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Engineering Report

FEASIBILITY STUDY FOR THE COLUMBUS McKINNON SITE

Columbus McKinnon Corporation
Tonawanda Facility
Tonawanda, New York

Revised December 1991
September 1991
Project No. 1332-01-1

MALCOLM PIRNIE

ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

MALCOLM PIRNIE

FEASIBILITY STUDY

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK

SEPTEMBER 1991
Revised December 1991

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1332-01-1

COLUMBUS McKINNON SITE
FEASIBILITY STUDY

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

Page

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

TABLE OF CONTENTS (Continued)

Page

LIST OF PLATES

LIST OF APPENDICES

MALCOLM PIRNIE

EXECUTIVE SUMMARY

1.0 BACKGROUND

A site located along Ellicott Creek which encompasses an alleged former waste oil disposal area at the Columbus McKinnon Corporation (CM), Tonawanda, New York facility, has been listed by the New York State Department of Environmental Conservation (NYSDEC) on the New York State Registry of Inactive Hazardous Waste Disposal Sites (Site Number 915016). The NYSDEC has classified the site as "2", having found that portions of the site present a significant threat to the public health or the environment. Subsequently, CM Corporation entered into an Order-on-Consent dated October 2, 1989 (Index No. B9-0240-88-10) with NYSDEC to: a) design and implement an Interim Remedial Measure (IRM) to eliminate erosion of Ellicott Creek bank soils; b) develop and implement a Work Plan for the completion of a Remedial Investigation/Feasibility Study for the alleged former waste oil disposal area; and c) prepare and submit an approvable RI report and FS study for the site. Columbus McKinnon completed IRM construction in November 1990 consisting of grading 165 feet of the creek bank along the Central Area of site to uniform slopes and installation of an erosion control geotextile and riprap to provide erosion protection from storm water surface runoff, ice, and wave action in Ellicott Creek. The Remedial Investigation Report was completed and conditionally approved by the NYSDEC on June 27, 1991, with an Addendum subsequently approved on September 4, 1991.

The purpose of this Feasibility Study (FS) is to: identify and evaluate candidate treatment and containment alternatives for remediation of the contamination identified in the RI; and to develop a remedial approach which will provide reliable, long-term protection of human health and the environment in a cost-effective manner.

2.0 NATURE AND EXTENT OF CONTAMINATION

Sampling was conducted during the RI to, in conjunction with the historic data, more precisely define the horizontal and vertical extent of soil/fill and creek sediment contamination and to verify the presence/absence of ground water contamination.

Soil sampling results indicated that PCBs and the metals of concern (viz., cadmium, chromium, nickel and lead) were detected primarily within the surficial soil/fill. The highest concentration of PCBs was found in the Central Area, the location of the alleged waste oil disposal. The concentrations diminish with increasing depth. Concentrations of the four metals were not elevated above naturally-occurring background concentrations in the native soil underlying the fill and trace PCBs were detected in the native soil only in the Central Area. Halogenated volatile organic compounds (HVOCs) were detected at trace levels at depth at only a few locations.

Shallow ground water in the well nearest to the alleged former waste oil disposal area contained trace levels of volatile organics, no detectable metals with the exception of nickel, and no detectable PCBs. Ground water collected from all other Study Area monitoring wells contained no detectable metals, HVOCs or PCBs.

During the RI, Arochlor 1254 was detected at 87 mg/kg (dry wgt.) just offshore of the alleged former waste oil disposal area. PCBs were detected at concentrations less than 20 mg/kg (dry wgt.) at all other sediment sampling stations. Concentrations of metals and PCB (Arochlor 1254) offshore from the alleged former waste oil disposal area were elevated with respect to upstream sampling locations and downstream locations.

Filter fabric and riprap, installed as an Interim Remedial Measure to control erosion of the creek bank, extends approximately 20 to 25 feet into the creek and overlies the area of highest PCB concentrations detected in creek sediment, and approximately 44% of the total area (and 36% of the total volume) of sediment exhibiting detectable PCB concentrations.

An evaluation of contaminant loadings to Ellicott Creek under current conditions (viz. including all temporary and/or interim remedial measures implemented to date) indicated that soil erosion is the predominant contaminant migration pathway, and that contributions from other potential pathways were negligible. Remedial measures completed to date are estimated to have resulted in more than a 90% reduction in PCB loading and an approximate 55% to 80% decrease in the metal loading to the Creek from the Study Area. The current contaminant load to Ellicott Creek from the Study Area via soil erosion is approximately 13.4 kg/year for the four metals of interest and 0.19 kg/year for PCBs.

MALCOLM PIRNIE

3.0 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS

Contaminants which were evaluated in connection with the public health and environmental risk evaluation consisted of PCBs, cadmium, chromium, lead and nickel. These compounds were selected due to their inherent toxicity and their frequency of detection in on-site soils. The risk assessments were performed on the basis of the former unremediated conditions at the site and are summarized in the following table.

HUMAN HEALTH RISK ASSESSMENT SUMMARY*

Contact Media	Exposure Route	Human Health Risk	
		Lead	**PCBs**
Soils	Ingestion	Slight toxicity concern	Cancer risk approx. 4 in 100,000
	Dermal	Slight toxicity concern	Cancer risk approx. 5 in 10,000
Surface Water/ Sediment	Ingestion	No toxic health effects	Cancer risk approx. 2 in 1 billion
	Dermal	No toxic health effects	Cancer risk approx. 7 in 100 trillion
Fish	Ingestion	N/A	Calculated maximum concentration of PCBs in fish fillets is 0.16 mg/kg; FDA tolerance limit for PCBs in fish as food is 2 mg/kg
	Dermal	N/A	N/A

* Prior unremediated condition

Health and environmental risk estimates are much lower for current conditions when the degree of risk reduction achieved by the interim remedial measures now in place are considered.

Health Risk

The health risk assessment indicates that ingestion and skin contact with surficial soils of site maintenance personnel may result in slight toxicity due to possible lead exposure. Repeated exposures from, and inadvertent ingestion of, PCB-contaminated surficial soil may also result in a potentially significant incremental cancer risk. The estimated risks associated with dermal contact and ingestion of surface water sediment from swimming in Ellicott Creek and consumption of fish caught in the Creek were not considered to be significant.

Environmental Risk

The environmental risks to fish and fish-eating wildlife exposed to Study Area creek sediment were assessed by comparing predicted maximum sediment pore water concentrations to Federal and New York State Ambient Water Quality Standards. This comparison is expressed as a Hazard Quotient, as summarized in the following table:

AQUATIC TOXICITY QUOTIENT CALCULATION FOR PCB-CONTAMINATED SEDIMENT PORE WATER

FRESHWATER AQUATIC TOXICITY CRITERIA ug/l:

Acute	Chronic	Notes	Ref.		
2	0.014 0.001	1 1	1 2		

HAZARD QUOTIENT CALCULATION:

	Sediment Conc. mg/Kg (dry wgt)	Pore Water Conc. (ug/l)	Hazard Quotient		
			Acute	Chronic	Ref.
Prior Unremediated Conditions	Max. 87	4.10	2.05	293 4100	1 2
	Avg. 14	0.66	0.33	47 660	1 2
Current Conditions	Max. 0.83	0.039	0.02	2.8 39	1 2
	Avg. 0.51	0.024	0.012	1.7 24	1 2
Background Conditions	Max. 3.6	0.17	0.085	12 170	1 2
	Avg. 1.9	0.090	0.045	6.4 90	1 2

NOTES:
(1) Criteria based on all chlorinated isomers of the compound.

REFERENCES:
(1) USEPA, 1986. Quality Criteria of Water. Office of Regulations and Standards. EPA 440/5-86-001.
(2) NYSDEC, Surface Water Quality. Standard Documentation for Polychlorinated Biphenyls dated July 26, 1984.

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THEODORE HADZI-ANTICH
Partner

December 6, 1991

E. Joseph Sciascia, P.E.
Hazardous Waste Remediation Engineer
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

Re: Columbus McKinnon Inactive Hazardous Waste Site #915016 Submittal of Feasibility Study Revision and Response to Comments

Dear Mr. Sciascia:

In accordance with the requirements of Order on Consent No. B9-0240-88-10, enclosed please find eight (8) copies of the final draft of the Feasibility Study ("FS") prepared for the Columbus McKinnon site. Attachments 1 through 3 of this letter are prepared to respond to comments received from your office on September 23, October 16, and October 23, 1991 on draft portions of, and the original draft of the FS prepared for this site. Each comment is numbered followed by either the citation from the FS report where the comment is addressed, or the rationale for not incorporating the comment into the report.

We are confident that the analysis presented in the enclosed study will lead to the selection of a remedial alternative that will be protective of human health and the environment and acceptable to all parties involved in this matter.

Very truly yours,

JAECKLE, FLEISCHMANN & MUGEL

By: Theodore Hadzi-Antich
Theodore Hadzi-Antich

Enclosures
cc: John Dicky

1

ATTACHMENT NO. 1

Response to September 23, 1991 NYSDEC comments:

COMMENT 1: Page 2, 2nd Paragraph
The document referred (Guidance for conducting RI/FS under CERCLA, October 1988) does indicate the need to express the Remedial Action Objectives in terms of target cleanup level. See the first paragraph on page 4-15 of that document. Also, it is not correct to say that there are no specifically applicable quantitative ARARS or SCGS that should be used to define Remedial Action objectives. See the Guidance on Remedial Actions for Superfund Sites with PCB contamination - EPA August 1990. The Remediation goals as defined on page 28 recommends 1 ppm of PCB in soil which equates to approximately 10^{-5} excess cancer risk. Also the New York State sediment criteria and guideline recommend 20 ppb of PCB in sediments which should be used as remediation goals. It is therefore necessary these goals should be included in the Remedial Action Objectives. The remedial alternatives then will be evaluated towards attainment of these objectives taking into consideration other factors as described in the EPA and State guidelines.

RESPONSE: As stated in our letter of September 12, 1991 and as reiterated on page 27 of the USEPA's "Guidance on Remedial Actions for Superfund Sites with PCB Contamination"; "The concentration of PCBs in the soil above which some action should be considered (i.e., treatment or containment) will depend primarily on the exposure estimated in the baseline risk assessment based on current and potential future land use." Thus, it is perfectly within the available guidance, and in fact more appropriate if a baseline risk assessment has been performed, to present Remedial Action Objectives for a site based on risk reduction and not numerical cleanup levels.

In addition, as we noted in our September 12, 1991 letter to the Department, several approved Feasibility Study Reports at PCB sites contain remedial action objectives which do not state numerical clean-up levels. However, we have refined our remedial objectives so as to specify more clearly that acceptable risk reduction is the focus of our remedial action objectives.

COMMENT 2: Page 5, 1.2.2.3: Creek Sediments
On the first line indicate the sediment chemical concentration on dry weight basis instead of wet basis.

RESPONSE: This comment has been addressed in Section 1.2.2.3 of the FS report.

COMMENT 3: Page 6, 1.2.3: Containment and Transport
On the 12th line change to "includes all temporary and/or interim remedial measures implemented..." instead of "includes all remedial measures implemented...". Also change "the remedial" on line 14 to "those".

RESPONSE: This comment has been addressed in Section 1.2.3 of the FS report.

COMMENT 4: *<u>Page 6, 1.2.4: Public Health and Environment Concerns</u>*
The approach taken to perform the risk assessment is not considered very conservative. However, if Columbus McKinnon believes as such then add in the 2nd paragraph "Columbus McKinnon believes that the approach taken...".

RESPONSE: This comment has been addressed in Section 1.2.4 of the FS report.

COMMENT 5: *<u>Page 8, 1st Paragraph</u>*
A brief explanation of hazard index is appropriate. Also, the presence of sheet plastic over contaminated soil would not be considered to have a long term impact. Therefore, its use while helpful, should be put into proper context.

RESPONSE: This comment has been addressed in Section 1.2.4.1 of the FS report.

COMMENT 6: *<u>Table 1-1: Action specific ARARS and TBC's</u>*

1. *Include New York State Sediment Criteria and guidelines in the list.*

2. *In the line of TSCA 40 CFR 761.120-139 and columns for Excavate/Treat, and Insitu Vitrification, indicate either "A" or"TBC". Also in the column of Dredge/Treat indicate the same as above.*

RESPONSE:

1. We do not consider the New York State Sediment Criteria and guidelines to be an action-specific ARAR. It has, however been included in the list of potential chemical-specific ARARs and TBCs presented on Table 1-8 of the FS report.

2. This comment has been addressed in Table 1-6 of the FS report.

COMMENT 7: *<u>Table 1-2: Location Specific ARARS</u>*
Include "6NYCRR 608 - Use and Protection of Waters" in the list.

RESPONSE: This comment has been addressed on Table 1-7 of the FS report.

COMMENT 8: *<u>Table 1-3: Chemical Specific ARARS</u>*
For 6NYCRR 701 and 702 Ambient Water Quality Standards, in the PCB column, change to "ug/l" from mg/l. also add "1ppm" in the PCB column for soil clean up criteria Draft DEC TAGM.

RESPONSE: This comment has been addressed on Table 1-8 of the FS report.

COMMENT 9: *<u>Table 1-3</u>*
The NYSDEC Division of Fish and Wildlife Sediment Criteria Document (December 1989) should be included as a TBC. Also, the table incorrectly lists the lead standard for Ambient Water Quality as not applicable. The standard for class C waters is derived by the formula exp (1.266 [in ppm hardness)] -4.661)

RESPONSE: This comment has been addressed in Table 1-8 of the FS report.

COMMENT 10: *Page 12: Ellicott Creek Sediments*
In the items 1 and 2 indicate the Remedial goals for PCBs in the soil at 1 ppm and for sediments at 20 ppb in accordance with the Guidance on Remedial Action for Superfund Sites with PCB contamination, EPA August 1990 and NYS sediment criteria respectively.

RESPONSE: Refer to Response to Comment No. 1.

COMMENT 11: *Page 13, 2.3.3: Ellicott Creek Sediments*
It is stated that 131 cubic yards of the contaminated sediments have been immobilized as a result of the IRM. Those sediments are under the rip-rap. They are only covered by loose stones from top. Covering them does mean that they have been immobilized and lost their contamination potentials. More over the IRM was not intended to be a long term remedy as it was installed only as an interim measure to protect the banks of the creek. Therefore appropriate remedial alternatives which will achieve the final remediation goals for the sediments (including those presently under the rip rap) need to be identified and properly evaluated in the FS.

RESPONSE: While the IRM was implemented to address erosion of the creek banks, its installation necessitated covering some portion of creek bottom sediment for stability. As stated in Section 2.3.2 of the FS report, approximately 130 cubic yards of PCB contaminated Study Area sediment have been covered by the existing IRM. The IRM is constructed with a MIRAFI 700X non-woven geotextile with an effective opening size of 70-100 mesh. This material has a filtering efficiency that will retain particles one half the diameter of the largest size openings; viz. 75-85 μm particles (silt-sized) or larger. The filtering efficiency of the fabric coupled with observed ground water velocities which are insufficient to move silt or clay-sized particles, makes particle migration from under the filter fabric highly unlikely. The fabric is not exposed to weathering since it is covered by the riprap and is resistant to biological attack or decay. The riprap which covers the fabric consists of one to two feet of four to eight-inch stone. Water velocities in excess of eight feet per second would be required to move this sized particle. Therefore even 100-year flood velocities would not be expected to move or damage the riprap. While the IRM was placed as a temporary measure, it has a high degree of permanence and it is appropriate to evaluate it as a permanent remedial measure. It is also important to note that the work plan for the IRM states that the IRM "may or may not be incorporated as part of the final remedy".

COMMENT 12: *Page 14: Creek Bank Excavation*
It is not correct to say that there is currently no technically feasible means of excavating the bank that would prevent the introduction of PCB contaminated soil into Ellicott Creek. We believe that the creek bank can be excavated by installing steel sheet pile wall near the creek.

The creek bank excavation alternative should therefore be retained for further evaluation.

Furthermore, it should be made clear that there have never been any agreements or understandings with the Department that the IRM would be a part of the final remedy. Therefore, the 3rd sentence in this paragraph should be dropped from this section and elsewhere and the presence of a rip-rap should not exclude other response objectives from being considered further. This is a serious shortcoming of this report.

Therefore, remediation alternatives which require excavation should be further screened and if appropriate, carried through to detailed assessment. Included should be the installation of a coffer dam in the creek and removal of contaminated sediments and soil, and various feasible treatment and disposal alternatives.

RESPONSE: While Columbus McKinnon and their technical representatives contend that any means of excavating the creek bank clearly presents a greater environmental risk than containment in place, the State's comment has been addressed in Sections 3 and 4 of the FS report.

While Columbus McKinnon understands that there have never been any agreements between the Department and CM that the IRM should be a part of the final remedy for the site, the work plan prepared for the existing IRM , approved by the NYSDEC, clearly states that "the IRM may or may not be incorporated into the final site remediation plan". Thus, both NYSDEC and CM contemplated that the IRM could be part of the final site remediation. We also call your attention to the NYSDEC's TAGM regarding interim remedial measures dated February 12, 1991, which states that an IRM may become the final remedy. Therefore, clearly the IRM at the CM site must be considered in the evaluation of technical feasibility of any remedial alternative.

COMMENT 13: *Page 14: Creek Bank Stabilization*
It is not correct to say that the rip-rap for the IRM was selected due to its being most effective technology. The fact of the matter is that sheet piling has been selected for stabilizing the creek bank from erosion. It was envisioned that the sheet pilings could have been part of various remedies. However, later on Columbus McKinnon requested, and considering that is was only an interim measure, the Department agreed to, the change of the IRM design.

In view of the fact that sheet piling shall be a permanent measure, an alternative having the sheet piling should be included for further evaluation.

RESPONSE: As we indicated to the Department by letter dated January 18, 1990 and in subsequent discussions with the Department on January 20, 1990, Hartman Engineering informed us that it would not proceed with design work for the IRM steel sheetpiling cut-off wall for the site because associated problems that could occur with its installation. These problems are set forth on pages 2-3 of the approved Alternative Interim Remedial Measure Work Plan dated February 1990. Thus the riprap was the most effective technology at the time given the problems posed by the installation of the sheetpiling cut-off wall. Moreover, Columbus McKinnon expressed its strong reservations about implementing an IRM before completion of the RI/FS process. Please refer to our letter to the Department dated April 10, 1989.

COMMENT 14: Page 15 and 16: Excavation/Off-site Disposal/Excavation/Treatment
As pointed in earlier comments, excavation of the contaminated soil can be made after installing a sheet piling wall near the creek bank. This will not result in the release of contaminated soils into the creek. Accessibility problem to the site can be worked out by considering different viable alternatives specific to the site location. Access through the Conrail property and/or through the creek should be considered. Therefore, the rip-rap and the accessibility problem are not good reasons for eliminating these alternatives for further consideration. Therefore, these alternatives should be retained for further evaluation.

RESPONSE: While Columbus McKinnon and its technical representatives still believe that any means of excavation of the site soils present a real and significant risk of release of contaminated soils into the creek; the various means for excavating the site soils are presented in Sections 3 and 4 of the FS report and brought through preliminary screening and detailed analysis. No feasible means of access is available through the Conrail property and access across the creek presents an inherent, and as stated by NYSDEC representatives at our October 21, 1991 meeting, an unacceptable risk.

COMMENT 15: Page 17-18 - Excavation Treatment
This alternative should not be eliminated by stating that it would not be cost effective. Cost is one of the factors among other relevant ones to be considered later during the detailed evaluation of alternatives. However, since soil excavation alternatives must be retained for further evaluation, this alternative should not be deleted from further consideration.

RESPONSE: This comment has been addressed in Sections 3 and 4 of the FS report.

COMMENT 16: Tables 2-2 and 3-1
The tables should be revised to include other alternatives recommended for further evaluation in these comments.

RESPONSE: This comment has been addressed on Tables 2-1 and 3-1 of the FS report.

COMMENT 17: Page 23, 3.2.2. - Soils
All capping alternatives should note the presence of the nearby stream and the potential for flood damage to result. The asphalt cap would be especially subject to lifting and shifting under such circumstances. Also capping is considered a temporary measure. It is the clear position of this Department

and SARA that permanent remedies will be implemented where practicable. This concept should be reflected in the screening process.

RESPONSE: Review of flood data and site plan contours indicate that a strip of the site at the north end, approximately 200 lineal feet long and a maximum of 16 feet wide, adjacent to the areas proposed for covering is below the 100-year flood elevation (El. 571.6). Prior to covering surfaces along this length of creek bank with any of the proposed cover alternatives, the adjoining creek bank surface elevation must be raised as much as 2½ feet to match the 100-year flood stage level. This issue can be easily addressed during the design and implementation of any of the technically feasible cover alternatives.

This comment has been addressed in Sections 4.2.3 through 4.2.6 of the FS report. The NYSDEC's hierarchial remedial preference is clearly presented in Tables 3-1 and 4-1 and discussed within the report. It is also reflected in the scoring process.

GENERAL COMMENT: *It is important for you to note that the assumption that the rip-rap which was installed as an interim remedial measure must be a part of the final remedy has caused a fundamental flaw in the preliminary screening of alternatives. The assumption has caused a number of reasonable and viable alternatives be "screened out" of further study. By doing so, time has been lost for doing treatability work associated with those alternatives. Therefore, it may be necessary to immediately task your contractor to undertake this work so that it can be integrated into the draft final FS report.*

RESPONSE: A number of remedial alternatives were not brought through preliminary screening in the original FS due to the environmental risk posed by these alternatives; and not solely as a result of the presence of the IRM. In this regard, please see our response to comment No.'s 11 and 12 of the Department's September 23, 1991 letter. While a more detailed discussion of these risks has been presented in the revised FS, this has not appreciably changed the recommendation of the report and thus Columbus McKinnon does not feel the original FS was "fundamentally flawed".

A thorough review of the treatment processes available for treating PCB-contaminated materials has resulted in the screening out of these processes based on either their non-applicability for site conditions or their lack of development beyond the bench-or pilot-scale testing stage. Therefore no treatability testing is proposed.

2

ATTACHMENT NO. 2

Response to October 16, 1991 Comment Letter:

COMMENT 1: Page 1-1

The purpose of the Feasibility Study as stated in paragraph 2 needs to be reversed to reflect Section 121 of SARA which states a strong statutory preference for remedies that are highly reliable and provide long term protection. In addition to being protective and cost effective, additional remedy selection consideration should include:

- *A preference for remedial actions which employ treatment that permanently and significantly reduce the volume, toxicity and mobility of hazardous substances, etc.*
- *Off-site transport and disposal without treatment is the least favored approach where practicable treatment technologies are available.*
- *Use of permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.*

RESPONSE: The Department's hierarchial remedial preference is clearly presented in Tables 3-1 and 4-1, and discussed within the evaluation of remedial alternatives presented in the FS report.

COMMENT 2: Figure 1-2

The limits of the IRM creek bank stabilization project is shown extending about 25-feet from the base of the creek bank. This is not consistent with Figure 1-2 which shows the riprap ending at the toe of the creek bank. This inconsistency needs clarification.

RESPONSE: This comment has been addressed in Figure 1-2 and Section 1.2.2.3 of the FS report.

COMMENT 3: Page 1-3

Paragraph 2 needs to include missing information about the initial IRM design concept approved by the Department. The original consent order called for the installation of a "cut-off wall of steel sheet piling". The installation of sheet pilings was consistent with the long term goal of providing a permanent remedy. It was envisioned that contaminated soil behind the piling would be removed and treated and/or disposed either on-site or off-site. Prior to implementation of this measure Columbus McKinnon approached DEC with concerns about possible stability problems if soil behind the pilings were removed, etc. Documentation (design calculations) to substantiate this contention was requested. However, Columbus McKinnon proposed an alternative, the *installation of geotextile membrane and stone riprap which would provide a comparable degree of erosion control. The alternative was accepted by DEC and set forth in a modified consent order and design work plan.*

RESPONSE: Documentation of the historical derivation of the IRM would also need to express Columbus McKinnon's strenuous reservations about implementing an IRM before any real information regarding contaminant pathways and hence design criteria for the IRM were established. This proposed historical discussion does not further the assessment of remedial alternatives pursued within this document. However, you may refer to our letter to the Department dated April 10, 1989 for such a discussion. You may also refer to the discussion presented on page 2-3 of the Alternate Interim Remedial Work Plan, February 1990.

COMMENT 4: *Page 1-4: Central Area*
The concentration of halogenated volatile organics should be shown - range and average. Also the range of PCB concentrations should also be shown.

- *The report should explain what is meant by "at depth".*
- *The depth of fill and the depth of contaminated soil should be stated.*
- *The concentrations of metals should be reported.*

RESPONSE: This comment has been addressed by the addition of Tables 1-1 through 1-3 and Appendix A.

COMMENT 5: *Page 1-5*
The section on ground water needs to state the levels of volatile organics and describe the difference in PCB sample results from both rounds of sampling. It is important to note that one of two rounds of sampling showing no PCBs present does mean an absence of PCBs in the future. The text should be revised to reflect this.

RESPONSE: This comment has been addressed in Section 1.2.2.2 of the FS report. The text has been revised only to present more detailed information on the groundwater sampling performed and the subsequent analytical results. It should be noted that these results indicated no detectable PCBs present in the groundwater in the wells nearest the alleged former waste oil disposal area after more than 60 years have elapsed since the alleged initiation of disposal of spent water-soluble cutting oils. Thus there is no data to indicate that there is any migration of PCBs from the fill material into the ground water under existing site conditions, or that there should be any measurable migration anticipated in the future.

COMMENT 6: <u>_Page 1-5: Creek Sediments_</u>

The report should explain that the lower levels of PCBs found in sediment during the RI could have been caused by:

a. Deposition of uncontaminated sediment over the contaminated sediment causing a dilution effect on the samples.

b. Transport of contamination further downstream.

RESPONSE: There are many potential mechanisms that may be responsible for the observed lower concentrations of PCBs detected during more recent sediment sampling events, including a number of mechanisms not mentioned in the NYSDEC's comment, such as analytical variability, sampling variability as well as bacterial or photolytic degradation of PCBs. Since neither these mechanisms nor the ones suggested by NYSDEC's comment can be factually supported, Columbus McKinnon chooses not to burden the FS report with conjecture.

COMMENT 7: <u>_Page 1-6_</u>

The 1st paragraph indicates that the riprap extends 20'-25' into the creek from the toe of the bank. We have seen no documentation which indicates precisely where riprap ends in relation to the toe. The Department was not given prior notice of the survey done on September 12-23, 1991. The IRM data indicate that the riprap ends at the slope and does not extend much on the bed. Also, to state that contamination under the riprap will not be transported may not be correct. Openings in the geotextile membrane will allow the movement of ground water into the creek. While the membrane may act as a filter for soil particles the degree of filtration is in serious question. Of course, any contamination in the water will pass through the membrane without any hinderance. One of the primary concerns about leaving contaminated sediment in place, of course is the dissolution and diffusion of contamination into surface water. The geotextile membrane may not accomplish this to any significant degree for both bottom sediments and contaminated soil.

RESPONSE: The stream survey conducted by Malcolm Pirnie has been more clearly documented in this revised version of the FS report and this has been reflected in Figure 1-2 and Plate No. 1. The routes of contamination migration presented in the FS report are reiterated from those presented in the NYSDEC-approved RI. Consequently, there is no need to revise the FS report to incorporate this comment. The potential contaminant loads introduced by the routes of contaminant migration presented by the NYSDEC are considered insignificant in comparison to the contaminant loads presented in Section 1.2.3 and will not be presented in the FS. Further clarification of the insignificance of these contaminant migration pathways as presented at our October 21, 1991 meeting is presented herein below.

Diffusion from Sediments
Diffusion of contamination from stream bottom sediments is the smallest (and is in fact immeasurable) mechanism for transport. Diffusion from the sediments is taken into account through the State's sediment criteria approach. This methodology provides for a very conservative calculation of the theoretical pore water concentration based on the highest concentration of PCBs detected at a single point in the stream sediments. The calculated pore water concentration in a single point is then assigned to all sediments within the Study Area and compared directly to surface water standards.

Advection of PCBs via Ground Water Transport
Advection through ground water transport (again not measurable with current accepted analytical practices) is the next smallest mechanism for transport of PCBs. A calculation of the contaminant loading from the site, making the very conservative assumption that PCBs are present in the groundwater at the detection limit, which was presented at our October 21,1991 meeting is included here as Exhibit No. 1. This calculation illustrates that with soil erosion controlled by a cover over the site and the creek banks, that PCB loading from ground water alone will not cause contravention of the ambient water quality standard in the stream. This calculation assumes complete mixing within the stream. While this may not be completely reflective of actual conditions, the only way to determine the mixing zone would be to perform advective stream modeling. However, even without performing modeling, it should be obvious that with groundwater flow at approximately 0.1% of the actual stream flow contributing to a flowing stream environment, the "mixing zone" for PCB "diffusion" from the site would be minimal.

In addition, the ambient water quality standard of 0.001 ug/l is 500 times lower than the achievable detection limit for PCBs. Therefore to make the assumption that the concentration of PCBs is in fact at the detection limit and to then perform modeling based on this overly conservative assumption would in no way provide a definitive illustration of "actual" conditions in the stream. It would also be inappropriate to attempt to implement a "model" which cannot be calibrated nor validated to the existing physical conditions at the site due to the limitations of analytical detectability.

Particle Migration
Of the mechanisms for transport identified in this comment, particle migration provides the greatest potential for measurable impact. However , the attached diagram (Exhibit No. 2) illustrates that a velocity of at least 1.0 ft/s would be required to move clay or silt-sized particles. Without even taking into account the filtration

EXHIBIT NO. 1

COLUMBUS MCKINNON SITE

Calculation of PCB Concentration in Ellicott Creek with IRM Extension and Soil Cap

Ellicott Creek Average Flow = 130 ft^3/sec (p. 5-1, RI Report)

Average PCB load to Ellicott Creek:

Groundwater	=	<0.004 kg/yr	(Table 7-2, RI Report)
Soil Erosion	=	0	(Table 7-2, RI Report)

Concentration of PCB in Ellicott Creek water column:

$$C = \frac{0.004 \text{ kg/yr}}{130 \text{ ft}^3\text{/sec} \times 8640 \text{ sec/day} \times 365 \text{ day/yr}}$$

$$= 3.5 \times 10^{-7} \text{ mg/l}$$

$$= 3.5 \times 10^{-4} \text{ ug/l}$$

llf/1332011.pcb

Hjulstrom's Diagram

In the past most geology texts expressed competency in terms of a critical velocity rather than a critical shear stress or shear velocity. The diagram relating critical velocity to grain size is often called the *Hjulstrom diagram* after its originator (Fig. 4-8). Strictly, the Hjulstrom diagram gives the critical velocity only for flows of 1 m depth.

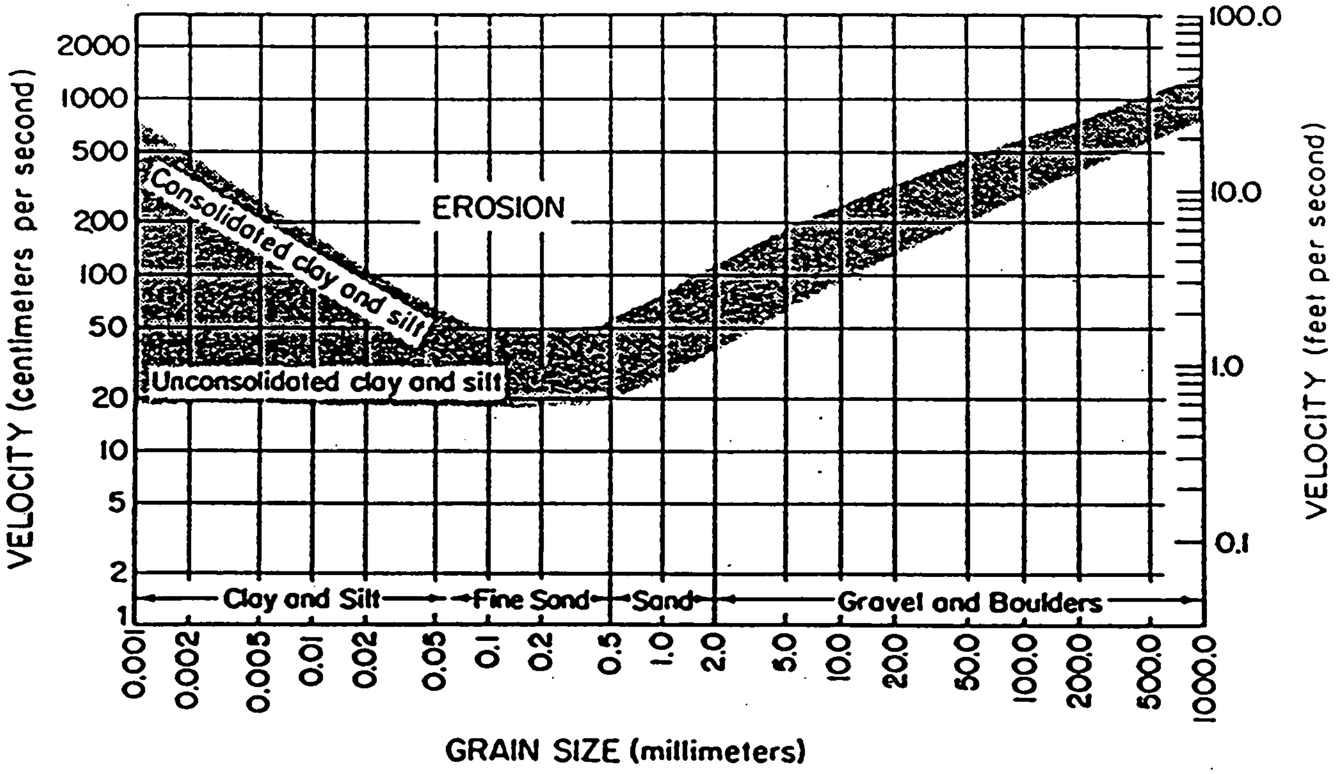

Fig. 4-8 Hjulstrom's diagram, showing critical velocity for movement of quartz grains on a plane bed at a water depth of one meter, as modified by Sundborg (1956). The shaded area indicates the scatter of experimental data. There are very few reliable data in the clay and silt region.

Blatt, H., G. Middleton and R. Murray. 1980. Origin of Sedimentary Rocks 2nd Edition. Prentice Hall, Inc., Englewood Cliffs, NJ. p.782.

capacity of the filter fabric, the measured groundwater flows are three orders of magnitude lower than 1.0 ft/s, thus movement of the sediment particles through the filter fabric can not be expected to occur.

COMMENT 8: *Page 1-6, Section 1.2.3*
There are other routes of contamination migration:

- *Erosion of sediments from the creek bottom by infrequent storms, however, the creek normally has a low flow velocity.*

- *Dissolution and diffusion of contamination in the sediment. The RI report does not provide contaminant loading rates for each of the above. The FS report needs to look at the dispersion models typically used for sediments, in the guidance provided, and arrive at levels for the sediment that are protective based on the dispersion route of contamination. It is important to note that surface water standards for PCBs is below instrument detection limits therefore the concentration of contamination in surface water for a area wide sources can only be done through modelling using theoretical flux from ground water and sediment.*

RESPONSE: See Response to Comment No. 7.

COMMENT 9A: *Page 1-8*
"Human Health Risk Assessment Summary" indicates the level of concern is an FDA tolerance value for fish fillets. This is a rather unusual comparison because the FDA sets levels of consumption not for protection of public health and the environment. USEPA does that and as the RI report clearly points out on page 8-23, "USEPA has proposed that the ambient water quality concentration should be zero for protection of human health from the potential cacogenic effect of PCB exposure through the ingestion of contaminated water and fish...".

RESPONSE: The human health risk assessment summary herein is repeated from the summary provided in the NYSDEC - approved RI report. The FDA tolerance value for fish fillets is an accepted standard (as opposed to the USEPA'S recommended criterion) in fact set for protection of human health through ingestion.

COMMENT 9B: *Also, the method used to compute the estimated level of 0.16 mg/kg PCB contamination in fish fillet does not consider diffusion of PCBs from contaminated sediments and ground water. While the last round of ground water sampling does not detect PCBs, dissolution and dispersion will, of course, cause a flux of contamination from the soil into the creek.*

RESPONSE: The method used to compute the estimated level of 0.16 mg/kg PCB contamination in fish fillet does not consider diffusion of PCBs from contaminated sediments or groundwater. As stated in the response to comments No's 7 & 8, the primary contaminant loading contributions were considered in calculating the fish fillet concentrations. The alternate mechanism of diffusion of non-detectable levels of PCBs from sediment and groundwater is considered insignificant (see Response to Comment No.s 7 and 8)in comparison and is in fact unquantifiable.

COMMENT 9C: *Reference is made in both the RI report and the FS to New York State surface water "criteria". The use of the work "criteria" is incorrect because the levels being referenced are standards rather than criteria. There is a significant difference because standards are legally enforceable while criteria may not be. Furthermore, the best usage classification for Ellicott Creek has recently been upgraded to Class B.*

RESPONSE: These corrections have been made in the FS report.

COMMENT 10: *Page 1-9 and Table 1-1*

The hazard quotient calculations must be based on PCB concentrations from the historical as well as RI data even though the sampling locations may be very near to or covered by the riprap. The purpose of the IRM is to protect the bank slope from the wave action and not to remediate the contaminated sediments. Therefore, a baseline risk assessment must include all contaminated sediments in the Ellicott Creek. The hazard quotients for current conditions have been grossly underestimated.

Data from sampling locations CS-1, CS-2 and SC-3 are not representative of "actual conditions" since they are upstream or downstream of the most heavily contaminated area of Ellicott Creek. In addition, sediment concentrations used for "background conditions" are also unrepresentative. An arithmetic average is calculated by summing all available data. The average presented in Table 1-1 was derived only from the highest and lowest quantified data. Non-detectable results, the equivalent of zero concentration, were not included. Also, the data from the Niagara River Area Sediments study cannot truly be considered background since all samples were taken in areas where the stream travels through the heavily developed areas including the section downstream of the Columbus McKinnon site. Therefore, the statement on page 1-10, 2nd paragraph which indicates only a marginal potential for aquatic toxicity at the site, is not true.

Table 1-1. Needs to be revised to reflect 0.001 ug/l is a surface water standard for the State of New York. Also, where are references 1 and 2 located?

Table 1-1 indicates that the maximum concentration of contaminated sediment not covered by the riprap is 0.83 vs. 87 under the riprap. This again implies that the contamination in the sediment under the riprap is isolated from the water column. Of course, this is not the case, the geotextile membrane was designed to cause water to flow through it. Therefore, Table 1-1 needs to be revised accordingly.

RESPONSE: As stated in response to Comment No. 11 of the Department's September 23, 1991 comment letter, while the IRM was installed as an interim remedial measure to address creek bank erosion, it is very effective in containing the migration of the underlying sediments and has a high degree of permanence. In addition, the IRM has been in place for approximately 16 months. As this segment of Ellicott Creek is a natural sediment deposition zone, the fabric and riprap have additionally been covered with a layer of natural stream sediment since its installation. While the filter fabric allows water to pass through it, the riprap and natural sediment deposition effectively isolate the sediments from the water column. These facts coupled with the technical impracticality and environmental and public health risks posed by the removal of the IRM, illustrate that its presence must be considered in the evaluation of any remedial scenario. Therefore, it is appropriate for a baseline risk assessment (i.e., the environmental risk associated with the "No Action" alternative) to be performed taking into account the presence of the IRM. Thus, the Hazard Quotient should be calculated for those exposed sediments which have the potential to impact the stream.

The calculation of the Hazard Quotient using the maximum concentration on a dry weight basis of exposed stream sediment indicated only a marginal potential for chronic toxicity to aquatic organisms. In order to place this calculated Hazard Quotient into perspective, this same Hazard Quotient calculation approach was used with NYSDEC PCB data on nearby segments of stream to illustrate the impact of the Columbus McKinnon site on this stretch of Ellicott Creek. All available data indicating the presence of PCBs was utilized in the calculations. This comparison is both valid and representative of the actual conditions of the stream since the "background" sample results came from the same sediment depositional zone of the stream with the same industrial/commercial setting.

The closest "background" NYSDEC sampling location is approximately 300 yards from the Columbus McKinnon site. While limited short-term flow reversal of the surface stream flow due to wind effects may be possible during low flow periods. It is highly unlikely that this could cause sediment on the stream bed to migrate upstream as the State's comment suggests. The background PCB data was presented as total PCBs. Even if the results indicated the presence of Aroclor 1254 (the most prevalent Aroclor detected at the

Columbus McKinnon site) each Aroclor is made up of many different congeners of PCBs. Identification of similar congeners would be necessary to attempt to identify the origin of PCB contamination.

COMMENT 11:

<u>*Page 1-10*</u>

The 1st paragraph indicates that sampling results from a prior survey shows higher levels of contamination upstream of the site from those downstream. This conclusion is unacceptable because it is based only on two data points which may or may not be representative of conditions present. The potential from flow reversal due to river elevation changes and wind effect have not been addressed. The report should also state whether the PCBs found were the same as those released from the Columbus McKinnon site (Arochlor 1254). Good engineering practice would warrant a statistical comparison valid to a 95% confidence level to support the notion that Columbus McKinnon should not be required to cleanup levels of contamination which exceed background conditions.

RESPONSE:

See response to Comment No. 10 above.

COMMENT 12:

<u>*Page 2-1 and 2-2*</u>

Remedial action objectives need major revision to reflect the following:

a. The remedial goal for this project is to cleanup the chemical contamination to prerelease conditions.

b. The purpose of the remedial project is to remediate rather than mitigate.

c. The proposed remedial action objectives need a much greater degree of specificity.

Response action for the creek bank should be modified to include entire stretch of contaminated creek bank. The segment with temporary riprap should be included. Therefore, this would include <u>at least</u> 365 L.F. of creek bank.

RESPONSE:

Parts a, b, & c: As stated in our response to comment No's 1 and 10 of the September 23,1991 comment letter, the Remedial Action Objectives for the site are set in appropriate terms and follow available guidance. We have refined our remedial action objectives so as to specify more clearly that acceptable risk reduction is the focus of our remedial action objectives.

Part d: Section 2.3.1 of the report has been modified to reflect this comment.

COMMENT 13: <u>*Section 2.4, Page 2-3 to 2-6: General Comments*</u>

This entire section must be completely revised. Both Columbus McKinnon and the contractor, Malcolm Pirnie exercised very poor judgement in attempting to use criteria for screening which completely depart from the EPA guidance specified in the work plan and consent order. It is surprising to see an experienced consulting firms of the stature of Malcolm Pirnie submitting a work product of this level of deficiency. The following are specific comments in this regard:

- *Excavation of the contaminated creek bank must not be precluded because it would affect the riprap IRM. The riprap's primary function is for erosion control during the study and design phases of this project an may or may not be included in the selected remedial alternative. Therefore, possible destruction of the riprap is <u>not</u> contradictory to the remedial goals for this portion of the site.*

- *The conclusion that any excavation of soil and or sediment will necessarily cause the spread of significant contamination to Ellicott Creek has not been supported. Your attention is directed toward EPA's Handbook of Remedial Actions at Waste Disposal Sites (EPA/625/6-85/006). This publication contains a number of technologies which would minimize if not eliminate the chance of any resuspension of contamination in Ellicott Creek. Temporary cofferdams are well suited for conditions at the Columbus McKinnon site and their construction is straight forward and readily available.*

RESPONSE: Section 2.4 of the original FS has been eliminated and more detail has been provided to a number of excavation alternatives. The excavation alternatives have been presented in Sections 3 and 4 of the revised FS report and are carried through preliminary screening and detailed analysis. However as stated previously, Columbus McKinnon and its technical representatives still contend that very real and significant risks to the environment are presented by these alternatives which are in fact contradictory to the remedial action objectives for the site. Furthermore, the inclusion of the details of these risks and incorporation of these alternatives into the evaluation process does not alter the conclusions of this report. It is at best a cursory conclusion by the State that alternatives exist for excavation of study area soils and sediments which are "well-suited for conditions at the CM site and their construction is straight forward and readily available". The technical difficulties and risks posed by each excavation alternative are discussed in detail in the enclosed report.

COMMENT 14: *Page 2-3, 2.3.3: Ellicott Creek Sediments*

The report does not show how the extent of contaminated sediments covered by the riprap was determined. Clearly, the creek bank should not be included in this area. This is a relatively minor issue because the riprap has not been determined to be an acceptable remedy for dissolved PCBs or PCBs in sediment pore water.

RESPONSE: As stated previously, the limits of the IRM have been clearly delineated on Figures 1-2 and on Plate No. 1 through survey data compiled on September 12 and 13, 1991. In addition, while the riprap and filter fabric were placed as an "interim measure" its permanence and effectiveness at containment of both creek bank soils and sediments must be considered in an evaluation of remedial alternatives. This is substantiated by the work plan prepared for the existing IRM, approved by the NYSDEC, which states that "the IRM may or may not be incorporated into the final site remediation plan". This is also consistent with the Department's TAGM regarding interim remedial measures dated February 12, 1991, which states that an IRM may become the final remedy.

COMMENT 15: *Page 2-4: Creek Bank Excavation*

It is not correct to say that there is no technically feasible means of excavating the bank that would prevent the introduction of PCB contaminated soil into the creek. As already mentioned in these comments, installation of a temporary cofferdam will provide the degree of isolation required for preventing the introduction of PCB contaminated soil into the main body of the stream.

RESPONSE: This comment has been addressed in Sections 3 and 4 of the FS report.

COMMENT 16: *Page 2-5 and 2-6: Excavation/Offsite Disposal, Excavation/Treatment*

The reasons given for screening out the above two alternatives are not justified. As mentioned in these and earlier Department comments these alternatives can be implemented by making a cofferdam in the creek.

RESPONSE: More detail has been provided as to the means available for excavation/offsite disposal and excavation/treatment of the study area soils and sediments in Sections 3 and 4 of the FS report.

COMMENT 17: *Page 2-7: No Action*

For reason previously stated, that statement indicating 40% of the study area has stabilized, has not been supported.

RESPONSE: The results of the stream survey conducted by Malcolm Pirnie, Inc. on September 12 and 13, 1991 have been documented on Figure No. 1-2 and Plate No. 1. The survey data supports the fact that 44% of the area of study area sediments (and 36% of the volume) have already been covered through placement of the IRM.

COMMENT 18: <u>*Page 2-8: Excavation/Treatment*</u>
Comments same as those for creek bank excavation.

Table 2-2. It is incomplete. All viable and appropriate alternative should be included.

RESPONSE: Addressed in response to comment No. 16 above.

COMMENT 19: <u>*Page 3-4, 3.2.1: Creek Bank*</u>
Other appropriate alternatives including sheet piling, cofferdam and installation of Fabriform should be included in the text for evaluation purposes.

RESPONSE: This comment has been addressed in Section 3.1.3 of the FS report.

COMMENT 20: <u>*Page 3-6: 6 NYCRR Part 360 Soil Cap and Synthetic Cap*</u>
The reasons given for screening out these alternatives are not justified. In place of 4% slope, 2% slope of the cap is also allowed. This will reduce the height of the alleged mound creation near the Columbus McKinnon property. Access problem can be worked by either making a passage by alteration in the Columbus McKinnon building or from the other bank of the Creek. IRM is only an interim measure and its removal should be considered in conjunction with appropriate remedial alternatives for the contaminated sediments and the bank slope.

RESPONSE: The 6NYCRR Part 360 regulations only authorize a 4 percent minimum slope. However, even with a reduced side slope requirement of 2%, the thickness of the cap construction itself is not practical on this narrow site with one side sloped towards the creek. Access problems are addressed in Response to Comment No. 14 of the September 23, 1991 letter and in Section 3.2 of the FS report.

COMMENT 21: <u>*Table 3-1*</u>
The preliminary scoring has not been done as required by NYS HWR TAGM 90-4030. Many items have been ignored and many appropriate alternatives not considered. The table is incomplete.

RESPONSE: The preliminary scoring has been performed for additional alternatives and Table 3-1 has been revised accordingly.

COMMENT 22: <u>*Page 3-4 and 3-5: Insitu Stabilization*</u>
Fabriform having monolithic concrete armor structure formed by pumping fine aggregate concrete into specially woven synthetic fabric forms, should be included in the discussion.

RESPONSE: This comment has been addressed in Sections 3.1.2.2, 3.1.3.2, 3.2.3.1, 4.3.3, and 4.4.3.

COMMENT 23:	<u>*Page 3-7: RCRA Cap*</u> *Comments same as Part 360 cap.*
RESPONSE:	Addressed in response to comment No. 20 above.
COMMENT 24:	<u>*Page 3-7: Topsoil Cap*</u> *This remedy while providing temporary protection against contact with contamination, is subject to erosion and damage by creek bank flooding. It has the undesirable attribute of allowing precipitation water to percolate into and come in contact with the contaminated fill. As a result dissolution of contamination will occur and be transported in ground water and Ellicott Creek. Therefore, this alternative is not considered effective and should be dropped from further consideration.*
RESPONSE:	A very narrow band, a maximum of 16 feet wide towards the north end of the site is subject to flooding above the creek banks during a 100-year flood. Each of the cap/covering alternatives will be designed to prevent any long-term damage from the 100 year flood event. After more than 60 years of precipitation, measurable leaching of PCBs from the fill material into the ground water has not been observed to occur. Additionally, as presented in our response to comment No's 7 and 8 & of the October 16, 1991 comment letter, dissolution of non-detectable levels of PCBs from the ground water into the stream is not expected to cause contravention of the ambient water quality standard in the stream. Therefore all the cap/covering alternatives were conceived to prevent direct contact with the sites soils only, and not to prevent the introduction of rainwater into the site. In order to improve the long-term integrity of the topsoil covering alternative, we have incorporated a layer of synthetic membrane.
COMMENT 25:	<u>*Page 3-8: Gravel Cap*</u> *The same comments apply as stated for the topsoil cap.*
RESPONSE:	A very narrow band, a maximum of 16 feet wide towards the north end of the site is subject to flooding above the creek banks during a 100-year flood. Each of the cap/covering alternatives will be designed to prevent any long-term damage from the 100 year flood event by raising the creek bank surface elevation above the 100-year flood elevation prior to placing the cover. After more than 60 years of precipitation, measurable leaching of PCBs from the fill material into the groundwater has not been observed to occur. Additionally, as presented in our response to comment No's. 7 and 8 and of the October 16, 1991 comment letter, dissolution of non-detectable levels of PCBs from the groundwater into the stream is not expected to cause contravention of the ambient water quality standard in the stream. Therefore all the cap/covering alternatives were conceived to prevent direct contact with the sites

soils only, and not to prevent the introduction of rainwater into the site. In order to improve the long-term integrity of the topsoil covering alternative, we have incorporated a layer of synthetic membrane.

COMMENT 26: <u>*Page 3-8: Insitu Vitrification (ISV)*</u>
Our technology group has advised the ISV has been found to have numerous problems with implementation. As a consequence it has been withdrawn as being commercially available by various vendors. Therefore, this technology should be dropped from further consideration.

RESPONSE: Based on the most recent information provided by the NYSDEC on the viability of Insitu Vitrification, this process was introduced in Section 3.1.14 and screened out during the preliminary screening presented in Section 3.2.13 of the FS report.

COMMENT 27: <u>*Page 3-9: Excavation/Off-site Disposal*</u>
The construction of a temporary cofferdams can be accomplished by barge. Preassembled sections of sheeting are partitioned and operated from a barge. Of course, a preconstruction geologic site investigation may be necessary to ensure that bedrock or impervious strata will not interfere with pile driving operations.

RESPONSE: The implementability issues associated with installation of temporary steel sheet pile cofferdams are presented in Sections 3 and 4 of the FS report.

COMMENT 28: <u>*Page 4-2: Short Term Impacts and Effectiveness*</u>
This paragraph should also state that the existing risk, however, would remain.

RESPONSE: This comment has been addressed in Section 4.2.1 of the FS report.

COMMENT 29: <u>*Page 4-2: Long Term Effectiveness and Performance*</u>
While the stones in the riprap is not expected to deteriorate, but the riprap on the slope requires frequent maintenance to replenish the rocks lost due to settlement of the soil and scouring of the stream bed. In addition, there is no mention on the time period the membranes would stay intact. It is the membrane, of course, that reduces the movement of contaminated soil particle from the creek bank to surface waters.

RESPONSE: This comment has been addressed in response to Comment No. 11 of September 23, 1991 letter and in Section 4.4.2 of the FS report.

COMMENT 30: <u>*Page 4-3: Compliance with ARARs*</u>
It is not correct to say that.

RESPONSE: This comment has been addressed in Section 4.2.1 of the FS report.

COMMENT 31: <u>*Page 3-9: Excavation/Offsite Disposal*</u>
The reasons for screening out the alternatives is given as difficulties in constructing a cofferdam and the damage to the IRM. As mentioned earlier in these comments these reasons are not justified.

RESPONSE: Addressed in response to comment No's 16 & 18.

COMMENT 32: <u>*Page 4-2: Long Term Effectiveness and Performance*</u>
The statement indicating 96% reduction in PCB loading and over 60% reduction in the loading to the creek apply only to the effectiveness of the geotextile and riprap in providing temporary erosion control. No mention is made of the unsuitability of the geotextile in preventing the movement of contamination water.

RESPONSE: As stated in our response to comment No's 7 and 8, the diffusion of non-detectable levels of PCBs from the ground water into the creek is not considered a significant contaminant migration pathway and is not expected to cause contravention of the stream's ambient water quality standard. Thus the filter fabric was not designed to prevent the introduction of ground water. The performance of the filter fabric is discussed with respect to its effectiveness in controlling the dominant contaminant migration pathway, i.e., soil erosion.

COMMENT 33: <u>*Page 4-3: Overall Protection of Human Health and the Environment*</u>
Since the riprap and geotextile are not impervious, the contaminated water from the pores of soil and sediment along the creek bank will be in contact with the body of water in the creek. Therefore risk to the aquatic life from the contaminated sediments under the riprap continues to exist despite the IRM.

RESPONSE: Addressed in response to comment No's 10 and 11.

COMMENT 34: <u>*Page 4-6: Long Term Effectiveness and Performance*</u>
this heading is actually "Long Term Effectiveness and Permanence". Was the permanence replaced by Performance intentionally or by error? Reference to the existing pieces of plastic sheets covering area of high level contamination can hardly be considered anything but temporary.

