into the tank access manway. The leachate would have backed up the collection lines with the level in the manways and leachate lines in equilibrium. Since a leak is present in the leachate line within the inlet pipe manway, this access structure would have filled concurrently with the tank access manway. Therefore, the level of leachate in the collection tank and manway openings during the 2009 site inspection could be representative of the head in the leachate collection line (presumably near the upper portion of the landfill) when the valve was finally closed. With the tank inlet valve closed, the level in the collection tank and manways would remain elevated even when the valve to the ABP were opened and the leachate flow resumed a steady state.

A second alternative to explain the elevation in the tank is that the collection tank was filled to capacity and the inlet valve was closed and leachate flow was diverted to the ABP. Therefore, leachate could not "backflow" into the collection system. If a portion of precipitation was able to enter the manway openings, then the level in the collection tank would rise above the top of the collection tank as was observed. This scenario may be plausible as the level in the manway openings in 2009 were higher than what was observed in 2008 (Photos 6 and 7).

2010 (Malcolm Pirnie 2010b)

In March 2010, a damaged cleanout riser pipe for the leachate collection system was repaired by removing the damaged section of riser and attaching a new section of PVC pipe with a PVC coupler.

Based on the recommendations in the draft PRR and in consultation with NYSDEC, leachate collection system samples were collected from the north and south PPRS and leachate inlet pipes in the combination sampling sump (Figure 3-1) to evaluate the potential presence of volatile organic compounds (VOCs), metals, and PCBs discharged to the ABP. One sample was also collected from the leachate collection tank (Figure 3-2) for waste disposal characterization.

As shown in Table 3-1, VOCs were not detected in any of the leachate collection system samples at concentrations greater that the indicated quantitation limits.

As shown in Table 3-2, the sodium concentration in the sample from the leachate collection tank (Tank) was 32,700 micrograms per liter (ug/l) which is greater than the corresponding NYSDEC Class GA Standard of 20,000 ug/l. Table 3-1 shows that this result is greater than the 2008 sample result (26,300 ug/l) and is the only metal exceeding the applicable NYSDEC Class GA or AA Standards.

As shown in Table 3-3, none of the samples collected from the leachate collection system contained PCBs at concentrations greater than the indicated quantitation limits. One sample (MW-X) was collected from the north PPRS and submitted as a field duplicate. As shown in Table 3-3, no PCBs were detected in any of these samples.

In November 2010, Malcolm Pirnie and NYSDEC representatives visited the site to continue the evaluation of the leachate collection tank. The purpose was to evaluate a suspected leak in the leachate inlet piping (identified during the 2009 site visit) and to determine the position and confirm the operation of the inlet valve to the leachate collection tank. In addition, based on the historical analytical data from samples collected from the leachate collection tank, and prior approval from the Town of Minetto Waste Water Treatment Plant (WWTP) operator, the contents of the leachate collection tank (approximately 10,000 gallons) were discharged to the Town of Minetto sanitary sewer system.

The contents of the 10,000 gallon collection tank (with the exception of approximately 0.6 feet remaining at the bottom of the tank) were pumped to the Town of Minetto sanitary sewer system using a “trash pump”. After the contents were removed, a remote inspection camera was placed in the inlet pipe manway to evaluate the integrity of the pipe, inlet valve, and inlet manway opening. No leaks were observed in the inlet leachate pipe or valve, however, an approximately 4-inch diameter bulk head opening was identified in the top of the collection tank. The bulk head opening was threaded but did not contain a threaded plug. Therefore, the inlet manway opening and leachate container are hydraulically connected. This explained why the level in both of the manways decreased the same amount as the level in the leachate collection tank was lowered during the above-mentioned 2009 tank evaluation and dye-tracer testing.

During the inspection, an approximately 20-foot extension rod was used to manipulate and confirm the proper operation of the inlet valve to the collection tank. The valve was found to be in the closed position. Since the valve had not been operated between 2007 and 2010, and leachate was only being discharged to the ABP, the leachate in the collection tank was generated prior to 2007.

At the direction of the NYSDEC (based on historical leachate sampling results and approval from the Town of Minetto WWTP operator), the direction of leachate discharge was changed from the ABP to the Town of Minetto sanitary sewer on November 17, 2010.

2011

In June 2011, O&M activities were completed in accordance with the Work Plan, recommendations in the draft PRR, and in consultation with NYSDEC. No significant issues were reported with the condition or security of landfill. However, based on the inspection, the landfill cover had not been mowed and presents a potential for woody vegetation to compromise the integrity of the landfill.

Based on the recommendations in the draft PRR and in consultation with NYSDEC, leachate collection system samples were collected from the north and south PPRS and leachate effluent pipes to evaluate the potential presence of PCB discharged to the ABP and/or Town of Minetto WWTP, respectively. The PPRS and leachate (temporally diverted from the Town of Minetto sanitary sewer) samples were collected from the combination sampling sump (Figure 3-1). As shown in Table 3-3, no PCBs were detected in the PPRS or leachate samples above the indicated laboratory quantitation limits.

3.1.2 O&M Conclusions and Recommendations

Historic site data, site reconnaissance information, and sampling data have been used to evaluate and monitor the landfill and leachate collection system. Based on historical data, the Columbia Mills Landfill was completed in accordance with the ROD. Based on visual observations and PPRS and leachate sampling data, the landfill is operating as designed and is effective at protecting human health and the environment.

Based on the current status of the site, additional O&M activities should continue to ensure the performance, effectiveness, and protectiveness of the landfill on an annual basis. The following actions are recommended to improve the current O&M process:

- Perform a site survey to document the horizontal and vertical position of landfill monitoring points and landfill components.

- Update existing site plans to document the locations of the leachate collection system components.

- Prepare a revised O&M Plan with the recommended O&M procedures from the draft PRR and Post Closure Plan and in accordance with Section 6.4 of DER-10.

3.2 Monitoring Plan Compliance

Groundwater quality in the vicinity of the site is monitored in accordance with the NYSDEC-approved Work Plan. Groundwater from all monitoring wells associated with the site is sampled to provide information on groundwater quality and assess hydrogeologic site conditions, including groundwater flow and velocity. Figure 3-3 shows the locations of the wells.

3.2.1 Groundwater Monitoring Program

Groundwater samples are collected from the monitoring well network between 2007 and 2011 on a five quarter sampling schedule. The monitoring well network includes eight groundwater monitoring wells and 14 piezometers (Figure 3-3). Groundwater monitoring wells occur in four two-well clusters and are screened in shallow and deep groundwater monitoring zones to assess the vertical variations in groundwater quality.

Groundwater samples are collected using low flow groundwater purging and sampling procedures in accordance with the protocols outlined in the NYSDEC-approved Work Plan. Groundwater samples collected during the groundwater monitoring program are analyzed for PCBs by USEPA Method 8082. However, based on the historical sampling requirements discovered during the document review (as indicated in Section 3.1.1.1) and at the request of NYSDEC, groundwater samples collected in 2008 were also analyzed for VOCs, metals (total and dissolved), and cyanide by USEPA Methods 8260B, ILM05.3, and 9012B, respectively. Based on the 2008 sampling results and recommendations presented in the draft PRR, groundwater samples collected in 2009 were analyzed for PCBs and total and dissolved metals by USEPA Methods 8082 and ILM05.3, respectively. Based on the results of the 2008 and 2009 sampling events and in consultation with NYSDEC, groundwater samples collected in 2010 and 2011 were analyzed for PCBs only.

Groundwater monitoring wells are evaluated for integrity and suitability for groundwater monitoring. Each well is also assessed for damage to the surface casing and/or curb box. If feasible, damaged monitoring wells will be repaired. If any concerns cannot be repaired, they will be replaced.

Groundwater levels are measured in monitoring wells in conjunction with the groundwater monitoring program discussed above. Water levels are measured to the nearest hundredth of a foot and recorded in dedicated field log books. Water levels are used to calculate groundwater elevations across and facilitate an evaluation of groundwater flow conditions at the site.

In accordance with the current Work Plan, an annual report is submitted to the NYSDEC summarizing the site activities and monitoring results from the previous year. The report also provides an evaluation of the remedy performance and effectiveness.

3.2.2 Groundwater Monitoring Results

Groundwater monitoring wells were sampled annually between August 2007 and June 2011 as described in Section 3.2.1. Groundwater sampling results from the 2007 though 2010 sampling events were submitted to NYSDEC with the respective quarterly Reports and Annual Groundwater Monitoring Summaries. The results of the 2011 sampling event will be submitted with the 2011 Annual Groundwater Monitoring Summary.

3.2.2.1 Well Inspections

The groundwater monitoring wells and piezometers were evaluated for integrity and suitability for groundwater monitoring and water levels as discussed in Section 3.2.1. The landfill piezometers are constructed of 2-inch PVC with an approximately 3-foot above-ground riser pipe with no protective casing. At the request of the NYSDEC, new locks were installed on all groundwater monitoring wells during the third quarter 2007 sampling event. Based on the 2007 through 2011 well inspection forms, the integrity of each well and/or piezometer was generally acceptable. However, in 2007, only 12 of the 14 landfill piezometers could be located. The two missing piezometers were located in 2008 and appeared to be damaged during mowing. The piezometers were repaired during the 2008 field activities by replacing the PVC risers. During the 2011 groundwater sampling event landfill piezometers LFP-7 through LFP-10 could not be located, possibly due to shielding by the extensive tall vegetation on the landfill.

The top of casing elevations for the piezometers are not known, therefore, annual measurements can only be used to provide qualitative groundwater elevation data. However, the existing monitoring well network provides sufficient data to evaluate groundwater flow across the site.

3.2.2.2 Water Level Survey

Water levels were measured as described in Section 3.2.1. A summary of groundwater levels is provided in Table 3-7. As shown in Table 3-7, 2011 groundwater elevations in shallow overburden and bedrock wells ranged from 310-feet above mean sea level (amsl) to 324-feet amsl; groundwater elevations in deep bedrock wells ranged from 300-feet amsl to 324-feet amsl. Based on groundwater elevations, the direction of groundwater flow in the vicinity of the site is generally to the east toward the ABP and the Oswego Canal.

3.2.3 Groundwater Sampling

Groundwater sampling results for the 2007 through 2011 sampling events are summarized in Table 3-1 (VOCs), Table 3-2 (metals), and Table 3-3 (PCBs).

3.2.3.1 Groundwater Sampling Results - VOCs

As shown in Table 3-8, none of the samples collected during the fourth quarter 2008 sampling event contained concentrations of VOCs greater than the applicable NYSDEC Class GA Standards. Although VOCs were detected in several of the samples, Table 3-8 shows that the concentrations of these compounds in groundwater are an order of magnitude less than the applicable NYSDEC Class GA Standards. The sample from MW-3D was not analyzed for VOCs due to limited groundwater recovery from this well. Groundwater samples were not analyzed for VOCs during any of the other (2007, 2009, 2010, or 2011) sampling events.

3.2.3.2 Groundwater Sampling Results – Metals

Table 3-9 shows that iron concentrations exceeded the corresponding NYSDEC Class GA Standard of 300 ug/L in the 2008 and/or 2009 groundwater samples collected from groundwater monitoring wells MW-1S, MW-1D, MW-2S, and MW-4S. The maximum concentration of iron (1,830 ug/L) was detected in the sample from MW-4S. The concentrations of sodium in the 2008 and 2009 samples from MW-1D, MW-4S, and MW-4D exceeded the NYSDEC Class GA Standard of 20,000 ug/L. The maximum concentration reported in these wells was 108,000 ug/L in the 2008 sample from MW-4D. Table 3-9 shows that only one monitoring well (MW-4S) contained manganese greater than the NYSDEC Class GA Standard of 300 ug/L. The 2008 and 2009 total manganese concentrations in samples from this well were 740 ug/L and 941 ug/L, respectively. Metals were not analyzed from MW-3S and MW-3D due to limited groundwater recovery from these wells.

3.2.3.3 Groundwater Sampling Results - PCBs

Table 3-10 shows only one sample collected in 2007 contained PCBs. The estimated concentrations (indicated by the “J” qualifier) of Aroclor 1248 and Aroclor 1260 in the samples from MW-3S were 0.40 ug/L and 0.19 ug/L, respectfully. Therefore, the total PCBs concentration in the sample was 0.59 ug/L, which is greater than the respective NYSDEC Class GA Standard of 0.09 ug/L. As shown in Table 3-10, no PCBs were detected in any of the samples collected during the subsequent 2008 through 2011 sampling events.

3.2.4 Groundwater Monitoring Conclusions and Recommendations

Groundwater sampling results from the 2008 sampling event show that VOCs are not significantly impacting groundwater quality. Although groundwater analytical results for VOCs are only available from the 2008 sampling event, the results from the samples collected at the site were significantly less than the designated sampling criteria. Therefore, based on the available data, annual groundwater monitoring for VOCs is not necessary to evaluate site conditions.

Iron exceedances were reported in samples collected from up-gradient and down-gradient groundwater monitoring wells. Iron concentrations were lower in the deep (bedrock) groundwater monitoring zone compared to concentrations in the shallow (overburden and weathered bedrock) groundwater monitoring zone. With the exception of the sample from MW-4S (which contains more than five times the NYSDEC Class GA Standard), iron exceedances were generally similar across the site. Since the iron concentration in the sample collected from the leachate collection tank was significantly less than the NYSDEC Class GA Standard, contents of the landfill are not a likely source of the iron.

Sodium concentrations were greater than the NYSDEC Class GA Standard in several of the groundwater samples. Sodium was also greater than the applicable NYSDEC Class GA Standard in the sample from the leachate collection tank. Since calcium concentrations were also elevated in all of the samples collected from the site, road de-icing agents (sodium chloride and calcium chloride) applied to County Route 24 (Figure 1-1) are suspected to be the likely source of the sodium.

Manganese was only detected in one sample from the site at a concentration greater than the corresponding NYSDEC Class GA Standard. Manganese was not detected in the sample from the leachate collection tank, therefore landfill contents do not seem to be a likely source.

Based on recommendations in the draft PRR, surface water samples were collected from the ephemeral stream north of the landfill and ABP in 2009 to evaluate the potential sources of iron, manganese and/or sodium exceedances reported in the 2008 groundwater samples. Table 3-11 provides a summary of sample results from these locations. As shown in Table 3-11, iron (448 ug/L) and manganese (610 ug/L) were detected in the sample from the stream (collected upgradient of the site) at concentrations greater than the applicable NYSDEC Class GA Standard of 300 ug/L. Based on these data, and in consultation with the NYSDEC, metals are not considered to be a site-related contaminant of concern. Therefore, metal analysis for groundwater samples is not required to evaluate site conditions.

PCBs were detected in only one of the groundwater samples collected during the 2007 groundwater monitoring event. The sample was collected from a well located down-gradient of the landfill and contained concentrations of PCBs greater than the applicable NYSDEC Class GA Standard. No PCBs were detected in any of the samples collected during the subsequent 2008 through 2011 sampling events. In addition, no PCBs were detected in the 2008 sediment samples from the ABP or 2009 through 2011 samples from the PPRS or leachate collection system. However, since PCBs were disposed in the landfill, continued monitoring would be required to properly evaluate changes in groundwater quality over time.

3.3 Institutional Controls/Engineering Controls Certification

There is currently no IC/EC Plan for the site. As indicated in Sections 3.1 and 3.2, site operations and monitoring are currently evaluated in accordance with the Work Plan and/or recommendations presented in the draft PRR. In accordance with NYSDEC Periodic Review requirements, an Institutional controls (IC) and engineering controls (EC) (IC/EC) Certification Form is provided in Appendix D. As indicted in the IC/EC Certification Form, the IC/EC cannot be certified because the current deed restrictions and land use regulations are not known.

3.3.1 Institutional Controls

The ICs currently established for the site in the 2007 Work Plan include NYSDEC requirements for annual O&M and monitoring. Site inspections, as indicated in Sections 3.1 and 3.2, include verifying the integrity of the perimeter fence and mowing the landfill cover. According the Oswego County Real Property Tax web site, the site property is owned by Oswego County and is listed as a landfill. A copy of the property description is provided in Appendix E. According to page 22 of the ROD (Appendix A), ICs at the landfill were to include "…actions such as fencing, signage, and property deed covenants to prevent development of the site or use of groundwater below the site" (NYSDEC, 1992). On March 17, 2009, Malcolm Pirnie contacted the Oswego County Clerk and Town of Minetto to inquire about the deed restrictions and land use regulations but no information was available.

3.3.2 Engineering Controls

The ECs at the site consist of a cap and cover system for the landfill, leachate collection system (including PPRS), and a perimeter fence. Based on available information, the landfill was completed in 1997 in accordance with the ROD.

3.3.2.1 Landfill Construction

As indicated in Section 3.1.1.1, the landfill was constructed with a perimeter groundwater depressurization and leachate collection system that encompasses the landfill cell. The collection system can be regulated to allow leachate to discharge to the leachate collection tank, ABP, or Town of Minetto sewer system. Currently, as discussed in Section 3.1.1.1, leachate is being discharged to the Town of Minetto sewer system. A review of available NYSDEC and USEPA records did not indicate any current effluent discharge permits for the landfill.

According to the Columbia Mills Landfill Final Remediation Report (Malcolm Pirnie, 1997), three to four inches of sub-grade material was placed over the landfill waste. The remainder of the landfill cover system (from bottom to top) consists of a non-woven geo-textile filter fabric, 40-mil HDPE liner, geo-composite drainage material, two feet of compacted barrier protection soil, and six inches of topsoil.

As indicated previously, a six-foot chain-link fence surrounds the perimeter of the landfill and is inspected annually.

3.4 Institutional Controls/Engineering Controls Conclusions and Recommendations

An NYSDEC-approved IC/EC Plan should be prepared for the site in accordance with DER-10. Based on existing site data, ICs at the site, including proper land use restrictions, need to be verified. In addition, a Contingency Plan should be created to provide response guidance for personnel conducting annual on-site operations. The existing Work Plan provides for annual inspection of certain engineering controls including the perimeter fence and the vegetated landfill cover but does not address the leachate collection system. Therefore, an O&M checklist should be created to provide inspection personnel with an evaluation checklist for the site. In addition, a Contingency Plan should be prepared to provide personnel with a chain-of-events to be followed if a deficiency or failure is noted. The above-mentioned items and information from the Post Closure Plan should be integrated into a site-specific IC/EC Plan, prepared in accordance with DER-10.

4. Cost Evaluation

4.1 Work Assignment Budget

The estimated project budget for implementing the existing O&M and Groundwater Monitoring Plan was prepared in accordance with Malcolm Pirnie's Contract for Design/Construction services with the NYSDEC. The total approved cost for the existing four year (2006 – 2010) Work Assignment is $113,502. Table 4-1 provides a summary of costs estimated to complete the tasks listed in the existing Work Plan through 2012. As shown in Table 4-1, approximately $84,000 of the budgeted amount has been expended, providing approximately $29,400 to complete the remaining two years of the Work Assignment.

4.2 Periodic Review Costs

Table 4-2 provides an opinion of probable cost for performing the recommendations provided in the Periodic Review, including:

- Verification of deed restrictions and land use regulations
- Site survey
- Update site maps/drawings
- Development of site documents including:
    - Corrective Action Plan (CAP)
    - Site Management Plan (SMP)
    - Operations and Maintenance Plan (O&M Plan)
    - Long-term Monitoring Plan (LTM Plan)
    - Institutional Controls/Engineering Controls Plan (IC/EC Plan)
    - Contingency Plan

As shown in Table 4-2, the estimated cost to implement the recommendations presented in the PR is $24,250. Table 4-2 shows that the anticipated cost to perform annual O&M, sampling, and reporting for the remainder of the Work Assignment (calendar years 2011-2012) in accordance with the recommendations in the PR is $56,850. Therefore, the total anticipated cost complete the remaining two years in the work assignment is $81,000. As shown in Table 4-2, this amount is approximately $51,700 greater than estimated remaining resources ($29,400).

5. Recommendations and Conclusions

5.1 Recommendations

The PR was performed to evaluate the performance, effectiveness, and protectiveness of the current remedy. The PR was based on a review of the existing Work Plan, available site documents, monitoring data, field observations, and results of CMs instituted based on the draft PRR.

Based on these data, most of the deficiencies identified at the site can be rectified through administrative efforts and improved document retention practices and have no significant impact to the overall performance or effectiveness the remedy. However, landfill construction and operation and maintenance documents should be prepared and properly retained for use by maintenance personnel. Monitoring results indicate that the landfill is performing as intended. However, recurring landfill leachate monitoring is recommended to evaluate discharge from the site over time. Therefore, the Columbia Mills site will require Corrective Measures (CM) to ensure the appropriate level of protection to human health and the environment.

5.1.1 Corrective Action Plan

A Corrective Action Plan (CAP) will be prepared to provide details for each of CM recommended during this PR cycle. The CAP will include a timeline to indicate when each of the following CMs would be implemented:

- Site compliance with IC/EC Certification including:
    - Evaluation, documentation, inspection, and sampling procedures for the landfill and leachate collection system
    - Evaluation of deed restrictions
- Site survey
- Update Maps and Figures

The CAP and a site-specific SMP will be submitted to NYSDEC for review and final approval. Details of the SMP are provided below.

5.1.2 Site Management Plan

A SMP will be developed in accordance with DER-10 to provide a framework for monitoring the effectiveness of the remedy at the Columbia Mills site. The SMP will replace the current Work Plan procedures. The SMP will include the following site-specific documents:

- Institutional and Engineering Controls (IC/EC) Plan – describes the IC/ECs that are in place, effective and provide the appropriate levels of protection for human health and the environment.

- Long-term Monitoring (LTM) Plan – provides the procedures and monitoring requirements to evaluate the short-and long-term effectiveness of the remedy.

- Operation and Maintenance (O&M) Plan – identifies the proper procedures and contingency plans required to operate and maintain treatment, collection, and/or containment systems for the remedy.

- Site-specific Health and Safety Plan – identifies site-related hazards and provide requirements for the appropriate personal protective equipment (PPE) for on-site personnel.

5.1.3 Periodic Review Frequency

Since CMs have been recommended for the site, a one year field-oversight PR evaluation is recommended to verify that the CMs have either been implemented or completed and remain effective.

5.2 Conclusions

Based on a review of available site documents, monitoring data, and field observations, the overall performance, effectiveness, and protectiveness of the remedy for the Colombia Mills landfill are generally acceptable. However, gaps in administrative records have contributed to failures for several of the ICs for the site. In addition, existing Work Plan documents and monitoring procedures do not provide the appropriate level of effectiveness monitoring and protection for human health and the environment. Therefore CMs are recommended to bring the remedy into compliance with NYSDEC IC/EC Certification requirements. A SMP should be developed for the site to provide revised procedures for effective operation, maintenance, and monitoring the site over time. A one year field-oversight PR evaluation is recommended to assess the CMs and SMP activities.

6. References

Malcolm Pirnie, 1997, Post-Closure Operation, Maintenance, and Monitoring Plan for Columbia Mills Landfill, Malcolm Pirnie, Inc., February 1997.

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Malcolm Pirnie, 2007a, Columbia Mills Site Work Plan, Malcolm Pirnie, Inc., June 2007.

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Malcolm Pirnie, 2009b, Columbia Mills Site Quarterly Report and Annual Groundwater Monitoring Summary - 2008, Malcolm Pirnie, Inc., March 2009.

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Malcolm Pirnie, 2010b, Columbia Mills Site Quarterly Report and Annual Groundwater Monitoring Summary, Malcolm Pirnie - 2010, Inc., July 2010.

NYSDEC, 1992, Record of Decision, Columbia Mills Site, Minetto, Oswego County, New York, Site No. 7-38-012, New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

NYSDEC, 2002, Division of Environmental Remediation, Draft DER-10, Technical Guidance for Site Investigation and Remediation, December 25, 2002.

NYSDEC, 2008, Division of Environmental Remediation, Remedial Bureau E, Internal Guidance Procedure – 8, Periodic Review of Site Management Activities, August 21, 2008.

NYSDEC, Environmental Site Remediation Database Search Details, Accessed July 9, 2008, NYSDEC Site 7-38-012,

[http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3].

ARCADIS

Appendix **A**

Record of Decision

ARCADIS

Appendix **B**

Remediation Report

ARCADIS

Appendix **C**

Photograph Log

ARCADIS

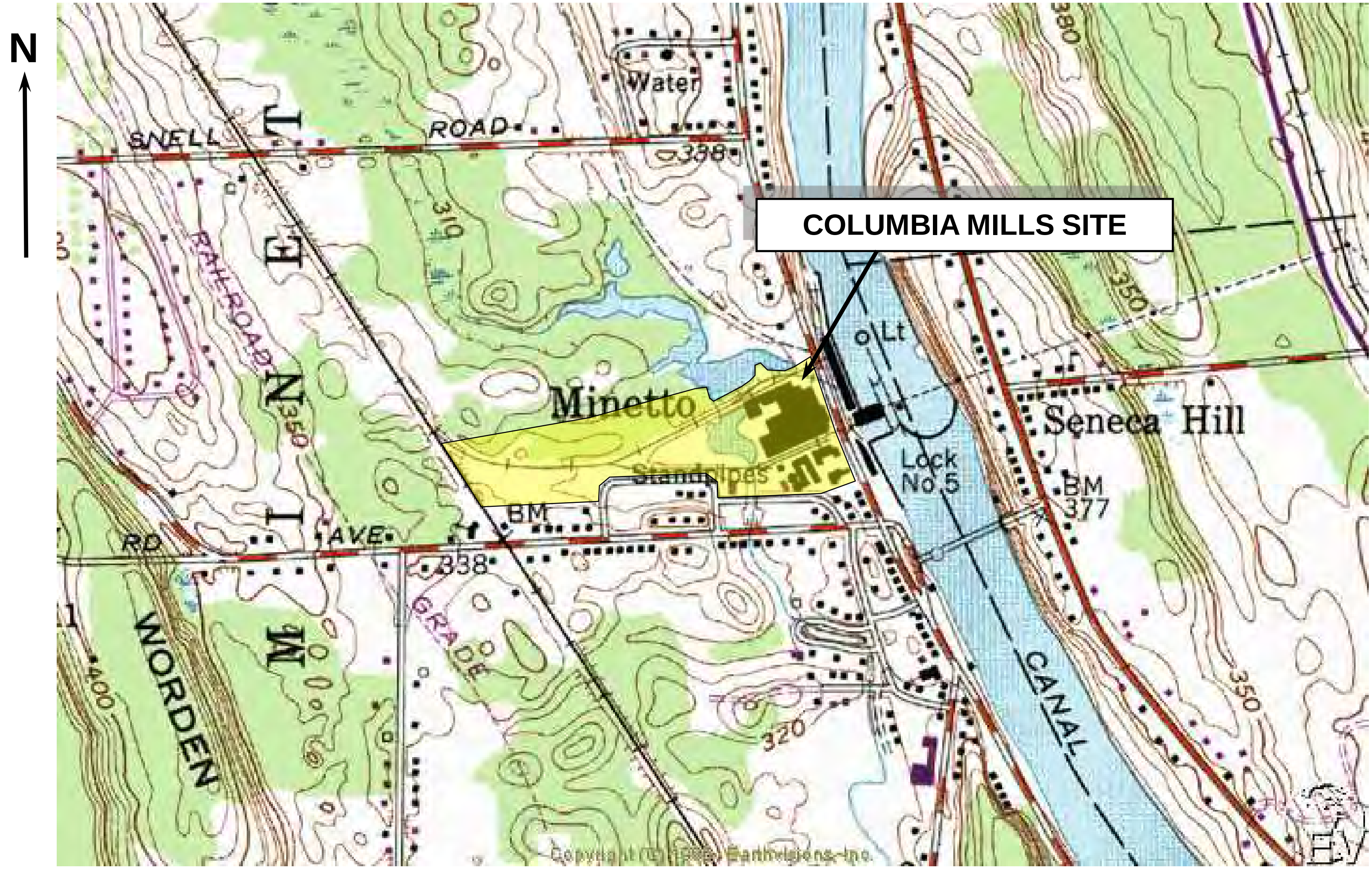
Appendix **D**

IC/EC Certification Form

ARCADIS

Appendix **E**

Oswego County Real Property Tax
Property Description



SOURCE: U.S.G.S 7.5 MIN. OSWEGO EAST QUAD, 1985

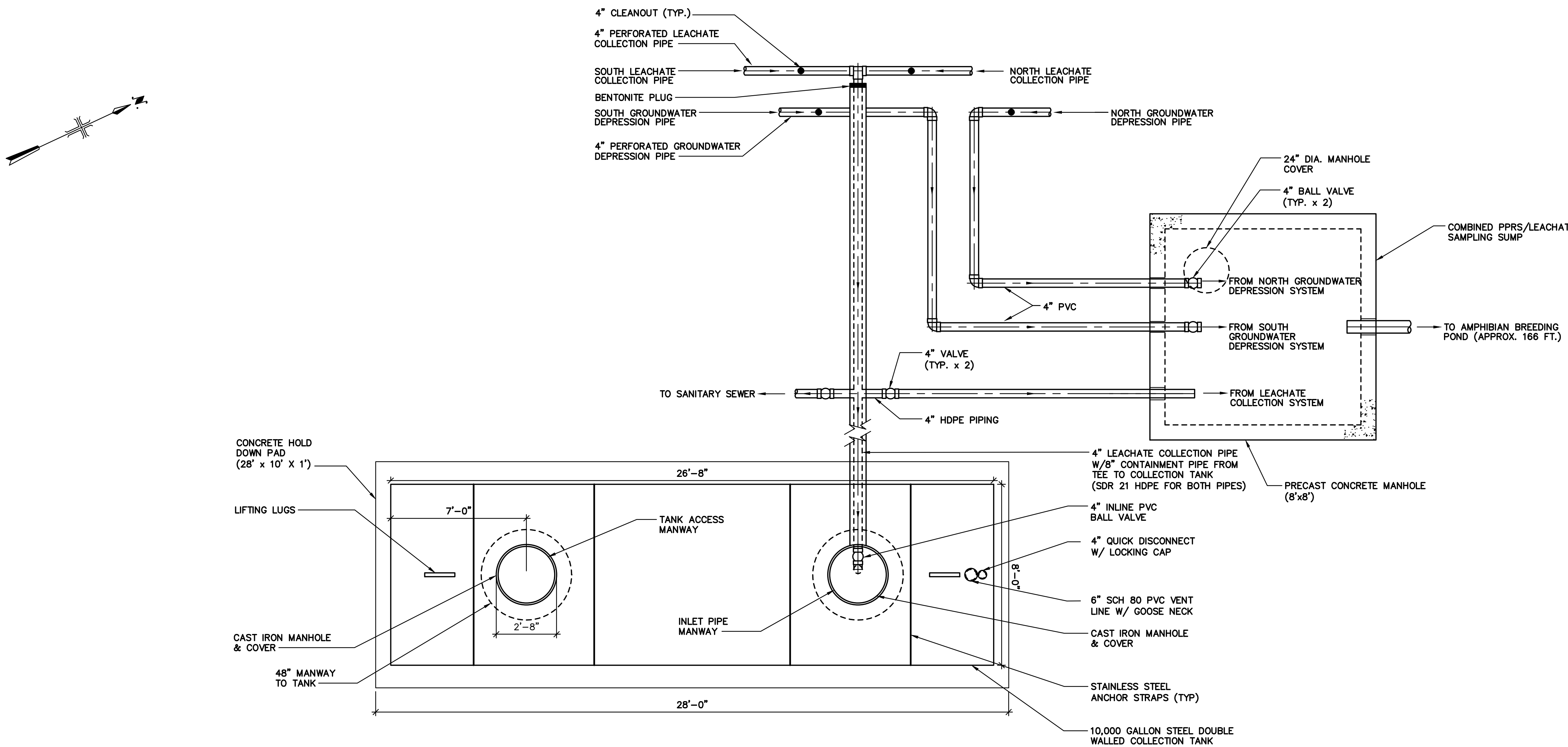
SCALE IN FEET
0 1,000 2,000 2,000

ARCADIS
Infrastructure · Water · Environment · Buildings

NYSDEC STANDBY CONTRACT NO. D004443-7
NYSDEC SITE NO. 7-38-012
MINETTO, NEW YORK

COLUMBIA MILLS SITE LOCATION

FIGURE 1-1



LEACHATE COLLECTION
TANK PIPING
PLAN VIEW

SCALE: 3/16" = 1'-0"

SOURCE: MALCOLM PIRNIE REMEDIAL LANDFILL DESIGN DRAWINGS (MARCH 1995) AND 2009 MALCOM PIRNIE DYE TESTING AT THE SITE.

