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CONESTOGA-ROVERS & ASSOCIATES REVIEW REPORT

ANALYSIS OF RECORD OF DECISION (ROD) FOR OPERABLE UNIT 3, AND PROPOSAL FOR ADDITIONAL NEEDED WORK

Strasburg Landfill Superfund Site Newlin Township Chester County, Pennsylvania

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ANALYSIS OF RECORD OF DECISION (ROD) FOR OPERABLE UNIT 3, AND PROPOSAL FOR ADDITIONAL NEEDED WORK

Strasburg Landfill Superfund Site Newlin Township Chester County, Pennsylvania

JANUARY 1993

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CONESTOGA-ROVERS & ASSOCIATES

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EXECUTIVE SUMMARY

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In March 1992, EPA issued a Record of Decision (ROD) selecting the remedial action for Operable Unit 3 (OU3) for the Strasburg Landfill Site in Newlin Township, Pennsylvania. The ROD describes a remedial action that includes capping the landfill and collection of leachate in a trench collection system for treatment by UV-ozone oxidation.

The Remedial Investigation (RI) does not adequately support the Feasibility Study (FS), as there is insufficient data to determine:

- the potential effectiveness of any cap in reducing the generation of leachate
- the ability to construct a cap on the existing landfill
- the effectiveness of a trench collection system for leachate
- the applicability of the UV-ozone oxidation treatment method to Strasburg Landfill leachate.

These inadequacies are recognized in the RI recommendations for the collection of additional data, and also to some extent in the ROD, which states on p. 47: "The implementability of the portion of alternatives 2, 3, 4, and 5 involving capping of the landfill is dependent upon the stability, design, and condition of the Strasburg Landfill. Some concerns include:

- That the slopes of the landfill sides are too steep;
- That the stability of the landfill is not studied; and

That part of the landfill is sitting in the groundwater."

The need for and effectiveness of a RCRA-type cap for reducing leachate generation cannot be adequately assessed without knowing whether or not the groundwater table is in the waste. The FS (p 1-56) indicates that waste is likely within the water table due to the landfill's position in a former valley. In such a situation, no cap will materially reduce leachate generation.

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Parts of the existing landfill are reported to be on a slope of 60% (ROD Decision Summary p.15). A cap, especially one that includes a synthetic membrane, will not survive on such a steep slope, or even on a slope in excess of only 25%. Consequently, although slope reduction will be required, it has apparently not been considered in the evaluation of alternatives.

Similarly, while the groundwater data gives little indication that a trench leachate collection system would be effective, the geologic data indicates significant opportunity for failure. Such failure would cause the implementation of OU4 to address groundwater contamination, which would immediately render the trench collection system redundant.

UV-ozone oxidation is not well suited to leachate treatment, because this method depends on penetration of UV light through the liquid. The liquid leachate from the site is very colored and would therefore prevent light penetration. Pre-treatment requirements, which would likely preclude UV-ozone oxidation from implementation, have not

been adequately accounted for in the evaluation process. Those pre-treatment requirements can only be determined through treatability studies, which have not been undertaken.

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As a result of these major concerns, there must be considerable uncertainty about the short-term and long-term effectiveness (including cost-effectiveness) and implementability of the proposed remedial action. The proposal for additional work contained in this report explains the need for removing this uncertainty, and presents a plan for conducting needed additional work.

1.0 INTRODUCTION

1.1 BACKGROUND

The Strasburg Landfill is an inactive 22-acre facility located on a 220-acre property. The property is located south of Strasburg Road in Newlin Township, Chester County, Pennsylvania.

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The Landfill operated from February 1979 until May 1983, when it was closed. The Landfill reportedly received both municipal and industrial waste during its operation. However, it is clear that the Landfill served as a significant disposal site for municipalities in southeastern Pennsylvania and, as such, received massive quantities of municipal waste.

In May 1983, the Pennsylvania Department of Environmental Resources suspended the landfill operation because of major operating violations, and apparently allowed the owner and operator to implement and complete an inadequate closure plan.

After the landfill was closed, volatile organic compounds were detected in an on-site monitoring well and in the witness system drain pipe, and in Briar Run east of the Landfill. A groundwater monitoring program was implemented and the Site was subsequently added to the National Priorities List in March 1989. A Remedial Investigation Report and a Feasibility Study were released in September 1991.

In December 1991 EPA Region 3 announced the proposed

plan for the site and requested comments in the document entitled:

"Superfund Program Proposed Plan Strasburg Landfill Newlin Township, PA December 1991" (Proposed Plan)

The Proposed Plan summarizes EPA's remedial strategy for the Site as

follows:

"EPA's strategy for OU 3 is to control hazardous emissions from the site, especially into the groundwater, through implementation of source control, specifically an impervious landfill cap, a landfill gas collection system, and an expanded leachate collection system. It is felt that implementation of these source control measures will be sufficient to remediate this Site so that the contaminated groundwater condition will be eliminated and the quality of the groundwater will revert to measured background levels. Groundwater will continue to be monitored for a period of not less than 24 months to examine the effectiveness of this action to clean up the groundwater to background levels. In the event monitoring of the groundwater in and around the Site demonstrates that these "source control" actions are not sufficient to return the groundwater to background then a final decision (OU 4) will be proposed, in conjunction with the Commonwealth to implement additional measures, for example, pumping and treating the groundwater to bring about remedial clean up of the aquifer." (Proposed Plan - p. 4 & 5)

Groundwater restoration often consists of extraction, treatment, and discharge actions. For this proposal it is felt that groundwater will be restored through "source control" actions thereby eliminating potential disruptions of nearby domestic well systems. (Proposed Plan - pg. 9)

Thus, although the Proposed Plan makes a passing

reference to an unspecified OU4, it is very clear that EPA expected the

Proposed Plan to effectively constitute a final remedy unlikely to require further remedial work.

On March 31, 1992 the Regional Administrator, Region III, signed a Record of Decision (ROD) which selects the remedial action for Operable Unit 3 (OU3) for the Strasburg Landfill Site in Newlin Township, Pennsylvania. The ROD describes a remedial action for the Site that does not meet the expectation of the December 1991 Proposed Plan.

It appears that just prior to the issuance of the ROD, EPA became aware of the significance of some concerns regarding implementability and effectiveness of the proposed remedial action, including:

• That the slopes of the landfill sides are too steep;

.....

- That the stability of the landfill is not studied; and
- that part of the landfill is sitting in the groundwater." (ROD pg. 47)

Because of these concerns, the remedial action <u>cannot</u> be determined to have been selected in accordance with Section 121 of CERCLA.

Prior to issuing a ROD, EPA should address the concerns expressed in the RI/FS.

It is not in accordance with the NCP to address questions affecting implementability and effectiveness in an RD/RA process, the answers to which are likely to materially change the selection of the remedial action.

1.2 <u>PRP GOAL</u>

Any remedy for the Site should be completed in the shortest reasonable time period but also must be effective. In the case of Strasburg, this aim may be in conflict with the separation of OU3 and OU4, as there is not enough good data presently available to objectively assess the effectiveness and implementability of OU3. For example, if OU4 in the form of a groundwater pump and treat system is required, the Site hydrogeology is such that the implementation of OU4 would immediately make the leachate collection trench component of OU3 redundant. Treatment of water in OU4 would not likely require the same process train as OU3 leachate resulting in a second redundancy. The PRP Goal is to ensure an effective remedy at the Site, reduce the overall time requirements for effective remedy implementation, and reduce the probability of making redundant expenditures.

1.3 PURPOSE AND ORGANIZATION

The purpose of this report is to present a proposal to conduct additional work at the Site, and to define and explain several

fundamental concerns that the PRP Group has about the inadequacies of the existing database for the Site. The report also explains how those inadequacies affect the ability to make informed objective, conclusions about the Site and the remedy selection process.

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The report presents a review of the RI/FS in Section 2. Operable Units 3 and 4 are summarized and reviewed in Sections 3 and 4, respectively. The additional proposed work is described in Section 5.

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2.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) REVIEW

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The RI/FS for the Strasburg Landfill Site completed in

1991 is presented in the following reports:

- Remedial Investigation Strasburg Landfill Site Alternative Remedial Contracting Strategy (ARCS) Region III September 1991 (RI)
- Feasibility Study Strasburg Landfill Site Alternative Remedial Contracting Strategy (ARCS) Region III September 1991 (FS)

The purpose of the RI was "to assess and document the potential for contaminant migration from the Strasburg Landfill Site" (RI - pg. 1). In fact "the field sampling program was designed and conducted to determine the nature and extent of contamination emanating from the landfill, gather information to evaluate impacts on public health and the environment, and develop, evaluate, and select alternatives to remediate the site" (RI - pg. 1-4).

Using the data collected in the RI, the FS was performed "to develop, evaluate, and select an alternative to remediate the Strasburg Landfill", which "will reduce or eliminate the human health and environmental receptors exposure to acceptable levels" (FS - p. 1).

It should be noted that prior to the completion of the FS,

two Focused Feasibility Studies (FFS) to support early action Record of Decision (ROD) to control leachate and provide alternative water supplies for affected homes southwest of the landfill, and to restrict site access, were completed. The RODs were signed by the Regional Administrator on June 29, 1989 and June 28, 1991, respectively, and the actions implemented and completed.

EPA recognized in the RI/FS that the data base was not complete, and that as a result concerns exist regarding the effectiveness and implementability of the selected remedial actions. The RI identifies the following (pp. 7-10 through 7-12) data base needs:

- (1) "The monitoring well network should be expanded to further evaluate possible migration pathways and hydraulic characteristics of the aquifer."
- (2) "Additional data should also be collected from the wells on site to provide information on aquifer characteristics."
- (3) "To evaluate the hydrologic connection between the streams and the groundwater, additional monitoring wells (previously referenced), stream gauging stations, and stream and groundwater gauging events are needed."