RESPONSE: On page 7 of 32 of the NYSDEC's TAGM No. 4030 for the Selection of Remedial Actions at Hazardous Waste Sites, this criterion is mistyped as "Long-term Effectiveness and Performance". This is corrected to "Long-term Effectiveness and Permanence" in this version of the FS report. While the exposed plastic sheeting may be subjected to weathering and photolytic degradation its integrity can be maintained by replacement as needed.

COMMENT 35: Page 4-7: Compliance with ARARs
What is the basis from the conclusion that the exposed contaminated fill will cause only short term contravention of Federal and State surface water quality criteria? If contaminated fill remains permanently exposed, then it can cause long term contravention of environmental standards.

RESPONSE: This comment has been addressed throughout Section 4.0 of the FS report.

COMMENT 36: Table 4-1
It is incomplete due to premature screening out of many appropriate alternatives. Numerical scores also do not seem correct. For example, no action and Institutional Controls have been given a score of 7 out of 15 in Long Term Effectiveness and Permanence. Actually the score should have been zero out of 15. Similarly, other scores are not correct.

Under "notes" the item "B" should be "Long Term Effectiveness and Permanence" instead of Long Term Effectiveness and Performance.

RESPONSE: Item B has been renamed throughout the text and tables. Additional alternatives have been carried through detailed analysis and included in Table 4-1.

COMMENT 37: Page 4-9: Overall Protection of Human Health and Environment
Reference to the existing torn and mutilated pieces of plastics lying on hot spots as a "durable plastic film" it is not consistent with reality. At best, this is only a temporary measure to prevent gross surface soil erosion.

RESPONSE: Addressed in response to comment No. 34.

COMMENT 38: Page 4-16: Compliance with ARAR
The technical impracticality of the Insitu vitrification should be further defined.

RESPONSE: This comment has been addressed in Section 3.2.13 of the FS report.

COMMENT 39: Page 4-17
On the first line, the reference to 40% effectiveness of the existing riprap is inappropriate for reasons previously discussed. Instead it should be "less than 30%".

Reduction of Toxicity, Mobility or Volume
Covering the sediments with geotextile and riprap does not eliminate the mobility of contaminated pore water from the sediment. The statement made in the report indicating the elimination in the mobility of the contamination and consequent elimination of exposure pathway to the aquatic life is therefore incorrect.

RESPONSE: Addressed in Response to Comment No. 11 of the September 23, 1991 letter, and Comment No's. 10 and 17 of the October 16, 1991 comment letter.

COMMENT 40: *Page 4-18: 1st Paragraph*
Technical impracticability referred as reason for non-compliance of TBCs for PCB contaminated sediments does not seem to be based on a good engineering judgement and practice. As mentioned earlier in these comments, the removal of contaminated sediments can be facilitated by the construction of a cofferdam in the creek. A temporary dam is a feasible and practical way of minimizing contaminant loading to the creek for both soil and sediment removal.

Overall Protection of Human Health and the Environment
It is not correct to conclude that the calculated environment risk posed by the existing stream conditions is lower than that presented by upstream and downstream reaches of Ellicott. The geotextile membrane does not prevent PCB contaminated water from sediment and soil from entering the water column. The purpose of the membrane was to prevent stream bank erosion.

RESPONSE: Part a: This comment has been addressed throughout Section 4.0 of the FS report.

Part b: Addressed in response to comment No's 10 and 11.

COMMENT 41: *Page 4-20: Long Term Effectiveness Performance*
Covering sediments with geotextile will not "effectively eliminate" environmental risk posed by sediments for reasons previously stated.

RESPONSE: Addressed in response to comment No's 10 and 11.

COMMENT 42: *Page 4-20: Reduction of Toxicity, Mobility or Volume.*
The last sentence is not true. The fabric and riprap will not eliminate all exposure pathways from the contaminated sediment to the aquatic biota.

RESPONSE: Addressed in response to comment No's 10 and 11.

COMMENT 43: *Page 4-21: Compliance with ARARs*
It is unlikely that installation of geotextile over sediment will cause compliance with the surface water standard for PCBs of 0.001 PPB. The geotextile will allow movement of PCB contaminated water from between the sediment particle into the water column. Partitioning calculations (using organic carbon content in the calculation) indicate a concentration of PCBs in excess of about 20 PPB (dry weight) in sediment will cause a contravention of the 0.001 PPB standard.

RESPONSE: Addressed in response to comment No's 10 and 11.

COMMENT 44:	*Page 4-21: Overall Protection of Human Health and Environment* As explained previously, this alternative will not prevent contamination form contaminated sediment from entering surface water.*
RESPONSE:	Addressed in response to comment No's 10 and 11.
COMMENT 45:	*Page 4-21 to 4-33:* *In these pages the same familiar statements such as "TCBs are not considered feasible due the technical impractability", "IRM immobilize the sediments", "No action remedy which includes pieces of plastic and the IRM has already effectively provided 96% reduction in PCB loading and 60% reduction in lead loading", and "IRM prevents direct contact with aquatic biota eliminating potential risk to the environment:, etc. have been repeated a number of times. These statements are, however, not correct and therefore, have led to erroneous conclusions about the effectiveness and acceptability of the use of soil cap to cover contaminated soil and extension of the riprap to cover the contaminated creek bank and sediment.*
RESPONSE:	This general comment has been addressed throughout the comments above.
COMMENT 46:	*On page 4-33, it is mentioned that dredging and offsite disposal does not reduce the toxicity or volume of the contaminants. However, dredging will remove contamination from the creek and permanently remove the source of contamination from Ellicott Creek.*
RESPONSE:	While removing the sediments from the study area will reduce the volume of contamination at the site, off-site disposal reduces neither the toxicity nor the volume of the contamination, and is in fact lower in the NYSDEC's hierarchy of remedial technologies (presented in the NYSDEC's TAGM 4030) than containment in-place.
COMMENT 47:	*Page 5-1: Recommended Remedial Alternative* *The recommended remedial alternative based on incomplete FS where in most of the appropriate alternatives were unduly screened out. The recommended alternative is therefore is not acceptable.*
RESPONSE:	This comment is addressed in the response, among others, to comment No. 13 above.

3

ATTACHMENT NO. 3

Response to October 23, 1991 NYSDEC comments:

COMMENT 1: *Your consultant, Malcolm Pirnie, contacted the U.S. Corps of Engineers about acceptability of constructing a temporary cofferdam in Ellicott Creek to facilitate the remediation. However, from additional discussion, it was clear that additional design information will have to be gathered and submitted to the Corps for a preliminary determination. There was consensus that the information would be put together by your consulting firm and a meeting scheduled with the Corps within two weeks. Please set a tentative meeting date with the Corps and advise us accordingly.*

RESPONSE: As stated in Malcolm Pirnie's November 9, 1991 letter to you, the Army Corps of Engineers was unwilling to meet to discuss potential technical difficulties associated with the installation of sheetpiling in Ellicott Creek without the submission of a formal permit application. However, these technical issues are presented in Section 3.2.2.2 of the FS report. The November 9, 1991 letter also requested that the State contact the Army Corps of Engineers directly to attempt to arrange this meeting.

COMMENT 2: *The typical stream cross section diagram reviewed at the meeting appears to represent one particular point along the rip-rap. Rather than try to depict an average condition, it would be more appropriate to show cross sections at fixed intervals along the length of the new rip-rap. There are two concerns with the typical cross section presented. The rip-rap is shown to extend further into Ellicott Creek than our recollection. Also, the slope shown on the diagram seems to be about 2:1. However, the actual slope of the creek bank appears to be much steeper, perhaps 1:1 in most areas.*

RESPONSE: Stream cross-sections developed from the September 12 and 13, 1991 survey have been presented on Plate No. 8 of the FS report.

COMMENT 3: *The use of a barge to transfer contaminated soil from the waste site is less preferred than using trucks. The use of the barge increases the chance of contamination accidentally entering Ellicott Creek. However in order to make the existing roadway behind the facility passable for dump trucks, work will be needed to stabilize and perhaps expand the width of the roadway.*

RESPONSE: Columbus McKinnon agrees that the use of a barge to transfer large volumes of contaminated soil from the waste site increases the chance of transferring contaminated materials into Ellicott Creek. Therefore the means for construction of a site access road is presented in Sections 3 and 4 of the FS report.

COMMENT 4: *A substantial amount of discussion evolved around the use of cofferdams. In previous correspondence, the Department suggested consideration of cofferdams to isolate the site's sediments and contaminated soil from Ellicott Creek during the remediation. By installing these temporary structures, contaminated sediments and soils can be mechanically removed without substantial creek water interference.*

The use of sheet pilings and soil anchors to stabilize the building foundation was also discussed. Your structural engineer considers this necessary to provide support during soil excavation work near the building foundations and Conrail Railroad embankment.

RESPONSE: Sections 3 and 4 of the FS present the technical issues associated with installing sheetpiling in Ellicott Creek for the removal of contaminated stream sediments and sheet piling along the building and railroad embankment for stabilization. All of the sediment removal alternatives involve dredging the contaminated sediments from inside the sheetpiling. Sections 3 and 4 of the FS report outlines the technical difficulties associated with dewatering and excavating inside temporary sheetpiling and the extreme risk of failure associated with this approach. Therefore, the excavation alternative of installing temporary sheetpiling, dewatering and mechanically dredging the sediments has been screened out on the basis of the extreme difficulty and severe environmental risk associated with implementation.

COMMENT 5: *The conceptual structural designs presented by your consultants for pilings and cofferdams seemed rather elaborate and perhaps overly conservative. It would be important for the final FS to contain a separate section addressing the preliminary structural design issues, signed and stamped by your structural engineer.*

RESPONSE: The conceptual and structural designs for the various sheetpiling alternatives presented at our October 21, 1991 meeting and in this revised FS report are based on the more than 20 years of experience in structural sheetpiling afforded by our technical consultant and are neither elaborate nor overly conservative, but represent sound engineering judgment and prudent design. The design assumptions made for each method of excavation are presented within the FS report.

COMMENT 6: *An estimation of the PCB contamination entering Ellicott Creek through groundwater was presented at the meeting. The calculation assumes complete mixing in Ellicott Creek. This, of course, does not occur instantaneously, therefore, a refined estimate using a basic advection/diffusion model will be needed. This theoretical approach is necessary because chemical analysis detection levels for PCBs are substantially higher than the applicable surface water standard (0.001 ug/l).*

RESPONSE: Addressed in response to comment No's 7 and 8 in the October 16, 1991 comment letter.

COMMENT 7: *After review of ARARS and TBCs remedial action objectives should be guided by the current EPA TSCA PCB Spill Cleanup Policy and the methodology contained in the draft DEC TAGM on contaminated sediments. For your information, other cleanup projects for fenced industrial properties have required cleanup to the 10 ppm level in soil. The NYS Department of Health has expressed a concern that under any remedial scenario surface soils should contain no more than 1 ppm PCBs.*

RESPONSE: We disagree with your interpretation of the guidance provided in the above referenced documents for establishing cleanup levels. Your comment regarding the remedial action objective has been addressed in response to comment No's 1 and 10 of the September 23, 1991 comment letter.

We believe you have incorrectly interpreted the guidance provided in the above-referenced documents for establishing cleanup levels at PCB contaminated sites, in your comment. The USEPA's "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" states (on page 26) a cleanup level determination for soils as follows: "the starting point action level for sites where unlimited exposure under residential land use is assumed is 1 ppm. Higher starting point values (10 to 25 ppm) are suggested for sites where the exposure scenario is industrial." It is clear from this guidance, that a remedial action goal of 1 ppm would be inappropriately applied at the CM site. This guidance document also states that "The determination of what combination of treatment and containment is appropriate will be guided by the program expectations to treat the principal threats and contain and manage low-threat material. The determination of what constitutes a principal threat will be site-specific but will generally include material contaminated at concentrations of PCBs that exceed 100 ppm (residential areas) or 500 ppm (industrial areas)." In addition, the guidance states "Consistent with Superfund expectations low-threat material should generally be contained on-site." and "where low concentrations of PCBs will remain on-site and direct contact risks can be reduced sufficiently, minimal long-term management controls are warranted".

The EPA'S guidance on PCB-contaminated Superfund sites also states that "Cleanup levels associated with surface water should account for the potential use of the surface water as drinking water, impacts to aquatic life, and impacts through the food chain." The guidance goes on to present the Equilibrium Partioning (EP) Approach for estimating the interim criteria for sediment. At no point in the document is a numerical remediation goal of 20 ppb presented.

The State's sediment criteria document provides a means for calculating sediment criteria based on the organic content of the sediment. This document also does not purport a "cleanup level" of 20 ppb. In fact, the guidance provided in the use of the State's sediment criteria approach states that the calculated criteria from this methodology are not to be considered cleanup standards; but are guidelines which, if exceeded, will require adequate assessment of the feasibility of remediation to these levels.

It should be noted that the recommendation of this FS report (and the previous draft version) addresses the Department of Health's concern that surface soils should contain no more than 1 ppm of PCBs.

COMMENT 8: *Columbus McKinnon pointed out that the draft TAGM for evaluation of contaminated sediment provides for conducting site specific fish studies to determine the ultimate impact of PCB contaminated sediments on aquatic organics. The firm certainly can undertake such a study if it considers the information to be potentially useful. The study being contemplated would involve subjecting fish to actual environmental conditions in Ellicott Creek and determining the impact. With respect to scheduling, it does not appear possible that such a study could exceed the 45 days allotted for revision to the draft FS. Therefore, the study results can be submitted at some later date for evaluation and consideration by the Department in the Record of Decision (ROD) process.*

RESPONSE: This comment is acknowledged.

COMMENT 9: *The evaluation of alternatives should clearly express the State's concern about leaving contaminated soils and sediments in the environment. Therefore, placing 6" of soil or gravel over highly contaminated soil will not be acceptable. The approach is rather unorthodox because it lacks the pump and treat counterpart for containing contaminant migration.*

RESPONSE: The evaluation of alternatives presented in the FS report addresses the State's concern about leaving contaminated soils and sediments in place by including the NYSDEC's hierarchy of remedial technologies.

Groundwater migration was not identified as a contaminant migration pathway in the NYSDEC - approved RI report nor the FS. The Response to Comment No's. 7 and 8 of the October 16, 1991 comment letter illustrates this fact. It is difficult to understand the State's reversal of opinion as to the contaminant migration pathways of concern with no additional data to support their contention. Thus, containment of groundwater was never identified as a necessary remedial technology. In addition, as identified in Response to Comment No. 7 of the Department's October 23, 1991 letter, the USEPA'S "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" states that "Consistent with Superfund expectations low-threat (viz., <500 ppm PCBs) material should generally be contained on-site". Thus, the cap/cover alternatives presented in the FS are not unorthodox in that they achieve the remedial action objectives and are consistent with the USEPA'S guidance for PCB contaminated sites.

COMMENT 10: *Mention was made that the installation of cofferdams would extend the remediation project to two (2) construction seasons. This statement was rather surprising given the scope of sheet piling work needed. Therefore, it would be helpful to explain the basis for this projection.*

RESPONSE: The time frame required to implement each alternative is discussed for each alternative presented in the FS report.

COMMENT 11: *Your consultants have come to the conclusion that soil removal by means of a "V" shaped excavation can be accomplished without causing significant risk to the building foundation or rip-rap. If this alternative is carried forward for detailed evaluation, the FS appendices should show the engineering computations and show how the removal of soil within the "V" will remove 78% of PCB mass from the site.*

RESPONSE: The PCB mass removal calculations have been finalized and included in Appendix B for the State's review. In addition, Plate No's. 3, 4 and 5 illustrate the concentrations of PCB's not removed under this excavation alternative.

COMMENT 12: *One major criticism of the September draft FS report is the lack of supporting data and computations. This work should be shown in appendices.*

RESPONSE: All supporting calculations and documentation utilized in the evaluation of alternatives are included as appendices to this FS report for your review.

COMMENT 13: *Cost alone will not be a basis for rejection of remedial alternatives. Alternatives which are considered implementable <u>must</u> be carried through the detailed evaluation. It should be pointed out that any remedy which call for the removal of contaminated soil and sediment will be complicated. However, being complicated should not be confused with implementable. The underlying theme of evaluation done so far is that there will be no quick fix remedy.*

RESPONSE: Cost is presented along with each of the evaluation criteria used for evaluating alternatives. No alternative is eliminated on the basis of cost alone. Cost is considered along with each of the other evaluation criteria.

COMMENT 14:	*The revised draft FS will be submitted within 45 days of October 16, 1991, the date of receipt of NYSDEC's disapproval of the first full draft.*
RESPONSE:	The Department granted a one week extension for submission of the revised draft FS report. Therefore, the revised deadline for submission is December 6, 1991.
COMMENT 15:	*Enclosed is a copy of the Department's Fish and Wildlife guidance on the use of aquatic sediment criteria which has previously been provided in the draft TAGM. You may find this helpful for this project.*
RESPONSE:	The Department's Fish & Wildlife guidance on the sediment criteria was utilized in the preparation of this version of the FS report.
COMMENT 16:	*While not discussed at the meeting, an estimate of O&M cost as present worth for each alternative is needed. Another column would be needed on Table 4-1 to include this information.*
RESPONSE:	An estimate of Operation and Maintenance cost was included into Table 4-1 and into the present worth for each alternative.

Sediment pore water concentrations were calculated on the basis of both the maximum and average PCB concentration in creek sediment under three (3) conditions as follows:

- prior unremediated conditions (prior to the installation of the IRM);
- current conditions (following installation of the IRM); and
- background conditions (characterized by NYSDEC sediment sampling results in Ellicott Creek beyond the limits of site-specific sampling programs).

Although the Hazard Quotients suggest there is a potential for chronic toxicity of Study Area creek sediments to aquatic organisms for each condition, the hazard quotients for the current condition (with the IRM in place) are less than for the background condition and represent only a marginal potential for aquatic toxicity.

4.0 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES

Based upon the contaminant characterization results, the exposure pathways, and risk evaluation presented in the remedial investigation, three (3) media- or location-specific components requiring remedial action have been identified:

- study area soils;
- the portion of the creek bank adjacent to the study area; and
- the narrow band of Ellicott Creek sediments adjacent to the site which has exhibited elevated PCB concentrations.

The NYSDEC-approved Remedial Investigation Report and Addenda concluded that the primary contaminant exposure pathways which may result in significant human health risk are from lead and PCBs in surficial soils by ingestion and/or dermal contact by site maintenance workers. The environmental risk assessment concluded that prior to completion of the IRM there may have been a significant potential for chronic toxicity for aquatic organisms exposed to sediments contaminated with PCB Aroclor 1254 in the creek immediately adjacent to the site, as well as for wildlife which consume fish from the creek. The additional environmental risk assessments performed as part of this FS indicate that these environmental risks have been effectively reduced to below background conditions by implementation of the IRM. Based upon this assessment, the following remedial action objectives have been developed for the Columbus McKinnon site:

1) To prevent ingestion/human contact with PCBs and lead in Study Area surficial soils.

2) To prevent releases of PCBs from Study Area sediments and soils that would result in adverse impacts on health and the environment.

5.0 DEVELOPMENT AND SCREENING OF GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES

The following subsections identify all general response actions available for each environmental media affected.

Soils

The portion of the Study Area where detectable PCB and/or lead contamination was observed in soils/fill constitutes an area of approximately 0.33 acres. The volume of soils requiring remediation is dependent upon the cleanup level(s) to be achieved and the depth of contaminants.

General response actions for both on-site and off-site Study Area soils are presented in Table 2-1. Alternatives for remediation of the soils include: no action; institutional controls; containment/isolation; in-situ treatment; various excavation methods followed by on-site or off-site treatment and/or disposal.

Creek Bank

The IRM riprap over geotextile erosion control fabric covers a 165-foot portion of the creek bank at the Columbus McKinnon site. The IRM was placed along the entire portion of creek bank in the Central Area as well as a segment of the creek bank in the South Area (Conrail property south of the Central Area) in order to prevent erosion of the more highly-contaminated soils from the Central area to Ellicott Creek. While implemented as an interim measure, the IRM has a high degree of permanence and effectiveness in accomplishing the remedial action objectives for this media. Consequently general response actions for creek bank include: the no-action alternative (i.e., leave the IRM in place); various containment alternatives including extending the IRM, augmenting the IRM by additional containment technologies; or excavation followed by treatment and/or disposal.

Ellicott Creek Sediment

Based upon Study Area data, the volume of Ellicott Creek sediments in the vicinity of the Columbus McKinnon site defined by detectable PCB concentrations is approximately 360 cubic yards. This volume of sediments is limited to an area of approximately 9100 square feet immediately adjacent to the site ranging from 0 to 2-feet in depth. However, the creek bank IRM extends into and covers approximately 4000 square feet of the contaminated sediments bordering the creek bank. As a result, approximately 130 cubic yards of the most highly-contaminated sediments have already been isolated. The remaining volume of unremediated contaminated sediments is therefore limited to approximately 230 cubic yards.

General response actions identified for the sediments are presented in Table 2-1 and include: no action; containment; and dredging followed by treatment and/or on-site or off-site disposal.

General response actions were then developed into technology alternatives for remediation of each of the environmental media at the Columbus McKinnon site. Each alternative was then screened with respect to its overall effectiveness in achieving the remedial action objectives for the site, as well as its implementability.

6.0 SUMMARY OF DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of the remedial alternatives remaining after screening. Each alternative was reviewed with respect to the seven evaluation criteria presented in the NYSDEC's TAGM for the "Selection of Remedial Actions at Inactive Hazardous Waste Sites." These criteria serve to provide a basis of comparison and allow for ranking of the alternatives:

- Short-Term Impacts and Effectiveness - The effectiveness of alternatives in protecting human health and the environment during construction and implementation of the remedial action is evaluated by this criterion. Short-term effectiveness is assessed by protection of the community, protection of workers, environmental impacts, and time until protection is achieved.

- Long-Term Effectiveness and Permanence - This criterion evaluates the long-term protection of human health and the environment at the completion of the remedial action. Effectiveness is assessed with respect to the magnitude of residual risks; adequacy of controls, if any, in managing treatment residuals or untreated wastes that remain at the site; reliability of controls against possible failure, and potential to provide continued protection.

- Reduction of Toxicity, Mobility and Volume - This evaluation criterion addresses the statutory preference for selecting remedial actions that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when the treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

- Implementability - This assessment evaluates the technical and administrative feasibility of alternatives and the availability of services and materials.

- Compliance with ARARs - This threshold assessment addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) of Federal or State environmental statutes or Standards, Criteria and Guidelines (SCGs) or provide grounds for invoking a waiver.

- Overall Protection of Human Health and the Environment - This is a threshold assessment which addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled. This evaluation allows for consideration of whether an alternative poses any unacceptable short-term or cross-media impacts.

- Cost - The estimated capital and long-term maintenance and monitoring costs are evaluated by this criterion.

Table 4-1 summarizes the results of the detailed analysis of the remedial alternatives by presenting the relative scoring of each evaluation criteria as well as the costs of each alternative. The results of the detailed analysis are discussed individually for each environmental medium below:

Soils

Although public access to the site is restricted or prevented under the no-action and institutional control alternatives, respectively, the potential for incidental contact with the soils by maintenance workers and associated health risks are not addressed under the no-action alternative. The potential for overland erosion of the soils not covered by plastic sheeting also remains under both alternatives. The long-term effectiveness of the existing plastic sheeting in the Central Area is also an issue.

All of the cover alternatives evaluated in detail (i.e., topsoil, asphalt, gravel or synthetic/soil), if properly maintained, provide long-term effectiveness in eliminating the potential for direct contact and associated health risks and prevent release of PCBs from the Study Area resulting from erosion. All of the cover systems are readily implementable. The synthetic/soil cover, while the most expensive cover system alternate, is most effective in creating a permanent barrier to direct contact and erosional loss of potentially contaminated soil, and substantially reduces infiltration of precipitation. The estimated present worth of the cover alternatives ranges from $200,000 to $291,000.

Excavation of the principal-threat soils is a readily implementable removal alternative. Any of the remaining excavation alternatives followed by off-site disposal are not as readily implementable as any of the cover alternatives or excavation of the principal-threat soils due to the necessity for a timber-deck haul road and the administrative obstacles precluding the excavation work. Neither the cover alternatives nor any of the excavation alternatives fully comply with the chemical-specific SCGs for this site medium in that they do not destroy or remove all the contamination from the site. All technologies will reduce long-term mobility of the contamination by preventing erosion, and will be permanently effective, providing that the cover system is maintained. None of the excavation options are completely effective in removing PCBs from the Study Area even when extensive and expensive structural sheeting is employed, due to a number of site-specific constraints including: the maximum depth of excavation; creek bank, IRM, building foundation, and railroad embankment concerns. The estimated mass of PCB contaminants that would be removed by various excavation options ranges from approximately 40 to 67 percent of the maximum present.

The estimated present worth of the excavation alternatives ranges from $1.4 million to $8.3 million for the incineration option, and from $594,000 to $2.3 million for the disposal option.

Creek Bank

Substantial reduction of environmental and human health risk from the prior unremediated condition has already been provided under the no-action alternative by installation of the IRM over the most heavily contaminated portion of the site. Calculation of the Hazard Quotient for the existing bank and creek bed conditions indicates only a marginal potential for aquatic toxicity and presents an environmental risk below that of background conditions in Ellicott Creek. However, the potential for release of PCBs and heavy metals, and for direct contact with potentially contaminated soil/fill from the exposed segments of creek banks still exists under the no-action alternative. Although the presence of contamination along the creek banks has not been verified erosion of the uncovered portion of the creek banks is occurring and provides the potential for continued contaminant loading to Ellicott Creek.

Calculation of estimated contaminant loadings to Ellicott Creek from the creek banks indicates that extension of the creek bank IRM or placement of revetment fabric will be effective in reducing PCB-contaminant loadings to the creek, and provide an unquantifiable reduction in human health risk. Both alternatives will provide long-term effectiveness with routine maintenance and repair, however the maintenance and repair of revetment fabric will be much more difficult and frequent . Whether either alternative complies with the chemical-specific TBCs for soils or sediment is unknown since contamination of the creek banks has not been verified; however, compliance with these TBCs is not considered appropriate due to the technical impracticability and potential for greater short-term risk resulting from disturbance of soils or sediments if the existing creek banks are disturbed.

Excavation of the creek bank will eliminate the potential for contaminant migration to Ellicott Creek via erosion; however, this will be accomplished only at significant short-term risk to the public, environment, and workers, and the implementability of this option is in serious question.

Ellicott Creek Sediments

A recent survey of the creek bed indicates that approximately 44% of the total area of creek sediment identified in the RI as contaminated is covered by the existing IRM. Hazard quotients calculated for these current conditions indicate only a marginal potential for aquatic toxicity and represent a lower potential for environmental risk than upstream and downstream reaches of Ellicott Creek not impacted by the Columbus McKinnon site. Therefore, while the no-action alternative does not further reduce the toxicity or volume of contaminants, the existing creek bank IRM effectively eliminates the mobility of the contaminated stream sediments, and prevents direct contact with aquatic biota thus substantially reducing potential risks to the environment. Development of a long-term maintenance program would assure the integrity and long-term effectiveness and performance of this alternative.

Both containment alternatives are readily implementable and, with proper measures taken during installation, can control short-term risks and be immediately effective once installed. All of the hydraulic dredging alternatives for the sediments are less readily implementable due to the many phases of the work (construction and operation of the dewatering units, dredging, treatment of the return water and transport of the contaminated sediments for the non-IRM removal option and addition of cofferdam sheeting for the IRM removal option) and presents greater short-term environmental and human health risks. The hydraulic dredging options requiring the installation of a cofferdam in the stream provide significant obstacles to implementability; specifically increased flood potential and prolonged impediments to navigation in this segment of Ellicott Creek.

Aside from the dredge/treatment/disposal alternatives, neither containment nor dredging and off-site disposal reduce the toxicity or volume of the contaminants. Both technologies immobilize the contamination, although no long-term maintenance is required once the sediments are removed through dredging. The present worth for the two containment options are $242,000 and $363,000, respectively; while the present worth of the hydraulic dredging/treatment/offsite disposal options are considerably greater at approximately $654,000 to $2.7 million.

7.0 RECOMMENDED REMEDIAL ALTERNATIVE

Based on the results of the analyses presented in Sections 2 through 4 of the FS report, the recommended remedial approach for the Columbus McKinnon site consists of:

- selective excavation of principal-threat soils, followed by off-site disposal in a permitted secure hazardous waste landfill;
- placement of a synthetic/soil cover system over the Study Area soils; and
- extending the IRM to stabilize the uncovered portions of the creek bank as well as the associated creek sediments.

The remedial approach outlined above consists of selectively excavating soils from each nominal 25-foot by 25-foot Study Area grid exhibiting PCB concentrations in excess of 500 mg/kg from any historical or RI sample collected and analyzed from that grid as tabulated below.

SUMMARY OF PRINCIPAL THREAT SOILS TO BE EXCAVATED		
Grid	**Depth of Excavation (feet)**	**Excavated Soil Volume (cy)**
Q	2	46.3
R	2	46.3
S	2	46.3
CC	4	44.4
EE	4	77.8
FF	2	44.4
TOTAL		305.5

The excavated areas would be filled with either surficial soil graded from adjacent areas of the site and/or clean off-site borrow soil. The remainder of the site would be regraded and clean off-site select fill would be placed and compacted to achieve design subgrade elevations and slopes. The final grades of all covered areas will be above the 100-year flood elevation of 571.6. A synthetic membrane/soil cover system, as depicted below, would then be installed over the Study Area covering all soils with PCBs in excess of 10 mg/kg as delineated by historical or RI data.

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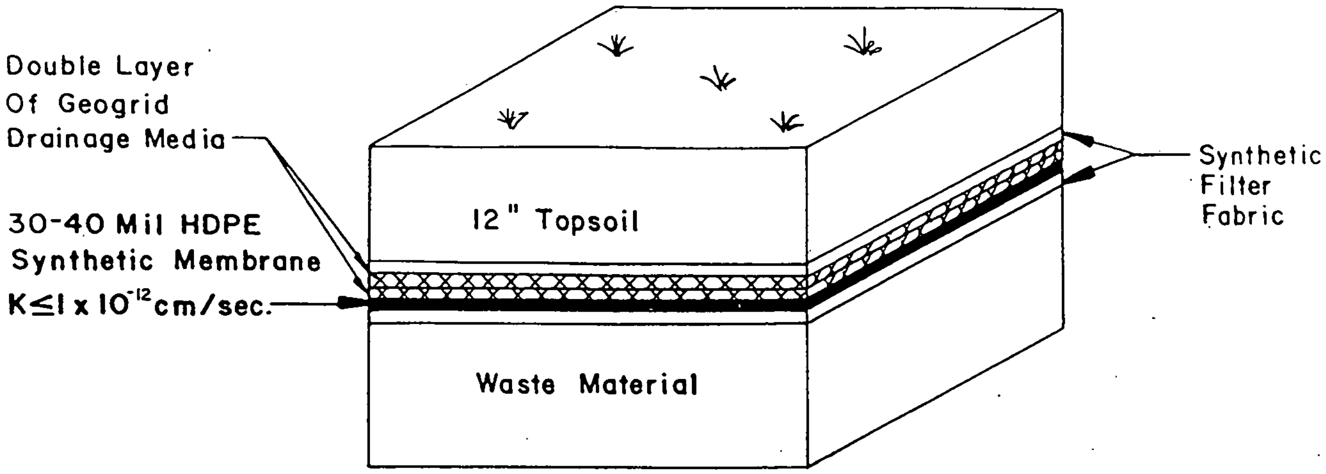
SYNTHETIC/SOIL COVER SYSTEM



In addition, the same riprap/erosion control fabric design employed in the existing IRM would be utilized to cover the remaining portions of the creek bank adjacent to the Study Area. This system would also necessarily extend into Ellicott Creek to cover all the study area sediments.

The synthetic/soil cover system will effectively reduce the PCB and lead loadings to Ellicott Creek provided by the existing mitigative measures by eliminating erosion from the surface of the site, and will provide an effective, long-term and reliable means to prevent direct contact with or ingestion of the contaminated Study Area soils. The extension of the creek bank IRM will prevent erosion of the bank to Ellicott Creek, and will completely cover the remaining exposed Study Area sediments on either side of the existing IRM.

This recommended remedial alternative fully meets or exceeds the remedial action objectives. Implementation of these alternatives can occur quickly, be effective immediately, and will provide no appreciable increased short-term environmental risk to the public health or the environment. Implementation of these remedial measures provides protection of both human health and the environment by preventing the potential for contact or ingestion of PCBs and lead and by preventing the potential for release of PCBs from the Study Area soils or sediments which could result in adverse environmental impacts.

A summary of the capital and annual operating and maintenance costs for the recommended remedial approach is as follows:

Action	Capital Cost ($)	Annual O&M ($)
Select excavation of principal-threat soils followed by off-site disposal	$509,000	$7,600
Placement of a synthetic/soil cover system across the Study Area soils	$220,000	*
Extension of the IRM to stabilize uncovered portions of Study Area creek bank and adjacent creek sediments	$292,000	$4,500
TOTAL	$1,021,000	$12,100
* Annual O&M included in excavation estimate		

1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF THE REPORT

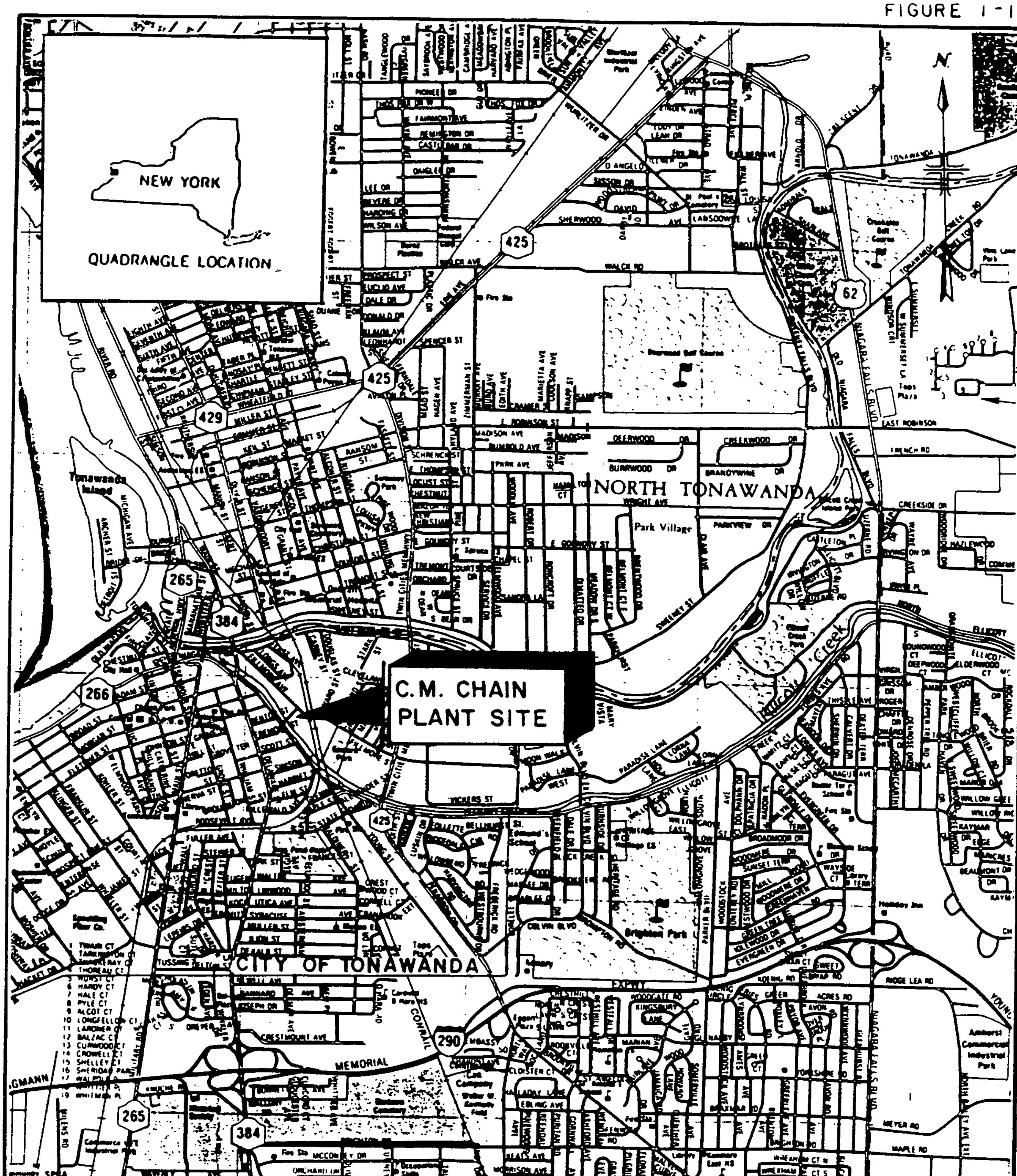
A site located along Ellicott Creek (Figure 1-1), which encompasses an alleged former waste oil disposal area at the Columbus McKinnon Corporation (CM), Tonawanda, New York facility, has been listed by the New York State Department of Environmental Conservation (NYSDEC) on the New York State Registry of Inactive Hazardous Waste Disposal Sites (Site Number 915016). The NYSDEC has classified the site as "2", having found that portions of the site present a significant threat to the public health or the environment. Subsequently, CM Corporation entered into an Order-on-Consent dated October 2, 1989 (Index No. B9-0240-88-10) with NYSDEC to: a) design and implement an Interim Remedial Measure (IRM) to prevent erosion of Ellicott Creek bank soils; b) develop and implement a Work Plan for the completion of a Remedial Investigation/ Feasibility Study for the alleged former waste oil disposal area; and c) prepare and submit an approvable RI report and FS Study for the site. Columbus McKinnon Corporation contracted with Malcolm Pirnie, Inc. to conduct the required Remedial Investigation/ Feasibility Study and design the IRM. The Remedial Investigation Report was conditionally approved by the NYSDEC on June 27, 1991, with an Addendum subsequently approved on September 4, 1991.

The purpose of this Feasibility Study (FS) is to: identify and evaluate candidate treatment and containment alternatives for remediation of the contamination identified in the RI; and to develop a remedial approach which will provide reliable, long-term protection of human health and the environment in a cost-effective manner. This FS report consists of five (5) sections as follows:

- The balance of Section 1 presents a summary of the site background including information contained in the RI, as well as a summary of the potentially applicable, relevant and appropriate requirements (ARARs) for the site.

- Section 2 presents the remedial action objectives for the site and identifies potential general response actions available to address the contaminants (viz. PCBs and lead) and media of interest (viz. soils and creek sediments).

FIGURE 1-1



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REMEDIAL INVESTIGATION FEASIBILITY STUDY

LOCATION OF C.M. CHAIN PLANT SITE

COLUMBUS McKINNON CORP. SEPTEMBER 1991

- Section 3 develops and combines the technologies and sub-options of screened general response actions into site-specific alternatives for remediation of the contaminated soils and sediments. These remedial alternatives are screened based on their effectiveness in achieving the remedial action objectives and their implementability.
- Section 4 provides a detailed analysis of each of the potentially feasible remedial alternatives based upon NYSDEC criteria for selection of a remedy in accordance with CERCLA and the Order-on-Consent.
- Section 5 describes the recommended remedial alternative, summarizes the rationale for remedy selection, and presents preliminary cost estimates.

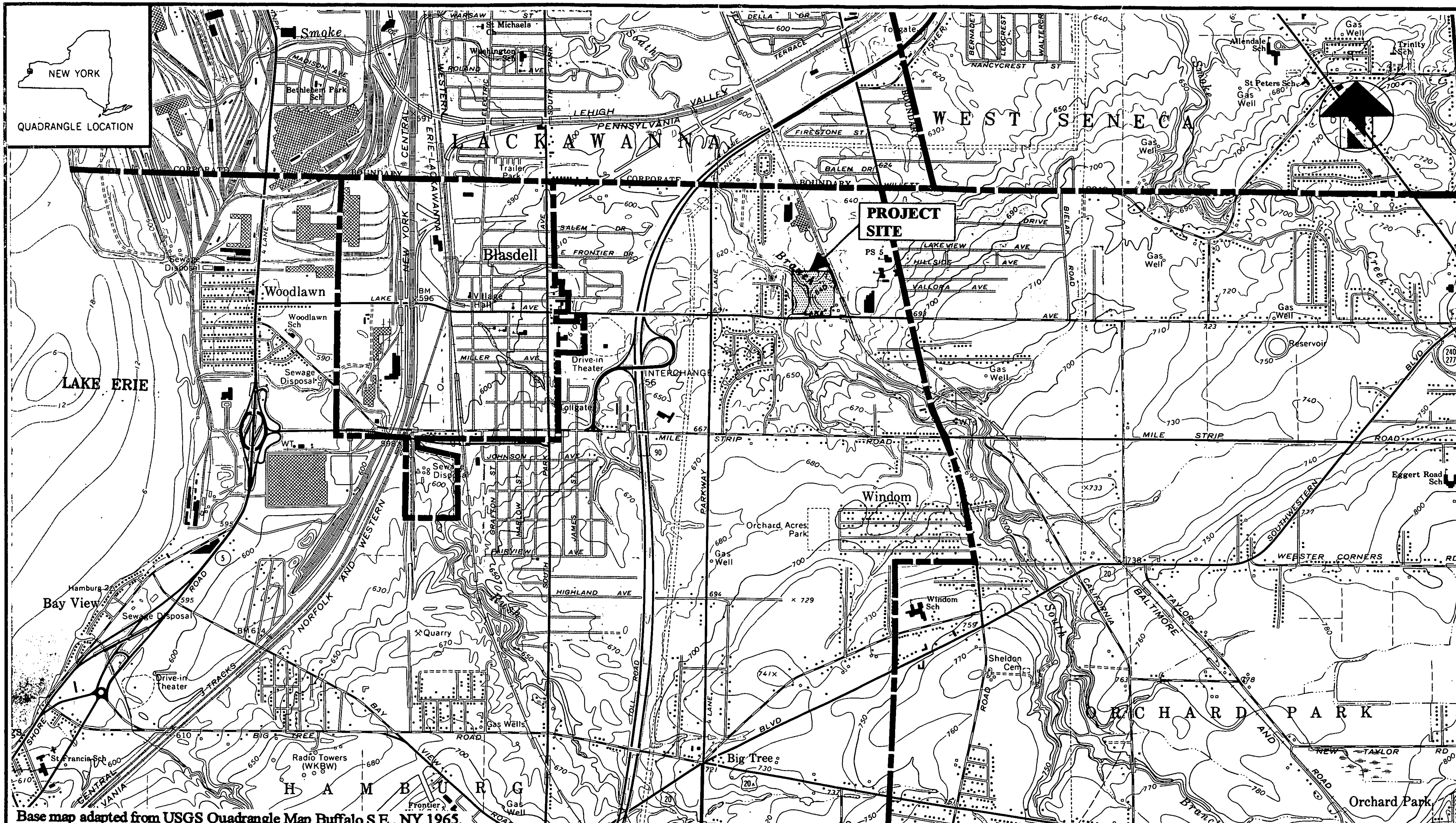
1.2 BACKGROUND INFORMATION

1.2.1 Study Area and Site History

The Study Area is located along Ellicott Creek at the CM Corporation's industrial facility at One Fremont Street in the City of Tonawanda, New York (Figure 1-2). The Study Area, as defined in the NYSDEC-approved RI Work Plan (Malcolm Pirnie, 1989), encompasses the area of known or suspected contamination determined by previous investigations. The Study Area boundaries are defined by the foundations of CM buildings, the Conrail railroad embankment, and the near-shore areas of Ellicott Creek as shown on Figure 1-2. The entire site is fenced and the site can be accessed only through the building.

Columbus McKinnon Corporation's facility was operated until 1984 for the manufacture of a variety of chain products. Since 1984, the facility has been used by CM to house a small forging and heat treating operation, and for the storage of CM products for sale, as well as for rental to other manufacturers.

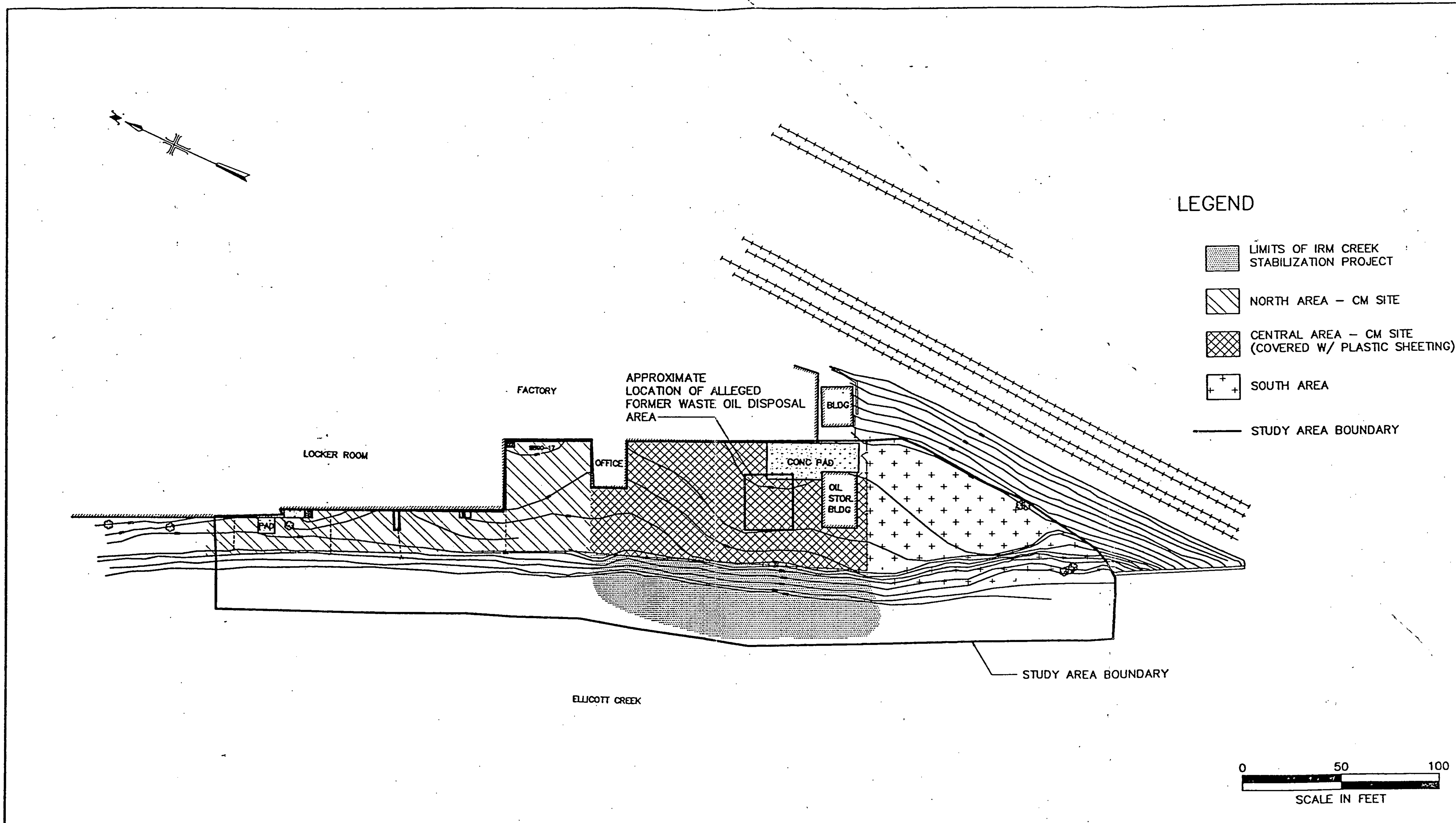
From 1930 through 1965, a small area of the plant property was allegedly used for the disposal of spent water-soluble cutting oils (see Figure 1-2). Reportedly, the alleged waste oil disposal area was a shallow depression on the order of one (1) foot deep. A total of 27,000 gallons of these oils were reportedly disposed of in the alleged waste oil disposal area through 1965, although company representatives believe this figure is substantially inflated. There has been no allegation that waste oil has been disposed of on-site since 1965. As a precautionary measure, the area of elevated PCB concentrations was covered with a durable plastic membrane in February 1983 to prevent soil migration to Ellicott Creek. The history of investigations at the site is summarized in the RI report.



Legend:
Corporate Boundary

McMahon & Mann Consulting Engineers, P.C.	**CHEM-TROL SITE** **HAMBURG, NEW YORK** **Scale: 1"=2000'**	**LOCATION PLAN** **Figure 1**

FIGURE 1-2



MALCOLM PIRNIE

COL-01-F12

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PROJECT STUDY AREA

COLUMBUS McKINNON CORPORATION SEPT 1991

The NYSDEC inspected the site on June 15, 1979 and issued a Hazardous Waste Disposal Site Report in April 1980. At that time, the NYSDEC and the NYS Department of Health classified the inactive waste site as "5" - no further action required (AES/CRA, 1985). Subsequently, investigations voluntarily conducted by Columbus McKinnon confirmed the presence of hazardous waste on the site and, in March 1987, the NYSDEC reclassified the site as a "2".

Pursuant to NYSDEC Order-on-Consent No. B9-0240-88-10, Columbus McKinnon completed IRM construction during the period of October - November 1990. The selected IRM design consisted of grading 165 feet of the creek bank along the site to uniform slopes and installation of filter fabric and riprap to provide erosion protection from storm water surface runoff as well as channel and wave erosion in Ellicott Creek. Details of the IRM are described in the IRM Work Plan (Malcolm Pirnie, February 1990) and IRM Construction Bid Package (Malcolm Pirnie, May 1990).

1.2.2 Nature and Extent of Contamination

Characterization of the nature and extent of contamination within the Columbus McKinnon site Study Area was accomplished by the collection and analysis of soil, ground water, and creek sediment samples. In accordance with the RI Work Plan, historic analytical data was used to characterize the nature of soil/ground water contamination and to identify the general area of contamination within the Study Area. Additional sampling was conducted during the RI to, in conjunction with the historic data, more precisely define the horizontal and vertical extent of soil/fill contamination and to verify the presence/ absence of ground water contamination. In accordance with the RI Work Plan, all samples were analyzed for PCBs and metals of concern (cadmium, chromium, nickel, and lead) as identified by NYSDEC. Also in accordance with the Work Plan, selected samples were analyzed for halogenated volatile organic compounds (HVOCs). The following subsections summarize the results of the analytical data collected during RI. Appendix A1 presents the individual sample analytical results. Plate 1 illustrates the locations of sample collection points at the site.

1.2.2.1 Soil

For the purpose of the soil results discussion, the site has been segregated into the following areas as shown on Figure 1-2:

- North Area - north of the office;
- Central Area - the area now covered by plastic sheeting and which includes the alleged former waste oil disposal area;
- South Area - Conrail property, between the railroad embankment and Ellicott Creek.

North Area

- Halogenated Volatile Organics - No HVOCs were detected in any of these samples.
- PCBs - PCB contamination in the North Area occurs principally in surficial soil/fill (i.e., 0-2 feet). The concentration of PCBs (i.e., Arochlor 1254) in surficial soil/fill in this area ranged from 0.36-125 mg/kg, with an average of 20 mg/kg (see Table 1-1).
- Metals - The concentrations of cadmium and lead in the fill material are elevated above naturally occurring background concentrations. Metal concentrations in the native soils underlying the fill are not elevated above naturally occurring levels.

Central Area

- Halogenated Volatile Organics - No volatile organic compounds were detected in the surficial soil samples collected in this area. However, trace concentrations of HVOCs (most notably dichlorobenzenes) were detected at depth (i.e., at 4-8 ft) at five (5) sample locations.
- PCBs - PCB contamination in the Central Area occurs both in surficial soil/ fill and at depth (see Table 1-2). The concentration of PCB in the surficial soil/fill was greater than 50 mg/kg at 29 of 46 sampling locations within the Central Area. The average concentration was 249 mg/kg. The PCB contamination at depth occurs predominantly within the area of the alleged former waste oil disposal area (see Figure 1-2). With the exception of three sample locations from an area of thin fill, only trace PCBs were detected in the native soil underlying the fill in the Central Area.

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-1
SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS
FOR NORTH AREA

Parameter	Depth Interval (feet)	Number of Occurrences/Analyses	Adjusted Dry Weight Basis[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2	21/30	0.36 - 125	20
	4-8	9/31	0.32 - 16	1.5
	8-16	2/9	1.8 - 33[3]	4.0 (0.37)
Cadmium	0-2	9/10	0.63 - 7.9	4.0
	4-8	8/31	1.3 - 233[3]	9.5 (2.0)
	8-16	0/10	ND	<0.5
Chromium	0-2	10/10	6.5 - 300[3]	65 (39)
	4-8	31/31	7.7 - 200[3]	32 (20)
	8-16	9/9	7.7 - 35	17
Nickel	0-2	10/10	9.3 - 96	36
	4-8	31/31	6.0 - 417[3]	48 (27)
	8-16	9/9	12 - 38	23
Lead	0-2	10/10	16 - 1200[3]	215 (105)
	4-8	31/31	4.8 - 1100[3]	75 (41)
	8-16	9/9	7.3 - 90[3]	19 (11)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the North Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods as described in Section 6.3.1 of the RI Report.

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-2
SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS FOR CENTRAL AREA

Parameter	Depth Interval (Feet)	Number of Occurrences/Analyses	Adjusted Dry Weight Basis[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2	46/46	0.22 - 2220[3]	249 (205)
	2-4	21/21	0.17 - 934	155
	4-8	39/43	0.04 - 153	23
	8-16	3/15	0.30 - 5.0	0.52
Cadmium[1]	0-2	10/12	1.1 - 28	10
	2-4	3/4	5.6 - 31	14
	4-8	14/22	1.4 - 45	7.7
	8-16	3/17	1.0 - 2.3	0.84
Chromium[1]	0-2	12/12	14 - 351	139
	2-4	4/4	29 - 154	101
	4-8	22/22	7.2 - 375	98
	8-16	17/17	4.4 - 18	12
Nickel[1]	0-2	12/12	19 - 1038	310
	2-4	4/4	194 - 614	411
	4-8	22/22	15 - 925	250
	8-16	17/17	11 - 30	20
Lead[1]	0-2	12/12	19 - 6750[3]	1017 (496)
	2-4	4/4	35 - 2638	1357
	4-8	22/22	5.9 - 2250	434
	8-16	16/17	5.2 - 233[3]	24 (11)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the Central Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods described in Section 6.3.1 of the RI Report.