ARCADIS Infrastructure · Water · Environment · Buildings	NYSDEC STANDBY CONTRACT NO. D00443-7 NYSDEC SITE NO. 7-38-012 COLUMBIA MILLS SITE MINETTO, NEW YORK	LEACHATE COLLECTION SYSTEM SCHEMATIC SCALE AS SHOWN	ARCADIS-US, INC. SEPTEMBER 2011 FIGURE 3-1

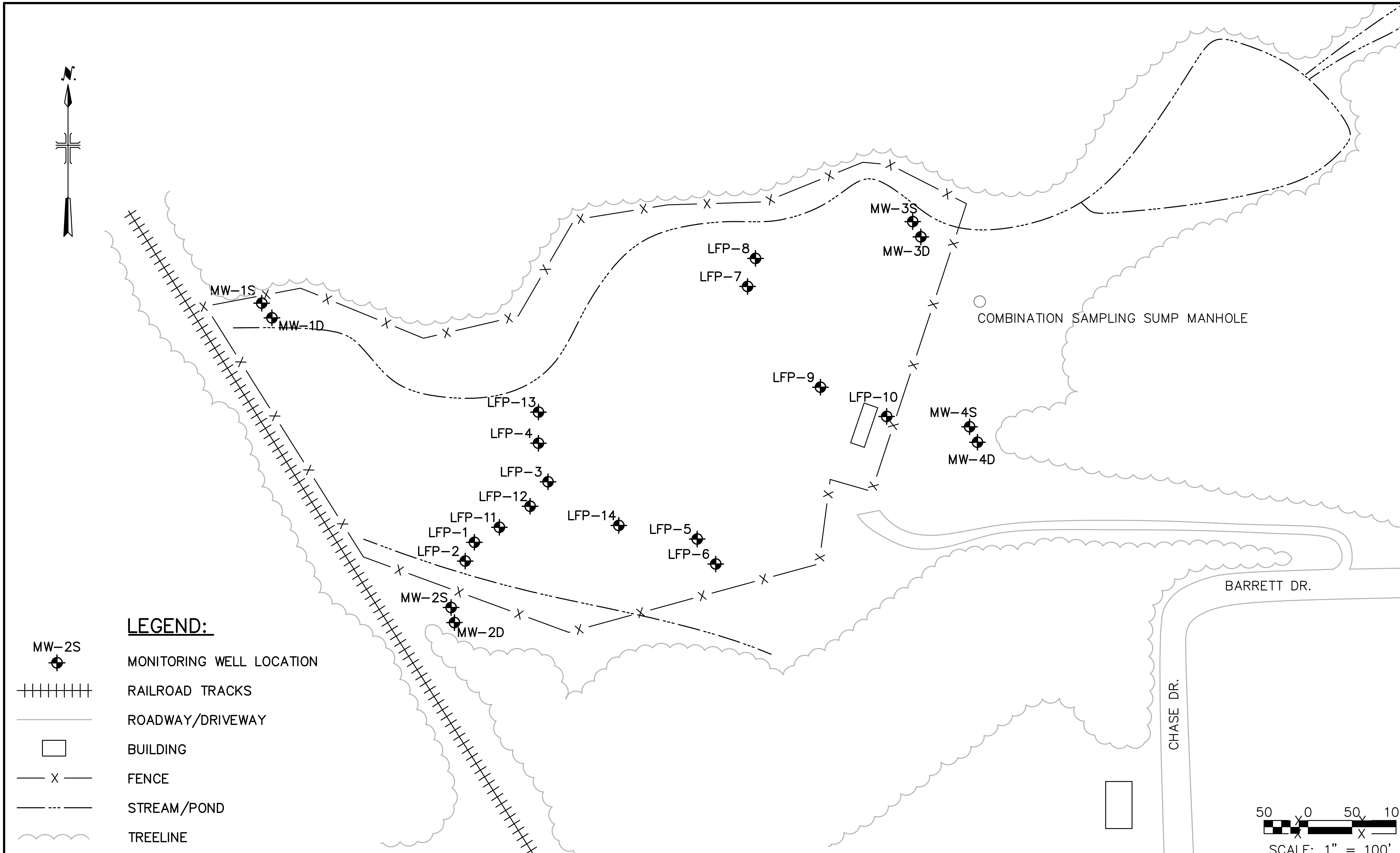
ARCADIS

COLUMBIA MILLS SITE
MINETTO, NEW YORK
NYSDEC SITE NUMBER 7-38-012

PROCESS FLOW DIAGRAM
(NOT TO SCALE)

September 2011

FIGURE 3-2



ARCADIS
Infrastructure · Water · Environment · Buildings

NYSDEC STANDBY CONTRACT NO. D00443-7
NYSDEC SITE NO. 7-38-012
COLUMBIA MILLS SITE
MINETTO, NEW YORK

GROUNDWATER MONITORING WELL LOCATIONS

SCALE: 1" = 100'

ARCADIS-US, INC.
SEPTEMBER 2011
FIGURE 3-3

Table 3-1
Summary of Leachate Collection System Sample Results - VOCs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	TANK 10/2/2008 ug/L
Analyte		
1,1,1-Trichloroethane	5	0.5 U
1,1,2,2-Tetrachloroethane	5	0.5 U
1,1,2-Trichloroethane	1	0.5 U
1,1-Dichloroethane	5	0.5 U
1,1-Dichloroethene	5	0.5 U
1,2-Dichloroethane	5	0.5 U
1,2-Dichloropropane	5	0.5 U
2-Hexanone		2.0 U
Acetone	50	2.7
Benzene	1	0.5 U
Bromodichloromethane	5	0.5 U
Bromoform	50	0.5 U
Bromomethane	5	1.0 U
Carbon disulfide		0.5 U
Carbon tetrachloride	5	0.5 U
Chlorobenzene	5	0.5 U
Chloroethane		1.0 U
Chloroform	7	0.5 U
Chloromethane		0.5 U
cis-1,2-Dichloroethene	5	0.5 U
cis-1,3-Dichloropropene	0	0.5 U
Dibromochloromethane	50	0.5 U
Ethylbenzene	5	0.5 U
Methyl Ethyl Ketone	50	2.0 U
Methyl isobutyl ketone		2.0 U
Methylene Chloride	5	0.17 J B
Styrene	5	0.5 U
Tetrachloroethene	5	0.1 J B
Toluene	5	0.5 U
trans-1,2-Dichloroethene	5	0.5 U
trans-1,3-Dichloropropene	0	0.5 U
Trichloroethene	5	0.5 U
Vinyl chloride	2	0.5 U
Xylenes, Total	5	1.5 U

Notes:
U - Analyte not detected
J - Estimated value
B - Analyte detected in blank and the sample

Table 3-2
Summary of Leachate Collection System Samples - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	TANK 10/2/2008 ug/L
Metals		
Aluminum		200 U
Antimony	3	60.0 U
Arsenic	25	10.0 U
Barium	1000	64.4 J
Beryllium	3	5.0 U
Cadmium	5	5.0 U
Calcium		25300
Chromium	50	0.60 J
Cobalt		50.0 U
Copper	200	25.0 U
Cyanide		10 U
Iron	300	98.1 J
Lead	25	2.0 J
Magnesium	35,000*	4740 J
Manganese	300	4.6 J
Mercury	1	0.20 U
Nickel	100	40.0 U
Potassium		4340 J
Selenium	10	35.0 U
Silver	50	10.0 U
Sodium	20000	**26300**
Thallium	0.5*	25.0 U
Vanadium		50.0 U
Zinc	2,000*	3.9 J

Notes:

(highlighted) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

* - NYSDEC Class GA Guidance Value

Table 3-3
Summary of Leachate Collection System Sample Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class AA/GA Standard	Leachate 6/19/2009 ug/L	Leachate 3/25/2010 ug/L	Leachate 6/22/2011 ug/L	North PPRS 6/19/2009 ug/L	North PPRS 3/25/2010 ug/L	North PPRS 6/22/2011 ug/L	South PPRS 6/19/2009 ug/L	South PPRS 3/25/2010 ug/L	South PPRS 6/22/2011 ug/L
Analyte										
PCB-1016	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1221	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1232	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1242	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1248	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1254	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
PCB-1260	-	0.53 U	0.53 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Total PCBs	0.09	-	-	-	-	-	-	-	-	-

Notes:
U - Analyte not detected

Table 3-3
Summary of Leachate Collection System Sample Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample **Date** **Units**	**NYSDEC** **Class AA/GA** **Standard**	**Tank** **10/2/2008** **ug/L**	**Tank** **3/25/2010** **ug/L**
Analyte			
PCB-1016	-	0.53 U	0.53 U
PCB-1221	-	1.1 U	0.53 U
PCB-1232	-	0.53 U	0.53 U
PCB-1242	-	0.53 U	0.53 U
PCB-1248	-	0.53 U	0.53 U
PCB-1254	-	0.53 U	0.53 U
PCB-1260	-	0.53 U	0.53 U
Total PCBs	0.09	-	-

Notes:
U - Analyte not detected

Table 3-4
Summary of Amphibian Breeding Pond Sediment Sampling Results - VOCs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Sediment Criteria(1) ug/kg	POND 10/2/2008 ug/kg
Analyte		
1,1,1-Trichloroethane		8.9 U
1,1,2,2-Tetrachloroethane	0.0003	8.9 U
1,1,2-Trichloroethane	0.0006	8.9 U
1,1-Dichloroethane		8.9 U
1,1-Dichloroethene	0.00002	8.9 U
1,2-Dichloroethane	0.0007	8.9 U
1,2-Dichloropropane		8.9 U
2-Hexanone		18 U
Acetone		36
Benzene	0.0006	8.9 U
Bromodichloromethane		8.9 U
Bromoform		8.9 U
Bromomethane		8.9 U
Carbon disulfide		8.9 U
Carbon tetrachloride	0.0006	8.9 U
Chlorobenzene		8.9 U
Chloroethane		8.9 U
Chloroform		8.9 U
Chloromethane		8.9 U *
cis-1,2-Dichloroethene		8.9 U
cis-1,3-Dichloropropene		8.9 U
Dibromochloromethane		8.9 U
Ethylbenzene		8.9 U
Methyl Ethyl Ketone		18 U
methyl isobutyl ketone		8.9 U
Methylene Chloride		2.9 J B
Styrene		8.9 U
Tetrachloroethene	0.0008	8.9 U
Toluene		8.9 U
trans-1,2-Dichloroethene		8.9 U
trans-1,3-Dichloropropene		8.9 U
Trichloroethene	0.0002	8.9 U
Vinyl chloride	0.00007	8.9 U
Xylenes, Total		8.9 U

Notes:
1 - Human Health Bioaccumulation Sediment Criteria from NYSDEC Technical Guide for Screening Contaminated Sediments
U - Analyte not detected
J - Estimated value
B - Analyte detected in an associated blank and the sample
* - Laboratory Control Spike exceeds control limits

Table 3-5
Summary of Amphibian Breeding Pond Sediment Sampling Results - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample	NYSDEC Sediment Screening Criteria[1]		POND
	Lowest Effect Level	Severe Effect Level	
Date			10/2/2008
Units	mg/kg	mg/kg	mg/kg
Metals (mg/kg or ppm)			
Aluminum			10000
Antimony	2	25	10.9 U
Arsenic	6	33	4.4
Barium			107
Beryllium			0.38 J
Cadmium	0.6	9	0.65 J
Calcium			2410
Chromium	26	110	12.2
Cobalt			6.0 J
Copper	16	110	11.3
Cyanide			890 U
Iron			15000
Lead	31	110	16.7
Magnesium			2640
Manganese	460	1100	1080
Mercury	0.51	1.3	0.042 J
Nickel	16	50	26.6
Potassium			845 J
Selenium			6.4 U
Silver	1	2.2	1.8 U
Sodium			82.4 J
Thallium			4.5 U
Vanadium			20.4
Zinc	120	270	94.6

Notes:

(shaded) - Concentration exceeds NYSDEC Sediment Screening Lowest Effect Level

1 - Human Health Bioaccumulation Sediment Criteria from NYSDEC Technical Guide for Screening Contaminated Sediments

U - Analyte not detected

J - Estimated value

Table 3-6
Summary of Amphibian Breeding Pond Sediment Sampling Results - Metals and PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample **Date** **Units**	**NYSDEC Sediment Criteria[(1)]** **ug/kg**	**POND** **10/2/2008** **ug/kg**
PCBs		
PCB-1016		30 U
PCB-1221		58 U
PCB-1232		30 U
PCB-1242		30 U
PCB-1248		30 U
PCB-1254		30 U
PCB-1260		30 U
Total PCBs	0.8	

Notes:
1 - Human Health Bioaccumulation Sediment Criteria from NYSDEC Technical Guide for Screening Contaminated Sediments
U - Analyte not detected

Table 3-7
Summary of Groundwater Elevations
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Well	Measuring Point Elevation (1) (feet)	8/6/2007		10/1/2008	
		DTW (feet)	Elevation (feet)	DTW (feet)	Elevation (feet)
MW-1S	324.85	6.94	317.91	4.91	319.94
MW-1D	325.14	3.70	321.44	1.96	323.18
MW-2S	335.93	13.90	322.03	13.22	322.71
MW-2D	335.90	13.95	321.95	13.39	322.51
MW-3S	316.02	6.42	309.60	5.71	310.31
MW-3D	315.79	8.23	307.56	16.52	299.27
MW-4S	321.63	12.20	309.43	12.21	309.42
MW-4D	321.26	11.44	309.82	11.29	309.97
LFP-1	NA	19.15	-	18.74	-
LFP-2	NA	16.40	-	16.45	-
LFP-3	NA	14.75	-	14.20	-
LFP-4	NA	13.57	-	13.40	-
LFP-5	NA	17.30	-	17.32	-
LFP-6	NA	14.50	-	14.19	-
LFP-7	NA	NM	-	Dry	-
LFP-8	NA	13.92	-	13.54	-
LFP-9	NA	18.20	-	18.00	-
LFP-10	NA	15.18	-	14.90	-
LFP-11	NA	23.77	-	23.18	-
LFP-12	NA	NM	-	Dry	-
LFP-13	NA	Dry	-	6.33	-
LFP-14	NA	26.37	-	26.00	-

Notes
(1) - Source: Malcolm Pirnie Inc. Project Number 0266319
Table 2-2, Monitoring Well and Piezometer Construction Summary
NA - Not Available
NM - Not Measured

Table 3-7
Summary of Groundwater Elevations
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Well	Measuring Point Elevation [(1)] (feet)	6/17/2009		3/24/2010		6/22/2011	
		DTW (feet)	Elevation (feet)	DTW (feet)	Elevation (feet)	DTW (feet)	Elevation (feet)
MW-1S	324.85	4.81	320.04	2.98	321.87	5.20	319.65
MW-1D	325.14	1.80	323.34	0.67	324.47	2.23	322.91
MW-2S	335.93	11.66	324.27	9.43	326.50	12.10	323.83
MW-2D	335.90	11.77	324.13	9.19	326.71	11.80	324.10
MW-3S	316.02	5.76	310.26	5.94	310.08	5.48	310.54
MW-3D	315.79	22.03	293.76	20.78	295.01	16.21	299.58
MW-4S	321.63	11.70	309.93	8.41	313.22	11.69	309.94
MW-4D	321.26	11.13	310.13	10.17	311.09	11.12	310.14
LFP-1	NA	18.36	-	18.00	-	18.30	-
LFP-2	NA	NM	-	13.12	-	Dry	-
LFP-3	NA	14.18	-	13.85	-	14.20	-
LFP-4	NA	13.24	-	13.28	-	13.25	-
LFP-5	NA	17.26	-	16.61	-	16.92	-
LFP-6	NA	13.44	-	12.40	-	13.40	-
LFP-7	NA	NM	-	Dry	-	NM	-
LFP-8	NA	13.21	-	12.39	-	NM	-
LFP-9	NA	17.93	-	17.79	-	NM	-
LFP-10	NA	14.90	-	14.81	-	NM	-
LFP-11	NA	22.89	-	22.41	-	22.85	-
LFP-12	NA	Dry	-	Dry	-	Dry	-
LFP-13	NA	6.50	-	5.48	-	6.60	-
LFP-14	NA	25.83	-	25.49	-	25.80	-

Notes
(1) - Source: Malcolm Pirnie Inc. Project Nu
Table 2-2, Monitoring Well and Piezom
NA - Not Available
NM - Not Measured

Table 3-8
Summary of Groundwater Sampling Results - VOCs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-1S 10/1/2008 ug/L	MW-X(1) 10/1/2008 ug/L	MW-1D 10/1/2008 ug/L	MW-2S 10/2/2008 ug/L
Analyte					
1,1,1-Trichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	5	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone		2.0 U *	2.0 U	2.0 U	2.0 U
Acetone	50	2.0 U	2.2	0.8 J	3.8
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	5	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	5	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide		0.26 J B	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	5	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	5	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane		1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane		0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Ethyl Ketone	50	2.0 U	2.0 U	2.0 U	2.0 U
Methyl isobutyl ketone		2.0 U	2.0 U	2.0 U	2.0 U
Methylene Chloride	5	2.0 U	0.61 J B	0.5 J B	0.42 J B
Styrene	5	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	0.5 U	0.5 U	0.1 J B	0.5 U
Toluene	5	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes, Total	5	1.5 U	1.5 U	1.5 U	1.5 U

Notes:
(yellow) - Concentration exceeds corresponding NYSDEC Class GA Standard
U - Analyte not detected
J - Estimated value
B - Analyte detected in blank and the sample
* - Laboratory Control Spike exceeds control limits
(1) - MW-X is a duplicate sample collected at MW-1S

Table 3-8
Summary of Groundwater Sampling Results - VOCs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-2D 10/1/2008 ug/L	MW-3S 10/2/2008 ug/L	MW-4S 10/1/2008 ug/L	MW-4D 10/1/2008 ug/L
Analyte					
1,1,1-Trichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	5	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone		2.0 U *	2.0 U *	2.0 U *	2.0 U *
Acetone	50	0.84 J	1.2 J	2.0 U	2.0 U
Benzene	1	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	5	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	50	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	5	1.0 U	1.0 U	1.0 U	1.0 U
Carbon disulfide		0.29 J B	0.27 J B	0.5 U	0.26 J B
Carbon tetrachloride	5	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	5	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane		1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	7	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane		0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	0	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	50	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	5	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Ethyl Ketone	50	2.0 U	2.0 U	2.0 U	2.0 U
Methyl isobutyl ketone		2.0 U	2.0 U	2.0 U	2.0 U
Methylene Chloride	5	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	5	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	5	0.5 U	0.12 J	0.5 U	0.5 U
trans-1,2-Dichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	0	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes, Total	5	1.5 U	1.5 U	1.5 U	1.5 U

Notes:

- Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected
J - Estimated value
B - Analyte detected in blank and the sample
* - Laboratory Control Spike exceeds control limits
(1) - MW-X is a duplicate sample collected at MW-1S

Table 3-9
Summary of Groundwater Sampling Results - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-1S 10/1/2008 ug/L	MW-1S (D) 6/18/2009 ug/L	MW-X (1) 10/1/2008 ug/L	MW-X (D) (1) 6/18/2009 ug/L	MW-1D 10/1/2008 ug/L	MW-1D (D) 6/18/2009 ug/L
Metals							
Aluminum		200 U	91.3 J	200 U	18.8 JB	200 U	21.9 JB
Antimony	3	60.0 U	3.0 U	60.0 U	3.0 U	60.0 U	3 U
Arsenic	25	10.0 U	2.0 U	10.0 U	2.0 U	10.0 U	3.7 J
Barium	1000	487	486	480	506.0	962	1030
Beryllium	3	5.0 U	0.2 U	5.0 U	0.2 U	5.0 U	0.2 U
Cadmium	5	0.89 J	0.3 J	5.0 U	0.4 J	5.0 U	0.3 U
Calcium		50800	51500	50100	53600 B	29200	31700 B
Chromium	50	0.55 J	0.3 J	2.3 J	0.3 U	10.0 U	0.3 U
Cobalt		0.56 J	0.8 J	50.0 U	0.7	50.0 U	0.5 U
Copper	200	25.0 U	1.3 U	25.0 U	1.3 U	25.0 U	1.3 U
Cyanide		10 U	U	10 U		10 U	
Iron	300	**509**	**499**	**539**	**546 B**	**433**	**407 B**
Lead	25	10.0 U	1.0 U	10.0 U	1.0 U	10.0 U	1 U
Magnesium	35,000*	11600	11700	11300	12100 B	7970	8730 B
Manganese	300	116	103.0	119	109	91.5	104
Mercury	1	0.20 U	0.1 U	0.20 U	0.1 U	0.20 U	0.1 U
Nickel	100	40.0 U	1.0 U	3.4 J	1.0 J	40.0 U	1 U
Potassium		1590 J	1270 J	2820 J	1330.0	3590 J	3420
Selenium	10	35.0 U	6.1 U	35.0 U	6.1 U	35.0 U	6.1 U
Silver	50	10.0 U	0.8 U	10.0 U	0.8 U	10.0 U	0.8 U
Sodium	20000	14500	13800	14200	14300.0	**27200**	**28800**
Thallium	0.5*	25.0 U	5.9 U	25.0 U	5.9 U	25.0 U	5.9 U
Vanadium		50.0 U	0.5 U	0.69 J	0.7 J	50.0 U	0.5 U
Zinc	2,000*	1.3 J	1.0 U	6.3 J	1.3 J	1.6 J	1 J

Notes:

(highlighted) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

* - NYSDEC Class GA Guidance Value

(1) - MW-X is a duplicate sample collected at MW-1S

D - Sample was Dissolved

B - Detected in Sample and Method Blank

Table 3-9
Summary of Groundwater Sampling Results - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-2S 10/2/2008 ug/L	MW-2S 6/19/2009 ug/L	MW-2S (D) 6/19/2009 ug/L	MW-2D 10/1/2008 ug/L	MW-2D 6/18/2009 ug/L	MW-2D (D) 6/18/2009 ug/L
Metals							
Aluminum		284	246	11.0 U	207	204	75.7 JB
Antimony	3	60.0 U	3 U	3.0 U	60.0 U	3.0 U	3.0 U
Arsenic	25	10.0 U	2 U	2.6 J	10.0 U	2.0 U	2.0 U
Barium	1000	319	239	236	288	239	234
Beryllium	3	5.0 U	0.2 U	0.2 U	5.0 U	0.2 U	0.2 U
Cadmium	5	5.0 U	0.3 U	0.3 U	5.0 U	0.3 U	0.3 U
Calcium		87800	71800	74300 B	69500	65000	66300 B
Chromium	50	0.91 J	0.5 J	0.6	0.63 J	0.3 U	0.3 U
Cobalt		50.0 U	0.5 U	0.5 U	50.0 U	0.5 U	0.6 JB
Copper	200	3.1 J	1.3 J	1.3 U	25.0 U	1.3 U	1.3 U
Cyanide		3.9 J			10 U		
Iron	300	**365**	136	19.3 U	216	132	19.3 U
Lead	25	2.2 J	1 J	1.0 U	10.0 U	1.0 U	1.0 U
Magnesium	35,000*	12300	9760 B	10200 B	16400	15800 B	16100 B
Manganese	300	16.5	4.3 J	0.2 J	53.7	134	185
Mercury	1	0.20 U	0.1 U	0.1 U	0.20 U	0.1 U	0.1 U
Nickel	100	40.0 U	1 J	1.3	40.0 U	1.1 J	1.0 U
Potassium		1480 J	1190 J	1210	1370 J	1090 J	1100
Selenium	10	35.0 U	6.1 U	6.1 U	35.0 U	6.1 U	6.1 U
Silver	50	10.0 U	0.8 U	0.8 U	10.0 U	0.8 U	0.8 U
Sodium	20000	6690	5070	5230	7560	6280	6660
Thallium	0.5*	25.0 U	5.9 U	5.9 U	25.0 U	5.9 U	5.9 U
Vanadium		50.0 U	0.6 J	0.5 U	50.0 U	0.5 U	0.5 U
Zinc	2,000*	1.9 J	1.9 J	2.0 J	1.9 J	2.8 J	2.8 J

Notes:

[yellow box] - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

* - NYSDEC Class GA Guidance Value

(1) - MW-X is a duplicate sample collected at MW-1S

D - Sample was Dissolved

B - Detected in Sample and Method Blank

Table 3-9
Summary of Groundwater Sampling Results - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-4S 10/1/2008 ug/L	MW-4S 6/18/2009 ug/L	MW-4S (D) 6/18/2009 ug/L	MW-4D 10/1/2008 ug/L	MW-4D 6/18/2009 ug/L	MW-4D (D) 6/18/2009 ug/L
Metals							
Aluminum		200 U	170 J	201 B	200 U	76.5 J	11 U
Antimony	3	60.0 U	3.0 U	3.0 U	60.0 U	3.0 U	3 U
Arsenic	25	10.0 U	2.3 J	2.0 U	10.0 U	2.0 U	2 U
Barium	1000	363	380	377	277	348	384
Beryllium	3	5.0 U	0.2 U	0.2 U	5.0 U	0.2 U	0.2 U
Cadmium	5	5.0 U	0.3 U	0.3 U	5.0 U	0.3 U	0.3 J
Calcium		60300	68700	69100 B	28000	36700	40700 B
Chromium	50	10.0 U	0.3 U	0.3 U	10.0 U	0.3 U	0.3 U
Cobalt		50.0 U	0.5 U	0.7 JB	50.0 U	0.5 U	0.6 JB
Copper	200	25.0 U	1.3 U	1.3 U	25.0 U	1.3 U	1.3 U
Cyanide		6.2 J			10 U		
Iron	300	**1680**	**1830**	**1820 B**	146	184	203 B
Lead	25	10.0 U	1.0 U	1.0 U	2.2 J	1.0 U	1 U
Magnesium	35,000*	13900	15100 B	15200 B	8020	10200 B	11200 B
Manganese	300	**740**	**941**	**927**	148	265	288
Mercury	1	0.20 U	0.1 U	0.1 U	0.20 U	0.1 U	0.1 U
Nickel	100	40.0 U	1.6 J	1.0 J	40.0 U	1.0 U	1 U
Potassium		4620 J	4220 J	4270	4020 J	3880 J	4430
Selenium	10	35.0 U	6.1 U	6.1 U	35.0 U	6.1 U	6.1 U
Silver	50	10.0 U	0.8 U	0.8 U	10.0 U	0.8 U	0.8 U
Sodium	20000	**34900**	**23000**	**23100**	**108000**	**68600**	**77500**
Thallium	0.5*	25.0 U	5.9 U	5.9 U	25.0 U	5.9 U	5.9 U
Vanadium		50.0 U	0.5 U	0.6 J	0.67 J	0.5 U	0.7 J
Zinc	2,000*	1.6 J	2.2 J	1.5 J	1.4 J	1.3 J	1 U

Notes:

(yellow highlight) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

* - NYSDEC Class GA Guidance Value

(1) - MW-X is a duplicate sample collected at MW-1S

D - Sample was Dissolved

B - Detected in Sample and Method Blank

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	**NYSDEC Class GA Standards**	**MW-1S 8/7/2007 ug/L**	**MW-1S 10/1/2008 ug/L**	**MW-1S 6/18/2009 ug/L**	**MW-1S 3/24/2010 ug/L**	**MW-1S 6/22/2011 ug/L**
Analyte						
PCB-1016	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
PCB-1221	-	1.1 U	1.1 U	0.52 U	0.53 U	0.5 U
PCB-1232	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
PCB-1242	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
PCB-1248	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
PCB-1254	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
PCB-1260	-	0.54 U	0.53 U	0.52 U	0.53 U	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

(yellow) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-1D 8/7/2007 ug/L	MW-1D 10/1/2008 ug/L	MW-1D 6/18/2009 ug/L	MW-1D 3/24/2010 ug/L	MW-1D 6/22/2011 ug/L
Analyte						
PCB-1016	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
PCB-1221	-	1.1 U	1.0 U	0.5 U	0.5 U	0.5 U
PCB-1232	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
PCB-1242	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
PCB-1248	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
PCB-1254	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
PCB-1260	-	0.54 U	0.52 U	0.5 U	0.5 U	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

- Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-2S 8/7/2007 ug/L	MW-2S 10/2/2008 ug/L	MW-2S 6/18/2009 ug/L	MW-2S 3/24/2010 ug/L	MW-2S 6/22/2011 ug/L
Analyte						
PCB-1016	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
PCB-1221	-	1.1 U	1.1 U	0.5 U	NS	0.5 U
PCB-1232	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
PCB-1242	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
PCB-1248	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
PCB-1254	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
PCB-1260	-	0.56 U	0.54 U	0.5 U	NS	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

- Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-2D 8/7/2007 ug/L	MW-2D 10/1/2008 ug/L	MW-2D 6/18/2009 ug/L	MW-2D 3/24/2010 ug/L	MW-2D 6/25/2011 ug/L
Analyte						
PCB-1016	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
PCB-1221	-	1.1 U	1.1 U	0.5 U	0.53 U	0.5 U
PCB-1232	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
PCB-1242	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
PCB-1248	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
PCB-1254	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
PCB-1260	-	0.56 U	0.55 U	0.5 U	0.53 U	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

- Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-3S 8/8/2007 ug/L	MW-3S 10/2/2008 ug/L	MW-3S 6/19/2009 ug/L	MW-3S 3/25/2010 ug/L	MW-3S 6/23/2011 ug/L
Analyte						
PCB-1016	-	0.50 U	0.53 U	0.5 U	0.5 U	0.63 U
PCB-1221	-	1.0 U	1.1 U	0.5 U	0.5 U	0.63 U
PCB-1232	-	0.50 U	0.53 U	0.5 U	0.5 U	0.63 U
PCB-1242	-	0.50 U	0.53 U	0.5 U	0.5 U	0.63 U
PCB-1248	-	0.40 J M	0.53 U	0.5 U	0.5 U	0.63 U
PCB-1254	-	0.50 U	0.53 U	0.5 U	0.5 U	0.63 U
PCB-1260	-	0.19 JMB	0.53 U	0.5 U	0.5 U	0.63 U
Total PCBs	0.09	**0.59**	-	-	-	-

Notes:

(yellow highlight) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-3D 8/8/2007 ug/L		MW-3D 10/2/2008 ug/L		MW-3D 6/19/2009 ug/L		MW-3D 3/25/2010 ug/L		MW-3D 6/23/2011 ug/L	
Analyte											
PCB-1016	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
PCB-1221	-	1.0	U	1.9	U	0.54	U	0.54	U	0.5	U
PCB-1232	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
PCB-1242	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
PCB-1248	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
PCB-1254	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
PCB-1260	-	0.5	U	0.93	U	0.54	U	0.54	U	0.5	U
Total PCBs	0.09	-		-		-		-		-	

Notes:

- Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-4S 8/7/2007 ug/L	MW-4S 10/1/2008 ug/L	MW-4S 6/18/2009 ug/L	MW-4S 3/24/2010 ug/L	MW-4S 6/22/2011 ug/L
Analyte						
PCB-1016	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
PCB-1221	-	1.1 U	1.1 U	0.5 U	0.54 U	0.5 U
PCB-1232	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
PCB-1242	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
PCB-1248	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
PCB-1254	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
PCB-1260	-	0.56 U	0.54 U	0.5 U	0.54 U	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

(yellow) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-10
Summary of Groundwater Sampling Results - PCBs
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	MW-4D 8/7/2007 ug/L	MW-4D 10/1/2008 ug/L	MW-4D 6/18/2009 ug/L	MW-4D 3/24/2010 ug/L	MW-4D 6/22/2011 ug/L
Analyte						
PCB-1016	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
PCB-1221	-	1.2 U	1.0 U	0.5 U	0.52 U	0.5 U
PCB-1232	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
PCB-1242	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
PCB-1248	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
PCB-1254	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
PCB-1260	-	0.61 U	0.52 U	0.5 U	0.52 U	0.5 U
Total PCBs	0.09	-	-	-	-	-

Notes:

(yellow) - Concentration exceeds corresponding NYSDEC Class GA Standard

U - Analyte not detected

J - Estimated value

M - Manual integrated compound

B - Analyte was detected in Method Blank.

NS - No sample. Container damaged.

Table 3-11
Summary of Surface Water Sampling Results - Metals
Columbia Mills
Minetto, New York
NYSDEC Site No. 7-38-012

Sample Date Units	NYSDEC Class GA Standards	NYSDEC Class AA Standards	POND 6/18/2009 ug/L	STREAM 6/18/2009 ug/L
Dissolved Metals				
Aluminum		100	19.9 JB	139 JB
Antimony	3	3	3.0 U	3.0 U
Arsenic	25	50	2.0 U	2.0 U
Barium	1000	1000	60.3	64.3
Beryllium	3	3	0.2 U	0.2 U
Cadmium	5	5	0.3 U	0.3 U
Calcium			35800 B	36700 B
Chromium	50	50	0.3 J	0.4 J
Cobalt		5	0.8 JB	0.8 JB
Copper	200	200	1.3 U	1.3 U
Cyanide	200	200		
Iron	300	300	173 B	**448 B**
Lead	25	50	1 J	1.0 U
Magnesium	35,000*	35000	8090 B	8080 B
Manganese	300	300	73.9 J	**610**
Mercury	0.7	0.7	0.1 U	0.1 U
Nickel	100	100	1.0 U	1.5 J
Potassium			1080	1200
Selenium	10	10	6.1 U	6.1 U
Silver	50	50	0.8 U	0.8 U
Sodium	20000		15000	17300
Thallium	0.5*	0.5*	5.9 U	5.9 U
Vanadium		14	0.5 J	0.9 J
Zinc	2,000*	2,000*	1.0 U	7.5 J

Notes:

(yellow highlight) - Concentration exceeds corresponding NYSDEC Standard

U - Analyte not detected

* - NYSDEC Class GA Guidance Value

(1) - MW-X is a duplicate sample collected at MW-1S

D - Sample was Dissolved

B - Detected in Sample and Method Blank

Table 4-1
Work Assignment Budget
Columbia Mills
NYSDEC Site Number 7-38-012

Work Assignment Budget	
Item	**Cost**
Labor	$30,348
Indirect Costs	$53,200
Direct Non-salary Costs	$6,953
Subcontractor Fees	
Laboratory	$3,250
Fence Repair	$2,065
Field Assistance	$8,788
Subcontract Management fee	$543
Fixed Fees	$8,355
Total	**$113,502**

Project Expenses	
2007 Project Expenses	$16,640
2008 Project Expenses	$17,072
2009 Project Expenses	$26,350
2010 Project Expenses	$24,010
Total Project Expenses	**$84,072**
Remaining Budget	**$29,430**

Note:
Budget information from 2.11 forms

Table 4-2
Opinion of Probable Cost
Columbia Mills Site Management
NYSDEC Site Number 7-38-012

Periodic Review Recommendation **Item**	**Cost**
Title Search	$250
Site Survey	$7,500
Revise Site Maps and Drawings	$1,500
Prepare Site Documents	$15,000
CAP	
SMP	
O&M Plan	
LTM Plan	
IC/EC Plan	
Contingency Plan	
(A) Sub-total	**$24,250**

Anticipated Costs	**Cost**
2011 Calander Year (O&M, Sampling, Reporting)	$25,211
2012 Calander Year (O&M, Sampling, Reporting)	$26,471
Contingency (+10%)	$5,168
(B) Sub-total	**$56,850**

Opinion of Probable Cost (A+B)	**$81,100**
(C) Remaining Work Assignment Funds	**$29,400**
Remaining Funds (C-(A+B))	**-$51,700**

Appendix **A**

Record of Decision

FILE COPY

Columbia Mills Site

Minetto (T), Oswego County, New York

Site No. 7-38-012

RECORD OF DECISION

March 1992

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE

Prepared by:
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation

18

Columbia Mills Site

Minetto (T), Oswego County, New York

Site No. 7-38-012

RECORD OF DECISION

March 1992

Prepared by:
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

DECLARATION STATEMENT - RECORD OF DECISION (ROD)

Columbia Mills Site
Minetto, Oswego County
Site No. 07-38-012

Statement of Purpose

The Record of Decision (ROD) sets forth the selected Remedial Action Plan for the Columbia Mills inactive hazardous waste site. This Remedial Action Plan was developed in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the New York State Environmental Conservation Law (ECL). The selected remedial plan complies to the maximum extent practicable with the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, of 1985.

Statement of Basis

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Columbia Mills site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix 5 of the ROD.

Description of Selected Remedy

The selected remedial action plan will control the potential contaminant routes of exposure to human health and the environment through excavation, capping and containment, and treatment of the source waste. The remedy is technically feasible and complies with the statutory requirements. Briefly, the selected remedial action plan includes the following:

A) Stabilize and cap wastes in the former plant disposal area and collected and treat groundwater from the area of capped wastes. Wastes in the landfill area will be

stabilized to prevent leaching of metals followed by containment. Containment will consist of the construction of a single membrane barrier cap in conjunction with a barrier drain to collect and transport for treatment, the leachate from the fill. In addition a second trench system will drain three ponds which currently form the edges of the landfill and will serve to direct surface water and groundwater away from the containment area. The contaminated pond and stream sediments, as well as soils and sediments from the main plant also contaminated with metals will also be included in this on-site containment system.

This containment system will eliminate the infiltration of precipitation into the landfill waste, prevent migration of contaminants into the surrounding environment, and will prevent the direct contact by both people and wildlife with the waste. Leachate will be collected and is expected to be treated on site and discharged to surface water or collected for off-site treatment, as appropriate. Treatment will meet the appropriate permit requirements for its discharge.

A groundwater monitoring program will be implemented to monitor the effectiveness of this system. Since the selected remedy results in hazardous wastes remaining on site, at a minimum, a five-year review of the effectiveness of the remedy is required. This review will be conducted to evaluate whether the implemented remedy continues to provide adequate protection of human health and the environment.

B) Extraction and treatment of the volatile organic compound contaminated groundwater in the UST Area 1 with vapor extraction treatment of soil hot spots. Groundwater treatment will commence first and will control contaminant migration in the aquifer. The vacuum extraction will be used only as necessary to remediate contaminated soil hot spots. Groundwater will be treated as necessary to meet the appropriate permit requirements for its discharge. Treatment is expected to be accomplished with air stripping or carbon absorption, and will be discharged to surface water. Groundwater and soils treatment design will incorporate proper controls so that all air discharge and water quality standards or criteria for discharge will be met.

C) Remove the sediments from the plants sewers and dispose of in the on-site landfill or off-site facility followed by the abandonment of sewer lines. This remedy will project the public health by eliminating the possibility of future contact with these materials and will eliminate current discharges to the Oswego River. It is expected that most sediments will be disposed of on the on-site landfill. However, any sediments which test as characteristic hazardous waste or contain high levels of organic contamination will be disposed of in an off-site facility.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected Remedial Action Plan is protective of human health and the environment. The remedies selected will meet the substantive requirements of the Federal and State laws, regulations and standards that are applicable or relevant and appropriate to the remedial action. The remedies will satisfy, to the maximum extent practicable, the statutory preference for remedies that employ treatment that reduce toxicity, mobility or volume as a principal element. This statutory preference will be met in the landfill by eliminating the mobility of contaminant pathways of exposure to human health and the environment through the installation of a containment system for the source waste at this site. In UST Area 1, the toxicity, mobility and volume of contaminants in the soil and groundwater will be reduced by the treatment system to be implemented, while in the sewer systems, the mobility of the contaminants will be addressed by their removal from an area of active migration on the sewers and contained either on or off site.

