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1.0 INTRODUCTION

Reporting of monitoring data for the Non-Aqueous Phase Liquid (NAPL) Plume Containment System, Aqueous Phase Liquid (APL) Plume Containment System, and Overburden Barrier Collection System (OBCS) began in 1993. Monitoring reports for the NAPL and APL Plume Containment Systems, as well as the OBCS, have been submitted quarterly since 1996. These quarterly monitoring reports have also included data from the Leachate Treatment System, Residential Community Monitoring Program, and NAPL accumulation and recovery.

Miller Springs Remediation Management, Inc. (MSRMI) has been assigned the responsibility of managing the Hyde Park RRT Program under the direction of Glenn Springs Holdings, Inc. (GSHI), a subsidiary of Occidental Petroleum Corporation.

1.1 REPORT ORGANIZATION

This report has been prepared to present monitoring data collected during the fourth quarter (October through December) 2002. All monitoring data presented have been collected and presented in accordance with the following documents:

i) "Stipulation on Requisite Remedial Technology Program" (RRT), dated November 13, 1995; and

ii) "Long-Term Monitoring Manual, Hydraulic (Water Levels), Physical (NAPL Presence-Seeps), Chemical (Groundwater Sampling), Hyde Park Landfill Site," dated October 9, 1998.

The report is organized as follows:

- **Section 1.0 Introduction:** Section 1.0 presents a summary of the project, its administration, and the organization of the report.
- **Section 2.0 NAPL Plume Containment System:** Section 2.0 presents NAPL purge well operating data, performance monitoring data, statistical analyses of analytical data, and descriptions of non-routine investigations and activities performed during this reporting period. Recommendations for further investigation of the Site groundwater flow system are also presented in Section 2.0.
- **Section 3.0 APL Plume Containment System:** Section 3.0 presents APL purge well operating data, performance monitoring data, APL plume flux calculations where required, and descriptions of non-routine investigations and activities performed

during this reporting period. Recommendations for further investigation of the APL Plume Containment System are also presented in Section 3.0.

- **Section 4.0 Overburden Monitoring Data:** Section 4.0 presents performance data from the Overburden Barrier Collection System and Residential Community Monitoring Well Network, and descriptions of non-routine investigations and activities performed during this reporting period. Recommendations for further investigation, if deemed necessary, are also presented in Section 4.0.
- **Section 5.0 Leachate Treatment Facility:** Section 5.0 presents analytical data collected from the Leachate Treatment Facility.
- **Section 6.0 NAPL Accumulation:** Section 6.0 presents a summary of the volume of NAPL collected from the Bedrock and Overburden Containment Systems and volumes of NAPL shipped off Site for incineration.

2.0 NAPL PLUME CONTAINMENT SYSTEM

The objective of the NAPL Plume Containment System as stated in the RRT is to design, install, and monitor a system to contain, to the extent practicable, NAPL and APL within the NAPL Plume found in the Lockport Bedrock and to maximize collection of contained NAPL.

Operation of the NAPL Plume Containment System commenced in 1994 and consisted of extraction from a series of six purge wells. The system has been modified over time to better achieve its objectives. The system presently consists of 17 NAPL Plume Containment Purge Wells (PWs) as shown on Figure 2.1 and 43 performance monitoring wells. The monitoring wells are installed at bedrock "unit" specific depths, or zones, within the Lockport bedrock formation. The zones are designated as upper, middle, and lower. The locations of the performance monitoring wells in the upper, middle, and lower bedrock zones are shown on Figures 2.2 through 2.4, respectively.

2.1 PURGE WELL OPERATIONS

The PW system was generally operated continuously during the fourth quarter of 2002. Well PM-4M remained dewatered during the fourth quarter. Well PW-2L was operational, but the flow meter did not register any flow.

Maintenance of the PW system was required during the fourth quarter of 2002 as noted below.

- PW-5UR, pump, and motor replaced on November 20, 2002.