- Metals - High concentration of metals in the Central Area also occurred within the surficial soil/fill. The concentrations of metals (Cd, Cr, Ni, Pb) diminish with increasing depth through the fill and into the underlying native soil.

South Area (Conrail Property)

- Halogenated Volatile Organics - Essentially no HVOC contamination was detected.

- PCBs - Similar to the North Area, the PCB contamination in the South Area occurs principally within the surficial soil/fill. The concentration of PCBs in the surficial soil/fill range from 0.63-427 mg/kg and average 51 mg/kg. Only one (1) of 21 samples collected at depth in the South Area exhibited a PCB concentration greater than 10 mg/kg (see Table 1-3).

- Metals - The concentrations of the four metals of interest within the fill are elevated above naturally occurring background concentrations. Concentrations of the four metals in the native soil underlying the fill were not elevated above naturally-occurring background concentrations.

1.2.2.2 Ground Water

Well cluster MW-2 is located immediately adjacent to the reported location of the alleged former waste oil disposal area. Well cluster MW-1 is also within the study area, but is somewhat removed from the alleged former waste oil disposal area in a cross-gradient direction. Well MW-3 is a background well located upgradient of the study area.

Ground water data obtained from the May 1990 sampling event for wells MW-1S, MW-2S, and MW-3 is considered to be biased due to the presence of a substantial amount of sediment in the samples. These wells exhibited the highest concentrations of contaminants (PCBs, metals), but also exhibited the highest turbidity. It is noted that shallow wells MW-1S and MW-2S are screened opposite fill material, therefore contaminants in the turbid samples are most likely adsorbed onto fill material which has entered the well. In comparison, samples collected from wells MW1I and MW2I, which are screened in permeable native soils underlying the fill, exhibited much lower turbidity and contaminant concentrations. Consequently, the true (dissolved) concentration of contaminants in the shallow ground water cannot be determined from the May 1990 ground water sampling results.

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-3
SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS FOR SOUTH AREA

Parameter	Depth Interval (Feet)	Number of Occurrences/Analyses	Adjusted Dry Weight Basis[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2	18/21	0.63 - 427[3]	51 (32)
	4-8	7/10	0.45 - 4.8	1.7
	8-16	1/11	ND - 28[3]	2.7 (ND)
Cadmium	0-2	7/7	1.9 - 114	48
	4-8	10/10	0.8 - 45	13
	8-16	1/11	ND - 1.3	0.60
Chromium	0-2	7/7	59 - 688	391
	4-8	10/10	26 - 457	244
	8-16	11/11	11 - 165[3]	30 (16)
Nickel	0-2	7/7	75 - 1250	692
	4-8	10/10	56 - 2750[3]	602 (364)
	8-16	11/11	20 - 1267[3]	136 (23)
Lead	0-2	7/7	313 - 16,250[3]	5020 (3148)
	4-8	10/10	0.6 - 3750	1826
	8-16	11/11	3 - 217[3]	41 - (8.6)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the South Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods as described in Section 6.3.1 of the RI Report.

After discussion and agreement with NYSDEC, all ground water monitoring wells were resampled in May 1991 using procedures designed to better define the character (i.e., dissolved or particulate) and source of any contaminants present in the well. Two (2) measures were taken during the May 1991 sampling event to resolve questions due to sample turbidity: a) purging was performed at the natural recovery rate of the well to minimize sample turbidity; and b) both total and field-filtered samples were submitted for the analysis of PCBs and metals.

Data from the May 1991 sampling event indicated that shallow ground water in the well nearest to the alleged former waste oil disposal area contained trace levels of volatile organics, no detectable metals with the exception of nickel, and no detectable PCBs (see data summary contained in Appendix A1). Ground water collected from all other study area monitoring wells contained no detectable metals, HVOCs or PCBs.

1.2.2.3 Creek Sediments

During the RI, Arochlor 1254 was detected at 87 mg/kg (dry wgt.) just offshore of the alleged former waste oil disposal area. PCBs were detected at concentrations less than 20 mg/kg (dry wgt.) at all other sediment sampling stations. Concentrations of metals and PCB (Arochlor 1254) offshore from the alleged former waste oil disposal area were elevated with respect to upstream sampling locations and downstream locations. The magnitude of PCB concentrations determined from historic sampling was higher than the recent RI sampling results. However, the spatial distribution of PCB in Ellicott Creek sediment observed during historic investigations was very similar to that determined during the more recent RI.

Filter fabric and riprap, installed as an Interim Remedial Measure to control erosion of the creek bank, extends approximately 20 to 25 feet into the creek and overlies contaminated creek sediment. The actual distribution of submerged riprap is shown on Plate 1, which is based on a survey of the creek bottom conducted by Malcolm Pirnie on September 12-13, 1991. The limits of the riprap cover the area of highest PCB concentrations detected in creek sediment, and approximately 44% of the total area (36 percent of the total volume) of sediment exhibiting detectable PCB concentrations (see Section 2.3.2).

1.2.3 Contaminant Fate and Transport

A comparison of yearly contaminant loadings to Ellicott Creek via ground water and soil erosion under current conditions (viz. including all temporary and/or the Interim Remedial Measure implemented to date) indicated that soil erosion is the predominant contaminant migration pathway, and that contributions from other potential pathways were negligible. In addition, those measures completed at the Study Area to date are estimated to have resulted in more than a 90% reduction in PCB loading and an approximate 55% to 80% decrease in the metal loading to the Creek from the Study Area.

1.2.4 Public Health and Environmental Concerns

Contaminants which were evaluated in connection with the public health and environmental risk evaluation consisted of PCBs, cadmium, chromium, lead and nickel. These compounds were selected due to their inherent toxicity and their frequency of detection in on-site soils.

Although Columbus McKinnon believes that the approach taken to perform the risk assessment was very conservative and likely overstates the actual risks associated with the site, it is the approach recommended by USEPA to allow for uncertainties in the risk assessment process. In addition, the risk assessment was performed on the basis of the former unremediated conditions at the site. Health and environmental risk estimates summarized in the following sections are much lower for current conditions when the degree of risk reduction achieved by the Interim Remedial Measures now in place is considered.

1.2.4.1 Health Risk

In the health risk assessment section of the RI report, several potentially viable exposure scenarios to site contaminants were evaluated:

- maintenance personnel may contact contaminated soils, resulting in absorption of contaminants through the skin;
- maintenance personnel may inadvertently ingest contaminated soils during yard work;
- residents and recreational users of Ellicott Creek may periodically consume fish caught in the Creek; and

- recreational users of Ellicott Creek may periodically use the creek for swimming, resulting in ingestion and/or absorption of contaminants through the skin.

The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period with a reference dose (RfD) derived for a similar exposure period (USEPA 1989; "Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual"). This ratio of exposure to toxicity is called a hazard quotient. The non-cancer hazard quotient assumes that there is a level of exposure (i.e., the RfD) below which it is unlikely for even sensitive populations to experience adverse health effects. If the hazard quotient exceeds 1, there may be concern for potential non-cancer effects.

For the assessment of non-cancer effects, a hazard index approach is used. This approach assumes that subthreshold exposures to several chemicals at the same time could result in an adverse health effect. It assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures to acceptable exposures. The hazard index is equal to the sum of the hazard quotients. When the hazard index exceeds a value of one (1) there may be concern for potential health effects. The results of the human health risk assessment based on Study Area conditions prior to completion of the IRM are summarized in Table 1-4.

To evaluate the overall potential for non-cancer and cancer effects posed by multiple chemicals, the USEPA has developed guidelines (USEPA 1986; "Guidelines for Risk Assessment of Chemical Mixtures"). For the assessment of cancer effects, the individual risks associated with exposure to each contaminant are summed. This represents an approximation of the precise equation for combining risks which accounts for the joint probabilities of the same individual developing cancer as a consequence of exposure to two or more carcinogens. This additive approach assumes independence of action by the compounds involved (i.e., that there are no synergistic or antagonistic chemical interactions and all chemicals produce the same effect; i.e., cancer).

In summary, the non-cancer risks associated with ingestion and skin contact with surficial soils during site maintenance activities results in a hazard quotient for lead and an overall Hazard Index of 1, indicating a potential cause for concern due to possible lead exposure. However, the current estimated risk is lower due to the plastic sheeting which

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-4
HUMAN HEALTH RISK ASSESSMENT SUMMARY*

Contact Media	Exposure Route	Human Health Risk	
		Lead	PCBs
Soils	Ingestion	Slight toxicity concern	Cancer risk approx. 4 in 100,000
	Dermal	Slight toxicity concern	Cancer risk approx. 5 in 10,000
Surface Water/ Sediment	Ingestion	No toxic health effects	Cancer risk approx. 2 in 1 billion
	Dermal	No toxic health effects	Cancer risk approx. 7 in 100 trillion
Fish	Ingestion	N/A	Calculated maximum concentration of PCBs in fish fillets is 0.16 mg/kg; FDA tolerance limit for PCBs in fish as food is 2 mg/kg
	Dermal	N/A	N/A

* Prior unremediated condition

covers the Central Area soils and reduces the potential for exposure. While the plastic sheeting has been effective for over seven years, its use is not intended as a permanent remedial measure. PCBs are the only compounds which have an associated cancer risk through exposure via ingestion. As indicated, exposures from inadvertent ingestion of, and skin contact with, PCB-contaminated surficial soils may result in a risk level of about 4 in 100 thousand and 5 in ten thousand respectively. The current estimated risk is much lower than calculated due to the plastic sheeting reducing the potential for exposure. The estimated cancer risk associated with dermal contact and ingestion of surface water sediment from swimming in Ellicott Creek is much less than 1 in one million, and non-cancer health risks did not indicate the potential for toxic health effects. Potential health risks associated with consumption of fish caught in the Creek were not considered to be significant.

1.2.4.2 Environmental Risk

The environmental risks to fish and fish-eating wildlife exposed to Study Area creek sediment pore water were assessed in the RI by comparing predicted maximum pore water concentrations to Federal and New York State Ambient Water Quality Standards. Hazard Quotients were calculated for prior unremediated conditions (viz. prior to installation of the IRM and the temporary plastic sheeting).

In response to NYSDEC comments to the RI Report Addendum No. 1, dated September 4, 1991, Hazard Quotients are re-evaluated in this section using adjusted dry weight PCB concentrations in creek sediment. The methodology used to adjust the laboratory results for sediment from wet weight to dry weight is described in Addendum No. 1 to the RI report. Additional environmental risk assessments are performed in this section to incorporate the impact of the IRM at the site (see calculations in Appendix A2).

Sediment water concentrations were calculated on the basis of both the maximum and average PCB concentration in creek sediment under three (3) conditions as follows:

- prior unremediated conditions (prior to the installation of the IRM);
- current conditions (following installation of the IRM); and
- background conditions (characterized by NYSDEC sediment sampling results in Ellicott Creek beyond the limits of site-specific sampling programs).

The Hazard Quotient for the current condition suggested a potential for chronic toxicity for aquatic organisms exposed to near-shore creek sediment contaminated with PCB-1254 based on dry weight data immediately adjacent to the site. Table 1-5 presents calculated pore water concentrations and Hazard Quotients for each of the three (3) conditions listed above based on dry weight concentrations. Actual conditions are characterized by PCB concentrations at RI sediment sampling locations CS-1, CS-3, and CS-4 (in dry weight). Sediment sampling locations that are covered by the IRM (see Plate 1) are no longer representative of actual conditions since the sediment underlying the filter fabric and riprap is protected from erosion, and is subject to additional natural deposition of stream sediment and is physically isolated from aquatic organisms.

Sediment PCB concentrations from Ellicott Creek that were previously reported in the Niagara River Sediment Study (NYSDEC 1987, pg. 59 and 82) include a value of 3.6 mg/kg upstream of the Columbus McKinnon site and a value of 0.28 mg/kg downstream.

The Hazard Quotient calculated from this background creek sampling is presented in Table 1-5. Although the Hazard Quotients presented in Table 1-5 suggest there is a potential for chronic toxicity of Study Area creek sediments to aquatic organisms for each condition, the Hazard Quotients for the current condition (with the IRM in place) are less than for the background condition and represent only a marginal potential for aquatic toxicity. Furthermore, the Hazard Quotient presented in Table 1-5 suggests there is a potential for acute toxicity of study area creek sediments to aquatic organisms in the prior unremediated condition based on maximum (not average) sediment concentration of PCBs. The IRM has effectively reduced the Hazard Quotient by over two orders of magnitude to far less than 1.0 as evidenced by current conditions.

1.3 IDENTIFICATION OF ARARS

Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) establishes cleanup standards for remedial actions performed under Sections 104 and 106. Remedial actions must achieve and maintain threshold criteria that: assures protection of human health and the environment; and complies with applicable, relevant and appropriate Federal and State requirements (ARARs). For any material remaining on-site, unless an appropriate CERCLA waiver is invoked, the level or

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-5
AQUATIC TOXICITY QUOTIENT CALCULATION
FOR PCB-CONTAMINATED SEDIMENT PORE WATER

FRESHWATER AQUATIC TOXICITY CRITERIA ug/l:

Acute	Chronic	Notes	Ref.		
2	0.014 0.001	1 1	1 2		

HAZARD QUOTIENT CALCULATION:

	Sediment Conc. mg/Kg (dry wgt)	Pore Water Conc. (ug/l)	Hazard Quotient		
			Acute	Chronic	Ref.
Prior Unremediated Conditions	Max. 87	4.10	2.05	293 4100	1 2
	Avg. 14	0.66	0.33	47 660	1 2
Current Conditions	Max. 0.83	0.039	0.02	2.8 39	1 2
	Avg. 0.51	0.024	0.012	1.7 24	1 2
Background Conditions	Max. 3.6	0.17	0.085	12 170	1 2
	Avg. 1.9	0.090	0.045	6.4 90	1 2

NOTES:
(1) Criteria based on all chlorinated isomers of the compound.

REFERENCES:

(1) USEPA, 1986. Quality Criteria of Water. Office of Regulations and Standards. EPA 440/5-86-001.

(2) NYSDEC, Surface Water Quality. Standard Documentation for Polychlorinated Biphenyls dated July 26, 1984.

standard of control that must be met for the hazardous substance, or contaminant is at least that of any applicable or relevant and appropriate standard, requirement, criteria, or limitation under any Federal environmental law, or any more stringent standard, requirement, criteria, or limitation promulgated pursuant to a State environmental statute.

A requirement is applicable if the specific terms of the law or regulation directly address the circumstances at a site. If not applicable, a requirement or certain provisions of the requirement may nevertheless be relevant and appropriate if circumstances at the site are, based on best professional judgement (BPJ), sufficiently similar to the problems or situations regulated by the requirement. Typically, the applicable or relevant and appropriate requirements (ARARs) for a site are classified into three categories:

- Ambient or chemical-specific requirements are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values in environmental media (i.e., air, water, soil). These values establish the acceptable concentration of a chemical that may be found in, or discharged to, the ambient environment. (Example: ambient water quality standards)

- Action-specific requirements are usually regulated technology- or activity-based actions taken with respect to hazardous or toxic wastes.

- Location-specific requirements are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.

ARARs will define the cleanup goals when they set an acceptable level with respect to site-specific factors. However, cleanup goals for some substances may have to be based on non-promulgated criteria and advisories rather than on ARARs because ARARs do not exist for those substances or because an ARAR alone would not be sufficiently protective in the given circumstances. To address these situations, those "to be considered" (TBC) criteria, advisories, and guidance are identified where they exist.

Section 121(d)(4) of SARA allows the selection of a remedial alternative that will not attain all ARARs if any of six conditions for a waiver of ARARs exist. The conditions are as follows:

(1) the remedial action is an interim measure whereby the final remedy will attain the ARAR upon completion;

(2) compliance will result in greater risk to human health and the environment than other options;

(3) compliance is technically impracticable;

(4) an alternative remedial action will attain the equivalent of the ARAR;

(5) for State requirements, the State has not consistently applied the requirement in similar circumstances; or

(6) compliance with the ARAR will not provide a balance between protecting public health, welfare, and the environment at the facility with the availability of Fund money for response at other facilities (fund-balancing).

Table 1-6 is a matrix that identifies potential remedial alternatives and their potentially action-specific applicable, relevant and appropriate requirements (ARARs) and TBCs. Tables 1-7 and 1-8 list potential location-specific and contaminant-specific ARARs and TBCs, respectively for the Columbus McKinnon site.

The procedure followed in the development of the ARARs is defined in the CERCLA "Compliance With Other Laws Manual"; EPA/540/G-89/006. New York State water quality standards and soil clean-up goals were developed from NYSDEC Water Quality Standards and Guidance Values, September 25, 1990, and the Proposed Division Technical and Administrative Guidance Memorandum: Determination of Clean-up Goals, respectively. The best usage classification of Ellicott Creek has recently been upgraded to Class B (Fish and Fish Propagation).

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-6
REMEDIAL ALTERNATIVES AND THEIR POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Federal ARARs	Description/Requirements	Corresponding NYS ARARs	Containment/ Capping	Creek Bed Stabilization	Excavate/Treat		Dredge/Treat		InSitu Vitrification, (Technology)	Volume Reduce, Soil Wash (Technology)	Incinerate (Technology)
					Off-Site Disposal	On-Site Disposal	Off-Site Disposal	On-Site Disposal			
TSCA 40 CFR 761.75	Chemical Waste Landfill Requirements		RA	N/A	A	RA	A	RA	N/A	N/A	N/A
TSCA 40 CFR 761.120-139	• PCB Spill Cleanup Policy		N/A	N/A	TBC	TBC	TBC	TBC	TBC	TBC	TBC
TSCA 40 CFR 761.60(e)(i)	Alt.Treatment Chemical Waste		N/A	N/A	A	A	A	A	A	A	N/A
TSCA 40 CFR 761.70	• Special Performance Standards for Incineration of PCBs		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A
OSHA 29 CFR 1910	Workers Engaged in Response Actions		A	A	A	A	A	A	A	A	A
RCRA 40 CFR 264.228	Surface Impoundments: Closure & Post-Closure Care	6NYCRR 373-2.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCRA 40 CFR 264.258	Waste Piles: Closure & Post-Closure Reqmts	6NYCRR 373-2.12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCRA 40 CFR 264.301 & 264.310(a)(b)	Landfills: Closure & Post-Closure Care (30 yr)	6NYCRR 373-2.14	RA	N/A	N/A	N/A	N/A	RA	N/A	N/A	N/A
RCRA 40 CFR 264.228(a) & (b)	Closure & Post-Closure Secure Landburial Facility	6NYCRR 373-2.7 & 373-2.14(g)	RA	N/A	N/A	RA	N/A	RA	N/A	N/A	N/A
RCRA 40 CFR 264.117(c)	Use of Property/Post-Closure Requirements	6NYCRR 373-2.7(g)	RA	N/A	N/A	RA	N/A	RA	A	N/A	N/A
RCRA 40 CFR 264.278	• Subsurface Monitoring Rqmts (Land Treatment)	6NYCRR 373-2.14(e); 373-2.6(h)	N/A	N/A	N/A	N/A	N/A	N/A	RA	N/A	N/A
RCRA 40 CFR 264.111	Closure reqmts to Minimize Maintenance & Eng. Controls	6NYCRR 373-2.7(b)	RA	RA	N/A	A	N/A	A	A	N/A	N/A

LEGEND:
N/A Not applicable or relevant and appropriate
A Applicable
RA Relevant and appropriate
TBC To be considered

• Technology-specific

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 1-6
REMEDIAL ALTERNATIVES AND THEIR POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Federal ARARs	Description/Requirements	Corresponding NYS ARARs	Containment/ Capping	Creek Bed Stabilization	Excavate/Treat		Dredge/Treat		InSitu Vitrification, (Technology)	Volume Reduce, Soil Wash (Technology)	Incinerate (Technology)
					Off-Site Disposal	On-Site Disposal	Off-Site Disposal	On-Site Disposal			
RCRA 40 CFR 264.178 & Tank System .197 & .288 & 258	Closure Reqmts/Decon of all residues/equipment	6NYCRR 373-2.7(e)	N/A	N/A	RA	RA	RA	RA	N/A	RA	N/A
RCRA 40 CFR 264.221 & 251	Des. & Oper. Proc. for Surface Imp & Waste Piles	6NYCRR 373-2.11(b); 2.12(b); 2.14(d)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCRA 40 CFR 264.373	* Thermal Treatment Requirements	6NYCRR 373-3.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A
RCRA 40 CFR 268(D)	Land Ban Restrictions & Storage		N/A	N/A	A	RA	A	RA	N/A	N/A	N/A
RCRA 264.340-399 Subpart O)	* Performance Standards for Incinerators	6NYCRR 373-3.15; 6NYCRR 219	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A
RCRA 40 CFR 264.230	Surface Impoundments/ Incompatible Waste Reqmts	6NYCRR 373-2.14(h-m)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCRA 40 CFR 263	Generator Reqmt for Manifesting Waste for Off-Site Disposal	6NYCRR 373-2.5	N/A	N/A	A	N/A	A	N/A	N/A	N/A	N/A
RCRA 40 CFR 270	Transporter Reqmts for Off-Site Disposal		N/A	N/A	A	N/A	A	N/A	N/A	N/A	N/A
RCRA 40 CFR 264.191-195	Tank Storage Design Reqmts	6NYCRR 373-2.10	N/A	N/A	N/A	N/A	A	A	N/A	A	N/A
RCRA 40 CFR 264.314	Non-containerized Liquid Hazardous Waste May Not be Landfilled		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RCRA 40 CFR 761.70	Incineration of Liquid & Non-Liquid PCBs >50 ppm		N/A	N/A	A	A	A	A	N/A	A	A
RCRA 40 CFR 264.171 & 172	Storage of RCRA Hazardous Waste (Waste Reduction) Lead	6 NYCRR 373-3.9 (Lead & PCB	N/A	N/A	A	A	A	A	N/A	A	A

LEGEND:
N/A Not applicable or relevant and appropriate
A Applicable
RA Relevant and appropriate
TBC To be considered
* Technology-specific

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TABLE 1-6
REMEDIAL ALTERNATIVES AND THEIR POTENTIAL ACTION-SPECIFIC ARARs AND TBCs

Federal ARARs	Description/Requirements	Corresponding NYS ARARs	Containment/ Capping *	Creek Bed Stabilization	Excavate/Treat		Dredge/Treat		InSitu Vitrification, (Technology)	Volume Reduce, Soil Wash (Technology)	Incinerate (Technology)
					Off-Site Disposal	On-Site Disposal	Off-Site Disposal	On-Site Disposal			
	Chemical Physical & Biological Treatment Requirements	6NYCRR 373-3.17	N/A	N/A	A	A	A	A	A	A	A
33 CFR 320-330, 40 CFR 230 and 33 USACOE 403	Conditions Required Before Dredge & Fill is an Allowable Alternative		N/A	N/A	N/A	N/A	A	A	NA	N/A	N/A
NESHAP 40 CFR 61 and Nat'l Ambient Air Quality Standards	Air Emission Standards	NYS Air Guidelines for Control of Toxins (Air Guide 1)	A	N/A	A	A	N/A	N/A	A	A	A
40 CFR 122.41	Discharge Monitoring Rqmts (Liquid) to Creek	6NYCRR 750-758/ TOG 1.6.1 Temp.Disch. NYS Regional App.	N/A	N/A	N/A	N/A	A	A	N/A	N/A	N/A
40 CFR 125.1	Best Management Practices to Prevent Toxic Release to Surface Water		RA	RA	RA	RA	RA	RA	RA	RA	RA
40 CFR 403.5	Discharge to Local POTW/ Must Comply w/POTW Permit		N/A	N/A	N/A	N/A	A	A	N/A	N/A	N/A
40 CFR 136.1 -	Use Approved Test Methods & QA/QC for Monitoring Effluent		N/A	N/A	N/A	N/A	TBC	TBC	N/A	TBC	TBC
		Toxicity Testing: TOG 1.3.2 Analytical Detectability: TOG B5-W-40	N/A	N/A	N/A	N/A	TBC	TBC	N/A	TBC	TBC
49 CFR 107, 171	DOT Rules for Hazardous Materials Transport		N/A	N/A	A	N/A	A	N/A	N/A	A	N/A

LEGEND
N/A Not applicable or relevant and appropriate
A Applicable
RA Relevant and appropriate
TBC To be considered

* Technology-specific

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TABLE 1-7
POTENTIAL LOCATION-SPECIFIC ARARs

Federal ARARs	Description/Requirements	
40 CFR 230, 30 USACOE, CWA Sec. 404	Prohibit Discharge of Dredge into Wetland 50 CFR 35.1/Wilderness Act 16USC1131	N/A
6 NYCRR 662-665 Article 24 Env. Conservation Law Freshwater Wetlands Act	Protection of Freshwater Wetlands	N/A
50 CFR 35.1/Wilderness Act 16 USC 1131	Preserve Wilderness Area (if Classified Wilderness Area)	N/A
50 CFR 27/16USC 668	Wildlife Refuge Considerations/ Actions	N/A
40 CFR 6.301/16USC 661 (Fish & Wildlife)	Prohibits Channeling or Diversion & Other Stream Modifications 40 CFR 6.302(e)/Wild & Scenic Rivers)	N/A
40 CFR 6.302(e)/Wild & Scenic Rivers	Avoid Activities That Will Affect these Rivers (Niagara River) 16 USC 1451 Coastal Zone Management	N/A
40 CFR 264.18(a)	TSD of HazWaste Prohibited within 200 feet of a Fault	N/A
40 CFR 264.18(b)	Design TSD Facility to Avoid Washout if within 100-yr Flood Plain	RA
40 CFR 6 Appendix A, Fish & Wildlife Act 16 USC 661	Actions Within Flood Plain/Lowland/ Flat - Minimize Potential Harm	A
36 CFR Part 65 & 800; 16 USC 469 & 470	Action to Recover and Preserve Artifacts at Historic Property	N/A
33 CFR Parts 320-330; 16 USC 661, 50 CFR 200	Action to Conserve Endangered Species or Threatened Species	N/A
6 NYCRR Part 608 Use and Protection of Waters	Disturbance of Protected Streams	A

LEGEND

N/A	Not applicable or relevant and appropriate
A	Applicable
RA	Relevant and appropriate
TBC	To be considered

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TABLE 1-8
POTENTIAL CHEMICAL-SPECIFIC ARARs AND TBCs

FEDERAL CHEMICAL-SPECIFIC ARARs				NYS CHEMICAL-SPECIFIC ARARs		
Medium		Lead	PCBs		Lead	PCBs
Water	40 CFR 264.94 RCRA MCL	($5.0x10^{-2}$ mg/L) RA	*	6NYCRR 703.5 Ground Water Quality Standards	($2.5x10^{-2}$)mg/L A	($1x10^{-4}$ mg/L) A
	40 CFR 141.50 - 141.51 SDWA MCL	N/A	N/A	10NYCRR 5 MCLs (Dept. of Health Drinking Water	N/A	*
	CWA Water Quality Criteria (Human Health) F&W/F	($5.0x10^{-2}$/mg/L) A	($7.9x10^{-8}$/$7.9x10^{-8}$ mg/L) A	6 NYCRR 750-758 (SPDES)	TBC	TBC
	CWA Ambient Water Quality (Aquatic Life) Acute/Chronic	($8.0x10^{-2}$/$3.2x10^{-3}$ mg/L) A	($2.0x10^{-3}$/$1.4x10^{-5}$ mg/L) A	6NYCRR 701 & 702 Ambient Water Quality Standards	(**) A	(.001 mg/l) A
Soils/Sediments	40 CFR 761 PCB Spill Cleanup Policy	*	(25 ppm) TBC	Soil Cleanup Criteria Draft DEC TAGM 6/91 H_2O/Soil	TBC	TBC (1 ppm)
				NYSDEC Fish and Wildlife Sediment Criteria Document Proposed DEC TAGM (12/89)	N/A	TBC
Air	40 CFR 50 National Ambient Air Quality Std	(3-month avg. 1.5 ug/m^3) A	*	6NYCRR 256 & 257 Ambient Air Quality Stds. (Air Guide 1)	*	*
	40 CFR 61 NESHAPS	*	*	NYS Air Guidelines for Control of Toxins (Air Guide 1)	*	Short-term 0.1 ug/m^3 Annual $4.5x10^{-4}$ ug/m^3

* = Not available
** = The standard for Class B waters is derived by the formula exp. (1.266[hardness] - 4.661)
F&W = Fish & Water Consumption
F = Fish Consumption Only
N/A = Not Applicable
TBC = To Be Considered
DL = Detection Limit

MALCOLM PIRNIE

2.0 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

2.1 INTRODUCTION

Based upon the contaminant characterization results and the exposure pathways and risk evaluation presented in the remedial investigation performed at the Columbus McKinnon site, three (3) media or location-specific components requiring remedial action have been identified:

- the portion of the creek bank adjacent to the study area;
- study area soils; and
- the narrow band of Ellicott Creek sediments adjacent to the site which has exhibited elevated PCB concentrations.

As concluded in the Remedial Investigation report, while ground water flow was identified as a potential means for the migration of contaminants off-site, its contaminant contribution is negligible, and is thus eliminated from remedial action considerations.

The ensuing subsections describe the development of remedial action objectives, general response actions and potentially applicable technologies for the three site components identified above.

2.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives for the site components identified in Section 2.1 are based upon the potential impacts to humans and the environment from the contaminants of interest identified during the RI. The NYSDEC-approved Remedial Investigation Report and Addenda concluded that the primary contaminant exposure pathways which may result in significant human health risk are from lead and PCBs in surficial soils by ingestion and/or dermal contact by site maintenance workers. The environmental risk assessment concluded that prior to completion of the IRM there may have been a significant potential for chronic toxicity for aquatic organisms exposed to sediments contaminated with PCB

Aroclor 1254 in the creek immediately adjacent to the site, as well as for wildlife consuming fish from the creek. The additional environmental risk assessments performed as part of this FS indicate that these environmental risks have been reduced to below background conditions by implementation of the IRM.

Based upon this assessment, the following remedial action objectives have been developed for the Columbus McKinnon site:

1) To prevent ingestion/human contact with PCBs and lead in Study Area surficial soils.

2) To prevent releases of PCBs from Study Area sediments and soils that would result in adverse impacts on health and the environment.

2.3 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

Based on the remedial action objectives for the site, the following subsections discuss all general response actions available for each environmental media affected.

2.3.1 Soils

The portion of the Study Area where detectable PCB and/or lead contamination was observed in soils/fill constitutes an area of approximately 0.33 acres. The volume of soils requiring remediation (defined by the depth of detected contamination) is dependent upon the cleanup level(s) to be achieved. As discussed in the Remedial Investigation report, the concentrations and mass of PCBs is greatest within the Central Area soils. Elevated levels of lead occur on-site in the Central Area and off-site in the South Area of the Study Area.

General response actions for both on-site and off-site Study Area soils are presented in Table 2-1. Alternatives for remediation of the soils include: no action; institutional controls; containment/isolation; in-situ treatment; excavation followed by disposal; and excavation followed by on-site or off-site treatment and disposal. A discussion of each of these is provided in Section 3.0.

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TABLE 2-1

PRELIMINARY LIST OF GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES

Environmental Medium	General Response Actions	Remedial Technologies
Study Area Soils	No Action	
	Institutional Controls	Fencing
	Containment/Isolation	Cover (topsoil, asphalt, soil, synthetic membrane, gravel)
	Insitu Treatment	Vitrification, Stabilization, or Biological Treatment
	Excavation/Treatment; Off-Site Disposal	Physical (solidification, encapsulation) Chemical, Biological or Thermal treatment.
	Excavation/Treatment; On-Site Disposal	Physical (solidification, encapsulation) Chemical, Biological or Thermal treatment.
	Excavation/Off-Site Disposal	
Creek Bank	No Action	
	Containment/Isolation	Extend Riprap, Revetment Fabric
	Excavation/Treatment; Off-Site Disposal	Physical (solidification, encapsulation) Chemical, Biological or Thermal treatment.
	Excavation/Treatment; On-Site Disposal	Physical (solidification, encapsulation) Chemical, Biological or Thermal treatment.
	Excavation/Off-Site Disposal	
Stream Sediment	No Action	
	Containment/Isolation	In-place Stabilization (synthetic fabric, riprap), Revetment Fabric
	Dredging/On-Site Disposal	Mechanical or Hydraulic Dredging, On-Site Disposal
	Dredging/Off-Site Disposal	Mechanical or Hydraulic Dredging, Off-Site Disposal
	Dredging/Treatment; Off-site Disposal	Mechanical or Hydraulic Dredging; Physical, Chemical, Biological or Thermal treatment.
	Dredging/Treatment; On-site Disposal	Mechanical or Hydraulic Dredging; Physical, Chemical, Biological or Thermal treatment.

2.3.2 Ellicott Creek Sediment

Based upon Study Area data, the volume of Ellicott Creek sediments in the vicinity of the Columbus McKinnon site defined by detectable PCB concentrations is approximately 360 cubic yards. This volume of sediments is limited to an area of approximately 9100 square feet immediately adjacent to the site ranging from 0 to 2-feet in depth. However, the creek bank IRM extends into and covers approximately 4000 square feet of the contaminated sediments bordering the creek bank. As a result, approximately 130 cubic yards of the sediments have already been isolated. The remaining volume of sediments is therefore limited to approximately 230 cubic yards.

General response actions identified for the sediments are presented in Table 2-1 and include: no action; containment; dredging followed by on-site or off-site disposal; and dredging followed by treatment and on-site or off-site disposal.

2.3.3 Creek Bank

As shown in Figure 1-2, an IRM consisting of rip-rap over filter fabric was placed across a 165-foot portion of the creek bank at the Columbus McKinnon site during October - November 1990. The IRM was placed along the entire portion of creek bank in the Central Area as well as a segment of the creek bank in the South Area (Conrail property upstream of the Central Area) in order to effectively eliminate erosion of the more highly-contaminated soils from the Central area to Ellicott Creek. Since the riprap and filter fabric were placed as an interim measure, the entire length of creek bank, including that covered by the IRM, will be considered in the evaluation of remedial alternatives. However, since the IRM has a high degree of permanence and effectiveness in accomplishing the remedial action objectives for this media, its continued presence as a final remedial measure will be considered in the evaluation of remedial alternatives.

The general response actions for the creek bank are presented in Table 2-1. As shown, the alternatives for the creek bank include: the no action alternative; containment; or excavation followed by treatment or disposal. A description of these actions is presented in Section 3.0.

MALCOLM PIRNIE

3.0 DEVELOPMENT AND SCREENING OF TECHNOLOGIES

General response actions are developed in this Section into technology alternatives for remediation of each of the environmental media at the Columbus McKinnon site. Each alternative will then be screened with respect to its overall effectiveness in achieving the remedial action objectives for the site, as well as its implementability.

3.1 DEVELOPMENT OF TECHNOLOGIES

3.1.1 Soils

Section 2.0 identified several general response actions for remediation of the on-site soils. These general response actions can be effected through a variety of remedial technologies. A description of each of these general response actions and the associated remedial technologies is presented below.

3.1.1.1 No Action

A no-action alternative provides a benchmark for comparison to other remedial action alternatives and justifies the need for any remedial action. A no-action alternative will be retained throughout the preliminary screening process. The Central Area of the site is currently covered with a durable plastic membrane to reduce erosion and contact, and the site is fenced to restrict access. In the context of a no-action alternative these measures would remain in place and no further remedial actions would be undertaken for the study area soils.

3.1.1.2 Institutional Controls

As stated above, measures have already been taken by Columbus McKinnon to restrict access to the site and prevent migration of the most heavily contaminated Study Area soils. This alternative would include additional institutional measures such as deed restrictions, extending the fencing to encompass the South Area, additional signage, and discontinuing lawn maintenance to prevent direct contact of maintenance workers with the Study Area soils.

3.1.1.3 Containment

Containment alternatives may involve various capping/covering technologies. Covering typically constitutes placing one or more layers of clean material over the contaminated soils to either reduce infiltration of precipitation and/or prevent direct contact, or prevent the erosion and transport of contaminated soil/fill off-site. Covering the site would meet the remedial objectives for the Study Area soils by preventing ingestion and human contact and by preventing the release of PCBs and lead from the site via erosion. The cover technologies which will be considered for the Columbus McKinnon soils are identified below:

6NYCRR Part 360 Soil Cap

The 6NYCRR Part 360 soil cap is placed in layers following grading of the site to facilitate surface water run-off. The initial layer consists of synthetic filter fabric covered by crushed stone or sand for venting methane gas typically generated by decomposition of municipal solid waste in landfills. The gas vent layer is then covered by another layer of filter fabric, followed by an 18-inch barrier layer of recompacted, low permeability soil/clay. A barrier protection layer of 24-inches of compacted soil protects the barrier layer from root penetration, desiccation and freezing. A final 6-inches of topsoil is then placed and seeded to promote vegetative growth for erosion control purposes. The typical 6NYCRR Part 360 soil cap design is shown in Figure 3-1.

6NYCRR Part 360 Synthetic Cap

The 6NYCRR Part 360 synthetic cap is identical to the 6NYCRR Part 360 soil cap, with the exception of the 18-inch low permeability layer. In the case of the synthetic cap, this layer is replaced by a synthetic membrane liner, typically 40 mil or thicker, having lower permeability than the recompacted soil/clay layer. This synthetic layer significantly reduces infiltration of surface water, thereby lessening the potential for leaching of contaminants from the landfill material. This alternative also reduces the overall thickness of the cap. The typical 6NYCRR Part 360 synthetic cap design is illustrated in Figure 3-2.

6NYCRR Part 373 (RCRA) Cap

The RCRA cap is implemented at hazardous waste sites. This type of cap is especially useful when the potential for ground water contamination from the hazardous constituents exists. The typical 6NYCRR Part 373 cap is illustrated in Figure 3-3. As shown, the initial layer (placed following site grading to facilitate surface water run-off)

6 NYCRR PART 360 SOIL CAP

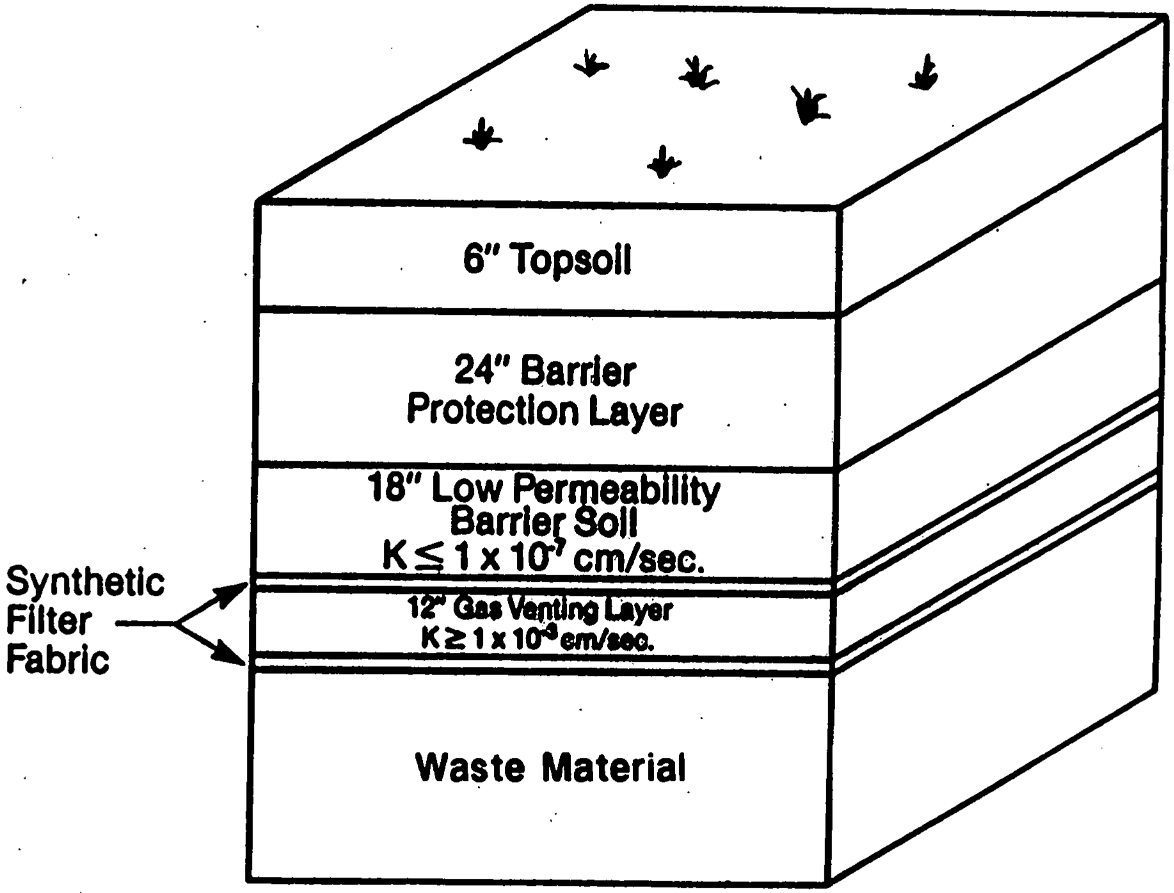


FIGURE 3-1

6 NYCRR PART 360 SYNTHETIC CAP

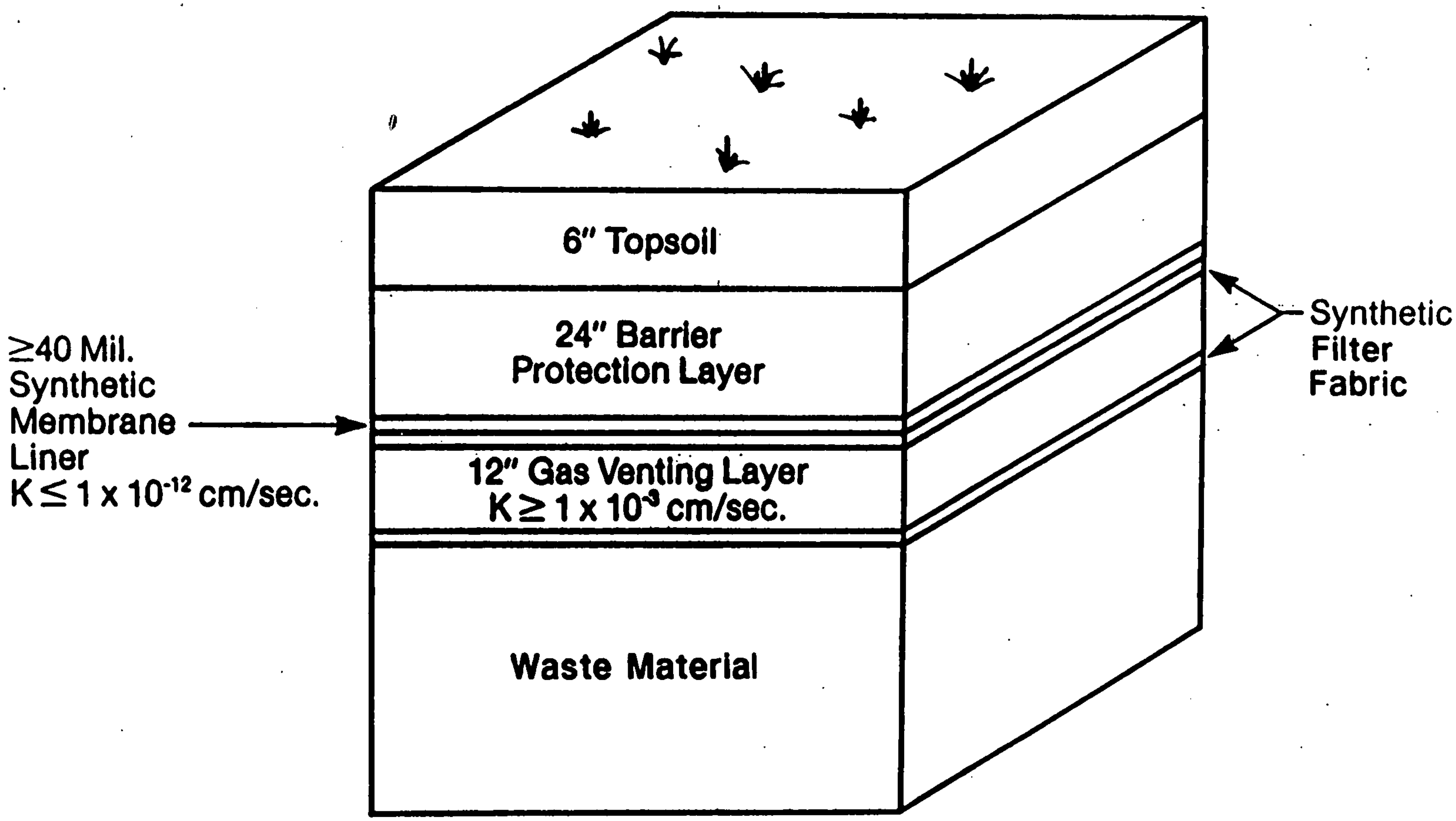


FIGURE 3-2

TYPICAL 6 NYCRR PART 373 CAP

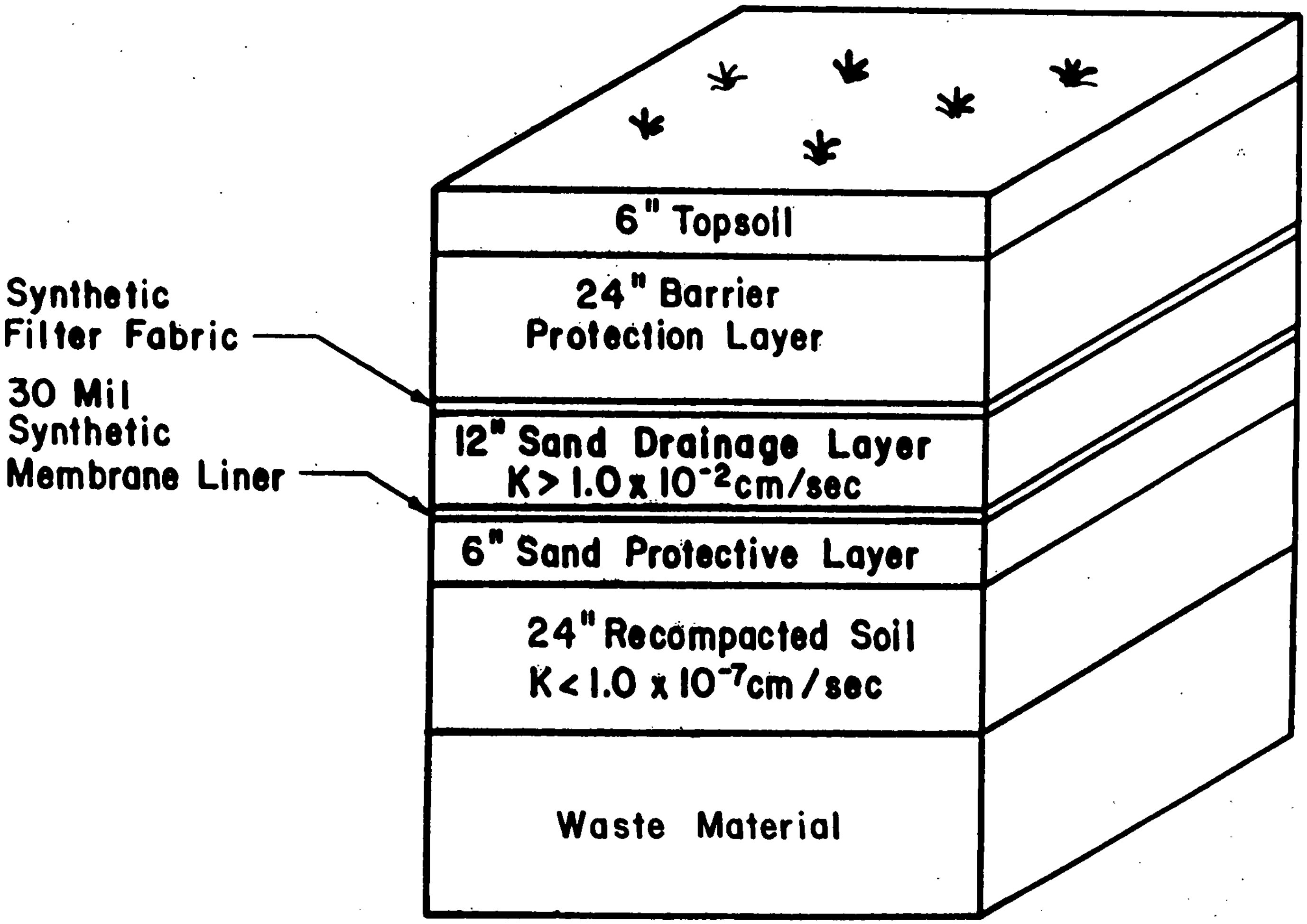


FIGURE 3-3

consists of 24-inches of low permeability, recompacted soil followed by 6-inches of sand, a synthetic membrane liner, a 12-inch sand drainage layer, a layer of synthetic filter fabric, and a 24-inch barrier protection layer. The final layer is 6-inches of topsoil seeded to promote vegetative growth for erosion control purposes.

Topsoil Cover

A topsoil cover is typically used only for the purpose of preventing erosion and mitigating contact with contaminated materials. It is only partially effective in reducing infiltration of precipitation or surface water through the soil by promoting evapotranspiration and runoff by improved vegetation cover. Following site grading to enhance surface runoff, an approximate 12-inch thick layer of topsoil would be placed over the contaminated soils and seeded to promote vegetative growth for erosion control and evapotranspiration. Typical topsoil cover is illustrated in Figure 3-4.

Asphalt Cover

An asphalt cover is effective in mitigating erosion and contact with contaminated materials at a hazardous waste site, and will limit infiltration of surface water to various degrees depending upon its thickness and composition. A standard asphalt cover will include a layer of stone, followed by a base asphalt course and a final top course. The asphalt layers are smoothed and compacted following placement. The conceptual asphalt cover design is shown in Figure 3-5.

Gravel Cover

A gravel cover is typically used for the purpose of preventing erosion and mitigating contact with contaminated materials. It is not effective in preventing infiltration of precipitation or surface water through the gravel to the subgrade. Following site grading to prevent any pooling or ponding of precipitation, a geotextile filter followed by an approximate 6-inch thick layer of crushed gravel would be placed over the contaminated soils. This cover system is illustrated in Figure 3-6.