Further data base needs, which raise additional concerns,

are identified in the FS (pp. 7-11 & 7-12):

"The implementability of this alternative involving capping the Landfill is dependent upon the stability, design, and condition of the Strasburg Landfill. Some concerns include:

- That the slopes of the landfill sides are too steep;
- That the stability of the landfill is not studied; and
- That part of the landfill is sitting in the groundwater."

The FS then goes on to note that "The cap included in this alternative is based on assumptions about the integrity and stability of the landfill" (pg. 7-11). The FS does not discuss the implications if these assumptions are found to be in error.

Because information about the integrity and stability of the landfill is absent, the FS notes that "special design features will be needed to cover the steep slopes of the landfill as well as for tie-in of the cap to the base. There is a potential need for a retaining wall around part of the landfill" (FS - pg. 7-11).

Since the FS recognizes a concern regarding integrity and stability, the proposed cap may not be implementable. The slope stability correction may interfere with the proposed leachate collection trench. Consequently, the total capital cost of \$6,035,000 to cap the site (FS - pg. 7-13) may be grossly in error, and the proposed cap may not be cost effective.

3.0 OPERABLE UNIT 3 REVIEW

Operable Unit 3 (OU3) includes the following

components:

- Removal of the existing landfill cover;
- Installation of a landfill cap over the existing 22-acre landfill;
- Installation of a landfill gas venting system;
- Revegetation of the landfill cap;
- Installation of a sub-surface leachate collection system;
- Construction of a leachate treatment system; and
- Operation and Maintenance.

These components are described as Alternative 3 in the ROD and as Alternative 5 in the Feasibility Study.

The remedy components can be conveniently subdivided into two categories: cap components, and leachate collection and treatment components. The cap components include:

- Removal of the existing landfill cover;
- Installation of a landfill cap over the existing 22-acre landfill;
- Installation of a landfill gas venting system; and
- Revegetation of the landfill cap.

The leachate collection and treatment components

include:

- Installation of a sub-surface leachate collection system; and
- Construction of a leachate treatment system.

Operation and maintenance is common to all remedy components.

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Each category of remedial action is described separately in the following subsections.

3.1 <u>CAP</u>

The cap is described in the FS as a "RCRA Cap" and in the ROD as a "25PA Code Chapter 264 Subchapter G" cap. In both cases, the cap is comprised of 24 inches of compacted clay, an impermeable synthetic membrane, 24 inches of compacted sand and 12 inches of topsoil. The ROD specifically states that the existing cap would be removed but the FS does not appear to make this a requirement. The cost estimate calculation presented in Appendix A of the FS does not state whether the cost of removing the existing cap is included in the cost estimate.

The FS also indicates on pages 5-9 that "The

implementability of replacing the landfill cap with a multi-layered RCRA cap depends on the landfill design, stability and existing conditions." The FS then acknowledges that none of these factors are adequately described in the RI, stating:

"Of particular concern is the slope of some of the landfill sides, particularly the east and south sides, and the potential presence of groundwater in the landfill. Existing design, construction, and stability information of the Strasburg Landfill will be collected during cap design. Required information should be gathered and special design and construction techniques should then be used to effectively install the cap."

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Based on this language, it would seem that a

multi-layered RCRA-type cap was selected as part of the remedy without ascertaining that it can in fact be constructed and would be effective. At best, this means that the cost estimate cannot be correct, as it was formulated without an understanding of cap construction requirements. In the worst case, a remedy component has been selected without knowledge of its implementability and effectiveness.

The purpose of the cap as stated in the ROD is "to reduce landfill emissions, infiltration of precipitation; and the amount of leachate produced." (ROD Decision Summary p.32) The FS states (p. 5-9) "Recapping the whole landfill would reduce both its emissions to the atmosphere and its leachate generation through vertical infiltration of water." Clearly, reducing leachate generation is a major goal of the RCRA-type cap. However, placement of a RCRA-type cap will not achieve the goal of leachate reduction if the groundwater table is within the waste materials. As stated in the FS (p. 1-56):

"It is likely that there has been a rise in the water table in the area of the former valley in response to the 120 feet of fill placed within the valley. It is unreasonable to expect the groundwater to remain beneath the former valley floor when groundwater has been found at approximately 5 to 60 feet below the ground surface in monitoring

wells located around the landfill. It is likely that illicit groundwater infiltrates the landfill despite the underdrain system emplaced beneath the landfill. This illicit groundwater, unless totally captured by the leachate and witness drain system, will promote contaminant migration from the landfill into the groundwater."

This scenario is consistent with the landfill's position in the bottom of a valley that formerly contained an intermittent stream (FS p. 1-56), and with the generation of leachate from the landfill underdrain system.

Without knowing where the water table is relative to the bottom of the waste, there is no way of determining whether or not the RCRA-type cap selected by EPA would reduce infiltration. With the water table in the waste, even a RCRA-type cap will not significantly reduce leachate generation.

Furthermore, even if the water table were determined to be below the bottom of the waste, a RCRA-type cap is still very likely not required. The difference in infiltration rates between a RCRA-type cap and a sanitary landfill cap has not been evaluated in the Strasburg RI/FS. This difference is typically quite small, and is insignificant when a cap is combined with a leachate collection or groundwater extraction system. When leachate is collected and/or affected groundwater is extracted, the result of infiltration is controlled. Consequently, preventing infiltration becomes less important. If an elaborate cap completely removes the need for groundwater/leachate treatment, then a significant benefit is achieved. However, if no amount of capping will eliminate the need for groundwater/leachate treatment, then the incremental increase in leachate generation resulting from a less elaborate cap

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will not materially affect the performance or cost of a groundwater/leachate treatment system.

The absence of sufficient hydrogeologic data at the Strasburg Landfill means that EPA has failed to perform an objective balancing of effectiveness and cost as between the cap on the one hand and groundwater/leachate treatment on the other.

As indicated previously, slope stability also has not been adequately assessed at the Strasburg Landfill. Topographic mapping presented in the RI is insufficiently detailed to permit an independent assessment of the slope. However, if the description of a 50%-60% grade for the eastern slope of the landfill (p.15, Decision Summary for the ROD for OU 3) is correct, then a major slope correction must be evaluation and should have been scoped as part of the cap selection process. Significantly any cap that includes a synthetic membrane layer covered with soil will fail along the plane of the synthetic membrane if the slope exceeds approximately 25%. EPA has selected just such a cap for Strasburg.

The FS, and consequently the ROD, defer an analysis of the slope until some unspecified time before the installation of the cap. However, the need for slope correction raises significant concerns of implementability and cost-effectiveness when therefore, should have been considered in the FS. These concerns include:

- availability of large quantities of clean fill;
- haul routes for clean fill;

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- odors if waste is excavated;
- location of leachate collection and treatment systems (both existing and proposed);
- drainage; and
- selection of a design slope which determines what cap materials are acceptable, which in turn affects shape, construction and cost.

3.2 LEACHATE COLLECTION AND TREATMENT

A leachate collection and treatment system is included in the selected alternative for OU3. The leachate collection system would consist of a trench and tile drain "around the southern boundary of the landfill" (FS p. 5-10). The ROD states that the trench would be "on the southwest, south and southeast sides of the landfill". The location and length of trench contemplated are not specified in the ROD or FS. However, the cost estimate presented in Appendix A indicates that the trench length would be 1,650 feet or approximately one-third of the landfill perimeter. The cost estimate is also based on a trench depth of 10 feet. There is insufficient data to determine the validity of that figure, but EPA's assumption of a ten-foot depth for the trench is suspect. The limited data on surface topography (Figure 3-9, RI) and groundwater (Figure 4-1, RI) suggest that at least half of the southern landfill boundary and all of the southwest boundary have significantly more than 10 feet of overburden, and possibly more than 50 feet, before encountering the water table. If the water table is not present in the waste on-site, the ⁴ predominant direction of leachate flow would be vertically downward as the leachate responded to unsaturated groundwater flow conditions. As a result, leachate would bypass the leachate collection system and enter the groundwater flow system. Thus, there appears to be a significant opportunity for a trench-style leachate collection system to fail at the Strasburg Site. The FS recognizes this potential for failure on p. 5-10 which stated that, "If the leachate is leaking through the bottom of the landfill this technology may not be appropriate".

The effectiveness of a trench system will be even further compromised as the trench alignment is moved away from the perimeter of the waste to accommodate regrading for slope stability (i.e., the further away from the source, the greater the opportunity for vertical flow and consequent leakage and groundwater contamination).

Vertical flow from the waste materials into the groundwater, bypassing any trench control system, remains a distinct possibility that must be addressed before any trench-style leachate collection system can be selected as an alternative that will not fail. Groundwater contamination described in Section 4.6.3 of the RI provides evidence that the Site leaks through its bottom. Site geology presented in Section 4.3.1 of the RI indicates that weathering and fracturing of the geologic materials exists, which could provide contaminant migration pathways into the bedrock. The geology and concern for deeper bedrock and aquifer contamination are neatly summarized in the last paragraph of RI Section 4.3.1.

"The water level in the shallow monitoring wells indicates that saturated conditions at this site are generally encountered below the saprolite and within the weathered bedrock unit. Some of the fractures, joints, and schistosity planes within the weathered bedrock are likely to be in hydraulic connection with fractures, joints, and schistosity planes in the unweathered bedrock. Since these zones of secondary porosity are the primary route of groundwater movement, these zones also provide pathways for contaminant movement into the bedrock."