The average operating pumping rates and set point elevations at each of the bedrock purge wells during the fourth quarter of 2002 are presented in Table 2.1.

Based on the metered flow from individual wells, the average operating pumping rate of the NAPL Plume Containment System during operation over the fourth quarter was 61.7 GPM. This flow is approximately 1 GPM lower than the average flow reported for the third quarter 2002, 6 GPM lower than the average flow reported for the second quarter 2002, and 10 GPM lower than the flow reported for the first quarter 2002. It has been hypothesized that the observed reduction in flow rates is due to the operating water levels in the New York Power Authority (NYPA) forebay. During the winter months, NYPA is allowed to divert water from the upper Niagara River without

restrictions, this results in lower water levels in the forebay and potentially less water in the bedrock formations at the Site.

During the fourth quarter of 2002, a total of 7,913,144 gallons of groundwater were pumped from the NAPL Plume Containment System purge wells and treated. Based on monthly chemical analyses of water in Decanter No. 3, treatment of the pumped groundwater resulted in the removal of approximately 283 pounds of chemical mass (a decrease of approximately 268 pounds compared to the third quarter 2002).

2.2 CONTAINMENT SYSTEM MONITORING

Routine performance monitoring of the NAPL Plume Containment System consists of hydraulic, chemical, and NAPL presence monitoring. The performance monitoring well network for chemical and NAPL monitoring is as presented in the "NAPL Plume Assessment and System Design Recommendations" report dated July 1995, and modified most recently during the fourth quarter of 2000. The hydraulic monitoring program for the NAPL Plume Containment System was modified during the second quarter 2002, with the submission of the report entitled "Work Plan for the Site Characterization Report – Hydrologic Characterization" dated April 5, 2002. With the submission of that Work Plan, MSRMI discontinued the hydraulic monitoring program until a revised monitoring network representative of the significant discreet flow zones beneath the Site is established. Therefore, during this reporting period, only routine chemical and NAPL presence monitoring were conducted. The monitoring conducted during this quarter is described in the following subsections.

2.2.1 HYDRAULIC MONITORING

Hydraulic monitoring of well pairs located at the perimeter of the NAPL plumes (referred to as bedrock performance well pairs) was established in the RRT to gather data to verify the effective performance of the NAPL Plume Containment System.

2.2.1.1 WATER LEVEL MEASUREMENTS

As described previously, hydraulic monitoring was discontinued during the second quarter of 2002 in order to begin work necessary to establish a revised monitoring network. For reference purposes, cumulative hydraulic monitoring data for the Site from 1993 through April 2002 are included on the enclosed CD under the filename

HIST.pdf. These data have not been revised since the submission of the second quarter 2002 report.

2.2.1.2 HYDRAULIC GRADIENT EVALUATION

With the discontinuation of the hydraulic monitoring program, the hydraulic gradient evaluations have also been discontinued. A revised hydraulic gradient monitoring program will be developed following the revision of the hydrologic characterization of the Site.

2.2.2 NAPL MONITORING

NAPL monitoring is performed to provide information to assist in the evaluation of containment system effectiveness. NAPL monitoring consists of:

i) the physical inspection of monitoring wells located both inside and outside the NAPL plumes for the presence of NAPL; and

ii) determination of the volume of NAPL removed by the NAPL Plume Containment System.

2.2.2.1 NAPL PRESENCE CHECKS

Prior to any purging or sampling activities, a check for NAPL presence was performed at each well using a weighted tape measure with a length of cotton rope attached. This NAPL presence check methodology was summarized in the memorandum entitled "NAPL Presence Check Method Comparison, Hyde Park RRT Program" dated January 12, 2001. During the fourth quarter of 2002, NAPL was not observed in any of the outer wells or those inner wells that are located beyond the limits of the bedrock NAPL plume definitions. A summary of the findings of the NAPL presence checks performed in 2002 is presented in Table 2.2.