Synthetic Membrane/Soil Cover System

A synthetic membrane/soil cover system consists of a synthetic membrane barrier layer typically 30-40 mil thick sandwiched between layers of synthetic fabric and geogrid synthetic drainage material. The synthetic fabric functions to protect the plastic sheeting from perforation due to rocks or sharp objects. The top layer of synthetic fabric is then covered with a 12-inch layer of topsoil and is seeded to promote vegetative growth for

TOPSOIL COVER SYSTEM

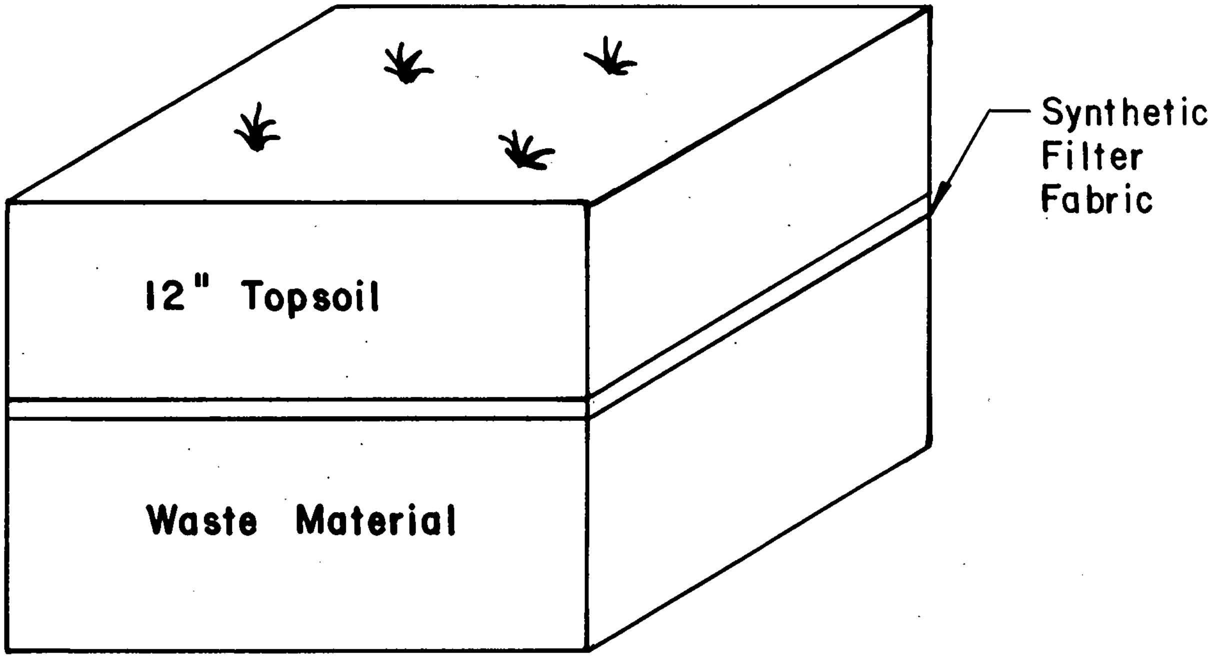


FIGURE 3-4

ASPHALT COVER SYSTEM

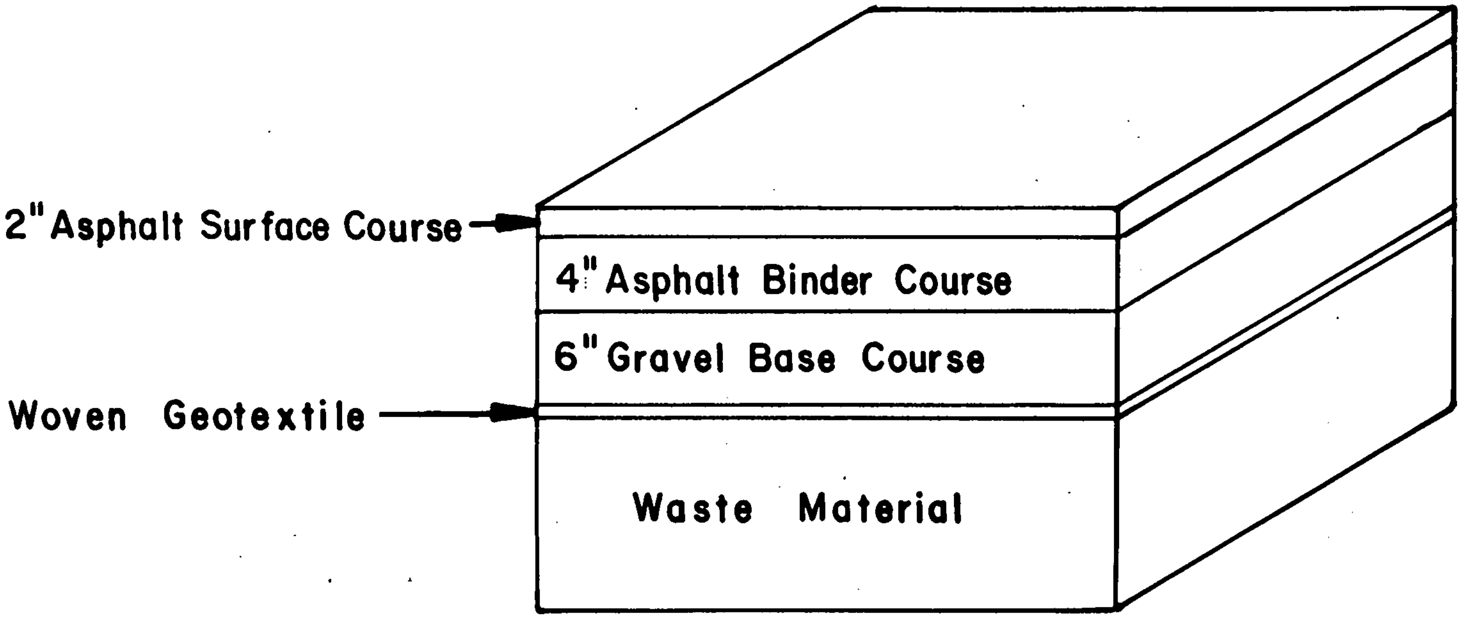


FIGURE 3-5

GRAVEL COVER SYSTEM

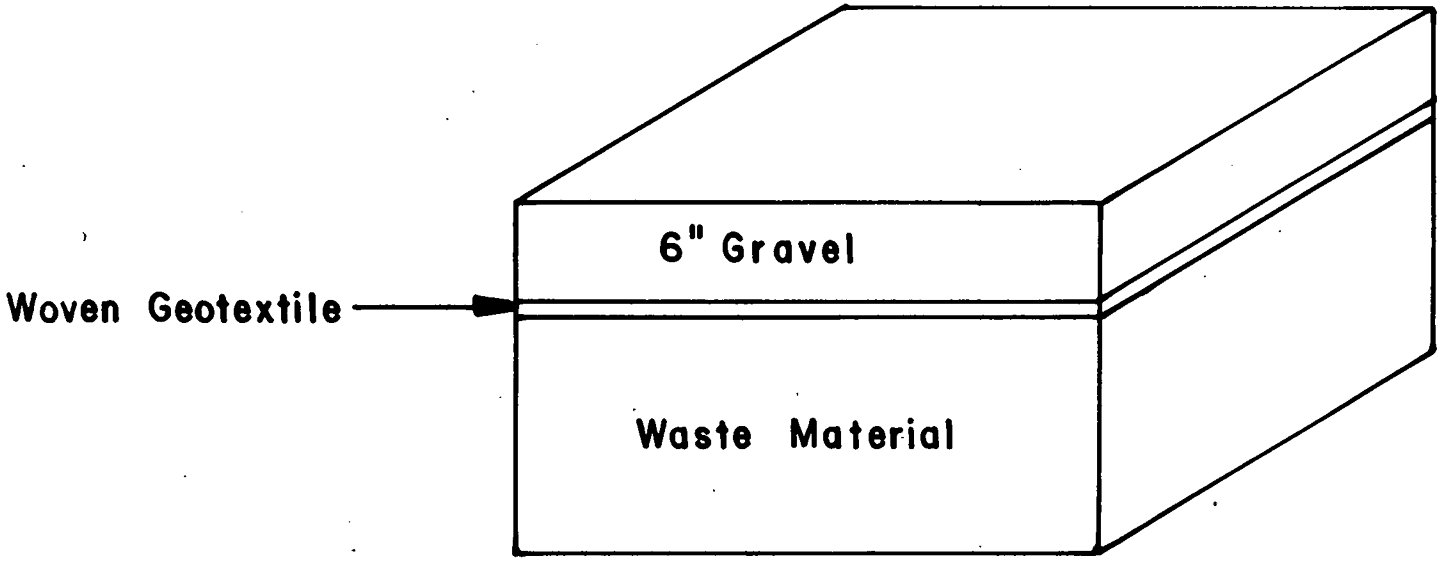


FIGURE 3-6

erosion control purposes. The synthetic membrane/soil cover system is effective in mitigating erosion and contact with contaminated soils, and limiting infiltration of surface waters. A typical synthetic membrane/soil cover design is illustrated in Figure 3-7.

3.1.1.4 In-situ Treatment

In-situ treatment involves the immobilization or destruction of hazardous materials in-place (viz., without excavation). The in-situ technologies which will be considered for the Columbus McKinnon Site are described below:

In Situ Solidification/Stabilization

In situ solidification/stabilization involves the fixation of contaminated soils in-place. The technology is typically effected by augering or cutting into a portion of the soils and then pumping polymer or concrete-based solidification agents into the opening. These solidification agents blend with the contaminated soil to a solid matrix. The process is repeated, as necessary, across the site until all contaminated soils are immobilized.

In-situ Vitrification

In-situ vitrification involves the use of an electrical network to heat soils to temperatures of 1600 to 2000° C, which results in glassification of the soil constituents, thereby immobilizing all contaminants present. The process is typically operated on a rectangular grid basis, whereby probes are inserted into the four corners of the grid and a shallow trench is dug between diagonal corners and fitted with a graphite and glass frit. A high amperage current is then passed through the soil to generate the necessary heat for glassification. As a result of this heat, the organics may be driven-off in the gaseous form, necessitating an off-gas collection system. This process is considered potentially effective for soils up to 18 feet in depth, and treats an average of 4-5 tons per hour of soil.

In Situ Biological Soil Detoxification

Biological soil detoxification involves the use of microorganisms to biodegrade toxic organics to a less toxic form. Due to the difficulty associated with delivering organisms to deep soil, the process typically requires tilling the soil frequently to expose new surfaces. In some cases, UV light is used as a first step (photolytic degradation) and biological degradation is the second step.

SYNTHETIC/SOIL COVER SYSTEM

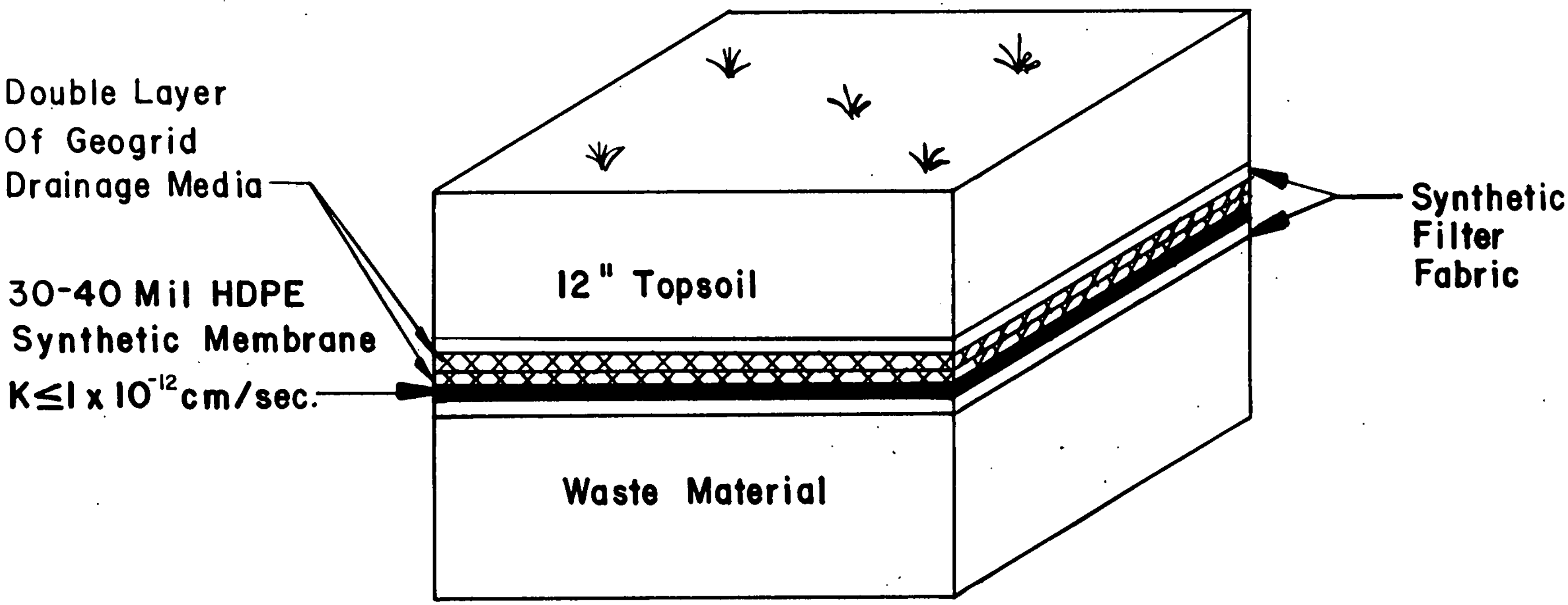


FIGURE 3-7

3.1.1.5 Excavation/Off-Site Disposal

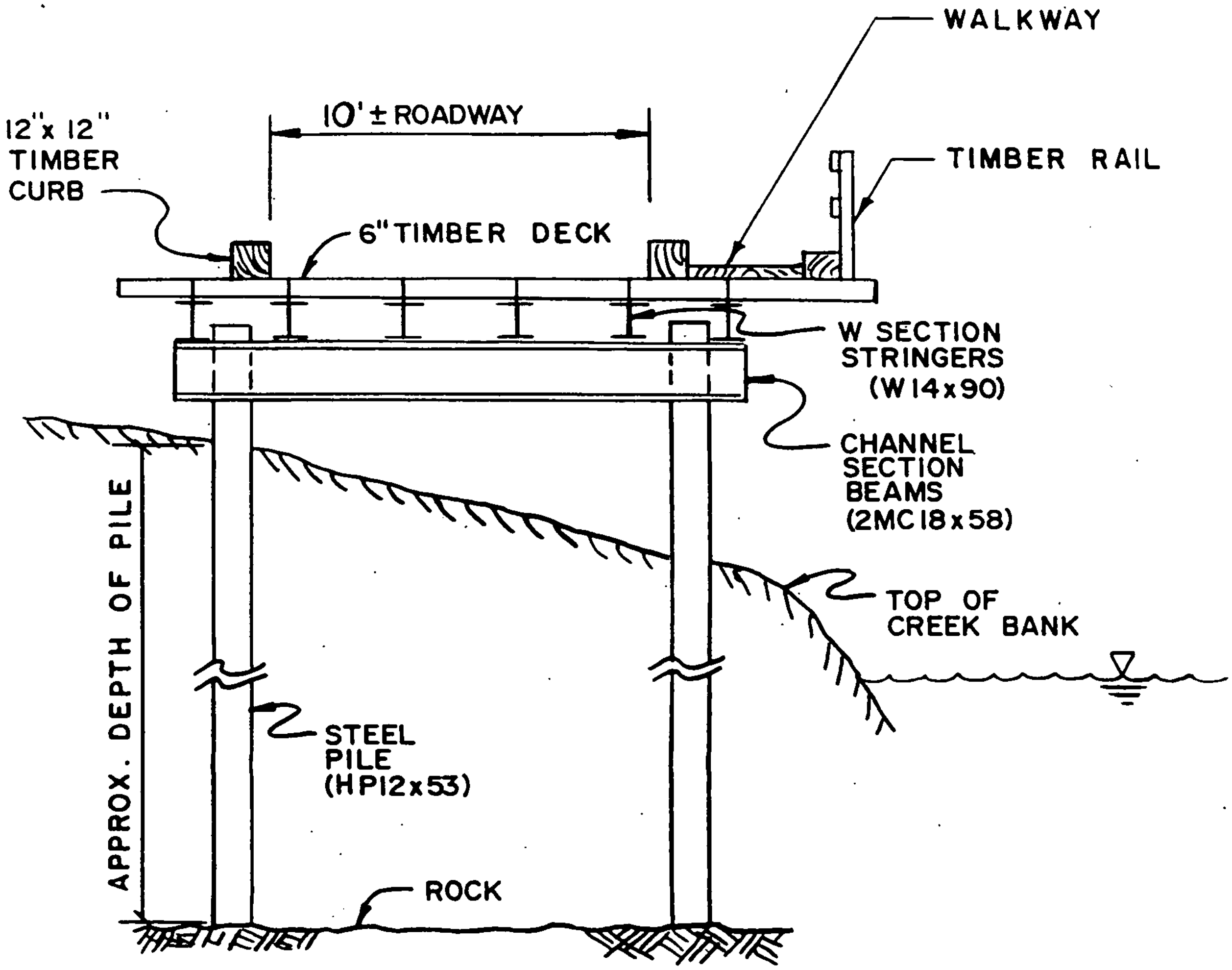
Excavation followed by off-site disposal can be accomplished through several means. Due to the physical restrictions of the Columbus McKinnon site, excavation and transport of contaminated soils is complex and difficult, requiring consideration of both the site's limited access and its structural characteristics (viz., the buildings, the railroad embankment, and the creek bank). Plate 2 is a plan view of the site which illustrates the locations of these structures/restrictions as well as the site topography.

As shown on Plate 2, site access is limited to a narrow strip along the main building having a length of approximately 290 feet and a somewhat level width of approximately 12 feet from the building (the site slopes steeply toward Ellicott Creek thereafter). The width is highly inadequate for large excavation and hauling equipment. Therefore, transport of heavy equipment along this access path without some form of widening and stabilization will likely cause sloughing of the creek bank soils and could result in serious injury to construction personnel and/or significant release of PCB-contaminated soils to Ellicott Creek .

In order to accommodate large excavation and hauling equipment, it would be necessary to construct a haul road over the current access pathway. Although alternate access routes were considered, including travel over/under the railroad tracks, installation of a bridge across Ellicott Creek from the Columbus McKinnon-owned parking lot to the site and transport of the soils via barge, these alternates generally present increased overall risk, cost and/or implementation barriers. The on-site access road is therefore considered the best means for travel to/from the Study Area if large volumes of soil are to be excavated.

Construction of the haul road could be accomplished by driving steel piling along the pathway and constructing a timber-decked roadway (AASHTO HS20-44) for transport of excavated soils. A schematic of the timber-decked road is shown in Figure 3-8. The anticipated path of the road is shown on Plate 3. As indicated, a decontamination pad will be required at the end of the roadway to prevent the migration of contaminated soils off-site from vehicle tires and undercarriages. Furthermore, the large trees currently located in the anticipated path of the timber-decked road would have to be cut down and removed.

Presuming a haul road could be constructed, excavation of the site soils would require consideration of the physical characteristics and structures previously described.



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TONAWANDA FACILITY

TYPICAL ELEVATION OF TEMPORARY ROADWAY

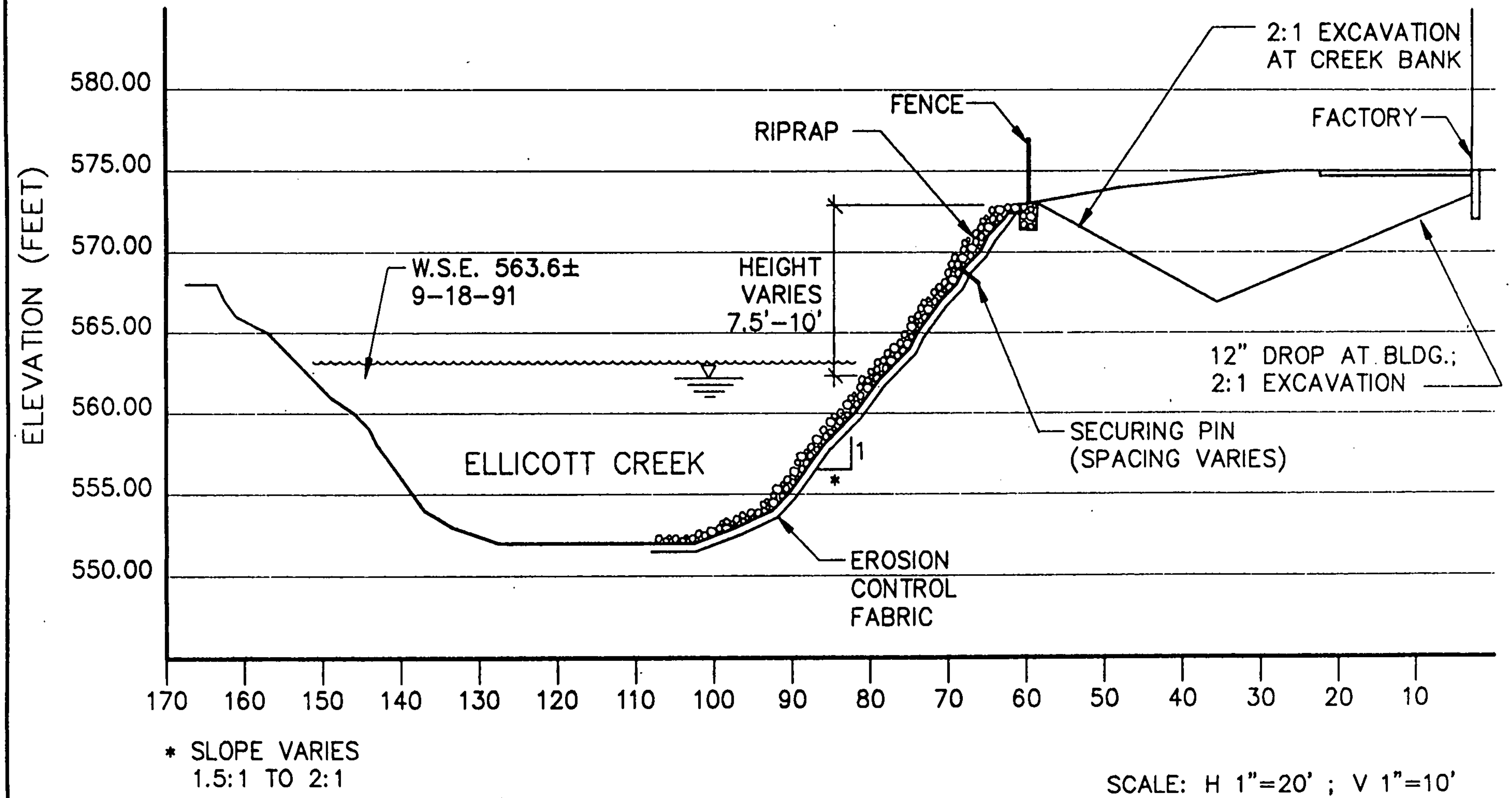
COLUMBUS McKINNON CORP. NOVEMBER 1991

In accordance with OSHA 29 CFR 1926.652, any excavation into loose soils (as is the case for the soil and fill at the Columbus McKinnon site) which is not shored or otherwise stabilized must be performed such that a slope is maintained to prevent cave-in. The degree of this slope (viz., the angle of repose) is ultimately the decision of the project engineer and is based on soil characteristics and field conditions. Due to the fine, loose nature of the soil and fill at the CM site, it is anticipated that a 2:1 slope would be required during excavations. This slope would be necessary at the railroad embankment and the creek bank. A 2:1 slope would also be necessary at the buildings for prevention of structural failure of the foundation, however vertical excavation to 1 foot below grade at the foundation would be feasible prior to excavating at a 2:1 slope. This method of excavation (i.e., 2:1 slopes at the buildings, railroad embankment and creek bank with no formal stabilization) is hereafter referred to as "unstabilized excavation" and is depicted in Figure 3-9.

A more difficult and costly means of excavation than the unstabilized excavation involves driving sheetpiling at the top of the creek bank, at the foot of the Conrail railroad embankment, and along the face of the building foundations. In this case excavation would be vertical along the sheeting and would not necessitate a 2:1 slope because the soils would already have been stabilized.

A profile of the sheetpiling installation at the building foundations is depicted in Figure 3-10. The plan view is depicted in Figure 3-11. As indicated, the sheeting requires stabilization anchors be driven at an angle through the foundation into the soil below the building. Due to cost considerations, it would likely be more economical to demolish the concrete pad and oil storage building than it would to protect these structures with sheet-piling. An alternate method of stabilizing the building foundations is conventional underpinning. Underpinning involves sequential excavation of a localized area below the existing foundation, followed by the placement of short (typically 3-foot wide) sections of concrete within the excavation to support the existing foundation. However, loose soil conditions make this approach to stabilization impractical as well as unsafe to construction personnel, and places the building at increased risk of structural damage. (See Section 3.2.1.4)

A profile of the sheetpiling installation at the railroad embankment is shown in Figure 3-12, and a plan view is presented in Figure 3-13. As indicated, this form of stabilization is similar to that at the building foundations.



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COL-01-309

TONAWANDA FACILITY
PROFILE OF UNSTABILIZED EXCAVATION
(NO SHEET PILING) OF SITE SOILS

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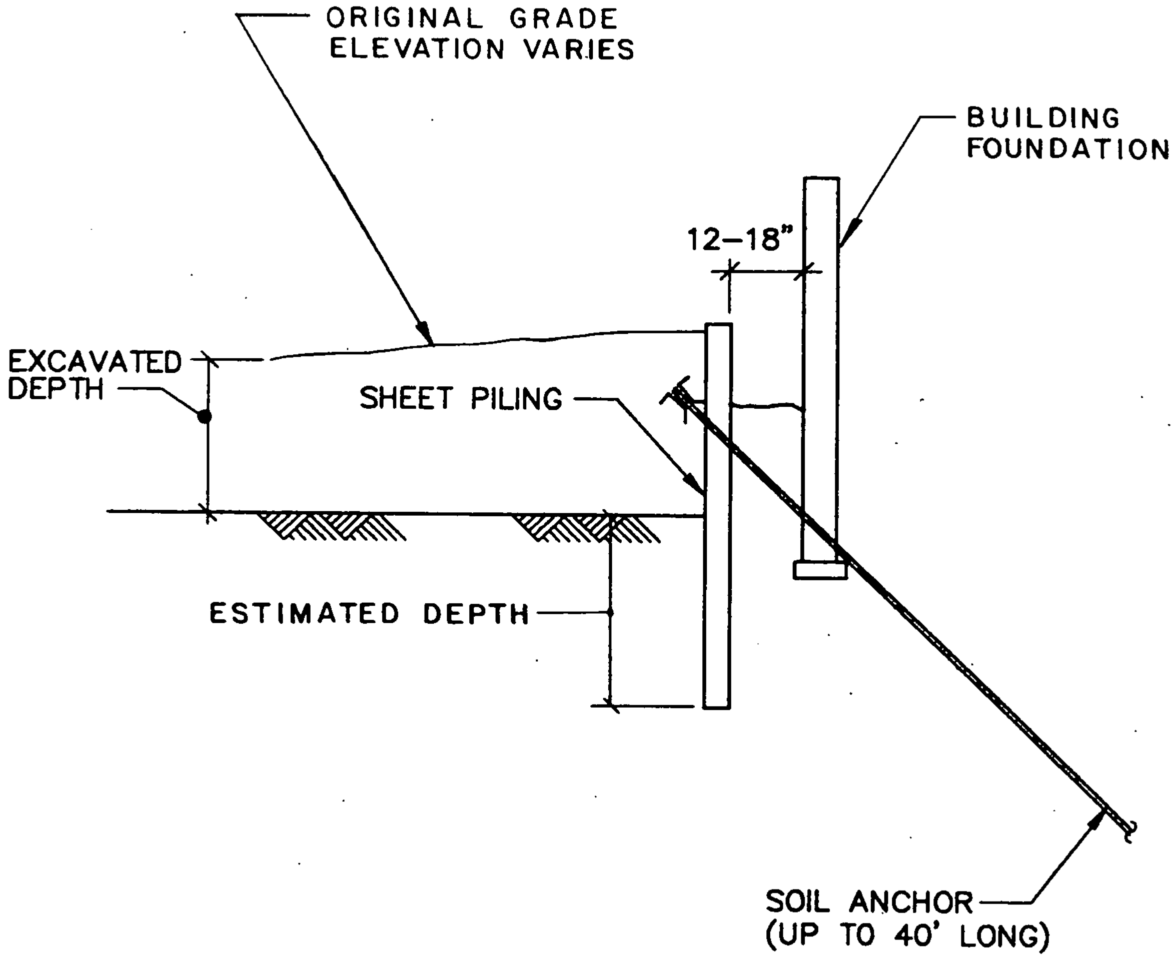
FIGURE 3-9



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PROFILE OF SHEET PILING STABILIZATION AT BUILDING FOUNDATION

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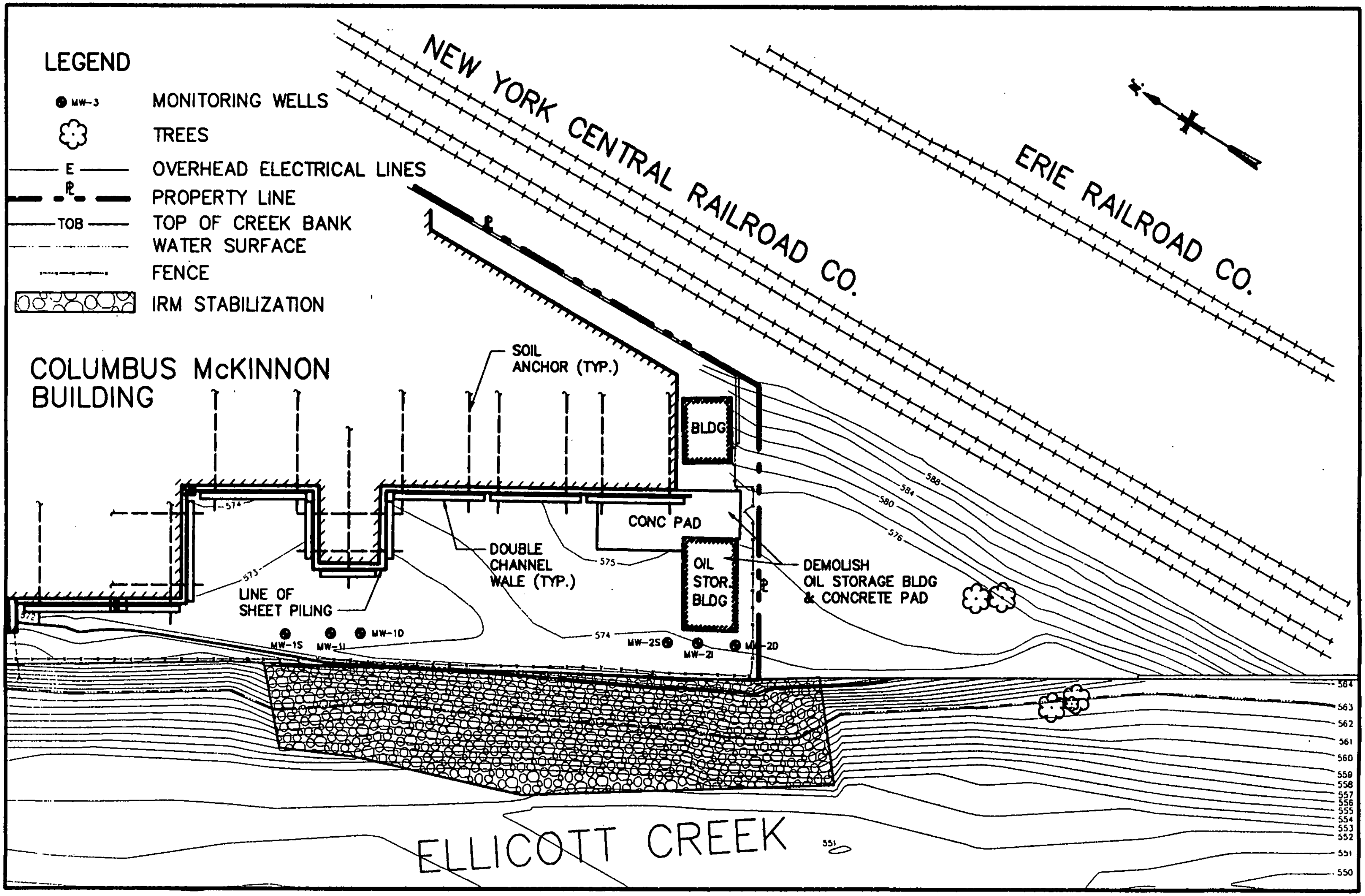

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PLAN VIEW OF SHEET PILE STABILIZATION AT BUILDING FOUNDATION

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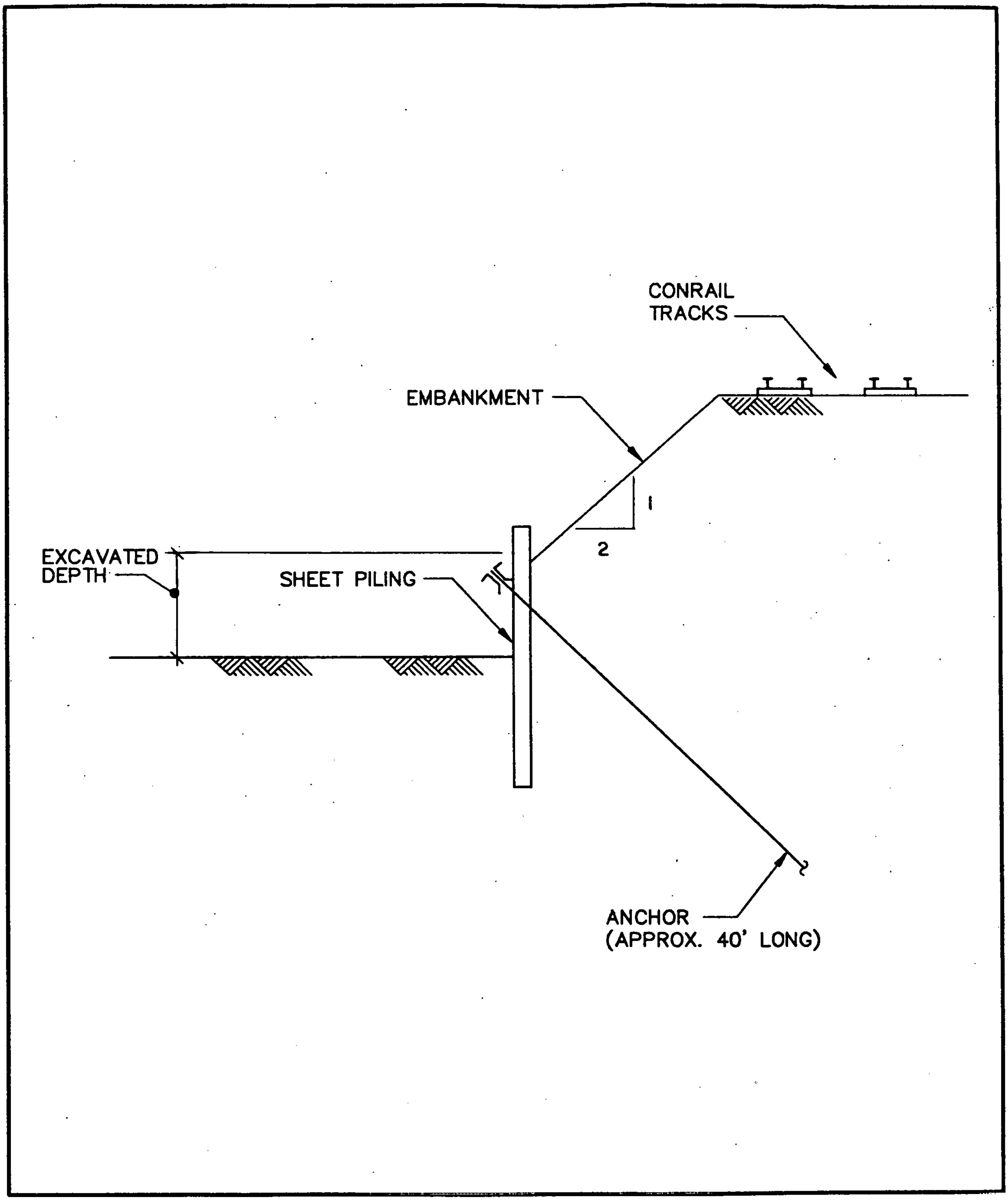
FIGURE 3-11



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PROFILE OF RAILROAD EMBANKMENT STABILIZATION

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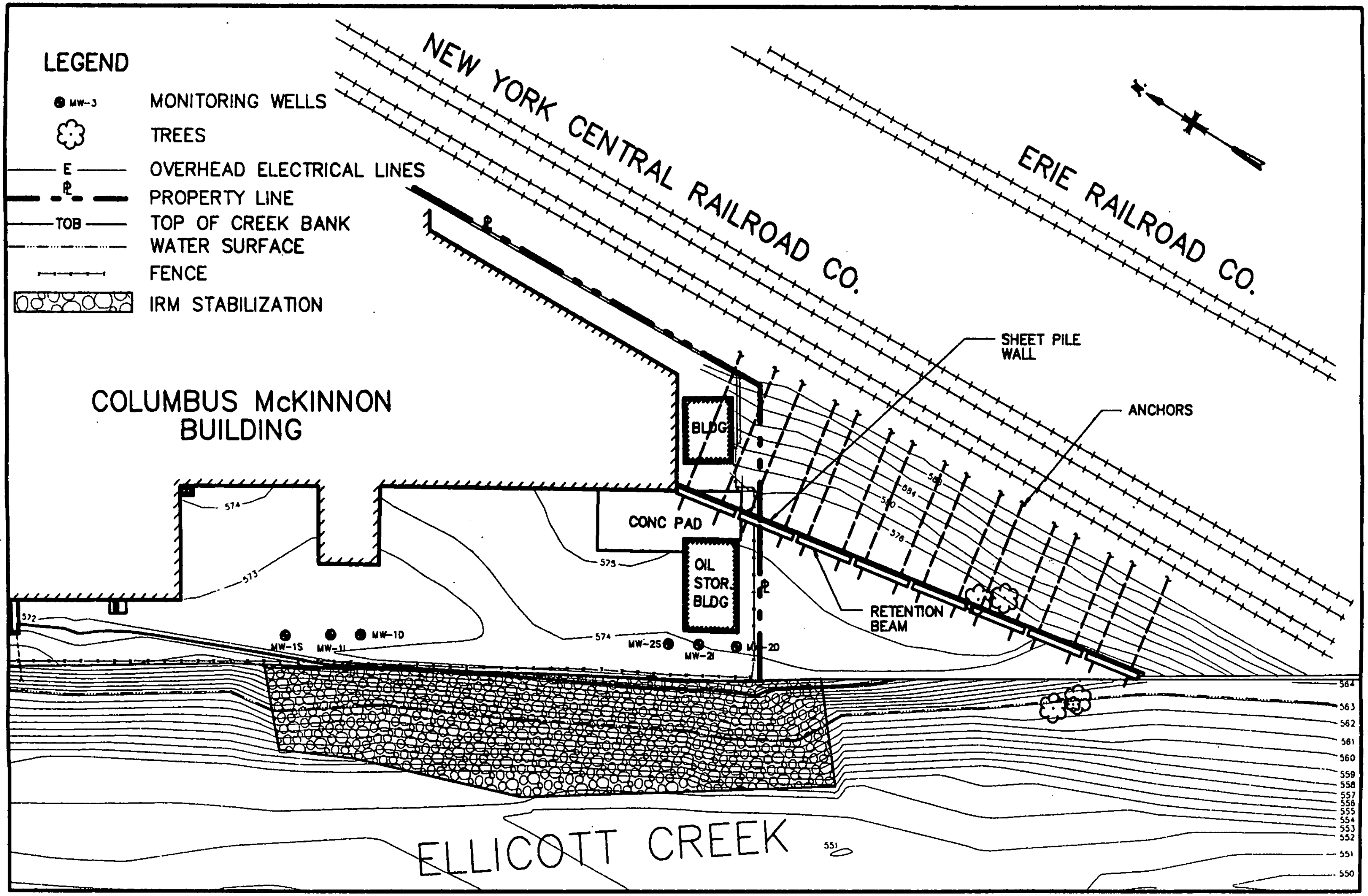

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PLAN VIEW OF RAILROAD EMBANKMENT STABILIZATION

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FIGURE 3-13

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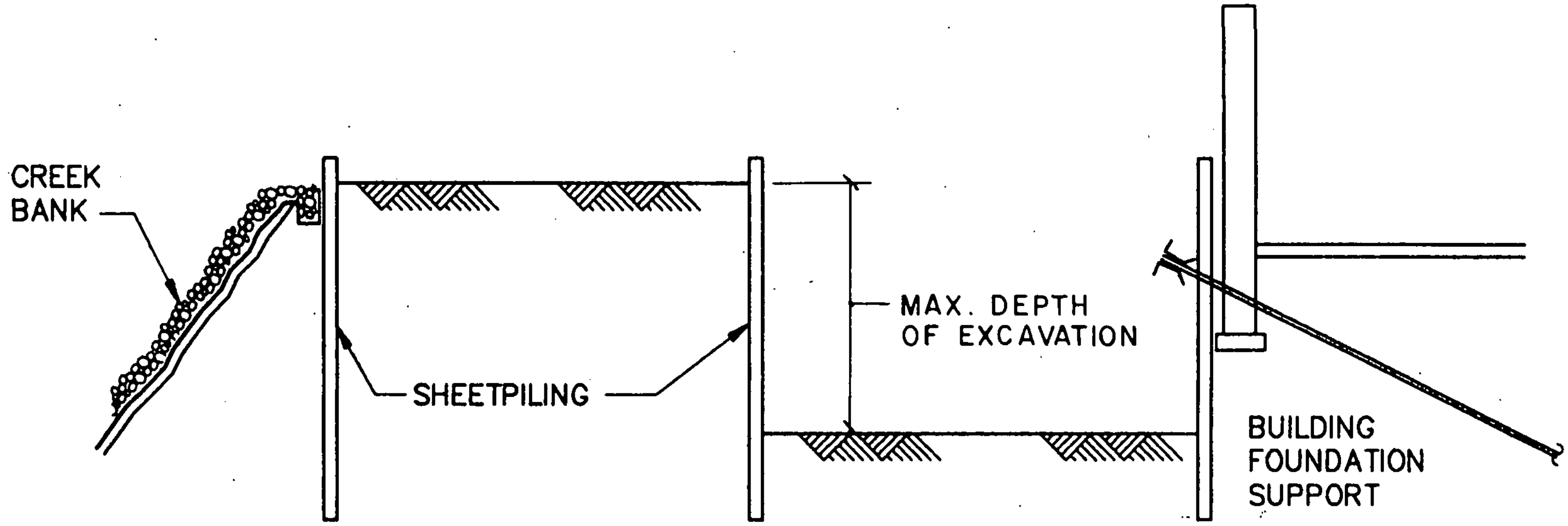
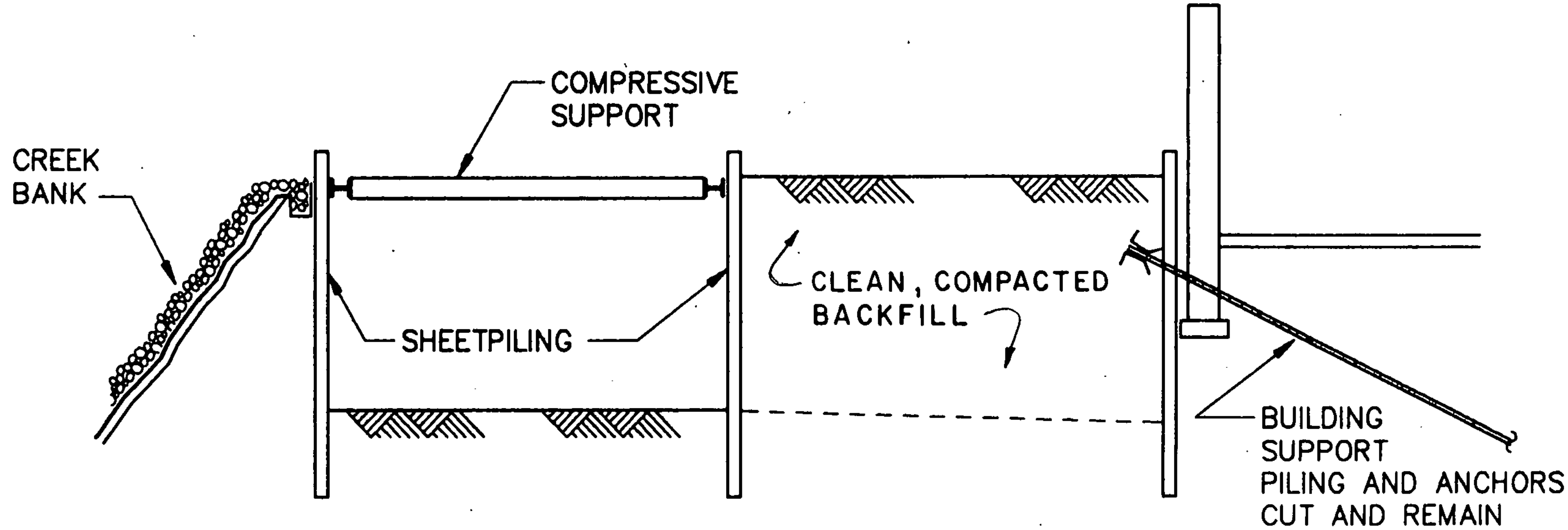
In order to prevent against loss of soil into Ellicott Creek during excavation, stabilization of the top of the creek bank for excavation of soils between the building and the creek bank requires the use of two parallel lengths of sheetpiling. Support is achieved by connecting the top of the bank sheeting to the parallel sheeting using bracing rods (see Figure 3-14). Although the bracing could be connected from the top of the creek bank sheeting to the building, this would prohibit the movement of excavation equipment across the site due to the barrier presented by the bracing itself. As depicted in Figure 3-14, excavation of the soil along the eastern section of the site would be completed first. Following backfilling, the soil along the western section of the site adjacent to the creek bank would then be excavated. The movement of excavation equipment would be along the backfilled easter section of the site between the building and the sheetpiling.

Excavation of soil utilizing the sheetpile stabilization methods described above is hereafter referred to as "stabilized excavation". Although this method of stabilization does afford an increase in the volume of soils to be excavated in comparison to the unstabilized excavation alternative, it does not allow for complete excavation of the creek bank soils. This is primarily due to the fact that it is not possible to excavate the triangular wedge of creek bank soil between the west sheetpile wall and the creek.

A third means of excavation does not rely on standard excavation equipment but rather utilizes a drill rig equipped with a 4-foot caisson auger head. The head bores a 4-foot diameter hole through a hollow exterior steel casing which is driven into the area to be excavated before the boring is initiated. The excavated soils are forced up through the center of the casing and deposit outside the perimeter of the hole. Upon completion of the boring to the required depth, the hole is backfilled with clean soil from an off-site source and the casing is then removed. The next boring is then completed immediately adjacent to the first and so-on until the maximum number of borings have been completed. In the case that the borings are completed such that no overlapping occurs. The pattern of the borings is as depicted in Figure 3-15. This pattern of borings is referred to as "close-pack, non-overlapping caisson". If the borings are completed such that they are overlapping (eliminating the interstitial material not excavated in the non-overlapping case), the pattern of the borings is as depicted in Figure 3-16. This pattern of borings is referred to as "close-pack, overlapping caisson" and represents the fourth means of excavation to be considered for the Columbus McKinnon site.



PHASE I – EXCAVATION OF EASTERN SECTION AT CREEK BANK



PHASE II – EXCAVATION OF WESTERN SECTION AT CREEK BANK

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PROFILE OF TWO PHASED APPROACH FOR SOIL EXCAVATION

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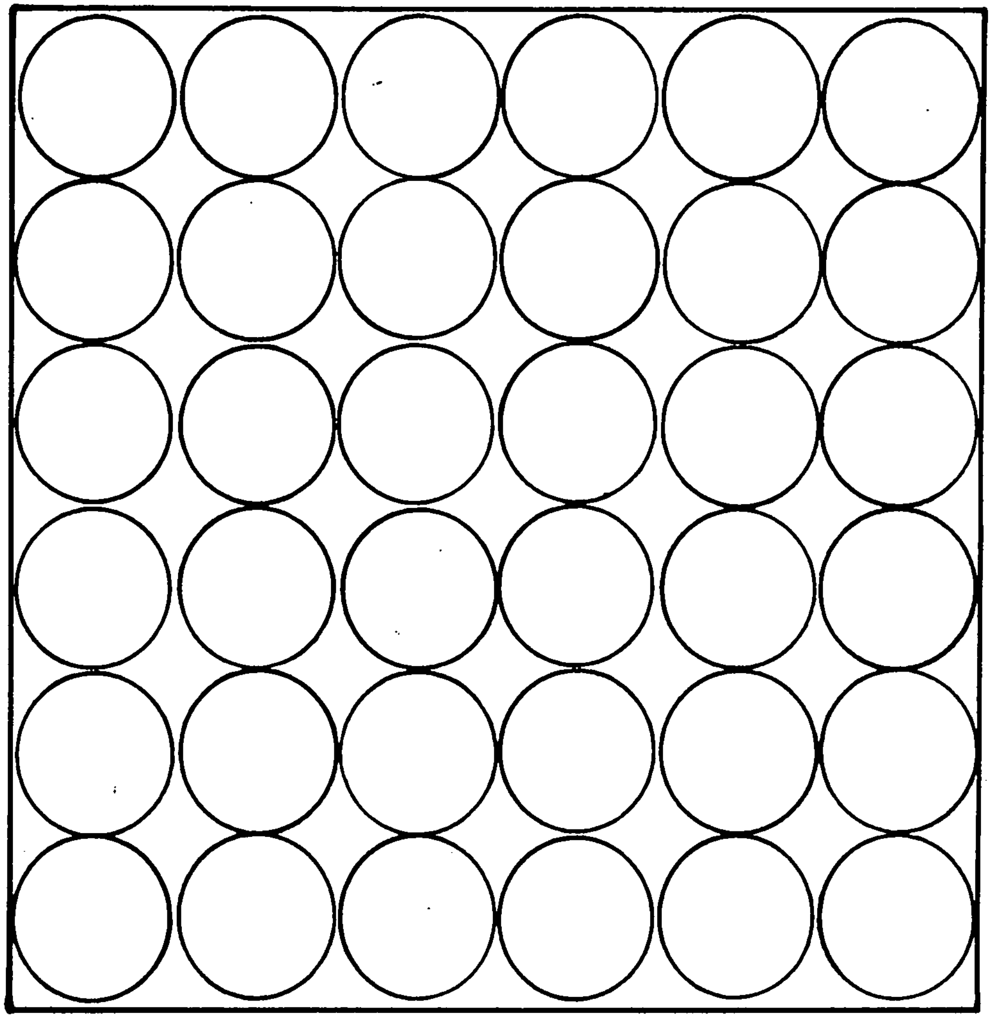
FIGURE 3-14



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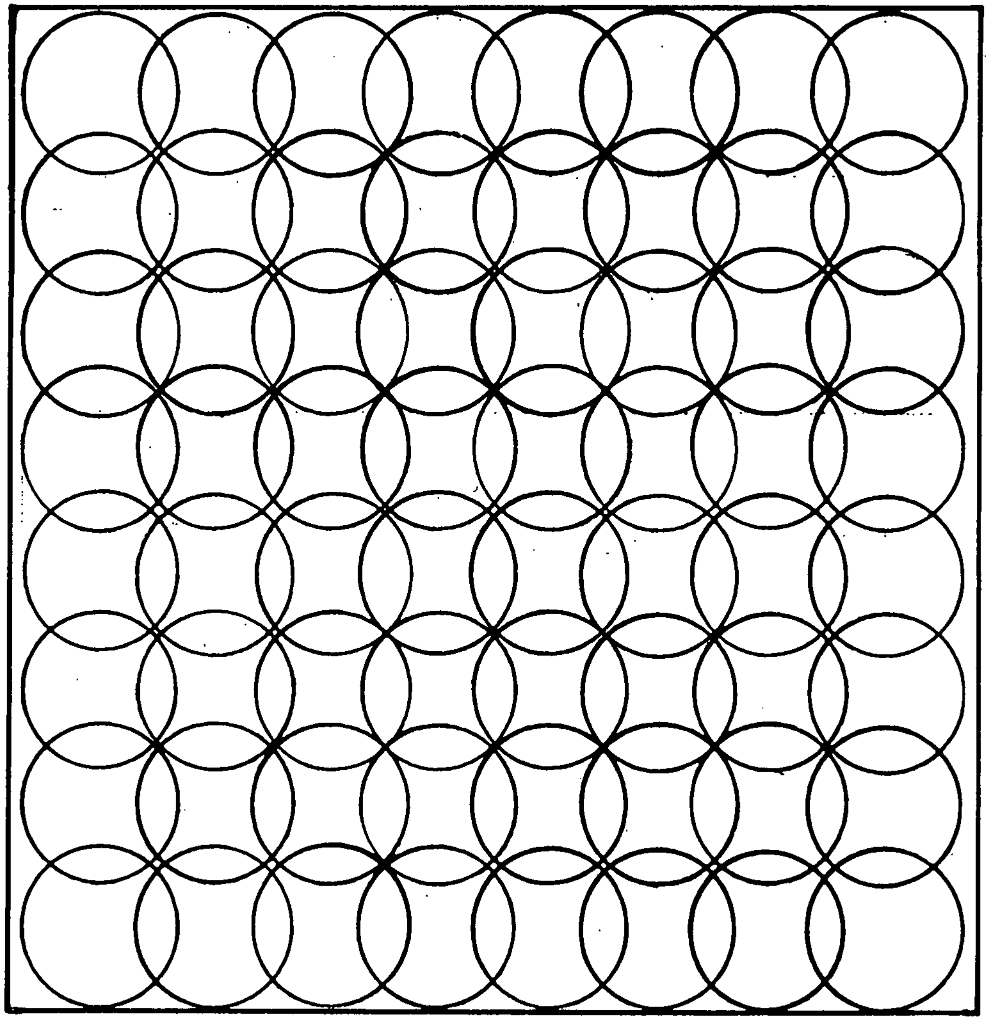
COL - 01

ENGINEERING FEASIBILITY STUDY
CLOSE PACK, NONOVERLAPPING CAISSON BORING PATTERN

COLUMBUS McKINNON CORP.
TONAWANDA FACILITY

NOVEMBER 1991

FIGURE 3-15



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COL - 01

ENGINEERING FEASIBILITY STUDY
CLOSE PACK, OVERLAPPING
CAISSON BORING PATTERN

COLUMBUS McKINNON CORP.
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NOVEMBER 1991

FIGURE 3-16

The excavation alternatives discussed to this point are generally intended as potentially feasible alternatives for excavation of the Study Area soils from depths of 0 feet to 10 feet below ground surface (viz. the top of the shallow ground water table), and would depend upon the PCB cleanup objective. However, a fifth and final excavation alternative will also be considered - excavation of "principal threat" soils.

In accordance with the USEPA's "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" those materials generally considered to constitute a "principal threat" include those soils which exhibit PCB concentrations in excess of 500 mg/kg. The results of past soil sampling events performed at the Columbus McKinnon site indicate that principal threat soils are limited in most cases to the upper 2 feet of soil, and in no case are these soils any deeper than 4 feet below grade. Excavation of these soils would be relatively straightforward and would not necessitate sheetpiling or forms of stabilization as the principal threat soils are shallow and are primarily located near the central portion of the Study Area away from the on-site structures. Furthermore, the relatively low volume of soil excavated in this case (i.e., 313 yd^3) should not necessitate construction of a formal haul access road. Smaller equipment, such as a Bobcat (TM) or tractor, could feasibly traverse the current access pathway with little risk and could deposit small loads of contaminated soil into a truck stationed in the yard area of the plant. A layer of gravel placed over the existing pathway (similar to that described for the cover alternatives) would be necessary to provide a flat, stable surface during wet weather. Movable precast concrete "Jersey" barriers could be installed along the top of the creek bank to prevent equipment from sliding in. An additional feasible means for removing this low volume of soil would be to fill load boxes within the study area, which could then be lifted by crane or transported by barge across the creek to a waiting transport truck.

Upon excavation of the contaminated soils, the off-site disposal option involves transport of the soil to a permitted hazardous waste landfill. Clean fill from an off-site source would replace the excavated material in all cases.

3.1.1.6 Excavation/Treatment/Off-Site Disposal

Excavation followed by treatment and off-site disposal differs from the excavation/off site disposal option only in that the soils would first be treated through physical, chemical, biological or thermal means prior to being deposited in a permitted hazardous waste landfill, or if determined after treatment to be non-hazardous, in a sanitary landfill. The means for excavating the soils would be through one of the methods described in Section 3.1.1.5. The treatment alternatives for the excavated materials are described below.

Physical Treatment

Physical treatment of excavated soils typically refers to solidification or stabilization of the soil by mixing it with a solidification agent, typically a polymer-based additive or Portland cement, on a small batch basis. The solidified soil matrix typically represents a less toxic condition in that the leachability of hazardous constituents is reduced and hazardous constituents are less mobile because the solidified matrix is resistant to erosion. The bound matrix is typically formed in a cubic mold which allows for stacking of the hardened blocks, or can be replaced in slurry form into the excavation from which it was removed, where it solidifies.

Chemical Treatment

Chemical treatment of excavated soils is performed by "washing" the soils with either a solvent-based chemical or aqueous detergent solution which reacts with the contaminants in the soil such that they leach from the soil to the aqueous wash solution. The washed soil is then dried to vaporize any remaining wash solution and the resulting solution is treated further to separate the contamination from the wash reagent. Washed soil is then disposed off-site in a sanitary or secure landfill depending on the concentration of contaminant residuals.