The RI further suggests flow between shallow and deeper groundwater with its analysis of groundwater flow. On page 4-19, the RI states:

"The groundwater contour maps indicate that the potentiometric surface of the groundwater in the bedrock closely approximates the groundwater contours of the water table aquifer. This suggests that communication exists between the weathered and unweathered bedrock."

Both upward and downward vertical gradients are measured in monitoring well pairs located at the Site. This indicates that conditions exist that permit downward groundwater flow in some locations during some periods of time. The RI (p. 4-22) also recognizes that "Additional monitoring is needed to further evaluate vertical groundwater gradients and seasonal variability of measured groundwater elevations".

With so much uncertainty as to groundwater flow, it is not possible to say that a trench-style leachate collection system will be effective. Indeed, indirect evidence concerning the geologic materials and groundwater flow suggests that trench-style system will in fact be ineffective.

At the very unit additional hydrogeologic data is required to make an objective evaluation of the trench system.

The ROD indicates that leachate treatment will be by UV-ozone oxidation, with the treated water discharged to local surface water. The FS identifies the discharge point as Briar Run.

UV ozone treatment employs a controlled combination of ozone and UV light to induce rapid photochemical oxidation of halogenated organic compounds. Treatment requires UV light penetration of the wastewater stream. Consequently, performance and effectiveness are significantly affected by wastewater turbidity, color, and the presence of suspended solids and dissolved solids. Secondary effects on performance result from the precipitation of minerals on the quartzite light source and the growth of bioslime. As a result, successful implementation of UV ozone treatment at one site does not automatically transfer to application at the Strasburg Site, contrary to the implication at page 4-31 of the FS.

Treatability studies should always be conducted on the actual wastewater stream to ensure that appropriate technology is used and that treatment objectives can be consistently met. Landfill leachate is a difficult matrix to treat due to its high content of suspended solids, dissolved solids, iron, manganese and COD. These parameters which are contributed by municipal solid waste, interfere with the treatment of parameters such as chlorinated VOC, which are typically attributed to industrial waste sources. The municipal solid waste leachate parameters typically require pretreatment which may or may not affect treatment of the target industrial waste parameters. The FS acknowledges pretreatment possibilities but does not account for their costs.

"Additional costs would be incurred for similar ancillary equipment described above for air stripping that would be needed for the installation and operation of the oxidation system (some of these items would be smaller and/or less expensive than those needed for air stripping due to UV/ozonation's more integrated nature and smaller size). Costs for design and consultant services during construction would also be required." (FS pg. 4-34)

The treatment process train could be very different

depending on whether the fluid treated is primarily leachate or groundwater. Leachate is typically a high-strength, low-volume waste stream, while groundwater is a low-strength high- volume waste stream. In sum, considerations of effectiveness dictate that different technologies be applied to these basically different waste streams.

4.0 **OPERABLE UNIT 4**

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Operable Unit 4 is described conceptually in the ROD as

follows:

"A future ROD (OW 4) will specifically address groundwater in the area of the site. The scope of this future remedial action (OU 4) will be based on the success of the remedy selected for this (OU3) operable unit." (ROD Decision Summary p. 13)

The ROD Decision Summary goes on to state that monitoring of OU3 for a minimum period of 2 years after the completion of OU3 will be conducted before implementing OU4 (ROD Decision Summary p. 13). OU4 would be expected to consist of groundwater pumping and treatment.

The ROD's approach of implementing OU3 when there is a real probability that it will shortly be replaced or made redundant by OU4 is seriously flawed for the reasons described in the following paragraphs.

As described in Section 3.2 above, there appears to be at the least the opportunity for leachate to escape any trench drain system at the Site, thereby contaminating groundwater. This opportunity should be investigated and an early determination made as to the effectiveness of a trench drain system and the need for a groundwater pump and treat system. A groundwater pump and treat system would immediately make the trench system redundant, and also possibly inoperative if groundwater levels are lowered in the area of the trench.

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As also discussed above, a groundwater pumping system would likely require a different treatment hardware than that for any leachate treatment system due to the higher volume of water and lower parameter concentrations. These features of the groundwater would automatically eliminate the need for the leachate treatment plant as its design would be based on lower volume flowrates and higher influent parameter concentrations.

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5.0 WORK PROPOSAL

Property

Work will be conducted to obtain the information needed to adequately define the hydrogeological conditions at of the Site. The results of this investigation would in turn permit the following to occur:

- an objective evaluation of the leachate generation characteristics of the Site particularly as they may or may not be affected by a cap;
- an objective assessment of leachate collection by the trench method versus collection of affected groundwater by groundwater pumping.

The required work would be conducted in accordance with the Work Plan presented in Appendix A.

A conceptual schedule is illustrated in Table 6.1. It is expected that the proposed supplementary RI/FS work would be completed within one year. This schedule would not affect the completion date of the final remediation of the Site as problems associated with implementation of both the cap and groundwater contaminant migration aspects of the remedy would be identified and resolved during design. Implementation of the existing OU3 ROD will result in identification of these problems at some later stage of the design or implementation resulting in delay at the time.

TABLE 6.1

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SCHEDULE

Activity	Duration (days)	Accumulated Time (days)	
Finalize Work Plan	90	90	
Complete Field Work	180	270	
Complete Report	30	300	

APPENDIX A

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WORK PLAN

STRASBURG LANDFILL SUPERFUND SITE NEWLIN TOWNSHIP CHESTER COUNTY, PENNSYLVANIA

1.0 INTRODUCTION

The Remedial Investigation (RI) and the Feasibility Study (FS) completed for the Site in September 1991 recognize the following data gaps:

- "The monitoring well network should be expanded to further evaluate possible migration pathways and hydraulic characteristics of the aquifer" (RI - p. 7-10).
- (2) "In the event that groundwater treatment or groundwater control are considered as remedial options at this site, more extensive pump tests should be performed" (RI - pp. 7-11 and 7-12).
- (3) "Additional data should also be collected from the wells on site to provide information on aquifer characteristics....This information is crucial to evaluate groundwater gradient data collected from the residential wells and the recharge of the aquifer at these locations" (RI - p. 7-11).
- (4) Concerns regarding the proposed cap for the site include:
 - " that the slopes of the landfill sides are too steep;
 - that the stability of the landfill is not studied; and

- that part of the landfill is sitting in the groundwater" (FS - pg. 7-11).

The identified data gaps are suitably collected as part of the work proposed herein so as to allow for the completion of an FS which is not inconsistent with the NCP. As discussed in the accompanying report, the data gaps identified are sufficiently broad that the work to fill those gaps would be expected to affect the selection of the final remedy.

2.1 <u>PLAN OF WORK</u>

Supplemental data collection at the site would be as follows:

- A monitoring well cluster would be installed at MW21 to determine whether a deeper groundwater flow regime exists.
- (2) A monitoring well cluster would be installed at MW31 and a cluster also installed along the fracture trace on which MW-3I is located.
- (3) A deep monitoring well would be installed adjacent to MW-5S to monitor deep groundwater quality upgradient of the landfill. The data to be obtained is imperative to determine background water quality upgradient of the landfill, especially since a low-level concentration of PCE (2 µg/L) from MW-5S was detected during the last sampling event.
- (4) Monitoring wells would be installed in the groundwater zone nearest the surface in areas of high soil gas concentrations surrounding the landfill. Information from these wells will aid in the evaluation of the soil gas sources and in the evaluation of whether the landfill is located into the water table.

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- (5) Modified pump tests would be performed at the well clusters to determine the extent of communication between monitoring wells at a well cluster (i.e. if pumping at one well has an immediate effect on the other well or wells within a given cluster). This will help assess the vertical movement of potential contaminant release in the groundwater. Since the greatest groundwater contamination has been detected in the wells along the fracture trace at the southwestern edge of the landfill, that area should be targeted for the pump tests. Pump tests will also require the installation of piezometers to monitor the response of the aquifer during pumping. If an existing monitoring well cannot be used as the actual pumping well (i.e. M-5), an additional well will need to be constructed for this purpose.
- (6) Water level monitoring would be conducted at all existing wells, including stream gauging, to permit a groundwater gradient mapping and definition of the relationship between groundwater and surface water flow. This information will be used to assess the expected future extent of groundwater contamination and to assess the optimium location to intercept potential contaminant release from the landfill.
- (7) Water quality monitoring for a Site Specific Parameter List would be conducted to allow for the definition of groundwater impacts and an evaluation of the need for groundwater controls.

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م_ (کونکه این ک This would permit improved definition of the area requiring groundwater control.

(8) Work would be conducted to identify the base of disposed waste,
either from historical records or from on-site excavation/boring.
This work is needed to determine if the landfill is located in the water table.
APPENDIX B

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STATEMENT OF QUALIFICATIONS AND EXPERIENCE OF CONESTOGA-ROVERS & ASSOCIATES

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1.0 <u>CORPORATE PROFILE</u>

1.1 <u>COMPANY HISTORY</u>

Conestoga-Rovers & Associates (CRA) is an engineering firm with its head office located in Waterloo, Ontario and Canadian branch offices in Toronto, Ottawa, and Belleville. Affiliate American offices, under the U.S. name of Conestoga-Rovers & Associates, Inc., are located in Niagara Falls and Wappingers Falls, New York; St. Paul, Minnesota; Chicago, Illinois; Detroit, Michigan; and Atlanta, Georgia. The company was formed in 1976 through the amalgamation of two individual firms, Conestoga Engineering Limited and Frank A. Rovers & Associates Limited. Both firms were actively involved in environmental assessments prior to amalgamation and became extensively involved with the hazardous waste problems that were developing in the late 1970s in the Niagara Falls, New York area.