2.2.2.2 NAPL ACCUMULATION RATIO

In accordance with the "Future Monitoring and Assessment Requirements" Section 4.1.2.2, dated 1996, a determination of the ratio of NAPL / APL extracted through

the operation of the bedrock NAPL plume containment system during the fourth quarter was made.

Approximately 7.9 million gallons of APL were removed from the bedrock purge wells. During the same period, 585 gallons of NAPL were removed from the bedrock purge wells. The current NAPL / APL ratio (0.000074) and the ratios calculated since 1999 are presented in Table 2.3. Review of the data indicates that there is no apparent increasing or decreasing trend in the APL / NAPL ratio.

2.2.3 CHEMICAL MONITORING

Groundwater samples are collected and analyzed each quarter to obtain data for use in the evaluation of the NAPL Plume Containment System. The groundwater monitoring consists of the collection of samples from the outer well of each of the bedrock performance well pairs.

Four monitoring wells (F4U, G1M, G1L, and H2M) were removed from the chemical monitoring program during the third quarter of 2002. These monitoring wells were retrofit with 1-inch diameter piezometers across specific flow zones. With the installation of the piezometers, the monitoring intervals of the wells have changed; thus, analytical data collected from the retrofit piezometers are not comparable to historical data.

The chemical monitoring was conducted between November 4 and November 11, 2002. A well purging and sampling summary for the November 2002 sampling event is presented in Table 2.4. The chemical monitoring data are presented in Section 2.2.3.2 of this report. These analytical data are used in the statistical analyses presented in Section 2.2.3.3 of this report.

2.2.3.1 FIELD PROCEDURES

All monitoring well purging and sample collection activities were conducted in accordance with the procedures presented in the report entitled "Long-Term Monitoring Manual, Hydraulic (Water Levels), Physical (NAPL Presence-Seeps), Chemical (Groundwater Sampling), Hyde Park Landfill Site," dated October 9, 1998. Well volumes purged from each well prior to sample collection are summarized in Table 2.4. All purged groundwater was transported to the Hyde Park treatment facility for

treatment and disposal. Table 2.4 also presents a sample key and water quality observations and measurements for the samples collected.

2.2.3.2 ANALYTICAL RESULTS

The analytical results for the fourth quarter 2002 chemical monitoring event are summarized in Table 2.5. The cumulative analytical data for all quarterly chemical monitoring events dating back through 1996 are included on the enclosed CD under the filename HIST.pdf. The analytical data were reviewed for conformance to standard Quality Assurance / Quality Control (QA / QC) protocols, and copies of the resultant data validations are kept on file at the Western New York MSRMI Administration office.

2.2.3.3 STATISTICAL ANALYSIS OF ANALYTICAL RESULTS

In accordance with Section 4.3.8.1-Lateral NAPL Plume Migration of the RRT Stipulation, a statistical evaluation of the NAPL Plume Containment Effectiveness Parameters (phenol, benzoic acid, chlorendic acid, total chlorobenzoic acid, and total organic halides [TOX]), was performed using the fourth quarter 2002 analytical data from the outer well of each gradient pair.

Individual well groundwater analytical data were assessed for trends using either the Mann-Kendall trend test (if <50 percent non-detects) or logistic regression (for 50-99 percent non-detects). For the purposes of the fourth quarter 2002 data analysis, the analytical data from the 12 most recent sampling events (i.e., from February 2000 to present) were used. Analytes not detected in samples from a given well (i.e., 100 percent non-detects) between February 2000 and the present were not evaluated. The results of the trend analyses are presented in Table 2.6. A memorandum presenting the fourth quarter 2002 statistical analyses, including descriptions of the statistical methods and concentration vs. time plots for each of the wells evaluated is contained in Appendix A of this report.

The results of the fourth quarter statistical analyses demonstrate the following trends:

i) no statistically significant increasing trends were identified; and
ii) four statistically significant decreasing trends in concentrations were observed: TOX in samples from wells B1U and D2M and chlorendic acid at D2M and B1L.