Biological Treatment

Biological treatment of excavated soils may be performed through direct application of microorganism-rich aqueous solution or through biological treatment of the wastewater solute obtained following soil washing. Biological treatment relies on microorganisms to metabolize organic contaminants. Biological treatment may be accomplished under aerobic or anaerobic conditions. Metabolic rates of aerobic microorganisms are typically faster and therefore favored for treatment. A supplemental oxygen source is also typically required for aerobic treatment. Other important requirements and control variables for effective biological treatment include:

- pH (typically in the range of 6-9 standard limits)
- temperature (typically metabolic rates increase with temperature)

- macronutrients (supplements organic, nitrogen and/or phosphorus may be needed to support the biomass)
- micronutrients (trace metals and/or other micronutrients may improve metabolic rates)
- moisture content
- biodegradability of contaminants
- use of cultured or naturally-occurring microorganisms

The treated soil residuals would be disposed off-site in a secure or sanitary landfill depending on contaminant concentrations.

Thermal Treatment

Thermal treatment involves heating the contaminated soils to the point of volatilization or combustion, thereby volatilizing or oxidizing organic material, including organic contamination. Volatile gasses and/or particulates emitted during the combustion process are typically scrubbed or adsorbed to the point that they can be discharged to the atmosphere. The scrubber liquid is periodically clarified and settled sludge is disposed off-site. The ash generated during the combustion process would be disposed off-site in a landfill.

3.1.1.7 Excavation/Treatment/On-Site Disposal

Excavation followed by treatment and on-site disposal is essentially identical to excavation followed by treatment and off-site disposal, with the exception of the final destination of the treated soil. On-site disposal would involve returning the treated soils to the Columbus McKinnon site. Depending upon the degree of treatment achieved and residual contaminant concentrations in the treated soil, containment of the treated soil previously described in Section 3.1.1.3 may also be required to prevent direct human contact and associated public health risks.

3.1.2 Creek Sediments

Potential remediation alternatives for contaminated sediments in Ellicott Creek adjacent to the Columbus McKinnon site were identified in Section 2.0. These alternatives and process options are described below.

3.1.2.1 No Action

A no-action alternative will be retained throughout the preliminary screening process. Approximately 36% of the volume of contaminated Study Area creek bottom sediments are already covered by the IRM which serves to eliminate scouring, suspension and migration of the covered sediments, and isolates those sediments from contact between fish, waterfowl and other aquatic organisms. The IRM consists of a MIRAFI 700X non-woven geotextile with an effective opening size of 70-100 mesh. This fabric has a filtering efficiency that will retain particles one-half the diameter of the largest size opening or larger; (viz. 75-85 um). On top of the filter fabric is a nominal one-foot (to two-foot at the base of the slope) thickness of 4 to 8-inch stone. In the context of a no-action alternative, these measures would remain in place and no further remedial actions would be undertaken.

3.1.2.2 Containment/Isolation

Containment alternatives may include various stabilization technologies which would serve to contain and immobilize non-IRM covered sediments by the installation of in-place coverings or by fixation of sediments. Containment will then serve to eliminate scouring, suspension and migration of PCB-contaminated sediments, and also isolate sediments from contact and intake of contaminants by humans and aquatic organisms. The technologies considered for containment of study area creek sediments adjacent to the Columbus McKinnon site are identified below. Two options will serve as an extension of the IRM and the remaining option will serve to augment it. Creek sediment containment could be concurrently deployed with creek bank containment.

Riprap/Erosion Control Fabric

This option employs the technology selected for the IRM. Stabilization of the remaining unstabilized contaminated sediments would be similarly achieved by placing a synthetic fabric over the sediments to prevent sediment migration and potential contact with aquatic organisms. The erosion control fabric would be covered with riprap to keep the fabric in place and free from access to marine life. The fabric and the riprap would be placed from a barge. The installation of the riprap will serve as an IRM extension.

Revetment Fabric

Revetment fabric would serve as an IRM extension by containing/isolating the creek sediments in a similar manner to riprap/erosion control fabric by casting in-place a submerged uniform layer of concrete over the sediments. The revetment fabric process involves placing a premanufactured double-layer woven fabric envelope over the area to be stabilized. A fluid sand/cement mortar mixture is then pumped into the fabric envelope. The cement mortar mixture cures to form a stable and uniform mat of concrete that will serve to contain/isolate sediments from scour, suspension, migration and ingestion, and contact by humans and aquatic organisms. Placement of the revetment fabric will require the facilities of a barge or boat in conjunction with a submarine diver. Pumping of the mortar mixture could be accomplished from the creek bank or barge.

Grouting

The grouting alternative would serve to stabilize existing or future riprap-covered creek sediments by fixating the sediments currently covered by the erosion control fabric and riprap.

There are numerous grouting techniques and materials available. A technique that could potentially be used would involve permeation grouting wherein cementitious or chemical grouts are injected under pressure into the media to be grouted. Port grout pipes are installed in a predetermined design pattern. Grout is injected through the ports at specific intervals and rates to treat the target area. Depending on the grout material used, the product will result in a solidified low-permeability soil mass. The port grout pipes would have to be installed along the creek bottom through the riprap and erosion control fabric. Installation would require the use of a barge to drive the grout pipes.

3.1.2.3 Dredging

General

Discussions presented in this section are limited to creek sediment removal methods only. Disposal alternatives for creek sediments are discussed in the next Section. In evaluating each dredging alternative, two sub-options are addressed:

- excavation and disposal of sediments outside the IRM limits only; or
- removal of the IRM (riprap/erosion control fabric) and excavation and disposal of entire Study Area sediments within and outside the IRM limits.

Dredging Methods

Excavation of the contaminated sediments could be performed via hydraulic or mechanical dredging methods. Hydraulic dredging involves the use of an underwater vacuum-type device (portable cutter-head pump), which serves to scrape the bottom of the creek while lifting the slurried sediment through a flexible hose to a discharge point. Movement of the head of the unit is typically controlled from a barge, and a high-capacity pump provides the necessary suction. Due to the nature of this operation, a large amount of water is removed with the sediment. Typically four volumes of water are removed for each volume of sediment extracted.

Hydraulic dredging could be performed by installing a temporary silt curtain in the stream to reduce the migration of disturbed sediments downstream.

Mechanical dredging is most commonly performed using a clamshell bucket operated from shore or from a barge. Mechanical dredging typically results in a high degree of suspension of sediments. In hazardous waste remediation applications such as this, suspension of contaminated sediments can mobilize and release a significant mass of contaminants to surface waters which can create localized or widespread acute toxicity impacts on aquatic biota. As such, mechanical dredging of contaminated creek sediments without positive, reliable containment or dewatering is not considered to be implementable. In addition, mechanical dredging around the toe of the existing IRM could not be performed without substantial disruption of the IRM. A cofferdam could be utilized to segregate a particular section of the stream, which is then pumped dry prior to excavation. The excavation would then be performed using conventional excavation equipment in the dewatered excavation or from the top of the adjacent creek bank. The operation area near the creek bank would require access improvements (viz. a haul road) previously discussed in Section 3.1.1.5.

On the basis of the requirements outlined above, all dredging options involving maintaining the existing IRM would necessitate hydraulic rather than mechanical dredging.

Regardless of the method for dredging, it will be necessary to dewater sediments prior to disposal. The Toxic Substance and Control Act prohibits the deposition of PCB-contaminated liquids in a secure landfill. Dewatering of dredged sediments may be accomplished through the use of temporary steel dewatering tanks that will be situated in a Columbus McKinnon-owned parking area opposite the remediation area. The supernatant from the dewatered sediments would be treated through sand filtration followed by activated carbon to separate and remove any potential PCB contamination from the water prior to discharge back to Ellicott Creek. Disposal of sediments will be addressed in the next Section.

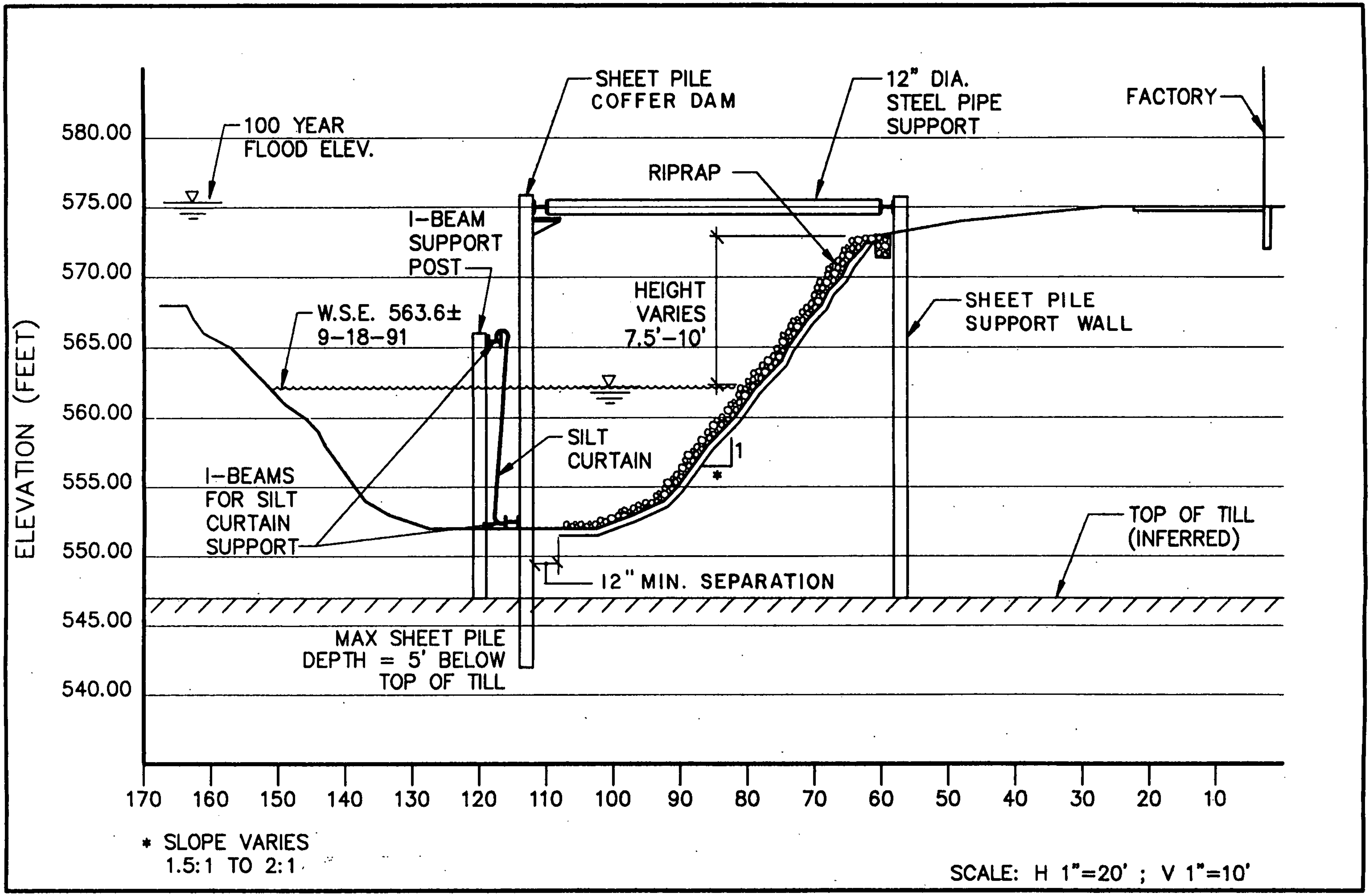
IRM Removal

Removal of the IRM in order to dredge sediments underneath the IRM will require the construction of a temporary cofferdam, as shown in Figures 3-17 and 3-18, to prevent the introduction and downstream migration of PCB-contaminated sediment and creek bank soils disturbed by the removal process. This cofferdam would be supplemented by a silt curtain as illustrated in Figure 3-17. The silt curtain will prevent disturbance and downstream migration of creek bottom sediments during the period of installation and removal of the cofferdam. Prior to sediment dredging, the IRM riprap and erosion control fabric will be manually removed. Such removal of the IRM, however, will be difficult and tedious. The riprap stone may be removed by using specially-equipped excavation equipment only or excavation equipment in combination with manual filling of excavator buckets. This manual removal will require divers in dry suits with supplied air to physically lift the rocks from the submerged creek bank and bottom into the excavation buckets. This would be preceded by the removal of the riprap above the waterline either by hand or with a cherry-picker. The underlying erosion control fabric will also be removed for disposal with the sediments. Removal of sediments can be accomplished using conventional dredging equipment situated near the creek bank. The excavated riprap may be re-used to stabilize other portions of the creek bank. The disposition of sediments and erosion control fabric is addressed in the following dredge/disposal alternatives.

3.1.2.4 Disposition of Dredged Sediments

Dredging/Off-site Disposal

The non-IRM removal option will involve hydraulic dredging of the Study Area sediments around the IRM area. Excavated sediments and water would be directed to a temporary dewatering tanks situated in a parking area across the creek (see Plate 2). Dewatered sediments would be hauled off-site for land disposal in a secure permitted hazardous waste landfill.



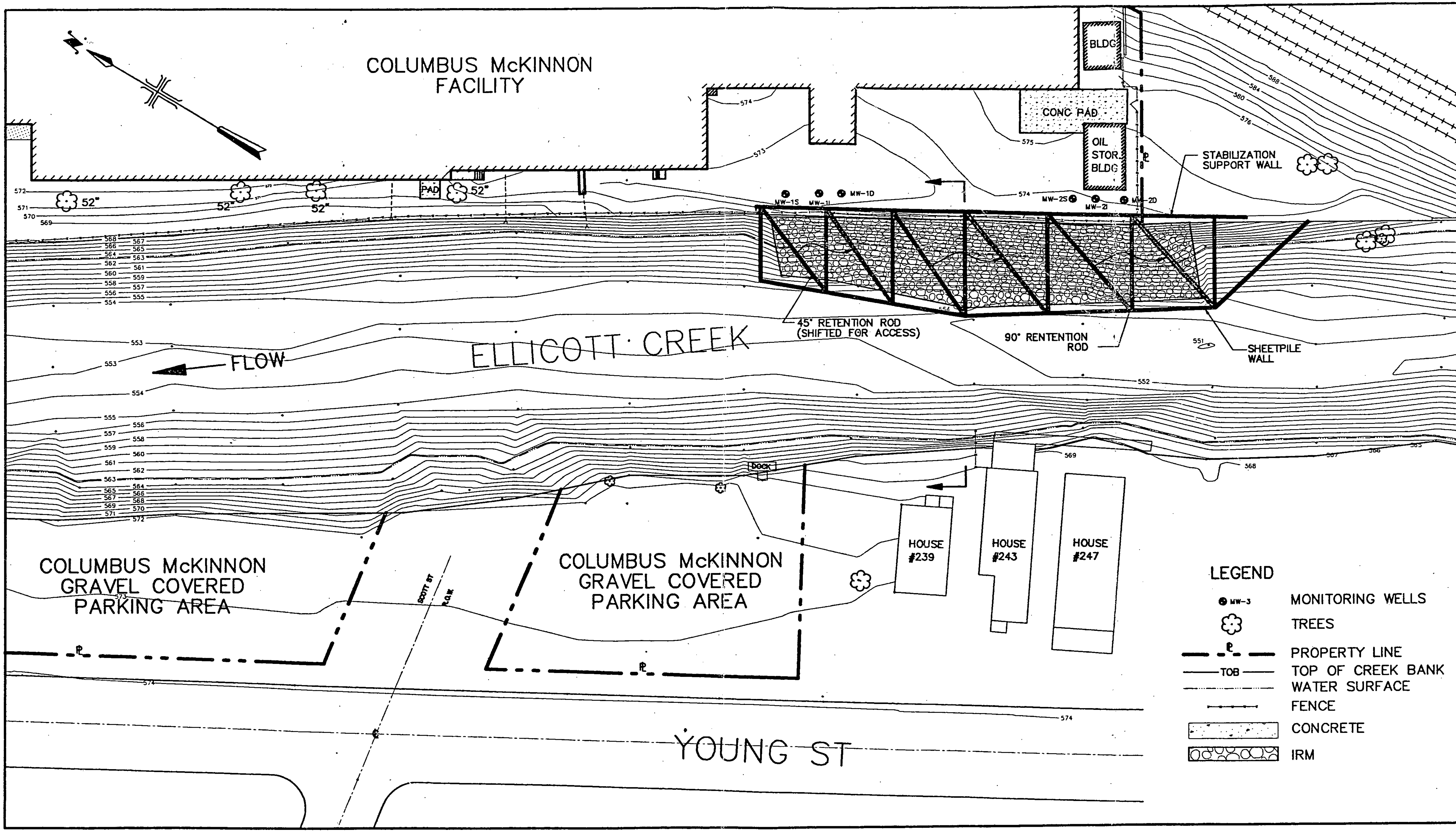
MALCOLM PIRNIE

TONAWANDA FACILITY
PROFILE OF SHEET PILE
COFFER DAM AROUND IRM

COLUMBUS McKINNON CORP. NOVEMBER 1991

FIGURE 3-17

FIGURE 3-18



MALCOLM PIRNIE

40 0 40 80
SCALE OF FEET

TONAWANDA FACILITY

PLAN VIEW OF SHEETPILE COFFERDAM FOR REMOVAL OF IRM

COLUMBUS McKINNON NOVEMBER 1991

The IRM removal option would require installation of a silt curtain and sheetpile cofferdam as discussed in Section 3.1.2.3 prior to removal. The IRM riprap would first be carefully removed, followed by removal of the underlying erosion fabric and then dredging of the Study Area sediments. Once completed, the cofferdam will be removed and the riprap may be re-used to stabilize the creek bank. The erosion control fabric will be disposed of accordingly. In each situation, no replacement/restoration of the creek bottom would be undertaken other than that which is incidental to the creek bank stabilization.

Dredging/Treatment/Off-Site Disposal

The dredging/treatment/off-site disposal alternative differs from the dredging/off-site disposal alternative only in that the sediments would first be treated through physical, chemical, biological, or thermal means prior to disposal in an off-site secure permitted hazardous waste landfill or, if determined after treatment to be nonhazardous, in a sanitary landfill. The treatment alternatives for dewatered sediments are identical to those for excavated soils as described in Section 3.1.1.6.

The erosion control fabric removed during the IRM removal alternative would require separate disposition in a secure hazardous waste landfill unless otherwise incinerated. It is anticipated that the material will be bulky and difficult to handle once excavated, which limits possible treatment alternatives.

Dredging/On-Site Disposal

The dredging/on-site disposal option differs from the preceding sediment dredging options only in that dewatered sediments/erosion control fabric would be disposed of on-site, untreated, in a secure hazardous waste disposal cell. The disposal cell would be constructed in accordance with 6NYCRR Part 373 rules and regulations governing hazardous waste disposal facilities. Providing that all the various technical and regulatory requirements could be met, a NYSDEC permit to construct and operate a Part 373 landfill cell may not be required.

Dredging/Treatment/On-Site Disposal

The dredging/treatment/on-site disposal alternative differs from the preceding sediment dredging alternative only in that the sediments would first be treated through physical, chemical, biological, or thermal means prior to on-site disposal. Depending on the character of treated and dewatered sediments, those sediments determined hazardous must be disposed of on-site in a hazardous waste disposal cell constructed in accordance with

6NYCRR Part 373 rules and regulations. Treated sediments determined nonhazardous could be disposed of on-site with vegetative cover or other contaminant (cover) systems previously described.

3.1.3 Creek Bank

Potential remediation alternatives for remediation of contaminated Ellicott Creek bank soil adjacent to the Columbus McKinnon site were identified in Section 2.0. These alternatives and their process options are described below.

3.1.3.1 No Action

A no-action alternative provides a benchmark for comparison to other remedial action alternatives and justifies the need for any remedial action. In order to affect this comparison and justification, a no-action alternative will be retained for the creek bank throughout the preliminary screening process.

As discussed earlier, the creek bank along the Central Area of the site as well as along a portion of the South area has been stabilized with erosion control fabric and riprap (viz. the IRM). The no action alternative by definition retains the existing IRM. The remainder of the South Area creek bank as well as the North Area (viz., the areas which have exhibited lower contamination levels in comparison to the Central Area) creek banks would remain uncovered if the no action alternative is selected.

3.1.3.2 Containment

Containment alternatives may include various creek bank stabilization technologies which will serve to contain and immobilize non-IRM covered creek bank materials by the installation of stable and durable coverings. Containment of the remaining study area of the creek bank would further reduce potential erosion of PCB-contaminated creek bank materials and also isolate creek bank soil from contact and intake of contaminants by humans and aquatic organisms. The containment technologies considered for containment/ stabilization of the Study Area creek bank adjacent to the Columbus McKinnon site are identified below. All options presented below would serve as an extension of the IRM. Several of the options could be employed to augment the existing IRM. Creek bank containment should be concurrently deployed with creek sediment containment.

Riprap/Erosion Control Fabric

This alternative employs the technology used for the IRM. Stabilization of the remaining creek bank in the Study Area would be similarly achieved by placing a synthetic erosion control fabric over a prepared creek bank slope followed by a layer of riprap as described in Section 3.1.2.1. The filter fabric serves to effectively eliminate soil migration. The riprap serves to keep the fabric in place while also serving as a permanent physical barrier from contact between humans and aquatic organisms. The fabric and riprap could also be similarly placed from a barge. Where preparation of the creek bank surface is required, this could be accomplished from either the top of bank and/or a barge.

Revetment Fabric

Revetment fabric could serve as either an IRM extension or to augment the IRM by stabilizing/isolating the creek bank by casting in-place a uniform layer of concrete between layers of geotextile over a prepared creek bank slope. A description of materials and installation methods is described in Section 3.1.2.2. Benefits are similar to those for riprap stabilization.

3.1.3.3 Excavation

General Discussion

Excavation and disposal options for creek bank materials are discussed in the following sections. In each creek bank excavation alternative, selective excavation of IRM riprap and erosion control fabric followed by bulk excavation of creek bank materials (soil, sediment, existing erosion protection materials including stone and rubble) is proposed. Creek bank excavation alternatives could be concurrently implemented with complementary soils and/or sediment excavation alternatives.

Prior to excavating creek bank materials, construction access and creek isolation measures will be required to facilitate creek bank excavation. Construction access problems and limitations are discussed in Section 3.1.1.5. Creek isolation would involve the installation of a silt curtain and temporary sheetpile cofferdam in the creek around the Study Area to ensure that creek bank soils do not fall into Ellicott Creek during excavation. The cofferdam would be similar to the cofferdam described in Section 3.1.2.3 and illustrated in Figure 3-17 for removal of the IRM and hydraulic dredging of the sediments.

Excavation of creek bank soils will be considered through two (2) separate mechanisms: mechanical excavation within the non-dewatered cofferdam and mechanical excavation within the dewatered cofferdam. In either case, the riprap would be retained for future use, the fabric will be disposed of accordingly, and the water would require treatment similar to that described for sediment dredge water prior to its being released back into the creek.

In each excavation option, the excavated creek banks would require restoration. Where significant quantities of bulk excavated soils results in extensive alteration of the creek bank, fill soil will be required to restore the creek bank and creekside areas. These fill soils would be placed and compacted under controlled conditions and under close monitoring and supervision. Creek bank erosion protection materials (riprap or revetment fabric) will be placed over all excavated creek bank areas. The IRM riprap selectively removed can be reused for this purpose. Additional riprap and replacement erosion control fabric will be required to complete the restoration.

Disposition of dewatered sediments and bulk excavated creek bank materials is addressed in the following excavation/disposal options.

Excavation/Off-Site Disposal

Excavation of creek bank materials would proceed as discussed in Section 3.1.3.3. Bulk excavated creek bank materials and dewatered sediments would be hauled off-site for land disposal, untreated, in a secure permitted hazardous waste landfill. Following the excavation, the creek bank areas would be restored as discussed in the preceding section.

Excavation/Treatment/Off-Site Disposal

The excavation/treatment/off-site disposal option differs from the preceding excavation/off-site disposal option only in that the bulk excavated creek bank materials and dewatered sediments would be first treated through physical, chemical, biological, or thermal means prior to disposal in an off-site secure permitted hazardous waste landfill; or, if determined after treatment to be nonhazardous, in a sanitary landfill. Treatment alternatives are described in Section 3.1.1.6.

Excavation/On-Site Disposal

The excavation/on-site disposal option differs from the preceding creek bank excavation option only in that excavated creek bank materials would be disposed of on-site untreated in a secure hazardous waste disposal cell. The disposal cell would be constructed in accordance with 6NYCRR Part 373 rules and regulations governing hazardous waste disposal facilities.

Excavation/Treatment/On-Site Disposal

The excavation/treatment/on-site disposal alternative differs from the preceding creek bank material excavation alternative only in that the creek bank materials would first be treated through physical, chemical, biological or thermal means prior to on-site disposal. Depending on the character of treated creek bank materials, treated creek bank materials determined hazardous must be disposed of in an on-site hazardous waste disposal cell constructed in accordance with 6NYCRR Part 373 rules and regulations. Treated creek bank materials determined nonhazardous could be deposited on-site and vegetated or placed under a containment cover system previously described in this Section.

3.2 SCREENING OF ALTERNATIVES

The preliminary screening of each of the alternatives discussed in Section 3.1 is presented here. The assessment includes an evaluation of each alternatives effectiveness and implementability. Preliminary costs for each of the alternatives are also presented, although cost is not used as a criteria for eliminating any alternative from further evaluation.

3.2.1 Soils

The no-action alternative will be retained through the preliminary screening process as a basis for comparison. The preliminary screening of the remaining alternatives for the Study Area soils is presented below.

3.2.1.1 Institutional Controls

Institutional controls such as additional fencing, signage, and deed restrictions effectively reduce the potential for human contact with contaminated soils. These controls are readily implemented and are not subject to problems associated with site access for heavy equipment. A preliminary cost estimate for implementation of institutional controls is presented in Table 3-1. It is estimated that the construction portion of this alternative would require approximately four weeks to complete. This alternative passes the preliminary screening of alternatives and will be retained for further detailed analysis.

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FEASIBILITY STUDY

TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E (1)	Technologies Eliminated Based On: I (2)
ENVIRONMENTAL MEDIUM: Creek Bank									
No Action	–	creek bank remains with existing IRM on Central Area bank and portion of South Area bank	limits erosion of bank from area of highest contamination	–	no implementation required	–	–		
Extension of Creek Bank Stabilization	D	creek bank IRM is extended across South Area (80 feet) and North Area (110 feet)	mitigates release of PCBs from the site via erosion	15/25	readily implementable, reliable technology	12/15	$291K		
Containment with Revetment Fabric	D	concrete-filled revetment fabric placed across entire creek bank	mitigates release of PCBs from the site via erosion	15/25	readily implementable, reliable technology	12/15	$354K		
Dewatered Excavation of Creek Bank with Off-Site Incineration of Soils	A	sheet pile wall constructed at toe of existing IRM, mechanical excavation of soils, off-site incineration	eliminates potential for migration of PCBs and erosion from the creek bank	18/25	significant uncertainty in reliability of sheet piling	8/25	-		X
Dewatered Excavation of Creek Bank with Off-Site Disposal of Soils	E	sheet pile wall constructed at toe of existing IRM, mechanical excavation of soils, off-site disposal	eliminates potential for migration of PCBs and erosion from the creek bank	12/25	significant uncertainty in reliability of sheet piling	8/15	-		X
Non-dewatered Excavation of Creek Bank with Off-Site Incineration of Soils	A	sheet pile wall constructed at toe of existing IRM, mechanical excavation of soils, off-site incineration	eliminates potential for migration of PCBs and erosion from the creek bank	16/25	extremely difficult to implement	9/15	$7.9M		
Non-dewatered Excavation of Creek Bank with Off-Site Disposal of Soils	E	sheet pile wall constructed at toe of existing IRM, mechanical excavation of soils, off-site disposal	eliminates potential for migration of PCBs and erosion from the creek bank	15/25	extremely difficult to implement	9/15	$2.6M		

NOTES:
* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:

A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

(continued)

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TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E (1)	Technologies Eliminated Based On: I (2)
ENVIRONMENTAL MEDIUM: Study Area Soils									
No Action	D	site remains with existing remedial measures: • plastic sheeting over area of highest contamination • access restricted by fencing	limits human exposure to the contaminants	–	no implementation required	–	–		
Institutional Controls	D	measures taken to reduce human contact (signs, fencing, deed restrictions, etc.)	limits human exposure to the contaminants	16/25	readily implementable	13/15	13K		
6NYCRR Part 360 Soil Cap	D	site covered with soil-based layers	effectively reduces mobility of contaminants and mitigates further migration	15/25	not feasible to implement	7/15	–		X
6NYCRR Part 360 Synthetic Cap	D	site covered with soil and synthetic layers	effectively reduces mobility of contaminants and mitigates further migration	15/25	not feasible to implement	7/15	–		X
RCRA Cap	D	site covered with soil and synthetic layers	effectively reduces mobility of contaminants and mitigates further migration	15/25	not feasible to implement	7/15	–		X

NOTES:

* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:

A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

(continued)

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E [1]	I [2]
ENVIRONMENTAL MEDIUM: Study Area Soils (continued)									
Topsoil Cover	D	site covered with topsoil	effectively reduces mobility of contaminants and mitigates further migration	15/25	readily implementable, reliable technology	14/15	$153K		
Gravel Cover	D	site covered with gravel	effectively reduces mobility of contaminants and mitigates further migration	15/25	readily implementable, reliable technology	14/15	$150K		
Synthetic/Soil Cover System	D	site covered with soil and synthetic layers	effectively reduces mobility of contaminants and mitigates further migration	15/25	readily implementable, reliable technology	14/15	$220K		
Asphalt Cover	D	site covered with asphalt	effectively reduces mobility of contaminants and mitigates further migration	15/25	readily implementable, reliable technology	14/15	$203K		
Excavation of "Principal Threat" Soils with Off-site Incineration	A	excavation of soils exhibiting PCB concentrations above 500 mg/Kg; soils incinerated off-site	removes 57% of total mass of PCBs at the site and all PCBs in excess of 500 ppm	19/25	readily implementable, reliable technology	13/15	$1.3M		
Partial Excavation without Sheet Piling, Off-Site Incineration of Soils	A	excavation of contaminated soils, 2:1 slope maintained at buildings, creek bank and RR embankment; soils incinerated off-site	removes 52% of total mass of PCBs at the site	20/25	readily implementable, reliable technology	13/15	$6.1M		

NOTES:
* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:
A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

(continued)

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FEASIBILITY STUDY

TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E (1)	Technologies Eliminated Based On: I (2)
ENVIRONMENTAL MEDIUM: Study Area Soi (continued)									
Total Excavation with Sheet Piling, Off-Site Incineration of Soils	A	excavation of contaminated soils, sheet piling stabilization at building foundations, RR embankment and top of creek bank	removes 61% of total mass of PCBs from the site	20/25	difficult to implement	10/15	$8.2M		
Excavation via Non-Overlapping, Close-Pack Caisson Borings; Off-Site Incineration of Soils	A	contaminated soils excavated by augering 4 ft. caisson borings in a non-overlapping patter; soils incinerated off-site	removes 40% of total mass of PCBs at the site	19/25	difficult to implement	11/15	$5.9M		
Excavation via Overlapping, Close-Pack Caisson Borings; Off-Site Incineration of Soils	A	contaminated soils excavated by augering 4 ft. caisson borings in an overlapping pattern; soils incinerated off-site	removes 48% of total mass of PCBs at the site	19/25	difficult to implement	11/15	$6.2M		
Excavation of "Principal Threat" soils with Off-site Disposal	E	excavation of soils exhibiting PCB concentrations above 500 mg/Kg; soils disposed off-site	removes 57% of total mass of PCBs at the site and all PCBs in excess of 500 ppm	16/25	readily implementable, reliable technology	13/15	$509K		
Partial Excavation without Sheet Piling, Off-Site Disposal of Soils	E	excavation of contaminated soils, 2:1 slope maintained at buildings, creek bank and RR embankment; soils disposed off-site	removes 52% of total mass of PCBs at the site and all PCBs in excess of 500 ppm	16/25	readily implementable, reliable technology	13/15	$1.6M		
Total Excavation with Sheet Piling, Off-Site Disposal of Soils	E	excavation of contaminated soils, sheet piling stabilization at building foundations, RR embankment and top of creek bank	removes 61% of total mass of PCBs from the site	16/25	difficult to implement	10/15	$2.2M		
Excavation via Non-Overlapping, Close-Pack Caisson Borings; Off-Site Disposal of Soils	E	contaminated soils excavated by augering four ft. caisson borings in a non-overlapping pattern; soils disposed off-site	removes 40% of total mass of PCBs at the site	15/25	difficult to implement	11/15	$1.4M		

NOTES:
* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:
A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

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FEASIBILITY STUDY

TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E (1)	Technologies Eliminated Based On: I (2)
ENVIRONMENTAL MEDIUM: Study Area So ·s (continued)									
Excavation via Overlapping Close-Pack Caisson Borings; Off-Site Disposal of Soils	E	contaminated soils excavated by augering four ft. caisson borings in an overlapping pattern; soils disposed off-site	removes 48% of total mass of PCBs at the site	15/25	difficult to implement	11/15	$1.5M		
ENVIRONMENTAL MEDIUM: Stream Sedim· its									
No Action	-	sediments remain partially covered by creek bank IRM	somewhat mitigates environmental risk to fish and wildlife	–	no implementation required	–	–		
Containment - Synthetic Fabric/Rip-Rap	D	sediments covered by erosion control fabric stabilized with riprap	effectively mitigates environmental risk to fish and wildlife by removing PCBs from water column	15/25	readily implementable, reliable technology	14/15	$250K		
Containment - Revetment Fabric	D	sediments covered by concrete-filled revetment fabric	effectively mitigates environmental risk to fish and wildlife by removing PCBs from water column	15/25	readily implementable, reliable technology	13/15	$138K		
Containment - Underwater Grouting	D	sediments bound in grout matrix	effectively mitigates environmental risk to fish and wildlife by removing PCBs from water column	16/25	substantial implementation difficulties and high degree of environmental risk	7/10	–		X

NOTES:

* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:

A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

(continued)

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 3-1

PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Remedial Technology	NYSDEC Hierarchy Achieved *	Description	Effectiveness (E)	Score	Implementability (I)	Score	Preliminary Cost Est. (C)	Technologies Eliminated Based On: E (1)	I (2)
ENVIRONMENTAL MEDIUM: Stream Sediments (continued)									
Hydraulic Dredging around IRM, Off-Site Disposal	E	portable cutter head pumps sediments to temporary dewatering basin; dewatered sediments hauled to secure landfill for disposal	effectively mitigates environmental risk to fish and wildlife	17/25	somewhat difficult to implement	10/15	$654K		
Hydraulic Dredging around IRM, Off-Site Incineration	A	portable cutterhead pumps sediments to temporary dewatering basin, dewatered sediments hauled to off-site incineration facility	effectively mitigates environmental risk to fish and wildlife	20/25	somewhat difficult to implement	10/15	$1.4M		
Remove IRM, Hydraulic Dredging of All Study Area Sediments, Off-Site Disposal	E	sheet piling installed at toe of IRM, IRM removed, portable cutter head pumps sediments to temporary dewatering basin, dewatered sediments hauled to secure landfill for disposal	effectively mitigates environmental risk to fish and wildlife	19/25	difficult to implement	10/15	$1.7M		
Remove IRM, Hydraulic Dredging of all Study Area Sediments, Off-Site Incineration	A	sheet piling installed at toe of IRM, IRM removed, portable cutter head pumps sediments to temporary dewatering basin, dewatered sediments hauled to secure landfill for incineration	effectively mitigates environmental risk to fish and wildlife	22/25	difficult to implement	10/15	$2.8M		

NOTES:

* NYSDEC Hierarchy of Remedial Technologies, from "most" to "least" desirable:

A - Destruction: results in permanent reduction in toxicity
B - Separation/Treatment: results in permanent and significant reduction in volume
C - Solidification/ Chemical Fixation; results in permanent and significant reduction in mobility
D - Control and Isolation: results in reduction in mobility, but not volume or toxicity
E - Off-Site Land Disposal

(1) E = Effectiveness
(2) I = Implementability

3.2.1.2 Containment

6NYCRR Part 360 Soils Cap

The 6NYCRR Part 360 soils cap would be effective for preventing contact with, and ingestion of, PCB and lead contamination and would also substantially prevent the erosion of contamination off-site. Several difficulties, however, lie in the implementation of this alternative. Specifically, entrance to the Study Area is limited to an access drive approximately 10-12 feet wide. This prevents the use of large equipment in constructing the cap, and will require construction of a haul access road. Furthermore, the relatively small size of the site itself and the proximity to Ellicott Creek limits mobility, which would likely result in a longer time for construction than an equivalent site having no mobility restrictions. In addition, the volume of material required for a 6NYCRR Part 360 soil cap in combination with even a minimal slope would substantially raise the grade at the east border of the site, and would create a mound approximately 6 feet high at Columbus McKinnon's facility. In addition, this excess load on the site surface could potentially de-stabilize the creek bank soils. Finally, the 6NYCRR Part 360 cap would have to be "keyed in" at the edge of the site (at the IRM). This would necessitate excavation immediately adjacent to the IRM to a depth of approximately four (4)feet, an action which would potentially result in collapse of the IRM and the transfer of PCB-contaminated soils to Ellicott Creek. Finally, access to the site would require removal of the large trees currently located along the access path. As a result of these difficulties, the 6NYCRR Part 360 soil cap is not considered a technically viable alternative for remediation of the on-site soils.

6NYCRR Part 360 Synthetic Cap

Placement of a 6NYCRR Part 360 synthetic cap across the site offers similar advantages and implementation obstacles as the Part 360 soil cap. Although the Part 360 synthetic cap is approximately 18 inches less in thickness than the soil cap, the synthetic cap will still present problems with respect to the elevation of the cap, the limited mobility precluding heavy equipment use, and the keying in of the cap at the creek bank. Finally, access to the site would require removal of the large trees currently located along the access path. The 6NYCRR Part 360 synthetic cap is therefore not a technically viable alternative for remediation of the on-site soils.

RCRA Cap

The RCRA cap is designed to prevent human contact and surface water percolation at a hazardous waste site; however, it requires that approximately 6 feet of cover material be placed over the site. This amount of cover in combination with the slope of the site will result in a substantial elevation in grade at the east end of the site, creating an approximately 8-foot mound at Columbus McKinnon's facility and necessitating a 6-foot excavation behind the IRM in order to key in the cap at the creek bank. Finally, access to the site would require removal of the large trees currently located along the access path. The RCRA cap is, therefore, not a technically viable means for remediating the Columbus Mckinnon site.

Asphalt Cover System

An asphalt cover system will prevent overland erosion of soils from the Columbus McKinnon site and will also prevent human exposure to the contamination. An asphalt cover offers advantages over the caps previously discussed in that the thickness of the cover (approximately one foot) does not pose substantial excavation problems at the creek bank nor build-up problems at the east end of the site. Although heavy equipment usage will be limited due to the site's size constraints, it is feasible that small vehicles could be utilized to transport the warmed asphalt and that a small mechanical roller could be utilized to compact the layers. This would preclude construction of a sheetpile-stabilized access road and would only require placement of a layer of gravel over the existing access path. A preliminary cost estimate for construction of an asphalt cover at the Columbus McKinnon site is presented in Table 3-1. It is estimated that the construction portion of this alternative would require 2-3 months to complete. This technology is a viable alternative for achieving the remedial action objectives for the Study Area soils and will be retained for further detailed analysis.

Topsoil Cover

A topsoil cover will prevent human contact with contamination at the Columbus McKinnon site and, when properly vegetated, will also effectively prevent overland erosion of contaminated soils from the site. A topsoil cover is typically between 6 inches and 1 foot thick and therefore does not present increased elevation problems at the east end of the site nor excavation problems associated with keying in at the creek bank IRM. A preliminary cost estimate for construction of a topsoil cover is presented in Table 3-1. As in the case of an asphalt cover, the cost for construction of a topsoil cover also includes placement of a layer of gravel over the existing access road. It is estimated that the construction portion of this alternative would require 3-4 months to complete. This alternative also passes the preliminary screening of alternatives and will be retained for further detailed analysis.

Gravel Cover

A gravel cover offers similar benefits as the topsoil cover. Implementation of this alternative will prevent direct human contact with, and ingestion of, contaminated soils and will effectively prevent overland erosion of soils from the site. In addition, the thickness of a gravel cover (viz., 6 inches) does not present elevation problems at the east end of the site; nor does it present keying problems at the creek bank IRM. A preliminary cost estimate for construction of a gravel cover is presented in Table 3-1. It is estimated that the construction portion of this alternative would require 3-4 months to complete. This alternative passes the preliminary screening of alternatives and will be retained for further detailed analysis.

Synthetic Membrane/Soil Cover System

A synthetic membrane/soil cover system will prevent direct human contact with, and ingestion of, contaminated soils at the Columbus McKinnon site and, when vegetated, will effectively prevent overland erosion of contaminated soils from the site. In addition, it will eliminate infiltration of surface water to soils below the plastic sheeting. A synthetic cover does not present elevation problems at the east end of the site nor excavation problems associated with keying in at the IRM. A preliminary cost estimate for construction of a synthetic membrane/soil cover system is presented in Table 3-1. It is estimated that the construction portion of this alternative would require 3-4 months to complete. This technology is a viable alternative for achieving the remedial action objectives for the study area soils and will be retained for further detailed analysis.

3.2.1.3 In Situ Treatment

In Situ Vitrification

In situ vitrification at hazardous waste sites has revealed serious implementation problems. As a result, this technology is not considered a technically acceptable means for remediation of the Columbus McKinnon site and will not be carried through detailed analysis.

In Situ Solidification/Stabilization

According to USEPA, in situ solidification has not been effectively demonstrated on a full-scale basis as a viable means for hazardous waste site remediation. As a result, this technology is not considered a technically acceptable means for remediation of the Columbus McKinnon site and will not be carried through detailed analysis.

In Situ Biological Soil Detoxification

According to USEPA, in situ biological soil detoxification has not been effectively demonstrated on a full-scale basis as a viable means for hazardous waste site remediation. As a result, this technology is not considered a technically acceptable means for remediation of the Columbus McKinnon site and will not be carried through detailed analysis.

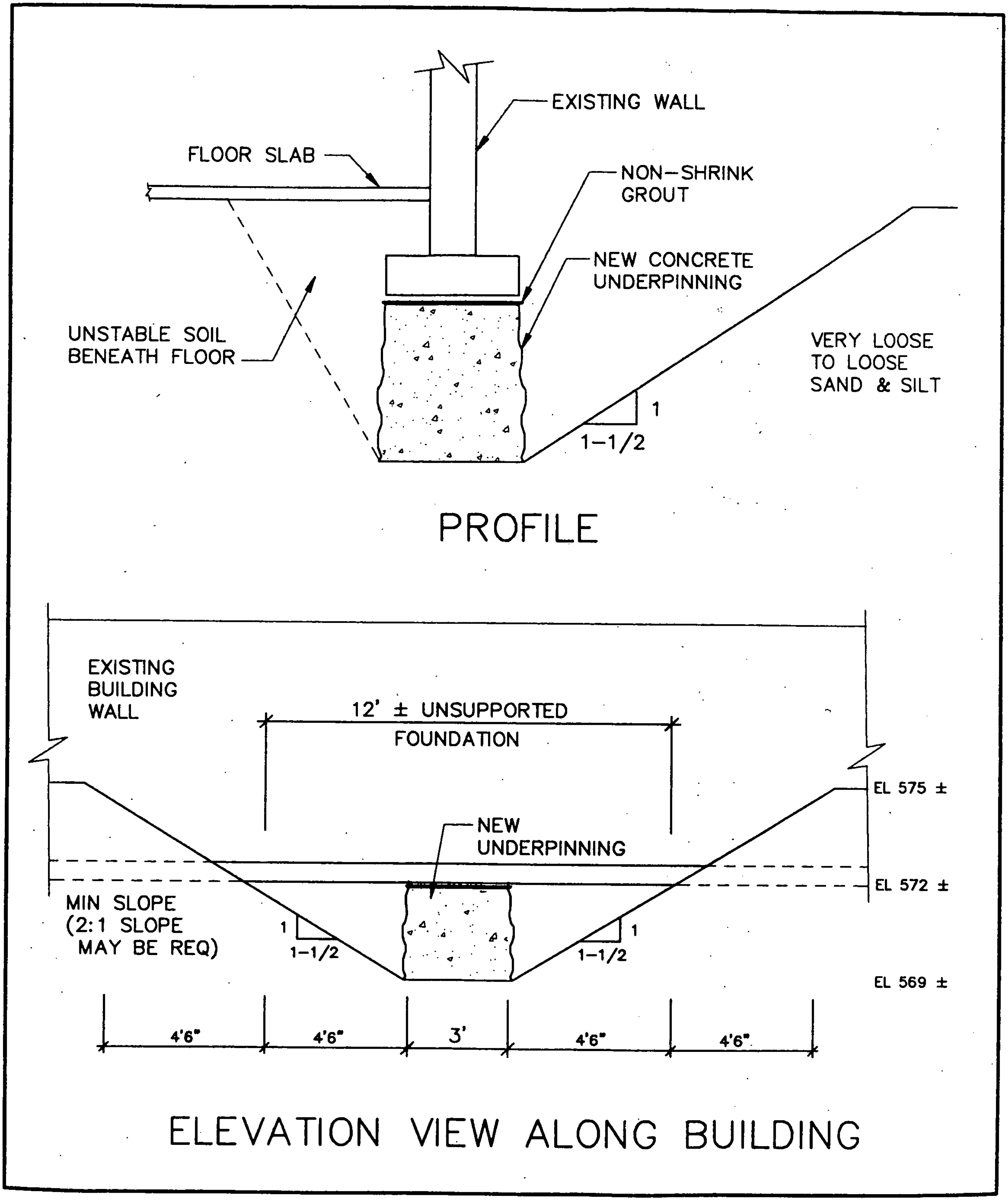
3.2.1.4 Excavation/Off-Site Disposal

As discussed in Section 3.1.1.5, five (5) excavation alternatives for contaminated soils at the Columbus McKinnon site will be considered: unstabilized excavation; stabilized excavation; close-pack, non-overlapping caisson; close-pack, overlapping caisson; and excavation of principal-threat soils.

As indicated in Section 3.1, conventional underpinning must be eliminated from consideration for use at this site. First, inspection of the building indicates that vertical settlement and horizontal displacement of the foundation has occurred in the past. The building will not tolerate any significant movement, as such movement will jeopardize the structural integrity of the building. Second, the soil which supports the foundation is very loose to loose sand, silt, and fill. It cannot be expected to hold vertical sides during excavation, and slopes of 1-1/2 horizontal:1 vertical sides should be the minimum anticipated. As shown in Figure 3-19, this will result in unsupported sections of foundation in the range of 12 feet. Additionally, the loose sand and silt would be expected to be unstable and voids would be expected to occur beneath the floor slab. Therefore, based on the safety risks to construction personnel and the risk of further structural damage to the building, the traditional underpinning method has been eliminated in favor of sheetpiling (discussed in Section 3.1.1.5).

In order to evaluate the effectiveness of each of the five excavation options in combination with off-site disposal of the contaminated soils, it was first necessary to construct a representative excavation plan for the site. This was accomplished by

FIGURE 3-19



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TONAWANDA FACILITY

TRADITIONAL UNDERPINNING TO SUPPORT BUILDING

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segregating the site into grids approximately 25 feet wide by 25 feet long, as exhibited on Plate 4. The results of split-spoon samples falling within each 25-foot x 25-foot grid were used to quantify the PCB contamination levels at 2-foot depth intervals. The PCB concentration within each grid was assumed for each 2-foot deep layer (i.e, 0-2', 2-4', 4-6', etc.) to be equivalent to the maximum split-spoon sample PCB concentration recorded within the layer (mg/kg, dry weight). For layers not sampled, the concentration was assumed to be equivalent to the greater of the layers above or below it. Concentration levels for layers which exhibited non-detectable results for all split-spoon samples were assumed to be equivalent to the detection limit. Once the PCB concentrations of the individual layers within a 25-feet x 25-feet grid were quantified according to these methods, the PCB concentration across the entire depth of the grid was determined by calculating the average of the individual 2-foot layers (the depth to contamination was assumed as far as the deepest 2-foot layer exhibiting detectable PCB concentrations). Upon completion of this process for each of the grids, the mass of PCBs within each grid was calculated by multiplying the PCB concentration by the volume of contaminated soil. The total PCB mass at the site was then calculated as the sum of the grids, resulting in a total PCB mass of approximately 67,400 grams. The PCB concentration data utilized in performing these calculations is summarized in Appendix B.1.

Upon determination of the total PCB mass at the site, excavation alternatives were compared on the basis of the percentage of total PCB mass removed at a given cleanup criteria (viz. 10 ppm and 25 ppm, respectively). PCB mass removed from each grid was calculated by subtracting the mass of PCBs not excavated due to the limitations of the excavation (eg., soil not excavated due to 2:1 slope) from the total PCB mass present. Calculations of PCB mass excavated for each of the five (5) excavation alternatives are presented in Appendices B2 through B6. A summary of the PCB removal efficiency for each of the excavation alternatives is presented for the 10 ppm and 25 ppm cleanup scenarios in Table 3-2.

As shown in Table 3-2, none of the five excavation alternatives completely removes all PCB contamination from the site at either the 10 nor 25 ppm PCB cleanup scenarios (primarily due to the presumed level of contamination in the adjacent creek banks). In fact, the maximum achievable PCB mass removal for the site based upon the given cleanup criteria and excavation alternatives is 67%. This PCB maximum mass removal could be achieved following installation of sheetpiling at the top of the creek bank, at the toe of the railroad embankment and at the building foundations, and completing excavation of all contained soils above 10 ppm PCBs. Table 3-2 illustrates that for either cleanup goal the difference in mass of PCBs removed between the most effective option (stabilized excavation) and the least effective option is approximately 20% of the total PCB mass.

As indicated in Table 3-2, the straightforward excavation of the principal-threat soils alone will eliminate 57% of the total PCB mass at the site. In addition, excavation of the principle threat soils coupled with the placement of a topsoil cover will prevent direct human contact and ingestion of the low-threat PCBs and lead from the Study Area soils consistent with the Superfund guidance for PCB-contaminated materials. The location and depth of the areas containing principal-threat soils are shown schematically in Plate 5.

The total PCB mass removal percentages for the excavation alternatives discussed which are shown in Table 3-2 are a function of: the PCB cleanup limit; the effects of the site structures in prohibiting excavation of all contaminated soil; the presumed contamination levels in the adjacent creek banks; and the overall efficiency of the excavation technique. The effects of the site structures are most prevalent in the case of unstabilized excavation. In order to demonstrate these effects, the breakdown of PCB concentrations at depth as well as the degree of excavation achievable is illustrated for unstabilized excavation on an areal basis at 10 and 25 ppm cleanup scenarios in Plates 6 and 7, respectively.

Excavation of the on-site soils followed by off-site disposal will serve to reduce risk from direct contact with contaminated soils and will reduce erosion of site soils to Ellicott Creek. However, the primary factor in this risk reduction will not be the removal of a portion of the contaminated soils, but rather from the placement of a cover system over the site following excavation.

Several short-term risks may be encountered if excavation is undertaken at the site. These risks include: dust migration; the potential for failure of the haul access road during transport of vehicles and equipment to/from the site (this will not be a factor in the case that only principal-threat soils are excavated); the potential for failure of the sheetpiling at the railroad embankment, creek bank, or building foundations if incorporated into the excavation plan; and the potential for a mishap during the transport of the contaminated soils to the hazardous waste landfill.

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TABLE 3-2

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SUMMARY OF EFFECTIVENESS OF EXCAVATION ALTERNATIVES

Alternative	Max. Volume Contaminated Soil (cy)	Maximum PCB Mass (grams)	Max. Vol. Contaminated Soil Above Cleanup Level (cy)	Max. PCB Mass Above Cleanup Level (grams)	Volume of Contaminated Soil Excavated (cy)	Mass of PCBs Above Cleanup Level Excavated (grams)	% Removal of PCB Mass Above Cleanup Level	% Removal of Maximum PCB Mass
PCB CLEANUP LEVEL - 10 mg/kg:								
A	4766	674,020	2869	532,950	1821.0	347,240	65.2	51.5
B	4766	674,020	2869	532,950	2476.0	452,180	84.8	67.1
C	4766	674,020	2869	532,950	1711.0	318,480	59.8	47.3
D	4766	674,020	2869	532,950	2022.0	377,480	70.8	56.0
E	4766	674,020	2869	532,950	313	387,470	65.8	57
PCB CLEANUP LEVEL - 25 mg/kg:								
A	4766	674,020	2616	454,050	1790.0	344,340	75.8	51.1
B	4766	674,020	2616	454,050	2249.0	410,100	90.3	60.8
C	4766	674,020	2616	454,050	1606.0	272,220	60.0	40.4
D	4766	674,020	2616	454,050	1779.0	322,290	71.0	47.8
E	4766	674,020	2616	454,050	313	387,470	77.3	57

NOTE:

Alt. A = Excavation with no sheetpiling stabilization (V-shape).
Alt. B = Excavation with sheetpiling stabilization at building foundations, RR embankment, and top of creek bank.
Alt. C = Excavation via non-overlapping close-pack caisson.
Alt. D = Excavation via overlapping close-pack caisson.
Alt. E = Excavation of principal threat soils.

The cost estimate for excavation and disposal of the site soils under each of the five excavation alternatives is presented in Table 3-1. The costs represent excavation of contaminated soil under an assumed cleanup criteria of 25 ppm PCB's. As discussed previously, excavation of site soils does not include creek bank soils. Depending upon the alternative, the time to implement the construction portion of the excavation alternatives is estimated to range from 3 to 6 months. This alternative passes the initial screening and will be retained for further detailed analysis.

3.2.1.5 Excavation/Treatment/Off-site Disposal

Excavation of the contaminated soils followed by off-site treatment and disposal presents identical benefits to the site as the excavation/off site disposal alternative, and also results in identical PCB mass removals and short-term risks. The preliminary evaluation of each of the potential treatment methods for the excavated soils as described in Section 3.1.1.6 is presented below.

Physical Treatment

Physical treatment of the excavated soils through solidification/stabilization means increases volume/weight of the soils due to the addition of solidification materials, resulting in increased disposal costs over the non-treated soil. This treatment alternative offers some minimal advantage in comparison to the off-site disposal option; however, these advantages are negligible. On this basis, physical treatment of the excavated soils is eliminated from further consideration.