3-25-92
DATE

Edward O. Sullivan
Deputy Commissioner

TABLE OF CONTENTS

Columbia Mills Site
Minetto (T), Oswego County, New York
Site No. 07-38-012

Section

X

SECTION 1: SITE LOCATION AND DESCRIPTION

The Columbia Mills site is an abandoned manufacturing plant located along Route 48 near to its intersection with Route 25, in the Town of Minetto, Oswego County. The site consists of approximately 100 acres of land, 10 of which constitute the main plant area, and 90 acres of wooded area, part of which is the site of the former plant landfill. The site is bounded on the east by Route 48, which runs parallel to the Oswego River, by Benson Avenue (Route 25) to the south, on the north by Snell Road (Route 42) and to the west by a Conrail track right-of-way (Figures 1 and 2). The area surrounding the site consists of both residential and agricultural areas. The Oswego River is approximately 100 feet northeast of the site.

The main plant area is comprised of nine standing structures, several partially and completely demolished buildings, rubble and a 200-foot tall radial brick chimney. Several underground tunnels, including one that crosses Route 48, still exist in the main plant area along with the abandon plant sewer systems. Two ponds which were used to store process water for the plant are located to the north and northwest of the main plant area.

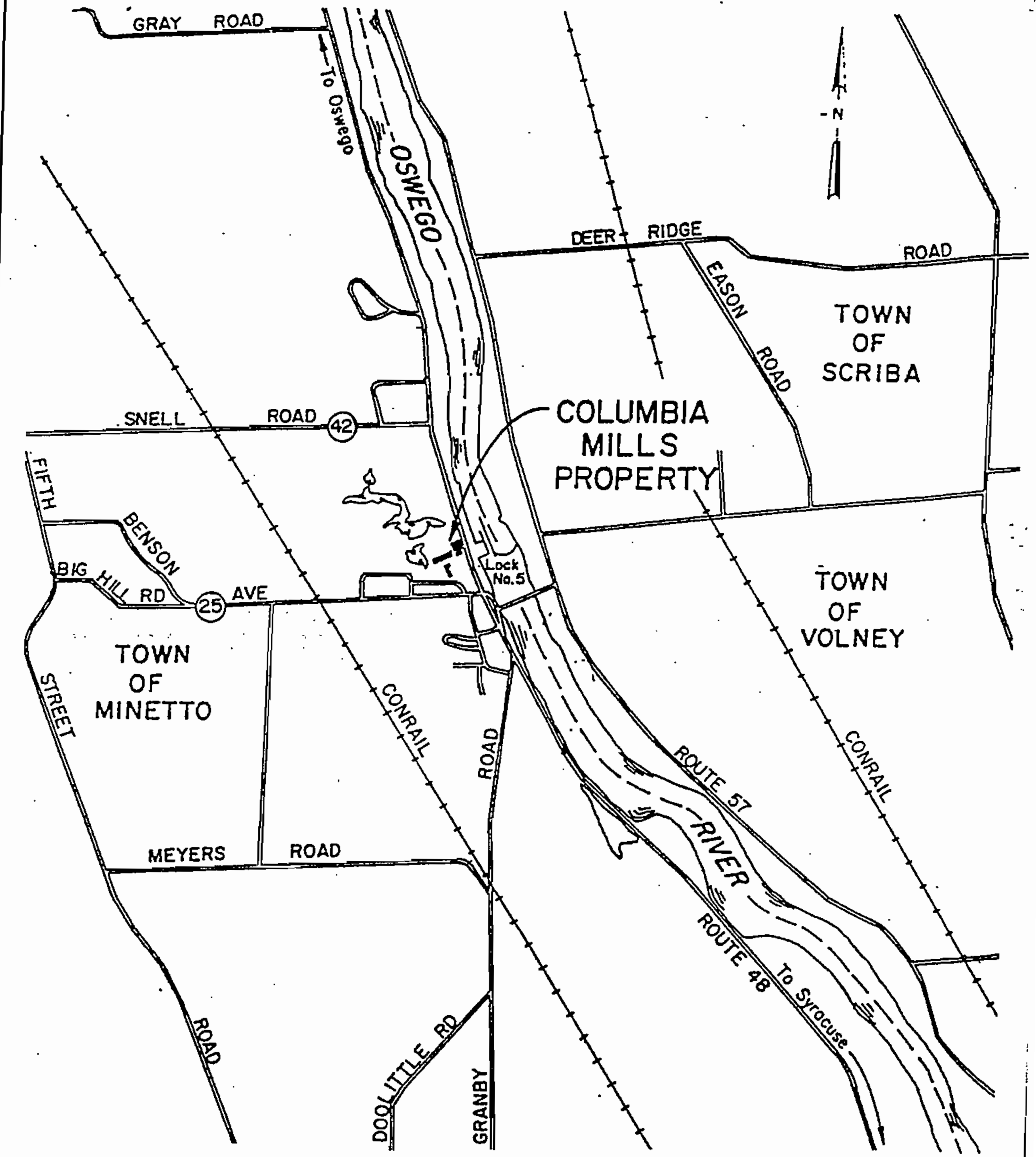
To the west of the main plant area there exists approximately 90 acres of undeveloped land. This area includes several ponds, streams, and the former plant landfill. The landfill is approximately five acres in area and consists of drums, ash, and debris. It is partially bordered by three ponds, designated ponds 1, 2 and 3. Pond 1 discharges into an unnamed creek which runs toward the main plant and discharges into the larger of the former process ponds. The landscape of this area is gently rolling and is predominantly heavily wooded. Ten acres of the property to the far north consists of low lying marshy areas, which includes a NYSDEC designated wetland area.

SECTION 2: SITE HISTORY

The Columbia Mills Company was a manufacturer of coated cloth and vinyl products from 1887 until the plant closed in 1976. After the plant ceased to operate, the property was sold to Columin Development Corporation, who initiated salvage operations. During the salvaging process asbestos (from pipe wrappings and other sources) was left exposed and buried in rubble. This salvaging operation ended prematurely and Columin defaulted on property taxes. There is currently a dispute regarding ownership and the property belongs to Oswego County and/or the Town of Minetto.

2.1: PREVIOUS INVESTIGATIONS

Site Reuse Investigation: In 1984, Calocerinos & Spina (C&S) was retained by Oswego County to evaluate the potential for site reuse. During this investigation several potential hazards were identified on site. Containers of chemicals and underground storage tanks were identified as well as physical hazards due to the lack of site security measures.



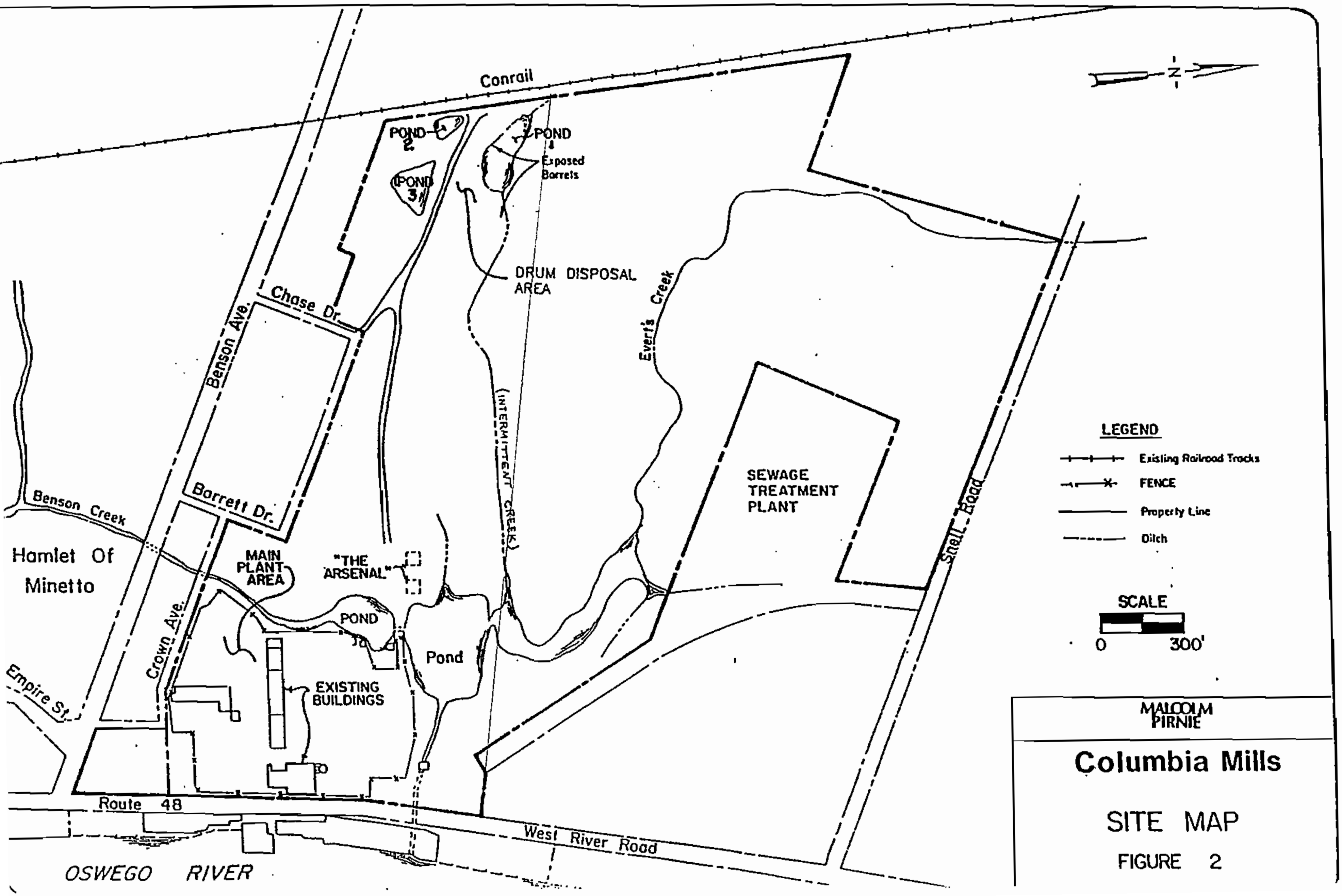
MALCOLM PIRNIE

COLUMBIA MILLS
SITE LOCATION MAP

FIGURE 1

APRIL 1988

SCALE: 1" = 2000'



Columbia Mills

SITE MAP

FIGURE 2

Phase II Investigation: In order to evaluate potential contaminant sources in the main plant and drum disposal areas relative to human health and the environment, to improve site security measures and to arrange for the removal of the drums and bags of chemicals in the main plan area, during 1985 C&S was authorized by Bond, Schoeneck & King, attorneys for the Columbia Mills company, to perform a Phase II site investigation.

Results of the Phase II investigation indicated that contamination of the soil, surface water and shallow groundwater by organics had occurred in locations hydraulically downgradient of underground storage tanks in the main plant area. In addition, the presence of metals and organic compounds resulted in contamination of the surface soil and metals contamination of surface water and sediment in the drum disposal area.

During the Phase II study site security was improved and actions were undertaken to characterize and remove the abandoned containers of chemicals in the main plant area.

Expanded Phase II Investigation: Following the NYSDEC review and comment of the Phase II report, Columbia Mills agreed to fund additional Phase II investigations and pursue an number of interim remedial measures (IRMs).

During the period March 1987 to August 1988 Malcolm Pirnie, Inc. performed several work tasks as part of the expanded Phase II investigation. Soil, sediment and surface water samples were collected on site and three additional deep groundwater monitoring wells were installed and sampled. A domestic water well inventory was performed in the vicinity of the site. Sixteen wells were identified as used for drinking water purposes, but none of these are located hydraulically downgradient of the site. During August 1987, approximately 200 samples of rubble and demolition debris from the main plant area were collected and analyzed for asbestos. Asbestos was found to be present throughout the main plant area in the buildings and debris piles.

Initial RI Report: Although a supplemental Phase II report was originally to be prepared at the conclusion of the expanded Phase II investigation, it was determined that since the reporting requirements would be similar, an RI report would be prepared in lieu of the supplemental Phase II report. Based on this decision, additional sampling and analyses were requested by the NYSDEC and the New York State Department of Health (NYSDOH). The additional sampling and analyses included collection of groundwater, surface water, sediments and soil samples for analysis for the compounds on the Target Compound List (TCL).

The results of the interim remedial actions and the post-Phase II investigation were presented in a draft RI report which was submitted to the NYSDEC and the NYSDOH in October 1988.

Additional Air Investigation: In August of 1988, due to the piles of debris containing asbestos material located in the main plant area, the NYSDEC's Division of Air Resources performed an ambient air investigation for asbestos to assess the risk immediate area of the test pit. After an evaluation of alternatives, vapor extraction conducted in conjunction with groundwater withdrawal was determined to be the most feasible alternative. Construction of the vapor extraction system began in the fall of 1991 and start-up is expected to begin in the spring of 1992. The system is expected to operate for several years.

3.2: RESULTS OF THE REMEDIAL INVESTIGATIONS (RI)

The RI was conducted by Malcolm Pirnie, Inc., for Columbia Mills, Inc., in two phases from October, 1989 to August 1991. Work tasks included:

- Conducting two soil gas surveys in the main plant area.
- Installing additional groundwater monitoring wells and piezometers.
- Excavating and sampling of test pits in the drum disposal area.
- Conducting a natural resources investigation at the site.
- Sampling groundwater, soil, sediment, and surface water.
- Investigating the storm sewers and conducting sampling of sewer water and sediment.
- Collection of biota and tissue sampling to examine possible site impacts on wildlife.

A summary of the major results and the conclusions of the supplemental RI for the different site area is provided below. Data tables are provided in Appendix 4. A complete description of all RI activities and data is contained in the RI/FS report.

DRUM DISPOSAL AREA:

Soils/Waste: RI activities in the drum disposal area included of test pitting and sampling of soils and wastes. The landfill is approximately five acres in area and consists of drums, ash, and debris at depths to 11 feet. The approximate area of contamination is shown in Figure 3. The fill material contains levels of cadmium (14.7 ppm to 28.5 ppm), chromium (112 ppm to 588 ppm), copper (156 ppm to 1100 ppm), lead (1300 ppm to 4600 ppm), zinc (856 ppm to 8950 ppm), and cyanide (1.4 ppm to 36.90 ppm). Previous sampling of the fill in the former railroad bed identified lead at 65,000 ppm on the surface. The results of the October, 1990 TCLP metals analysis identified lead from the surface soil at location No. 1 at 178 ppm which exceeds the regulatory level of 5 ppm, indicated the presence of a characteristic hazardous waste. Semi-volatile compounds were detected in all samples. The only VOC detected in the soils was toluene at concentrations of 2 ppb and 7 ppb.

Groundwater: Groundwater in the drum disposal area exists in both the overburden deposits (shallow zone) and bedrock (deep zone). Bedrock in this area due to off site migration. Samples were taken at the site boundary downwind of debris piles. Asbestos levels detected were all at or below expected ambient concentrations.

SECTION 3: CURRENT STATUS

Upon review of the draft RI report it was determined that additional work was necessary to define the nature and extent of contamination resulting from the various areas of the site. An order on Consent was signed on March 20, 1989 between Columbia Mills, Inc. and the NYSDEC. This document set forth the time frame for the development and implementation of a supplemental RI and Feasibility Study (FS). Due to known contamination at elevated levels in three areas of the main plant area, Columbia Mills signed a second consent order for three IRMs.

3.1: INTERIM REMEDIAL MEASURES (IRMS)

Prior to the supplemental RI the following IRMs were undertaken at the site:

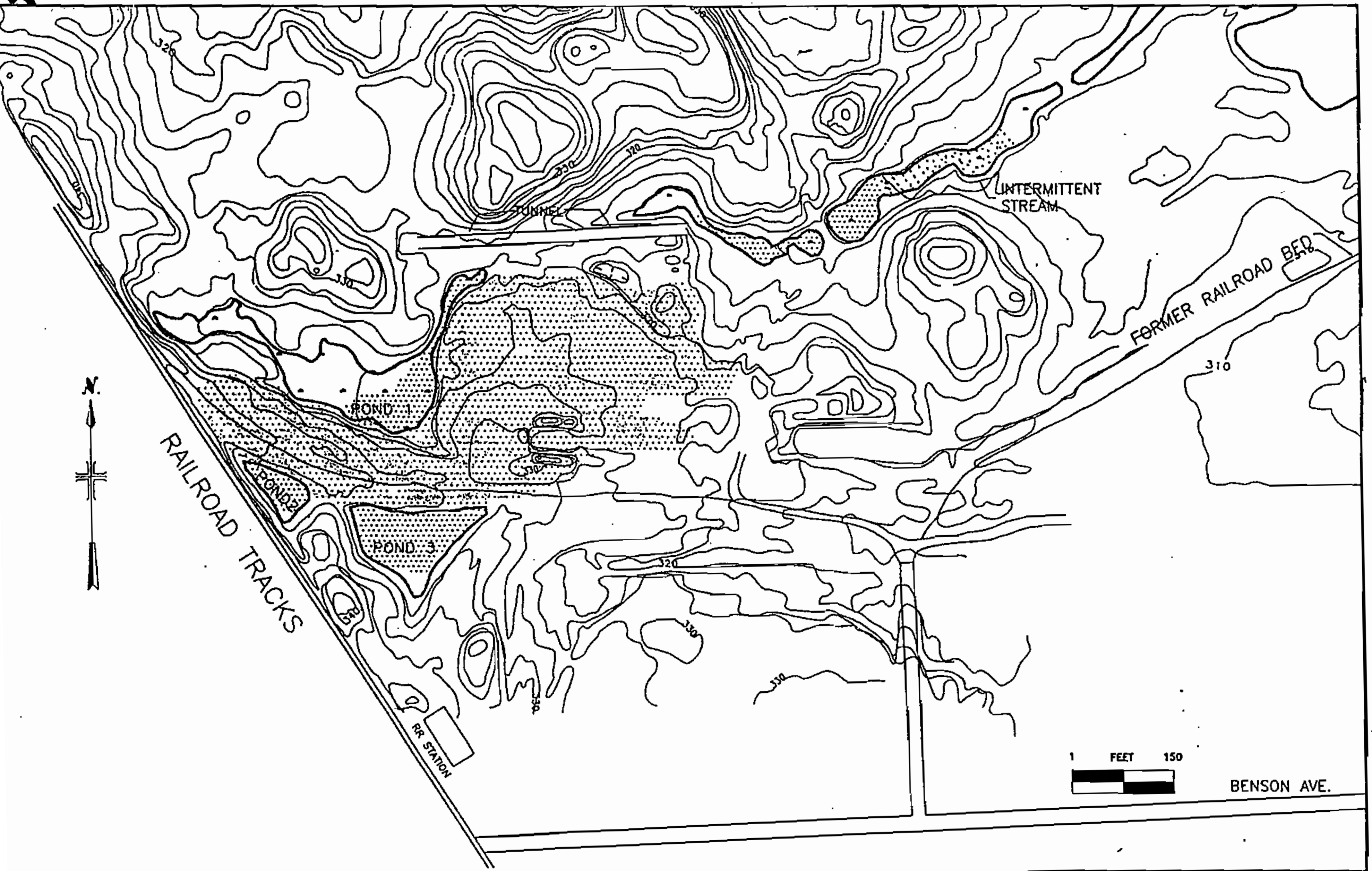
- A fence was secured around the main plant area in 1985.
- In the fall of 1987 over 100 containers of chemicals were removed from the main plant area.
- Eight underground storage tanks were removed from the site in the summer of 1988. Contaminated soils were excavated and staged in piles on site.
- In June 1988 the accessible part of the most contaminated area of the drum disposal area was covered with a six inch soil cover to prevent contact with surface soils.

The more current IRM program under the IRM Order on Consent addressed three locations with known contamination in the main plant area:

Building 8 IRM: Results of the 1987 and 1988 PCB sampling in Building 8 identified soil contaminated with up to 43,000 ppm of PCBs. Removal of these soils was undertaken during September 20 - 21, 1989.

Stockpiled Soil IRM: This IRM involved spreading and aerating the contaminated soil piles from the 1988 tank excavations, to reduce the VOC levels. This remediation occurred during July through September 1990 and resulted in levels of less than 1 ppm well below the clean-up goal of 10 ppm.

Test Pit 3 IRM: No tanks were unearthed in the UST area 3 in 1987, but soil sampling in the test pit indicated the presence of toluene (11,000 ppb), ethylbenzene (4,800 ppb) and xylenes (59,000 ppb). A small scale pilot vapor extraction test was conducted during September 1990 on the VOC contaminated surface soils in the



-SOIL / FILL REMEDIAL UNIT

-POND & CREEK SEDIMENT REMEDIAL UNIT

COLUMBIA MILLS

DRUM DISPOSAL AREA
SOIL / FILL & SEDIMENT
REMEDIAL UNIT LOCATIONS

MALCOLM	Date	Figure No.

occurs at depths of less than one foot below land surface to 20 feet. Groundwater flow in the shallow zone in the fill area is generally north, from pond 3 to pond 1. In the deep zone groundwater flow is east towards the river.

Metals and semi-volatile compounds were detected in the shallow groundwater of the drum disposal area at B-10S where lead (80 ppb), zinc (614 ppb), and cyanide (143 ppb) exceeded standards. Semi-volatiles found to be present at concentrations above their class GA values are: Benzo (a) anthracene, chrysene, benzo (b) floranthene, benzo (k) flouranthene, and benzo (d) pyrene. Values were estimated at 1-3 ppb. For the deep groundwater, the volatile organic compounds, toluene, Trichloroethene (TCE) and methylethyl ketone (MEK), were detected in MW-10D at levels below groundwater standards.

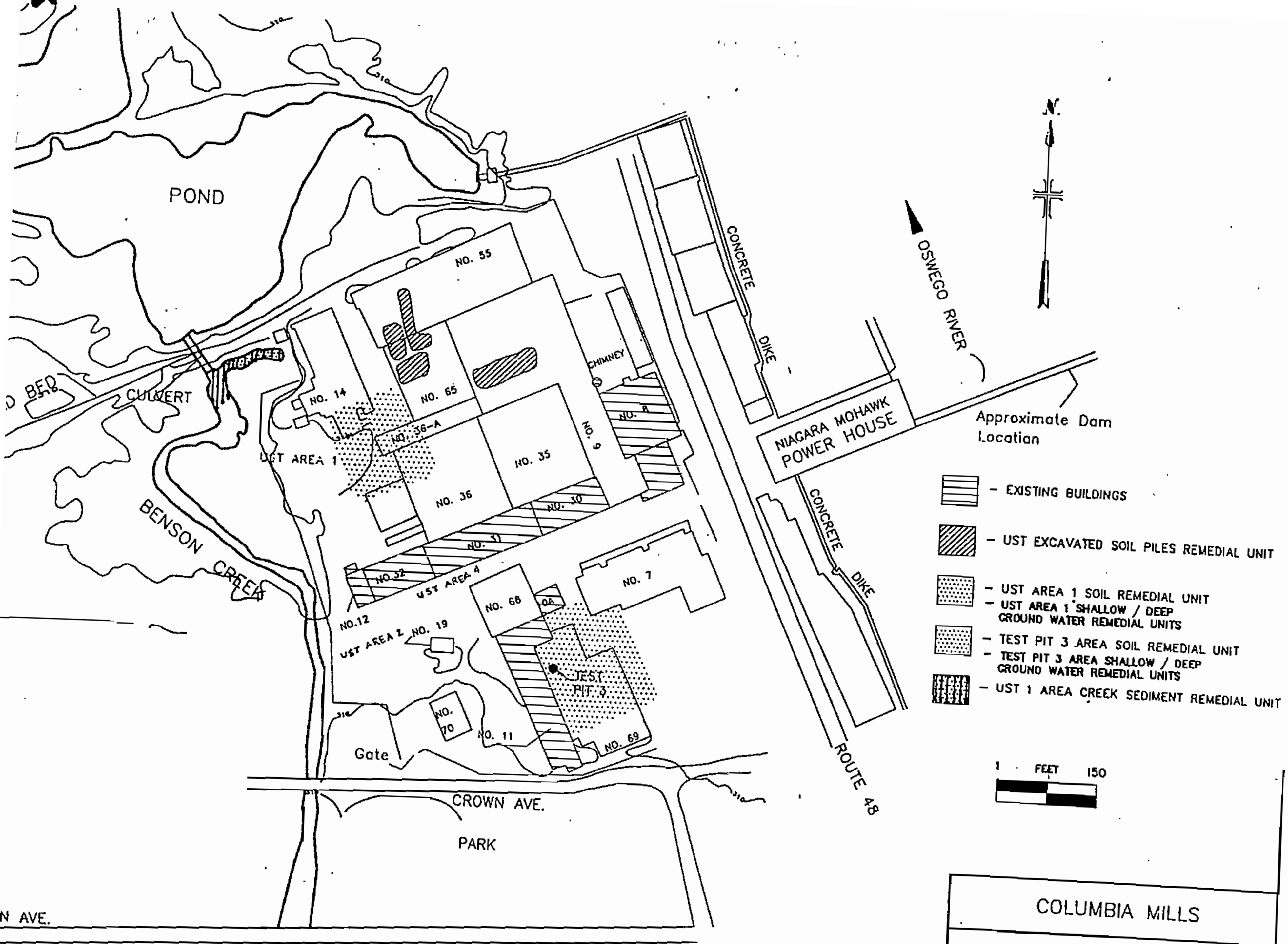
Sediments: Elevated levels of some metals have been detected in the sediments of ponds 1, 2 and 3. The extent of contamination in the three ponds is determined primarily through the analysis of the previous data collected during 1985 and 1987. The extent of sediment contamination is shown in Figure 3. Sampling of sediments in pond 1 has indicated that the metals contamination is concentrated in the top one foot layer of sediments in the southeast quarter of the pond. Metals detected at elevated concentrations in this area include cadmium (.35 ppm to 6.6 ppm), chromium (2.6 ppm to 110 ppm), copper (5.7 ppm to 180 ppm), lead 1.7 ppm to 480 ppm), nickel (2 ppm to 130 ppm), and zinc (41 ppm to 2300 ppm). In pond 3 sediments, the 1985 sampling identified lead up to 13,000 ppm. The October 1990 RI TCLP sampling of pond 3 identified lead at 18 ppm, exceeding the TCLP regulatory level. In pond 2, the 1985 sampling identified elevated metals; particularly lead (720 ppm to 3,000 ppm) and zinc (94 ppm to 7800 ppm).

The sediment in the intermittent stream running from pond 1 to Evert's Creek was sampled for inorganics as part of the supplemental RI. The sample locations closest to the drum disposal area, SED-4, SED-5, and SED-6 contained the greatest number of metals at concentrations exceeding NYSDEC sediment criteria. Based on this information it appears that the metals contamination in the sediment in this stream is concentrated in a 400 foot section east of the concrete "tunnel", downstream from the drum disposal area.

Surface Water: In past sampling of the ponds there have been sporadic detections above surface water standards of cadmium, lead, and zinc. Limited surface water sampling was conducted in the drum disposal area as part of the additional RI field work. The only recent exceedence of class D standards was the June 1991 sample SW-8 of pond 1. Lead was detected at 270 ppb and zinc was detected at 2100 ppb.

MAIN PLANT AREA

Soil: Soil sampling was concentrated in the four areas where underground storage tanks (UST) had been present, identified as UST areas 1 through 4 (see Figure 4). In UST area 1, VOCs were detected in the soil zone directly above bedrock (10-12



COLUMBIA MILLS

MAIN PLANT AREA
SOIL & SEDIMENT
REMEDIAL UNIT LOCATIONS

MALCOLM	Date	Figure No.

feet). The compound detected at the highest concentration was toluene at 13 ppb. Benzene was detected at 16 ppb in boring B-19D which is located east of the tank area. The five surface soil samples located at the edge of UST area 1, on the bank of Benson Creek, identified some metals at slightly elevated levels. Metals in the borings taken in the tank area were at background levels.

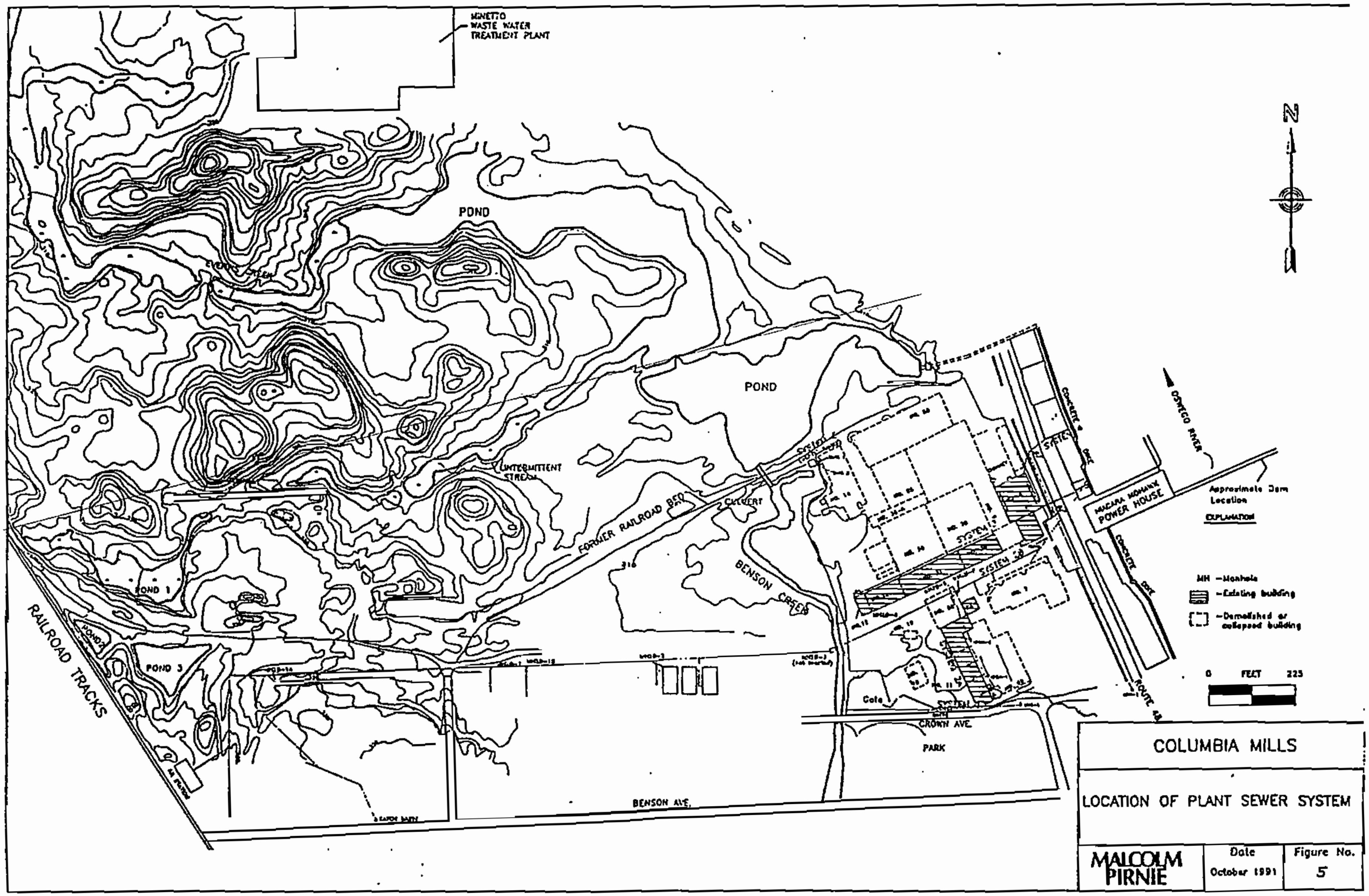
Previous sampling indicated the presence of VOCs in the soils of UST areas 2 and 4, however, detectable levels of VOCs were not found in these areas during the summer 1989 soil gas survey. Elevated levels of VOCs were found in the test pit 3 area soil. This contamination is being addressed under the IRM program. Semi-volatile compounds were also detected in this area but not at levels of concern.

The VOC contamination in the stockpiled soils from the former tank excavations was effectively alleviated through aeration of the soil. Supplemental RI sampling of the soil piles identified elevated levels of semi-volatile compounds and levels of lead up to 2420 ppm.

Groundwater: Similar to the drum disposal area, groundwater in the main plant exists in both the overburden deposits (shallow zone) and bedrock (deep zone). Shallow groundwater flow, in the main plant area, is complicated by the presence of the building foundations, tunnels, and storm sewers. Over most of the main plant area shallow groundwater is collected by the bedding of sewer system 2B and discharged to the Oswego River. In other sections, groundwater discharges to Benson Creek. The deep groundwater flow pattern is influenced by the water ponded behind the Niagara-Mohawk hydroelectric dam. Much of the deep zone groundwater, therefore, flows north towards Benson Creek and the main pond before discharging to the Oswego River.

In the main plant area sampling of shallow and deep groundwater monitoring wells identified VOC contamination in the area east of UST Area 1 and in the vicinity of UST Area 3 (see Figure 4). In the UST Area 1 the shallow groundwater contained toluene (4 ppb) and TCE (71 ppb) in Well B-21S. VOC contamination was confirmed during additional sampling of this well in April 1991, with several compounds exceeding groundwater standards. The following compounds were detected: Vinyl chloride (18 ppb), 1, 2 DCE (85 ppb), TCE (100 ppb), Benzene (2 ppb), MEK (19 ppb). A little further east, in the bedrock groundwater at B-19D, benzene and toluene have been consistently detected at concentrations exceeding their respective GA standards. The concentration of benzene has averaged 16.5 ppb and toluene 66.5 ppb. Contamination has migrated to a depth in bedrock greater than B-19D as sampling of the deeper well, B-25D, during April 1991 indicated the presence of toluene at 41 ppb. The deep bedrock represents a poor-water bearing unit.

In the test pit 3 area, analytical results of the RI sampling of the shallow monitoring wells and the deep wells have indicated that, in general, only low levels of VOCs are present in the groundwater in this area. The only MCL/GA standard exceedences noted for organics were toluene (10 ppb) and MEK (140 ppb). Tentatively identified compounds (TICs), identified as cyclohexanes, appear to be the main contaminants in the test pit 3 area groundwater.


MINETTO WASTE WATER TREATMENT PLANT
POND
POND
EVERTS CREEK
INTERMITTENT STREAM
FORMER RAILROAD BED
CULVERT
BENSON CREEK
POND 1
POND 2
POND 3
RAILROAD TRACKS
BENSON AVE.
CROWN AVE.
PARK
Gate
SYSTEM
CONCRETE DIKE
OSWEGO RIVER
NIAGARA MOHAWK POWER HOUSE
ROUTE 48
Approximate Dam Location
N
EXPLANATION
MH -Manhole
-Existing building
-Demolished or collapsed building
0 FEET 225
COLUMBIA MILLS
LOCATION OF PLANT SEWER SYSTEM
MALCOLM PIRNIE
Date
October 1991
Figure No.
5

Sediments/Surface Water: The sediment in Benson Creek near UST area 1 was sampled for VOCs and inorganics as part of the supplemental RI. The analytical results indicate that two VOCs were detected in the sediments: MEK (37 ppb) at SED 2 and toluene (3 ppb) at SED 5. Metals analysis indicated that nearly all metals were present with the highest concentrations at locations SED 4 and SED 5. These samples were obtained from the area of ponded water between UST area 1 and the embankment north. Levels of lead were 429 ppm at SED 4 and 1560 ppm at SED 5. Further up on the bank from SED 5 lead was detected in sample SS-7 at 13,800 ppm.