Table 2.7 presents a comparison of the statistical trend analyses performed using data from each quarter of 2001 and each quarter of 2002. Only wells / analytes with a significant trend identified during at least one evaluation are presented. Comparing the fourth quarter 2002 results to the third quarter 2002 results, none of the statistically significant increasing trends were repeated, and four new decreasing trends were identified. This change is due to dropping the year 2000 data from the evaluation and is representative of recent conditions at the Site. Comparing the fourth quarter 2002 results to the fourth quarter 2001 results, one decreasing trend (TOX at B1U) is consistent. The three increasing and three other decreasing trends observed in the fourth quarter 2001 evaluation have not persisted through 2002, and four new decreasing trends have been noted.

2.3 NON-ROUTINE INVESTIGATIONS AND FIELD ACTIVITIES

During the fourth quarter 2002, field activities associated with the definition of groundwater flow patterns within the revised geologic framework of the Site continued. The field activities being performed to collect the data necessary to complete this definition are presented in the report entitled "Workplan, Site Characterization Report – Hydrologic Characterization" dated April 5, 2002, herein referred to as Work Plan.

During the fourth quarter the following activities outlined in the Work Plan were performed:

i) Retrofit Well Development - Each of the piezometers installed during the third quarter 2002 was developed in order to maximize the hydraulic connection to the aquifer. Development consisted of surging and pumping a minimum volume of 3 gallons of water each of the piezometers.

ii) Retrofit Well Slug Testing - Two slug tests were performed at each of the newly installed piezometers. The first slug test was conducted following installation of the piezometer and prior to development. The data from this slug test were used to analyze the suitability of the depths of the installation of the piezometers. The second slug test was performed following development of the piezometer. The data from the second slug test was compared to the data from the first slug test to determine if the development was adequate. If it was determined that well development was sufficient, the slug test data were also used to determine the transmissivity of the flow zone screened by the piezometer.

iii) Installation of New Piezometer - Work was initiated for the installation of piezometers at six locations during the third quarter 2002. These new piezometers are to be installed in 6-inch diameter open bedrock boreholes and screened across specific flow zones. The piezometers will be constructed of 1-inch diameter PVC. During the fourth quarter 2002, drilling and piezometer installations were completed at each of these locations.

iv) Installation of Dataloggers - During the fourth quarter 2002, each of the piezometers installed in 2002 was equipped with a Telog™ datalogger. Following installation, each datalogger was calibrated and programmed.

No other investigations were performed with respect to the NAPL plume containment system during the fourth quarter of 2002.

2.4 SUMMARY

The water levels in the operating bedrock purge wells were generally at or very close to their set point elevations during October, November, and December 2002. The average pumping rate for the system during operation over the fourth quarter was 61.7 GPM.

During the fourth quarter 2002, 7,913,144 gallons of groundwater were pumped from the bedrock by the NAPL Plume Containment System purge wells and treated resulting in the removal of 283 pounds of chemical mass.

NAPL monitoring indicates that NAPL is not present in any monitoring well located outside of the NAPL plume boundary in any of the three bedrock zones.

Chemical monitoring and statistical analyses indicate that chemical concentrations, where detected, are generally stable. There is limited variability in some parameters possibly reflective of effects of the addition of five purge wells in 2001.

2.5 ACTION ITEMS

Work described in the Hydrologic Characterization Work Plan will continue into future quarters.

3.0 APL PLUME CONTAINMENT SYSTEM

The objective of the APL Plume Containment System is to contain by pumping, to the extent practicable, APL in the Lockport Bedrock within the area of the remediated APL plume.

The APL Plume Containment System currently consists of two purge wells (APW-1 and APW-2) and four monitoring well pairs (ABP-1/ABP-2, ABP-3/ABP-4, ABP-5/ABP-6, and ABP-7/ABP-8). The locations of these wells and the remediated APL plume are shown on Figure 3.1. The performance criteria for the APL Plume Containment System (remediated APL plume) is to achieve flow convergence towards the purge wells and eliminate seepage at the gorge face to the extent practicable.