Chemical Treatment

Chemical treatment technologies for contaminated soil/fill involve transferring the contamination to a liquid solvent, which is then treated to remove the organic contamination. According to USEPA, this method has not been effectively demonstrated on a full-scale basis for PCB-contaminated waste sites. Consequently, this method of treatment is eliminated from further consideration.

Biological Treatment

According to USEPA, biological treatment of PCB-contaminated wastes has not been proven effective on a full-scale basis and therefore is not a viable alternative for treatment of excavated soils from the Columbus McKinnon site. Consequently, this technology is eliminated from further consideration.

Thermal Treatment

Thermal treatment of excavated soil/fill although very costly, is an effective means for destruction of organic contamination. Off-site incineration facilities are typically permitted for either bulk incineration (incineration of non-drummed waste) or for non-bulk incineration, whereby contaminated soils are first packed into 55-gallon fiber-based drums at the site and the entire drum is incinerated, eliminating direct handling of the hazardous soil at the incineration facility. Non-bulk incineration is typically more expensive than bulk incineration due to cost and increased effort in packing drums at the site as well as the reduction in the amount of contaminated soil which can be loaded per truck. The cost for excavation and incineration of contaminated soils from the Columbus McKinnon site is presented for each of the five (5) excavation alternatives in Table 3-1, and assumes a cleanup criteria of 25 ppm PCBs. As in the case of excavation followed by off-site disposal of contaminated soils, even at a cleanup criteria of 10 ppm none of the excavation alternatives removes greater than 67% of the PCB mass from the Columbus McKinnon site. Again, excavation of the site soils does not include any portion of the creek bank.

3.2.1.6 Excavation/Treatment/On-site Disposal

Excavation followed by treatment of contaminated soils and return of the treated material to the Columbus McKinnon site is not feasible for any of the considered treatment technologies. As per the discussion in section 3.2.1.5, incineration of contaminated soils is the only treatment technology determined viable on the basis of technical feasibility. Return of ash from the incineration process to the original site is not typical for most off-site incineration facilities, and offers no advantage over off-site disposal aside from a negligible decrease in the amount of fill needed to restore the Columbus McKinnon property. It should be noted that on-site incineration is not plausible at the Columbus McKinnon site due to size constraints. This alternative is therefore eliminated from further consideration.

3.2.2 Creek Sediments

The no-action alternative will be retained throughout the preliminary screening to provide a basis for justification and comparison of the remedial alternatives. The preliminary screening of creek bed sediment remediation alternatives is presented below.

3.2.2.1 Containment

Riprap/Erosion Control Fabric

In situ stabilization of the segment of contaminated creek sediments immediately adjacent to the site, through placement of erosion control fabric followed by riprap for stabilization, is effective in that it prevents the release of PCBs from Study Area sediments that would result in adverse environmental risk to fish and wildlife by immobilizing the contaminated sediments and effectively preventing contact of the contaminated creek sediments with aquatic biota. In addition, this endeavor would require little more effort than extension of the creek bank IRM, and could presumably be performed at the same time. A permit from the U.S. Army Corps of Engineers (USACE) would likely be required for this remedial alternative; however, it is not anticipated that obtaining this permit would be difficult, as a permit was granted for the initial IRM placement. This alternative will be retained through detailed analysis. It is estimated that the construction portion of this alternative would require 1-2 months to implement. A cost estimate for stabilizing the contaminated creek sediments through this process is presented in Table 3-1.

Revetment Fabric

Placement of concrete grout-filled revetment fabric across the creek bank offers similar short-term advantages to the riprap/erosion control fabric for containment/isolation of sediments. This option could be implemented concurrently with placement of revetment fabric across the creek bank. A USACE permit may also be required. Although the revetment fabric will serve to immobilize the contaminated sediments and prevent direct contact with aquatic biota, the rigidity of the concrete may lead to long-term degradation of the revetment fabric cover due to cracking and shifting, as well as degradation due to ice damage. The damage caused by these effects will be more difficult to repair in the case of revetment fabric than in the case of erosion fabric covered by riprap. This alternative will be retained through detailed analysis. It is estimated that the construction portion of this alternative would require 1-2 months to implement. A cost estimate for stabilizing contaminated creek sediments is presented in Table 3-1.

Grouting

Providing appropriate soil and field conditions exist, grouting can provide an effective means to immobilize/stabilize soils. However, the intended grout application for surficial creek bed sediments within the Study Area is not technically feasible for the following reasons:

- The sediments and underlying fine-grained soils have very low void space and are impenetrable with permeation grouting techniques using either chemical or cementitious grouts;

- penetration grouting is limited to areas with a thick overburden. The sediments within the Study Area have low overburden thickness which limits application pressures, thereby compounding the penetration problems;

- variable soil/sediment conditions and grout application pressures could lead to "blow out" of the surficial layer causing disruption of the IRM and suspension of contaminated sediments.

As a result, this technology is not a technically-acceptable means for remediation of the Study Area sediments site and will not be carried through detailed analysis.

3.2.2.2 Dredging - General Discussion

As discussed in Section 3.1.2.3, both mechanical and hydraulic dredging have been considered for removal of contaminated sediments from the Study Area. Both have been considered in the case that the IRM is removed; however, as discussed in Section 3.1.2.3, only hydraulic dredging is feasible in the case that the IRM is not removed. In any of these scenarios, a USACE permit would be required and the excavated sediments would have to be dewatered prior to disposal or treatment.

Mechanical Dredging

Mechanical dredging of the Study Area sediments presents significant implementation problems in that it necessitates construction of a sheetpile cofferdam. Dredging within the confines of a cofferdam is necessary, as mechanical dredging through the unrestricted waters of Ellicott Creek would cause substantial suspension and potential downstream migration of contaminated sediments. A hydraulic analysis of the effects of a cofferdam surrounding the Study Area sediments on Ellicott Creek (see Appendix C) shows that the decreased area for flow near the cofferdam severely constricts the creek channel and would result in overtopping the creek bank and severe flooding upstream and adjacent to the site even if only a 10-year recurrent storm were to occur while the cofferdam was in place. This factor alone gives rise to serious concern as to the effects of such an occurrence on the residential dwellings across from and upstream of the Study Area along Ellicott Creek. It should be noted that the calculations presented in Appendix C rely on creek profile data collected during September 1991. This profile data is presented in Plates 2 and 8, attached hereto.

Ignoring this flood risk, mechanical dredging of the study area sediments within the confines of the sheetpile cofferdam could be performed two ways: with or without dewatering behind the sheeting. Although dewatering is feasible, there is exceptional risk associated with this operation. One such hazard is the possibility of inward movement of the bottom of the sheetpiling due to loss of toe restraint. This would occur if: the piling did not penetrate adequately into the till due to obstructions or due to the density of the till; or, if a channel within the till allowed outside pressurized water to channel under the piling such that "blow out" of a section of sheeting occurred. This latter phenomena is referred to as "piping" and is not uncommon in cofferdam installations. Such an occurrence would endanger the safety of construction personnel and would also cause suspension and release of contaminated sediments and creek bank soils into Ellicott Creek. As a result of these problems, dewatering behind a sheetpile cofferdam followed by mechanical dredging is not considered a technically acceptable means for removing Study Area sediments.

Although the potential for mechanical dredging without dewatering behind the sheetpiling is possible, this alternative also poses the threat of flooding upstream and across the creek and is not as effective as hydraulic dredging due to redeposition of suspended contaminated sediment. Furthermore, the cost of this alternative is prohibitive in comparison to hydraulic dredging and would only be considered potentially desirable if coupled with mechanical excavation of the creek bank. On this basis, mechanical dredging through a non-dewatered cofferdam will not be considered further.

Hydraulic Dredging

Hydraulic dredging, if utilized, would rely on the availability of a large area for construction of a dewatering facility for the contaminated sediments retrieved from the creek bottom. The area behind the Columbus McKinnon facility is insufficient; however, Columbus McKinnon Corp. owns a parking area (approximately 100′ x 400′) situated across Ellicott Creek which could be utilized for this purpose. A dewatering facility would entail temporary steel dewatering tanks and water treatment (sand filtration followed by activated carbon units) to separate and remove any PCB contamination from the water prior to discharge back to Ellicott Creek.

Hydraulic dredging of creek sediments outside the limits of the existing IRM is more readily implementable compared with the option of removing the IRM to dredge all Study Area sediments. Although a certain portion of PCB-contaminated sediments would remain under the IRM, these sediments are effectively immobilized, thus preventing contact with and suspension and migration of these sediments.

Removal of the IRM and hydraulic dredging of the Study Area creek sediments is implementable but would require that sheetpiling be driven around the Study Area in order to contain the suspended sediments and creek bank sloughing during removal of the riprap and erosion control fabric. Dewatering behind the sheetpiling would not be required for hydraulic dredging; however, the same problems, including the potential for flooding of the adjacent and upstream dwellings during a storm event as well as the prolonged impairment of navigation would result. Ellicott Creek is an extensively-used navigable waterway. The cofferdam will effectively restrict nearly half of the channel width. During installation and dredging, the barge will occupy the navigable portion of the channel, thus completely blocking passage of recreational boats for an extended duration.

Hydraulic dredging all Study Area creek bed sediments would result in the removal of PCB-contaminated sediments, thus eliminating the potential for human or aquatic contact/ingestion or suspension and migration of these sediments. Further discussion regarding the fate of dredged sediments will assume that hydraulic dredging is employed and not mechanical dredging.

3.2.2.3 Hydraulic Dredging/Off-site Disposal

The feasibility, benefits, and limitations of removing the sediments are presented in detail in the preceding section. Following dewatering, disposal of the contaminated sediments at an off-site secure landfill could be readily implemented. Several firms within the Western New York area are available to provide transport of the sediments. The off-site disposal alternative will be retained through detailed analysis. It is estimated that the time to implement the construction portion of this alternative is approximately two months in the case of dredging around the IRM and 3-4 months in the case of removing the IRM prior to dredging. Cost estimates for dredging around the IRM followed by off-site disposal of sediments, as well as for the removal of the IRM followed by off-site disposal of dredged sediments are presented in Table 3-1.

3.2.2.4 Hydraulic Dredging/Treatment/Off-site Disposal

This option differs from the preceding sediment removal/disposal option only in that dewatered sediments would be treated prior to disposal. As discussed in Section 3.2.1.5, incineration is considered the only feasible means for treating PCB-contaminated soils/sediments. Thermal treatment of dredged and dewatered sediment, although very costly, is an effective means for destruction of organic contamination. Hydraulic dredging followed by off-site incineration, therefore, passes the initial screening and will be retained for further detailed analysis. The time frame for implementation of this alternative is essentially identical to that identified in Section 3.2.2.3. Cost estimates for hydraulic dredging around the IRM as well as for removal of the IRM followed by hydraulic dredging and off-site incineration of contaminated sediments are presented in Table 3-1.

3.2.2.5 Dredging/On-Site Disposal

Creek bottom sediment dredging followed by on-site disposal would require the construction of a secure permitted 6NYCRR 373 landfill cell. Site location and size constraints prohibit the construction of a containment cell within the regulatory requirements. This alternative, therefore, is not considered implementable. It is eliminated from further consideration and will not be carried through the detailed analysis process.

3.2.2.6 Dredging/Treatment/On-Site Disposal

This alternative consists of dewatered creek bottom sediments being treated off-site, and return of the treated sediments to the Columbus McKinnon site for final disposition. As discussed in Section 3.2.1.5, incineration is considered the only feasible means for treating PCB-contaminated soils/sediments. However, return of thermally treated materials from a treatment facility to the original site is not typically conducted by most off-site incineration facilities and offers no advantage over off-site disposal. Therefore, this alternative is eliminated from further consideration and will not be carried through the detailed analysis process.

3.2.3 Creek Bank

The no-action alternative will be retained throughout the preliminary screening process as a basis for justification and comparison of the remedial alternatives.

3.2.3.1 Containment

Riprap/Erosion Control Fabric

Placement of riprap/erosion control fabric represents an extension of the IRM. Extension of the IRM will provide a highly effective means for preventing erosion of PCBs into Ellicott Creek and preventing direct human contact with potentially contaminated creek bank soils. It has been proven implementable based upon its usage for stabilizing/isolating the Central Area creek bank. Potential difficulties in implementation of the extension of the IRM include the limited number of contractors able to obtain a barge for the construction, and the possible difficulties in obtaining permission from Conrail to remediate the South Area bank. In addition, a USACE permit would also be required, although this process should not pose a problem since a permit has already been obtained for the existing IRM. The estimated time frame for implementation of the construction portion of this alternative is approximately 1-2 months. This alternative will be retained through detailed analysis. A preliminary cost for this IRM extension is presented in Table 3-1.

Revetment Fabric

Placement of concrete grout-filled revetment fabric for creek bank stabilization/isolation is an implementable augmentation and extension of the IRM. The revetment fabric will function in similar fashion to riprap/erosion control fabric. Potential implementation difficulties are similar to the difficulties presented for riprap/erosion control fabric. A USACE permit would be required for installation of the revetment fabric. The revetment fabric offers one advantage over the IRM extension as a more positive barrier to permeation by sediment and sediment pore water. The long-term integrity of the revetment fabric is not considered to be as great as rock riprap and geotextiles. This alternative will be retained through detailed analysis. The estimated time frame for implementation of the construction portion of this alternative is approximately 1-2 months. A preliminary cost for this creek bank containment option is presented in Table 3-1.

3.2.3.2 Excavation - General Discussion

In general, excavation of contaminated creek bank materials, followed by treatment and/or disposal, presents an effective means for eliminating potential PCB contamination from creek bank materials. As previously discussed in Section 3.1.3.3, excavation of creek bank materials would be accomplished by isolating the creek bank from creek channel waters via a cofferdam (i.e., the same cofferdam as described in Section 3.1.2.3), followed by selective excavation of IRM riprap then bulk mechanical excavation of creek bank materials. Construction of the cofferdam poses serious short-term risks that must be addressed; most importantly, the high probability of off-site flooding and the potential for structural failure of the dam, thereby releasing contaminated soil or sediment to the creek; and/or the encroachment of creek water into the creek bank excavation during a significant storm event. Discussions of these risks flooding are presented in Section 3.2.2.3.

Ignoring the aforementioned risks, there are two mechanisms available for excavation behind the cofferdam: dewatering behind the cofferdam followed by mechanical excavation, or by mechanically excavating behind the non-dewatered cofferdam. The ability of a temporary cofferdam to withstand the lateral forces exerted by creek waters when the contained area is dewatered is uncertain. Numerous failure situations can occur, including toppling of the sheeting, undertoe slippage, and sheet seam failure. The creek channel is a navigable waterway and construction would significantly restrict channel navigability; therefore, the USACE is expected not to permit these measures and these options are considered to be technically infeasible.

As a result of the extreme difficulties associated with construction of the sheetpile cofferdam and the probability of catastrophic failure of the sheetpiling, dewatering followed by creek bank excavation is not considered a technically viable alternative for achieving the remedial objectives and, therefore, will not be retained for further analysis.

Mechanical excavation of the creek bank behind a non-dewatered cofferdam poses identical flood potential as mechanical dredging through the dewatered cofferdam, however there is less potential for catastrophic failure of the sheetpiling since the water pressure gradient is not as great a factor. In order to achieve non-dewatered excavation of the creek bank soils, it would be necessary to mount a clamshell dredge on a barge and excavate from the creek side, as the stability of study area soils will decrease with the removal of the bank soils. Removal of the bank soils will necessitate additional stabilization to that shown in

Figure 3-17. Due to the removal of the creek bank, soil behind the sheetpiling closest to the building will exert a force in the direction of the creek. This can be restrained through the use of bracing connecting the top of the sheetpiling closest to the building to the building itself. However, such bracing will prohibit excavation equipment traffic on the site soils, therefore necessitating excavation using a barge-mounted clamshell.

As the creek bank soils are removed, a high degree of mixing of creek bank soils and suspension of the contaminated soils/sediments will occur inside the area of the cofferdam. This will require treatment of the water, including capture of suspended sediments behind the sheeting to be accomplished prior to dismantling the cofferdam. Such treatment, however, cannot involve dewatering behind the cofferdam due to the potential failure scenario previously described. Therefore, treatment must involve continual pumping of the contaminated water out of the cofferdam, coupled with simultaneous pumping of clean water from Ellicott Creek into the cofferdam. Treatment in this manner would require operation of a high capacity filtration/carbon treatment system (possibly staged across the Creek in the parking area) and will require extensive analytical testing on the influent to the treatment system to determine when successful treatment of the water within the cofferdam has been achieved.

Thus, excavation of the creek bank would be an extremely difficult and risk-prone operation. In addition, the potential for flooding, restriction of Ellicott Creek usage, and the possibility of failure of the sheetpiling due to natural effects or due to an accident during the excavation activities could feasibly result in the transport of contaminated soils sediment and water downstream. In spite of these significant problems and even though this activity will be extremely difficult to implement, mechanical excavation of the bank without dewatering behind the sheetpiling passes the initial screening and will be further analyzed in detail. As indicated in Sections 3.2.1 and 3.2.2, off-site disposal and off-site incineration are considered the only technically acceptable means for treatment of the dewatered, contaminated soils. These procedures are discussed below.

3.2.3.3 Excavation/Off-Site Disposal

Excavation followed by off-site disposal of the creek bank soils without dewatering behind the sheetpile cofferdam poses some risk to the general public due to the transport of contaminated sediments on public roadways; however, once removal has taken place, this final disposition of the materials is effective and implementable. This alternative passes the initial screening and will be further analyzed in detail. Due to the relatively high number of potential technical and administrative implementation problems which may impede the progress of this alternative, it is difficult to estimate the time frame for completion of the construction phase of the project. However, it is assumed that excavation of the creek bank soils could be completed in a single construction season. A preliminary cost estimate for this alternative is presented in Table 3-1.

3.2.3.4 Excavation/Off-Site Incineration

Excavation followed by off-site incineration poses identical implementation problems and risks as excavation followed by off-site disposal. The nearest accepter of bulk soils for incineration is located in Deerpark, Texas. This alternative passes the initial screening and will be retained for further detailed analysis. Due to the relatively high number of potential technical and administrative implementation problems which may impede the progress of this alternative, it is difficult to estimate the time frame for completion of the construction phase of the project. However, it is assumed that excavation of the creek bank soils could be completed in a single construction season. A preliminary cost estimate for this alternative is presented in Table 3-1.

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4.0 DETAILED ANALYSIS OF ALTERNATIVES

4.1 INTRODUCTION

This section presents the detailed analysis of the remedial alternatives remaining after screening. Each alternative is herein reviewed with respect to the seven evaluation criteria presented in the NYSDEC's TAGM for the "Selection of Remedial Actions at Inactive Hazardous Waste Sites." These criteria serve to provide a basis of comparison and allow for ranking of the alternatives by preference:

- Short-Term Impacts and Effectiveness - The effectiveness of alternatives in protecting human health and the environment during construction and implementation of the remedial action is evaluated by this criterion. Short-term effectiveness is assessed by protection of the community, protection of workers, environmental impacts, and time until protection is achieved.

- Long-Term Effectiveness and Permanence - This criterion evaluates the long-term protection of human health and the environment at the completion of the remedial action. Effectiveness is assessed with respect to the magnitude of residual risks; adequacy of controls, if any, in managing treatment residuals or untreated wastes that remain at the site; reliability of controls against possible failure, and potential to provide continued protection.

- Reduction of Toxicity, Mobility and Volume - This evaluation criterion addresses the statutory preference for selecting remedial actions that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when the treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

- Implementability - This assessment evaluates the technical and administrative feasibility of alternatives and the availability of services and materials.

- Compliance with ARARs - This threshold assessment addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of Federal or State environmental statutes or Standards, Criteria and Guidelines (SCGs) or provide grounds for invoking a CERCLA waiver.

- Overall Protection of Human Health and the Environment - This is a threshold assessment which addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled. This evaluation allows for consideration of whether an alternative poses any unacceptable short-term or cross-media impacts.

- Cost - The estimated capital and long-term maintenance and monitoring costs are evaluated by this criterion.

4.2 ANALYSIS OF STUDY AREA SOILS ALTERNATIVES

Based upon the preliminary screening presented in Section 3.0, the following soils remediation alternatives have been retained for detailed analysis: no action; institutional controls; topsoil cover; gravel cover; asphalt cover; synthetic cover; and five (5) excavation alternatives followed by either off-site incineration or off-site disposal. The five excavation alternatives include: stabilized excavation, unstabilized excavation, non-overlapping caisson borings, overlapping caisson borings, and excavation of principal-threat soils. All the excavation alternatives assume backfill from a clean, off-site source followed by placement of a cover system across the Study Area. Detailed analysis of these alternatives follows.

4.2.1 No-Action Alternative

The no-action alternative for the Study Area soils consists of maintaining the existing fencing to restrict site access, as well as the plastic sheeting currently in-place covering the Central Area of the site. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Under the no-action alternative, no remedial construction activities take place; therefore, there is no potential for increased short-term risks to the environment or public health. The environmental and public health risks presented in Section 1.2.4 for the current conditions will remain.

Long-Term Effectiveness and Permanence - The in-place plastic film reduces PCB loading from the site surface by 86% from the prior unremediated condition and reduces lead loading by approximately 50%, thus substantially reducing the environmental risk posed by continued contaminant loadings to the creek. In addition, the restricted site access and physical barrier provided by the plastic sheeting over the most heavily contaminated portion of the site significantly reduces the potential for direct human contact with the contaminants. With regular inspection and maintenance and/or replacement as necessary, the temporary protection provided by the plastic film could be considered permanent. The protection to public health and the environment afforded by the existing mitigative measures will remain effective on a long-term basis, if adequate maintenance measures are undertaken to ensure their integrity.

Reduction of Toxicity, Mobility or Volume - The no-action alternative does not contribute to the reduction of toxicity or volume of the contaminated soils outside of the natural degradation of contaminants which may occur. The installation (and proposed continued maintenance) of the plastic sheeting over the Central Area has provided appreciable reduction in mobility of the portion of the Study Area with highest contaminant levels reducing potential PCB-contaminant loading by 86% and potential lead loadings by 50%.

Implementability - This alternative has already been implemented.

Compliance with ARARs - The no-action alternative complies with all the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Tables 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. The no-action alternative will not cause contravention of the chemical-specific federal and state ground water quality standards. The no-action alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - As identified above, the restricted site access and the physical barrier provided by the plastic sheeting over the most heavily contaminated portion of the site significantly reduces the potential for direct human contact with the contaminants. In addition, the reduced mobility of the soils in the most heavily contaminated portion of the site has substantially reduced the PCB and lead loadings to the creek already from the prior unremediated conditions. These measures have contributed to an environmental risk under the existing condition that is well below that posed by the background stream condition.

Costs - No capital costs are associated with the no action alternative. Annual maintenance costs are presented in Table 4-1. A breakdown of the maintenance costs is presented in Appendix D1.

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4.2.2 Institutional Controls

This alternative consists of supplementing the existing mitigative measures employed at the site by Columbus McKinnon. This would include instituting deed restrictions to limit future uses of the site, extending the existing fence to encompass the South Area of the Study Area to prevent access to the site installing additional signage and eliminating the current lawn maintenance practices to prevent potential exposure to maintenance workers. The evaluation of this alternative is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy D: control/isolation resulting in reduction in mobility of the contaminant. A discussion of the evaluation criterion for this alternative follows.

Short-term Impacts and Effectiveness - Some short-term risks to personnel installing the fence will need to be addressed, but these risks are easily addressed through the use of appropriate health and safety procedures. These measures will become effective immediately.

Long-term Effectiveness and Permanence - This alternative provides the same degree of environmental protection afforded by the no-action alternative. This alternative further reduces the potential for direct human contact with the Study Area soils from that of the no-action alternative in that unauthorized access to the site will be prevented and there will be no exposure potential to routine maintenance workers.

Reduction of Toxicity, Mobility, or Volume - Implementation of additional institutional controls does not contribute to the reduction of toxicity or volume of the contaminated study area soils, aside from the natural degradation of contaminants which may occur. As stated in Section 4.2.1, appreciable reduction in mobility of the most heavily contaminated portion of the Study Area soils has been provided by the existing plastic sheeting which reduces potential PCB contaminant loadings by 86% and potential lead loadings by 50% from the prior unremediated condition.

Implementability - Based on availability of equipment and materials, this alternative is readily implementable. A potential administrative delay exists due to the need to obtain permission from Conrail to extend the fencing onto their property.

Compliance with ARARs - This alternative complies with the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Table 1-6 and 1-7 with the exception of TSCA 40 CFR 761.75, for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - The reduced mobility of the soils in the most-heavily contaminated portion of the site provided by the durable plastic film has substantially reduced PCB and lead loadings to the creek from the prior unremediated condition. The existing measures (plastic film and IRM) have contributed to an environmental risk that is well below that posed by the background stream conditions. The further restriction of site access provided by these additional institutional controls further reduces the potential for direct human contact with the contaminants from that provided by the no-action alternative.

Costs - The capital and annual maintenance and monitoring costs for this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.3 Asphalt Cover Alternative

This alternative involves placement of an asphalt cover across the contaminated study area soils. As depicted in Figure 4-1, a total area of approximately 15,600 square feet is proposed for remediation based upon the results of soil sampling completed at the site. The asphalt cover would be comprised of a single layer of woven geotextile, followed by an approximately 6-inch stone base, a 4-inch binder course of asphalt and a 2-inch top course. The evaluation of the asphalt cover alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy D: control/isolation resulting in reduction in mobility of the contaminant. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the placement of the cover, but these risks are easily addressed through the use of appropriate health and safety procedures. The cover will become effective immediately upon placement.

Long-Term Effectiveness and Permanence - As with any cover system, long term maintenance, including repair of any cracks or damage caused by weathering, is required to ensure the integrity of the cover. Due to the relatively small size of the site and limited access, however, the degree of effort required to maintain the asphalt cover would be minimal. Therefore this alternative provides long-term effectiveness in achieving the remedial action objectives for the site.

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FEASIBILITY STUDY

TABLE 4-1
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial Technology	Description	NYSDEC Hierarchy Achieved*	Relating Scoring of Evaluation Criteria 1	2	3	4	5	6	Cumulative Score	Cost ($1000's) Capital	Annual O&M[1]	Present Worth
Environmental Medium - Creek Bank												
No Action	Creek bank remains with existing IRM on Central Area bank and portion of South Area bank	-	10/10	7/15	2/15	15/15	3/10	8/20	45	0	5	51
Extension of IRM	Creek bank IRM is extended across South Area (80 feet) and North Area (110 feet)	D	9/10	8/15	2/15	13/15	3/10	20/20	58	292	4.5	343
Containment w/Revetment Fabric	Concrete-filled revetment fabric placed across entire creek bank	D	9/10	7/15	2/15	13/15	3/10	20/20	57	354	4.2	401
Excavation Without Dewatering, Behind Sheeting, Off-Site Disposal	Sheetpile cofferdam installed; soils excavated and disposed off-site	E	5/10	10/15	0/15	9/15	3/10	20/20	50	2.7M	4.2	2.7M
Excavation Without Dewatering, Behind Sheeting, Off-Site Incineration	Sheetpile cofferdam installed; soils excavated and incinerated off-site	A	5/10	11/15	15/15	9/15	3/10	20/20	66	7.9M	4.2	7.9M
Environmental Medium - Study Area Soils												
No Action	Site remains with existing remedial measures: • plastic sheeting over area of highest contamination • access restricted by fencing	-	10/10	7/15	0/15	15/15	3/10	6/20	41	0	6.5	74
Institutional Controls	Controls such as fencing, signs, etc. are implemented	-	10/10	7/15	0/15	15/15	3/10	6/20	41	13	6.9	90
Topsoil Cover	Site covered with topsoil	D	10/10	7/15	2/15	15/15	3/10	20/20	57	153	7.5	238
Gravel Cover	Site covered with crushed gravel	D	10/10	7/15	2/15	15/15	3/10	20/20	57	150	6.9	228
Asphalt Cover	Site covered with asphalt	D	10/10	7/15	2/15	15/15	3/10	20/20	57	203	7.6	288
Synthetic/Soil Cover System	Site covered with synthetic and soil layers	D	10/10	7/15	2/15	15/15	3/10	20/20	57	220	7.6	305

NOTES:
1 - Short-term impacts and effect
2 - Long-term effectiveness and permanence
3 - Reduction of toxicity, mobility and volume
4 - Implementability
5 - Compliance with ARARs
6 - Overall protection of human health and the environment
(1) Assumes 30-year O & M costs at 8% interest.

NYSDEC Hierarchy of Remedial Technologies, from "most" to "least desirable:
A - Destruction: results in permanent reduction in toxicity.
B - Separation/Treatment: results in permanent and significant reduction in volume.
C - Solidification/Chemical Fixation: results in permanent and significant reduction in mobility.
D - Control and Isolation: results in reduction in mobility, but no volume or toxicity.
E - Off-Site Land Disposal

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

TABLE 4-1
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

		NYSDEC Hierarchy Achieved*	Relating Scoring of Evaluation Criteria						Cumulative Score	Cost ($1000's)		
			1	2	3	4	5	6		Capital	Annual O&M(1)	Present Worth
Environmental Medium - Study Area Soils (continued)												
Partial Excavation Without Sheet-piling, Off-Site Incineration of Soils	Excavation of contaminated soils, 2:1 slope maintained at buildings, creek bank and RR embankment. Soils incinerated off-site.	A	8/10	12/15	9/15	13/15	3/10	20/20	65	6.1M	7.5	6.2M
Excavation of "Principal Threat" Soils, Off-site Incineration of Soils	Soils exhibiting PCB concentrations >500 mg/Kg excavated and incinerated off-site	A	8/10	11/15	9/15	13/15	3/10	20/20	64	1.3M	7.5	1.4M
Total Excavation With Sheetpiling, Off-Site Incineration of Soils	Excavation of contaminated soils, sheetpiling stabilization at building foundations, RR embankment, and top of creek bank. Soils incinerated off-site.	A	8/10	12/15	9/15	11/15	3/10	20/20	63	8.2M	7.5	8.3M
Excavation Via Non-Overlapping, Close-Pack Caisson Borings, Off-Site Incineration of Soils	Contaminated soils excavated by augering 4 ft caisson borings in a non-overlapping pattern. Soils incinerated off-site.	A	8/10	11/15	9/15	11/15	3/10	20/20	62	5.9M	7.6	6.0M
Excavation Via Overlapping, Close-Pack Caisson Borings, Off-Site Incineration of Soils	Contaminated soils excavated by augering 4 ft caisson borings in an overlapping pattern. Soils incinerated off-site.	A	8/10	11/15	9/15	11/15	3/10	20/20	62	6.2M	7.6	6.3M
Partial Excavation Without Sheetpiling, Off-Site Disposal of Soils	Excavation of contaminated soils, 2:1 slope maintained at buildings, creek bank and RR embankment. Disposal of soils off-site.	D	8/10	8/15	0/15	13/15	3/10	20/20	52	1.6M	7.6	1.7M
Excavation of "Principal Threat" Soils, Off-site Disposal of Soils	Soils exhibiting PCB concentrations >500 mg/Kg excavated and disposed off-site.	E	8/10	8/15	0/15	13/15	3/10	20/20	52	509K	7.6	594K
Total Excavation With Sheetpiling, Off-Site Disposal of Soils	Excavation of contaminated soils, sheetpiling stabilization at building foundations, RR embankment, and top of creek bank. Disposal of soils off-site.	D	8/10	8/15	0/15	10/15	3/10	20/20	49	2.2M	7.6	2.3M
Excavation Via Non-Overlapping, Close-Pack Caisson Borings, Off-Site Disposal of Soils	Contaminated soils excavated by augering 4 ft caisson borings in a non-overlapping pattern. Disposal of soils off-site.	D	8/10	7/15	0/15	11/15	3/10	20/20	49	1.4M	7.6	1.5M

NOTES:
1 - Short-term impacts and effect
2 - Long-term effectiveness and permanence
3 - Reduction of toxicity, mobility and volume
4 - Implementability
5 - Compliance with ARARs
6 - Overall protection of human health and the environment
(1) Assumes 30-year O & M costs at 8% interest.

NYSDEC Hierarchy of Remedial Technologies, from "most" to "least desirable:
A - Destruction: results in permanent reduction in toxicity.
B - Separation/Treatment: results in permanent and significant reduction in volume.
C - Solidification/Chemical Fixation: results in permanent and significant reduction in mobility.
D - Control and Isolation: results in reduction in mobility, but no volume or toxicity.
E - Off-Site Land Disposal

COLUMBUS McKINNON CORP.
FEASIBILITY STUDY

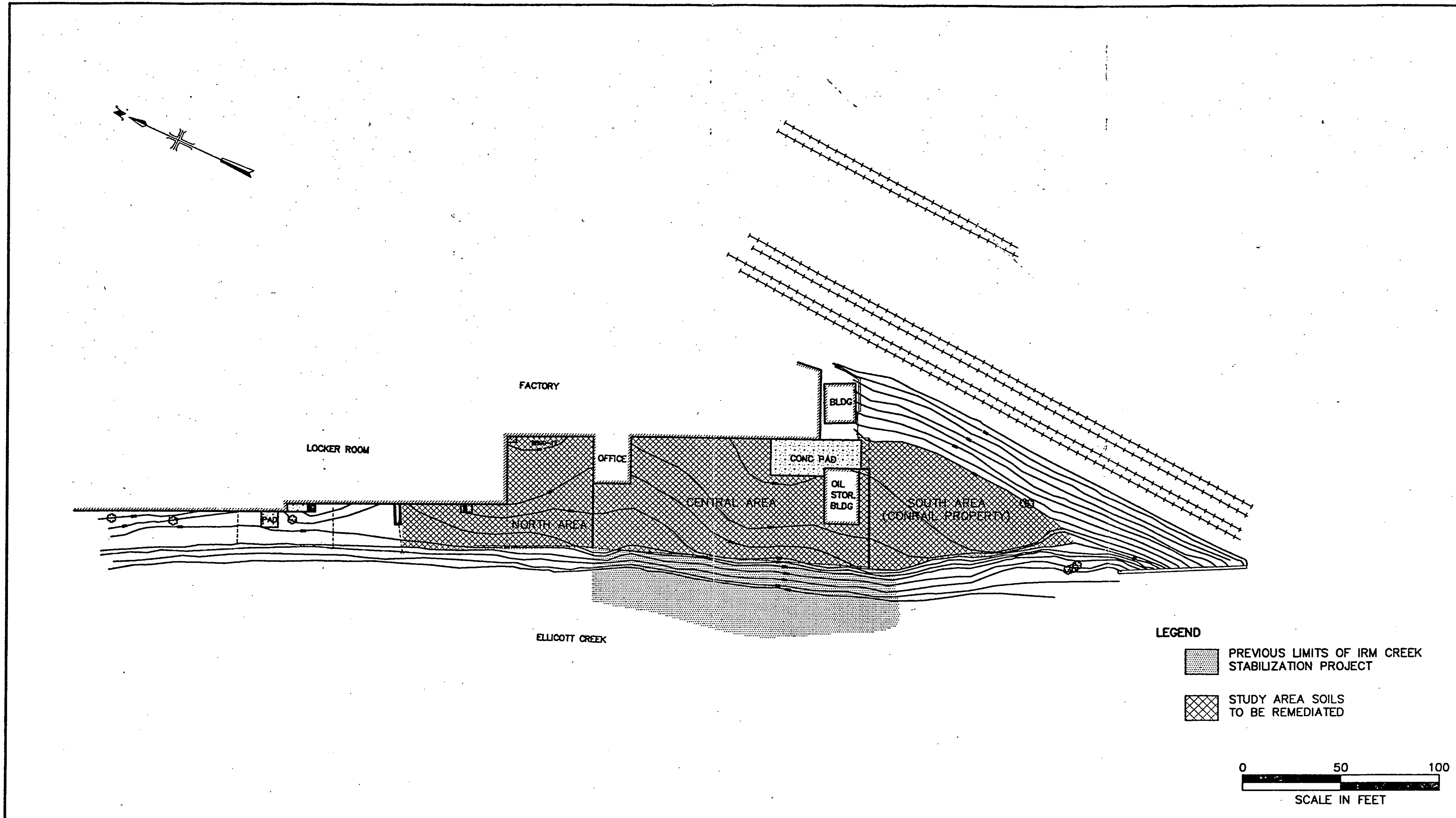
TABLE 4-1
DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

		NYSDEC Hierarchy Achieved*	Relating Scoring of Evaluation Criteria 1	2	3	4	5	6	Cumulative Score	Cost ($1000's) Capital	Annual O&M(1)	Present Worth
Environmental Medium - Study Area Soils (continued)												
Excavation Via Overlapping, Close-Pack Caisson Borings, Off-Site Disposal of Soils	Contaminated soils excavated by augering 4 ft caisson borings in an overlapping pattern. Disposal of soils off site.	D	8/10	7/15	0/15	11/15	3/10	20/20	49	1.7M	7.6	1.8M
Environmental Medium - Stream Sediments												
No Action	Sediments remain partially covered by creek bank IRM	-	10/10	7/15	2/15	15/15	3/10	13/20	50	-	1.3	14.4
Containment - Synthetic Fabric/Rip-rap	Sediments covered by erosion control fabric stabilized w/riprap	D	9/10	8/15	2/15	11/15	6/10	20/20	56	250	9.2	363
Containment - Revetment Fabric	Sediments covered by concrete-filled revetment fabric	D	9/10	7/15	2/15	11/15	6/10	20/20	55	138	9.2	242
Hydraulic Dredging Around IRM, Off-Site Disposal	Portable cutterhead pumps sediments to temporary dewatering basin; dewatered sediments hauled to secure landfill for disposal	E	6/10	11/15	0/15	10/15	6/10	20/20	53	654	-	654
Hydraulic Dredging Around IRM, Off-Site Incineration	Portable cutterhead pumps sediments to temporary dewatering basin; dewatered sediments hauled to off-site incineration facility	A	6/10	12/15	7/15	10/15	6/10	20/20	61	1.4M	-	1.4M
Remove IRM, Hydraulic Dredge All Study Area Sediments, Off-Site Disposal	Sheetpiling installed at toe of IRM; IRM removed. Portable cutterhead pumps sediments to temporary dewatering basin; dewatered sediments hauled to secure landfill for disposal.	E	7/10	11/15	0/15	9/15	6/10	20/20	53	1.7M	-	1.7M
Remove IRM, Hydraulic Dredge All Study Area Sediments, Off-Site Incineration	Sheetpiling installed at toe of IRM; IRM removed. Portable cutterhead pumps sediments to temporary dewatering basin; dewatered sediments hauled to off-site incineration facility.	A	7/10	15/15	15/15	9/15	6/10	20/20	72	2.8M	-	2.8M

NOTES:
1 - Short-term impacts and effect
2 - Long-term effectiveness and permanence
3 - Reduction of toxicity, mobility and volume
4 - Implementability
5 - Compliance with ARARs
6 - Overall protection of human health and the environment
(1) Assumes 30-year O & M costs at 8% interest.

NYSDEC Hierarchy of Remedial Technologies, from "most" to "least desirable:
A - Destruction: results in permanent reduction in toxicity.
B - Separation/Treatment: results in permanent and significant reduction in volume.
C - Solidification/Chemical Fixation: results in permanent and significant reduction in mobility.
D - Control and Isolation: results in reduction in mobility, but no volume or toxicity.
E - Off-Site Land Disposal

FIGURE 4-1



MALCOLM PIRNIE

COL-01-F42

LIMITS OF STUDY AREA
SOIL REMEDIATION

COLUMBUS McKINNON CORPORATION SEPT 1991

Reduction of Toxicity, Mobility or Volume - Placement of an asphalt cover will effectively eliminate the mobility of the contaminants but will not have any measurable effect on the toxicity or volume of contamination at the site.

Implementability - Materials and equipment for placement of an asphalt cover are readily available in the Western New York area. The site's size constraints will cause some modification of typical construction practices, but will not appreciably impact the technical implementability of this alternative. However, a potential delay with regard to administrative implementability may be posed by the need to obtain permission from Conrail to extend the cover onto their property. Review of flood information data and site plan contours indicates that a strip of the site toward the north end, approximately 200 lineal feet long and a maximum of 16 feet wide, adjacent to the areas proposed for covering is below the 100-year flood stage level (El. 571.6) (see Plate 2). Prior to covering surfaces along this length of creek bank with the proposed cover alternative, the adjoining creek bank surface elevation must be raised as much as 2½ feet to match the 100-year flood stage level. This is necessary to provide flood protection for the cover. In addition, the raised top of creek bank must be protected from erosion by installing erosion protection measures similar to the IRM (erosion control fabric covered with riprap).

Compliance with ARARs - This alternative complies with the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Placement of an asphalt cover across the study area soils is protective of human health and the environment in that it eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for the asphalt cover are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.4 Topsoil Cover Alternative

This alternative involves placement of a topsoil cover across the contaminated study area soils. As shown in Figure 4-1, a total area of approximately 15,600 square feet is proposed for remediation based upon the results of soil sampling completed at the site. The topsoil cover would be comprised of an approximately 12-inch layer of topsoil, which would be placed over the contaminated soils following grading. The topsoil would then be seeded to prevent erosion. The evaluation of the topsoil cover alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy D: control/isolation resulting in reduction in mobility of the contaminant. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the placement of the cover, but these risks are easily addressed through the use of appropriate health and safety procedures. The cover will become fully effective upon achieving successful vegetative growth.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the topsoil cover. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the topsoil cover would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site.

Reduction of Toxicity, Mobility or Volume - Placement of a topsoil cover will effectively reduce the mobility of the contamination through erosion, but will not have any measurable effect on the toxicity or volume of contamination at the site.

Implementability - Materials and equipment for placement of a topsoil cover are readily available in the Western New York area. The site's size constraints will cause some modification of typical construction practices, but will not appreciably impact the technical feasibility of this alternative. A potential for delay exists in administrative implementability due to the need to obtain permission from Conrail to extend the cover onto their property. Review of flood information data and site plan contours indicates that a strip of the site toward the north end, approximately 200 lineal feet long and a maximum of 16 feet wide, adjacent to the areas proposed for covering is below the 100-year flood stage level (El. 571.6) (see Plate 2). Prior to covering surfaces along this length of creek bank with the proposed cover alternative, the adjoining creek bank surface elevation must be raised as much as 2½ feet to match the 100-year flood stage level. This is necessary to provide flood protection for the cover. In addition, the raised top of creek bank must be protected from erosion by installing erosion protection measures similar to the IRM (erosion control fabric covered with riprap).

Compliance with ARARs - This alternative complies with the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Placement of a topsoil cover across the study area soils is protective of human health and the environment in that it eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for the topsoil cover are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.5 Gravel Cover Alternative

This alternative involves placement of approximately six inches of crushed gravel across the contaminated Study Area soils. As shown in Figure 4-2, a total area of approximately 15,600 square feet is proposed for remediation based upon the results of soil sampling completed at the site. The evaluation of the gravel cover alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy D: control/isolation resulting in reduction in mobility of the contaminant. A discussion of each long and a maximum of 16 feet wide, for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the placement of the cover, but these risks are easily addressed through the use of appropriate health and safety procedures. The cover will become effective immediately upon placement.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the gravel cover. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the gravel cover would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site.

Reduction of Toxicity, Mobility or Volume - Placement of a gravel cover will effectively eliminate erosion of the contamination, but will not have any measurable effect on the toxicity or volume of contamination at the site.

Implementability - Materials and equipment for placement of a gravel cover are readily available in the Western New York area. The site's size constraints will cause some modification of typical construction practices, but will not appreciably impact the technical feasibility of this alternative. A potential for delay exists in administrative implementability due to the need to obtain permission from Conrail to extend the cover onto their property. Review of flood information data and site plan contours indicates that a strip of the site toward the north end, approximately 200 lineal feet long and a maximum of 16 feet wide, adjacent to the areas proposed for covering is below the 100-year flood stage level (El. 571.6) (see Plate 2). Prior to covering surfaces along this length of creek bank with the proposed cover alternative, the adjoining creek bank surface elevation must be raised as much as 2½ feet to match the 100-year flood stage level. This is necessary to provide flood protection for the cover. In addition, the raised top of creek bank must be protected from erosion by installing erosion protection measures similar to the IRM (erosion control fabric covered with riprap).

Compliance with ARARs - This alternative complies with the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Placement of a gravel cover across the study area soils is protective of human health and the environment in that it eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for the gravel cover are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.6 Synthetic/Soil Cover System Alternative

This alternative involves placement of synthetic and soil layers across the contaminated Study Area soils. As shown in Figure 4-2, a total area of approximately 15,600 square feet is proposed for remediation based upon the results of soil sampling completed at the site. The evaluation of the synthetic/soil cover system alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy D: control/isolation resulting in reduction in mobility of the contaminant. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the placement of the cover system, but these risks are easily controlled through the implementation of appropriate health and safety procedures. The cover will become effective immediately upon successful vegetation of the topsoil layer.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the synthetic/soil system cover. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the synthetic/soil cover system would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site.

Reduction of Toxicity, Mobility or Volume - Placement of a synthetic/soil cover system will effectively eliminate the mobility of the contamination through prevention of erosion of contaminated Study Area soils but will not have any measurable effect on the toxicity or volume of contamination at the site.

Implementability - Materials and equipment for placement of a synthetic/soil cover system are readily available in the Western New York area. The site's size constraints will necessitate some modification of typical construction practices, but will not appreciably impact the technical feasibility of this alternative. A potential for administrative delay exists due to the need to obtain permission from Conrail to extend the cover onto their property. Review of flood information data and site plan contours indicates that a strip of the site toward the north end, approximately 200 lineal feet long and a maximum of 16 feet wide, adjacent to the areas proposed for covering is below the 100-year flood stage level

(El. 571.6) (see Plate 2). Prior to covering surfaces along this length of creek bank with the proposed cover alternative, the adjoining creek bank surface elevation must be raised as much as 2½ feet to match the 100-year flood stage level. This is necessary to provide flood protection for the cover. In addition, the raised top of creek bank must be protected from erosion by installing erosion protection measures similar to the IRM (erosion control fabric covered with riprap).

Compliance with ARARs - This alternative complies with the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Placement of a soil/synthetic cover across the across the Study Area soils is protective of human health and the environment in that it eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for the synthetic cover are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.7 Unstabilized Excavation, Off-Site Incineration of Soils

Unstabilized excavation refers to standard excavation at the site without the use of sheetpiling at the creek bank, railroad embankment, or building foundations and requires that minimum 2:1 slopes be maintained during excavation adjacent to these structures. The off-site incineration option involves bulk transport of the excavated soil material to an off-site incineration facility for thermal destruction. The evaluation of the unstabilized excavation/incineration alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy A: destruction resulting in permanent reduction in toxicity. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road and the potential for collapse of the railroad embankment/creek bank or failure of the building foundation. Dust generated during the excavation will have to be controlled through wetting of the excavation area. In addition, transport of excavated material will, by its nature, present risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover soils.

Reduction of Toxicity, Mobility or Volume - Unstabilized excavation followed by thermal destruction of the soils will effectively reduce the mobility of the contamination if coupled with a topsoil cover. The estimated mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 330,000 grams, or 49% of the original maximum PCB mass calculated for the site assuming a 25 ppm cleanup limit. The excavated soil will be incinerated, resulting in the destruction of approximately 344,000 grams (i.e., 51%) of the total maximum PCB mass.

Implementability - Materials and equipment for unstabilized excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site incineration facility is located in Deerpark, Texas. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the inter-state transport and incineration of contaminated soils.

Compliance with ARARs - Unstabilized excavation followed by placement of a topsoil cover and off-site incineration of contaminated soils will comply with all the relevant and appropriate action-and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Stabilized excavation followed by off-site incineration is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for unstabilized excavation followed by off-site incineration of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.8 Stabilized Excavation, Off-Site Incineration of Soils

Stabilized excavation refers to excavation at the site combined with the use of sheetpiling at the top of the creek bank, foot of the railroad embankment, and at all building foundations. The sheetpiling eliminates the necessity for 2:1 slopes during excavation adjacent to these structures. The off-site incineration option involves bulk transport of the excavated soil material to an off-site incineration facility for thermal destruction. The evaluation of the stabilized excavation/incineration alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy A: destruction resulting in permanent reduction in toxicity. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road and the potential for failure of the excavation sheeting, resulting in the potential collapse of the railroad embankment/creek bank or failure of the building foundation. Dust generated during the excavation will have to be controlled through dampening of the excavation area. In addition, transport of excavated material will present risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Stabilized excavation followed by thermal destruction of the soils will effectively reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following stabilized excavation will be approximately 264,000 grams, or 39% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm. The excavated soil will be incinerated, resulting in the destruction of approximately 410,000 grams (i.e., 61%) of the total maximum PCB mass.

Implementability - Materials and equipment for stabilized excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site incineration facility is located in Deerpark, Texas. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the inter-state transport and incineration of contaminated soils.

Compliance with ARARs - Stabilized excavation followed by placement of a topsoil cover and off-site incineration of contaminated soils will comply with all relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Stabilized excavation followed by off-site incineration is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for stabilized excavation followed by off-site incineration of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.9 Excavation via Non-overlapping, Close-Pack Caisson Borings - Off-site Incineration of Soils.

Excavation via non-overlapping, close-pack caisson borings involves augering through a series of pre-set hollow casings as described in Section 3.1.1.5. The casing serves as a temporary means of stabilization, and is removed following backfilling of the bore hole. The off-site incineration option involves bulk transport of the excavated soil material to an off-site incineration facility for thermal destruction. The evaluation of the non-overlapping, close-pack caisson boring alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy A: destruction resulting in permanent reduction in toxicity. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road. Dust generated during the augering will have to be controlled through dampening of the drilling area. In addition, transport of excavated material will present risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Non-overlapping, close-pack caisson borings followed by thermal destruction of the soils will effectively eliminate the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 400,000 grams, or 60% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm.. The excavated soil will be incinerated, resulting in the destruction of approximately 270,000 grams (i.e., 40%) of the total maximum PCB mass.

Implementability - Materials, equipment and personnel for close-pack caisson boring excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site incineration facility is located in Deerpark, Texas. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the inter-state transport and incineration of contaminated soils.

Compliance with ARARs - Close-pack caisson boring followed by placement of a topsoil cover and off-site incineration of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Non-overlapping, close-pack caisson boring followed by off-site incineration is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for non-overlapping, close-pack caisson boring followed by off-site incineration of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.10 Excavation via Overlapping, Close-Pack Caisson Borings - Off-site Incineration of Soils.

Excavation via overlapping, close-pack caisson borings involves augering through a series of pre-set hollow casings as described in Section 3.1.1.5. The casing serves as a temporary means of stabilization, and is removed following backfilling of the bore hole. The off-site incineration option involves bulk transport of the excavated soil material to an off-site incineration facility for thermal destruction. The evaluation of the overlapping, close-pack caisson boring alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy A: destruction resulting in permanent reduction in toxicity. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road. Dust generated during the augering will have to be controlled through dampening of the drilling area. In addition, transport of excavated material will present some risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Overlapping, close-pack caisson borings followed by thermal destruction of the soils will effectively reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 350,000 grams, or 92% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm. The excavated soil will be incinerated, resulting in the destruction of approximately 320,000 grams (i.e., 48%) of the total maximum PCB mass.

Implementability - Materials, equipment and personnel for close-pack caisson boring excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site incineration facility is located in Deerpark, Texas. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the inter-state transport and incineration of contaminated soils.

Compliance with ARARs - Close-pack caisson boring followed by placement of a topsoil cover and off-site incineration of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.756 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Overlapping, close-pack caisson boring followed by off-site incineration is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for overlapping, close-pack caisson boring followed by off-site incineration of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.11 Excavation of Principal Threat Soils; Off-Site Incineration

Excavation of principal-threat soils refers to select excavation of the soils exhibiting PCB concentrations in excess of 500 mg/kg. This degree of contamination is generally limited to the top two feet of soil in specific locations at the Columbus McKinnon site and, therefore, can be excavated using standard techniques. The off-site incineration option involves bulk transport of the excavated soil material to an off-site incineration facility for thermal destruction. The evaluation of the excavation of principal-threat soils followed by off-site incineration alternative for remediation of the Study Area soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy A: destruction resulting in permanent reduction in toxicity. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, as well as the potential for sloughing of the soils at the creek bank during excavation of the principal threat soils adjacent to the bank. Dust generated during the excavation will have to be controlled through dampening of the excavation area. In addition, transport of excavated material will present risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of damage to the cover, as necessary, caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the controlled access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover material.

Reduction of Toxicity, Mobility or Volume - Excavation of principal threat soils followed by thermal destruction of the excavated material will effectively reduce the mobility of the contamination if coupled with a cover. The mass of the PCB contamination remaining at the site following excavation of the principal threat soils will be approximately 286,550 grams, or 43% of the original maximum PCB mass calculated for the site. The excavated soil will be incinerated, resulting in the destruction of approximately 387,470 grams (i.e., 57%) of the total maximum PCB mass.

Implementability - Materials and equipment for excavation of principal threat soils are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site incineration facility is located in Deerpark, Texas. The site's size constraints will necessitate usage of small excavation equipment and/or a crane to lift boxes of contaminated soil across Ellicott Creek. Thus, the necessity of the haul road will be obviated. Potential for administrative delays exist due to the need to obtain permits for the inter-state transport and incineration of contaminated soils.

Compliance with ARARs - Excavation of principal threat soils followed by placement of a topsoil cover and off-site incineration of the soils will comply with all action- and location-specific ARARs in Tables 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Excavation of principal threat soils followed by off-site incineration is protective of human health and the environment in that the soils exhibiting high concentrations of PCBs are removed from the site, and the cover system eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for excavation of principal threat soils followed by off-site incineration are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.12 Unstabilized Excavation, Off-Site Disposal of Soils

Unstabilized excavation refers to standard excavation at the site without the use of sheetpiling at the creek bank, railroad embankment, or building foundations and requires that minimum 2:1 slopes be maintained during excavation adjacent to these structures. The off-site disposal option involves bulk transport of the excavated soil material to a hazardous waste landfill for disposal. The evaluation of the unstabilized excavation/disposal alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy E: off-site land disposal. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road and the potential for collapse of the railroad embankment/creek bank or failure of the building foundation. Dust generated during the excavation will have to be controlled through dampening of the excavation area. In addition, transport of excavated material will, by its nature, present some risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the cover soils.

Reduction of Toxicity, Mobility or Volume - Unstabilized excavation followed by off-site disposal of the soils will reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 330,000 grams, or 49% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm. The excavated soil will be disposed, therefore none of the PCB mass will be reduced in toxicity or volume.