Past sampling of surface water from Benson Creek near UST-area 1, which was performed before the tanks were removed, indicated the presence of VOCs. In the most recent analyses as part of this RI, no VOCs were detected and zinc was the only metal detected at 6 ppb.

Sewers: The investigation of on-site sewers identified six piping systems, which were sampled and characterized. Three of the systems 2A and B, 3, and 4 discharge to the Oswego River. Systems 1 and 6 consist of former roof drain piping and contain no flowing of water. System 5 is the former septic drainage from building 14 and consists of 2 tanks which formerly discharged to Benson Creek. System 2B originates near the drum disposal area and runs under Benson Creek and through the main plant area. The sewers are shown in Figure 5.

Semi-volatile contaminants are present in sediment in all storm sewers which were sampled. System 6 contained no sediments and sampling of system 3 sediments in 1987 identified only the presence of metals. VOCs were detected at low levels in system 1 and 4 sediments. The highest detection was toluene at 170 ppm in SS-1 of system 2A. Metals and low levels of pesticides or PCBs were detected in most sediments sampled. In general, these contaminants exist at lower levels in the sewer waters, which discharge to the Oswego River.

Arsenal Area: The arsenal area is located behind the main plant area, shown on Figure 2. It was a former storage area for explosive chemicals which have since been removed from site. Overall, the magnitude of contamination in the arsenal area is very slight. Semi-volatiles appear to be the predominant contaminants in this area, but are present at low concentrations.

SECTION 4: ENFORCEMENT STATUS

The potentially responsible parties (PRPs) for the Columbia Mills site include Columbia Mills, Inc. and the Columin Development Corporation. Columbia Mills sold the property to Columin who then defaulted on property taxes and have not been located since. There is currently a dispute regarding ownership and the property belongs to Oswego County and/or the Town of Minetto.

On March 20, 1989, Columbia Mills, Inc. entered into an Order on Consent with the NYSDEC for the performance of the RI/FS. Columbia Mills also entered an Interim Order on Consent for remediation of the test pit 3 area, five soil piles from the underground storage tank excavations, and the building 8 area PCBs. To date, the RI/FS is complete and the Building 8 and soil pile IRMs have been completed. The construction activities associated with the pit 3 IRM will soon be completed and it is expected to be in operation in early 1992. It will operate for several years until contaminants present have been treated and reduced to below action levels.

SECTION 5: GOALS FOR THE REMEDIAL ACTIONS

Remedial action objective are established under the broad guidelines of meeting all standards, criteria, and guidances (SCGs) and for protecting human health and the environment. Human health risks are based on comparison to health remediation goals. Data relevant to the exposure levels of trespassers to the site is presented in the Baseline Risks Assessment Reports prepared by Malcolm Pirnie, Inc. The sediment criteria guidance document and the soil background levels will be used as guidelines for the remediation of pond and creek sediments and soils.

The media of concern identified for the Columbia Mills site are the soils/wastes, sediments and groundwater in the main plant area and drum disposal area. The remedial action objectives for the site are as follows:

1) Reduce contamination in site soils and sediments, including sewer sediments, to prevent unacceptable risks to human health and the environment.

2) Prevent direct exposure to surface soils sediments and contaminated groundwater.

3) Prevent releases from contaminated areas that would result in groundwater or surface water contaminant levels in excess of SCGs.

4) Reduce contaminant levels in the groundwater in order to achieve groundwater standards.

SECTION 6: SUMMARY OF THE EVALUATION OF THE ALTERNATIVES

The Columbia Mills site consists of two remedial areas: the main plant area and the drum disposal area. Three contaminated areas in the main plant area have been remediated or are being remediated by implementing Interim Remedial Measures (IRMs). The IRMs were discussed in Section 4.1. Within the two remedial areas the following remedial units, which are subject of this PRAP, have been identified:

1) Drum disposal area remedial units

- drums/fill
- shallow groundwater between ponds 1 and 3
- pond and creek sediments

2) Main plant area remedial units

- underground storage tank (UST) area 1 soils and excavated soil piles
- UST area 1 groundwater
- UST area 1 creek sediments
- sewer system sediments
- debris piles and building interiors (asbestos)

Based upon chemical and geologic information gathered during the RI, general response actions were identified for each medium of concern. The general response actions are listed in Appendix 2. Several remedial technologies were identified for each general response action. The various remedial technologies, listed in Appendix 2, were then screened for applicability and effectiveness based on the specific site characteristics and contamination present. These technologies were combined into alternatives comprehensively addressing the contamination at each remedial unit. These alternatives were then screened using the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) "Selection of Remedial Actions at Inactive Hazardous Waste Sites.

The alternatives evaluated in the detailed analysis are listed and discussed below for each remedial unit identified. The results of the TAGM scoring for each operable unit are in Appendix 2. For a complete discussion of this evaluation refer to Section 4 of the Feasibility Study Report, Vol. I.

A. **Contaminated Soils**

Drum Disposal Area Soil/Fill Material

Alternative 1: No action

Alternative 2: Drain ponds and re-route creek/cap in place.

Alternative 3: Drain ponds and re-route creek/lime stabilization/cap in place.

Alternative 4: Drain ponds and re-route creek/excavate/lime stabilization/cap in railroad right-of-way.

Alternative 5: Drain Ponds and re-route creek/excavate/dispose of in off-site landfill.

Alternatives 2, 3 and 4 involve draining and permanently diverting the ponds and surface water to prevent contact with the fill. Alternatives 3 and 4 add lime or other material to the fill to stabilize the metals. These alternatives involve capping the fill in place or in the railroad right-of-way. In alternative 5 the ponds are temporarily diverted to allow for excavation of the fill.

All action alternatives would be expected to comply with applicable SCGs. They would all be equally protective of human health and the environment, although off-site disposal of the waste would allow for unrestricted use of the land in that area. The two alternatives involving lime stabilization are more effective than just capping the material in place since an additional step would be taken to prevent the leaching of metals into the groundwater. The least difficult alternative to implement would be Alternative 2, since this alternative would not involve any additional treatment or excavation. The most difficult to implement would be Alternative 4 which involves excavation, lime stabilization in place and capping in the railroad right-of-way. Alternatives 3 and 5 are comparable in difficultly. The most cost effective alternative was determined to be Alternative 2 which involves capping the material in place. Disposing of the Drum Disposal Area fill material off site would be approximately ten times more expensive than Alternatives 2 or 3. <u>(The estimated costs for each alternative in the detailed analysis are listed in Appendix 3.)</u>

<u>UST Area 1 Soils</u>

Alternative 1: No action

Alternative 2: Excavation/on site disposal.

Alternative 3: Excavation/off site disposal.

Alternative 4: Soil washing (in situ)

Alternative 5: Vapor extraction

Except for the no action alternative all alternatives would be expected to achieve applicable SCGs and all would be protective of human health and the environment. The two in-situ alternatives of soil washing and vapor extraction would be more effective in the short term, mainly because they do not involve excavation. Excavating the soils would result in short term impacts from dust generation and possible VOCs becoming airborne. Also, the two in-situ treatment alternatives would be more effective in the long term, as the contamination would be destroyed rather than being moved from one location to another. Vapor extraction would be the least difficult alternative to implement, while excavation and on site disposal would be the most difficult to implement. This is because construction of an on site landfill would be necessary. Looking at relative costs, vapor extraction appears to be the most cost effective of the four alternatives.

<u>UST Excavated Soil Piles</u>

Alternative 1: No action

Alternative 2: Disposal in off-site landfill.

Alternative 3: Cap in railroad right-of-way.

Alternative 4: Lime stabilization/cap in railroad right-of-way.

These alternatives basically involve either disposing off site or placement under the cap in the drum disposal area. Alternatives 3 and 4 are dependent on the landfill option being chosen for the drum area fill.

Except for the no action alternative each of the alternatives would comply with applicable SCGs and provide for the protection of human health and the environment. Off site disposal of the soils would be less effective in the short term than the other alternatives. Increased traffic off site during remediation would pose short term risks and would also enhance the possibility of contaminant migration off site. In the long term, stabilization and capping the soil in the railroad right-of-way would be most effective since it is a more permanent solution, and results in the greatest reduction of toxicity and mobility.

Overall, alternatives 2, 3 and 4 appear to be equally implementable. Lime stabilization and capping the material in the railroad right-of-way would be less cost effective than just capping the material or off site disposal, but there does not appear to be a large incremental difference in cost between the three alternatives.

B. Sediments

Drum Disposal Area Pond and Creek Sediments/UST Area 1 Creek Sediments

Alternative 1: No action

Alternative 2: Excavation/on site disposal.

Alternative 3: Excavation/off site disposal.

Alternative 4: Excavation/treatment/ on site disposal.

Alternative 5: Excavation/treatment/ off site disposal.

Alternative 6: Excavation/lime stabilization/cap in railroad right-of-way.

All action alternatives involve the excavation of the sediments, with disposal either off site or on site. On site disposal would consist of either consolidating the material within the drum area fill or construction of an on-site landfill. The addition of a treatment or stabilization step would further reduce migration of contaminants.

Except for the no action alternative, all alternatives would comply with applicable SCGs. All would be equally protective of human health and the environment, although the off site disposal alternatives would remove the contamination from the site altogether. The alternatives which involve the disposal of the sediments on site are more effective in the short term. This is due in part to the possibility of contamination being transported off site when the sediments are removed for disposal in an off-site landfill. In the long term, Alternatives 4 and 5, which involve treatment appear to be the most effective because treatment will decrease the mobility of the contaminants.

Alternative 6 involving lime stabilization and capping with other on-site fill is considered to provide the greatest reduction of toxicity and mobility of contamination and is the most implementable. In terms of relative cost Alternative 6, would be the most cost effective alternative followed by an on site landfill while the least cost effective alternatives would be the off site disposal options.

C. Contaminated Groundwater

Drum Disposal Area - Shallow Groundwater

Alternative 1: No action

Alternative 2: Containment

Alternative 3 : Extraction/treatment/ discharge to surface water.

Alternative 4: Divert pond water/ lower groundwater table/collect and treat leachate/discharge to surface water.

Containment consists of vertical barriers, such as slurry walls, to restrict groundwater migration through the fill. The extraction alternative involves installing recovery wells in the drum disposal area. Alternative 4 involves the construction of two trenches one to divert surface water and groundwater around the landfill so they would not contact the fill. The second trench would collect groundwater from the fill for treatment.

With the exception of the no-action alternative, all alternatives will comply with applicable SCGs, including GA standards/guidance values and surface water discharge limits. The three action alternatives would be equally protective of human health and the environment.

The alternatives of containment and extraction/treatment would be equally effective in the short term impacts to the environment. In the long term, Alternative 4, divert pond water, would be the most effective. This alternative has the longest expected lifetime and a minimal amount of long term monitoring would be required. Diverting the pond water and discharging to surface water was determined to be the most implementable action alternative, while the remaining two alternatives, containment and extraction and treatment, were determined to be the least.

The most cost effective action alternative was determined to be Alternative 4. Alternative 3, extraction and treatment of the groundwater, was estimated to be the highest in cost.

Shallow Groundwater - UST Area 1/ Deep Groundwater (Well B-19D Area)

Alternative 1: No action

Alternative 2: Extraction/discharge to sanitary sewer.

Alternative 3: Extraction/ pretreatment/discharge to sanitary Sewer.

Alternative 4: Extraction/treatment/ discharge to surface water.

All action alternatives involve the installation of recovery wells to extract contaminated groundwater. These alternatives would be operated in conjunction with some type of soil remediation.

The alternatives that would treat the extracted groundwater prior to discharge would be expected to comply with all applicable SCGs would be the most protective to human health and the environment since the risk of exposures would be reduced by the removal of VOCs. During remediation, these two alternatives would also be the most effective due to the treatment of the contaminants in the water prior to discharge, but they are less implementable than the no treatment option. The extraction and treatment alternatives would be the least cost effective. Overall, the alternative of treating the water and discharging it to surface water would be the most feasible.

D. Contaminated Sewer Sediment

The sewer systems 1, 2A, 2B, 3, and 4 were evaluated separately in the FS, but for simplicity these sewer systems will be discussed together since many alternatives overlap. Three or more of the following alternatives were evaluated for each sewer system:

Alternative 1: No action (all systems).

Alternative 2: Monitoring/permitting (systems 1 and 4).

Alternative 3: Close line in place (systems 1, 2A, 3 and 4).

Alternative 4: Flush sediments/off site disposal (systems 2A, 2B, 3 and 4).

Alternative 5: Excavation/off site disposal (system 1).

Alternative 6: Close main plant section of line 2B in place/divert upstream flow into Benson Creek (system 2B only).

Most systems can either be closed in place or have sediments flushed out for disposal. Alternative 2 would involve extending the site fence to include system 1 and monitoring would be required, for system 4 a permit would be obtained for the discharge of the sewer water. Alternative 3 involves sealing manholes and plugging sewer lines with grout. For system 2B, diverting the upstream portion of the line to Benson Creek (Alternative 6) will prevent water from continuing to flow through contaminated areas of the main plant.

Although no SCGs are directly applicable to the sediments in the sewers, all alternatives would comply with any action specific SCGs. Closing lines or flushing sediments are the most protective of human health and reduce mobility of contaminants. Closing lines in place would be the most implementable action alternative, and also most cost effective, however, removal of sediments or line excavation would be the most protective remedy in the long term.

Sewer System 5

Sewer System 5 is discussed separate from the other sewer systems since it involves two small buried septic tanks containing sediments. The alternatives evaluated are as follows:

Alternative 1: No action

Alternative 2: Close system in place (fill with concrete).

Alternative 3: Excavate tanks and sediment/cap in railroad right-of-way.

Although no SCGs are applicable to the sediments in Sewer System 5, the sediments in Tank 2 may be contributing to the slight contamination of water present in that tank. This water may be conveyed to Benson Creek. All alternatives would provide for the protection of human health and the environment. The no action alternative would provide no reduction in contaminant toxicity, mobility or volume since no action would be taken. Closing the system in place would provide for the greatest reduction in contaminant mobility, while excavating the tanks and sediment and disposing of them in the Drum Disposal Area would provide slightly less.

In terms of cost effectiveness, the no action alternative was rated the highest. the most cost effective action alternative was determined to be closing the system in place. Excavating and capping the material in the railroad right-of-way would involve a slight incremental increase in costs.

SECTION 7: SUMMARY OF THE GOVERNMENT'S DECISION

All of the remedial units discussed above are summarized under three preferred alternatives which are presented in Table 1. Each remedial measure is described below along with the rationale for its selection. All remedial units are shown in Figures 3, 4, and 5. These remedies do not address the asbestos problem in the main plant area. Asbestos cannot be addressed under the inactive hazardous waste remedial program.

A. Stabilize and Cap Wastes in the Railroad Right-of-Way/Collect and Treat Groundwater from the Area of Capped Waste.

Wastes in the landfill area will be stabilized to prevent leaching of metals followed by containment. Containment will consist of the construction of a single membrane barrier cap in conjunction with a barrier drain to collect and transport for treatment the leachate from the fill. In addition a second trench system will drain the three ponds which currently form the edges of the landfill and will serve to direct surface water and groundwater away from the landfill. The contaminated pond and stream sediments as well as soils and sediments from the main plant will also be included in this on-site containment system, after treatment, to stabilize metals.

This remedy will include a groundwater monitoring program to insure the remedy is effective. In addition, since the selected remedy results in hazardous wastes remaining on site, at a minimum, a five year review of the effectiveness of the remedy is required. In addition, deed restrictions or other appropriate measures shall be instituted to prohibit future use as residential and to inform future owners of the conditions. A more detailed description of this alternative is presented in Appendix 1, along with diagrams depicting this remedial measure.

Lead has been established as the indicator parameter to determine the boundaries for remediation in the drum disposal area fill material the suggested clean-up level for lead is to the background levels in the adjacent community. This clean-up goal will be further evaluated during the design phase of the project. Confirmatory sampling will be required as appropriate to define clean-up goals and the remedial boundaries during construction.

The NYSDEC wetland designated OW-16 lies within the northwest corner of the Columbia Mills property. However, since the area being remediated does not lie within the NYSDEC designated wetland area, and should not interfere with it, a permit will not be required.

All SCGs will be met with this alternative by preventing the flow of precipitation and groundwater through the fill material which will stop the leaching of metals into the groundwater. Any groundwater or leachate migrating from the fill will be collected and treated before discharge. Although unrestricted use of the land following remediation will not be possible, this alternative will protect human health and the environment since contact with the fill will be prevented by the cap.

Short term risks of blowing dusts during remediation can be controlled by wetting the work area. Operation and maintenance will involve monitoring groundwater quality, cap maintenance and repair, and collection and treatment of leachate. While the implementability of this alternative is considered to be similar in complexity to off site disposal, this alternative is, however, cost effective since the cost of off site disposal is estimated to be ten times the cost of this alternative.

B. Extraction and Treatment of Groundwater in the UST-1 Area with Vapor Extraction Treatment of Soil Hot Spots

The recommended alternative for the UST Area 1 volatile organic compounds is groundwater extraction and treatment in conjunction with vacuum extraction of soils, as necessary. This treatment technology is currently proceeding as an IRM in the UST Area 3. Groundwater treatment will commence first to control contaminant migration and will also serve to lower the groundwater table for the vacuum extraction process. The groundwater is expected to be treated by air stripping or carbon absorption and applicable measures will be taken so that air streams meet air standards and criteria. The vacuum extraction will only be used as necessary to remediate contaminated soil hot spots. If sampling during the installation of the groundwater system identifies limited contamination, the vacuum extraction system will be scaled back or eliminated entirely. Additional details on this remedy are provided in Appendix 1.

This alternative will be required to meet the action specific SCGs determined to be applicable for an air discharge. This alternative is protective of human health and the environment since contaminants will be removed from the site. Short term risks will be mitigated by treating the contaminated air stream and groundwater as applicable. This alternative is considered to be a permanent remedy, as well as, the most easily implemented and the most cost effective.

C. Remove Sewer Sediments/ Abandon Sewer Lines/Dispose in On-site Landfill

No one alternative evaluated in the FS is considered by the NYSDEC to provide adequate long term protection to human health. To provide long term protection of human health, and address public concerns, the State has required that the sediments in the sewer lines be removed and the lines plugged to prevent discharge of groundwater. All accessible systems will have sediments removed by either excavation or flushing and collection. Systems which are not accessible by these techniques will be excavated in their entirety. It is expected that most sediments will be disposed of in the on-site landfill. However, any sediments which test as a characteristic hazardous waste or contain high levels of organic contamination will be disposed at an off-site facility.

Applicable SCGs will be met with this alternative. This alternative is protective of human health and the environment. No short term risks are posed. Although this remedy is not classified as a permanent remedy, it will be effective in the long term since sediments will be removed. This alternative is more difficult to implement than sealing lines in place, and is not quite as cost effective, but it is the only remedy which provides long term protection of human health.

TABLE 1
COLUMBIA MILLS

GOVERNMENT'S PREFERRED REMEDIAL ALTERNATIVE

REMEDIAL MEASURE	REMEDIAL UNIT ADDRESSED/ ESTIMATED VOLUME	ESTIMATED COSTS
A. Stabilize and Cap Wastes in the Railroad Right-of-Way, Collect and Treat Groundwater from the Area of Capped Waste	- Drum Disposal Area Fill material (57,000 cu. yd) - UST Excavated Soil Piles (1,000 cu. yd) - Drum Disposal Area Pond & Creek Sediment (3,000 cu. yd) - UST Area 1 Creek Sediment (120 cu. yd) - Drum Disposal Area Shallow Groundwater - Tanks 1 and 2, Sewer System 5 (1.1 cu. yd)	Total Capital Cost: $3,000,000 Present Worth: $3,228,400
B. Extraction and Treatment of Groundwater with Vapor Extraction Treatment of Soil Hot Spots	- UST AREA 1 Soil (12,500 cu.yd) - UST Area 1 Shallow Groundwater - Well B-19D Area Deep Groundwater	Total Capital Costs: $314,000 Present Worth: $630,700
C. Remove Sewer Sediments or Excavate Lines/Dispose of in On-site Landfill	- Sewer System 1 (200 cu. yd total) - Sewer System 2A - Sewer System 2B, Main Plant Area Portion - Sewer System 3 - Sewer System 4, Main Plant Area Portion	Total Capital Costs: $221,400 Present Worth: $227,400

APPENDIX 1

APPENDIX 1

This Appendix presents a more detailed description of the steps which will be undertaken to implement the preferred alternative defined in the PRAP.

A. Stabilize and Cap Wastes in the Railroad Right-of-Way/Collect and Treat Groundwater from the Area of Capped Waste.

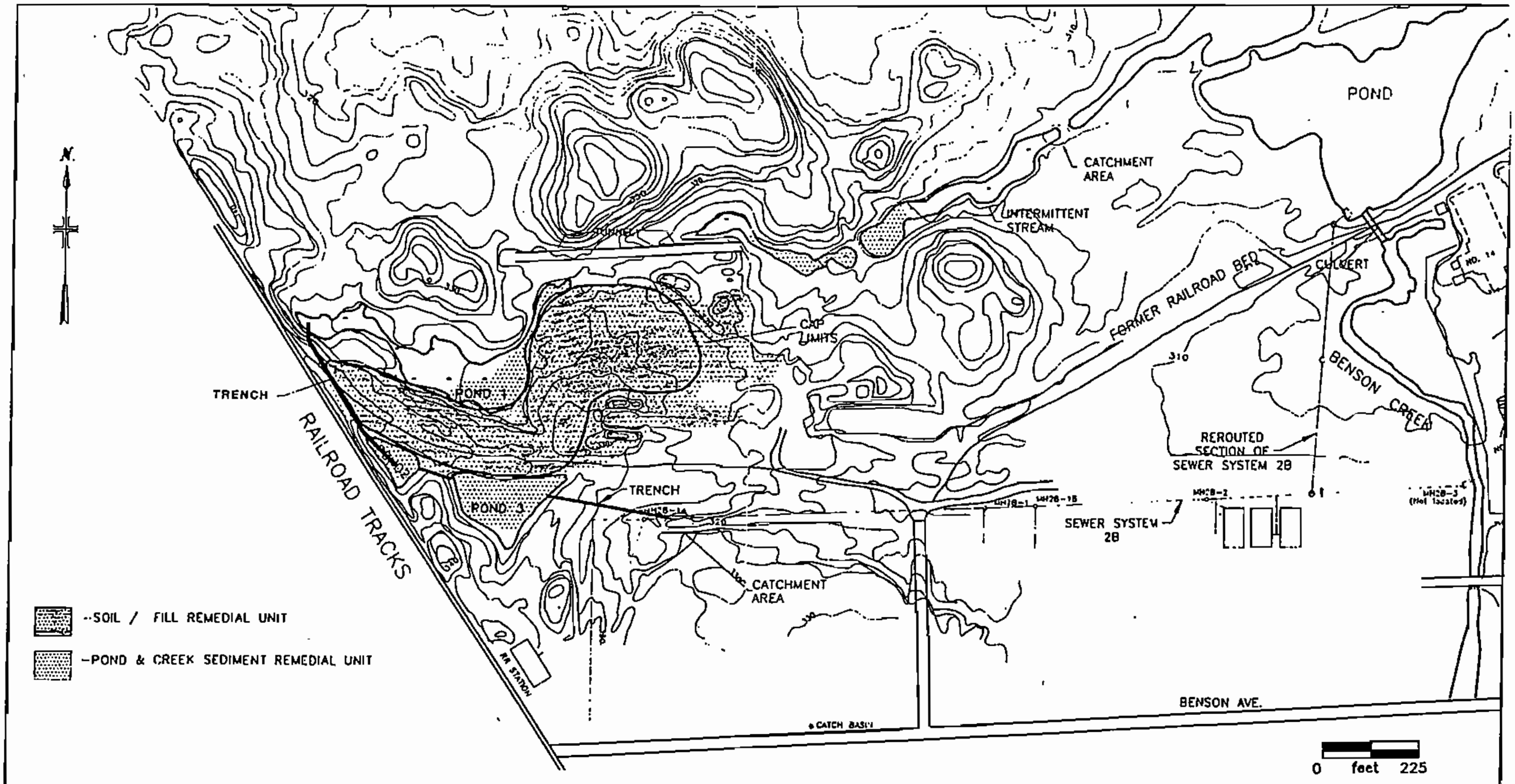
The selected remedial measure for the soil and fill in the Drum Disposal Area will also incorporate the following: 1) the sediments which will be dredged from the Drum Disposal Area ponds and a portion of the intermittent creek, 2) the sediments which will be dredged from the ponded area in Benson Creek adjacent to UST Area 1, 3) the stockpiled soils from the former UST areas and 4) the excavated tanks and surrounding fill from Sewer System 5. The wastes will be stabilized by the application of lime or other acceptable stabilization material and covered with a single barrier cap. A barrier trench will be constructed to collect groundwater generated from the landfill for treatment.

Also included within the same remedial measure will be the draining of the Drum Disposal Area ponds and diversion of the intermittent creek that drains Pond 1 away from the Drum Disposal Area. The drainage of the ponds and creek serves to lower the groundwater table below the bottom of fill and to divert the surface water away from the contaminated fill, facilitating the remediation of the shallow groundwater between Ponds 1 and 3 and surface water drainage in this area. The upstream portion of Sewer System 2B will be diverted to Benson Creek and will provide the drainage for Ponds 2 and 3 and surface water in this area. The system will serve as a permanent conveyance for the diverted water away from the fill. A pond will be constructed along the creek of similar area to the three removed.

The remedial measure consists of the following work tasks to be carried out in the approximate order listed below:

1. Diversion of Sewer System 2B

This system will serve to drain the former area of ponds 2 and 3 and surface runoff. As shown in Figure 6, a new connection will be made to Sewer system 2B at a point near the former apartment buildings. The new piping will convey water from this point to the ponded area of Benson Creek behind the Main Plant Area. The existing pipe leading toward the Main Plant Area will be broken and plugged to prevent water from flowing into the Main Plant Area portion of the sewer.



COLUMBIA MILLS		
DRUM DISPOSAL AREA DURING CONSTRUCTION OF REMEDIAL MEASURES		
MALCOLM PIRNIE	Date October 1991	Figure No. 6

2. Catchment Areas

Catch basins will be constructed to collect and treat water and sediments from the ponds. Pond sediment will not be dredged until after the landfill barrier drain is installed. Treatment of water from catch basins will be ongoing during construction of the capped area. Contaminated sediments will be removed from catch basins on a regular basis and placed on the area to be capped.

Two separate catchment areas will be constructed as shown in Figure 6. One will serve to collect water and sediments from Pond 1 and the intermittent creek for treatment, and the other will collect the same from Ponds 2 and 3. The treated water from each catchment area will be pumped to the intermittent stream downstream of the area or to MH2B-1A, depending on the catchment used. Construction of the catchment areas may begin prior to completion of the diversion of Sewer System 2B. However, the trench from Ponds 2 and 3 cannot be connected to the catchment area until the diversion of sewer System 2B is complete.

3. Lime Stabilization of Contaminated Fill Left in Place

The use of lime as an appropriate stabilization material will be confirmed during a pilot test. The application of lime to the contaminated fill is expected to raise the pH of any percolating waste sufficient to prevent the leaching of metals from the fill material. The treatment will not involve mixing the lime into the material which is to be capped, but rather will involve the application of lime to the surface of the material. Each addition of material from other areas of the Columbia Mills site will be similarly stabilized by the application of lime.

4. Construction of Trench at West End of Capped Area

A wide trench will be constructed at the west end of the Drum Disposal Area as shown in Figure 6. The trench will divert groundwater flow to Trenches A and B on either side of the area to be capped and away from the fill material, thus preventing contact with the contaminated fill. It will also act to limit access to the capped area. The trench will be excavated to a depth of approximately three feet below the lower limit of the fill material (approximately 15 feet below the land surface) and will be an estimated 50 to 60 feet wide at land surface. The trench length will be approximately 500 feet.

5. Excavation of Contaminated Fill Outside of the Capped Area

Some of the contaminated fill is currently located outside of the boundaries of the area to be capped. For this reason, it will be necessary to excavate a small quantity of the fill and place it inside the limits of the area to be capped as shown on Figure 6. The excavated fill will then be stabilized by the application of lime as previously described. The areas where the contaminated fill is excavated from will be filled with clean material from a source to be determined.

6. **Construction of Inner Leachate Trench (Barrier Drain)**

The barrier drain will be constructed under the edge of the area to be capped to collect any landfill leachate. Once in the trench this groundwater will flow to a treatment area where it will be treated and discharged to the outer trench.

7. **Dredging of Sediments and Excavation of Sewer System 5 Tanks**

The areas containing sediment will be dredged and the sediment removed from these areas will be transported to the Drum Disposal Area. The sediments removed from the intermittent creek and Ponds 1, 2 and 3 will be placed directly onto the lime stabilized area of fill within the limits of the capped area as shown in Figure 6. The tanks from Sewer System 5 and the fill comprising the adjacent creek bank will be excavated during the dredging of the UST Area 1 sediments. The sediments removed from this ponded area of Benson Creek will be transported to the railroad right-of-way along with the tanks and fill excavated from Sewer System 5 and the adjacent bank, where they will be placed with the Drum Disposal Area sediments. Stabilization material will be applied to at a rate to be determined in the pilot test to prevent the leaching of metals from the sediments.

The sediments removed are expected to be relatively dry due to the seasonal low groundwater and drainage of the water from the ponds in the Drum Disposal Area into catchment basins. As previously stated, it may be necessary to add recovery wills to pump down the groundwater in the area of the ponds to facilitate removal of sediments. In order to prevent the water in Benson Creek from flowing back into the ponded area during the removal of the sediments, a small, temporary dam or sheet piling will be installed. Once the contaminated sediments have been removed, the dam or sheet piling will be removed and the ponded area will be restored.

8. **Construction of Diversion Trenches**

Diversion of the water in Ponds 1, 2 and 3 will be achieved by constructing permanent trenches through the bottom of the ponds. The water from Pond 1 will be diverted around the Drum Disposal Area to the intermittent stream beyond the clean up area. The water drained from Ponds 2 and 3 will be diverted to MH-1A on Sewer System 2B which will ultimately drain into Benson Creek.

The diversion trenches will be constructed before the final cover of the capped area is in place to permanently lower and divert the groundwater and surface water. The trenches will be excavated approximately three feet below the lower limit of contaminated fill and approximately four feet below the grade of the bottom of the ponds to sufficiently lower the groundwater table in the capped area. The trench on the north side of the capped area will originate near the culvert which allows water to flow under the existing railroad tracks into Pond 1 and will continue, as shown in Figure 7, around the capped area to a point in the intermittent stream beyond the tunnel. The trench on the south side of the capped area will originate near the culvert which allows water to flow under the existing railroad tracks into Pond 2 and continue through Pond 3 to MH-1A of Sewer System 2B. The trenches will be lined with a geotextile filtering membrane which will allow water to flow into the trench and provide stabilization for the side walls. The trenches will be filled with crushed stone to allow for water to flow through the trenches and to prevent the trenches from becoming filled with debris. The existing contours of the ponds will remain except for where stabilization of slopes are necessary.

9. **Regrading of Capped Area with Stockpiled Soils**

The soils which were previously excavated from the former UST areas and stockpiled in the Main Plant Area will be used to approximate the contours of the final capped area. The soil will be loaded onto trucks and transported to the Drum Disposal Area where it will be systematically placed and compacted to form a base for the final cover. Fill material from the main plant area will be brought in, if necessary, to complete the final grading as shown in Figure 7.

10. **Construction of Single Barrier Cap**

When final grading of the fill materials and stockpiled soils is complete, the construction of the single membrane cap will begin. The landfill cap system detailed below was chosen to (1) eliminate the infiltration of precipitation into the landfilled waste materials, (2) prevent erosion of contaminated soils and (3) to prevent the direct contact by both people and wildlife with the waste.

The landfill cap will cover the area of waste deposition which contains lead in surface soils above a clean-up goal to be established during the remedy design phase. Surface run-off and water from the drainage layer of the cap will be channeled to the adjacent drainage trenches with discharge ultimately to the Oswego River. Leachate within the landfill will run into a passive drainage system trench under the cap which will be directed to catchment areas for treatment and discharged to the river.

The components of the landfill cap will be, as required by 6NYCRR Part 360-2.13, and are presented here, in order, starting from the existing landfill surface to the surface of the cap. (Also see Figure 8.)

- A minimum 12 inch compacted layer. This layer may be constructed utilizing some or all of the following: consolidated waste soils from other locations on site or "clean fill" brought to the site. This material will be used to create appropriate landfill slopes and contours and may range from a minimum of 12 inches to several feet in thickness. It is likely that a combination of all of the above sources of fill will be utilized in contouring the landfill.

- A gas venting layer if necessary consisting of 12 inches of graded stone (or an equivalent geotextile gas venting material) combined with piping to vent the gas to the atmosphere.

- The low permeability barrier layer. This will consist either of an 18 inch low permeability soil layer (clay) constructed to minimize precipitation into the landfill. The clay must have a maximum remolded coefficient of permeability of 1×10^{-7} cm/second. This material must be placed on a slope of no less than four percent to promote positive drainage and at maximum slope of 33 percent to minimize erosion.

  A geomembrane, typically a high density polyethylene material (HDPE), may be used as an alternative to the low permeability soil layer. It must have a maximum coefficient of permeability of 1×10^{-12} centimeters per second, chemical and physical resistance to materials it may come in contact with and accommodate the expected forces and stresses caused by installation, settlement and weather. The minimum thickness of the geomembrane will be 40 mils.

- A drainage layer which will have a minimum hydraulic conductivity of 2×10^{-2} cm/sec and a final bottom slope of two percent after settlement and subsidence will be used to drain precipitation which percolates into the soil of the cap. Water removed by this layer will be transmitted to a perimeter drain system and then discharged to surface water.

  This drainage layer will consist of either a six inch layer of crushed stone and conveyance piping or a geosynthetic drainage membrane designed to perform the equivalent function of the 6 inch stone drainage layer.

- A 24 inch barrier protection layer of soil must be installed above the low permeability cover. Material specifications, installation methods and compaction specifications must be adequate to protect the geomembrane barrier layer from frost and thaw damage, root penetration, to resist erosion and to be stable on the final cover design slopes. Consideration should also be given to the prevention of burrowing by animals down to the geomembrane.

- A 6 inch topsoil layer must be designed and constructed to maintain vegetative growth over the landfill. A thicker layer of topsoil may be required if the post-closure site use warrants a thicker layer.

Access restrictions at landfill sites are intended to prevent or reduce exposure to on-site contamination. They include actions such as fencing, signage, and property deed covenants to prevent development of the site or use of groundwater below the site. Access restrictions may also be used to protect the integrity of the landfill cap system.

Signs will be posted on the site to advise people that intrusive activities into the soils are not allowed. This warning will serve to prevent potential damage to the buried geomembrane or filter fabric.

B. Extraction and Treatment of Groundwater in the UST-1 Area with Vapor Extraction Treatment of Soil Hot Spots

Remediation of the UST area groundwater will consist of pumping and treating of the groundwater utilizing the test pit 3 area treatment system. In addition, vapor extraction will be implemented similar to the test pit 3 area remediation if field conditions deem it necessary.

The following plan for the cleanup of the UST Area 1 soil and groundwater remedial units will be implemented:

1. Install groundwater recovery wells in the are of groundwater contamination and commence pumping operations to prevent the contaminant plume in this area from migrating. Pipe the withdrawn groundwater to the groundwater treatment system which will be in operation in the Test Pit 3 Area unless hydraulics or contaminant loadings prohibit such a set up. Should this be the case, a separate treatment system or modifications to the Test Pit 3 system would be necessary.