Services in waste treatment technologies are provided through the affiliated firm of TreaTek-CRA Company with offices in Grand Island, New York; Boston, Massachusetts; Pittsburgh, Pennsylvania; and Stockton, California.

CRA employs approximately 350 professional and support staff. The professional staff include civil, chemical, geological, mechanical and biological engineers; hydrologists, hydrogeologists and geologists; chemists; biologists; and planners. In addition to the full-time staff, CRA also retains a number of specialists who have expertise in such areas as systems

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modeling, statistical methods, soil chemistry, toxicology and industrial hygiene.

CRA's extensive expertise in environmental engineering, in both Canada and the United States, has equipped CRA to carry out environmental projects to the state-of-the-art, from the initial investigation through remedial design and construction, to long-term management and monitoring.

1.2 CRA ORGANIZATION

CRA provides environmental services to Canadian and American clients, and is divided into four main divisions:

- Environmental Services, including preliminary site evaluation, environmental impact assessment and conceptual design and monitoring.
- Construction Services, including detailed design; preparation of plans, specifications and bidding documents; bid call and evaluation; cost estimating; and construction management and administration of field implementation.
- Technical Support Services, which provides a number of important services both for project support and as independent services to clients. Technical Support includes CRA's Hydrogeology and Analytical Services groups. The Hydrogeology group is widely knowledgeable in both

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Philipina Field contaminant and water supply hydrogeology. The Analytical Services group, which includes environmental chemists who supervise and manage CRA's analytical subcontractors, design and implement monitoring/analytical programs and their associated quality assurance/quality control programs. Also within Technical Support are specialists in health and safety, groundwater contaminant modeling, environmental planning, and computer services.

 Civil Engineering Services, which provides support to the environmental engineering functions of the company in this area. Civil Engineering services also provides direct engineering services for site services; water treatment and distribution; and stormwater management.

2.0 CORPORATE EXPERTISE AND EXPERIENCE

2.1 CORPORATE EXPERTISE

CRA enjoys an international reputation regarding the assessment, management and resolution of environmental problems. CRA is intimately familiar with proposed and promulgated waste management and environmental regulations throughout North America, and has extensive expertise in the following:

- Engineering of domestic and hazardous waste disposal on land systems, including detailed hydrogeologic investigation, location of disposal sites, landfill design, pretreatment of waste streams prior to disposal, professional management of operating landfills, and design of systems to control gas and contaminant migration.
- Remedial investigation and feasibility studies, including risk assessment.
- Design, implementation, inspection and project management of remedial construction, including closure of RCRA and hazardous material storage or treatment facilities, and leachate collection and treatment including deep well disposal.
- Site monitoring, environmental and industrial hygiene sampling.
- Environmental/Compliance audits and assessments.

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- Wastewater treatment from bench testing to full scale design.
- Decommissioning and/or decontamination of industrial facilities.
- Negotiation of Consent/Administrative Orders.
- Provision of Expert Testimony.

2.2 CORPORATE EXPERIENCE

A partial list of projects and clientele selected as being representative of the broad scope of Professional Services completed and/or ongoing by CRA are presented in Tables 1 and 2. Table 1 describes the project while Table 2 provides further details on work performed on each project.

The projects listed for reference in Tables 1 and 2 show that CRA can expertly assess, advise and represent, on most facets, the management of domestic and hazardous wastes or materials, including hydrogeology; site design; facility closure or retrofit; construction and project management of remedial efforts; monitoring and analyses; data evaluation; environmental assessments; computer modeling of groundwater and mass transport; and personnel hazardous waste safety programs.

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3.0 <u>REFERENCES</u>

3.1 <u>REFERENCES PERTAINING TO CANADIAN PROJECTS</u>

The following references are provided regarding CRA's

professional services:

Mr. Fraser Craig, Supervisor Environmental Control Department Algoma Steel Corporation Limited 503 Queen Street West Sault Ste. Marie, Ontario P6A 5P2 Telephone: 705-945-2351

Mr. Ben Jetten Blake, Cassels and Graydon Barristers & Solicitors Commerce Court West Toronto, Ontario M5L 1A9 Telephone: 416-863-2731

Mr. J. Allan Ramsay Environmental Management Co-ordinator Corporation of The City of Burlington P.O. Box 5013, 426 Brant Street Burlington, Ontario L7R 3Z6 Telephone: 416-335-7807

Mr. George Kelly Director, Solid Waste Management Division Municipality of Metropolitan Toronto Department of Works, 439 University Avenue Toronto, Ontario M5G 1Y8 Telephone: 416-392-8286

Mr. Roman Martiuk Director, Solid Waste Operations Regional Municipality of Waterloo Marsland Centre 20 Erb Street West Waterloo, Ontario N2J 4G7 Telephone: 519-885-9400 Mr. Howard Goldby, P. Eng. Environmental Manager WMI Waste Management of Canada, Inc. 2700 Matheson Boulevard East East Tower, Suite 803 Mississauga, Ontario LAW 4V9 Telephone: 416-629-4151

Mr. Jim Kutyba, Director of Waste Management County of Lambton Planning Department P.O. Box 3000 789 Broadway Street Wyoming, Ontario N0N 1T0 Telephone: 519-845-3303

The following references are provided regarding expert

representation in negotiation/litigation forums:

Mr. Burton Kellock, Q.C. Blake, Cassels and Graydon Commerce Court West, 26th Floor Toronto, Ontario M5L 1A9 Telephone: 416-863-2691

Mr. Andrew C. Wright, LL.B. McLennan, Wright Barristers & Solicitors 148 Fullarton Street Suite 1700, Talbot Centre London, Ontario N6A 5P3 Telephone: 519-434-7393

Mr. Doug Thomson McCarthy Tetrault Toronto Dominion Bank Tower Suite 4700, 50th Floor Toronto, Ontario M5K 1E6 Telephone: 416-362-1812

Further references can be supplied upon request.

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3.2 <u>REFERENCES PERTAINING TO AMERICAN PROJECTS</u>

The following references are provided regarding CRA's

professional services:

Mr. Jay Cull Occidental Chemical Corporation 360 Rainbow Boulevard South P.O. Box 728 Niagara Falls, New York 14302 Telephone: 716-286-3000

Mr. Neil Leipzig Environmental and Safety Supervisor Solvay Animal Health Inc. 2000 Rockford Road Charles City, Iowa 50616 Telephone: 515-257-2422

Mr. Romer Wilsek Director Environmental Affairs Kraft General Foods Inc. 5401 Old Orchard Road, 5th Floor Skokie, Illinois 60077 Telephone: 708-998-3307

Mr. Charles Hanson Vice-President, Environmental Affairs Velsicol Chemical Corporation Memphis Environmental Center 2603 Corporate Avenue, Suite 100 Memphis, Tennessee 38132 Telephone: 901-345-1788

Mr. Stewart Johnson Vice-Chairman, Chem-Dyne Site Trust Fund Ciba-Geigy Corporation 444 Sawmill River Road Ardsley, N.Y. Telephone: 914-478-3131

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representation in negotiation/litigation forums:

Mr. Charles Tisdale, Jr. King & Spalding 191 Peachtree Street Atlanta, Georgia 30303-1763 Telephone: 404-572-4600

Mr. Tom Terp Taft, Stettinius & Hollister 1800 Star Bank Center Cincinnati, Ohio 45202 Telephone: 513-381-2838

Mr. Nathan P. Eimer Sidley & Austin 1 First National Plaza Chicago, Illinois 60603 Telephone: 312-853-7000

Martin B. Wasser, Esq. Phillips, Nizer, Benjamin, Krim & Ballon 31 West 52nd Street New York, N.Y, 10019-6167 Telephone: 212-977-9700

Anthony Young, Esq./Keith Watson, Esq. Piper & Marbury 1200 Nineteenth Street N.W. Washington, D.C. 20036 Telephone: 202-861-3900

Mr. Gibson L. Smith, Jr. Robinson, Bradshaw & Hinson, P.A. 1900 Independence Center 101 North Tyron Street Charlotte, North Carolina 28246 Telephone: 704-377-2536

Further references can be supplied upon request.

TABLE 1

GENERAL PROJECT REFERENCES

I	WORK DESCRIPTION		LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEM DATE	WORK ENT COMPLETIO DATE	V ESTIMATED COST
1	 Field Investigation and Rep Conceptual and Final Desig Writing, Contract Document and Field Supervision of Rei (Chemical Waste Landfill) 	corting, sn, Specification it Preparation, emedial Action	Love Canal Southern Sector, Niagara Falls, NY	City of Niagara Falls	1978 1978	1979	\$8.5 million
8	 Conceptual and Final Desig Writing, Contract Document and Field Supervision of Re Action (Chemical Waste La 	gn, Specification tt Preparation, emedial andfill)	Love Canal, Central and Northern Sectors, Niagara Falls, NY	New York State Dept. Environmental Conser Albany, NY	of 1979 vation	1980	\$3.3 million
ŝ	 Contract Document Preparal Approval, and Construction (Leachate Treatment) 	tion, Design, 1 Supervision	Love Canal Activated Carbon Treatment Plant, Niagara Falls, NY	New York State Dept. Environmental Conser Albany, NY	of 1980 vation	1980	\$1.1 million
ব	 L. Conceptual and Final Desig Writing, Contract Document and Field Supervision of Rei (Chemical Waste Landfill) 	gn, Specification tt Preparation, emedial Action	Final Cover, Love Canal, Niagara Falls, NY	New York State Dept. Environmental Consei Albany, NY	of 1981 vation	1981	\$360,000
1020 1	 Field Investigation and Rep Conceptual and Final Desig Writing, Contract Document and Field Supervision of Rei (Chemical Waste Landfill) 	oorting, sn, Specification t Preparation, emedial Action	Hyde Park, Niagara Falls, NY	Occidental Chemical (Hooker Chemicals & Plastics Corporation) Niagara Falls, NY	Corp. 1978	1979	Confidential
	 Field Investigation and Rep Conceptual and Final Desig Writing, Contract Document and Field Supervision of Rei (Chemical Waste Landfill) 	oorting, 5n, Specification at Preparation, 2medial Action	LaBounty Landfill Charles City, Iowa	Solvay Animal Healt Charles City, Iowa	1980 Inc. 1980	1982	Confidential