Three clusters of APL Flux Monitoring Wells (AFW-1U/M/L, AFW-2U/M/L, and AFW-3U/M/L) oriented toward the west of the Site and located south of the remediated APL plume (as shown on Figure 3.2) monitor the remainder of the APL plume. The performance criteria for the APL Flux Monitoring Wells (AFWs) is to monitor the APL plume flux to the Niagara River through chemical monitoring and to determine whether the flux measured in these wells exceeds the Flux Action Levels specified in the RRT Stipulation.

3.1 APL PURGE WELL OPERATIONS

During the fourth quarter 2002, automated pump operations were uninterrupted, and groundwater levels within each purge well were generally maintained within their respective design settings. No maintenance activities were performed on APWs during this quarter.

During the fourth quarter 2002, 127,715 gallons of groundwater were pumped from the bedrock by the APL Plume Containment System purge wells and treated. Based on semiannual chemical analyses of water from the two APWs, treatment of the pumped groundwater resulted in the removal of approximately .10 pounds of chemical mass through the operation of the APL purge wells.

3.2 PERFORMANCE MONITORING

3.2.1 WATER LEVEL MEASUREMENTS

The hydraulic monitoring program for the APL Plume Containment System was modified during the second quarter 2002 with the submission of the report entitled "Workplan for the Site Characterization Report – Hydrologic Characterization" dated April 5, 2002. With the submission of this Work Plan, MSRMI discontinued the hydraulic monitoring program until a revised monitoring network, representative of the significant discreet flow zones beneath the Site is established. Therefore, no hydraulic monitoring was performed during the fourth quarter 2002. For reference purposes, the cumulative hydraulic monitoring data for the Site from 1993 through the second quarter of 2002 are included on the enclosed CD under the filename HIST.pdf.

3.2.2 GRADIENT EVALUATION

With the discontinuation of the hydraulic monitoring program, evaluations of hydraulic gradient evaluations have also been discontinued. A revised hydraulic gradient monitoring program will be developed following the revised hydrologic characterization of the Site.

3.2.3 SEEP FLOWS

The four gorge face seeps (GF-S1, GF-S2, GF-S3, and GF-S4 shown on Figure 3.3) were inspected on December 19, 2002. During this inspection, each of the four seeps were found to be dry. A cumulative history of the seep flow rate estimations is included on the enclosed CD under the filename HIST.pdf.

3.2.4 CHEMICAL MONITORING

Analytical groundwater samples are collected each quarter from the APW and AFW wells in order to assist in the evaluation of the APL Plume Containment System and calculate the APL Plume flux when required. Two of the AFW well clusters (AFW-1 and AFW-2) were retrofit with 1-inch diameter piezometers during the second quarter of 2002. As a result of the retrofitting of AFW-1 and AFW-2, sampling procedures for collecting the APW/AFW composite sample require modification. A draft Work Plan presenting new procedures for collecting the APW/AFW composite sample was

presented to the Agencies' field representatives during a project review meeting on September 17, 2002. The proposed sampling procedures were not approved during this quarter; therefore, an APW / AFW composite sample was not collected.

Chemical monitoring of the APL Plume Containment system includes semiannual sampling of the APW wells in February and August. Samples collected from these wells are analyzed for the Collected Liquids Monitoring Parameters (CLMPs) as described in Section 9.9 of the RRT.

3.2.4.1 APW CLMP/ACIDS SAMPLING AND ANALYSES

In accordance with the RRT Stipulation (Section 11.1.3 Collected APL Monitoring and Section 9.9 Collected Liquids Monitoring Parameters), the APWs are sampled semiannually, generally during the first and third quarters. Samples are analyzed for the CLMPs, as well as benzoic, monochlorobenzoic (sum o, p, and m isomers), and chlorendic acids. The sampling generally conducted during the third quarter was delayed in 2002 until the fourth quarter. This sampling was conducted on October 9, 2002. The next sampling event for the CLMP parameters will be performed in February 2003.