2. During recovery well installation, sample soil from borings and submit for analysis to determine if any areas containing high levels of volatile organic compound (VOC) contamination exist in the unsaturated zone.

3. Depending on the analytical results of the soil sampling, implement one of the following:

    a. **Very low VOC concentrations or no VOCs detected in soil.**

    Vapor extraction would not be implemented in UST Area 1. Remediation of the soil would not be necessary if no VOCs were detected or if VOC concentrations were near the established clean-up level of 1 ppm.

b. **Intermediate VOC concentrations detected in soil.**

If areas of intermediate level VOC contamination exist, a soil gas survey would be conducted to better determine the extent of VOC contamination in the subsurface soils. The implementation of vapor extraction would be delayed until the remediation of the Test Pit 3 Area was complete and the treatment system which will be in operation in that area was available. In this case, vapor extraction would be implemented on the UST soils to aid in reducing the length of time for groundwater treatment.

c. **High VOC concentrations detected in soil.**

If areas of soil containing high levels of VOC contamination exist, a soil gas survey would be conducted to pinpoint the problem areas. Remediation of the soil in these areas utilizing a separate vapor extraction system would commence as soon as possible.

APPENDIX 2

SUMMARY OF GENERAL RESPONSE ACTIONS

Main Plant Area		
Contaminated Medium	Contamination Concern	General Response Action
Soils	VOCs Semivolatiles Metals	No Action/Access Restrictions Excavation/Treatment/Disposal In-Situ Treatment Containment
Sediments (including sewers)	VOCs Semivolatiles Pesticides/PCBs Metals	No Action/Access Restrictions/Monitoring Removal/Treatment/Disposal In-Situ Treatment Containment
Shallow and Deep Ground Water	VOCs	No Action/Monitoring Containment Collection/Treatment/Discharge In-Situ Ground Water Treatment
Building and Debris Piles	Asbestos	No Action/Access Restrictions Containment Removal/Treatment/Disposal
Drum Disposal Area		
Contaminated Medium	Contamination Concern	General Response Action
Soil/Fill Material	Metals Semivolatiles	No Action/Access Restrictions Containment Excavation/Treatment/Disposal In-Situ Treatment
Sediments	Metals Semivolatiles	No Action/Access Restrictions/Monitoring Excavation/Treatment/Disposal In-Situ Treatment Containment
Shallow Ground Water	Metals	No Action/Monitoring Containment Collection/Treatment/Disposal In-Situ Ground Water Treatment

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Soils

General Response Action	Applicable Remedial Technology	Process Options	Applicable	
			Main Plant Area	Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
No action.	No Action		Yes	Yes
	Deed restrictions.		Yes	Yes
Access restrictions.	Fencing.		Yes	Yes
Containment Actions:	Containment Technologies:			
Containment.	Capping.	Clay cap, synthetic membrane, multi-layer.	Yes	Yes
	Vertical Barriers.	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, ground injection.	Yes	Yes
	Surface controls.	Diversion/collection, grading, soil stabilization.	Yes	Yes
	Sediment control barriers.	Coffer dams, curtain barriers.	Yes	Yes
	Dust controls.	Revegetation, capping.	Yes	Yes
Excavation/Treatment Actions:	Removal Technologies:			
Excavation/treatment/disposal.	Excavation.	Solids excavation.	Yes	Yes
	Treatment Technologies:			
	Solidification, fixation, stabilization, immobilization.	Lime Stabilization, Sorption, pozzolanic agents, encapsulation.	Yes	Yes
	Dewatering	Belt filter press, dewatering and drying beds.	Yes	Yes
	Physical treatment.	Water/solvent leaching (with subsequent liquids treatment).	Yes	Yes
	Chemical treatment.	Lime neutralization.	Yes	Yes
	Biological treatment.	Cultured microorganisms.	Yes	No
In-situ treatment.	In-situ treatment.	Surface bioreclamation.	Yes	No
	Thermal treatment.	Incineration, pyrolysis.	Yes	No
Disposal excavation.			Yes	Yes

1069-04-1

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Sediments

General Response Action	Applicable Remedial Technology	Process Options	Applicable	
			Main Plant Area	Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
No action.	No Action		Yes	Yes
Access restrictions to monitoring.	Deed restrictions.		Yes	Yes
	Fencing.		Yes	Yes
Excavation Actions:	Removal Technologies:			
Excavation.	Excavation.	Sediments excavation.	Yes	Yes
	Containment Technologies:			
	Capping.	Removal with clay cap, multi-layer, asphalt.	Yes	Yes
	Vertical barriers.	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, grout injection.	Yes	Yes
	Sediment control barriers.	Coffer dams, curtain barriers, capping barriers.	Yes	Yes
Excavation/Treatment Actions:	Treatment Technologies:			
Removal/disposal.	Solidification, fixation, stabilization.	Sorption, pozzolanic agents, encapsulation,	Yes	Yes
Removal/treatment/disposal.	Dewatering.	Lime Stabilization, dewatering and drying beds.	No	Yes
	Physical treatment.	Sedimentation, dewatering and drying beds.	Yes	Yes
		Water/solids leaching (with subsequent treatment).	Yes	Yes
	Chemical treatment.	Neutralization, oxidation, electrochemical reduction.	No	No
	Biological treatment.	Landfarming.	Yes	No
	Thermal treatment.	Incineration pyrolysis.	Yes	No

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Ground Water

General Response Action	Applicable Remedial Technology	Process Options	Applicable: Main Plant Area	Applicable: Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	Yes
No action.	Deed restrictions.		Yes	Yes
Alternative residential water supply.	Fencing.		Yes	Yes
Monitoring.				
Containment Actions:	Containment Technologies:			
Containment.	Capping.	Clay cap, synthetic membrane, multi-layer.	Yes	Yes
	Vertical barriers.	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, groun injection.	Yes	Yes
Collection Treatment Actions:	Extraction Technologies:			
Collection/treatment discharge.	Ground water collection/pumping.	Wells, subsurface or leachate collection.	Yes	Yes
	Enhanced removal.	Solution mining, vapor extraction, enhanced oil recovery.	Yes	No
	Treatment Technologies:			
	Physical treatment.	Coagulation/flocculation, oil-water separation, air stripping, adsorption.	Yes	No
	Chemical treatment.	Neutralization, precipitation, ion exchange oxidation/reduction.	Yes	Yes
	Disposal Technologies:			
	Discharge to WWTP (after treatment).		Yes	Yes
	Discharge to surface water (after treatment).		Yes	Yes
In-situ ground water treatment.	In-situ treatment.	Subsurface hioreclamation.	Yes	No

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Structures

General Response Action	Applicable Remedial Technology	Process Options	Applicable: Main Plant Area	Applicable: Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	N/A
No action.	Deed restrictions.		Yes	N/A
Access restrictions.	Fencing.		Yes	N/A
Treatment Actions:	Removal Technologies:			
Removal/Disposal.	Excavation.	Excavation, debris removal	Yes	N/A
	Removal	Asbestos removal	Yes	N/A
Containment Actions:	Containment Technologies:			
	Barriers.	Encapsulation	Yes	N/A
		Seal Buildings	Yes	N/A

N/A – Not Applicable – No contaminated strutures in Drum Disposal Area.

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Drums and Debris

General Response Action	Applicable Remedial Technology	Process Options	Applicable: Main Plant Area	Applicable: Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
No action.	No Action		Yes	Yes
Access restrictions to (location).	Deed restrictions.		Yes	Yes
	Fencing.		Yes	Yes
Containment Actions:	Containment Technologies:			
	Capping.	Clay cap, synthetic membranes, multi-layer.	Yes	Yes
	Vertical barriers.	Slurry wall, sheet piling.	No	Yes
	Horizontal barriers.	Liners, grout injection.	No	Yes
		Dust controls.	Yes	Yes
Excavation/Treatment Actions:	Removal Technologies:			
Removal/disposal.	Excavation.	Solids excavation.	Yes	Yes
	Drum/Debris Removal.	Drum and debris removal.	Yes	Yes
Removal/treatment/disposal.	Treatment Technologies:			
	Physical treatment.	Water/solvent leaching (with subsequent liquids treatment).	No	No
	Chemical treatment.	Neutralization.	No	No
	Biological treatment.	Cultured microorganisms.	No	No
	Thermal treatment.	Incineration, pyrolysis, gaseous incineration.	No	No
	Solids processing.	Crushing and grinding, screening, classification.	No	No
	Disposal.	On-site landfill.	Yes	Yes
		Off-site landfill.	Yes	Yes

TABLE 4-1
DETAILED ANALYSIS RESULTS
REMEDIATION OF DRUM DISPOSAL AREA FILL MATERIAL
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
Drain Ponds & Reroute Creek/ Cap in Place	10	20	9	6	2	12	15	74
Drain Ponds & Reroute Creek/Lime Stabilization/Cap in Place	10	20	9	11	8	11	14	83
Drain Ponds & Reroute Creek/Excavate/Lime Stabilization/Cap in Railroad Right-of-Way	10	20	8	11	8	9	12	78
Drain Ponds & Reroute Creek/Excavate/ Dispose in Off-Site Landfill	10	20	6	11	2	10	2	61

TABLE 4-2
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST AREA 1 SOILS
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	0	Alternative should not be further considered since it does not meet SCGs						0
Excavation/On-Site Disposal	10	20	8	6	2	9	12	67
Excavation/Off-Site Disposal	10	20	5	11	2	10	10	68
Soil Washing (In-Situ)	10	20	9	14	14	10	8	85
Vapor Extraction	10	20	9	14	15	13	15	96

TABLE 4-4
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST EXCAVATED SOIL PILES
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
Dispose in Off-Site Landfill	10	20	6	12	2	11	15	76
Cap in Railroad Right of Way	10	20	8	10	2	11	14	75
Lime Stabilazation/Cap in Railroad Right-of-Way	10	20	8	13	8	11	12	82

TABLE 4-5
DETAILED ANALYSIS RESULTS
REMEDIATION OF DRUM DISPOSAL AREA POND AND CREEK SEDIMENTS
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
Excavation/On-Site Disposal	10	20	9	6	2	11	10	68
Excavation/Off-Site Disposal	10	20	6	11	2	12	8	69
Excavation/Treatment/On-Site Disposal	10	20	9	11	8	9	8	75
Excavation/Treatment/Off-Site Disposal	10	20	6	14	8	9	7	74
Excavation/Lime Stabilization/Cap In Railroad Right-of-Way	10	20	9	11	8	11	15	84

TABLE 4-6
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST AREA 1 CREEK SEDIMENTS
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
Excavation/Off-Site Disposal	10	20	6	11	2	12	8	69
Excavation/Treatment/On-Site Disposal	10	20	8	11	8	9	8	74
Excavation/Treatment/Off-Site Disposal	10	20	6	14	8	10	7	75
Excavation/Lime Stabilization/Cap in Railroad Right-of-Way	10	20	8	11	8	11	15	83

TABLE 4-7
DETAILED ANALYSIS RESULTS
REMEDIATION OF SHALLOW GROUND WATER
IN DRUM DISPOSAL AREA (Between Ponds 1 & 3)
METALS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Containment	10	17	9	4	2	10	10	62
Extraction/Treatment/ Discharge to Surface Water	10	17	9	6	6	10	8	66
Divert Pond Water/Lower GW Table/ Discharge to Surface Water	10	17	8	10	2	11	15	73

TABLE 4-9
DETAILED ANALYSIS RESULTS
REMEDIATION OF SHALLOW GROUND WATER
IN MAIN PLANT AREA (UST 1 Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	9	6	0	12	15	56
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	8	6	9	8	67
Extraction/Treatment/Discharge to Surface Water	10	17	9	7	6	11	8	68

TABLE 4-11
DETAILED ANALYSIS RESULTS
REMEDIATION OF DEEP GROUND WATER
IN MAIN PLANT AREA (Well B-19D Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	9	6	0	12	15	56
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	7	6	8	8	65
Extraction/Treatment/Discharge to Surface Water	10	17	9	7	6	9	8	66

TABLE 4-12
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 1

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	9	0	13	15	74
Institutional - Monitoring, Access Restrictions	10	20	10	7	0	13	11	71
Excavation/Off-Site Disposal	10	20	6	12	2	10	5	65
Close Sewer Line in Place	10	20	10	11	5	11	15	82

TABLE 4-13
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 2A

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	6	0	13	15	71
Close Line in Place	10	20	10	8	5	12	15	80
Flush Sediments/Off-Site Disposal	10	20	6	11	2	10	5	64

TABLE 4-14
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 2B

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	9	0	13	15	74
Flush Sediments/Off Site Disposal	10	20	6	12	2	11	15	76
Close Main Plant Section of Line in Place/ Divert Upstream Flow into Benson Creek	10	20	8	11	5	12	13	79

TABLE 4-15
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 3

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	20	10	9	0	13	15	77
Close Line in Place	10	20	10	11	5	10	15	81
Flush Sediments/Off-Site Disposal/ Fill Trenches	10	20	6	12	2	11	12	73

TABLE 4-16
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 4

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	17	10	9	0	13	15	70
Monitoring/Permitting	6	17	10	7	0	13	12	65
Close Line in Place	10	20	10	11	5	12	15	83
Flush Sediments/Dewater/ Off-Site Disposal	10	20	6	12	2	11	10	71

TABLE 4-17
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 5

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	20	10	9	0	13	15	73
Close System In Place (Fill with Concrete)	10	20	10	11	5	12	15	83
Excavate Tanks & Sediment/Cap in Railroad Right-of-Way	10	20	9	10	2	11	13	75

APPENDIX 3

COST ANALYSIS
DRUM DISPOSAL AREA FILL

ALTERNATIVE #1 -	**Cap In Place**	
	Construction Costs	$2,143,000
	Contingency (15%)	$321,450
	Total Construction Costs	$2,464,450
	Engineering (10%)	$246,445
	Total Project Cost	$2,710,895
	Annual O & M Cost	$23,500
	Present Worth – O & M (30 yrs)	$221,535
	Total Present Worth	**$2,932,400**
ALTERNATIVE #2 -	**Lime Stabilize, Cap In Place**	
	Construction Costs	$2,245,000
	Contingency (15%)	$336,750
	Total Construction Costs	$2,581,750
	Engineering (10%)	$258,175
	Total Project Cost	$2,839,925
	Annual O & M Cost	$23,500
	Present Worth – O & M (30 yrs)	$221,535
	Total Present Worth	**$3,061,500**
ALTERNATIVE #3 -	**Excavate, Lime Stabilize, Cap in RR Right-of-Way**	
	Construction Costs	$2,585,000
	Contingency (15%)	$387,750
	Total Construction Costs	$2,972,750
	Engineering (10%)	$297,275
	Total Project Cost	$3,270,025
	Annual O & M Cost	$23,500
	Present Worth – O & M (30 yrs)	$221,535
	Total Present Worth	**$3,491,600**
ALTERNATIVE #4 -	**Excavate, Dispose Off-Site**	
	Construction Costs	$30,716,000
	Contingency (15%)	$4,607,400
	Total Construction Costs	$35,323,400
	Engineering (10%)	$3,532,340
	Total Project Cost	$38,855,740
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$38,855,700**

COST ANALYSIS
UST AREA 1 SOIL

ALTERNATIVE #1 -	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 -	**Excavate, Dispose On-Site**	
	Construction Costs	$1,975,000
	Contingency (15%)	$296,250
	Total Construction Costs	$2,271,250
	Engineering (10%)	$227,125
	Total Project Cost	$2,498,375
	Annual O & M Cost	$14,590
	Present Worth - O & M (30 yrs)	$137,540
	Total Present Worth	**$2,635,900**
ALTERNATIVE #3 -	**Excavate, Dispose Off-Site**	
	Construction Costs	$4,037,500
	Contingency (15%)	$605,625
	Total Construction Costs	$4,643,125
	Engineering (10%)	$464,313
	Total Project Cost	$5,107,438
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$5,107,400**
ALTERNATIVE #4 -	**Soil Washing**	
	Construction Costs	$1,250,000
	Contingency (15%)	$187,500
	Total Construction Costs	$1,437,500
	Engineering (10%)	$143,750
	Total Project Cost	$1,581,250
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$1,581,300**

COST ANALYSIS
UST AREA 1 SOIL

ALTERNATIVE #5 –	**Vapor Extraction, Ground Water Withdrawal**	
	Construction Costs	$247,950
	Contingency (15%)	$37,193
	Total Construction Costs	$285,143
	Engineering (10%)	$28,514
	Total Project Cost	$313,657
	Annual O & M Cost	$100,000
	Present Worth – O & M (4 yrs)	$317,000
	Total Present Worth	**$630,700**

COST ANALYSIS
UST EXCAVATED SOIL PILES

ALTERNATIVE #1 -	**Dispose Off-Site**	
	Construction Costs	$303,000
	Contingency (15%)	$45,450
	Total Construction Costs	$348,450
	Engineering (10%)	$34,845
	Total Project Cost	$383,295
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$383,300**
ALTERNATIVE #2 -	**Cap in RR Right-of-Way**	
	Construction Costs	$187,000
	Contingency (15%)	$28,050
	Total Construction Costs	$215,050
	Engineering (10%)	$21,505
	Total Project Cost	$236,555
	Annual O & M Cost	$1,550
	Present Worth - O & M (30 yrs)	$14,612
	Total Present Worth	**$251,200**
ALTERNATIVE #3 -	**Lime Stabilize, Cap in RR Right-of-Way**	
	Construction Costs	$190,700
	Contingency (15%)	$28,605
	Total Construction Costs	$219,305
	Engineering (10%)	$21,931
	Total Project Cost	$241,236
	Annual O & M Cost	$1,550
	Present Worth - O & M (30 yrs)	$14,612
	Total Present Worth	**$255,800**

COST ANALYSIS
DRUM DISPOSAL AREA POND & CREEK SEDIMENTS

ALTERNATIVE #1 -	**Excavate, On-Site Disposal**	
	Construction Costs	$567,500
	Contingency (15%)	$85,125
	Total Construction Costs	$652,625
	Engineering (10%)	$65,263
	Total Project Cost	$717,888
	Annual O & M Cost	$3,700
	Present Worth - O & M (30 yrs)	$34,880
	Total Present Worth	**$752,800**
ALTERNATIVE #2 -	**Excavate, Off-Site Disposal**	
	Construction Costs	$939,000
	Contingency (15%)	$140,850
	Total Construction Costs	$1,079,850
	Engineering (10%)	$107,985
	Total Project Cost	$1,187,835
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$1,187,800**
ALTERNATIVE #3 -	**Excavate, Treat, On-Site Disposal**	
	Construction Costs	$1,017,500
	Contingency (15%)	$152,625
	Total Construction Costs	$1,170,125
	Engineering (10%)	$117,013
	Total Project Cost	$1,287,138
	Annual O & M Cost	$3,700
	Present Worth - O & M (30 yrs)	$34,880
	Total Present Worth	**$1,322,000**
ALTERNATIVE #4 -	**Excavate, Treat, Off-Site Disposal**	
	Construction Costs	$1,342,000
	Contingency (15%)	$201,300
	Total Construction Costs	$1,543,300
	Engineering (10%)	$154,330
	Total Project Cost	$1,697,630
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$1,697,600**

COST ANALYSIS
DRUM DISPOSAL AREA POND & CREEK SEDIMENTS

ALTERNATIVE #5 -	Excavate, Lime Stabilize, Cap in RR Right-of-Way	
	Construction Costs	$470,000
	Contingency (15%)	$70,500
	Total Construction Costs	$540,500
	Engineering (10%)	$54,050
	Total Project Cost	$594,550
	Annual O & M Cost	$4,600
	Present Worth - O & M (30 yrs)	$43,364
	Total Present Worth	**$637,900**

COST ANALYSIS
UST AREA 1 CREEK SEDIMENTS

ALTERNATIVE #1 -	**Excavate, Dispose Off-Site**	
	Construction Costs	$38,250
	Contingency (15%)	$5,738
	Total Construction Costs	$43,988
	Engineering (10%)	$4,399
	Total Project Cost	$48,386
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$48,400**
ALTERNATIVE #2 -	**Excavate, Treat, On-Site Disposal**	
	Construction Costs	$209,900
	Contingency (15%)	$31,485
	Total Construction Costs	$241,385
	Engineering (10%)	$24,139
	Total Project Cost	$265,524
	Annual O & M Cost	$190
	Present Worth - O & M (30 yrs)	$1,791
	Total Present Worth	**$267,300**
ALTERNATIVE #3 -	**Excavate, Treat, Off-Site Disposal**	
	Construction Costs	$56,250
	Contingency (15%)	$8,438
	Total Construction Costs	$64,688
	Engineering (10%)	$6,469
	Total Project Cost	$71,156
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$71,200**
ALTERNATIVE #4 -	**Excavate, Lime Stabilize, Cap in RR Right-of-Way**	
	Construction Costs	$23,770
	Contingency (15%)	$3,566
	Total Construction Costs	$27,336
	Engineering (10%)	$2,734
	Total Project Cost	$30,069
	Annual O & M Cost	$235
	Present Worth - O & M (30 yrs)	$2,215
	Total Present Worth	**$32,300**

COST ANALYSIS
DRUM DISPOSAL AREA SHALLOW GROUND WATER

ALTERNATIVE #1 –	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 –	**Containment**	
	Construction Costs	$1,943,400
	Contingency (15%)	$291,510
	Total Construction Costs	$2,234,910
	Engineering (10%)	$223,491
	Total Project Cost	$2,458,401
	Annual O & M Cost	$4,850
	Present Worth – O & M (30 yrs)	$45,721
	Total Present Worth	**$2,504,100**
ALTERNATIVE #3 –	**Extract, Treat, Discharge to Surface Water**	
	Construction Costs	$169,000
	Contingency (15%)	$25,350
	Total Construction Costs	$194,350
	Engineering (10%)	$19,435
	Total Project Cost	$213,785
	Annual O & M Cost	$20,600
	Present Worth – O & M (30 yrs)	$194,196
	Total Present Worth	**$408,000**
ALTERNATIVE #4 –	**Divert Ponds, Discharge to Surface Water**	
	Construction Costs	$254,000
	Contingency (15%)	$38,100
	Total Construction Costs	$292,100
	Engineering (10%)	$29,210
	Total Project Cost	$321,310
	Annual O & M Cost	$450
	Present Worth – O & M (30 yrs)	$4,242
	Total Present Worth	**$325,600**

COST ANALYSIS
WELL B19-D/UST AREA 1 - GROUND WATER

ALTERNATIVE #1 -	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 -	**Extract, Discharge to Sanitary Sewer**	
	Construction Costs	$79,920
	Contingency (15%)	$11,988
	Total Construction Costs	$91,908
	Engineering (10%)	$9,191
	Total Project Cost	$101,099
	Annual O & M Cost	$34,600
	Present Worth - O & M (30 yrs)	$326,174
	Total Present Worth	**$427,300**
ALTERNATIVE #3 -	**Extract, Treat, Discharge to Sanitary Sewer**	
	Construction Costs	$122,120
	Contingency (15%)	$18,318
	Total Construction Costs	$140,438
	Engineering (10%)	$14,044
	Total Project Cost	$154,482
	Annual O & M Cost	$41,000
	Present Worth - O & M (30 yrs)	$386,507
	Total Present Worth	**$541,000**
ALTERNATIVE #4 -	**Extract, Treat, Discharge to Surface Water**	
	Construction Costs	$122,120
	Contingency (15%)	$18,318
	Total Construction Costs	$140,438
	Engineering (10%)	$14,044
	Total Project Cost	$154,482
	Annual O & M Cost	$22,700
	Present Worth - O & M (30 yrs)	$213,993
	Total Present Worth	**$368,500**

COST ANALYSIS
SEWER SYSTEM 1 SEDIMENTS

ALTERNATIVE #1 -	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 -	**Monitoring, Access Restrictions**	
	Construction Costs	$4,200
	Contingency (15%)	$630
	Total Construction Costs	$4,830
	Engineering (10%)	$483
	Total Project Cost	$5,313
	Annual O & M Cost	$500
	Present Worth - O & M (30 yrs)	$4,714
	Total Present Worth	**$10,000**
ALTERNATIVE #3 -	**Excavate, Off-Site Disposal**	
	Construction Costs	$12,450
	Contingency (15%)	$1,868
	Total Construction Costs	$14,318
	Engineering (10%)	$1,432
	Total Project Cost	$15,749
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$15,700**
ALTERNATIVE #4 -	**Close Sewer Line In Place**	
	Construction Costs	$10,400
	Contingency (15%)	$1,560
	Total Construction Costs	$11,960
	Engineering (10%)	$1,196
	Total Project Cost	$13,156
	Annual O & M Cost	$500
	Present Worth - O & M (30 yrs)	$4,714
	Total Present Worth	**$17,900**

COST ANALYSIS
SEWER SYSTEM 1 SEDIMENTS

ALTERNATIVE #5 –	Excavate, Lime Stabilize, Cap in RR Right-of-Way	
	Construction Costs	$8,700
	Contingency (15%)	$1,305
	Total Construction Costs	$10,005
	Engineering (10%)	$1,001
	Total Project Cost	$11,006
	Annual O & M Cost	$25
	Present Worth – O & M (30 yrs)	$236
	Total Present Worth	**$11,200**

COST ANALYSIS
SEWER SYSTEM 2A SEDIMENTS

ALTERNATIVE #1 –	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 –	**Close Line In Place**	$5,750
	Construction Costs	$500
	Contingency (15%)	$75
	Total Construction Costs	$575
	Engineering (10%)	$58
	Total Project Cost	$633
	Annual O & M Cost	$500
	Present Worth – O & M (30 yrs)	$4,714
	Total Present Worth	**$5,300**
ALTERNATIVE #3 –	**Flush Sediments/Off–Site Disposal**	
	Construction Costs	$35,000
	Contingency (15%)	$5,250
	Total Construction Costs	$40,250
	Engineering (10%)	$4,025
	Total Project Cost	$44,275
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$44,300**
ALTERNATIVE #4 –	**Flush Sediments, Lime Stabilize, Cap in RR R.O.W**	
	Construction Costs	$26,900
	Contingency (15%)	$4,035
	Total Construction Costs	$30,935
	Engineering (10%)	$3,094
	Total Project Cost	$34,029
	Annual O & M Cost	$5
	Present Worth – O & M (30 yrs)	$47
	Total Present Worth	**$34,100**

COST ANALYSIS
SEWER SYSTEM 2B SEDIMENTS

ALTERNATIVE #1 –	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 –	**Flush Sediments, Off-Site Disposal**	
	Construction Costs	$38,100
	Contingency (15%)	$5,715
	Total Construction Costs	$43,815
	Engineering (10%)	$4,382
	Total Project Cost	$48,197
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$48,200**
ALTERNATIVE #3 –	**Close Main Plant Section, Divert Upstream Flow**	
	Construction Costs	$35,500
	Contingency (15%)	$5,325
	Total Construction Costs	$40,825
	Engineering (10%)	$4,083
	Total Project Cost	$44,908
	Annual O & M Cost	$500
	Present Worth – O & M (30 yrs)	$4,714
	Total Present Worth	**$49,600**
ALTERNATIVE #4 –	**Flush Sediments in Main Plant Area, Lime Stabilize Cap in RR Right-of-Way, Divert Upstream Flow**	
	Construction Costs	$54,400
	Contingency (15%)	$8,160
	Total Construction Costs	$62,560
	Engineering (10%)	$6,256
	Total Project Cost	$68,816
	Annual O & M Cost	$55
	Present Worth – O & M (30 yrs)	$518
	Total Present Worth	**$69,300**

COST ANALYSIS
SEWER SYSTEM 3 SEDIMENTS

ALTERNATIVE #1 –	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 –	**Close Line In Place**	
	Construction Costs	$34,000
	Contingency (15%)	$5,100
	Total Construction Costs	$39,100
	Engineering (10%)	$3,910
	Total Project Cost	$43,010
	Annual O & M Cost	$500
	Present Worth – O & M (30 yrs)	$4,714
	Total Present Worth	**$47,700**
ALTERNATIVE #3 –	**Flush Sediments, Off-site Disposal, Fill Trenches**	
	Construction Costs	$68,700
	Contingency (15%)	$10,305
	Total Construction Costs	$79,005
	Engineering (10%)	$7,901
	Total Project Cost	$86,906
	Annual O & M Cost	$500
	Present Worth – O & M (30 yrs)	$4,714
	Total Present Worth	**$91,600**
ALTERNATIVE #4 –	**Flush Sediments, Lime Stabilize, Cap in RR Right-of-Way, Fill Trenches**	
	Construction Costs	$60,700
	Contingency (15%)	$9,105
	Total Construction Costs	$69,805
	Engineering (10%)	$6,981
	Total Project Cost	$76,786
	Annual O & M Cost	$545
	Present Worth – O & M (30 yrs)	$5,138
	Total Present Worth	**$81,900**

COST ANALYSIS
SEWER SYSTEM 4 SEDIMENTS

ALTERNATIVE #1 -	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 -	**Monitoring, Permitting**	
	Construction Costs	$5,000
	Contingency (15%)	$750
	Total Construction Costs	$5,750
	Engineering (10%)	$575
	Total Project Cost	$6,325
	Annual O & M Cost	$1,480
	Present Worth - O & M (30 yrs)	$13,952
	Total Present Worth	**$20,300**
ALTERNATIVE #3 -	**Close Line In Place**	
	Construction Costs	$6,350
	Contingency (15%)	$953
	Total Construction Costs	$7,303
	Engineering (10%)	$730
	Total Project Cost	$8,033
	Annual O & M Cost	$500
	Present Worth - O & M (30 yrs)	$4,714
	Total Present Worth	**$12,700**
ALTERNATIVE #4 -	**Flush Sediments, Dewater, Off-Site Disposal**	
	Construction Costs	$24,200
	Contingency (15%)	$3,630
	Total Construction Costs	$27,830
	Engineering (10%)	$2,783
	Total Project Cost	$30,613
	Annual O & M Cost	$0
	Present Worth - O & M (30 yrs)	$0
	Total Present Worth	**$30,600**

COST ANALYSIS
SEWER SYSTEM 4 SEDIMENTS

ALTERNATIVE #5 – Flush Sediments, Lime Stabilize, Cap in RR R.O.W

Construction Costs	$24,350
Contingency (15%)	$3,653
Total Construction Costs	$28,003
Engineering (10%)	$2,800
Total Project Cost	$30,803
Annual O & M Cost	$5
Present Worth – O & M (30 yrs)	$47
Total Present Worth	**$30,800**

COST ANALYSIS
SEWER SYSTEM 5 SEDIMENTS

ALTERNATIVE #1 –	**No Action**	
	Construction Costs	$0
	Contingency (15%)	$0
	Total Construction Costs	$0
	Engineering (10%)	$0
	Total Project Cost	$0
	Annual O & M Cost	$0
	Present Worth – O & M (30 yrs)	$0
	Total Present Worth	**$0**
ALTERNATIVE #2 –	**Close System In Place – (Fill W/Concrete)**	
	Construction Costs	$800
	Contingency (15%)	$120
	Total Construction Costs	$920
	Engineering (10%)	$92
	Total Project Cost	$1,012
	Annual O & M Cost	$250
	Present Worth – O & M (30 yrs)	$2,357
	Total Present Worth	**$3,400**
ALTERNATIVE #3 –	**Excavate, Cap in RR Right–of–Way**	
	Construction Costs	$6,250
	Contingency (15%)	$938
	Total Construction Costs	$7,188
	Engineering (10%)	$719
	Total Project Cost	$7,906
	Annual O & M Cost	$300
	Present Worth – O & M (30 yrs)	$2,828
	Total Present Worth	**$10,700**

COLUMBIA MILLS
REMEDIAL MEASURE COST ANALYSES

1) **Stabilize and cap wastes in the railroad right-of-way, collect and treat ground water from the area of capped waste**

Construction Costs	$2,377,000
Contingency (15%)	$356,550
Total Construction Costs	$2,733,550
Engineering (10%)	$273,355
Total Project Cost	$3,006,905
Annual O & M Cost	$23,500
Present Worth – O & M (30 yrs)	$221,535
Total Present Worth	**$3,228,400**

2) **Extraction and treatment of ground water in the UST-1 Area with vapor extraction treatment of soil hot spots.**

Construction Costs	$247,950
Contingency (15%)	$37,193
Total Construction Costs	$285,143
Engineering (10%)	$28,514
Total Project Cost	$313,657
Annual O & M Cost	$100,000
Present Worth – O & M (4 yrs)	$317,000
Total Present Worth	**$630,700**

3) **Remove sewer sediments or excavate lines, disposal of sediments in the on-site landfill (capped area).**

Sewer System 1 – Excavate, Lime Stabilize, Cap in RR Right-of-Way

Construction Costs	$8,700
Contingency (15%)	$1,305
Total Construction Costs	$10,005
Engineering (10%)	$1,001
Total Project Cost	$11,006
Annual O & M Cost	$25
Present Worth – O & M (30 yrs)	$236
Total Present Worth	**$11,200**

Sewer System 2A – Flush Sediments, Lime Stabilize, Cap in Railroad Right-of-Way

Construction Costs	$26,900
Contingency (15%)	$4,035
Total Construction Costs	$30,935
Engineering (10%)	$3,094
Total Project Cost	$34,029
Annual O & M Cost	$5
Present Worth – O & M (30 yrs)	$47
Total Present Worth	**$34,100**

COLUMBIA MILLS
REMEDIAL MEASURE COST ANALYSES

Sewer System 2B – Flush Sediments in Main Plant Area, Lime Stabilize, Cap in Railroad Right–of–Way, Divert Upstream Flow

Construction Costs	$54,400
Contingency (15%)	$8,160
Total Construction Costs	$62,560
Engineering (10%)	$6,256
Total Project Cost	$68,816
Annual O & M Cost	$55
Present Worth – O & M (30 yrs)	$518
Total Present Worth	**$69,300**

Sewer System 3 – Flush Sediments, Lime Stabilize, Cap in Railroad Right–of–Way, Fill Trenches

Construction Costs	$60,700
Contingency (15%)	$9,105
Total Construction Costs	$69,805
Engineering (10%)	$6,981
Total Project Cost	$76,786
Annual O & M Cost	$545
Present Worth – O & M (30 yrs)	$5,138
Total Present Worth	**$81,900**

COLUMBIA MILLS
REMEDIAL MEASURE COST ANALYSES

Sewer System 4 – Flush Sediments, Lime Stabilize, Cap in Railroad Right-of-Way

Construction Costs	$24,350
Contingency (15%)	$3,653
Total Construction Costs	$28,003
Engineering (10%)	$2,800
Total Project Cost	$30,803
Annual O & M Cost	$5
Present Worth – O & M (30 yrs)	$47
Total Present Worth	**$30,800**

Total Sewer Costs:

Total Project Cost	$221,440
Present Worth – O & M (30 yrs)	$5,986
Total Present Worth	**$227,400**

APPENDIX 4

COLUMBIA MILLS SURFACE SOIL
MAIN PLANT AREA – UST AREA 1
FREQUENCY OF DETECTION
- Validated Data -

INORGANIC	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATION* (mg/kg)	BACKGROUND CONCENTRATION** (mg/kg)
Aluminum	5/5	5130J–7030J	8800J–9880J
Antimony	1/5	8.8B	8.0B–8.6B
Arsenic	5/5	0.90J–4.8J	2.8J–3.3J
Chromium	5/5	5.2J–16.0J	8.5–8.6
Copper	5/5	22.2J–128J	8.5B–25.2J
Iron	5/5	6160J–19400J	11900J–12100J
Lead	5/5	12.2J–116J	8.6J–15.9J
Magnesium	5/5	543J–1620J	1180J–2350J
Manganese	5/5	157J–537J	178–313
Zinc	5/5	34.7J–833J	33.9J–45.5J

NOTES:
*As detected in samples obtained November 1989.
**Concentrations detected in two background surface soil samples obtained November 1989. Data is validated.
J–Indicates an estimated value.
B–This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

COLUMBIA MILLS SOIL
MAIN PLANT AREA - AREA A
FREQUENCY OF DETECTION
- Validated Data -

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS	RANGE OF DETECTED CONCENTRATIONS	BACKGROUND CONCENTRATION**
VOLATILE ORGANICS (ug/kg)				
Methylene Chloride	16/16		8B–28B*	32B–71B
Benzene	1/16	5–6	1J*	6U–7U
Toluene	10/16	5–6	1J–120J*	6U–7UL
Xylenes	1/16	5–6	5J*	6U–7UL
INORGANICS (mg/kg)				
Cadmium	1/26		1.3J	0.69U–0.66
Lead	26/26		1.1B–485J*	8.6J–15.9J
Mercury	11/26		0.12J–2.8J	0.11U–0.14U
Zinc	26/26		20.0J–499J*	33.9J–45.5J

NOTES:

Volatile organic samples obtained from former Piles 1,2 & 4 and inorganic samples obtained from former Piles 1,2,3 & 4 October 1989.