Implementability - Materials and equipment for unstabilized excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest hazardous waste landfill permitted to accept PCB-contaminated soils is located in Model City, New York. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the transport of contaminated soils.

Compliance with ARARs - Unstabilized excavation followed by placement of a topsoil cover and off-site disposal of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Unstabilized excavation followed by off-site disposal is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for unstabilized excavation followed by off-site disposal of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.13 Stabilized Excavation, Off-Site Disposal of Soils

Stabilized excavation refers to excavation at the site combined with the use of sheetpiling at the top of the creek bank, foot of the railroad embankment, and at all building foundations. The sheetpiling eliminates the necessity for 2:1 slopes during excavation adjacent to these structures. The off-site disposal option involves bulk transport of the excavated soil material to a hazardous waste landfill for disposal. The evaluation of the stabilized excavation/disposal alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy E: off-site land disposal. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road and the potential for failure of the excavation sheeting, resulting in the potential collapse of the railroad embankment/creek bank or failure of the building foundation. Dust generated during the excavation will have to be controlled through dampening of the excavation area. In addition, transport of excavated material will present some risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Stabilized excavation followed by off-site disposal of the soils will reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following stabilized excavation will be approximately 264,000 grams or 39% of the original maximum PCB mass calculated for the site assuming a 25 ppm PCB cleanup limit. The excavated soil will be disposed off-site, therefore none of the PCB mass will be reduced in toxicity or volume.

Implementability - Materials and equipment for stabilized excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site hazardous waste landfill permitted to accept PCB-contaminated soils is located in Model City, NY. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the transport of contaminated soils.

Compliance with ARARs - Stabilized excavation followed by placement of a topsoil cover and off-site disposal of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7 with the exception of TSCA 40 CFR 761.75, for which a waiver would likely be required. This alternative will not cause contravention of the chemical-specific federal and state ground water quality standards. Additionally, erosion of the Study Area soils will be effectively eliminated through this remedial alternative, thus complying with the federal and state surface water quality criteria and standards. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Stabilized excavation followed by off-site disposal is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for Stabilized excavation followed by off-site disposal of excavated soils is presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.2.14 Excavation via Non-overlapping, Close-Pack Caisson Borings - Off-site Disposal of Soils.

Excavation via non-overlapping, close-pack caisson borings involves augering through a series of pre-set hollow casings as described in Section 3.1.1.5. The casing serves as a temporary means of stabilization, and is removed following backfilling of the bore hole. The off-site disposal option involves bulk transport of the excavated soil material to a hazardous waste landfill for disposal. The evaluation of the non-overlapping, close-pack caisson boring alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy E: off-site land disposal. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road. Dust generated during the augering will have to be controlled through dampening of the drilling area. In addition, transport of excavated material will present some risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Non-overlapping, close-pack caisson borings followed by off-site disposal of the soils will reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 400,000 grams, or 60% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm.. The excavated soil will be disposed, thus none of the total PCB mass will be reduced in toxicity or volume.

Implementability - Materials, equipment and personnel for close-pack caisson boring excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site hazardous waste landfill is located in Model City, New York. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the transport of contaminated soils.

Compliance with ARARs - Close-pack caisson boring followed by placement of a topsoil cover and off-site disposal of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Non-overlapping, close-pack caisson boring followed by off-site disposal is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for non-overlapping, close-pack caisson boring followed by off-site disposal of excavated soils is presented in Table 4-1. A detailed breakdown of these costs is presented in Appendix D1.

4.2.15 Excavation via Overlapping, Close-Pack Caisson Borings - Off-site Disposal of Soils

Excavation via overlapping, close-pack caisson borings involves augering through a series of pre-set hollow casings as described in Section 3.1.1.5. The casing serves as a temporary means of stabilization, and is removed following backfilling of the bore hole. The off-site disposal option involves bulk transport of the excavated soil material to an off-site hazardous waste landfill. The evaluation of the overlapping, close-pack caisson boring alternative for remediation of the on-site soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy E: off-site land disposal. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, including the potential for failure of the timber haul road. Dust generated during the augering will have to be controlled through dampening of the drilling area. In addition, transport of excavated material will present some risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the limited access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover.

Reduction of Toxicity, Mobility or Volume - Overlapping, close-pack caisson borings followed by off-site disposal of the soils will effectively reduce the mobility of the contamination if coupled with a topsoil cover. The mass of the PCB contamination remaining at the site following unstabilized excavation will be approximately 350,000 grams, or 52% of the original maximum PCB mass calculated for the site assuming a PCB cleanup limit of 25 ppm. The excavated soil will be disposed, thus none of the total PCB mass will be reduced in toxicity or volume.

Implementability - Materials, equipment and personnel for close-pack caisson boring excavation are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site disposal facility is located in Model City, NY. The site's size constraints will necessitate construction of a timber haul access road in order to allow for the passage of large excavation equipment. Potential for administrative delays exist due to the need to obtain permission from Conrail to excavate on their property and for the need to obtain permits for the transport and disposal of contaminated soils.

Compliance with ARARs - Close-pack caisson boring followed by placement of a topsoil cover and off-site disposal of contaminated soils will comply with all the relevant and appropriate action- and location-specific requirements for containment of hazardous wastes identified in Table 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Overlapping, close-pack caisson boring followed by off-site disposal is protective of human health and the environment in that the clean fill and topsoil cover eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for overlapping, close-pack caisson boring followed by off-site disposal of excavated soils is presented in Table 4-1. A detailed breakdown of these costs is presented in Appendix D1.

4.2.16 Excavation of Principal Threat Soils; Off-Site Disposal

Excavation of principal-threat soils refers to select excavation of the soils exhibiting PCB concentrations in excess of 500 mg/kg. This degree of contamination is generally limited to the top two feet of soil in specific locations at the Columbus McKinnon site, and therefore can be excavated using standard techniques. The off-site disposal option involves bulk transport of the excavated soil material to an off-site permitted hazardous waste landfill. The evaluation of the excavation of principal threat soils followed by off-site disposal alternative for remediation of the Study Area soils is summarized in Table 4-1. As indicated, this alternative achieves NYSDEC hierarchy E: off-site land disposal. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Some short-term risks to construction personnel will need to be addressed during the excavation work, as well as the potential for sloughing of the soils at the creek bank during excavation of the principal threat soils adjacent to the bank. Dust generated during the excavation will have to be controlled through dampening of the excavation area. In addition, transport of excavated material will present risk to the general public.

Long-Term Effectiveness and Permanence - Long-term maintenance would be required to ensure the integrity of the vegetated topsoil cover material. This maintenance includes repair of the cover, as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the controlled access, however, the degree of effort required to maintain the cover material would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site. This alternative would become fully effective immediately upon successful vegetation of the topsoil cover material.

Reduction of Toxicity, Mobility or Volume - Excavation of principal threat soils followed by disposal of the excavated material will effectively reduce the mobility of the contamination if coupled with a synthetic/topsoil cover or a topsoil cover alone. The mass of the PCB contamination remaining at the site following excavation of the principal threat soils will be approximately 286,550 grams, or 43% of the original maximum PCB mass calculated for the site. The excavated soil will be disposed, therefore none of the PCB mass will be reduced in toxicity or volume.

Implementability - Materials and equipment for excavation of principal threat soils are readily available in the Western New York area. As discussed in Section 3.0, the nearest off-site disposal facility is located in Model City, NY. The site's size constraints will necessitate usage of small excavation equipment and/or a crane to lift boxes of contaminated soil across Ellicott Creek, thus the need for a haul road will be obviated. Potential for administrative delays exist due to the need to obtain permits for the transport and disposal of contaminated soils.

Compliance with ARARs - Excavation of principal threat soils followed by placement of a cover and off-site disposal of the soils will comply with all action- and location-specific ARARs identified in Tables 1-6 and 1-7 with the exception of TSCA 40 CFR 761.75, for which a waiver will likely be required. This alternative does not comply with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Excavation of principal threat soils followed by off-site disposal is protective of human health and the environment in that the soils exhibiting high concentrations of PCBs are removed from the site, and the cover system eliminates both the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - Estimated capital, maintenance and monitoring costs for excavation of principal threat soils followed by off-site disposal are presented in Table 4-1. A breakdown of these costs is presented in Appendix D1.

4.3 ANALYSIS OF ELLICOTT CREEK SEDIMENT ALTERNATIVES

Based on the results of the preliminary screening presented in Section 3.0, the following alternatives for remediation of Ellicott Creek sediments have passed the initial screening and will undergo detailed analysis in this Section: no action; containment with synthetic fabric and riprap; containment with revetment fabric; and hydraulic dredging followed by off-site disposal or off-site incineration of the dredged sediments. The dredging will be considered in both the case that the existing IRM is not removed, and in the case that the existing IRM is removed prior to dredging.

4.3.1 No-Action Alternative

The no-action alternative consists of leaving the contaminated Ellicott Creek sediments immediately adjacent to the site in place. The portion of sediments currently covered by the toe of the creek bank IRM (i.e., 44% of the total area of stream sediments identified as contaminated) would remain covered. A summary of the no-action alternative for the creek bank sediments is presented as Table 4-1. A discussion of each of the evaluation criterion for this alternatives follows.

Short-Term Impacts and Effectiveness - Under the no-action alternative, no remedial construction activities take place; therefore, there is no potential for increased short-term risks to the public health or the environment. The risks as identified in Section 1.2.4 remain unchanged.

Long-Term Effectiveness and Permanence - The Hazard Quotient calculated in Section 1.2.4.2 indicates that the existing stream condition provides only a marginal potential for environmental risk posed by the remaining uncovered stream sediments to aquatic organisms and fish-eating wildlife, and in fact presents a lower environmental risk than background stream conditions. The existing rock riprap is extremely durable and will remain effective indefinitely provided the IRM is routinely maintained and repaired. While the IRM was implemented to address erosion of the creek banks, its installation necessitated covering some portion of creek bottom sediment for stability. The IRM is constructed with a MIRAFI 700X non-woven geotextile with an effective opening size of 70-100 mesh. This material has a filtering efficiency that will retain particles one-half the diameter of the largest size openings or larger; viz. 75-85 um particles (silt-sized). The filtering efficiency of the fabric, coupled with observed ground water velocities insufficient to move silt or clay-sized particles, makes particle migration from under the filter fabric highly unlikely. The fabric is not exposed to weathering since it is covered by the riprap and is resistant to biological attack or decay. On top of the filter fabric is one to two feet of four to eight-inch diameter stone. Water velocities in excess of eight feet per second would be required to move this-sized particle; therefore, even 100-year flood velocities would not be expected to move or damage the riprap. While the IRM was placed as a temporary measure, it has a high degree of permanence and it is, therefore, appropriate to evaluate it as a permanent remedial measure.

Reduction of Toxicity, Mobility or Volume - The no-action alternative does not contribute to the reduction of toxicity or volume of the contaminated sediments outside of the natural degradation which may occur. The creek bank IRM however effectively eliminates the mobility and direct exposure of aquatic wildlife to the most highly contaminated stream sediments.

Implementability - This alternative has already been implemented.

Compliance with ARARs - The no-action alternative complies with all the action- and location-specific relevant and appropriate requirements for containment of hazardous wastes identified in Tables 1-6 and 1-7.

The no-action alternative does not comply with the chemical-specific TBCs for PCB-contaminated stream sediments; however, compliance with these TBCs is not considered achievable due to the technical impracticability and the potential for greater short-term risk to the environment resulting from the disturbance of the stream sediments.

Overall Protection of Human Health and the Environment - The no action alternative is protective of human health and the environment in that a large portion (viz. 4000 square feet) of the sediments comprising the most heavily contaminated area of the stream is currently covered by the creek bank IRM already in place. Figure 4-3 illustrates the area of sediments which have been characterized during previous sediment sampling, and the resulting area which is covered by the creek bank IRM. As discussed in Section 1.2.4.2, the calculated environmental risk posed by the existing stream conditions is in fact lower than that presented by upstream and downstream reaches of Ellicott Creek.

Costs - No capital costs are associated with the no action alternative. Maintenance costs of the creek bank IRM are presented in Table 4-1.

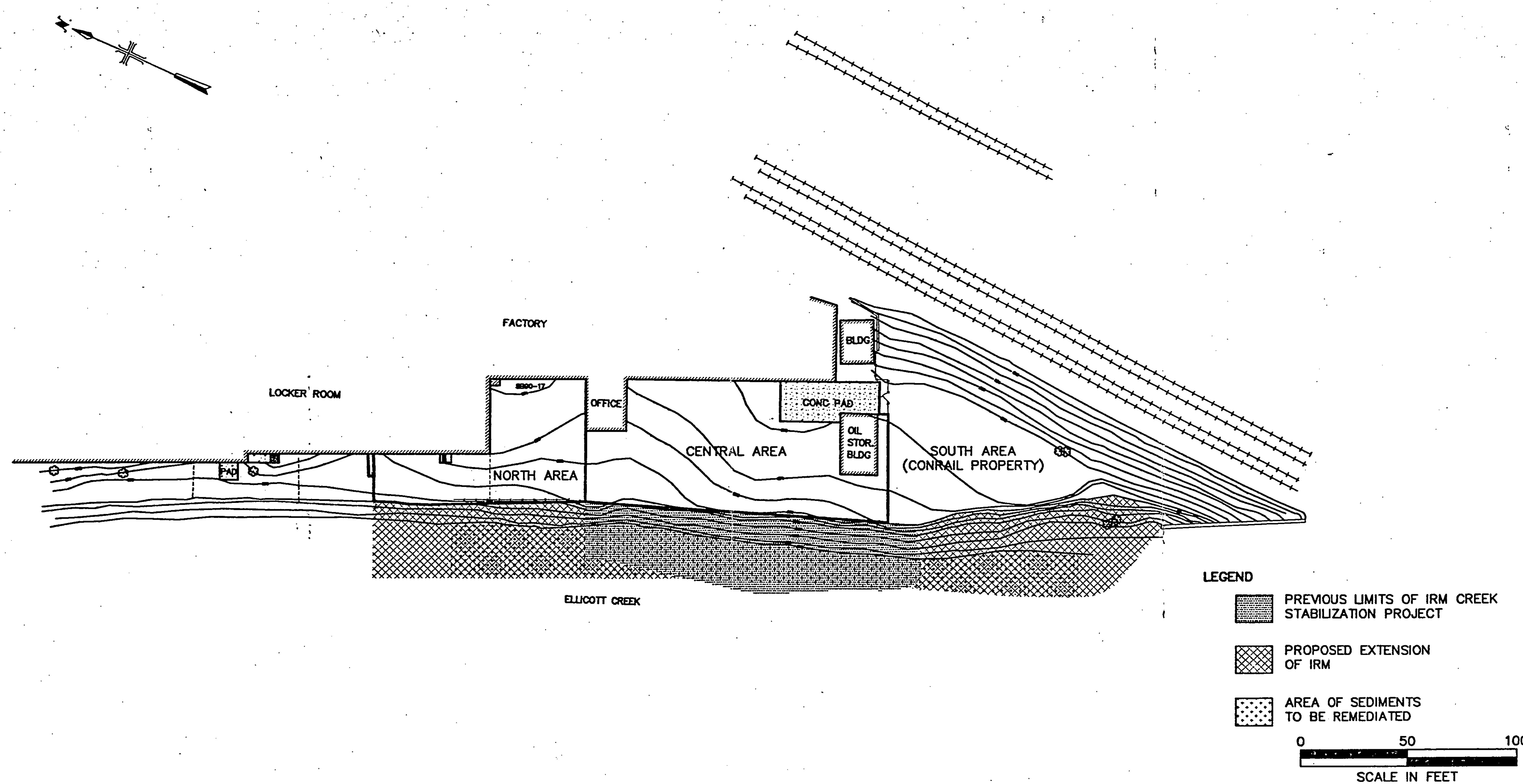
4.3.2 Erosion Control Fabric/Riprap

The area of the creek bed to be stabilized through the placement of erosion control fabric followed by riprap is presented in Figure 4-2. The fabric and riprap would be placed from a barge in a manner similar to that of the creek bank IRM.

A summary of the evaluation of the erosion control fabric alternative for the creek bed sediments is presented in Table 4-1. A discussion of each of the evaluation criteria follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel installing the erosion control fabric and riprap which would need to be controlled through the implementation of appropriate health and safety procedures. This alternative becomes effective immediately upon completion of the construction. Some short-term impacts to the environment may be expected during placement activities in the creek. Short-term mitigative measures to control the bed disturbance are available but are only moderately reliable in controlling the risk.

FIGURE 4-2



MALCOLM PIRNIE

COL-01-F43

CREEK BED SEDIMENTS TO BE REMEDIATED

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Long-Term Effectiveness and Permanence - Covering the contaminated sediments in-place effectively eliminates the environmental risk posed by contaminated sediments to aquatic life by preventing migration of the sediments as well as eliminating the potential for direct contact to aquatic biota. A long-term maintenance program will be required to ensure the effectiveness provided by this alternative, but as stated in Section 4.3.1, the erosion control/riprap alternative is extremely durable.

Reduction of Toxicity, Mobility or Volume - This alternative does not serve to reduce the toxicity or volume of the contamination within the sediments, however it does immobilize the sediments and eliminate the potential environmental risk presented through direct contact with aquatic biota.

Implementability - Materials required to implement this alternative are readily available. Placement of erosion control fabric followed by riprap will require a USACE permit; however, this would not be anticipated to delay implementation. Firms capable of performing the work may be limited, but should not pose a significant implementation problem.

Compliance with ARARs - This alternative can be implemented to comply with all the action- and location-specific ARARs identified for creek bed stabilization in Tables 1-6 and 1-7. Containment of the creek bed sediments does not comply with the chemical-specific TBCs for PCBs in sediments; however, compliance with these TBCs is not considered feasible due to the technical impracticability and the potential for greater short-term risk to the environment resulting from the disturbance of the stream sediments.

Overall Protection of Human Health and the Environment - This alternative is protective of human health and the environment because it prevents both the migration of the sediments and direct contact with the contamination.

Cost - Estimated capital, maintenance and monitoring costs for this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2.

4.3.3 Revetment Fabric

Stabilization of the creek bed sediments can also be accomplished through the placement of concrete grouted revetment fabric. The revetment would be placed from a barge in a manner similar to that of the creek bank IRM.

A summary of the evaluation of the revetment stabilization alternative for the creek bed sediments is presented in Table 4-1. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel installing the revetment which would need to be controlled through the implementation of appropriate health and safety procedures. In addition, short-term increased risks to the environment may be expected during placement activities. Short-term mitigative measures to control the creek bed disturbance are available, but are only moderately reliable in controlling the risk. This alternative becomes effective immediately upon completion of the construction.

Long-Term Effectiveness and Permanence - Covering the contaminated sediments in-place reduces the environmental risks posed by the contact of the sediments with aquatic biota. However, the long-term effectiveness of the fabric is questionable due to the potential for cracking and shifting of the solid revetment cover. A long-term maintenance program will be required ensure the integrity of the revetment cover.

Reduction of Toxicity, Mobility or Volume - This alternative does not serve to reduce the toxicity or volume of the contamination within the sediments; however, it does effectively immobilize the sediments.

Implementability - Materials required to implement this alternative are readily available. Placement of revetment will require a USACE permit; however, this is not anticipated to delay implementation. Firms capable of performing the work may be limited, but should not pose a significant implementation problem.

Compliance with ARARs - This alternative can be implemented to comply with all the action- and location-specific ARARs identified for creek bed stabilization in Tables 1-6 and 1-7. Containment of the creek bed sediments does not comply with the chemical-specific TBCs for PCBs in sediments; however, compliance with these TBCs is not considered feasible due to the technical impracticability and the potential for greater short-term risk to the environment resulting from the disturbance of the stream sediments.

Overall Protection of Human Health and the Environment - This alternative is protective of human health and the environment because it prevents both the migration of the sediments and direct contact of aquatic biota with the contamination.

Cost - Estimated capital, maintenance and monitoring costs for this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2.

4.3.4 Hydraulic Dredging Around IRM/Off-Site Disposal

Hydraulic dredging of the Study Area sediments outside the limits of the existing IRM would be performed from a barge and would require the use of the parking lot across Ellicott Creek as a staging area for temporary dewatering units and treatment units necessary to decontaminate the resulting dredged water. The dredged sediments would then be transported to Chemical Waste Management's secure landfill located approximately 25 miles from the site in Model City, NY.

A summary of the evaluation of the dredging/disposal alternative for the creek bed is presented in Table 4-1. A discussion of each of the evaluation criterion follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel performing the dredging, drying and handling of the contaminated sediments as well as to the community and the environment during transport to the permitted disposal facility; however, these risks should be controllable through implementation of proper safety precautions. Some short-term environmental impacts may be expected during dredging activities in the creek due to disturbance of the creek bed sediments. There are short-term mitigative measures available to reduce this risk (i.e., silt curtains), although these are only moderately reliable in controlling the risk.

Long-Term Effectiveness and Permanence - Contaminated sediments outside the limits of the IRM are removed from the creek bed and placed in a secure landfill. No long-term maintenance is associated with the remediated creek sediments. The remaining IRM-covered sediments are effectively immobilized. As discussed in Section 4.3.2, the IRM is extremely durable and will remain effective on a long-term basis. Therefore, this remedial alternative provides long-term effectiveness in achieving the remedial action objectives for the sediments.

Reduction of Toxicity, Mobility or Volume - Hydraulic dredging of non-IRM covered sediments followed by disposal in a secure landfill eliminates any mobility associated with these exposed sediments; however, off-site disposal does not serve to reduce the volume or toxicity of the contaminants. Volume and toxicity are partially eliminated from consideration for the portion of Ellicott Creek adjacent to the site, but are not ultimately reduced by the deposition of the sediments in a secure landfill or sediments left in place covered by the IRM.

Implementability - Dredging of the contaminated sediments will require a USACE permit. As a result of the many phases of work (viz., dredging, construction and operation of the drying beds, treatment of the water, and transport of the contaminated sediments), several firms would need to be contracted, presenting some administrative difficulty.

Compliance with ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs. Compliance with these TBCs for the creek sediments is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - Hydraulic dredging of sediments outside the limits of the IRM followed by off-site disposal of the contaminated sediments in a secure landfill is protective of human health and the environment in that the contaminated sediments are removed from the site, thereby reducing any potential for direct contact or migration. As for the remaining sediments left in-place under the IRM, the human health risk posed by the potential for direct human contact with the creek bed sediments is eliminated by the physical barrier created by the IRM. Additionally, the environmental risk to aquatic and fish-eating wildlife caused by remaining covered sediments is effectively mitigated through the reduced mobility and isolation of these creek bed sediments. The potential for continued contaminant loadings from remaining creek sediments is effectively eliminated by the erosion protection and isolation afforded by the IRM.

Costs - Capital and present-worth costs for implementation of this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2.

4.3.5 Hydraulic Dredging of All Study Area Sediments/Off-Site Disposal

Hydraulic dredging of contaminated sediments in the Study Area would be performed from a barge and would require the use of the parking lot across Ellicott Creek as a staging area for temporary dewatering units and carbon treatment units necessary to decontaminate the resulting dredged water. Dredging of sediments currently covered by the IRM requires the removal of the IRM. IRM removal would necessitate the construction of a cofferdam to contain suspended sediments and creek bank sloughing. IRM riprap would be recovered and reused to stabilize other creek bank portions. The dredged sediments would then be transported to Chemical Waste Management's secure landfill located approximately 25 miles from the site in Model City, NY.

A summary of the evaluation of the dredging/disposal alternative for the creek bed sediments is presented in Table 4-1. A discussion of each of the evaluation criterion follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel performing the dredging, drying and handling of the contaminated sediments as well as to the community and the environment during transport to the permitted disposal facility; however, most of the risks should be easily controlled through implementation of proper health and safety precautions. A significant short-term risk exists due to the high probability of flooding caused by the channel restriction created by the cofferdam. There are no readily implementable mitigative measures available to reduce this flooding risk.

Long-Term Effectiveness and Permanence - Contaminated sediments are removed from the creek and placed in a secure landfill. No long-term maintenance is associated with the remediated creek sediments, therefore this remedial alternative provides long-term effectiveness in achieving the remedial action objectives for the sediments.

Reduction of Toxicity, Mobility or Volume - Hydraulic dredging of all Study Area creek bed sediments followed by disposal in a secure landfill eliminates any mobility associated with the sediments. Volume and toxicity are not ultimately reduced by the disposition of the sediments in a secure landfill.

Implementability - Installation of a cofferdam and dredging of the contaminated sediments will require a USACE permit. It is anticipated that the requirements for flood control measures required by the Corps under a permit will be technically infeasible. As a result of the many phases of work (viz., cofferdam construction and removal, dredging, construction and operation of the drying beds, treatment of the water, and transport of the contaminated sediments), several firms would need to be contracted, presenting a number of administrative difficulties.

Compliance with ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs. Compliance with these TBCs for the creek sediments is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - Hydraulic dredging of all study area creek sediments followed by off-site disposal of the contaminated sediments in a secure landfill is protective of human health and the environment in that the contaminated sediments are completely removed from the site, thereby mitigating any potential for direct contact or migration.

Costs - Capital costs for implementation of this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2. No long-term monitoring or maintenance is necessary for the dredged creek bed.

4.3.6 Hydraulic Dredging Around IRM/Off-Site Incineration

Hydraulic dredging of the contaminated sediments outside the limits of the existing IRM would be performed from a barge and would require the use of the parking lot across Ellicott Creek as a staging area for temporary dewatering units and treatment units necessary to decontaminate the resulting dredged water. The dredged sediments would then be transported to a permitted facility for thermal treatment (incineration). Depending on the character of the residues (hazardous vs. nonhazardous), residues may be disposed of in a sanitary landfill.

A summary of the evaluation of the dredging/treatment/disposal alternative for the creek bank sediments is presented in Table 4-1. A discussion of each of the evaluation criterion follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel performing the dredging, drying and handling of the contaminated sediments as well as to the community and the environment during transport to the permitted incineration facility; however, these risks should be controllable through implementation of proper health and safety precautions. Some short-term environmental impacts may be expected during dredging activities in the creek due to disturbance of the creek bed sediments. There are short-term mitigative measures available to reduce this risk (i.e., silt curtains), although these are only moderately reliable in controlling the risk.

Long-Term Effectiveness and Permanence - Contaminated sediments are partially removed from the creek bed and placed in a secure landfill. No long-term maintenance is associated with the remediated creek sediments. The remaining IRM-covered sediments are effectively immobilized. As discussed in Section 4.3.2, the IRM is extremely durable and will remain effective on a long-term basis. Therefore, this remedial alternative provides long-term effectiveness in achieving the remedial action objectives for the sediments.

Reduction of Toxicity, Mobility or Volume - Hydraulic dredging followed by incineration reduces the mobility, volume, and toxicity associated with the sediments outside the IRM. The mobility of the sediments remaining under the IRM has been effectively eliminated.

Implementability - Dredging of the contaminated sediments will require a USACE permit. As a result of the many phases of work (viz., dredging, construction and operation of the drying beds, treatment of the water, and transport and incineration of the contaminated sediments), several firms would need to be contracted, presenting some administrative difficulty.

Compliance with ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs; however, compliance with the TBCs for the creek sediments is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - Hydraulic dredging of sediments outside the limits of the IRM followed by incineration and disposal of the contaminated sediments in a secure landfill is protective of human health and the environment in that the contaminated sediments are completely removed from the site, thereby mitigating any potential for direct contact or migration. As for the remaining sediments left in-place under the IRM, the human health risk posed by the potential for direct human contact with the creek bed sediments is eliminated by the physical barrier created by the IRM.

Additionally, the environmental risk to aquatic and fish-eating wildlife caused by remaining covered sediments is effectively mitigated through the reduced mobility and isolation of these creek bed sediments. The potential for continued contaminant loadings from remaining creek sediments is effectively eliminated by the erosion protection and isolation afforded by the IRM.

Costs - Capital costs for implementation of this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2. No long-term monitoring or maintenance is necessary for the dredged creek bed.

4.3.7 Hydraulic Dredging of All Study Area Sediments/Off-Site Incineration

Hydraulic dredging of all contaminated sediments in the Study Area would be performed from a barge and would require the use of the parking lot across Ellicott Creek as a staging area for temporary dewatering units and carbon treatment units necessary to decontaminate the resulting dredged water. Dredging of sediments currently covered by the IRM requires the removal of the IRM. IRM removal would necessitate the construction of a cofferdam to contain suspended sediments and creek bank sloughing. IRM riprap would be recovered and reused to stabilize other creek bank portions. The dredged sediments would then be transported to a permitted facility for thermal treatment (incineration). Depending on the character of the residues (hazardous vs. nonhazardous), residues may be disposed of in a sanitary landfill. A summary of the evaluation of the dredging/offsite incineration alternative for the creek bank sediments is presented in Table 4-1. A discussion of each of the evaluation criterion follows.

Short-Term Impacts and Effectiveness - There are potential short-term risks to the personnel performing the dredging, drying and handling of the contaminated sediments as well as to the community and the environment during transport to the incineration facility however, most of the risks should be easily controlled through implementation of proper health and safety precautions. A significant short-term risk involves the high probability of flooding caused by the channel restriction created by the cofferdam. There are no readily implementable mitigative measures available to reduce this flooding risk.

Long-Term Effectiveness and Permanence - Contaminated sediments are removed from the creek and placed in a secure landfill. No long-term maintenance is associated with the remediated creek sediments, therefore this remedial alternative provides long-term effectiveness in achieving the remedial action objectives for the sediments.

Reduction of Toxicity, Mobility or Volume - Hydraulic dredging of all study area creek bed sediments followed by incineration eliminates any mobility and toxicity associated with these sediments.

Implementability - Installation of a cofferdam and dredging of the contaminated sediments will require a USACE permit. It is anticipated that the flood control measures required by the Corps under a permit will be technically infeasible. As a result of the many phases of work (viz., cofferdam construction and removal, dredging, construction and operation of the drying beds, treatment of the water, and transport and incineration of the contaminated sediments), several firms would need to be contracted, presenting a number of administrative difficulties.

Compliance with ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs identified in Table 1-8; however, compliance with these TBCs is not considered achievable due to the technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - Hydraulic dredging of all study area creek sediments followed by incineration and off-site disposal of the contaminated sediments in a secure landfill is protective of human health and the environment in that the contaminated sediments are completely removed from the site, thereby mitigating any potential for direct contact or migration.

Costs - Capital costs for implementation of this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D2. No long-term monitoring or maintenance is necessary for the dredged creek bed.

4.4 ANALYSIS OF CREEK BANK ALTERNATIVES

Based on the results of the preliminary screening presented in Section 3.0, the alternatives for remediation of the creek bank soils which will undergo detailed analysis in this Section include: no action; extension of the IRM; containment with revetment fabric; and excavation without dewatering behind the cofferdam followed by off-site disposal or off-site incineration of the excavated soils.

4.4.1 No Action Alternative

The no-action alternative consists of retaining the 110-foot stabilized segment of the creek bank bordering the Central Area and the portion of the South Area covered with the existing IRM. A discussion of each of the evaluation criterion for this alternative is presented below:

Short-Term Impacts and Effectiveness - Under the no-action alternative, no additional remedial construction activities would take place; therefore, there is no potential for increased short-term risks to the public health or the environment. The risks identified in Section 1.2.4 remain unchanged.

Long-Term Effectiveness and Permanence - Calculations of contaminant loadings to Ellicott Creek via erosion of the creek bank presented in Table 7-3 of the RI report, illustrate that the existing IRM has provided a 97% reduction in PCB loadings and over 60% reduction in the calculated lead loading to Ellicott Creek. The rock riprap is extremely durable (as discussed in Section 4.3.1) and will remain effective indefinitely provided that the IRM is routinely maintained and repaired. Such maintenance and repair should consist of: at least one (1) annual inspection, preferably in the Spring following ice melt; replacement or repair of displaced riprap and/or exposed, settled, or eroded creek bank segments.

Reduction of Toxicity, Mobility or Volume - While the existing IRM does not provide any reduction in toxicity or volume of the contamination, it does effectively eliminate the mobility of the most highly-contaminated segment of the Study Area.

Implementability - This alternative has already been implemented.

Compliance With ARARs - There are no applicable or relevant and appropriate action- or location-specific requirements relative to the creek bank remedial alternatives, provided that no soil fill is removed. The no-action alternative for the creek bank does not cause contravention of the chemical-specific federal and state ground water quality standards. Erosion of creek bank soils along the North and South Areas could potentially cause contravention of federal and state surface water quality criteria or standards or in a very localized area along the creek bank during storm events.

Although the contamination of the creek bank soils has not been quantified, it is expected that the no-action alternative may not comply with the EPA's PCB spill clean-up policy or the NYSDEC's draft TAGM on soil clean-up criteria. However, compliance with these TBCs is not considered appropriate due to the technical impracticability and the potential for greater short-term risks to the environment resulting from the disturbance and transport of PCB-contaminated soils and sediments which would occur if the creek bank is disturbed.

Overall Protection of Human Health and the Environment - The protection of human health and the environment afforded by the existing IRM results from the reduced mobility and isolation of the most highly-contaminated creek bank soils in the Central Area of the site. While the remaining uncovered portions of the creek bank provide an unquantified residual human health risk, the mobility of creek bank soils through erosion is effectively eliminated in this segment of the creek bank covered by the IRM and the associated human health risks from dermal exposure and ingestion of PCB- and lead-contaminated soils is also effectively eliminated by the physical barrier created by the IRM.

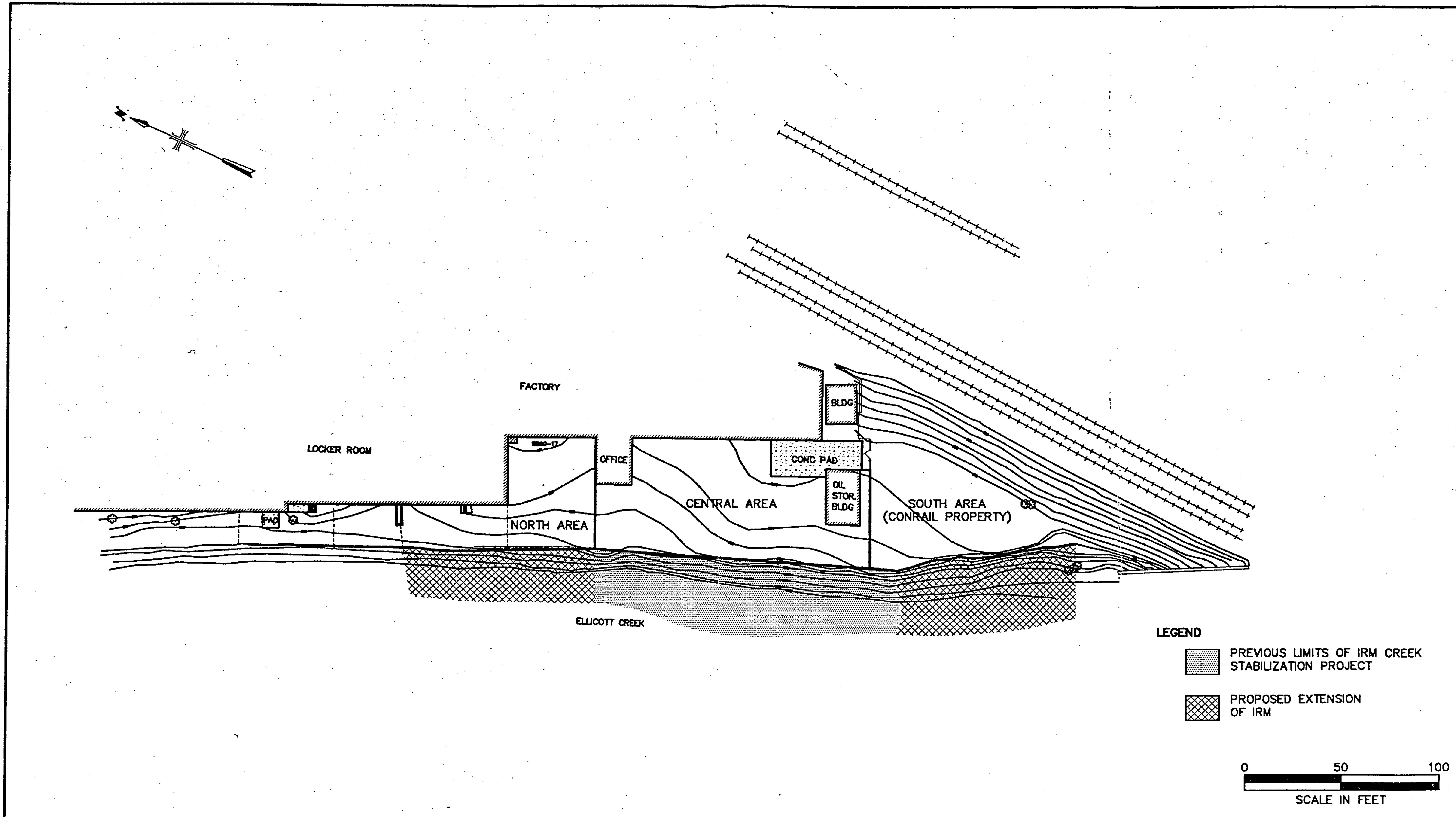
Additionally, incremental environmental risks to aquatic and fish-eating wildlife indigenous or transient to the segment of Ellicott Creek adjacent to the IRM are also effectively mitigated by the physical barrier created by the submerged portion of the IRM. This is illustrated by the Hazard Quotient calculated for the existing conditions which shows only a marginal potential for environmental risk; well below the risk posed by background stream conditions. The filter fabric and riprap effectively eliminates mobility of the most contaminated stream sediments and isolates them from direct contact with fish, thereby mitigating acute toxicity impacts to background levels.

Costs - No capital costs are associated with the no action alternative. Annual maintenance and monitoring costs are estimated at $5,000.

4.4.2 Erosion Control Fabric/Riprap IRM Extension

This IRM extension alternative is one of two containment options. This alternative involves placement of erosion control fabric followed by riprap over the remaining portion of the South Area bank (approximately 80 feet in length) as well as the North Area bank (approximately 110 feet in length) in order to provide further mitigation of erosion of soils to Ellicott Creek (see Figure 4-3). A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Slight releases of soils to Ellicott Creek may be expected during preparation of the creek bank for placement of the erosion control fabric



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COL-01-F41

CREEK BANK REMEDIATION THROUGH EXTENSION OF IRM

COLUMBUS McKINNON CORPORATION SEPT 1991

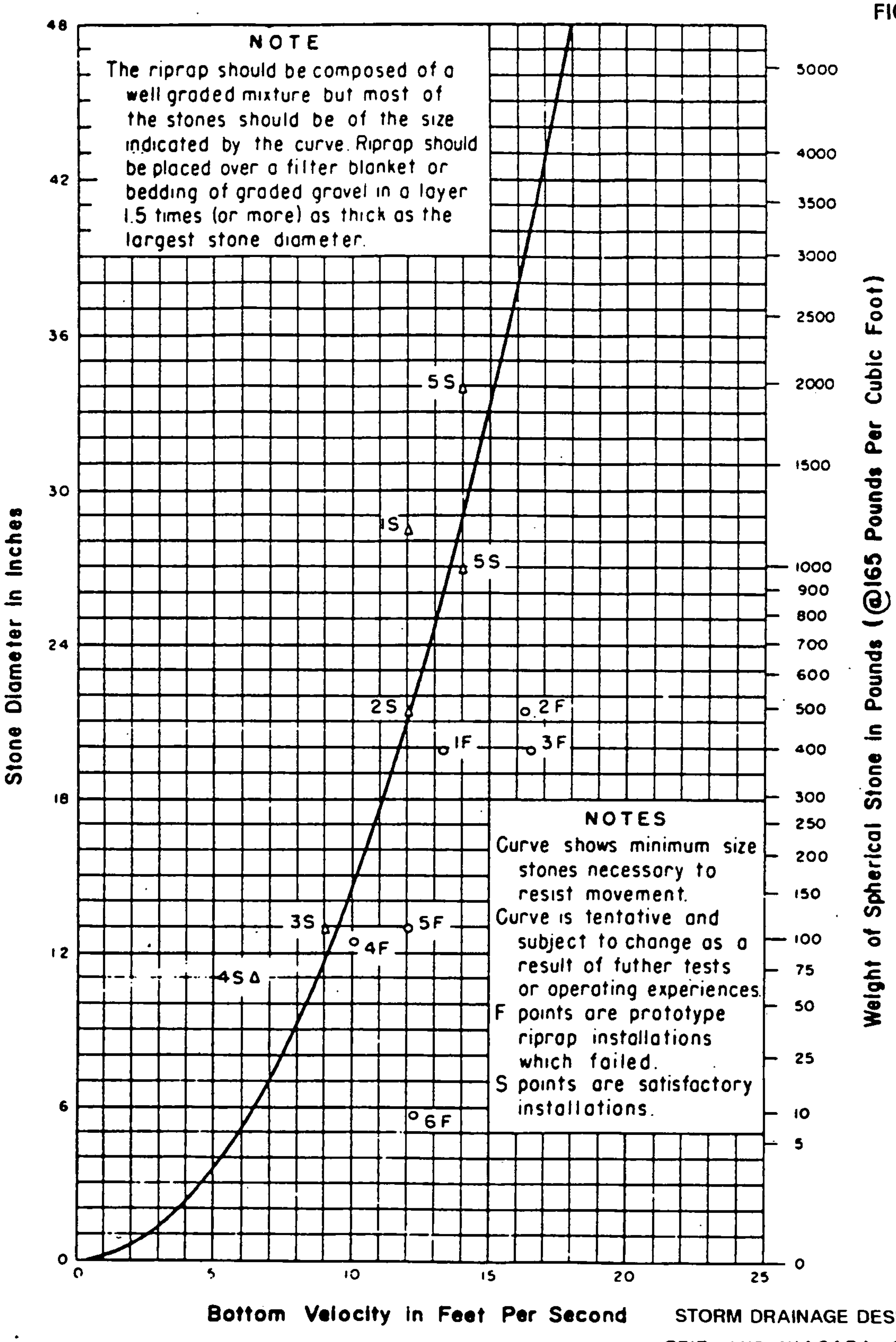
and riprap. In addition, minimal safety risks to construction workers may also exist as a result of the contamination in the creek bank soils. However, the use of proper engineering controls and appropriate health and safety procedures will reduce both these risks to a negligible level. Creek bank stabilization through this IRM extension option will provide immediate and effective erosion protection upon implementation.

Long-Term Effectiveness and Permanence - The filter fabric has a filtering efficiency that will retain particles 75-85 um (silt-sized) or larger, thus proving extremely effective in eliminating the potential for continued PCB or lead loadings from the creek banks. The fabric itself is resistant to bacterial decay or attack. With a one to two-foot layer of four to eight-inch stone covering the filter fabric, the fabric is completely protected from the degradative effects of weathering. In addition, a velocity in excess of eight feet per second would be required (see Figure 4-4) to move the range of stone size that constitutes the riprap; thus, even 100-year flood stream velocities would not be expected to damage the riprap. Therefore, the IRM and the proposed IRM extension option are extremely durable and will remain effective on a long-term basis if adequate maintenance measures are undertaken to ensure its integrity. Such maintenance should consist of: annual inspection, preferably in the Spring following ice melt; and, as required, replacement or repair of displaced riprap.

Reduction of Toxicity, Mobility or Volume - This IRM extension option will not result in any reduction in toxicity or volume of the contamination; however, it will further reduce the mobility of the creek bank soils by effectively eliminating erosion. This will reduce the calculated contaminant loadings to the creek by 0.038 kg/yr for PCBs and 5.53 kg/yr for lead.

Implementability - Construction materials for the creek bank stabilization extension (viz., erosion control fabric and riprap) are readily available in the Western New York area. A barge will likely be required for placement of these materials, reducing the number of available firms to perform this work. However, this should not pose an implementation problem. A potential delay with regard to administrative implementation is presented by the need to obtain permission from Conrail to stabilize the South Area bank. A USACE permit for the work will also be required, although this has been obtained previously for the original IRM implementation, thus should be easily obtained for its extension.

FIGURE 4-4



STORM DRAINAGE DESIGN MANUAL

ERIE AND NIAGARA COUNTIES
REGIONAL PLANNING BOARD

REGIONAL STORM-SURFACE WATER
DRAINAGE MANAGEMENT STUDY

RIPRAP SIZING

THE PREPARATION OF THIS REPORT HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE UNITED STATES DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT UNDER THE PROVISIONS OF THE HOUSING ACT OF 1954 AS AMENDED.

HARZA ENGINEERING COMPANY, APRIL 1972

Compliance with ARARs - The extension of the creek bank stabilization to the north and south areas is not impacted by any action-specific ARARs. This action will comply with all the location-specific ARARs identified in Table 1-6 relative to actions within a floodplain. This remedial measure does not comply with those "to-be considered" chemical-specific SCGs for soils identified in Table 1-8 in that it does not provide removal or destruction of the unquantified creek bank contamination. However, compliance with these TBCs for the creek bank soils is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - The human health risk posed by the potential for direct human contact with the creek bank soils is eliminated by the physical barrier created by the IRM and its extension.

Additionally, the potential for adverse impacts to aquatic and fish-eating wildlife are effectively eliminated through the reduced mobility and isolation of the entire Study Area creek banks and the associated creek bed sediments. The potential for continued contaminant loadings from the creek banks is effectively eliminated by the erosion protection afforded by the IRM, and the isolation of the creek bed sediments associated with extension of the IRM reduce the environmental risk from the contaminated sediments to well below that of background stream conditions.

Cost - Estimated capital, annual maintenance and monitoring costs for this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D3. The period for future maintenance is 30 years.

4.4.3 Revetment Fabric IRM Extension

This IRM extension alternative is the second of two containment options. It involves placement of concrete grout filled revetment fabric over the remaining portion of the South Area bank (approximately 80 feet in length) as well as the North Area bank (approximately 110 feet in length) in order to provide further mitigation of erosion of soils to Ellicott Creek (see Figure 4-3). A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Slight releases of soils to Ellicott Creek may be expected during preparation of the creek bank for placement of the revetment fabric. In addition, minimal safety risks to construction workers may also exist as a result of the contamination in the creek bank soils. However, the use of proper engineering controls and appropriate health and safety procedures will reduce these risks to a negligible level. Creek bank stabilization through this IRM extension option will provide immediate and effective erosion protection upon implementation.

Long-Term Effectiveness and Permanence - As identified in Section 4.4.1, the existing IRM appreciably reduced the contaminant loadings through erosion of the creek bank to Ellicott Creek. This IRM extension option provides nominally greater effectiveness in reducing the potential for continued PCB loadings than the existing IRM, and moderately improves the effectiveness of the existing IRM in reducing lead loadings. However, the long-term effectiveness of revetment fabric is questionable. The rigidity of the concrete blanket may lend itself to cracking due to weather conditions, ice damage, or build-up of ground water behind the impermeable concrete. Such damage will be more difficult to repair than for the riprap option and will necessitate extensive maintenance. Such maintenance should consist of: semi- annual inspection, preferably in the Spring following ice melt as well as in the Fall ; and, as required, replacement or repair of damaged revetment and/or exposed, settled, or eroded creek bank segments.

Reduction of Toxicity, Mobility or Volume - This IRM extension option will not cause any reduction in toxicity or volume of the contamination; however, it will further reduce the mobility of the creek bank soils by effectively eliminating erosion.

Implementability - Construction materials and labor for extension are readily available in the Western New York area. A barge will likely be required for placement of these materials, reducing the number of available firms to perform this work. However, this should not pose a substantial implementation problem. A potential delay with regard to administrative implementation is presented by the need to obtain permission from Conrail to stabilize the South Area bank. A USACE permit for the work will also be required.

Compliance with ARARs - The placement of revetment fabric across the creek bank is not impacted by any action-specific ARARs. This action will comply with all the location-specific ARARs identified in Table 1-7 relative to actions within a floodplain. This remedial measure does not comply with those "to-be considered" chemical-specific SCGs for soils identified in Table 1-8 in that it does not provide removal or destruction of the unquantified creek bank contamination. However, compliance with these TBCs for the creek bank soils is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - The human health risk posed by the potential for direct human contact with the creek bank soils is eliminated by the physical barrier created by the revetment fabric.

Additionally, the environmental risk to aquatic and fish-eating wildlife are effectively mitigated through the reduced mobility and isolation of the entire Study Area creek banks and the associated creek bed sediments. The potential for continued contaminant loadings from the creek banks is effectively reduced by the erosion protection afforded by the revetment fabric if it is maintained, and the isolation of the creek bed sediments associated with extension of the IRM reduce the environmental risk from the contaminated sediments to well below that of background stream conditions.

Cost - Estimated capital, annual maintenance and monitoring costs for this alternative are presented in Table 4-1. A breakdown of these costs is presented in Appendix D3. The period for future maintenance is 30 years.

4.4.4 Excavation/Off-Site Disposal

Excavation of the creek bank soils followed by off-site disposal involves installation of a temporary cofferdam around the Study Area bank, and mechanical excavation from a barge without dewatering behind the sheetpiling. The excavated sediments would be dried prior to disposal in order to achieve the solids percentage required by the landfill. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Significant short-term environmental impacts can be expected due to releases of potentially contaminated soils/sediments to Ellicott Creek while driving the sheeting and while installing the silt curtain. In addition, the potential for flooding of the nearby homes as well as for potential upstream flooding will be prevalent during moderate to heavy rainfall events due to the restricted flow channel. The sheetpile wall as well as the presence of a barge will essentially prohibit navigation in Ellicott Creek. This alternative will be effective in that it eliminates the contaminated soils from the creek bank.

Long-Term Effectiveness and Permanence - This alternative provides removal of the contaminated creek bank soils from the site, however, it is not considered permanent by NYSDEC definition as the soils are disposed of in a hazardous waste landfill.

Reduction of Toxicity, Mobility or Volume - This alternative will not reduce the overall toxicity or volume of the contamination, however it will involve the removal of the creek bank soils, thereby eliminating any potential for mobility with respect to Ellicott Creek.

Implementability - Excavation of the creek bank requires extensive coordination of regulatory agencies and technical experts. The potential for flooding, failure of the cofferdam, and restricted navigational access is likely to prohibit issuance of an ACOE permit. In addition, the limited area for staging dewatering and water treatment facilities will also pose implementation problems. Permission from Conrail will be required to excavate the South Area creek bank.

Compliance With ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs identified in Table 1-8; however, compliance with these TBCs for the creek bank soils is not considered achievable due to the technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - This alternative is protective of human health and the environment in that potentially contaminated creek bank soils are completely removed from the site, thereby mitigating any potential for direct contact or migration.

Costs - Capital and present worth costs for implementation of this alternative are presented in Table 4-1. Annual maintenance is necessary to ensure that the replaced bank does not erode. A breakdown of the costs for this alternative is presented in Appendix D3.

4.4.5 Excavation/Off-Site Incineration

Excavation of the creek bank soils followed by off-site incineration of the involves installation of a temporary cofferdam around the Study Area bank and mechanical excavation from a barge without dewatering behind the sheetpiling. The excavated sediments would be dried prior to transport to the incineration facility. A discussion of each of the evaluation criterion for this alternative follows.

Short-Term Impacts and Effectiveness - Significant short-term environmental impacts can be expected due to releases of potentially contaminated soils/sediments to Ellicott Creek while driving the sheeting and while installing the silt curtain. In addition, the potential for flooding of the nearby homes as well as for potential upstream flooding will be prevalent during moderate to heavy rainfall events due to the restricted flow channel. The sheetpile wall as well as the presence of a barge will essentially prohibit navigation in Ellicott Creek. This alternative will be effective in that it eliminates and destroys the contaminated soils from the creek bank.

Long-Term Effectiveness and Permanence - This alternative provides permanent and irreversible removal of the contaminated creek bank soils from the site.

Reduction of Toxicity, Mobility or Volume - This alternative will involve the removal of the creek bank soils, thereby eliminating any potential for mobility with respect to Ellicott Creek. Excavated soils will be incinerated, thereby reducing the toxicity and volume of the contamination.

Implementability - Excavation of the creek bank requires extensive coordination of regulatory agencies and technical experts. The potential for flooding, failure of the cofferdam, and restricted navigational access may prohibit issuance of an ACOE permit. In addition, the limited area for staging dewatering and water treatment facilities will also pose implementation problems. Permission from Conrail will be required to excavate the South Area creek bank.

Compliance With ARARs - Implementation of this alternative will be carried out in compliance with all action- and location-specific ARARs identified in Tables 1-6 and 1-7. This action will not comply with the chemical-specific TBCs identified in Table 1-8; however, compliance with these TBCs for the creek bank soils is not considered achievable due to the technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - This alternative is protective of human health and the environment in that potentially contaminated creek bank soils are removed from the site and the contaminants destroyed, thereby mitigating any potential for direct contact or migration.

Costs - Capital and present worth costs for implementation of this alternative are presented in Table 4-1. Annual maintenance is necessary to ensure that the replaced bank does not erode. A breakdown of the costs for this alternative is presented in Appendix D3.

4.5 COMPARISON OF ALTERNATIVES

This section presents a comparison among alternatives with respect to the evaluation criteria discussed in the previous sections.

4.5.1 Comparison of Study Area Soils Alternatives

Short-Term Impacts and Effectiveness - No potential for increased short-term risks to the environment or public health exist for the no-action alternative. Some short-term risks to construction personnel will need to be addressed during the construction of the institutional controls or any of the cover alternatives, but these risks are easily addressed through the use of appropriate health and safety procedures. The institutional controls, asphalt and gravel covers would become effective immediately upon placement. The topsoil and synthetic covers will become effective upon achieving successful vegetative growth.

A greater number of short-term human health and environmental risks would need to be addressed for any of the excavation alternatives, including potential for failure of the sheetpile stabilized haul road or the creek bank, railroad embankment, or building foundations. However, these potential failure modes would be minimized in the case of excavation of principal-threat soils. Engineering controls for curbing fugitive dust emissions would also be necessary. None of the excavation alternatives will achieve 100% removal of the PCB contamination, therefore these alternatives are only effective upon backfilling and placement of a cover system over the Study Area.

Long-Term Effectiveness and Permanence - The measures in place under the no-action and institutional controls alternative have already substantially reduced the environmental risk posed by continued contaminant loadings to the creek. Any of the cover alternatives would effectively eliminate erosion of the Study Area soils, which provides a moderately increased effectiveness in reducing contaminant loads.