GENERAL PROJECT REFERENCES

ł	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST	
Ň	Field Investigation and Reporting. Conceptual and Final Design, Specification Writing, Contract Document Preparation, and Field Supervision of Remedial Action (Chemical Waste Landfill)	Hardeman County, Tennessee	Velsicol Chemical Corj Chicago, Illinois	0. 1980	1980	Confidential	
ઝં	Design and Project Management of Remedial Cleanup (Derailment of Chemical Tank Train)	Mississauga, Ontario	Gity of Mississauga and Regional Municipality of Peel, Ontario, Canad	l 1980 la	1980	Confidential	1 71) (
6	Field Investigation and Reporting, and Design of Remedial Works for Consent Judgment Including Direct Involvement in Negotiations of the Consent Judgment with State and Federal Agencies	St. Louis, Michigan	Velsicol Chemical Corj Chicago, Illinois		1983	Confidential	1 · 4
10.	Field Investigation and Reporting. Conceptual and Final Design, Specification Writing, Contract Document Preparation and Field Supervision of Remedial Action (Landfill)	St. Louis, Michigan	Velsicol Chemical Corj Chicago, Illinois	. 1982	1982	Confidential	7
.	Conceptual and Final Design, Specification Writing, Contract Document Preparation, and Field Supervision of Remedial Action (Chemical Plant Closure)	St. Louis, Michigan	Velsicol Chemical Corr Chicago, Illinois	0. 1980	1984	Confidential	
12.	Field Investigation and Reporting, Conceptual Design (Landfill)	Wood Ridge, New Jersey	Velsicol Chemical Corj Chicago, Illinois	. 1980	1981	Confidential ි	

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GENERAL PROJECT REFERENCES

ļ	WORK DESCRIPTION	LOCATION OF WORK	OWNER C OR CLIENT	WORK OMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
13.	Field Studies and Design of Remedial Works for Consent Judgment (3 Landfills)	Hyde Park, 102nd Street, S-Area, Niagara Falls, NY	Occidental Chemical Co (Hooker Chemicals & Plastics Corporation) Niagara Falls, NY	гр. 1978	Ongoing	Confidential
14.	Field Studies and Design of Remedial Works for Consent Judgment (Landfill)	Gratiot County, Michigan	Velsicol Chemical Corp. Chicago, Illinois	1981	1984	Confidential
15.	Field Studies and Design of Remedial Works for Major Chemical Plant (SPDES Permit Renewal, Hydrogeologic Investigation, Sewer Outfall Studies, Negotiated, Chemical Containment Program, Dioxin Surveys)	Niagara Falls, NY	Occidental Chemical Co (Hooker Chemicals & Plastics Corporation) Niagara Falls, NY	-d-	Ongoing	Confidential
16.	Field Investigation and Reporting, Design of Site Remedial Action and Plans of Operation and Management with Field Supervision of Same (3 Active Landfills)	Toronto, Ontario	Waste Management of Canada Inc. Toronto, Ontario, Canada	1972	Ongoing	Confidential
17.	Field Investigation, Reporting and Design of Site Remedial Action and Plans of Operation and Management to Remove On-Site Drummed and Tanked Waste with Field Supervision of Same (Abandoned Waste Storage and Treatment Facility) Sub-consultant to CDM	PAS Site, Oswego, NY	EPA/New York State Dept. of Environmental Conservation	1981	1982	\$2 million

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ESTIMATED COST	Confidential	Confidential	\$ 800,000	\$2.8 millior	\$1.1 million
WORK COMPLETION DATE	Orgoing	Ongoing	1983	1982	1983
WORK MENCEMENT DATE	1978	1981	1982	1982	1982
сом	nical Corp. als & tion) गुर्ग	inada Inc. io, Canada	uth ment of pontrol	e Water ution sion	ew eer Supply mtrol
OWNER OR CLIENT	Occidental Cherr (Hooker Chemic Plastics Corpora Niagara Falls, N	Westinghouse Ca Hamilton, Ontar	EPA/State of So Carolina Depart of Health and Environmental C	New Hampshire Supply and Polli Control Commiss	EPA/State of Ne Hampshire Wat and Pollution Co Commission
LOCATION OF WORK	Montague, Michigan	London, Ontario	SCR&D Site, Bluff Road, Columbia, SC	Gilson Road Nashua, NH	Keefe Environmental Services Site, Epping, NH
WORK DESCRIPTION	Field Investigation, Reporting and Design of Site Remedial Action for Land Disposed Waste (Landfill and Chemical Plant Facility), Hydraulic Containment System for Entire Plant Site	Field Investigation, Reporting, Design and Supervision of Site Remedial Action (PCB Contamination at Plant Facility)	Field Investigation, Reporting and Design of Site Remedial Action and Plans of Operation and Management to Remove On-Site Drummed and Tanked Waste with Field Supervision of Same (Abandoned Waste Storage, Transfer and Treatment Facility) Sub-consultant to CDM	Design, Implementation and Supervision of Health and Safety and Air Monitoring Program and Quality Assurance/Quality Control Program during Construction of Cap and Containment Wall at Former Hazardous Waste Disposal Area	Field Investigation, Reporting and Design of Site Remedial Action and Plans of Operation and Management to Remove On-Site Drummed and Tanked Waste, and Contaminated Soil (Abandoned Waste Storage and Treatment Facility) Sub-consultant to CDM
	18.	19.	50	31 .	2
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GENERAL PROJECT REFERENCES

ļ	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATI COST
5	 Negotiation of a Consent Order with State and Federal Agencies for Remedial Works. Consent Order was Negotiated and Signed Within a One Month Period 	Fridley, Minnesota	FMC Corporation Philadelphia, PA	1983	1983	Confider
<u>ъ</u>	 Field Investigations, Reporting, Conceptual and Final Design, and Field Supervision of Remedial Action, Preparation of RCRA Part B Applications, Preparation of Groundwater Protection Plan, and Post-Closure Monitoring (Drummed, Liquid and Industrial Waste Landfill) 	Fridley, Minnesota	FMC Corporation Philadelphia, PA	1982	Ongoing	Confider
7	 Specification Writing, Contract Document Preparation, and Bid Negotiation for Site Remedial Action (Organic Sludge Lagoons 20 Million Gallons) 	Marshall, Illinois	Velsicol Chemical Cc Chicago, Illinois	orp. 1982	1983	Confider
5	 Field Investigation, Reporting and Design of Site Remedial Action including Field Supervision of Same (Oil Spill) 	St. Louis, Michigan	Velsicol Chemical Cc Chicago, Illinois	хр. 1982	1983	Confide
n AR	7. Hydrogeologic Investigation and Environmental Impact Evaluation	Corunna, Ontario	Tricil Waste Limited Corunna, Ontario, Ca	1979 nada	1979	Confide
≈ 30 56 7	 Field Investigation, Reporting, Design of Site Remedial Action, Preparation of Plan of Work, and Field Supervision (Chlorinated & Nonchlorinated Solvent Landfill) 	Poughkeepsie, N.Y.	IBM Corporation Poughkeepsie, N.Y.	1983	1983	Confider

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ESTIMATED COST	Confidential	Confidential	Confidential	Confidential
WORK COMPLETION DATE	Orgoing	1987	1984	Ongoing
WORK MENCEMENT DATE	1983	1982	1983	1983
OWNER COM	Occidental Chemical Corp. (Hooker Chemicals & Plastics Corporation) Niagara Falls, N.Y.	Generator Technical Committee	Union Carbide Corporation Cleveland, Ohio	Schenectady Chemicals Inc. Schenectady, NY
LOCATION OF WORK	Tacoma, Washington	Chem-Dyne Site Hamilton, Ohio	Kittanning, PA	Schenectady, NY
WORK DESCRIPTION	Hydrogeologic Investigations, Field Studies and Design of Remedial Work (Plant Site and Four Off-Site Disposal Areas)	Hydrogeologic Investigation, Reporting, Design and Evaluation of Remedial Action Alternatives, Preparation of Final Closure Plan, and Negotiation of Consent Order (Abandoned Drummed Waste Storage and Handling Facility), Preparation of Closure Plan and Supervision of Remedial Action	Hydrogeologic Investigation, Reporting, Specification Writing, Final Design, Closure Plan, Contract Document Preparation, Remedial Construction Supervision (Settling Pond Contaminated with PCB)	Environmental Audit, Field Studies, SPDES Permit Application, Hydrogeologic Investigation, Evaluation of Remedial Action Alternatives
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GENERAL PROJECT REFERENCES

		WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
	33.	Hydrogeologic Investigation, Reporting and Design, and Evaluation of Remedial Action Alternatives, RCRA Part B Permit Application, Remedial Design (Barrier Wall and Groundwater Containment System), Contract Document Preparation, Remedial Construction Supervision	Rotterdam Junction, NY	Schenectady Chemicals Schenectady, NY	6 Inc. 1983	Ongoing	Confidential
	34.	Hydrogeologic Investigations, Data Analysis, Field Studies, Design and Implementation of Appropriate Remedial Works for Major Manufacturing Facility Including Plant Buildings and On-Site Disposal Areas	Minneapolis, MN	Honeywell, Inc. Minneapolis, MN		Ongoing	Confidential
	35.	Hydrogeologic Field Investigation, Environmental Assessment, Landfill Design, Performance Monitoring, Management and Monitoring Performance (175 Acre Landfill Site)	Waterloo, Ontario	Regional Municipality Waterloo Ontario, Canada	of 1983	Ongoing	Confidential
AR3015	36.	Hydrogeologic Review, Alternative Landfill Design, Leachate Control, Negotiations with Regulatory Authority, Environmental Impact Assessment, (100 Acre Landfill Site)	Sarnia, Ontario	City of Sarnia Ontario, Canada	1983	Ongoing	Confidential
69	37.	Field Investigation, Reporting, Design of Remedial Work Plan, Supervision of Remedial Construction (Solvent and Chemical Spill)	Poughkeepsie, NY	IBM Corporation Poughkeepsie, NY	1984	1985	Confidential

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GENERAL PROJECT REFERENCES

	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST	
38	Preparation of Closure Plan, Development and Implementation of Health and Safety Protocols, Provision of Remedial Construction Quality Control	Hempstead, NY	Nassau County Dept. of Public Works	1984	1984	\$70,000	i
39.	Hydrogeologic Investigation, Reporting, Design and Installation of Aqueous and Non-Aqueous Phase Plume Recovery Wells (Chemical Plant)	Taft, Louisiana	Occidental Chemical C Niagara Falls, NY	orp. 1983	Orgoing	Confidential	
6	Evaluation of Hydrogeologic Study and Independent Review of Analytical Data Base (Pentachlorophenol Spill)	Penticton, British Columbia	Greenwood Forest Produ Penticton, British Colu	kets 1984 mbia	1984	Confidential	
41.	Remedial Investigation and Feasibility Study at Former Industrial Waste Disposal Facility Under Joint Federal and State Consent Order	WDE Site, Andover, Minnesota	Generator Technical Committee	1984	Orgoing	Confidential	
45.	Remedial Investigation and Feasibility Study, Design and Implementation of Remedial Measures at Chemical Plant, RCRA Interim Status Impoundments, Off-Site Surveys	Middleport, NY	FMC Corporation Middleport, NY	1382	Orgoing	Confidential	
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	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
43.	Technical Review of Previous Hydrogeologic Data, Field Study to Augment Existing Hydrogeologic Study, Technical Guidance for Preparation of Consent Order, and Design and Implementation of Interim Response Action with Groundwater Recovery and Treatment System (Pentachlorophenol and Creosote Contamination of Groundwater)	Bangor, Wisconsin	Webster Lumber Bangor, Wisconsin	1984	Ongoing	Confidential
44.	Remedial Investigation and Feasibility Study and Remedial Design and Implementation (Creosote and Fuel Oil Spills,	New Brighton, MN s)	Bell Pole New Brighton, MN	1984	Ongoing	Confidential
45.	Evaluation of Remedial Construction Alternatives, Preparation of Work Plan, Detailed Design of Remedial Construction, and Supervision of Remedial Construction	North Hollywood Dump, Memphis, TN	Group of Potential Responsible Parties	1984	1985	Confidential
46.	Remedial Investigation and Feasibility Study (Solidified Waste Lagoon)	Marshall, Illinois	Velsicol Chemical Co Chicago, Illinois	rp. 1985	Ongoing	Confidential
47.	Remedial Investigation and Feasibility Study, Interim Response Actions (Former Industrial Waste Landfill)	Wauconda Sand and Gravel, Chicago, Illinois	Generator Technical Committee	1984	Ongoing	Confidential
48.	Hydrogeologic Investigation, Remedial Investigation, Design, Implementation and Field Supervision of Remedial Construction (PCB Contamination in Creek Sediments)	London, Ontario	Westinghouse Canada and Ministry of the Environment Hamilton, Ontario, C	Inc. 1983 anada	Ongoing	\$2 million

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GENERAL PROJECT REFERENCES

	WORK DESCRIPTION	LOCATION OF WORK	OWNER C	WORK OMMENCEMENI DATE	WORK COMPLETION DATE	ESTIMATED COST
49.	Reporting, Conceptual and Final Design, Specification Writing, Contract Document Preparation and Field Supervision of Remedial Action (Chemical Waste landfill)	LaBounty Landfill, Charles City, Iowa	Solvay Animal Health I Charles City, Iowa	nc. 1984	Orgoing	Confidential
ŝ	Hydrogeologic Investigation and Environmental Impact Evaluation of Former Plant Site	Heath, Ohio	DOW Chemical USA Heath, Ohio	1985	Orgoing	Confidential
51.	As Special Master to US Federal Court, Manage, Design and Administer Cleanup and Disposal of Drummed and Tanked Hazardous Wastes, Recovery of Commercial Products and Demolition of Facility (Oil Refinery)	East Chicago, Indiana	U.S. Federal Court Re: Energy Cooperative] Chicago, Illinois	1985	1 388	Confidential
52.	Sampling and Analysis of Drummed Wastes, Provision of Health and Safety, Preparation of Work Plans	Krysowaty Farm Site, Hillsborough Twp., New Jersey	Sevenson Containment Corporation Niagara Falls, NY	1985	1 386 1386	\$2.3 million
23.	Sampling and Analysis of Drummed and Tanked Waste, Provision of Health and Safety, Preparation of Work Plans	PAS Site, Oswego, NY	Sevenson Containment Corporation Niagara Falls, NY	1982	1985	\$3.8 million
57	Hydrogeologic Review of Proposed Landfill Site	Burlington, Ontarlo	Corporation of the City or Burlington, Ontario, Can	if 1985 ada	Orgoing	Confidential
33.	Design and Construction of Control System	Bayview Landfill Burlington, Ontario	Corporation of the City c Burlington, Ontario, Can	if 1985 ada	Ongoing	Confidential

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ł	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
56.	Hydrogeologic Investigation, Remedial Investigation, Remedial Design, Provision of Health and Safety, Sewer Studies, Contract Document Preparation	Niagara Falls, NY	Reichhold Chemicals Niagara Falls, NY	1983	Ongoing	Confidential
57.	Hydrogeologic Investigation, Remedial Investigation, Remedial Design, Design and Implement Health and Safety Program, Contract Document Preparation and Supervision	Albany, NY	Mercury Refining Compa Albany, NY	1982 1982	1986	Confidential
58.	Technical Review of Previous Hydrogeologic Data. Cost Apportionment Negotiations with the Potential Responsible Parties and States Agencies	Brookfield Ave. Landfill Pennsylvania Ave. Landfill, Avenue Landfill, Fountain Avenue Landfill, Edgemere Landfill, Pelham Bay Landfill, New York, N	Group of Potentially Responsible Parties Y	1985	Ongoing	Confidential
59.	Remedial Investigation/Feasibility Study, Interim Response Action, Regulatory Negotiations Regarding Former Coal Gasification Plant Site	Minneapolis, MN	Minnegasco	1985	Ongoing	Confidential
60.	Remedial Investigation/Feasibility Study, Interim Response Action Regulatory Negotiations Regarding Former Coal Gasification Plant Site	Ottawa, Ontario	Regional Municipality c Ottawa-Carleton Ontario, Canada	of 1986	Ongoing	Confidential

TABLE 1 (Cont d) GENERAL PROJECT REFERENCES

GENERAL PROJECT REFERENCES

ļ	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
61.	Feasibility Study, Supplemental Remedial Investigation, Design and Implementation of Remedial Works	Minneapolis, MN	Honeywell Inc. Minneapolis, MN	1984	Orgoing	Confidential
62.	Investigation, Analysis and Design of Remedial Action for Decontamination of Five PCB Contaminated Manufacturing Facilities and Associated Equipment	Kentucky, Tennessee and Indiana	Dart & Kraft Inc. Glenview, Illinois	1984	Ongoing	Confidential
63.	Modification of SPDES Permit including Design of Remedial Site Construction	Middleport, NY	FMC Corporation Middleport, NY	1985	Ongoing	Confidential
25	Hydrogeologic Investigation, Remedial Investigation, Design, Implementation and Field Supervision of Remedial Construction, Design and Supervision of Interim Removal Actions	Waynesboro, Tennessee	Dart & Kraft Inc. Glenview, Illinois	1984	Orgoing	Confidential
65	Design of Remedial Construction, Preparation of Contract and Bid Documents, Bid Call, Construction Management and Contract Administration, Procurement	Chem-Dyne Site, Hamilton, Ohio	Chem-Dyne Site Trust Fund (Cenerator Group)	1985	1987	Confidential
Ś	Investigation, Design and Supervision of Closure for RCRA Storage Facilities	Poughkeepsie, NY	IBM Corporation Poughkeepsie, NY	1985	1986	Confidential
67.	Investigation, Design and Supervision of Construction of Gas Exclusion and Treatment System Beneath Office Building	Minneapolis, MN	FMC Corporation Minneapolis, MN	1985	1986	Confidential