*Additional QA/QC samples (MS, MSD, duplicate, replicate) included in range of detected concentrations.

**Concentrations detected in two background surface soil samples obtained November 1989. Data is validated. Additional QA/QC samples (MS, MSD, replicate) included in range of concentrations for volatile organics.

U – Indicates compound was analyzed but not detected.

L – Indicates sample quantitation limit is an estimated quantity.

J – Indicates an estimated value.

B – This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

COLUMBIA MILLS SOIL
MAIN PLANT AREA - AREA A
FREQUENCY OF DETECTION
- Non Validated Data -

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS	RANGE OF DETECTED CONCENTRATIONS	BACKGROUND CONCENTRATION*
VOLATILE ORGANICS (ug/kg)				
Acetone	2/12	1500–1600	4600–4700	13UL–70B
Trichlorotrifluoroethane	3/16	20	73–360	
1,1,1-Trichloroethane	1/19	20–30	58	6U–7UL
Tetrachloroethylene	8/26	20–30	34–530	6U–7UL
SEMIVOLATILES (ug/kg)				
Phenanthrene	1/4	1000	1000	390U–490U
Dibutyl phthalate	2/4	1000	1000–1900	2600B–4000B
Fluoranthene	1/4	1000	1000	390U–490U
Pyrene	1/4	1000	1100	390U–490U
Bis(2-ethylhexyl)phthalate	1/4	1000	1000	390U–2500B
INORGANICS (mg/kg)				
Aluminum	4/4		4600–5700	8800J–9880J
Arsenic	4/4		4.0–6.0	2.8J–3.3J
Barium	4/4		50–220	34.2J–60.8J
Beryllium	4/4		0.18–0.58	0.42B–0.45B
Cadmium	4/4		0.28–0.60	0.69U–0.66
Calcium	4/4		990–4200	254J–282J
Chromium	4/4		11–26	6.5–8.6
Cobalt	4/4		4.4–5.6	4.1B–5.8B
Copper	4/4		16–60	8.5B–26.2J
Iron	4/4		8000–14000	11900J–12100J
Lead	4/4		46–280	8.6J–15.9J+
Magnesium	4/4		2200–3200	1180J–2350J
Manganese	4/4		200–360	178–313
Mercury	4/4		0.05–0.30	0.11U–0.14U
Nickel	4/4		6.6–9.8	7.6–10.5
Potassium	4/4		400–440	176B–256B
Sodium	4/4		72–98	53.0B–64.5B
Vanadium	4/4		12–14	15.5–19.2
Zinc	4/4		27–240	33.9J–45.5J

NOTES:
Volatile organic samples obtained from former Piles 1,2 & 4 August 1988 and from aerated former Pile 3 August and September 1990. Semivolatile and inorganic samples obtained from former Piles 1, 2, 3 & 4 June 1989.
* Concentrations detected in two background surface soil samples obtained November 1989. Data is validated. Additional QA/QC samples (MS, MSD) included in range of concentrations for volatile and semivolatile organics.
+ Concentrations of lead in twelve surface soil samples obtained at locations outside the Drum Disposal Area (Background) in April 1988 ranged from 8.9 ppm – 53 ppm (average = 26.5 ppm). Data was not validated.
U – Indicates compound was analyzed but not detected.
L – Indicates sample quantitation limit is an estimated quantity.
J – Indicates an estimated value.
B – This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

COLUMBIA MILLS SOIL
MAIN PLANT AREA – AREA B
FREQUENCY OF DETECTION
– Validated Data –

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATIONS	BACKGROUND CONCENTRATION**
SEMIVOLATILES (ug/kg)			
2–Methylphenol	5/5	38J–380J*	390U–490U
4–Methylphenol	2/5	69J–180J*	390U–490U
Naphthalene	5/5	72J–270J*	390U–490U
Acenaphthylene	5/5	60J–270J*	390U–490U
Acenaphthene	2/5	44J–110J	390U–490U
Phenanthrene	5/5	410–34000J*	390U–490U
Anthracene	5/5	66J–9200J*	390U–490U
Fluoranthene	5/5	550–3900J*	390U–490U
Pyrene	5/5	390–3300	390U–490U
Benzo(a)anthracene	5/5	240J–19000J*	390U–490U
Chrysene	5/5	320J–20000J*	390U–490U
Benzo(b)fluoranthene	5/5	380J–2400J*	390U–490U
Benzo(k)fluoranthene	5/5	260J–3000J*	390U–490U
Benzo(a)pyrene	5/5	300J–17000J*	390U–490U
Indeno(1,2,3–cd)pyrene	5/5	270J–9300J*	390U–490U
di–n–Butyphthalate	5/5	88B–490B*	2600B–4000B
INORGANICS (mg/kg)			
Lead	5/5	19.8J–2420J*	8.6J–15.9J
Mercury	3/5	0.12J–0.54J	0.11U–0.14U
Zinc	5/5	159J–632J*	33.9J–45.5J

NOTES:
Samples obtained from former Pile 5 October 1989.
*Additional QA/QC samples (MS, MSD, duplicate) included in range of detected concentrations.
**Concentrations detected in two background surface soil samples obtained November 1989.
Data is validated. Additional QA/QC samples (MS, MSD) included in range of concentrations for semivolatiles.
U – Indicates compound was analyzed but not detected.
J – Indicates an estimated value.
B – This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

COLUMBIA MILLS SOIL
MAIN PLANT AREA - AREA B
FREQUENCY OF DETECTION
- Non Validated Data -

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATIONS*	BACKGROUND CONCENTRATION**
SEMIVOLATILES (ug/kg)			
Phenanthrene	1/1	2700	390U-490U
Fluoranthene	1/1	2500	390U-490U
Pyrene	1/1	2100	390U-490U
Chrysene	1/1	1200	390U-490U
Benzo(a)anthracene	1/1	1000	390U-490U
Bis(2-ethylhexyl)phthalate	1/1	1400	390U-2500B
INORGANICS (mg/kg)			
Aluminum	1/1	5200	8800J-9880J
Arsenic	1/1	6.0	2.8J-3.3J
Barium	1/1	900	34.2J-80.8J
Beryllium	1/1	0.22	0.42B-0.45B
Cadmium	1/1	0.70	0.69U-0.66
Calcium	1/1	1100	254J-282J
Chromium	1/1	68	8.5-8.6
Cobalt	1/1	5.2	4.1B-5.8B
Copper	1/1	62	8.5B-25.2J
Iron	1/1	10000	11900J-12100J
Lead	1/1	630	8.6J-15.9J+
Magnesium	1/1	2400	1180J-2350J
Manganese	1/1	350	178-313
Mercury	1/1	0.25	0.11U-0.14U
Nickel	1/1	8.0	7.6-10.5
Potassium	1/1	480	176B-256B
Sodium	1/1	86	53.0B-64.5B
Vanadium	1/1	14	15.5-19.2
Zinc	1/1	310	33.9J-45.5J

NOTES:

*As detected in composite sample obtained June 1989 from former Pile 5. No volatile organics were detected in exit samples obtained from former Pile 5 in November 1990 following soil aeration activities.

**Concentrations detected in two background surface soil samples obtained November 1989. Data is validated. Additional QA/QC samples (MS, MSD) included in range of concentrations for semivolatiles.

+ - Concentrations of lead in twelve surface soil samples obtained at locations outside the Drum Disposal Area (Background) in April 1988 ranged from 8.9 ppm - 53 ppm (average = 26.5 ppm). Data was not validated.

U - Indicates compound was analyzed but not detected.

J - Indicates an estimated value.

B - This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

COLUMBIA MILLS SURFACE SOIL
ARSENAL AREA
FREQUENCY OF DETECTION
- Non Validated Data -

CHEMICAL	FREQUENCY OF DETECTION	DETECTED CONCENTRATION	BACKGROUND CONCENTRATION*
VOLATILE ORGANICS (ug/kg)			
Methylene chloride	1/1	12	32B–71B
SEMIVOLATILES(ug/kg)			
Bis(2-ethylhexyl)phthalate	1/1	1900	390U–2500B
TICS			
2-Ethyl-1-hexanol	1/1	6000	
Benzene acetic acid	1/1	600	
4-Hydroxy-3-methoxy benzaldehyde	1/1	180	
INORGANICS (mg/kg)			
Cadmium	1/1	1	0.69U–0.66
Chromium	1/1	11	8.5–8.6
Copper	1/1	5.6	8.6B–25.2J
Lead	1/1	100	8.6J–15.9J+
Nickel	1/1	2.7	7.6–10.5
Silver	1/1	0.3	0.53UL–0.64UL
Zinc	1/1	60	33.9J–45.5J

NOTES:

Sample A obtained August 1965.

*–Concentrations detected in two background surface soil samples obtained November 1969. Data is validated. Additional QA/QC samples (MS,MSD,reprep) included in range of concentrations for volatile and semivolatile organics.

+–Concentrations of lead in twelve surface soil samples obtained at probable background locations outside the Drum Disposal Area in April 1988 ranged from 8.9ppm – 53ppm (average = 26.5ppm). Data was not validated.

TIC–Tentatively identified compound.

U – Indicates compound was analyzed but not detected.

L – Indicates sample quantitation limit is an estimated quantity.

J – Indicates an estimated value.

B – This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar levle(s).

COLUMBIA MILLS SEDIMENT
MAIN PLANT AREA - BENSON CREEK
SUMMARY OF DETECTIONS
– Validated Data –

CHEMICAL	NOVEMBER 1989											FEBRUARY 1990	ORGANICS CRITERIA*		METALS CRITERIA	
	SED 1	SED 2	SED 2 (REPREP)	SED 3	SED 3 (DUPE)	SED 3 (DUPE - REPREP)	SED 4	SED 4 (MS)	SED 4 (MSD)	SED 5	SED 5 (REPREP)	SS-7	AQUATIC TOXICITY BASIS	HUMAN HEALTH RESIDUE BASIS	CRITERIA**	LIMIT OF TOLERANCE***
VOLATILE ORGANICS (ug/kg)																
Methylene chloride	52B	23B	40B	24B	58B	21B	360B	100B	220B	32B	75B	20B				
1,1,1-Trichloroethane	13U	10UL	9UL	6U	10UL	10UL	16UL	15UL	18UL	12UL	12UL	2J				
Toluene	13U	10UL	9UL	6U	10UL	10UL	16UL	106%	132%	3J	3J	10UL				
Methyl ethyl ketone	25UR	37J	130J	12UR	20UR	20UR	33UR	33UR	33UR	24UR	24UR	20UR				
SEMIVOLATILES (ug/kg)																
Phenanthrene												510J	4170+			
Fluoranthene												820J				
Pyrene												580J				
Benzo(a)anthracene												330J		39		
Chrysene												360J		39		
di-n-Butylphthalate												19000B				
INORGANICS (mg/kg)																
Aluminum	4050J	5760J		5890J	3820J		6550J			6190J		7590J				
Antimony	7.5U	8.8U		7.8U	5.4U		11.7B			20.6B		13.5				
Arsenic	2.6J	3.4J		2.9J	2.1J		7.4J			13.7J		11.6			5(4.0–5.9)	33
Cadmium	0.90U	1.1U		0.94U	0.65U		3.5B			9.3		3.0			0.8(0.6–1.0)	10
Chromium	6.8J	10.2J		8.8J	6.7J		18.1J			48.2J		1670J			26(22–31)	111
Copper	35.3J	62.6J		49.6J	38.3J		722J			373J		778			19(16–25)	114
Iron	7030J	12600J		9630J	6820J		30800J			9440J		20500			24000(20000–30000)	40000
Lead	2.4	61.8		65.9	44.0		429			1560		13800			27(23–31)	250
Magnesium	1000J	1580J		1180J	774J		1290J			1120J		2810J				
Manganese	213J	606J		281J	226J		767J			146J		137			428(400–457)	1100
Zinc	110J	200J		168J	138J		2750J			9830J		1950J			85(65–110)	800
Cyanide	10.0U	10.0U		10.0U	10.0U		45.0			10.0U		184				

NOTES:

November 1989 samples not analyzed for semivolatiles

REPREP–Replicate sample.

DUPE–Duplicate sample.

MS–Matrix spike.

MSD–Matrix spike duplicate.

U–Indicates compound was analyzed but not detected.

J–Indicates an estimated quantity.

B–This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

L–The sample quantitation limit is an estimated quantity.

%–Indicates percent recovery for MS and MSD samples.

R–Indicates an unreliable result based on data validation–compound (methyl ethyl ketone) may or may not be present in the sample due to poor instrument response.

*Source: NYSDEC Sediment Criteria Guidance Document – December 1989 Criteria based on sediment organic carbon content of 3%.

**Source: NYSDEC Sediment Criteria Guidance Document. Values in parenthesis are "no effect" and "lowest-effect" levels, respectively.

***Source: NYSDEC Sediment Criteria Guidance Document. Concentration which would be detrimental to the majority of species, potentially eliminating most.

+–EPA proposed interim sediment criteria.

MALCOLM PIRNIE

COLUMBIA MILLS GROUND WATER
DRUM DISPOSAL AREA
FREQUENCY OF DETECTION
– Validated Data –

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l)			
				USEPA MCL	NYSDEC MCL	NYSDEC GA–S	NYSDEC GA–G
VOLATILE ORGANICS							
Trichloroethene	1/3	1	3	5	5	5	
Toluene	1/3	1	3J–4*		5	5	50
SEMIVOLATILES							
Phenanthrene	1/3	10–11	2J		50		50
Fluoranthene	1/3	10–11	3J		50		50
Pyrene	1/3	10–11	3J		50		50
Benzo(a)anthracene	1/3	10–11	2J		50		0 002
Chrysene	1/3	10–11	2J		50		0.002
Benzo(b)fluoranthene	1/3	10–11	1J		50		0 002
Benzo(k)fluoranthene	1/3	10–11	0 8J		50		0 002
Benzo(a)pyrene	1/3	10–11	1J		50	ND	
di–n–Butylphthalate	2/3	10–11	2B		50	50	
INORGANICS (TOTAL)							
Aluminum	2/3	84 0	111–147				
Antimony	1/3	22 0	24.8B*				3
Chromium	2/3	2 0	3 0B–6 0B	50	50	50	
Copper	3/3		6.0–10.4*		1000	200	
Iron	3/3		5160J–27900J*		300	300	
Lead	1/3	3 0	80.0J	50	50	25	
Magnesium	3/3		11400J–17700J*				35000
Manganese	3/3		133J–1240J*		300	300	
Zinc	3/3		30.5B–614J*		5000	300	
Cyanide	1/3	10 0	143			100	

Notes:
Samples obtained from B–7D, B–10S and B–10D February 1990 Water was purged from wells one day before sampling to allow water in wells to sit overnight to reduce sample turbidity for metals analysis.
* Additional QA/QC sample (duplicate) included in range of detected concentrations.
SCGs–Standards, Criteria and Guidelines.
J–Indicates an estimated value.
B–This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s)
ND–Non detectable

MALCOLM PIRNIE

COLUMBIA MILLS GROUND WATER
DRUM DISPOSAL AREA
FREQUENCY OF DETECTION

– Non Validated Data –

CHEMICAL		FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l)			
					USEPA MCL	NYSDEC MCL	NYSDEC GA-S	NYSDEC GA-G
VOLATILE ORGANICS								
Methylene Chloride		5/12	1-5	1J-2.6B		5	5	50
Acetone		3/3		2JB-51		50		
1,1-Dichloroethylene		1/12	1-5	TR<1	7	5	5	0.07
Chloroform		2/12	1-5	6-7	100+	100+	100	
Methyl ethyl ketone		1/5	10	18		50		
Toluene		2/12	1-5	2J-4		5	5	50
SEMIVOLATILES								
Bis(2-ethylhexyl)phthalate		2/2	10	1J-4J		50	50	
INORGANICS								
Aluminum	- soluble	0/2	200	ND				
	- total	1/2	200	7220				
Antimony	- soluble	0/2	60.0	ND				
	- total	1/2	60.0	74.0				3
Barium	- soluble	1/2	200	238	1000(T)	1000(T)	1000(T)	
Cadmium	- soluble	0/5	5-10	ND				
	- total	2/6	5	110-120	10	10	10	
Calcium	- soluble	2/2	5000	51800-56300				
Chromium	- soluble	0/5	10-50	ND				
	- total	3/6	10-50	176-900	50	50	50	
Copper	- soluble	0/5	10-25.0	ND				
	- total	4/6	20-25.0	30-2500		1000	200	
Iron	- soluble	2/2	100	284-512				
	- total	2/2	100	17000-65000		300	300	
Lead	- soluble	0/5	5-100	ND				
	- total	3/6	3.0-300	2760-58000	50	50	25	
Magnesium	- soluble	2/2	5000	7110-15900				
	- total	2/2	5000	11500-11800				35000
Manganese	- soluble	2/2	15.0	116-2310				
	- total	2/2	15.0	91.6-4550		300	300	
Nickel	- soluble	3/5	30-40	40-120				
	- total	3/4	30	40-14000				
Sodium	- soluble	2/2	5000	6230-12900			20000(T)	
Zinc	- soluble	5/5	20.0	54-270				
	- total	6/6	5-20.0	39-22000		5000	300	
Cyanide		2/4	10.0-100	153-218			100	

Notes:

Samples obtained from B-7S October 1985; B-7S/B-7D April, August, October 1987 and April 1988; B-10D April 1990 and B-10S/B-10D October 1990.

SCGs-Standards, Criteria and Guidelines

J-Indicates an estimated value.

B-This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

ND-Indicates compound was analyzed but not detected.

TR-Trace amount detected.

+Limit for total trihalomethanes.

(T)-SCG for total Barium or Sodium.

MALCOLM PIRNIE

COLUMBIA MILLS SEDIMENT
INTERMITTENT STREAM ORIGINATING IN DRUM DISPOSAL AREA
SUMMARY OF DETECTIONS
- Validated Data -

Sample ID	SED-3	SED-4	SED-5	SED-6	SED-7	SED-8	SED-9	SED-10	Criteria*	Limit of Tolerance**
Inorganics (mg/kg)										
Aluminum	4900J	10300J	6180J	8040J	6880J	8690J	9870J	12400J		
Antimony	13.5B	31.4B	24.2B	16.2B	7.0U	7.2U	6.6U	5.4U		
Arsenic	1.5J	22.0J	6.6J	7.4J	3.3J	0.80J	0.81J	3.5J	5(4.0-5.5)	33
Cadmium	1.6B	88.8	25.4	23.4	10.1	2.2B	1.5B	0.66U	0.8(0.6-1.0)	10
Chromium	25.8J	151J	37.8J	46.6J	18.5J	13.1J	15.1J	18.6J	26(22-31)	111
Copper	49.3J	156J	48.6J	59.4J	22.1J	13.1B	13.4B	14.3B	19(15-25)	114
Iron	8800J	45500J	17100J	18000J	9200J	7690J	8470J	18200J	24,000 (20,000-30,000)	40,000
Lead	26.9	31.1	10.3	15.5	1.7	9.4	8.9	5.3	27(23-31)	250
Magnesium	971J	2650J	1380J	1800J	1610J	1670J	2010J	2470J		
Manganese	176J	6030J	3350J	1240J	1500J	561J	562J	4780J	428(400-457)	1100
Zinc	540J	7230J	2690J	2640J	1210J	593J	608J	282J	85(65-110)	800
Cyanide	10.0U	10.0U	10.0	26.0	10.0U	10.0U	10.0U	10.0U		

Notes: All samples collected November 1989. Results arranged based on sample locations, from upstream (SED 3) to downstream (SED-10).

U Indicates constituent was analyzed for but not detected.

J Indicates an estimated value.

B This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).

* Source: NYSDEC Sediment Criteria Guidance Document - December 1989. Values in parenthesis are "no-effect" and "lowest-effect" levels, respectively.

** Source: NYSDEC Sediment Criteria Guidance Document. Concentration which would be detrimental to the majority of species, potentially eliminating most.

MALCOLM PIRNIE

COLUMBIA MILLS SEDIMENT
DRUM DISPOSAL AREA – PONDS
FREQUENCY OF DETECTION
– Non Validated Data –

POND 1

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATION (mg/kg)	Criteria* (mg/kg)	Limit of Tolerance** (mg/kg)
INORGANICS				
Cadmium	13/13	0.35–8.6	0.8(0.6–1.0)	10
Chromium	13/13	2.8–110	26(22–31)	111
Copper	13/13	5.7–180	19(15–25)	114
Lead	12/13	1.7–480	27(23–31)	250
Nickel	13/13	2.0–130	22(16–31)	40
Silver	2/13	0.3–4.0		
Zinc	13/13	41–2300	85(65–110)	800

POND 2

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATION (mg/kg)	Criteria* (mg/kg)	Limit of Tolerance** (mg/kg)
INORGANICS				
Cadmium	4/4	1.0–9.2	0.8(0.6–1.0)	10
Chromium	4/4	20–62	26(22–31)	111
Copper	4/4	13–590	19(15–25)	114
Lead	4/4	120–3000	27(23–31)	250
Nickel	4/4	2.7–42	22(16–31)	40
Zinc	4/4	94–7800	85(65–110)	800

POND 3

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATION (mg/kg)	Criteria* (mg/kg)	Limit of Tolerance** (mg/kg)
INORGANICS				
Cadmium	6/6	0.63–8.4	0.8(0.6–1.0)	10
Chromium	6/6	13–200	26(22–31)	111
Copper	6/6	9.2–160	19(15–25)	114
Lead	6/6	58–13,000	27(23–31)	250
Nickel	6/6	4.6–60	22(16–31)	40
Silver	1/6	0.3		
Zinc	6/6	100–3200	85(65–110)	800

Notes:

* Values in parenthesis are "no effect" and "lowest effect" levels, respectively. Source NYSDEC, Division of Fish and Wildife document – Sediment Criteria – December 1989

** Concentration which would be detrimental to the majority of species, potentially eliminating most. Source: NYSDEC, Division of Fish and Wildife document – Sediment Criteria – December 1989

COLUMBIA MILLS SEDIMENT
INTERMITTENT STREAM ORIGINATING IN DRUM DISPOSAL AREA
SUMMARY OF DETECTIONS
- Non Validated Data -

SAMPLE ID / DATE COLLECTED	SED-3 04/11/88	SED3-MS 04/11/88	R 04/28/87	R 08/19/87	S 04/28/87	S 08/19/87	SED-2 04/11/88	ORGANICS CRITERIA*: AQUATIC TOXICITY BASIS	ORGANICS CRITERIA*: HUMAN HEALTH RESIDUE BASIS	ORGANICS CRITERIA*: WILDLIFE RESIDUE BASIS	METALS CRITERIA: CRITERIA**	METALS CRITERIA: LIMIT OF TOLERANCE***
VOLATILE ORGANICS (ug/kg)												
Toluene	24U	110%	20U		20U		4J					
Methylene Chloride	110B	150B	100U		100U		45B					
Acetone	41JB	43JB					17JB					
SEMIVOLATILES (ug/kg)												
Phenol	2000U						830J	18				
4-Chloro-3-methylphenol	2000U						490J					
Phenanthrene	2000U						430J	4170+				
Fluoranthene	2000U						500J					
Pyrene	400J						460J					
Chrysene	2000U						320J		39			
bis(2-Ethylhexyl)phthalate	710J						740J	3591				
TICS												
Carboxylic acid	2400J						3400J					
Hexanedioic acid							4200J					
PESTICIDES (ug/kg)												
4,4'-DDE	40J						13J	1500	0 3	30/25+		
4,4'-DDD	43J						6 4J	1500	0 3	30/25+		
INORGANICS (mg/kg)												
Aluminum	8130						4920					
Barium	166U						87 9					
Cadmium	23 2		2 1	3 1	14	38	1 8U				0 8(0.6–1.0)	10
Calcium	4620						3730					
Chromium	18 4		42	45	15	28	23 5				26(22–31)	111
Copper	181		70	53	30	29	63 3				19(16–25)	114
Iron	12300						6830				24,000(20,000–30,000)	40,000
Lead	81 5		250	180	73	47	606				27(23–31)	250
Manganese	408						192				428(400–457)	1100
Nickel	33 1U		8 6	14	14	52	21 5				22(16–31)	40
Selenium	4 7						2 1					
Zinc	2000		37	540	33	1800	662				85(65–110)	800

NOTES
Sample results arranged based on sample locations, from upstream (SED-3) to downstream (SED-2)
No data indicates compound was not analyzed
MS-Matrix Spike
U-Indicates compound was analyzed but not detected
J-Indicates an estimated quantity.
B-This result is qualitatively suspect since this analyte was detected in field and/or laboratory blank(s) at a similar level(s).
%Indicates percent recovery for MS sample.
TICs-Tentatively identified compounds.
*Source: NYSDEC Sediment Criteria Guidance Document – December 1989 Criteria based on sediment organic carbon content of 3%
**Source: NYSDEC Sediment Criteria Guidance Document Values in parenthesis are "no-effect" and "lowest-effect" levels, respectively.
***Source: NYSDEC Sediment Criteria Guidance Document Concentration which would be detrimental to the majority of species, potentially eliminating most
+–EPA proposed interim sediment criteria

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MALCOLM PIRNIE

COLUMBIA MILLS SURFACE WATER
DRUM DISPOSAL AREA – PONDS
FREQUENCY OF DETECTION
– Non Validated Data –

POND 1

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l)		
				USEPA ACUTE CRITERIA	USEPA CHRONIC CRITERIA	NYSDEC CLASS D STANDARD
VOLATILE ORGANICS						
Methylene Chloride	3/3	1	1.0–2.4			
INORGANICS						
Cadmium	4/4	0.01–5	0.06–5	2.55	0.84	2.55
Chromium	3/4	0.01–50	0.11–2.0	1,269*	151*	1,269
Chromium(+6)	3/4	0.004–10	0.009–0.010	16	11	16
Copper	3/4	0.01–20	0.10–0.8	12.4	8.53	12.4
Lead	3/4	0.05–100	0.6–3.5	50.2	1.95	50.9
Nickel	3/4	0.01–30	2–7	1,026	114	1,379
Zinc	4/4	0.01–10	62–890	84.6	76.6	234

POND 2

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l)		
				USEPA ACUTE CRITERIA	USEPA CHRONIC CRITERIA	NYSDEC CLASS D STANDARD
INORGANICS						
Cadmium	1/2	5	7	2.55	0.84	2.55
Zinc	2/2	10	40–270	84.6	76.6	234

POND 3

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l)		
				USEPA ACUTE CRITERIA	USEPA CHRONIC CRITERIA	NYSDEC CLASS D STANDARD
VOLATILE ORGANICS						
Methylene Chloride	2/2	1	3.0B–4.5B			
INORGANICS						
Cadmium	1/6	0.01–5	25	2.55	0.84	2.55
Copper	1/6	0.01–20	0.01	12.4	8.53	12.4
Lead	4/6	0.05–100	0.08–700	50.2	1.95	50.9
Nickel	2/6	0.01–30	0.01–0.02	1,026	114	1,379
Zinc	6/6	0.01–10	0.04–20,000	84.6	76.6	234

Note: SCGs – Standards, Criteria and Guidelines
* Value for Chromium III
B = Also found in blank; value shown corrected for concentration in blank.
Hardness dependent criteria based on calculated site surface water hardness of 68.2 mg/l. All criteria are hardness dependent except for Chromium(+6).

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COLUMBIA MILLS SURFACE WATER
INTERMITTENT STREAM ORIGINATING IN DRUM DISPOSAL AREA
FREQUENCY OF DETECTION

– Non Validated Data –

CHEMICAL	FREQUENCY OF DETECTION	RANGE OF SAMPLE QUANTITATION LIMITS (ug/l)	RANGE OF DETECTED CONCENTRATION (ug/l)	SCGs (ug/l) USEPA ACUTE CRITERIA	USEPA CHRONIC CRITERIA	NYSDEC CLASS D STANDARD
VOLATILE ORGANICS						
1,1,1–Trichloroethane	2/2	1	1 TR–1			
Chloroform	2/2	1	2	28,900*	1,240*	
INORGANICS						
Zinc	2/2	10	110–350	84.6+	76.6+	234+

Note: SCGs – Standards, Criteria and Guidelines
TR = Trace amount
* Insufficient data to develop criteria. Value presented is the lowest observed effect level.
\+ Hardness dependent criteria based on calculated site surface water hardness of 68.2 mg/l.

ARCADIS

Appendix **B**

Remediation Report

MALCOLM PIRNIE

COLUMBIA MILLS LANDFILL
FINAL REMEDIATION REPORT
NYSDEC SITE NO.: 07-38-012

PREPARED FOR:
NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION
50 WOLF ROAD
ALBANY, NY 12233

MARCH 1997

MALCOLM PIRNIE, INC.

P. O. Box 1938
Buffalo, New York 14219

0266-319-500/RR

MALCOLM PIRNIE

COLUMBIA MILLS LANDFILL
SITE NO. 07-38-012
MINETTO, NEW YORK

CONSTRUCTION COMPLETION NOTIFICATION

Construction was completed in general accordance with the Contract Documents prepared by Malcolm Pirnie, Inc. for the New York State Department of Environmental Conservation for the Columbia Mills Landfill Closure, Site No. 07-38-012, except as observed and noted herein.

Signature:____________________
Paul H. Werthman, P.E.
NYPE No.
Vice President

Signature:____________________
Kent R. McManus, P.E.
Project Manager

Signature:____________________
Terry J. Ried
Project Engineer

MALCOLM PIRNIE

COLUMBIA MILLS LANDFILL
FINAL REMEDIATION REPORT

TABLE OF CONTENTS

Page

MALCOLM PIRNIE

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 LOCATION

The Columbia Mills site consists of approximately 100 acres of land in Minetto, New York. The site originally encompassed approximately 130 acres; however, several plots of land were either sold or relinquished without fee. These plots were used for residential development, the sewage treatment plant, the Town of Minetto Fire Department and the Town Park. The Columbia Mills site is bound on the east by Route 48, by Benson Avenue (Route 25) to the south, on the north by Snell Road (Route 42) and to the west by a Conrail track right-of-way (See Figures 1-1 and 1-2).

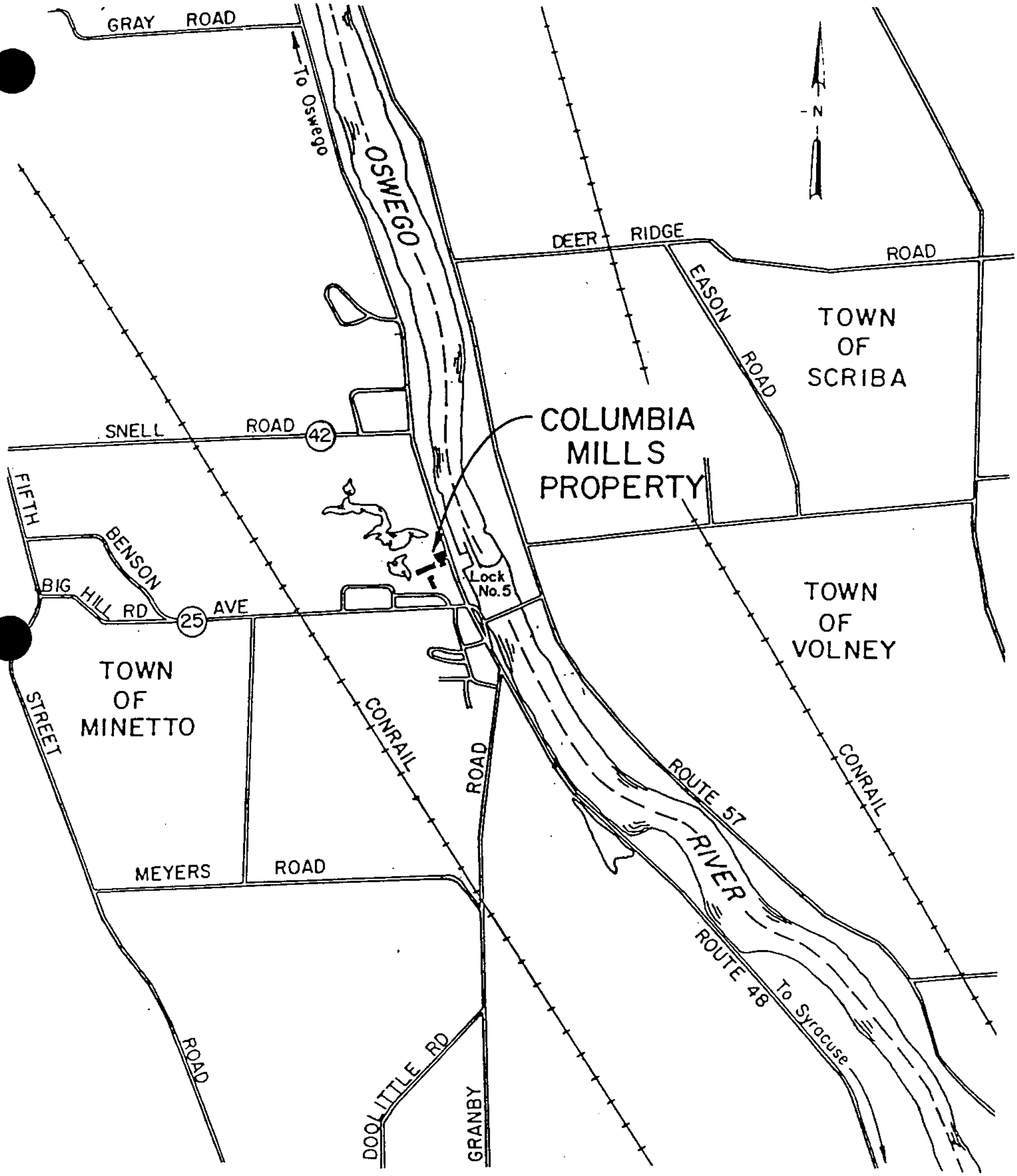
The 10 acres of land adjacent to Route 48 constitute the main plant area. Two ponds that were used to store process water for the plant are located to the north and northwest of the main plant area.

To the west of the main plant area there exists approximately 90 acres of undeveloped land. This area included several ponds (which were filled in as a result of site remediation activities), streams and the former plant's landfill (the drum disposal area). The landscape in this area is gently rolling and is predominately heavily wooded.

1.2 SITE HISTORY

Columbia Mills, Inc. was a manufacturer of coated cloth and vinyl products from 1887 until the plant closed in 1976. After the plant ceased to operate, the property was sold to Columin Development Corporation, who initiated salvage operations. For economic reasons, the salvaging ended prematurely and Columin defaulted on property taxes. Ownership of the site transferred to the County of Oswego.