The CLMP / acids samples were collected directly from the discharge of the APW pumps at the well heads. The sample key, pH, conductivity, temperature, and water quality observations from these wells are summarized in Table 3.1. The analytical results of the APW CLMP / Acids sampling are presented in Table 3.2.

3.2.4.2 APL PLUME FLUX CALCULATIONS

Since the AFW / APW composite sample was not collected during this quarter, the APL Plume Flux to the Niagara River was not calculated for the fourth quarter 2002. A calculation of the APL Plume Flux will be made following the approval of a Work Plan for collection of the AFW / APW composite sample.

3.3 NON-ROUTINE INVESTIGATIONS AND ACTIVITIES

During the fourth quarter 2002, a number of investigative activities were performed as described in the Hydrologic Characterization Work Plan. These activities are discussed in detail in Section 2.3 of this report.

3.4 SUMMARY

During the fourth quarter 2002, 127,715 gallons of groundwater were pumped from the bedrock by the APL Plume Containment System purge wells and treated resulting in the removal of approximately .10 pounds of chemical mass.

The four gorge face seeps were dry during December 2002, indicating that the APWs are working properly in reducing APL migration to the Niagara River.

3.5 ACTION ITEMS

One investigation / activity originally scheduled to be performed during 2001 was delayed due to outside issues, which have not yet been resolved. This investigation / activity is the installation of one APL Plume Containment System Purge Well (APW-3). The installation of APW-3 is dependent on access agreements with the applicable property owners. APW-3 will be installed once access has been granted for the well and forcemain installations. Should this access be granted prior to the hydraulic monitoring program scheduled for the first quarter of 2003, drilling will be delayed until the hydraulic monitoring program is completed.

4.0 OVERBURDEN MONITORING DATA

The required overburden monitoring reporting includes monitoring data for the following programs:

i) Overburden Barrier Collection System (Section 4.1); and

ii) Residential Community Monitoring Program (Section 4.2).

4.1 OVERBURDEN BARRIER COLLECTION SYSTEM

The objective of the Overburden Barrier Collection System (OBCS) is to contain the lateral migration of NAPL in the overburden and, to the extent practicable, contain APL migration in the overburden.

The OBCS consists of an overburden collection trench that extends around the north, west, and south of the Site and is located within the limits of the overburden APL plume. Eight pairs of OBCS monitoring wells (OMWs) are located beyond the OBCS alignment, with one well from each pair installed within the overburden APL plume limits and the second well from each pair installed outside the overburden APL plume limits. The locations of the OMWs are shown on Figure 4.1.

During the fourth quarter 2002, 1,656,060 gallons of groundwater were collected from the overburden by the OBCS System and treated. Based on monthly chemical analyses of water in Decanter Number 2, treatment of this water resulted in the removal of approximately 49.8 pounds of chemical mass.

4.1.1 PERFORMANCE MONITORING

Hydraulic and NAPL monitoring are performed at the OMWs in order to assess the performance of the OBCS system. Hydraulic data are used to determine whether or not an inward horizontal gradient across the APL plume boundary is being created by the OBCS or if a downward vertical gradient exists between the overburden and upper bedrock. NAPL monitoring is performed as an additional assessment in order to determine whether or not horizontal migration of overburden NAPL is occurring.

4.1.1.1 GRADIENT EVALUATION

Hydraulic monitoring of the OBCS is performed by collecting water level measurements from 16 OMWs installed around the Hyde Park Landfill. Hydraulic monitoring of the 16 OMWs was performed weekly in October, November and December 2002. Table 4.1 summarizes the fourth quarter hydraulic head differential gradients (referred to herein as hydraulic gradients). The cumulative hydraulic monitoring data for the OBCS from 1992 to present are included on the enclosed CD under the filename HIST.pdf.