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GENERAL PROJECT REFERENCES

	1	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
	68.	Quality Control/Quality Assurance Field Services and Certification of Closure for 7 Surface Impoundments	Calvert City, Kentucky	B.F. Goodrich Co. Calvert City, Kentucl	1986 ky	1987	Confidential
	69.	Remedial Investigation, Feasibility Study, Design of Remedial Works, Preparation of Bid Documents, Bid Award, Construction Management, Negotiation of Federal/State Order for PCB/Dioxin Contaminated Manufacturing Facility and Grounds	Crawfordsville, Indiana	Kraft, Inc. Glenville, Illinois	1986	Ongoing	Confidential
	70.	Negotiation of State Order, Design of Remedial Works, Preparation of Bid Documents, Bid Award, Construction Management for Aquifer Remediation and Long-Term Monitoring	Fridley, Minnesota	FMC Corporation Minneapolis, MN	1985	1987	Confidential
	71.	Investigate and Advise Region on Possible PAH Contamination of Water Supply Wells and Reservoir	Waterloo, Ontario	Region of Waterloo Ontario, Canada	1986	Ongoing	Confidential
AR3U I	22.	Remedial Investigation, Feasibility Study of Wood Treatment Plant and Surrounding Area	Brownsville, Alabama	James Brown Foundati Louisville, Kentucky	ion 1986	Ongoing	Confidential
575	73.	Trout Lake Watershed Management Study	North Bay, Ontario	North Bay-Mattawa Conservation Authori	1986 ity	1988	Confidential
	74.	Provide Expert Advice and Oversee Remedial Program at Former Coal Gasification Plant	Waterloo, Ontario	City of Waterloo Ontario, Canada	1986	Ongoing	Confidential

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ESTIMATED COST	Confidentia	Confidentia	Confidentia	& Confidentia	Confidentia	Confidentia
WORK COMPLETION DATE	Orgoing	Ongoing	Orgoing	Orgoing	1988	Orgoing
WORK COMMENCEMENT DATE	1987	1986	гр. 	1986	1985	1987
OWNER OR CLIENT	Group of Potentially Responsible Parties	Group of Potentially Responsible Parties	Velsicol Chemical Co Chicago, Illinois	Farley Northwest Chicago, Illinois	FMC Corporation Middleport, NY	FMC Corporation Middleport, NY
LOCATION OF WORK	Troy, Ohio	North Hollywood Dump Memphis, Tennessee	Hardeman County, Termessee	Bridgeport, Connecticut Totowa, New Jersey	Middleport, NY	Middleport, NY
WORK DESCRIPTION	Provide Expert Advice and Overview Remedial Investigation/Feasibility Study Undertaken by USEPA at Regional Incinerator and Landfill	Remedial Investigation/Feasibility Study, Design of Remedial Measures, Management of Remedial Construction at Municipal/Industrial Landfill and Adjacent Surface Water Bodies	Remedial Investigation/Feasibility Study, Design of Remedial Measures, Management of Remedial Construction at Chemical Waste Landfill	Remedial Investigation, Design of Remedial Measures, Management of Remedial Construction at Two Capacitor Plants	Design of Closure, Preparation of Contract Documents, Management of Remedial Construction for 3 RCRA Surface Impoundments and 5 Container Storage Areas	Design of Methylene Chloride Recovery and Treatment System (Overburden and Bedrock Aquifers)
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	ł	WORK DESCRIPTION	LOCATION OF WORK	OWNER CC	WORK MMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
	81.	Remedial Investigation, Evaluation of Remedial Alternatives and Remedial Design and Supervision of Remedial Measure for Underground Storage Tanks	Sacramento & Modesto California s	Kraft, Inc. Glenville, Illinois	1987	Ongoing	Confidential
	82.	Remedial Investigation/Feasibility Study of PCB Storage Site and Design and Supervision of Interim Removal Action	Baldwin, Florida (Yellow Water Road Site)	Group of Potentially Responsible Parties	1987	Ongoing	Confidential
	83.	Remedial Investigation/Feasibility Study for Hazardous Waste Landfill	Chester County, South Carolina	Group of Potentially Responsible Parties	1987	Ongoing	Confidential
	84.	Evaluation of Industrial Waste Sewage System	Youngstown, NY	IBM Corporation Poughkeepsie, NY	1987	1989	Confidential
	85.	EPA Review of Proposed Integrated Hazardous Waste Management Facility	West Lincoln, Ontario	Regional Municipality of Niagara, Ontario, Can	1987 Ida	Ongoing	Confidential
	86.	Decommissioning of Former Pesticide Plant	Sarnia, Ontario	Pfizer CNG Inc. Sarnia, Ontario, Canada	1987	1989	Confidentíal
AR3	87.	Emergency Response Action, Site Investigation and Remediation of Former Electroplating Facility	Charlotte, NC	Mutual Savings and Loan Association of Charlotte, NC	1987	1988	Confidential
0 5	88 8	Environmental Audit of Former Transformer Manufacturing Plant	Guelph, Ontario	Transelectric Technologies Guelph, Ontario, Canada	Inc. 1987	1988	Confidential
77	89.	Landfill Gas Utilization Review, Field Testing Program, Gas Collection System Design and Construction Supervision	Upper Ottawa Street Landfill, Hamilton, Ontario	Regional Municipality of Hamilton-Wentworth Ontario, Canada	1987	Ongoing	Confidential
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	•			WORK	WORK		
	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	COMMENCEMENT DATE	COMPLETION	ESTIMATED COST	
8	Remedial Investigation/Feasibility Study for Former Solvent Incinerator Site	Jadco-Hughes NPL Site, NC	Group of Potentially Responsible Parties	1988	Ongoing	Confidential	
91.	Environmental Assessment, Site Investigations, Design of Remedial Measures and Supervision of Remedial Construction for 60 Manufacturing and Retail Facilities	Across North America	J.I. Case Company	1988	Ongoing	Confidential	
92.	Environmental Assessment, Site Investigation, Evaluation of Remedial Alternatives, and Preparation of Remedial Cost Estimates for 75 Gasoline Storage and Retailing Facilities	Florida and Georgia	Muntord, Inc.	1388	1989	Confidential	1 N.P.
93.	Overview and Provision of Expert Advice for Remedial Investigation Investigation/Feasibility Study for Former Solvent/Waste Oil Processing Site	Wayne Recycling NPL Site Columbia City Indiana	Group of Potentially Responsible Parties	1988	Ongoing	Confidential	•
2.	Environmental Assessment, Site Investigation, Evaluation of Remedial Alternatives and Preparation of Remedial Cost Estimates for Underground Fuel Storage Facilities at Four Manufacturing Sites.	lowa and Illinois	Security Pacific	1988	1989	Confidential	

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GENERAL PROJECT REFERENCES

	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
95.	Design of Remedial Measures, Preparation of Bid Documents and Supervision of Remedial Construction for Removal Action at PCB Storage Site, Soil and Subsurface Tank Investigation	Jacksonville, Florida (Ellis Road Site)	Group of Potentially Responsible Parties	1988	Ongoing	Confidential
96.	Site Investigations, Evaluation of Remedial Measures, Remedial Design, Implementation and Supervision for former steel fabrication site.	Ernst Steel Site, Cheektowaga, N.Y.	Pyramid Company	1988	1989	Confidential
97.	Development of all Remedial Design/ Remedial Action Documents including Detailed Design for Final Site Closure	Marshall Illinois	Velsicol Chemical	1988	Ongoing	Confidential
98.	Design of RCRA Facility Assessment, SWML Investigation.	Middleport, N.Y.	FMC Corporation Middleport, N.Y.	1988	Ongoing	Confidential
. 66	Environmental Assessment, Site Investigations, Evaluation of Remedial Measures and Preparation of Remedial Cost Estimates for Gasoline Retaiting Facility Chain.	North Carolina	Citicorp.	6861	1989	Confidential
100.	Site Investigations and Environmental Assessment for Coal Processing Plant.	Tonawanda, N.Y.	Tonawanda Coke Corporation	1989	Ongoing	Confidential
101.	Oversight of State Remedial Investigation/Feasibility Study.	Pfohl Brothers Landfill, Cheektowaga N.Y.	PRP Committee	1989	Ongoing	Confidential