In its present state, the site consists of approximately 10 acres of standing structures, partially and completely demolished buildings and rubble (the main plant area), and approximately 40 acres of undeveloped property. This undeveloped property includes the



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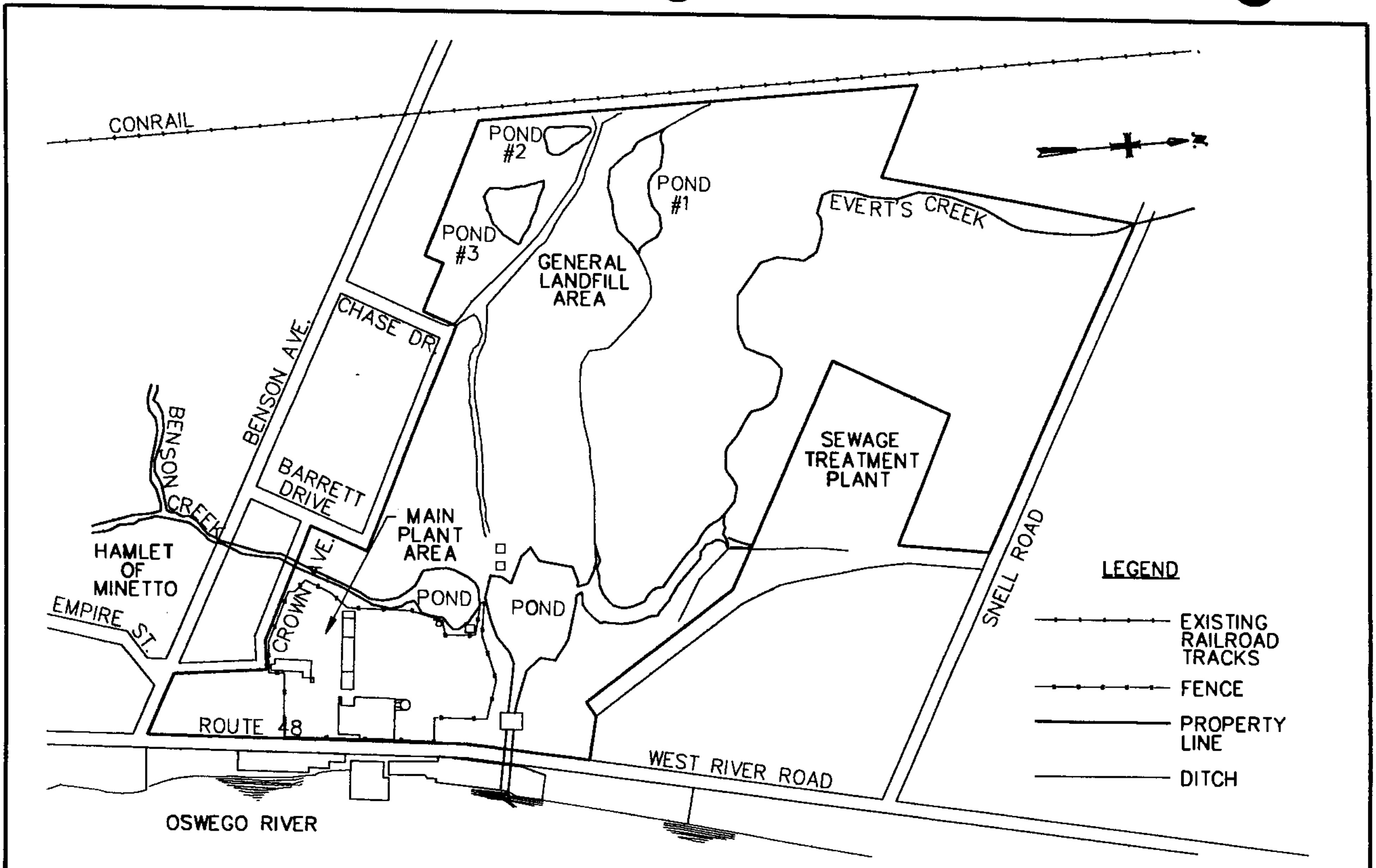
COLUMBIA MILLS
SITE LOCATION MAP

FIGURE I-1

OCTOBER 1988

SCALE: 1" = 2000'



MINETTO, NEW YORK
PRE-REMEDIATION
SITE MAP

COLUMBIA MILLS, INC.

JANUARY 1997

FIGURE 1-2

MALCOLM PIRNIE

0266F002

7518 : 02663195001\: \ACAD\PROJ\02663192\0266F002 SCALE: 1:1 01/23, 1997 at 14:26

plant's former landfill (the drum disposal area) which was remediated as described in this report.

A remedial investigation and feasibility study conducted at the site by Malcolm Pirnie, Inc. (Malcolm Pirnie) on behalf of Columbia Mills, Inc. identified areas of contamination and determined what actions should be taken to alleviate the contamination. Trace metal contaminated soils and sediment were found in the former drum disposal area along with isolated areas of semi-volatiles.

1.3 PROJECT DESCRIPTION

1.3.1 Remedial Objectives

The remedial action objectives for the Drum Disposal Area soils, sediments, and groundwater were established to meet applicable standards, criteria and guidelines (SCGs) and to protect human health and the environment . The soils in the Drum Disposal Area consisted of ash material, which is contaminated with elevated levels of cadmium, chromium, copper, lead, and zinc. Semivolatiles were also detected. The extent of soil contamination was to be determined by using lead as an indicator parameter. Confirmatory sampling was required to further define the limits of remediation.

Elevated levels of metals had previously been found in the sediments in Ponds 1, 2, and 3 and along the intermittent creek exiting Pond 1. Semivolatile contamination had also been found in the creek sediments. The shallow groundwater between Ponds 1 and 3 showed the presence of some metals at elevated concentrations. The historical data indicated that the majority of the metals are absorbed onto particulate matter and not dissolved in the groundwater.

The remedial objectives were to be met by the construction of a landfill cover system (cap) and associated components. The soils in the Drum Disposal Area were to be covered in-place by the cap. Soils outside of the proposed limits of the cap as well as pond and creek sediments were to be excavated, moved onto the landfill area, and encapsulated. The soils and sediments from the Main Plant Area which were previously staged on-site were also to be placed on the landfill area and stabilized. The shallow groundwater in the area was to be either hauled off-site to a permitted disposal facility or treated on-site and discharged to an adjacent stream.

Collected leachate and/or groundwater was to be either hauled off-site to a permitted disposal facility or treated on-site and discharged to an adjacent stream.

1.3.2 Remedial Design Documents

Remedial design documents including detailed design plans and specifications for the capping and closure of the former drum disposal area were prepared by Malcolm Pirnie and submitted to the New York State Department of Environmental Conservation (NYSDEC) for review and approval. The planned remediation work was advertised for public bids and a pre-bid conference was held at the Columbia Mills site on April 18, 1995. Sealed competitive bids were received on May 16, 1995. SLC Constructors, Inc. (SLC) was determined to be the low bidder with a bid of $1,664,628.13 plus $20,000.00 for pollution liability insurance for a total of $1,684,628.13. SLC was given formal Notice to Proceed on June 1, 1995 and started work at the site the week of August 7, 1995.

2.0 SUMMARY OF REMEDIAL WORK

2.1 HEALTH AND SAFETY

As a requirement of the Columbia Mills Landfill Remediation Contract, SLC was responsible for all construction site safety precautions. SLC subcontracted the work to Upstate Laboratories, Inc. (Upstate) to prepare a site specific Health and Safety Plan (HASP) to address procedures for the protection of personnel performing the work as well as the general public. The HASP was prepared in July 1995 in general conformance with OSHA standard 1910.120(I)(2) and with the project specifications. SLC's HASP was prepared and monitored under the direction of a Certified Industrial Hygienist and implemented on a daily basis by the Site Safety Officer (SSO).

In addition to outlining the various health and safety issues involved with a typical hazardous waste construction project (i.e., training, medical surveillance, work zone designations, personal protective equipment, emergency response procedures, etc.), the Columbia Mills HASP described site specific requirements due to the presence of specific wastes including metals and dust. Protocols for site air monitoring and decontamination were also presented in the HASP.

Site air monitoring was accomplished by the SSO as a means of determining the proper level of personnel protective equipment to be used, to document that the level of worker protection was adequate, and to assess the migration of contaminants to off-site receptors as a result of site operations. At the site, both the site perimeter and the actual work areas were monitored on a daily basis for total nuisance dust as well as metals, including arsenic, lead, chromium, manganese, copper, nickel, and zinc. All real time monitoring and documentation monitoring at the site perimeter was accomplished using Miniram PDM-3's while documentation monitoring within the work areas was performed using SLC dedicated sample pumps worn by site workers. The results of all monitoring were compared with specified action levels to determine changes in the level of protection or site operations. Table 2-1 lists site air monitoring frequencies while Table 2-2 lists established

TABLE 2-1

COLUMBIA MILLS LANDFILL CLOSURE
AIR MONITORING PROGRAM

MONITORING FREQUENCY

Task	Frequency & Location - Real Time Monitoring
Any Demolition or Excavation	Location: Upwind of Work Area. Frequency: 10-15 minutes to establish background. Equipment: Dust monitor.
Any Demolition or Excavation	Location: Work Area/Exclusion Zone. Frequency: Hourly. Equipment: Dust monitor.
Any Demolition or Excavation	Location: 1 upwind, 3 downwind at perimeter. Frequency: Continuously over 8 hours. Equipment: Dust monitor.
Any Demolition or Excavation	Location: Half the distance between the work zone and the down wind site perimeter. Frequency: Minimum of twice per day or when action levels have been exceeded. Equipment: Dust monitor.
Task	**Frequency & Location - Documentation Monitoring**
Any Demolition or Excavation	Location: 1 upwind, 3 downwind at perimeter. Frequency: Continuously over 8 hours. Equipment: Sample pumps to collect Total Nuisance Dust and Metals.
Any Demolition or Excavation	Location: Exclusion zone. 2 personal exposure samples. Frequency: 1 day out of every 5 days. Continuously over 8 hours. Equipment: Sample pumps to collect Total Nuisance Dust and Metals.

TABLE 2-2

COLUMBIA MILLS LANDFILL CLOSURE
AIR MONITORING PROGRAM

ACTION LEVELS

Contaminant	Monitoring	Action Level	Monitoring Frequency
Total Nuisance Dust	NIOSH 0500	>10<15 mg/m3 >15 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Arsenic	NIOSH 7900	>0.35<0.5 mg/m3 >0.5 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Lead	NIOSH 7300	>0.030<0.05mg/m3 >0.05 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Chromium	NIOSH 7300	>0.75<1.0 mg/m3 >0.1 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Manganese	NIOSH 7300	>0.75<1.0 mg/m3 >1.0 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Copper	NIOSH 7300	>0.75<1.0 mg/m3 >1.0 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Nickel	NIOSH 7300	>0.75<1.0 mg/m3 >1.0 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.
Zinc	NIOSH 7300	>7.0<10.0 mg/m3 >10.0 mg/m3	Evaluate dust suppression techniques. Sample two high risk workers for three consecutive days. Reevaluate results. Half or Full Face respirator with HEPA filter.

action levels for the dust and the metals of concern. Appendix A provides a summary of the data obtained from the site air monitoring program.

In addition to the daily air monitoring discussed above, Upstate periodically monitored volatile emissions within specific work areas when odors were encountered. While not a requirement of the HASP, this particular monitoring was performed using an HNu as an additional means of further protecting the site workers. When significant readings were observed on the HNu, the excavations were halted and a soil sample was collected for analysis. The level of protection for workers was increased as necessary before excavation activities resumed. In suspect areas air monitoring was performed throughout the work.

Due to the contaminants of concern as well as the intrusive nature of the work, the HASP also addressed site specific decontamination procedures for personnel and equipment. It was the responsibility of the SSO to ensure that all personnel and equipment which left the site were properly decontaminated. The plan included not only detailed decontamination procedures for personnel and equipment, but also measures developed to prevent contamination. In general, personnel decontamination procedures were limited to steps for cleaning, removal, and disposal of Level C type protective gear (no higher level of protection was warranted during the work). Equipment decontamination requirements included thoroughly washing all hand tools and small equipment while heavy equipment was cleaned by first removing loose debris followed by water washing. Designated decontamination areas were constructed for personnel and equipment.

The majority of the soil material washed from equipment and collected in the bottom of the decon pad was disposed of periodically within the landfill subgrade as the work progressed. Upon completion of the cover system construction however, some soil remained in the decon pad which could no longer be disposed of on-site. That material was analyzed for lead and determined to exceed allowable limits. It was therefore placed into nine 55-gallon drums and hauled off-site for disposal at Chemical Waste Management's Model City Landfill.

All decon water collected during construction activities was pumped to the on-site treatment facility for treatment. The decon pad was decontaminated, disassembled and transported back to SLC's Lockport office facilities.

2.2 SITE PREPARATION

Site preparation for the Columbia Mills Landfill Remediation Project generally consisted of mobilization, site surveying, clearing and grubbing, excavation of contaminated materials (viz. soils and sediments) and preparing the landfill subgrade.

Mobilization at the site began on August 14, 1995 and included setup of construction office trailers and transportation of construction equipment and materials to the site. Two office trailers were brought to the site for occupancy by the Engineer / NYSDEC and the Contractor. Both trailers were located in an uncontaminated area adjacent to the site access road. A project sign was installed at the entrance to the site. Following setup of the trailers, Scriba Electric, subcontractors to SLC, provided electrical connections including a new power pole, meter and associated cable. Telephone service was subsequently installed by New York Telephone. All electrical connections were inspected by a representative of the Fire Underwriters. A new 2-inch diameter waterline for service to the temporary treatment plant and decon pad was installed by the contractor from an existing main on Barrett Road adjacent to the Minetto firehouse. The water service connection was through a corporation stop installed by the City of Oswego Water Department.

Concurrent with site mobilization, the contractor began clearing portions of the site to allow for the establishment of the site survey baseline and surveying of the clearing limits and limits of contaminated fill and sediments. This clearing operation involved hand removal of trees and shrubs along the site perimeter and the old railroad bed as well as to expose existing monitoring wells and piezometers. The site survey was conducted by a subcontractor, Modi Engineers, and began on August 23, 1995.

Clearing and grubbing at the site was conducted by Monroe Tree Service (a subcontractor). Clearing within the landfill and future amphibian breading area was performed using heavy equipment to remove all trees and shrubs within the established clearing limits. Following removal, all trees were chipped on-site and the chips stockpiled for later use as on-site fill and for erosion control. Stump removal was accomplished using bulldozers to strip and stockpile stumps. The stockpiled stumps were then visually inspected for contamination (i.e., colored soil/bark). Visually clean stumps were ground in a tub grinder and mixed in with the chip pile while visually contaminated stumps were segregated for later burial in the landfill. Clearing and grubbing was also performed north of the site access road by the general contractor for installation of a 4-inch diameter leachate effluent sewer from the site to an existing manhole in Barrett Drive.

2.3 SOIL EXCAVATION/CONSOLIDATION

Following clearing, grubbing and surveying, the contractor began excavation of contaminated soil materials. In general, the contaminated materials at the site consisted of soils, debris (drums, etc.), and sediments. All contaminated materials were disposed on-site within the landfill area. Contaminated soils and debris were excavated from the areas shown on Sheet 2 of the Modi Engineering Record Drawings using large backhoes and bulldozers. These areas were excavated to predetermined depths and the material was moved to and consolidated within the landfill area. When excavation was completed within a given area, a representative of Upstate Labs (the site Health and Safety coordinators) collected exit samples of the excavation area. Based on the results of the sample analysis, the area was either deemed clean or further soil was removed and the area resampled. Each exit sample was analyzed at Upstate Labs for lead concentrations following USEPA Method 200.7 guidelines. Initially the cleanup goal for lead contaminated soils was set at 100 mg/kg; however, during the work, as a means of limiting excavation and based on similar project experience, the NYSDEC directed that the goal be raised based on the depth of the sample from the ground surface. Higher cleanup goals at deeper depths were considered reasonable since there was minimal potential of future contact. Cleanup goals at the ground surface however, were maintained at 100 mg/kg. Table 2-3 provides a summary of the exit sample analysis data presented in Appendix B. Exit sample locations are shown on the plan sheets in Appendix B.

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TABLE 2-3

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

EXIT SOIL SAMPLE ANALYSIS RESULTS

Sample Location	Sample Number	Date Collected	Sample Parameter	Analysis Results
Pond #2/D2	1A	9/15/95	Total Lead	<30 mg/kg
	2A	9/15/95	Total Lead	<30 mg/kg
	3A	9/15/95	Total Lead	82 mg/kg
	4A	9/15/95	Total Lead	<30 mg/kg
	5A	9/15/95	Total Lead	<30 mg/kg
Pond #3	1B	9/19/95	Total Lead	<30 mg/kg
			% Solids	85 %
	2B	9/19/95	Total Lead	<30 mg/kg
			% Solids	88 %
	3B	9/19/95	Total Lead	5,800 mg/kg(1)
			% Solids	77 %
	4B	9/19/95	Total Lead	42,000 mg/kg(1)
			% Solids	78 %
	5B	9/19/95	Total Lead	19,000 mg/kg(1)
			% Solids	76 %
	6B	9/20/95	Total Lead	<30 mg/kg
	7B	9/20/95	Total Lead	46 mg/kg
C1	1C	9/19/95	Total Lead	6,200 mg/kg
			% Solids	63 %
	2C	9/19/95	Total Lead	<30 mg/kg
			% Solids	86 %
	3C	9/19/95	Total Lead	180 mg/kg
			% Solids	87 %
	1C(r) *	9/25/95	Total Lead	50 mg/kg
	2C(r) *	9/25/95	Total Lead	<30 mg/kg
C2	1	9/28/95	Total Lead	<30 mg/kg
	2	9/28/95	Total Lead	530 mg/kg
	3	9/28/95	Total Lead	<30 mg/kg
	4	9/29/95	Total Lead	99 mg/kg
			% Solids	85 %
	5	9/29/95	Total Lead	130 mg/kg
			% Solids	92 %

Notes: (1) As agreed to with the NYSDEC, the on-site inspector directed the Contractor to remove all contaminated soil in the vicinity of sample locations 3B, 4B and 5B to rock, and no further exit soil samples were required.

* *Denotes additional samples collected at a previous location upon further excavation of additional soils.*

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TABLE 2-3

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

EXIT SOIL SAMPLE ANALYSIS RESULTS

Sample Location	Sample Number	Date Collected	Sample Parameter	Analysis Results
C3	1	9/29/95	Total Lead	93 mg/kg
			% Solids	91 %
	2	9/29/95	Total Lead	100 mg/kg
			% Solids	93 %
	3	9/29/95	Total Lead	<30 mg/kg
			% Solids	96 %
	4	10/03/95	Total Lead	<30 mg/kg
			% Solids	94 %
	5	10/03/95	Total Lead	120 mg/kg
			% Solids	93 %
C4	1H	9/25/95	Total Lead	48 mg/kg
	2H	9/25/95	Total Lead	84 mg/kg
	3	9/27/95	Total Lead	290 mg/kg
	4	9/27/95	Total Lead	90 mg/kg
	5	9/27/95	Total Lead	50 mg/kg
	3(r) *	10/02/95	Total Lead	300 mg/kg
			% Solids	75 %
	3(r2) *	10/04/95	Total Lead	37 mg/kg
			% Solids	74 %
C5	1	9/27/95	Total Lead	<30 mg/kg
	2	9/27/95	Total Lead	470 mg/kg
	2(r) *	10/02/95	Total Lead	200 mg/kg
			% Solids	83 %
	2(r2) *	10/04/95	Total Lead	<30 mg/kg
			% Solids	85 %
C6	1G	9/20/95	Total Lead	14,000 mg/kg
	2G	9/20/95	Total Lead	34 mg/kg
	3G	9/20/95	Total Lead	<30 mg/kg
	4G	9/20/95	Total Lead	440 mg/kg
	5G	9/20/95	Total Lead	<30 mg/kg
	1G(r1) *	9/25/95	Total Lead	410 mg/kg
	4G(r) *	9/25/95	Total Lead	23 mg/kg
	1G(r2) *	9/28/95	Total Lead	<30 mg/kg

* *Denotes additional samples collected at a previous location upon further excavation of additional soils.*

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TABLE 2-3

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

EXIT SOIL SAMPLE ANALYSIS RESULTS

Sample Location	Sample Number	Date Collected	Sample Parameter	Analysis Results
C7	1I	9/25/95	Total Lead	510 mg/kg
	2I	9/25/95	Total Lead	<30 mg/kg
	3I	9/25/95	Total Lead	81 mg/kg
	1I(r1) *	9/28/95	Total Lead	150 mg/kg
	1I(r2) *	10/03/95	Total Lead	1,700 mg/kg
			% Solids	86 %
	1I(r3) *	10/09/95	Total Lead	15 mg/kg
			% Solids	86 %
C8	1F	9/20/95	Total Lead	<30 mg/kg
	2F	9/20/95	Total Lead	<30 mg/kg
	3F	9/20/95	Total Lead	<30 mg/kg
	4F	9/20/95	Total Lead	<30 mg/kg
	5F	9/20/95	Total Lead	<30 mg/kg
C9	1E	9/20/95	Total Lead	<30 mg/kg
	2E	9/20/95	Total Lead	<30 mg/kg
	3E	9/20/95	Total Lead	<30 mg/kg
D1	1	9/27/95	Total Lead	2,400 mg/kg
	2	9/27/95	Total Lead	<30 mg/kg
	3	9/27/95	Total Lead	<30 mg/kg
	4	9/27/95	Total Lead	<40 mg/kg
	5	9/27/95	Total Lead	48 mg/kg
	6	9/27/95	Total Lead	1,100 mg/kg
	1(r)*	10/02/95	Total Lead	40 mg/kg
			% Solids	84 %
	6(r)*	10/02/95	Total Lead	<30 mg/kg
			% Solids	85 %
D3	1	9/27/95	Total Lead	<40 mg/kg
	2	9/27/95	Total Lead	<30 mg/kg
	3	9/27/95	Total Lead	<30 mg/kg
D4	1	9/27/95	Total Lead	<40 mg/kg
	2	9/27/95	Total Lead	2,400 mg/kg
	2(r) *	10/02/95	Total Lead	<40 mg/kg
			% Solids	61 %

* *Denotes additional samples collected at a previous location upon further excavation of additional soils.*

TABLE 2-3

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

EXIT SOIL SAMPLE ANALYSIS RESULTS

Sample Location	Sample Number	Date Collected	Sample Parameter	Analysis Results
D5	1D	9/20/95	Total Lead	<30 mg/kg
	2D	9/20/95	Total Lead	<30 mg/kg
	3D	9/20/95	Total Lead	34 mg/kg
	4D	9/20/95	Total Lead	<30 mg/kg
	5D	9/20/95	Total Lead	<30 mg/kg
	6D	9/20/95	Total Lead	42 mg/kg
	7D	9/20/95	Total Lead	<30 mg/kg
Outlet Stream	OS1	9/27/95	Total Lead	<30 mg/kg
	OS2	9/27/95	Total Lead	150 mg/kg
	OS3	9/27/95	Total Lead	360 mg/kg
	OS2(r) *	10/02/95	Total Lead	<30 mg/kg
			% Solids	82 %
	OS3(r1) *	10/02/95	Total Lead	290 mg/l
			% Solids	78 %
	OS3(r2) *	10/04/95	Total Lead	160 mg/kg
			% Solids	79 %
	OS3(r3) *	10/09/95	Total Lead	<20 mg/kg
			% Solids	23 %
Additional Sample Locations	Sample 1	09/01/95	Total Lead	32,000 mg/kg
			% Solids	74 %
	Sample 2	09/01/95	Total Lead	53,000 mg/kg
			% Solids	67 %
	Sample 3	09/01/95	Total Lead	54,000 mg/kg
			% Solids	79 %
	Sample 4	09/01/95	Total Lead	57,000 mg/kg
			% Solids	78 %
	SL 4	09/26/95	Total Lead	350 mg/kg
	SL 5	09/26/95	Total Lead	14,000 mg/kg
	SL 6	09/26/95	Total Lead	630 mg/kg
	C6A-1*	09/26/95	Total Lead	<30 mg/kg
	C6A-2*	09/26/95	Total Lead	230 mg/kg
	C6A-3*	09/26/95	Total Lead	320 mg/kg
	C6A-4*	09/26/95	Total Lead	45 mg/kg
	C6A-2(r)*	09/28/95	Total Lead	<30 mg/kg
	C6A-3(r)*	09/28/95	Total Lead	82 mg/kg
				<0.1 mg/l

* *Denotes additional samples collected at a previous location upon further excavation of additional soils.*

MALCOLM PIRNIE

TABLE 2-3

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

EXIT SOIL SAMPLE ANALYSIS RESULTS

Sample Location	Sample Number	Date Collected	Sample Parameter	Analysis Results
Railroad Remediation Area	Area 1 **	10/19/95	Total Lead	3,100 mg/kg
	Area 2 **	10/19/95	Total Lead	5,400 mg/kg
	Area 3 **	10/19/95	Total Lead	1,200 mg/kg
	Area 4 **	10/19/95	Total Lead	2,100 mg/kg
	Area 1-1	10/27/95	Total Lead	16 mg/kg
			% Solids	74 %
	Area 1-2	10/27/95	Total Lead	67 mg/kg
			% Solids	82 %
	Area 1-3	10/27/95	Total Lead	<20 mg/kg
			% Solids	80 %
	Area 2-1	10/27/95	Total Lead	79 mg/kg
			% Solids	60%
	Area 2-2	10/27/95	Total Lead	23 mg/kg
			% Solids	86%
	Area 2-3	10/27/95	Total Lead	110 mg/kg
			% Solids	79 %
	Area 3-1	10/31/95	Total Lead	<30 mg/kg
			% Solids	84 %
	Area 3-2	10/31/95	Total Lead	<30 mg/kg
			% Solids	83 %
	Area 3-3	10/31/95	Total Lead	120 mg/kg
			% Solids	83 %
	Area 4-1	10/31/95	Total Lead	<30 mg/kg
			% Solids	78 %
	Area 4-2	10/31/95	Total Lead	<30 mg/kg
			% Solids	78 %
	Area 4-3	10/31/95	Total Lead	<30 mg/kg
			% Solids	80%
	North Embankment	10/05/95	Total Lead	51,000 mg/kg

* *Denotes additional samples collected at a previous location upon further excavation of additional soils.*

** *Original samples collected in Areas 1 through 4 were collected as composites of the entire area. Subsequent samples were grab samples.*

In addition to site soils and debris, contaminated pond and stream sediments were also excavated and disposed of in the landfill area. Site investigation results showed that sediments within three existing ponds as well as an on-site intermittent stream contained lead levels above the cleanup goal. The proposed excavation plan for contaminated sediments required that all standing water in the ponds be drained, the sediments excavated, dried sufficiently to remove standing water such that the criteria of the USEPA SW-846 Method 99095 Paint Filter Test were met, and deposited within the landfill area. During construction it was noted that only Pond #2 contained standing water; therefore, it was the only one which needed to be drained prior to excavation. Sediments from the other areas were excavated directly and moved to the landfill using bulldozers. Water from Pond #2 was pumped into a large tank until it could be treated. Following excavation of contaminated sediments, exit samples were again collected to determine if cleanup goals had been achieved.

During excavation operations, both for removal of contaminated fill and debris and for installation of the effluent sewer, additional contaminated soils were encountered outside the previously delineated waste limits. In general, contamination in these areas was evident by the presence of colored soils. Cleanup quality was not determined by exit sampling in these areas; however, as directed by the NYSDEC, the Site Inspector and Contractor visually determined the absence of further colored soils in a given excavation. In general, the main areas of extra excavation included a large portion of the site south of the former railroad bed and several areas along the site access road.

A third area of additional contaminated soil was located east of the project site adjacent to the old railroad bridge. Soils in this area exhibited significant discoloration. Prior to removal of any soil in this area, soil samples were collected to verify the presence of lead. Sample analysis results indicated high lead levels in four individual areas. Soils from each of these areas as well as an existing pile of contaminated soil in the area were excavated and transported to the landfill area for consolidation. Exit samples were collected to verify removal efforts.

All excavated soils, debris, and sediments were transported to the landfill area for consolidation and subsequent capping. Bench-scale pilot studies conducted by Malcolm Pirnie prior to the start of work showed that the addition of lime to the lead contaminated soils would raise the pH of any percolating water and thereby prevent leaching of the lead from the soil particles. Lime was added to the consolidated soils at a rate of approximately 360 pounds per acre using push type lawn spreaders.

All excavated areas were backfilled using clean on-site soils originating from trenching operations, the construction of site drainage swales and construction of the amphibian breeding pond area. When all on-site soil sources were exhausted, backfilling was completed using soil obtained from off-site sources. Off-site soil, supplied by Northern Concrete, consisted of bank run gravel which met the gradation requirements specified in the contract documents. All site backfill was compacted to a minimum of 90% modified proctor maximum dry density. Soil compaction was verified by a representative of Van Der Horst (a subcontractor to SLC) using a nuclear densitometer.

The final elevations of the landfill subgrade were slightly lower than shown on the design plans. This variance from the construction plan was considered insignificant since the maximum and minimum grades were achieved. Actual grades varied from 11% to 25%. Final contours are shown on the Record drawings prepared by Modi Engineering.

2.4 WELL AND PIEZOMETER DECOMMISSIONING

Van Der Horst Geotechnical Engineering was retained by SLC to decommission existing monitoring wells and piezometers in accordance with the contract documents. The work was performed between September 5 and September 7, 1995. A standard grout mixture was used consisting of 5.6 pounds of sodium-bentonite, 94 pounds of Type I portland cement and 9.1 gallons of potable water.

The grout was placed from the bottom of the hole to the top using a tremie pipe. The screens, pipe and protective casings were removed by lifting as the grout was being placed. The wells and piezometers were removed using either the drill rig or a backhoe, whichever was necessary to provide the necessary uplift force. Well and piezometer materials were disposed within the landfill subgrade.

The following table summarizes the amount of monitoring well and piezometer work which was performed:

COLUMBIA MILLS LANDFILL MINETTO, NEW YORK		
Well	**Diameter (in)**	**Depth Decommissioned (ft)**
MW-7S	2" I.D.	13.5
MW-7D	4" I.D.	27.0
MW-105	2" I.D.	12.0
MW-100	4" I.D.	28.0
P-6	1" I.D.	18.5
P-8	1" I.D.	14.0
P-10	1" I.D.	20.0
P-11	1" I.D.	20.0
Total		**153**

2.5 MONITORING WELL AND PIEZOMETER INSTALLATIONS

Eight groundwater monitoring wells were installed by Van Der Horst Geotechnical Engineering for SLC between December 1 and December 14, 1995. The location of the wells are shown on the record drawings. The wells (MW-1S, MW-1D, MW-2S, MW-2D, MW-3S, MW-3D, MW-4S, and MW-4D) were installed as clusters consisting of one shallow well (15-foot depth) and a deep well (25 foot depth). The drill rig utilized hollow stem augers through the unconsolidated material and an NX core barrel and reaming through bedrock. The diameter of the finished hole was 4-inches.

Split-spoon samples were collected continuously for the full length of the hole using a 2-inch OD spoon. When the desired depth of the boring was reached, a 2-inch diameter, flush-threaded joint PVC casing and screen was assembled and placed in the borehole. Select sand was used to backfill the annular space around the screen. The sand was brought to a level of one foot above the top of the screen. A two-foot thick bentonite pellet seal was then placed above the sand. The remaining annular space was backfilled with a cement-bentonite grout. Before the grout had set, a 6-inch steel protective casing was placed over the well casing. The base of the protective casing was set approximately three feet below grade to prevent frost heaving. A surface seal consisting of concrete was poured around the protective casing to prevent infiltration of surface water. The surface of this seal was sloped away from the well.

Piezometers located inside the landfill footprint were installed approximately ten feet from the inner edge of the leachate collection trench using the same general auguring and backfilling techniques used for the monitoring well installations. The location of the piezometers are shown on the record drawings. Fourteen piezometers were installed between December 5 and December 11, 1995. The base of the screen was set approximately 1 foot below the invert of the collection system piping at each location. No protective steel casings were utilized.

Monitoring well and piezometer logs showing details of construction are included in Appendix C.

2.6 AMPHIBIAN BREEDING POND CONSTRUCTION

The three on-site ponds which were eliminated during the site remediation work functioned as amphibian breeding sites prior to construction. The NYSDEC required that they be replaced on an acre per acre basis.

A new 0.8-acre amphibian breeding pond was constructed in the northeast corner of the project area along the path of the existing intermittent stream. The pond receives surface water runoff primarily from the northern perimeter drainage swale and effluent from the groundwater and leachate collection systems.

A pre-cast concrete trapezoidal weir on the east end of the pond controls the elevation of water and acts as an overflow structure. Water overflowing the weir flows in a northeasterly direction through an existing intermittent stream. All grading work on the pond was completed during the 1995 construction season. During the course of the work, construction personnel relocated amphibians and turtles to the pond area.

Two types of wetland vegetation were planted around the perimeter of the pond in June 1996. At the edge of water, one row of Nodding Smartweed rootstock was planted on 3-foot centers. Approximately one foot lower into the water, another row of Burrweed rootstock was planted on 3-foot centers. Both types of plants are an excellent food source for wildlife. At the end of construction, additional wetland vegetation was already re-establishing around the perimeter of the pond.

2.7 GROUNDWATER DEPRESSION/LEACHATE COLLECTION SYSTEM CONSTRUCTION

A combined groundwater depression/leachate collection system was constructed around the perimeter of the landfill at the toe of slope. The location of the collection system along with pertinent construction details are shown on the Record Drawings.

The collection system generally consisted of two gravel filled trenches running parallel to each other separated by a vertical wall geomembrane liner system. The collection pipe within each trench was four-inch corrugated, perforated HDPE pipe. Pipe sections were connected with mechanical couplers. Collection system cleanout pipes were installed along the length of each trench.

The following general procedure was utilized by the contractor to construct the trenches:

- A trench was excavated approximately four feet wide beginning on the downstream end and working upstream.
- A six-inch diameter corrugated HDPE pipe underdrain with a geotextile sock around it was placed in the bottom of the excavation to drain collected groundwater/leachate from the trench during construction activities. Upon completion of the trenching work, the underdrain was filled with flowable fill and abandoned.
- After preseaming individual liner sections, a 40-mil HDPE geomembrane was suspended into the trench using a wooden support structure constructed of 2x4's to keep the geomembrane liner vertical during backfilling operations.
- Three feet of flowable fill was then placed into the bottom of the trench on each side of the HDPE liner wall (the depth of flowable fill was decreased to 6-inches in areas of rock excavation). The flowable fill was a soil/ cement/bentonite mix consisting of 2848 pounds of sand, 50 pounds of cement, 300 pounds of fly ash and 458 pounds of water per cubic yard. The flowable fill was an approved substitute for the originally specified soil/ bentonite mix.

The purpose of the flowable fill designed with a permeability of 1×10^{-6} cm/s, is to serve as a key for the vertical HDPE liner wall. The design intent is for the flowable fill and wall to act as a barrier to separate groundwater flow from outside of the landfill from leachate flow from within.

- After placement of flowable fill, each trench was lined with a non-woven, needle punched geotextile to serve as a filter fabric and prevent soil particles from clogging the drainage system.
- The four-inch collection pipe was then placed within the fabric envelope of each trench and backfilled with three feet of #1 and #2 stone. The fabric material was then lapped over the top of backfill to completely envelop the collection trench materials.
- Uncontaminated soil material was then utilized to complete the trench backfilling operations.