The data presented in Table 4.1 demonstrate that an inward horizontal hydraulic gradient within the overburden regime was achieved throughout this quarter at monitoring well pairs OMW-5R / OMW-6 and OMW-15 / OMW-16R. Inward hydraulic gradients were also demonstrated at monitoring well pairs OMW-1 / OMW-2 for 8 of 12 events, OMW-10R / OMW-9 for 10 of 12 events, OMW-11R / OMW-12R for 7 of 12 events, and OMW-13R / OMW-14R for 3 of 12 events.

The data in Table 4.1 also indicate the presence of a downward vertical hydraulic gradient from the overburden to the bedrock at each of the monitoring well pairs that did not meet the inward hydraulic gradient criteria as follows:

i) B1U / OMW-8R2;
ii) D1U / OMW-11R; and
iii) E4U / OMW-14R.

4.1.1.2 OVERBURDEN NAPL PRESENCE CHECKS

In accordance with Section 3.6.2.3 of the RRT Stipulation, a NAPL presence check was conducted at all overburden wells within the overburden APL plume but outside the defined (1996) overburden NAPL plume limit. Table 4.2 summarizes the results of the NAPL presence checks conducted during 2002. NAPL was not observed in any of the overburden monitoring wells inspected during the fourth quarter 2002 or during any historic monitoring event.

4.2 RESIDENTIAL COMMUNITY MONITORING PROGRAM

The objective of the Residential Community Monitoring Program is to supplement other monitoring and remedial programs by monitoring to provide "early warning" of APL plume migration toward residential areas, taking all feasible actions to prevent or

remediate such migration to residential areas and taking any additional action required to protect those living in the Hyde Park – Bloody Run area.

In order to meet this objective, eleven pairs of Community Monitoring Wells (CMWs), each consisting of one overburden and one shallow bedrock well, are located in the residential areas around the Hyde Park Landfill Site. These wells provide an early warning for possible APL plume migration towards the residential areas. The overburden (OB) wells are screened to within 1-foot of the bottom of the clay layer overlying the bedrock, while the shallow bedrock (SB) wells extend approximately 15 feet below the top of bedrock.

4.2.1 PERFORMANCE MONITORING

The performance monitoring activities required for the Residential Community Monitoring Program are as follows:

i) quarterly monitoring of overburden and bedrock groundwater elevations;

ii) analyses of soil air samples where no overburden groundwater is present; and

iii) annual groundwater sampling and analysis of CMW-2OB.

4.2.1.1 HYDRAULIC MONITORING AND GRADIENT EVALUATION

During the fourth quarter 2002, water levels were measured at the CMWs in December. Table 4.3 summarizes the vertical hydraulic head differential gradients (referred to herein as hydraulic gradients) for the fourth quarter. The cumulative hydraulic monitoring data for the CMWs from 1987 through this reporting period are included on the enclosed CD under the filename HIST.pdf.

The calculation of vertical hydraulic gradients indicates that downward hydraulic gradients were present this past quarter at all well pairs where water was present in the overburden. One overburden well, CMW-8OB, was dry during the December monitoring event. At this location, the elevation of the bottom of the well is higher than the groundwater elevation in the shallow bedrock well of the pair.

4.2.1.2 SOIL VAPOR SAMPLING

At two CMW well pair locations (CMW-7 and CMW-8), the overburden wells have historically contained little to no groundwater, indicating unsaturated conditions in the overburden soils in these areas. As a result, soil vapor samples are collected each quarter from the overburden well at each of these locations. Soil vapor samples were collected from these wells on November 20, 2002. Table 4.4 presents the analytical data for the soil vapor samples collected from CMW-7OB and CMW-8OB. All parameters were non-detect at each of these locations during the fourth quarter and have historically been non-detect.

4.2.1.3 ANNUAL GROUNDWATER SAMPLING

Sampling of community monitoring well CMW-2OB is performed annually each year as an early warning of APL migration in the overburden. This sampling event is performed in conjunction with quarterly sampling activities during the third quarter (August through October) of each year; therefore, well CMW-2OB was not sampled during the fourth quarter 2002. The next sampling event at CMW-2OB will occur during the third quarter of 2003.