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GENERAL PROJECT REFERENCES

ESTIMATED COST	Confidential	Confidential	Confidential	Confidential	Confidential المعادية الم
WORK COMPLETION DATE	Ongoing	Ongoing	Orgoing	Orgoing	Orgoing
WORK COMMENCEMENT DATE	1989	1989	1986	1989	1388
OWNER OR CLIENT	H. Llop Co. Inc.	Fisher-Calo Steering Committee	Manville Sales Corporation	Manville Sales Corporation	Ford Motor Company
LOCATION OF WORK	Niagara Falls, N.Y.	Kingsbury, Indiana	Manville, New Jersey	Waukegan, Illinois	Ann Arbor, Michigan (Spiegelberg Site)
WORK DESCRIPTION	Site Investigation, Evaluation of Remedial Measures, Implementation and Supervision of PCB Remediation of warehouse facilities.	Development of Site Work Plan and Implementation of Waste Characterization, Consolidation and Disposal Program for Tanked and Drummed Waste Under a 106 Order	Project Management of asbestos Decontamination and Partial Demolition of Asbestos Products Manufacturing Complex including PCB Decommissioning	Project Management of Asbestos Landfill Closure (NPL Site)	Design of Remedial Measures, Preparation of Bid Documents and Bid Call, Project Management of Remedial Measures for Paint Waste Landfill, Review of RI/FS and Agency Proposed Remedial Plan (NPL Site) and Negotiations of Final Remedial Design/ Remedial Action Implementation Plan
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WORK COMPLETION DATE	Ongoing	Ongoing	0661	Ongoing	1990
WORK COMMENCEMENT DATE	1988	1990	1989	1990	1989
OWNER OR CLIENT	PRP Group	Maxwellhouse Coffee	Grabill Corporation	PRP Group	Coca-Cola Bottling Co Affiliated, Inc.
LOCATION OF WORK	Ann Arbor, Michigan (Rasmussen Site)	Jacksonville, Florida Hoboken, New Jersey	Seven States	Newport, Kentucky	Georgia, South Carolina North Carolina
WORK DESCRIPTION	Design of Remedial Measures Preparation of Bid Documents and Bid Call, Project Management of Remedial Measures at Industrial Landfill, Preparation of Parallel Feasibility Study, Review of RI/FS and Agency Proposed Remedial Plan (NPL Site)	Environmental Assessment of Two Plants as Part of an Overall Evaluation To Support Possible Closure of one of the Plants	Environmental Audits of 13 Operating Companies Prior To Sale Under Chapter 107 Bankruptcy	Peer Review of USEPA RI/FS and Development of Cost Allocation Alternatives; Landfill	Closure of 40 USTs From 13 Operating Plants
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	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
118.	Negotiation of 106 Order, Development of RI/FS Work Plans, Conduct RI/FS	Northport, Michigan	Vulcan Cincinnati, Inc	0661	Ongoing	Confidential
119.	Site Investigations, Environmental Assessment, Evaluation of Remedial Measures	Falconer, New York	Advanced Environmer Services	ıtal 1989	Ongoing	Confidential
120.	Preparation and Supervision of RI/FS	Wheatfield, New York (Niagara County Refuse)	PRP Group	1988	Ongoing	Confidential
121.	Environmental Audit of Four Uniroyal-Goodrich Canada Inc. Tire Manufacturing Plants	Kitchener, Lindsay, Ontario	McMillan, Binch, Barristers & Solicitor:	1989	1989	Confidential
122.	Design of Ultraviolet Oxidation Treatment System, Groundwater Remedial Plan, Buried Waste Remediation Plan	Elmira, Ontario	Uniroyal Chemical Lt	d. 1990	Ongoing	Confidential
123.	Bioremediation of Oil Tar	Port Stanley, Ontario	Ultramar Canada	1988	Ongoing	Confidential
124.	Site Investigation of Pentachlorophenol Contamination and Remedial Design	Lumby, B.C.	Bell Pole Company Limited	1989	Ongoing	Confidential

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GENERAL PROJECT REFERENCES

1	WORK DESCRIPTION	LOCATION OF WORK	OWNER OR CLIENT	WORK COMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST	
12	 Development of Work Plans, Remedial Investigation, Feasibility Study, Report Preparation 	Niagara Falls, N.Y.	ICI Americas	1989	Ongoing	Confidential	
124	 Oversight of State Lead Interim Remedial Measures, Develop Supplementary RI/FS Work Plans, RI/FS, Report Preparation 	Chenango County, N.Y.	ICI Americas	1989	Ongoing	Confidential	
12	⁷ . Oversight of State Lead Interim Remedial Measures, Development of Supplementary Work Plans, RI/FS, Report Preparation	Staten Island, N.Y.	Whiteman, Osterman and Hanna	1985	Orgoing	Confidential .	-
128	l. Investigation of Abandoned Landfill Site, Design of New Waste Disposal Area	Ottawa, Ontario	Ministry of Transportati Ontario	on, 1988	Orgoing	\$325,000	
129	 Design of Leachate Treatment Facility, Including Obtaining Approvals, Contract Administration and Construction Supervision at the City of Samia Landfill Site 	Sarnia, Ontario	City of Samia	1388	Orgoing	\$2.2 million	· .

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	WORK DESCRIPTION	LOCATION OF WORK	OWNER C	WORK OMMENCEMENT DATE	WORK COMPLETION DATE	ESTIMATED COST
130.	 Design of Sludge Lagoon Remediation Program, Including Obtaining Approvals, Contract Administration and Construction Supervision of Synthetic-Lined Lagoons 	Samia, Ontario	City of Sarnia	1990	Ongoing	\$580,000
131.	RI/FS	Ypsilanti Twp., Michigan (Willow Run Sludge Lagoon)	PRP Group	1989	Ongoing	Confidential
132.	USEPA RI/FS Review	Lapeer County, Michigan (Metamora Landfill Site)	PRP Group	1990	Ongoing	Confidential
133.	Site Investigation and Hydrogeologic Study of Coal Tar Contamination. Detailed Design of a Subsurface Coal Tar Collection System	Sault Ste. Marie, Ontario	Algoma	1988	Ongoing	Confidential
134.	Site Investigation and Waste Characterization Pursuant to USEPA Order	Sault Ste. Marie, Michigan	Cannelton Industries	1988	Ongoing	Confidential
135.	Remedial Investigation/ Corrective Measures Study for Operating Chemical Plant	Cincinnati, Ohio	Solvay Animal Health I	nc. 1987	Ongoing	Confidential
136.	RD/RA Implementation	Reading, Ohio (Pristine Site)	Pristine Trust Group	1989	Ongoing	Confidential

TABLE 2

PROJECT WORK ACTIVITIES Work Activities

Project Name as Listed on Table 1	Ewoironmental Sampling	Hydrogeologic Stradies Reporting & Intermetation	Remedial Action Alternative Analysis	Data Management & Assessment	Remedial Work Design	Remedial Work Supervision Including Safety Program Management	Documentation for Permitting Approvals	
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PROJECT WORK ACTIVITIES

			Wo	rk Activities			
Project Name as Listed	Environmental	Hydrogeologic Studies Reporting &	Remedial Action Alternative	Data Management E	Remedial Work	Remedial Work Supervision Including Safety	Documentation for Permitting
1 JIGBT HO	Sampling	Interpretation	Analysis	Assessment	nesign	Program Management	Approvals
21	•			•	•	•	
73	•		•	•	•	•	
23	•	•	•	•			•
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25			•	•			
26	•	•	•	•	•	•	•
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31	•	•	•	•	•	•	•
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PROJECT WORK ACTIVITIES

			PM6	ork Activities			
Project Name as Listed on Table 1	Environmental Sampling	Hydrogeologic Studies Reporting & Interpretation	Remedial Action Alternative Analysis	Data Management & Assessment	Remedial Work Design	Remedial Work Supervision Including Safety Program Management	Documentation for Permitting Approvals
41	•	•	•	•		r.	•
42	•	•	•	•			•
43	•	•	•	•			•
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PROJECT WORK ACTIVITIES

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	Document for Permitti Amoria	HARIA		•	•	•		•		•	•	•				•	•	•	•		•	•
	Remedial Work Supervision Including Safety Provem Manacement	17/30/38 HIMPOT 11/11 18/17	•	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•	•	•
	Remedial Work Dosim	III III	•	•	•	•	•	•	•		•	•	•	•		•	•	•	•	•	•	•
ork Activities	Data Management & Assessment	41791100-0001 7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Μ	Remedial Action Alternative Analysis	cichina i	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Hydrogeologic Studies Reporting & Intermetation		•			•					•	•	•	•		٠	•	•	•	•		٠
	Environmental Samilino		٠	•		•		٠	•		•	•	•	•	٠	•	•	•	•	•	•	•
	Project Name as Listed on Tahle 1		61	62	63	4 9	65	%	67	68	69	70	71	72	73	74	75	76	77	78	62	8

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Puniart Name		Hydrogeologic Studiae	Remedial	Data Management	Remedial	Remedial Work Summision	Documentation for
as Listed	Environmental	Reporting &	Alternative	<u>ب</u> ور م	Work	Including Safety	Permitting
on Table 1	Sampling	Interpretation.	Analysis	Assessment	Design	Program Management	Approvals
81	•	•	•	•	•		•
82	•	•	•	•	•		•
8	•	● ^{1.}	•	•	٠		•
8			•	•			
%		•		•			
88	•	•	•	•	•		•
87	•	٠	•	•	•		•
88	•	•	•	•		·	
68	٠	•	•	•	•		•
8	•	•	•	•	• s		•
91	•	•	•	•	•		•
2	•	•	•	•			
33		•	•	. •			
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95	•	• .	•		•	•	•
8	•	•	•	•	•	•	
67	•	•	•	•	•	•	•
88	•	•	•	•			•
86	•	•	•	-			•
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PROJECT WORK ACTIVITIES

	Documentation for Permitting	Approvals		•	•	•		•	•	•	•		•	•		•	٠	•		•		· •
	Remedial Work Supervision Including Safety	Program Management	•	•	•	•	•	•	•				•	•		•				•	•	•
	Remedial Work	Design		•	•	•	•	•	•				٠	٠		•				•	•	•
rk Activities	Data Management E	Assessment		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Wo	Remedial Action Alternative	Analysis		•		•	•	•	•		•	•	•	•	•	•		•	•	•	•	•
	Hydrogeologic Studies Reporting &	Interpretation					•				•	•	•		•	•	•	•	•	•	٠	•
	Environmental	Sampling		•	•		•	•	٠		•		•	•		•		•		•	٠	•
	Project Name as Listed	on Table I	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120

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PROJECT WORK ACTIVITIES

			Mo	rk Activities			
Project Name as Listed on Table 1	Environmental Sampling	Hydrogeologic Studies Reporting & Interpretation	Remedial Action Alternative Analysis	Data Management E Assessment	Remedial Work Design	Remedial Work Supervision Including Safety Program Management	Documentation for Permitting Approvals
121	•	•	•	•			
12	•		•	•	•		•
<u>1</u> 3	•	•	•	•	•	•	•
124	٠	•	•	•	•		•
125	٠	•	•	•			
126	•	•	•	•	-		
127	•	•	•	•	•		
128	٠	•	•	•	•		•
129 ·	•		•	•	•	•	•
130	•	•	•		•	•	•
131	•	•	٠	•	•		•
132			•		•		
133	•	•	٠		•	-	•
134			٠		•		
135	•	•	•	•	•		
136	•	•	•	•	•	•	•

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