The collection trenches begin at the high point of the site along the western side. Approximately one-half of the system flows along the northern toe of slope and one-half along the southern toe of slope of the landfill. The two downgradient ends of the groundwater depression system come together on the eastern end of the landfill, then change course and run parallel to each other in an easterly direction, where they enter a pre-cast concrete sampling manhole.

The sampling manhole is an eight foot square vault where each collection line entering it can be monitored individually. The end of each of the groundwater depression system lines within the vault are fitted with a 4-inch PVC ball valve so that the flow can be shut off if it becomes contaminated. Also entering the sampling manhole is a separate discharge line from the leachate storage tank.

The combined flow of water (leachate and groundwater) from the sampling manhole is discharged to the amphibian breeding pond through a single pipe. All piping materials between the leachate storage tank and groundwater depression system to the amphibian breeding pond are solid SDR 35 PVC pipe.

During the trench and leachate tank excavation work, a significant amount of hard rock was encountered which required additional effort to remove. A Samsung 350 excavator with a 12,000 pound hammer was utilized to break up the rock so it could be excavated. The extra cost associated for this work was included in Change Order #1 (see Section 4.0).

All work on the collection system construction was completed during the 1995 construction season.

2.8 LEACHATE STORAGE TANK INSTALLATION

Leachate collected in the perimeter leachate collection system flows to an underground, 10,000 gallon double-walled storage tank located near the southeast corner of the landfill, adjacent to the site access road. The tank has two separate four-inch overflow lines. One line flows to the amphibian breeding pond and the other to the Town of Minetto sanitary sewer system. Flow in each discharge line is controlled by valves.

During the excavation of the hole for the tank, a significant amount of hard rock was encountered which required special efforts to remove. Due to the presence of the rock, the design of the tank anchoring system was modified to eliminate the concrete anti-flotation pad and instead anchor the tank using a series of anchor wedges embedded into the bedrock.

The tank was delivered to the site on November 2, 1995, however, due to the sequence of the work, wet working conditions and the winter shutdown period, the tank was not installed until the Spring of 1996. On April 18, 1996, SLC began installation of the storage tank. Inspection of the work was provided by a NYSDEC field representative. Prior to tank placement, the existing excavation was dewatered and all miscellaneous rock and silt removed. A layer of Type "J" stone was placed and the tank installed and leveled using a Komatsu PL 400 backhoe. Stainless steel anchors were installed in the rock, the tank strapped into place, and the excavation backfilled using Type "J" stone. Concurrent with backfill placement, SLC installed manway sections over each manway. Backfilling continued to the tank top using Type "J" stone and above the tank top to the leachate loading pad subgrade using offsite fill.

During tank installation, a vacuum was held on the interstitial space as a means of verifying tank integrity. Following backfill placement above the top of the tank, the contractor filled the tank with water and monitored for level changes. No change in water level was observed within the tank, thus further verifying the tank integrity.

Following placement of backfill to the tank top, all piping connections were made for the leachate and groundwater collection lines, the effluent sewer, and the 2-inch interstitial space probe, 4-inch suction line and the 6-inch tank vent. All piping and valving was installed as shown on the Record Drawings. All solid piping sections and valves were subsequently pressure tested and backfilled in accordance with contract plans and specifications. During installation of the valve boxes, the valve box detail was revised due to site conditions as shown on the Record Drawings to allow for installation and operation of the handwheels.

After completion of tank backfilling activities, the contractor placed and leveled approximately 6 inches of pea gravel to serve as bedding for the concrete leachate loading pad. SLC completed form work, placement of reinforcing mesh and poured concrete on June 26, 1996. The pad was allowed to harden before any forms were removed and allowed to cure still further prior to grading of areas adjacent to the pad.

2.9 FINAL COVER SYSTEM CONSTRUCTION

The majority of the site work conducted during the 1996 construction season involved the installation of the final cover system on the landfill area. In general, the final cover system consisted of a synthetic component and a soil component.

At the resumption of work in June 1996, after the winter shutdown period, the landfill surface consisted of consolidated soils and sediments intermixed with debris which had been exposed due to settlement and erosion during the winter. To provide a suitable subgrade for the cover system, the contractor first performed miscellaneous grading of the subgrade to smooth the surface and then placed a thin (3 to 4-inch) compacted layer of silty-sand soil material over the entire landfill footprint to act as a cushion for the overlying synthetic liner. All soil material was compacted using a smooth drum vibratory roller. Landfill subgrade compaction, as required by the contract specifications was verified by Van Der Horst using a nuclear densitometer. Compaction test results are included in Appendix D.

The contractor also installed one gas vent at each of the two landfill high points. Each gas vent was constructed of 6-inch diameter PVC well screen surrounded by a 2-foot square stone envelope wrapped in non-woven geotextile. Each vent was installed approximately 3 feet into the waste.

Upon completion of the subgrade preparation and acceptance of the subgrade by Malcolm Pirnie and Antana Linings (the liner installer), the contractor began placement of the synthetic portion of the final cover system. Beginning on June 4, 1996, the contractor and the liner installer placed the following material (from bottom to top):

- Non-woven geotextile filter fabric
- 40-mil high density polyethylene liner
- Geocomposite drainage material.

The non-woven filter fabric, placed in order to provide an additional measure of protection against punctures of the HDPE liner, was rolled out over the subgrade and continuously seamed by heat fusing adjacent panels together. The major component of the cover system, the 40-mil HDPE liner was placed next. Each individual panel was rolled out over the site either by hand or by using a 6-wheeled ATV. All rolls were supported during placement using a spreader bar held in place with a large backhoe. As each panel was placed and aligned, it was seamed to the adjacent panel using double wedge fusion welding equipment. Intersections of multiple panels and patches were seamed using extrusion methods as were the boots installed on each liner pipe penetration. Pipe boots for gas vents, cleanouts and piezometers were constructed in accordance with the details shown on the project plans using HDPE liner, neoprene gasketing material and stainless steel clamps.

HDPE liner installation and seaming were performed following strict QA/QC guidelines set forth in the project specifications. QA/QC testing included both non-destructive and destructive testing of all liner seams and patches. Non-destructive testing consisted of air pressure testing for fusion welded seams and vacuum box testing for extrusion welded seams. Destructive testing involved peel and sheer testing by the liner installer and an independent laboratory (Van Der Horst) of liner seam samples collected prior to the start of each day's work and from actual sections of seams in placed liner panels.

QA/QC testing results and the final panel layout are included in Appendix E. Geotextile and HDPE liner placement occurred simultaneously.

After completion of the HDPE liner installation, the contractor began placing and seaming the overlying geocomposite drainage material. The drainage material consisted of a single layer of HDPE geonet sandwiched between two layers of non-woven filter fabric. Each panel was seamed to the adjacent panel by tying the geonet components together using plastic wire ties and heat fusion welding the upper filter fabric layers together. The purpose of the geocomposite was to collect and drain water which may infiltrate through the cover soil and also act as a cushion layer to prevent damage to the HDPE during placement of cover soils. At the end of each day's placement activities, exposed materials were held in place using sand bags to prevent wind damage. A total of approximately 127,000 square feet of each cover system component were placed over the top of the landfill.

All components of the synthetic portion of the cover system were keyed into the subgrade at the toe of the landfill slope. A 2-foot wide, 2-foot deep anchor trench was excavated using a small backhoe. As shown on the Record Drawings, the anchor trench construction also included a 2-inch diameter perforated, corrugated HDPE pipe within an envelope of drainage stone as a toe drain to convey water collected in the geocomposite to one of several 2-inch diameter outfall pipes.

When placement of the synthetic material was complete, the contractor began placing the first of two lifts of barrier protection soil provided by Northern. Initially the contractor began placing soil using a large backhoe setting on a soil pad on the landfill sideslope. During this operation a slide occurred near the east end of the fill whereby the liner material began to slide down the slope under the weight of soil and equipment. Following investigation by the engineer and contractor, it was determined that the slide was caused by the use of too large of equipment on the side slope. The contractor then removed the soil material using a small backhoe and hand shovels and the liner returned to its original condition. Due to the slide, the contractor modified the barrier protection layer placement method to instead push material up the side slopes with bulldozers working from bottom to top around the perimeter of the site. The contractor also limited the size of equipment which operated on landfill side slopes.

Barrier protection material was placed and compacted in two 12-inch lifts as confirmed by grade markers installed by the contractor. Each lift was tested for compaction using a nuclear densitometer at a minimum frequency of one test per 10,000 square feet. Compaction testing results are included in Appendix D and locations are shown on Sheet 5 of the Modi Record Drawings. Approximately 9,400 cubic yards of barrier protection soil were transported to the site, placed and compacted.

The final component of the cover system included the placement of a single 6-inch layer of topsoil over the landfill following acceptance of the barrier protection layer compaction testing. The topsoil placed at the site was a mixture of silty-sand material and topsoil prepared to provide the proper organic content to support growth of vegetation while limiting the particle sizes to the approximate gradations specified in the contract documents (see Appendix F for topsoil QA test results). The topsoil was provided by Northern and placed by the contractor beginning on June 27, 1996. Approximately 2,300 cubic yards of topsoil were placed over the cover system.

2.10 SITE RESTORATION

Following completion of all remedial activities SLC began restoration and landscaping of the project site. In general, restoration included placement of topsoil and/or wood chips on all disturbed areas, fertilizing and seeding the site, and planting trees. Other miscellaneous tasks were also performed as described below.

During clearing and grubbing, Monroe Tree Service created a substantial pile of wood chips. These chips were primarily used for temporary erosion control on the side slopes adjacent to the amphibian breeding pond. However, due to the large quantity, the chips were also spread in several other work areas at the site as an approved substitute for the 6-inch layer of topsoil based on a guarantee provided SLC that grass will grow. Specifically, chips were spread in the railroad remediation area and in the flat area between the landfill and the amphibian breeding pond. No chips were spread within the limits of the landfill. The same topsoil discussed in Section 2.9 was placed by the contractor on all other areas outside of the landfill with the exception of a temporary haul road and the office trailer area.

The original contract specifications required that the contractor place topsoil within the drainage swales north and south of the fill area. To avoid potential erosion problems, 6-inch minus stone was placed instead of top soil in these drainage swales.

All seeding and planting at the site were performed by Bartlett Landscaping, a subcontractor to SLC. Beginning on June 19, 1996, the following seed mixture was placed by hydro seeding methods.

Seed Component	Application Rate (lbs/acre)
Perennial Ryegrass	10
Strong Creeping Red Fescue	20
Chewings Fescue	20
Hard Fescue	20
White Clover	30
Birdsfoot Trefoil*	10
Reeds Canary Grass*	10
* *These seeds were added to the seed mixture to provide a "wildlife friendly" mix as requested by the NYSDEC Division of Fish and Wildlife.*	

In conjunction with seed, Bartlett also placed the required fertilizers and soil amendments. A total of 10.3 acres were hydro seeded including all topsoiled areas, areas which were covered with wood chips (excluding the railroad remediation area) and the temporary haul road and the office trailer area.

Bartlett Landscaping also planted six 6-foot tall Norway Spruce trees along the boundary of an adjacent property, shielding the site from view. These trees were placed as directed by NYSDEC personnel, to appease the adjacent property owner.

The final restoration/landscaping tasks included planting of wetland plants, construction of the site access road and installation of site fencing. As required by the contract specifications, SLC planted two species of wetland plants around the perimeter of the amphibian breeding pond. The plants included Smartweed, placed 3-foot on center at the water surface (elevation 307.00) and Burweed, placed 3-foot on center approximately 12 inches under water (as directed by the plant supplier). A total of approximately 500 plants were placed by hand around the perimeter of the pond.

The site access road was constructed by SLC on July 3, 1996, and consisted of a layer of woven geotextile followed by a 12-inch layer of crushed gravel. The gravel, supplied by Northern, was compacted to 95 percent of modified proctor maximum dry density as confirmed by nuclear densitometer testing conducted by Van Der Horst. Appendix D includes all lab and field-testing data for the access road.

Installation of fencing was conducted in two phases at the site. The first phase occurred during the 1995 construction season following clearing and grubbing operations. This section of the fence was placed by Atlas Fence Company along the north boundary of the site as a means of limiting access during construction operations. Beginning on July 2, 1996, Atlas Fence installed the remaining fence sections at the site as well as three man gates and one vehicle access gate. The fence, associated gates and appurtenances were installed into conformance with the construction specifications and details. The fence alignment and gate locations were selected based upon field conditions.

2.11 GROUNDWATER/LEACHATE TREATMENT AND DISPOSAL

The nature of the work for the Columbia Mills Landfill closure required the handling of water collected both during and after construction. Water collected during construction included water within existing ponds and groundwater from excavations (dewatering water) as well as precipitation runoff and decon water. Water following construction was collected within the leachate/groundwater collection system.

During construction, collected water was pumped to either a series of on-site tanks or a temporary holding pond and sampled. Waters which met ground and surface water discharge criteria could be discharged directly to adjacent streams. The contractor was also given the following two options for the handling of waters not meeting these criteria:

- Off-site disposal at an approved treatment facility; or
- Treatment in a temporary on-site treatment plant.

During the work, the nature of the contamination precluded the use of direct disposal to adjacent streams. Subsequently the contractor hired CSK, Inc., to design, fabricate, and construct a semi-trailer mounted treatment facility to be operated by SLC. In addition, the contract documents required the construction of a 4-inch diameter sewer line from the leachate storage tank to a Town of Minetto sewer system manhole located in Barrett Road for future leachate disposal. This sewer was constructed early in the project, however, it was never utilized.

The temporary treatment plant operation included several processes designed to treat collected waters to surface water discharge standards using chemical addition, flocculation, sedimentation and filtration. The treatment plant was operated in a batch mode following collection of a sufficient quantity of water in 20,000 portable "frac" tanks or the temporary lined impoundment. After treatment, water was pumped to another "frac" tank and sampled. The results of the analyses conducted by Upstate Labs determined whether a particular batch could be discharged or required further treatment. In total, 851,400 gallons of water were treated during the construction phase of the project.

Following construction, the contract specifications required that the contractor isolate the leachate collection system and operate the treatment plant for six months while conducting periodic sampling of the waste stream. Based on past experience and analytical data, the NYSDEC revised the post-construction discharge program to include direct discharge of the combined groundwater and leachate streams to the amphibian breeding area with weekly sample collection and subsequent analysis. All samples were collected from the end of the outfall pipe which enters the pond. In accordance with the revised post-construction sampling program, the temporary treatment trailer remained in operational condition on-site for the entire sampling period in the event sample analysis results warranted treatment of the collected water. However, as shown on Table 2-4, of the seventeen samples which were collected, only one exceedence of the effluent criteria was observed (the sample collected on September 9, 1996 failed the discharge criteria limits for

TABLE 2-4

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

WATER SAMPLE ANALYSIS RESULTS FROM COMBINED DISCHARGE INTO POND

Analysis Parameter	Effluent Criteria	Sample Location and Date Collected					
		Effluent #1 (6/21/96)	Effluent #2 (6/25/96)	Effluent #3 (7/1/96)	Effluent #4 (7/8/96)	Effluent #5 (7/15/96)	Effluent #6 7/22/96)
Total Cyanide	0.06 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Total Suspended Solids	10 mg/l	<1 mg/l	1 mg/l	3 mg/l	<1 mg/l	<1 mg/l	<1 mg/l
Total Aluminum	0.1 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	0.08 mg/l	<0.05 mg/l
Total Antimony	0.8 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Barium	0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Cadmium	0.014 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	0.014 mg/l	0.011 mg/l
Total Chromium	0.5 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l
Total Copper	0.1 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Total Iron	0.3 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l
Total Lead	0.33 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l
Total Magnesium	---	---	---	---	---	---	---
Total Manganese	4.0 mg/l	0.23 mg/l	0.33 mg/l	0.33 mg/l	0.59 mg/l	0.78 mg/l	0.65 mg/l
Total Zinc	0.4 mg/l	0.1 mg/l	0.09 mg/l	0.1 mg/l	0.11 mg/l	0.11 mg/l	0.11 mg/l
Dissolved Copper	monitor	<0.02 mg/l	<0.02 mg/l	0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Toluene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Trichloroethene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Methyl Ethyl Ketone	monitor	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l

TABLE 2-4

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

WATER SAMPLE ANALYSIS RESULTS FROM COMBINED DISCHARGE INTO POND

Analysis Parameter	Effluent Criteria	Sample Location and Date Collected					
		Effluent #7 (7/29/96)	Effluent #8 (8/5/96)	Effluent #9 (8/12/96)	Effluent #10 (8/19/96)	Effluent #11 (8/26/96)	Effluent #12 (9/3/96)
Total Cyanide	0.06 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Total Suspended Solids	10 mg/l	2 mg/l	1 mg/l	2 mg/l	<1 mg/l	2 mg/l	<1 mg/l
Total Aluminum	0.1 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l
Total Antimony	0.8 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Barium	0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Cadmium	0.014 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Total Chromium	0.5 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l
Total Copper	0.1 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Total Iron	0.3 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	<0.03 mg/l	<0.06 mg/l	0.04 mg/l
Total Lead	0.33 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l
Total Magnesium	---	---	---	---	---	---	---
Total Manganese	4.0 mg/l	0.91 mg/l	1.1 mg/l	1.1 mg/l	1.3 mg/l	1.7 mg/l	2.1 mg/l
Total Zinc	0.4 mg/l	0.10 mg/l	0.09 mg/l	0.10 mg/l	0.09 mg/l	0.10 mg/l	0.09 mg/l
Dissolved Copper	monitor	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Toluene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Trichloroethene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Methyl Ethyl Ketone	monitor	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l

TABLE 2-4

COLUMBIA MILLS LANDFILL REMEDIATION
MINETTO, NEW YORK

WATER SAMPLE ANALYSIS RESULTS FROM COMBINED DISCHARGE INTO POND

Analysis Parameter	Effluent Criteria	Sample Location and Date Collected				
		Effluent #13 (9/9/96)	Effluent #14 (9/16/96)	Effluent #15 (9/24/96)	Effluent #16 (10/1/96)	Effluent #17 (10/8/96)
Total Cyanide	0.06 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	0.02 mg/l
Total Suspended Solids	10 mg/l	3 mg/l	<1 mg/l	2 mg/l	<1 mg/l	2 mg/l
Total Aluminum	0.1 mg/l	0.22 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	0.06 mg/l
Total Antimony	0.8 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Barium	0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l	<0.3 mg/l
Total Cadmium	0.014 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l	<0.005 mg/l
Total Chromium	0.5 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l	<0.05 mg/l
Total Copper	0.1 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Total Iron	0.3 mg/l	0.39 mg/l	0.22 mg/l	0.06 mg/l	0.08 mg/l	0.07 mg/l
Total Lead	0.33 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l	<0.1 mg/l
Total Magnesium	---	---	---	---	---	---
Total Manganese	4.0 mg/l	0.56 mg/l	2.8 mg/l	2.2 mg/l	2.5 mg/l	2.8 mg/l
Total Zinc	0.4 mg/l	0.07 mg/l	0.12 mg/l	0.09 mg/l	0.13 mg/l	0.10 mg/l
Dissolved Copper	monitor	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l	<0.02 mg/l
Toluene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Trichloroethene	0.01 mg/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
Methyl Ethyl Ketone	monitor	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l	<10 ug/l

MALCOLM PIRNIE

Aluminum and Iron). The reason for this is uncertain. The failure was considered insignificant since subsequent samples met the discharge limits.

3.0 FIELD ORDERS

A field order by definition is a written order issued by the engineer to the contractor which orders minor changes in the work in accordance with paragraph 8.4 of the General Conditions not involving an adjustment in the contract price or the contract time.

During the coarse of work at the Columbia Mills site, three such orders were issued to SLC by Malcolm Pirnie. Field Order No. 1 involved the substitution of wood chips from the site stockpile for the 6-inch layer of topsoil. This substitution was allowed as a means of using up the chips and based on a guarantee from the contractor that grass will grow.

Field Order No. 2 also involved a substitution for topsoil. In this instance 6-inch minus stone was substituted for topsoil within the north and south drainage swales in order to prevent erosion of the soil during precipitation events. The stone was placed to the same lines and grades required for the topsoil.

Field Order No. 3 involved a revision of the rim elevation of the beehive frame and grate installed on Manhole 2B-1A. The final rim elevation (321.3) was changed to 322.5 as a means of limiting excavation quantities in the south drainage swale. Prior to revising the rim elevation the entire length of the swale was surveyed to insure that adequate drainage will be provided.

4.0 CHANGE ORDERS

Two change orders were issued to address unforeseen site conditions during the course of the work.

Copies of both change orders are included on microfilm in the project records maintained by NYSDEC's Division of Hazardous Waste Remediation. A description of each change order is provided below.

4.1 CHANGE ORDER NO. 1

Change Order No. 1 was issued January 3, 1996 and included the following specific items:

- Work was performed on a time and material basis in completing the excavation and consolidation of contaminated soils found at the site during construction activities, but not delineated in the original Contract Documents. These areas of contamination were not contiguous to the areas delineated in the Contract Documents. This change resulted in additional time to complete the Contract to assure that all identified contaminated soils found at the site were consolidated under the landfill cap.

- Certain unit price bid items differed from the Contract Estimated Quantities due to conditions encountered in the field. This included:

  - Bid Item 1, Clearing and Grubbing - The actual quantity exceeded the Contract Estimated Quantity by 8% due to clearing required to excavate undelineated contaminated soils.

  - Bid Item 3, Excavating Contaminated Soil - The actual quantity exceeded the Contract Estimated Quantity by 93% due to encountering additional contaminated soils contiguous to delineated soils.

  - Bid Item 5, Excavating Creek and Pond Sediments - The actual quantity exceeded the Contract Estimated Quantity by 1% due to encountering additional contaminated sediments contiguous to delineated areas.

  - Bid Item 10, Culvert No. 2 Extension - A design change resulted in the elimination of the culvert extension. The existing culvert now discharges into southern perimeter swale. The contractor was paid for costs associated with restocking materials which were delivered to the site prior to the design change.

- Bid Item 12, Rock Removal - The actual quantity exceeded the Contract Estimated Quantity by 214% due to encountering rock along the sewer discharge line and the perimeter collection trench. The volume and hardness of the rock required additional equipment to be brought on-site.

- The completion of additional soil sampling and analysis outside of delineated contaminated areas to document the removal of all contaminated soils.

- For additional exit confirmation sampling and analysis as required in delineated contaminated soil areas to document the proper removal.

- Scope of work modifications associated with:

1. The 4-inch Perforated Groundwater Depression Piping System Configuration:
   a. The single 4-inch SDR 21.5 HDPE discharge line from the perforated groundwater depression collection system routed to the amphibian breeding area was changed to two (2) 4-inch SDR 21.5 HDPE lines.
   b. The sampling manhole detail, was modified to accommodate the two 4-inch lines.
   c. Two 4-inch HDPE flanged end tees were added to the groundwater collection line inside of the sampling manhole.
   d. Two 4-inch PVC flanged ball valves were added to the groundwater collection line inside of the sampling manhole.

   These modifications were necessary to enable the northern and southern groundwater collection systems to be diverted and monitored individually.

2. Modifications to the Anchoring Details related to the Leachate Collection Tank:
   a. The 28' x 10' 1" concrete hold down pad for the leachate collection tank was eliminated. The leachate collection tank was installed utilizing six 1" stainless steel wedge anchors installed in the existing site rock formation.

   These modifications were necessary to eliminate the unnecessary removal of additional rock and to eliminate the installation of a concrete hold down pad while installing the new tank.

3. Modifications to the Perimeter Collection Trench Detail in locations where it is set on bedrock to reduce the flowable fill depth from 36 inches to 6 inches. This change was necessary to eliminate the unnecessary removal of rock beneath sections of the perimeter collection trench.

- The soil was contaminated with VOCs in portions of the site where such contamination was not anticipated. The additional soil was removed and buried within the landfill.

- The Contract time was extended to account for a winter shutdown period between December 9, 1995 and June 2, 1996 because the HDPE liner could not be placed unless the air temperature was above 41 °F and due to winter weather conditions.

This Change Order increased the amount of the Contract by $244,338.52 to a total of $1,928,966.65.

4.2 CHANGE ORDER NO. 2

Change Order No. 2 was issued January 22, 1997 and included the following specific items:

- *Winter Shutdown Costs*

  The Contractor shut down operations due to winter weather conditions and the contract time was extended (see Change Order No. 1). Due to the shutdown the Contractor experienced extra costs associated with the mobilization and demobilization of equipment and the field office. Installation of silt fence was required around the site perimeter.

  The landfill subgrade work was unfinished at the time of the winter shutdown period. No landscaping or final cover system work had been performed which resulted in the need for the Contractor to install silt fence around the perimeter of the landfill to prevent erosion of contaminated soils into uncontaminated areas.

  It was also necessary for the Contractor to demobilize/remobilize equipment for maintenance purposes and due to site security reasons. The telephone service for the field offices and power service for the on-site treatment plant remained connected in the event their usage was necessary.

- *Additional Landscaping Costs*

  Six Norway Spruce Trees were planted along the edge of an adjacent property and 10 pounds per acre each of Birdsfoot Trefoil and Reed Canary Grass were added to the hydroseed mixture before seeding the site.

  The trees were planted near the rear property line of an adjacent property owner to screen the landfill site from his view. The additional seed was added at the request of NYSDEC Fish and Wildlife to produce a more wildlife friendly seed mixture.

- *Unit Price Bid Items*

  The actual quantity of some unit price bid items exceeded the estimated bid quantities. This included:

Contract Pay Item Number	Additional Amount
6- Geonet/Geotextile Composite Installation	6,856 sq. feet
7 - HDPE Installation	12,089 sq. feet
11 - Fencing Installation	281 linear feet
22 - Off-site Fill	8,444 cubic yards

  As a result of additional excavation of contaminated materials and rock as described in Change Order No. 1, site contours were modified. The changed site conditions required that additional off-site material be utilized to fill the excavations and that additional area be either capped or restored. The fence alignment was altered to better fit site conditions.

- *Credit Amounts (Two Items)*

  1. SLC decided to work overtime on the Columbia Mills project which required that Malcolm Pirnie provide additional inspection time. The cost of the additional inspection time was credited by the Contractor to the Department as required by Article 5.3.5 of the Contract General Conditions.

  2. The Contractor offered credit amounts for 12-inch drainage pipe (Bid Item #10) and for 4-inch collection pipe (Bid Items #4 and #8). 12-inch corrugated high density polyethylene pipe was substituted for 16-gauge galvanized corrugated metal pipe and 4-inch perforated HDPE pipe was substituted for SDR 21 pipe at the Contractor's request.

- The Contract time was extended to allow for the completion of punch list items associated with seeding and restoration of the site. The work could not be completed until weather conditions were suitable.

This Change Order increased the amount of the Contract by $79,602.46 to a total of $1,988,569.11.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The remediation of the Columbia Mills Landfill Closure area is substantially complete. All field activities have been completed by SLC Constructors with the exception of a few minor site restoration items which will be completed in the Spring of 1997 as the weather permits. Final completion as per Change Order No. 2 has been scheduled for June 30, 1997.

No further field investigations or remediation of the site is recommended at this time. The site will however require long-term monitoring and maintenance for a minimum 30-year post-closure period. The post-closure monitoring program will include the collection of groundwater, leachate discharge and sediment samples as well as performing landfill gas monitoring. It will also involve conducting site inspections and performing site maintenance as necessary.

A detailed Post-Closure Operations and Maintenance and Monitoring Plan has been prepared by Malcolm Pirnie to describe all post-closure activities. It is recommended that the post-closure plan be implemented by the NYSDEC.

Appendix **C**

Photograph Log

Photo 1: Discharge structure to Amphibian Breeding Pond.

Photo 2: Combination Sampling Sump

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COLUMBIA MILLS SITE
NYSDEC SITE NUMBER 7-38-012

APPENDIX A: PHOTOGRAPHS

FIGURE A-1

Photo 3: Fluorescent dye in leachate collection tank.

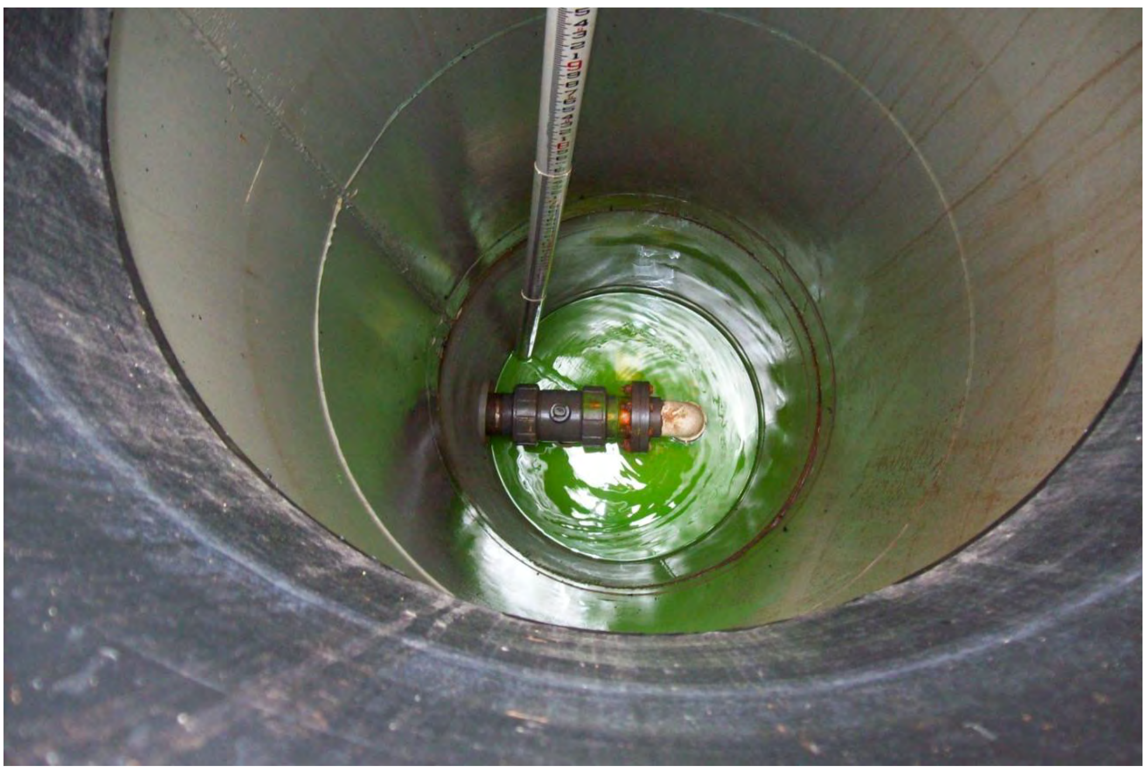

Photo 4: Inlet pipe manway and control valve.

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COLUMBIA MILLS SITE
NYSDEC SITE NUMBER 7-38-012

APPENDIX A: PHOTOGRAPHS

FIGURE A-2

Photo 5: 2008 collection tank level.

Photo 6: 2009 collection tank level.

Appendix **D**

IC/EC Certification Form

Enclosure 1
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. 7-38-012

Site Name: Columbia Mills

Site Address: Route 48 Zip Code: 13115

City/Town: Minetto

County: Oswego

Current Use: Dump Structure

Intended Use: Dump Structure

Box 2

Verification of Site Details

		YES	NO
1.	Are the Site Details above, correct?	☒	☐
	If NO, are changes handwritten above or included on a separate sheet?	☐	
2.	Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment since the initial/last certification?	☐	☒
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
3.	Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property since the initial/last certification?	☐	☒
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
4.	Has a change-of-use occurred since the initial/last certification?	☐	☒
	If YES, is documentation or evidence that documentation has been previously submitted included with this certification?	☐	
5.	For non-significant-threat Brownfield Cleanup Program Sites subject to ECL 27-1415.7(c), has any new information revealed that assumptions made in the Qualitative Exposure Assessment for offsite contamination are no longer valid ?	☐	☐
	If YES, is the new information or evidence that new information has been previously submitted included with this Certification?	☐	
6.	For non-significant-threat Brownfield Cleanup Program Sites subject to ECL 27-1415.7(c), are the assumptions in the Qualitative Exposure Assessment still valid (must be certified every five years) ?	☐	☐
	If NO, are changes in the assessment included with this certification?	☐	

SITE NO. 7-54-012 **Box 3**

Description of Institutional Control

Annual O&M and monitoring and site inspections, including verifying the integrity of the perimeter fence and mowing the landfill cover. According the Oswego County Real Property Tax web site, the site property is owned by Oswego County and is listed as a landfill.

Deficiencies - Deed Restrictions not known, no leachate monitoring requirements, no SMP.

Control Certification

YES	NO
	XX

Box 4

Description of Engineering Control

Landfill cap and cover system, leachate collection system, PPRS, and perimeter fence. Based on available information, the landfill was completed in 1997 in accordance with the ROD.
Deficiencies - No SMP.

Control Certification

YES	NO
	XX

Control Certification Statement

For each Institutional or Engineering control listed above, I certify by checking "Yes" that all of the following statements are true:

(a) the Institutional Control and/or Engineering Control employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

(b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

(c) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

(d) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control.

(e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

IC/EC CERTIFICATIONS
SITE NO.

Box 5

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 2 and/or 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Payson Long, Environmental Engineer at New York State Department of Environmental Conservation, 625 Broadway 12th Floor, Albany, New York 12233-7013,
print name / print business address

am certifying as Remedial Party (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

______________________________ ______________
Signature of Owner or Remedial Party Rendering Certification Date

Box 6

QUALIFIED ENVIRONMENTAL PROFESSIONAL (QEP) SIGNATURE

I certify that all information and statements in Box 4 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I Bruce Nelson, CPG at ARCADIS-US, 855 Route 146, STE 210, Clifton Park, New York 12065,
print name / print business address

am certifying as a Qualified Environmental Professional for the Remedial Party

(Owner or Remedial Party) for the Site named in the Site Details Section of this form.

[signature] ______________ 12/9/11
Signature of Qualified Environmental Professional, for the Owner or Remedial Party, Rendering Certification / Stamp (if Required) / Date

ARCADIS

Appendix **E**

Oswego County Real Property Tax Property Description

Property Description Report For: OFF St Rt 48, Municipality of Minetto

No Photo Available

		Status:	Active
		Roll Section:	Wholly Exem
		Swis:	353600
		Tax Map ID #:	183.02-02-05
		Property Class:	852 - Landfill
		Site:	COM 1
		In Ag. District:	No
		Site Property Class:	852 - Landfill
		Zoning Code:	06
		Neighborhood Code:	36003
Total Acreage/Size:	7.86	**School District:**	Oswego
Land Assessment:	2011 - $8,000	**Total Assessment:**	2011 - $8,000
Full Market Value:	2011 - $8,000	**Market Value/sqft:**	
Equalization Rate:	----	**Legal Property Desc:**	
Deed Book:		**Deed Page:**	
Grid East:	847005	**Grid North:**	1238810

Owners

County of Oswego
46 E Bridge St
Oswego NY 13126

Sales

No Sales Information Available

Utilities

Sewer Type:	None	**Water Supply:**	None
Utilities:	Electric		

Inventory

Overall Eff Year Built:		**Overall Condition:**	Fair
Overall Grade:	Economy	**Overall Desirability:**	2

Buildings

Basement	Year	Gross Floor

AC%	Sprinkler%	Alarm%	Elevators	Type	Built	Condition	Quality	Area (sqft)	Stories

Site Uses

Use	Rentable Area (sqft)	Total Units

Improvements

Structure	Size	Grade	Condition	Year

Land Types

Type	Size
Residual	7.86 acres

Special Districts for 2011

Description	Units	Percent	Type	Value
Minetto FD	0	0		0

Exemptions

Year	Description	Amount	Exempt %	Start Yr	End Yr	V Flag	H Code	Own %
2011	County Owned	$8,000	0	2001				0