4.3 NON-ROUTINE INVESTIGATIONS AND ACTIVITIES

During the fourth quarter 2002, there were no non-routine investigations or field activities conducted with regards to the overburden systems.

4.4 SUMMARY

4.4.1 OVERBURDEN BARRIER COLLECTION SYSTEM

During the fourth quarter 2002, 1,656,060 gallons of groundwater were collected from the overburden by the OBCS System and treated which resulted in the removal of approximately 49.8 pounds of chemical mass.

A review of the hydraulic monitoring data for the fourth quarter 2002 indicates that inward horizontal hydraulic gradients were present at six of the eight monitoring well pairs. Downward vertical hydraulic gradients were present at the monitoring well pairs where an inward hydraulic gradient was not achieved.

NAPL was not observed in any of the overburden monitoring wells, indicating that the OBCS continues to serve as an effective barrier to off-Site NAPL migration.

4.4.2 RESIDENTIAL COMMUNITY MONITORING PROGRAM

Downward vertical hydraulic gradients were achieved at all of the monitored well pairs during the fourth quarter 2002. One monitoring well, CMW-8OB was dry during the fourth quarter 2002. Soil vapor samples were collected from CMW-7OB and CMW-8OB. No analytes were detected in the soil vapor samples collected from these wells.

4.5 ACTION ITEMS

From the monitoring data obtained during the fourth quarter 2002, it has been determined that the overburden systems are operating properly and no further investigation or maintenance issues are evident at this time.

5.0 LEACHATE TREATMENT SYSTEM

In accordance with Section 11.1.4 of the RRT and Addendum I of the Settlement Agreement, the midpoint and effluent of the APL treatment system are monitored. Sampling is required at daily, weekly, and monthly intervals for various parameter groups in order to determine whether the APL Plume Flux is below the Flux Action Levels and whether and when the carbon beds need to be replaced or other maintenance activities need to be undertaken.

5.1 EFFLUENT ANALYSIS

The APL treatment system effluent was sampled daily, weekly, and monthly during the fourth quarter 2002. The sample data is grouped by frequency of sample collection for discussion in the following subsections.

5.1.1 DAILY SAMPLING

Table 5.1 summarizes the results of the daily composite sampling. No exceedances of the treatment levels were reported this quarter for any of the three daily parameters; pH, total organic carbon (TOC), and phenol.

5.1.2 WEEKLY SAMPLING

Table 5.2 summarizes the results of the weekly composite sampling. No exceedances of the treatment levels were reported this quarter for any of the five weekly parameters or their isomers from the collected effluent samples.

5.1.3 MONTHLY SAMPLING

Table 5.3 summarizes the results of the monthly composite sampling. No exceedances of the treatment levels were reported this quarter for any of the eight parameters or their isomers.

6.0 NAPL ACCUMULATION

The well extraction systems and manual NAPL removal collected approximately 1,223 gallons of NAPL during the fourth quarter of 2002. Monthly NAPL recovery identified by source is summarized in Table 6.1.

6.1 DECANTERS

Manual NAPL level measurements are conducted monthly in the three decanters. The levels are extrapolated to estimate the quantity of NAPL present in each of the decanters. A description of each decanter's source is provided below:

- Decanter No. 1 Bedrock Purge Well System
- Decanter No. 2 Overburden Barrier Collection System
- Decanter No. 3 Source Control System

The total NAPL accumulated during the fourth quarter 2002 was 1,223 gallons.

NAPL measurements in the decanters are subject to a measurement error of ±6 inches which equates to ±188 gallons of NAPL.

6.2 MANUAL RECOVERY

In an effort to enhance NAPL recovery at the Site, MSRMI has voluntarily initiated manual NAPL removal from monitoring wells where sufficient NAPL volumes exist. During the fourth quarter 2002, no NAPL was manually recovered.

6.3 INCINERATION

During the fourth quarter 2002, approximately 28,138 gallons of NAPL/Sludge were shipped from the Hyde Park Site for incineration. Much of this material is believed to have been bacterial sludge.