The restricted site access and physical barrier provided by the plastic sheeting over the most heavily contaminated portion of the site under the no-action alternative significantly reduces the potential for direct human contact with the contamination from the prior unremediated condition. Institutional controls further reduce this risk by preventing unauthorized access to the site, while the covers effectively eliminate the potential for direct human contact with the contamination. The excavation alternatives reduce the mass of PCBs in the study area soils from 40% to 67%, depending on the excavation alternative and the cleanup level. The potential for direct human contact with study area soils is substantially increased during the actual excavation and disposal/treatment work. The potential for on-site exposure after the excavated soils are backfilled and a topsoil cover is placed across the site is minimal.

Long-term maintenance would be required to ensure the integrity of any cover. This maintenance includes repair of the cover as necessary, from damage caused by weather conditions, animals, undesirable vegetation, etc. Due to the relatively small size of the site and the controlled access which prevents animals, people, etc. from entering the site, the degree of effort required to maintain the cover would be minimal, thus providing long-term effectiveness in achieving the remedial action objectives for the site.

Reduction of Toxicity, Mobility or Volume - With the exception of excavation followed by incineration, none of the Study Area soils alternatives reduces the overall toxicity or volume of the contamination aside from any natural degradation which may occur. All of the cover and excavation alternatives are equally effective in reducing the mobility of the contaminants.

Implementability - The no-action alternative has already been implemented. Materials and equipment for placement of either the institutional controls or any of the covers are readily available in the Western New York area. The site's size constraints will cause some modification of typical construction practices, but will not appreciably impact the technical implementability of these alternatives. However, a potential delay with regard to administrative implementability may be posed by the need to obtain permission from Conrail to excavate or extend the covers onto their property.

With the exception of excavation of principal-threat soils, excavation followed by either off-site land disposal in a hazardous waste landfill or off-site incineration will pose substantial technical difficulties due to the necessity for a sheet-pile stabilized haul access road and, in the case of stabilized excavation, sheetpiling at the toe of the railroad embankment, building foundations, and at the top of the creek bank. Administrative barriers which can be expected if excavation is selected include the procurement of a hazardous waste transport permit, procurement of a permit from the USACE to install sheetpiling for the haul access road in Ellicott Creek, and coordination with hazardous waste landfill or incineration facility personnel.

Compliance with ARARs - All of the Study Area soils alternatives will comply with all relevant and appropriate action- and location-specific requirements identified in Tables 1-6 and 1-7, with the exception of TSCA 40 CFR 761.75 for which a waiver will be required. None of the alternatives for the Study Area soils complies with the chemical-specific TBCs for soils identified in Table 1-8.

Overall Protection of Human Health and the Environment - Although public access to the site is restricted under the no-action alternative, the potential for incidental contact with the soils by maintenance workers is not addressed if no further remedial actions are taken for the site. In addition, the potential for overland erosion of the soils not covered by plastic sheeting will also remain if the on-site soils are not remediated. While institutional controls reduce the human health risk further by preventing unauthorized access to the site, the potential for environmental risk posed by erosion of Study Area soils into the creek still exists.

Placement of any of the cover systems is protective of human health and the environment in that these technologies effectively eliminate the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site. The excavation alternatives, if coupled with the placement of a cover system, will also effectively eliminate the potential for direct human contact with the soils and overland erosion to Ellicott Creek, thereby satisfying the remedial action objectives for the site.

Cost - No capital costs are associated with the no-action alternative. Implementing institutional controls represents a present-worth cost of $90,000. The present worth of the cover alternatives range from $228,000 to $305,000 The present worth of the excavation/ offsite disposal alternatives ranges from $594,000 to $2.3 million. The present worth of the excavation/off-site incineration alternatives ranges from $1.4 million to $8.3 million.

4.5.2 Comparison of Creek Sediment Alternatives

Short-term Impacts and Effectiveness - There is no potential for increased short-term risks to the public health or the environment posed by the no-action alternative. There are significant short-term environmental impacts under any of the remaining creek sediment alternatives. While there are mitigative measures available to control the creek bed disturbances caused by these remedial actions, they are only moderately reliable in controlling the risks.

There are potential short-term risks to the personnel installing the erosion control fabric and rip-rap or revetment fabric containment options which would require control through the implementation of appropriate health and safety procedures. There are a greater number of potential short-term risks associated with the dredge/treat/dispose options of those sediments outside the limits of the IRM and include the following: to personnel performing the dredging due to drying and handling of the contaminated sediments; and to the community and the environment during transport to the local permitted landfill or distant incineration facility. In addition to the above risks, there are additional risks associated with the dredge/treat/dispose options involving removing the IRM, including physical hazards during installation and removal of the cofferdam and excavation of the IRM riprap; potential failure of the cofferdam; and high probability of flooding caused by the cofferdam-created channel constriction. Risks such as sudden failure of the cofferdam or flooding are not easily or readily controllable and could have catastrophic human health or environmental impacts.

Long-Term Effectiveness and Permanence - The no-action alternative (i.e., the existing IRM covering 44% of the area of contaminated sediments) is effective in reducing the environmental risk posed by PCB-contaminated sediments to aquatic life and fish-eating wildlife to below that presented by background reaches of Ellicott Creek. However, if the creek bank IRM is considered an element of the no-action alternative, a long-term maintenance schedule for the toe of the IRM would be necessary to maintain its effectiveness. Further covering of the remaining contaminated sediments through placement of rip-rap/erosion control fabric or revetment fabric would provide greater effectiveness in preventing direct contact of aquatic biota with contaminated sediments, though with marginal risk reduction provided. The long-term effectiveness of revetment fabric remains questionable.

Removal of the remaining non-IRM covered contaminated sediments through dredging provides marginally improved effectiveness in achieving the remedial objectives. Additionally, no long-term maintenance for dredged areas is required. Long-term maintenance is still required for the remaining IRM-covered creek bed sediment areas.

Removal of the IRM and all contaminated creek sediments through dredging provides the greatest degree of effectiveness in achieving the remedial objectives since long-term maintenance of the creek bed is eliminated. However, this alternative provides only a marginally greater level of environmental risk reduction from either the no-action or the containment alternatives as well as the non-IRM covered dredge alternative.

Reduction of Toxicity, Mobility or Volume - The no-action alternative does not contribute to the reduction of toxicity or volume of the contaminated sediments outside of the natural degradation which may occur; however the existing creek bank IRM effectively eliminates the mobility of the most highly contaminated stream sediments. The containment alternatives do not serve to reduce the toxicity or volume of the sediments, however they do immobilize more Study Area sediments and eliminate the potential environmental risk presented by direct contact of aquatic biota with the sediments. Hydraulic dredging followed by disposal in a secure landfill or eliminates the mobility of the sediments but does not reduce the toxicity or volume of contamination. Volume and toxicity of contamination are ultimately reduced by incineration but provides only a marginal environmental benefit.

Implementability - The no-action alternative is already implemented. Materials required to implement the containment alternatives are readily available. Firms capable of performing this work are limited but should not pose a significant implementation problem. Placement of erosion control fabric/riprap or revetment fabric will require a USACE permit; however, this is not anticipated to delay implementation. Dredging of the contaminated sediments under the hydraulic dredging alternative will also require a USACE permit. Installation of the cofferdam for the alternative dredge options will require special consideration by USACE before an additional permit is issued and the technical requirements to control off-site flooding are anticipated to be technically infeasible. Due to the many phases of work (viz. cofferdam sheeting, dredging, construction and operation of the drying units, treatment of the water, and transport of the contaminated sediments), several firms would need to be contracted, presenting some coordination difficulties.

Compliance with ARARs - Implementation of any of the creek sediment alternatives will be performed in compliance with all the relevant and appropriate action- and location-specific requirements identified in Tables 1-6 and 1-7. None of the alternatives will comply with the chemical-specific TBCs for PCB-contaminated stream sediments. However, compliance with these TBCs for the creek sediments is not considered achievable due to technical impracticability and the potential for greater risk to the environment in attempting to achieve compliance.

Overall Protection of Human Health and the Environment - The no-action alternative is protective of human health and the environment in that a large portion (viz. 4000 square feet) of the sediments comprising the most heavily contaminated area of the stream is currently covered by the existing creek bank IRM already in place. As discussed in Section 1.2.4.2, the calculated environmental risk posed by the existing stream conditions is in fact lower than that presented by upstream and downstream reaches of Ellicott Creek and results in a hazard quotient which indicates only a marginal potential for aquatic toxicity and hence environmental risk. Containment or dredging, while effectively preventing contact with aquatic biota, provides only a marginal reduction in environmental risk.

Cost - There are no costs associated with the no-action alternative. The present worth of the IRM extension containment alternatives ranges from $363,000 for the fabric/riprap option to $242,000 for the revetment fabric option. The present worth of the dredging alternatives ranged from $654,000 to $2.8 million.

4.5.3 Comparison of Creek Bank Alternatives

Short-Term Impacts and Effectiveness - No short-term impacts are created by the no-action alternative. Slight short-term environmental and human health impacts are created in implementation of the extension of the IRM; however, these impacts are readily controllable. The excavation alternatives could cause significant environmental impacts due to the disturbance of soils/sediments in the creek.

The no-action alternative has effectively reduced the contaminant loading to the creek and prevents direct contact with the most heavily contaminated creek bank soils. Implementation of the IRM extension using either the erosion control fabric/riprap or revetment fabric option increases the effectiveness of the existing IRM and would become effective immediately upon placement. Excavation is effective in eliminating the potential for migration, with no measurable reduction in environmental or public health risk beyond the containment alternatives.

Long-Term Effectiveness and Permanence - The no-action alternative already effectively provides a 96% reduction in PCB loading to the creek and a 60% reduction in lead loading from the prior unremediated condition. The extension of the creek bank IRM or placement of revetment fabric provides greater effectiveness than the existing IRM in reducing PCB-contaminant loadings to the creek.

The no-action alternative prevents direct human contact with the most heavily contaminated portion of the Study Area creek bank while the IRM extension using either option would effectively prevent direct human contact with all Study Area creek banks. The rip-rap is extremely durable and remains effective indefinitely with routine maintenance and repair. The long-term effectiveness of the revetment fabric remains questionable. Excavation will essentially eliminate contaminant loading to the creek and, with off-site incineration, can be considered permanent.

Reduction of Toxicity, Mobility or Volume - The no-action alternative does effectively immobilize 96% of the PCB loading of the creek bank soils by covering the creek bank adjacent to the most heavily contaminated portion of the site. Extension of the IRM or the placement of revetment fabric to cover the entire Study Area creek banks provides even greater reduction in mobility of PCB contamination from the no-action alternative. Neither creek stabilization bank alternative will result in reduction in toxicity or volume of the creek bank soils. Excavation followed by off-site disposal limits the mobility of the soils via erosion but does not reduce toxicity or volume. Excavation followed by incineration reduces both toxicity and volume.

Implementability - The no-action alternative is already implemented. Implementation of the extension of the IRM or placement of revetment fabric requires construction materials which are readily available in the Western New York area. While a limited number of contractors are available to provide a barge for construction this should not pose a significant implementation problem. A potential delay with regard to administrative implementation is presented by the need to obtain permission from Conrail to stabilize the south area creek bank, and the need for a USACE permit. Installation of a cofferdam in the stream for each of the excavation alternatives pose significant implementation problems and also requires a USACE permit. It is anticipated that the flood control measures required under the permit will be technically infeasible, and that on this basis the USACE is not likely to issue a permit.

Compliance with ARARs - None of the creek bank alternatives are impacted by any action- or location-specific ARARs. None of the creek bank remediation alternatives is anticipated to comply with the chemical-specific TBCs for PCB-contaminated soils/ sediments identified in Table 1-8; however, compliance with these ARARs through the excavation alternatives presents serious technical implementation problems and significant risks to both public health and the environment.

Overall Protection of Human Health and the Environment - While substantial reduction of environmental risk has already been provided by installation of the IRM, the unquantified potential for release of PCBs from the exposed segments of creek banks still exists under the no-action alternative. Extension of the creek bank IRM or placement of revetment fabric provides protection of human health and the environment by effectively eliminating the erosion of soils from the creek bank and therefore the continued contaminant loadings to the creek; as well as eliminating the potential direct contact with contaminated soils by humans or wildlife. Creek bank excavation, if implementable, achieves these benefits as well, but at substantially greater cost and short-term risk.

Costs - There are no capital costs associated with the no-action alternative. The present worth of the extension of the creek bank stabilization is estimated at $343,000 for the erosion control fabric/riprap option and $401,000 for the revetment fabric option. The present worth of the excavation alternative is $2.7 million for excavation followed by disposal and $7.9 million for excavation followed by incineration.

4.6 SUMMARY OF DETAILED ANALYSIS

Table 4-1 summarizes the results of the detailed analysis of the remedial alternatives by presenting the relative scoring of each evaluation criteria as well as the costs of each alternative. The results of the detailed analysis are discussed individually for each environmental medium below:

4.6.1 Study Area Soils

Although public access to the site is restricted or prevented under the no-action and institutional control alternatives, respectively, the potential for incidental contact with the soils by maintenance workers is not addressed under the no-action alternative. The potential for overland erosion of the soils not covered by plastic sheeting also remains under both alternatives. The long-term effectiveness of the existing plastic sheeting in the Central Area is also an issue.

All of the cover alternatives identified; i.e., topsoil, asphalt, gravel or synthetic/soil provides long-term effectiveness in eliminating the potential for direct contact and erosion if properly maintained. All of the covers are readily implementable and, while the asphalt or gravel cover is effective immediately, the topsoil and synthetic/soil covers becomes effective shortly thereafter (once vegetation is established) and will require short-term sediment runoff controls in the interim. Of all the implementable cover systems considered, only the synthetic/soil cover is effective in substantially reducing infiltration of precipitation.

Excavation of the principal-threat soils is readily implementable. The remaining excavation alternatives followed by off-site disposal or incineration are not as readily implementable as any of the cover alternatives or excavation of the principal-threat soils due to the necessity for a sheetpile-stabilized haul road and the administrative obstacles precluding the excavation work (i.e., obtaining transport permits, coordination with disposal of incineration facilities, etc.). Neither the cover alternatives nor any of the the excavation alternatives comply with the chemical-specific SCGs for this site medium in that they do not destroy or remove all the contamination from the site; however, both technologies are effective in immobilizing the contaminants. All technologies will reduce long-term mobility of the contamination by preventing erosion, and will be permanently effective providing that the cover material is maintained. The estimated present worth of the cover alternatives ranges from \$228,000 to \$305,000. The estimated present worth of the excavation alternatives ranges from \$1.4 million to \$8.3 million for the incineration option, and from \$594,000 million to \$2.3 million for the disposal option.

4.6.2 Ellicott Creek Sediments

A recent survey of the creek bed indicates that approximately 44% of the total volume of creek sediment identified in the RI as contaminated is covered by the existing

IRM. Hazard quotients calculated for these current conditions indicate only a marginal potential for aquatic toxicity and, in fact, represent a lower potential for environmental risk than upstream and downstream reaches of Ellicott Creek not impacted by the Columbus McKinnon site. Therefore, while the no-action alternative does not reduce the toxicity or volume of contaminants, the existing creek bank IRM effectively eliminates the mobility of the most highly contaminated stream sediments, and prevents direct contact with aquatic biota thus substantially reducing any potential for risk to the environment. Development of a long-term maintenance program will ensure the integrity and long-term effectiveness and performance of this alternative.

Both containment alternatives are readily implementable and, with proper measures taken during installation, can control short-term risks and become immediately effective once installed. All of the hydraulic dredging alternatives for the sediments are less readily implementable due to the many phases of the work (construction and operation of the dewatering units, dredging, treatment of the return water and transport of the contaminated sediments for the non-IRM removal option and addition of cofferdam sheeting for the IRM removal option) and presents greater short-term environmental and human health risks. The hydraulic dredging options requiring the installation of a cofferdam in the stream provide significant obstacles to implementability; specifically off-site flood control measures.

Aside from the dredge/treatment/disposal alternatives, neither containment nor dredging and off-site disposal reduce the toxicity or volume of the contaminants. Both technologies immobilize the contamination, although no long-term maintenance is required once the sediments are removed through dredging. The present worth for the two containment options are $242,000 and $363,000, respectively; while the present worth of the hydraulic dredging/treatment/offsite disposal options are considerably greater than the containment alternatives and range from approximately $654,000 to $2.8 million.

4.6.3 Creek Bank

Substantial reduction of environmental and human health risk from the prior unremediated condition has already been provided under the no-action alternative by installation of the IRM over the most heavily contaminated portion of the site. In fact, calculation of the Hazard Quotient for the existing bank and creek bed conditions indicates only a marginal potential for aquatic toxicity and presents an environmental risk below that of background conditions in Ellicott Creek. However, the potential for release of PCBs and heavy metals, and for direct contact with potentially contaminated soil/fill from the exposed segments of creek banks still exists under the no-action alternative. Although the presence of contamination along the creek banks has not been verified and, thus, contaminant loadings and public health risks from the creek banks has not been quantified, erosion of the uncovered portion of the creek banks is occurring and provides the potential for continued contaminant loading to Ellicott Creek.

Calculation of estimated contaminant loadings to Ellicott Creek from the creek banks indicates that extension of the creek bank IRM or placement of revetment fabric will provide greater effectiveness in reducing PCB-contaminant loadings to the creek, and a reduction in human health risk. Both alternatives will provide long-term effectiveness with routine maintenance and repair, however the maintenance and repair of revetment fabric will be much more difficult and frequent . Whether either alternative complies with the chemical-specific TBCs for soils or sediment is unknown since contamination of the creek banks has not been verified; however, compliance with these TBCs is not considered appropriate due to the technical impracticability and potential for greater short-term risk resulting from disturbance of soils or sediments if the existing creek banks are disturbed.

Excavation of the creek bank will eliminate the potential for contaminant migration to Ellicott Creek via direct erosion; however, this will be accomplished only at significant short-term risk to the public, environment, and workers, and the implementability of this option is in serious question.

5.0 RECOMMENDED REMEDIAL ALTERNATIVE

5.1 RECOMMENDATION

Based upon the results of the analyses presented in Sections 2 through 4 of this report, the recommended remedial approach for the Columbus McKinnon site consists of:

- selective excavation of principal-threat soils (i.e., soils in excess of 500 ppm), followed by off-site disposal in a permitted secure hazardous waste landfill;
- placement of a synthetic/soil cover system across the Study Area soils; and
- extending the IRM to stabilize the uncovered portions of the Study Area creek bank and adjacent creek sediments.

5.2 CONCEPTUAL DESIGN

The recommended remedial approach outlined above consists of selectively excavating soils from each nominal 25-foot by 25-foot Study Area grid exhibiting PCB concentrations in excess of 500 mg/kg from any historical or RI sample collected and analyzed from that grid. Each grid area will be excavated to the depth where all historical and RI sample results confirmed PCB concentrations to be less than 500 mg/kg. The following table summarizes which Study Area grids are to be excavated and to what depth below existing ground surface.

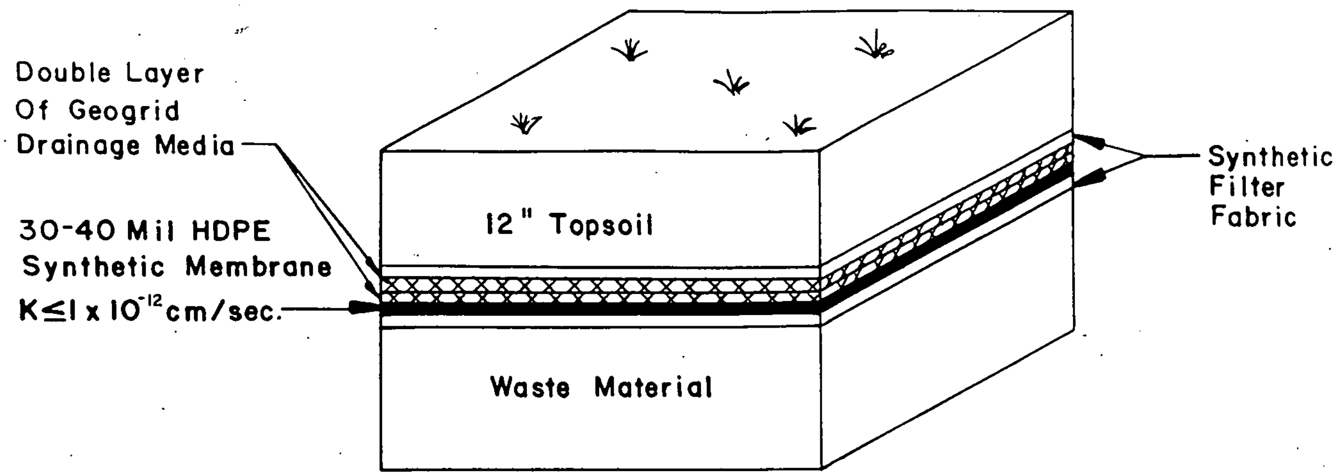
SUMMARY OF PRINCIPAL THREAT SOILS TO BE EXCAVATED		
Grid	**Depth of Excavation (feet)**	**Excavated Soil Volume (cy)**
Q	2	46.3
R	2	46.3
S	2	46.3
CC	4	44.4
EE	4	77.8
FF	2	44.4
TOTAL		305.5

As shown on the table, four of the grids (i.e., Q, R, S, and FF) would excavated to a depth of 2 feet and two grid areas (i.e., CC and EE) would be excavated to a depth of 4 feet below the existing ground surface elevation. Those grid areas adjacent to the IRM (i.e., CC, EE and FF) would be excavated to the edge of the anchor trench located along the fenceline at the top of the creek bank so as not to disturb the IRM. The means of excavation would be determined by the remedial construction contractor but would likely utilize a tracked crawler-loader or small rubber-tired loader. Procedures to control and monitor fugitive particulate (dust) emission during excavation and soil handling would be developed and implemented prior to construction.

The estimated 305.5 cubic yards of contaminated soil excavated from the Study Area would be containerized and removed via an improved access road along the back of the building, exiting the site via the Fillmore Avenue entrance gate. Access road improvements would consist of: grading and widening; placement of compacted select gravel fill; relocation of electrical and telephone wire and piping; possibly some tree removal; and installation of temporary precast concrete "Jersey" barriers along the top of the creek bank to prevent the accidental spillage of contaminated soil into Ellicott Creek. A temporary vehicle decontamination station would also be erected to wash potentially contaminated soil from vehicles and containers prior to exiting the work zone. Contaminated soils removed from the Study Area would be transported by permitted truck carrier to an off-site commercial permitted hazardous waste facility for secure land burial.

The excavated areas would be filled with either surficial soil graded from adjacent areas of the site and/or clean off-site borrow soil. The remainder of the site would be regraded and clean off-site select fill would be placed and compacted to achieve design subgrade elevations and slopes. The final grades of all covered areas will be above the 100-year flood elevation of 571.6. A synthetic membrane/soil cover system, as depicted below, would then be installed over the Study Area covering all soils with PCBs in excess of 10 mg/kg as delineated by historical or RI data.

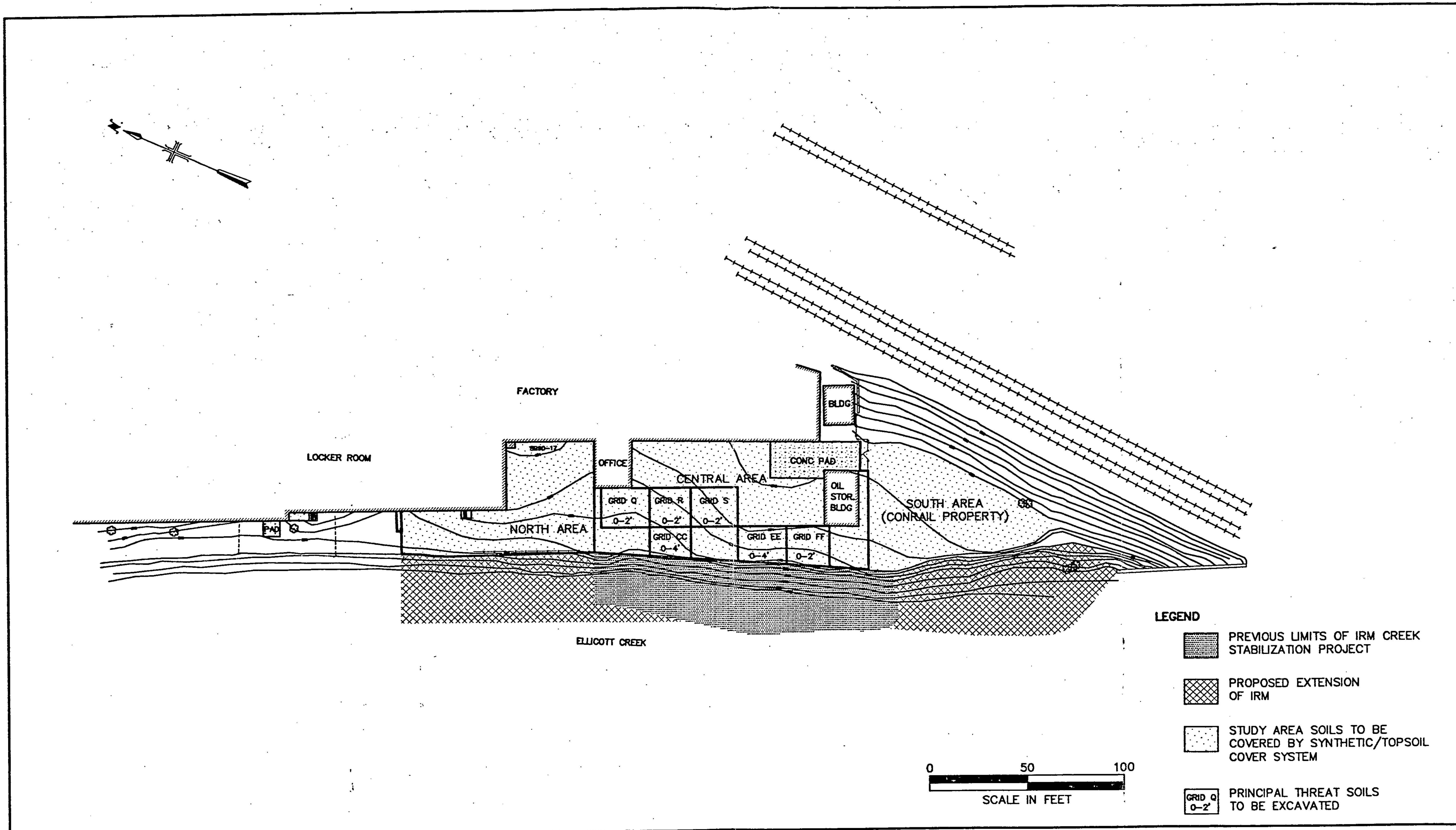
SYNTHETIC/SOIL COVER SYSTEM



This covered portion of the Study Area would encompass the entire South and Central Areas, and a portion of the Northern Area encompassing Grid Areas M and N, as graphically depicted on Figure 5-1.

The Study Area creek bank and contaminated creek sediments to be remediated are coextensive. The creek bank along the Southern Area, beginning at the southern edge of the IRM and extending south to the railroad bridge abutment, and along the Northern Area to the northern limit of the proposed containment cover system, including Grid Areas AA, Z, N and M, would be graded to a relatively uniform slope by placement of clean select gravel or crushed stone fill from off-site. A geotextile erosion control fabric and rock riprap identical to that used for construction of the existing IRM would be placed from the top of slope to the outer limits of any detected PCB contaminants in Ellicott Creek as determined by historical and RI data, as graphically depicted on Figure 5-1. The area of creek sediments covered would fully encompass and extend laterally beyond all creek grid Areas 1 through 30 (see Plate 3). The means and methods of construction would be determined by the remedial construction contractor under supervision by the remedial design engineer.

FIGURE 5-1



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SUMMARY OF PROPOSED REMEDIAL ALTERNATIVE

COLUMBUS McKINNON CORPORATION SEPT 1991

It is anticipated that similar construction means and methods employed for IRM construction would be utilized.

A post-remediation monitoring and maintenance/operations manual would be developed for NYSDEC approval prior to implementation. The manual would address:

- maintenance and inspection requirements and procedures
- site security methods
- monitoring requirements and procedures; and
- reporting and record-keeping requirements.

Implementation of the recommended remedial approach is not fully under the control of Columbus McKinnon Corporation. Full implementation will require securing:

- approval of Conrail Corporation for all remedial activities on their property including soil excavation, cover system construction, and creek bank remediation; and
- regulatory permits including a Section 404 dredge and fill permit from the U.S. Army Corps of Engineers and the New York State Department of Environmental Conservation.

5.3 SELECTION RATIONALE

The recommended remedial alternative described above fully meets or exceeds all remedial action objectives.

Proposed soil remediation measures are consistent with USEPA "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," which states that for sites in industrial areas, PCBs at concentrations of 500 ppm or greater will generally constitute a principal threat that should be removed, while low-threat material (material at concentrations less than 500 ppm) should generally be contained on-site.

Selective excavation of "principal threat" soils, as proposed, is estimated to result in the permanent removal of 57 percent in comparison to a total 67 percent maximum achievable removal of PCB contaminant mass in Study Area soils, both on- and off-site. The soil and creek bank containment cover system eliminates public health risks from direct contact or ingestion of contaminated soils and effectively eliminates further release of PCBs into Ellicott Creek due to erosion.

Remediation of the contaminated Ellicott Creek sediment would be coincident with the creek bank remediation and consistent with the existing IRM. By containing and effectively immobilizing the PCB-contaminated sediments under a thick permanent barrier potentially adverse environmental risks of uptake and bio-accumulation in fish and fish-eating wildlife are eliminated.

5.4 CERCLA WAIVER FROM ARARs

Section 121(d)(4) of SARA allows the selection of a remedial alternative that will not attain all ARARs if any of six conditions identified in Section 1.3 for a waiver of ARARs exists. As identified in Section 4.2.6, the cover system incorporated into this recommended remedial alternative will require a waiver from TSCA 40CFR 761.75, identified in Table 1-6 as an action-specific relevant and appropriate ARAR.

In addition, each of the recommended remedial measures will require a waiver from the chemical-specific TBCs for soils and sediments identified in Table 1-8; viz. the USEPA's Spill Cleanup Policy, the NYSDEC's draft soil cleanup criteria, and the NYSDEC's proposed sediment criteria. Waivers from these ARARs will be invoked based on the following criteria:

1. Greater Risk to the Health and the Environment, CERCLA Section 121(d)(4)(B) – This waiver is invoked based on the potential for significant and long-term adverse environmental impacts and the high degree of short-term environmental and public health risk resulting from implementation of alternative remedial measures.

2. Technical Impracticability, CERCLA Section 121(d)(4)(C) – This waiver is invoked based on the fact that the engineering means of attainment of the ARARs present significant (and in some cases completely infeasible) technical impracticabilities.

3. Equivalent Standard of Performance, CERCLA Section 121(d)(4)(D) - This waiver is invoked based on the equivalent risk reduction and protection of health, welfare, and the environment provided by the recommended remedial alternative as compared to other alternatives.

It is important to note that none of the remaining technically feasible remedial alternatives discussed in Section 4.0 provide the capability for achieving compliance with the ARARs identified above, and, thus, waivers from ARARs would be required for any remedial alternative selected.

5.5 COSTS

A summary of the capital and annual operating and maintenance costs for the recommended remedial approach is as follows:

Action	Capital Cost ($)	Annual O&M ($)
Select excavation of principal-threat soils followed by off-site disposal	$509,000	$7,600
Placement of a synthetic/soil cover system across the Study Area soils	$220,000	*
Extension of the IRM to stabilize uncovered portions of Study Area creek bank and adjacent creek sediments	$292,000	$4,500
TOTAL	$1,021,000	$12,100
* Annual O&M included in excavation estimate		

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APPENDIX A — ANALYTICAL DATA

A1 RI Report Data
A2 Hazard Rating Data

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APPENDIX A1

RI Report Data

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TABLE 6-1

COLUMBUS McKINNON CORPORATION

ANALYTICAL PARAMETERS AND METHODOLOGY

SAMPLE PARAMETER	ANALYTICAL METHODOLOGY (1)	SAMPLE MATRIX		
		SOIL	SEDIMENTS	GROUND WATER
Volatile Organic Compounds(2)	8010	X		X
PCBs	8080	X	X	X(3)
Cadmium	6010/7131	X	X	X(3)
Lead	7421	X	X	X(3)
Chromium	6010/7191	X	X	X(3)
Nickel	6010	X	X	X(3)

NOTES:

(1) SW846 - "Test Methods for Evaluating Solid Waste Physical/ Chemical Methods," Third Edition, September 1986.

(2) Specific VOCs are identified in Table 6-2.

(3) Total metals and PCBs were analyzed in May 1990. Both total and field-filtered metals and PCBs were analyzed in May 1991.

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TABLE 6-2

COLUMBUS McKINNON CORP.

HALOGENATED VOLATILE ORGANIC PARAMETERS

Bromodichloromethane
Bromoform
Bromethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Dibromochloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
trans-1-,2-Dichloroethylene
1,2-Dichloropropane
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Methylene chloride
1,1,2,1-Tetrachloroethene
Tetrachloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Vinyl chloride

TABLE 6-3

COLUMBUS McKINNON CORP.

SUMMARY OF HISTORIC PCB DATA FOR SOIL[1][2]
(Values in mg/kg)

SAMPLE LOCATION	SAMPLE DATE	DEPTH INTERVAL (feet)			
		SURFACE - 2	2 - 4	4 - 6	>6
B2	7/13/79	51	115		14
B3		13			0.8
B4	9/13/79	11	1	0.13	0.69
B5		30	14	0.76	0.86
B6		0.22	2.2		<0.001
B7	1/28/80	0.52	0.17[3]		
B8			1.5[3]	2.6[3]	
B9			1.7[3]	0.15	
B10	9/4/81	478	122		
B11		225[3]	172[3]	106	
B12			254[3]	99[3]	
BH-1	11/12/81	124			
BH-2		109[3]		62[3]	49
BH-3		164		0.27[3]	0.23
BH-4		269		153[3]	141
BH-5		102		9.9[3]	17
BH-6	11/12/81	37[3]		6.6[3]	6.0
BH-7		275[3]	549	56[3]	59
BH-8		<0.5	0.21	0.26[3]	0.36
BH-9		125	8.9	0.30[3]	0.04
BH-10	5/82	1210			
BH-11	5/82	1260			
BH-12		294			
BH-13		798			
BH-14	8/82	440	221		
BH-15		44	188		
BH-16	8/82	1077[3]			
BH-17		58	0.81		
BH-18		<1.7	0.25		
BH-19		65	9.6		
BH-20		209[3]			
BH-21	8/82	89[2]	506		
BH-22	9/82	24			
BH-23	8/82	599	147		
BH-24		25[3]			
BH-25	9/82	363			

(Continued)

TABLE 6-3

COLUMBUS McKINNON CORP.

SUMMARY OF HISTORIC PCB DATA FOR SOIL[1][2]
(Values in mg/kg)

SAMPLE LOCATION	SAMPLE DATE	DEPTH INTERVAL (feet)			
		SURFACE - 2	2 - 4	4 - 6	>6
BH-26	9/82	4.9			
BH-27		0.78			
BH-28		2220			
BH-29		94			
BH-30		272			
BH-31	9/82	427			
BH-32	11/82	1.9			
BH-33		8.4			
BH-34		126			
BH-35		<2.2			
BH-36	11/82	<0.10			
BH-37		20			
BH-38		46			
BH-39		125			
BH-40		<0.09			
BH-41	11/82	20			
BH-42		52			
BH-43		<.74			
BH-44		<0.36			
BH-45		61			
BH-46	11/82	67			
BH-47		<0.33			
BH-48		20			
BH-49		<1.5			
BH-50		<3.4			
BH-51	11/82	34			
BH-52		6.7			
BH-53		7.1			
BH-54	1/83	2.1			
BH-55		15			
BH-56	1/83	5.0			
BH-57		4.4			
BH-58		24			
BH-59		86			
BH-60		1.0			

(Continued)

MALCOLM PIRNIE

TABLE 6-3

COLUMBUS McKINNON CORP.

SUMMARY OF HISTORIC PCB DATA FOR SOIL(1)(2)
(Values in mg/kg)

SAMPLE LOCATION	SAMPLE DATE	DEPTH INTERVAL (feet)			
		SURFACE - 2	2 - 4	4 - 6	>6
BH-61 BH-62 BH-63	1/83	1.7 <2.0 <3.4			

NOTES:

(1) Analytical results for BH-series samples from report entitled "Groundwater and Additional Sampling Program," prepared by Advanced Environmental Systems, Inc. for Columbus McKinnon Corp., dated December 1983. Analytical results for B-series samples obtained from ACTS Testing Labs Inc. reports presented in Appendix E.

(2) Arochlor 1254 was the only PCB detected.

(3) Indicates an average of 2 values for that depth range.

(Continued)

TABLE 6-4a

COLUMBUS McKINNON CORP.

HISTORIC CREEK SEDIMENT TOTAL PCB ANALYTICAL RESULTS
(mg/kg)

<table>
<tr><th rowspan="2">Date</th><th rowspan="2">Distance from Bank (ft)</th><th colspan="8">LOCATION</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>10/8/82</td><td>5</td><td><0.12</td><td></td><td>107</td><td>366</td><td></td><td></td><td></td><td></td></tr>
<tr><td>(1)</td><td>15</td><td>1.5</td><td>10</td><td>127</td><td>222</td><td></td><td></td><td></td><td></td></tr>
<tr><td>10/29/82</td><td>5</td><td></td><td></td><td></td><td></td><td>18</td><td><0.43</td><td><2.9</td><td><3.3</td></tr>
<tr><td>(1)</td><td>15</td><td></td><td></td><td></td><td></td><td>10.1</td><td><0.36</td><td><0.26</td><td></td></tr>
<tr><td>7/6/83</td><td>15</td><td></td><td colspan="2">0.97*</td><td colspan="2">19*</td><td></td><td></td><td></td></tr>
<tr><td>(1)</td><td>25</td><td>0.29</td><td></td><td>0.33</td><td>0.39</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1/16/86</td><td>15</td><td></td><td colspan="2">8.8 11* 53</td><td colspan="2">60 9.7*</td><td></td><td></td><td></td></tr>
<tr><td>(2)</td><td>25</td><td></td><td></td><td>2.4</td><td>40</td><td></td><td></td><td></td><td></td></tr>
</table>

NOTES:

* Sample Collected between two locations.

(1) "Groundwater and Additional Sampling Program" report prepared for Columbus McKinnon Corp. by Advanced Environmental Systems, Inc., December 1983.

(2) "Ellicott Creek Surface Sediment, Re-analysis for PCBs" report prepared for Columbus McKinnon Corp. by Advanced Environmental Systems, Inc., July 1986.

TABLE 6-4b

COLUMBUS McKINNON CORP.

HISTORIC PCB CONCENTRATION (mg/Kg) OF "AT DEPTH" CREEK SEDIMENT SAMPLES[1]

SAMPLE LOCATION DISTANCE FROM SHORE (ft)		3 5	3 20	4 7	4 17
DEPTH OF SAMPLE:					
0 - 0.5 ft below creek bottom	PCB 1260 PCB 1254 PCB 1242	<0.5 0.9 (14)* <0.6	BDL 0.9 BDL	1.0 16 <1.0	BDL 0.1 BDL
0.5 - 1 ft below creek bottom	PCB 1260 PCB 1254 PCB 1242	No Sample	<0.2 4.9 <0.2	No Sample	BDL BDL BDL
1 - 1.5 ft below creek bottom	PCB 1260 PCB 1254 PCB 1242	No Sample	BDL 0.3 BDL	No Sample	BDL BDL BDL
1.5 ft - 2.0 ft below creek bottom	PCB 1260 PCB 1254 PCB 1242	No Sample	BDL 0.02 BDL	No Sample	BDL 0.02 BDL

NOTES:

Analysis performed by Advanced Environmental Systems.

* indates duplicate analysis

(1) This table from "Depth of PCBs at Four Locations in Ellicott Creek," report prepared by Advanced Environmental Systems, Inc. and Conestoga Rovers Associates, dated July 1985.

TABLE 6-5

COLUMBUS McKINNON CORP.

SUMMARY OF HISTORIC GROUND WATER MONITORING DATA (ug/l)

DATE	REFERENCE	SAMPLED BY	PARAMETER	* OW 1-83	* OW 2-83	DUPLICATE	FIELD BLANK	COMMENTS
8/15/83	(1)	AES	THO TVHO PCBs	1.7 19 ND	74 3142 ND		ND 3.4 ND	
10/20/83	(1)	AES	TVHO TCE Tetrachloroethene Methylene Chloride	39	1844 56 34 72	2710 58 31 162	15 ND ND ND	
8/27/84	(1)	AES	Vinyl Chloride Trans 1,2-DCE		160 160		ND ND	Tested for 113 organic Organic priority pollutants
1/14/85	(2)	AES	Vinyl Chloride Trans 1,2-DCE		115 100			Sample split with NYSDEC
9/25/85	(3)		TCE Vinyl Chloride 1,1-DCE		120 290 129			No semi volatiles detected

REFERENCES:

(1) "Ground Water and Additional Sampling Program," report prepared by Advanced Environmental Systems, Inc. for Columbus McKinnon Corp. dated December 1983.

(2) "OW-2 Groundwater Sample Split with the DEC," report prepared by Advanced Environmental Systems, Inc. for Columbus McKinnon Corp. dated February 18, 1985.

(3) NYSDEC, December 1985; Letter to Mr. John Dicky from Mr. Peter Beuchi, NYSDEC.

ND = Not Detected

* = Earth Dimensions, Inc. installed Wells OW 1-83 and OW 2-83 on August 8 and 9, 1983.

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TABLE 6-6

COLUMBUS McKINNON CORP.

BORING DEPTHS AND SAMPLING INTERVALS

Boring No.	Total Depth (ft)	Analytical Sampling Interval (ft below ground surface)
SB 90-1	8	0-2 4-6 6-8
SB 90-2	8	0-2 4-6 6-8
SB 90-3	8	4-6 6-8
SB90-4	8	0-2 4-6 6-8
SB 90-5	8	0-2 4-6 6-8
SB 90-6	6	0-2 4-6
SB 90-7	8	0-2 6-8
SB 90-8	6	4-6
SB 90-9	8	4-6
SB 90-10	14	0-2 6-8 12-14
SB 90-11	6	0-2 4-6
SB 90-12	8	0-2 4-6
SB 90-13	10	0-2 4-6 8-10
SB 90-14	16	4-6 8-10 14-16
SB 90-15	14	4-6 8-10 12-14
SB 90-16	8	4-6 6-8
SB 90-17	8	4-6 6-8

(continued)

MALCOLM PIRNIE

TABLE 6-6

COLUMBUS McKINNON CORP.

BORING DEPTHS AND SAMPLING INTERVALS

Boring No.	Total Depth (ft)	Analytical Sampling Interval (ft below ground surface)
SB 90-18	8	4-6 6-8
SB 90-19	10	4-6 8-10
SB 90-20	14	6-8 10-12 12-14
SB 90-21	16	6-8 14-16
SB 90-22	12	0-2 6-8 10-12
SB 90-23	12	4-6 10-12
SB 90-24	12	4-6 10-12
SB 90-25	10	0-2 4-6 8-10
SB 90-26	12	0-2 4-6 10-12
SB 90-27	8	0-2 6-8
SB 90-28	12	0-2 4-6 10-12
SB 90-29	12	4-6 6-8 8-10 10-12
SB 90-30	12	4-6 6-8 10-12
SB 90-31	10	4-6 8-10
SB 90-32	12	4-6 10-12
SB 90-33	22	4-6 6-8 20-22

(continued)

MALCOLM PIRNIE

TABLE 6-6

COLUMBUS McKINNON CORP.

BORING DEPTHS AND SAMPLING INTERVALS

Boring No.	Total Depth (ft)	Analytical Sampling Interval (ft below ground surface)
SB 90-34	18	4-6 8-10 10-12 16-18
SB 90-35	14	4-6 6-8 8-10 12-14
SB 90-36	12	4-6 6-8 10-12
SB 90-37	16	0-2 4-6 6-8 14-16
SB 90-38	12	0-2 4-6 10-12
SB 90-39	12	4-6 10-12
SB 90-40	14	4-6 12-14
SB 90-41	14	4-6 8-10 12-14
SB 90-42	12	0-2 4-6 10-12
SB 90-43	14	0-2 4-6 12-14
SB 90-44	12	0-2 4-6 10-12
SB 90-45	14	0-2 4-6 12-14
SB 90-46	14	0-2 4-6 12-14
SB 90-47	14	0-2 4-6 10-12

(continued)

MALCOLM PIRNIE

TABLE 6-6

COLUMBUS McKINNON CORP.

BORING DEPTHS AND SAMPLING INTERVALS

Boring No.	Total Depth (ft)	Analytical Sampling Interval (ft below ground surface)
SB 90-48	10	0-2 4-6 8-10
MW-1D	32	0-2 4-6 6-8 18-20 36-38
MW-2D	36	0-2 4-6 6-8
MW-3	30	4-6

MALCOLM PIRNIE

TABLE 6-7

COLUMBUS McKINNON CORP.

SOIL BORING FIELD OBSERVATIONS[1]

BORING NUMBER	BOREHOLE INTERVAL[2]	HEADSPACE ANALYSIS HNu RANGE (ppm)	FIELD OBSERVATIONS	BOREHOLE INTERVALS ANALYZED	FILL THICKNESS
SB 90-10	6-8 8-10 10-12	2.0 2.5 2.0	oil sheen; odor oil sheen; odor	0-2 6-8 12-14	4.3 <6.0
SB 90-13	4-6	2.5	oil sheen; odor	0-2 4-6 8-10	<6.5 <8.0
SB 90-14	6-8	0.0	oil sheen	4-6 8-10 14-16	8.3
SB 90-15	6-8 8-10	2.0 NA	odor odor	4-6 8-10 12-14	6.2
SB 90-16	4-6 6-8	2.5 .5		4-6 6-8	2.3
SB 90-20	6-8 8-10 10-12	0.0 0.0 0.0	oil sheen, odor oil sheen oil sheen	6-8 10-12 12-14	>2.8 <6.0
SB 90-21	6-8 8-10 10-12	0.0 0.0 2.0	oil sheen oil sheen oil sheen	6-8 14-16	>6.5 <8.0
SB 90-22	6-8	0.0	odor	0-2 6-8 10-12	>2.3 <6.0
SB 90-23	0-2 4-6	.5 1.5		4-6 10-12	>.3 <2.0
SB 90-24	2-4	1.0		4-6 10-12	.5
SB 90-26	4-6	20.0	staining, odor	0-2 4-6 10-12	2.2
SB 90-28	6-8	0.0	oil sheen	0-2 4-6 10-12	8.1
SB 90-29	6-8	NA	odor	4-6 6-8 8-10 10-12	>4.4 <6.0
SB 90-30	6-8	NA	staining	4-6 6-8 10-12	>2.2 <4.0

(Continued)

TABLE 6-7

COLUMBUS McKINNON CORP.

SOIL BORING FIELD OBSERVATIONS[1]

BORING NUMBER	BOREHOLE INTERVAL[2]	HEADSPACE ANALYSIS HNu RANGE (ppm)	FIELD OBSERVATIONS	BOREHOLE INTERVALS ANALYZED	FILL THICKNESS
SB 90-37	0-2 6-8 8-10 10-12 12-14	NA 100.0 70.0 7.0 5.0	odor staining staining	0-2 4-6 6-8 14-16	6.4
SB 90-39	2-4	.5		4-6 10-12	>4.4 <6.0
SB 90-40	0-2 2-4 4-6 6-8 8-10 10-12	2.0 4.0 200.0 3.5 6.0 10.0		4-6 12-14	6.2
SB 90-41	6-8 8-10 10-12	50.0 50.0-100.0 200.0	 odor odor	4-6 8-10 12-14	>7.1 <8.0
SB 90-43	8-10	0.0	staining	0-2 4-6 12-14	>6.6 <8.0
SB 90-44	2-4 4-6 8-10	2.0 1.0 NA	staining	0-2 4-6 10-12	>4.4 <6.0
SB 90-45	6-8 8-10	1.0 1.0	 staining	0-2 4-6 12-14	6.6
SB 90-46	8-10 10-12	0.0 0.0	staining staining	0-2 4-6 12-14	>2.7 <8.0
SB 90-47	8-10	0.0	staining	0-2 4-6 10-12	6.9
SB 90-48	8-10	0.0	staining	0-2 4-6 8-10	4.8
MW 1D	0-2 6-8	.5 0.0	staining	0-2 4-6 6-8 18-20	6.2

(Continued)

MALCOLM PIRNIE

TABLE 6-7

COLUMBUS McKINNON CORP.

SOIL BORING FIELD OBSERVATIONS[1]

BORING NUMBER	BOREHOLE INTERVAL[2]	HEADSPACE ANALYSIS HNu RANGE (ppm)	FIELD OBSERVATIONS	BOREHOLE INTERVALS ANALYZED	FILL THICKNESS
MW 1S	5-7 7-9 9-11 11-13	2.0 3.0 2.0 1.0	staining, odor, sheen staining staining	-	>5.5 <7.0
MW 2D	2-4 4-6	1.0 1.5		0-2 4-6 6-8	6.7
MW 2S	5-7 7-9 9-11 11-13 13-15	3.0 50.0 9.0 2.0 1.0	staining	-	>6.4 <7.0
CM 1-89	8-10 10-12 12-14 14-16 16-18 18-20	45.0 7.0 4.0 4.0 4.0 2.0	petroleum odor	-	8.2
CM 2-89	2-4 4-6 6-8 8-10 10-12 14-16	2.0 1.0 0.0 8.0 1.0 0.0	oil sheen tarry material oil sheen, odor discoloration, odor oil sheen	-	8.3
CM 3-89	4-6 6-8 8-10 10-12	2.0 2.0 1.0 1.0	oil sheen oil sheen oil sheen	-	8.1
CM 4-89	None				2.6
CM 5-89	None				0.0
BH 1-81	-	NA	refusal @ .5 ft		NA
BH 2-81	5.5 - 7.0	NA	odor	0 -.5 1.0 - 2.0 4.0 - 5.5 5.5 - 7.0	>7.0

(Continued)

MALCOLM PIRNIE

TABLE 6-7

COLUMBUS McKINNON CORP.

SOIL BORING FIELD OBSERVATIONS[1]

BORING NUMBER	BOREHOLE INTERVAL[2]	HEADSPACE ANALYSIS HNu RANGE (ppm)	FIELD OBSERVATIONS	BOREHOLE INTERVALS ANALYZED	FILL THICKNESS
BH 3-81	-	NA	-	0.5 2.0 - 4.5 4.5 - 5.5 5.5 - 7.0	4.5
BH 4-81	-	NA	-	0.2 .4 - 2.0 4.0 - 5.5 5.5 - 7.0	>7.0
BH 5-81	5.5 - 7.0	NA	odor	0 - .4 1.0 - 1.8 4.0 - 4.5 5.5 - 7.0	>7.0
BH 6-81	-	NA		0 - .2 .8 - 1.7 4.0 - 5.5 5.5 - 7.6	>7.6
BH 7-81	5.5 - 7.0	NA	odor	0 - .4 1.3 - 2.5 4.0 - 5.5 5.5 - 7.0	>7.0
BH 8-81	-	NA	-	0 - .1 3.3 - 3.5 3.5 - 5.5 5.5 - 7.0	3.3
BH 9-81	-	NA	-	0 - 2.0 2.0 - 4.0 4.0 - 5.5 5.5 - 7.0	5.5
B-1-79	.5 - 1.0	NA	oily substance, solvent odor	none	-
B-2-79	.5 - 1.0 1.0 - 1.5 6.0 - 7.0	NA	oily substance oil film or liquid	.5 - 1.5 2.5 - 3.0 6 - 7	-
B-3-79	-	NA	-	0 - 1.0 5.5 - 6.5	
B-4-79	-	NA	-	0 - 2.5 2.5 - 5.0 5.0 - 6.5 7 - 9	

(Continued)

MALCOLM PIRNIE

TABLE 6-7

COLUMBUS McKINNON CORP.

SOIL BORING FIELD OBSERVATIONS[1]

BORING NUMBER	BOREHOLE INTERVAL[2]	HEADSPACE ANALYSIS HNu RANGE (ppm)	FIELD OBSERVATIONS	BOREHOLE INTERVALS ANALYZED	FILL THICKNESS
B-5-79	0 - 1.5 1.5 - 3.5 5 - 6 8 - 9 10 - 11	NA	oil odor in all samples	0 - 1.5 1.5 - 3.5 5 - 6 10 - 11	6.0
B-6-79	0 - 2.5 2.5 - 5	NA	fine metal fragments	0 - 2.5 2.5 - 5.0 7 - 8 9 - 11	7.2
B-7-80	2.5 - 3.0 3.0 - 3.5	NA	solvent odor solvent odor	.5 - 1.5 2.5 - 3.0 3.0 - 3.5	
B-8-80	2.5 - 3.0 4.0 - 4.5 4.5 - 5.0	NA	oily film and odor	2 - 2.5 2.5 - 3.0 4 - 4.5 4.5 - 5	-
B-9-80	.5 - 1.0	NA	black carbon waste	2 - 2.5 3.5 - 4 5 - 5.5	-
B-10-81	.5 - 1.0 2 - 3	NA	oil film oily film and metal fragment	.5 - 1.0 2 - 3	-
B-11-81	0 - 1 1.5 - 2 2.5 - 3 3 - 3.5 3.5 - 4 4.5 - 5	NA	oily film oily film oily film wet w/oil liquid wet w/oil liquid wet w/oil liquid	0 - 1 1.5 - 2 2.5 - 3 3 - 3.5 3.5 - 4 4.5 - 5	-
B-12-81	3 - 3.5 5 - 5.5	NA	oily film oily film	2 - 2.5 3 - 3.5 4 - 4.5 4.5 - 5	

NOTES:

(1) Table 6-7 lists only those borings exhibiting detectable organic vapors in headspace or other field evidence of contamination.

(2) Intervals exhibiting field evidence of contamination.

TABLE 6-8

COLUMBUS McKINNON CORPORATION

CREEK SEDIMENT SAMPLING STATION DESCRIPTIONS

Sampling Station	Approximate Water Depth (ft.)	Observations
1	6.5	Black silt, organic matter
2	6	Black silt, leaves, oily sheen
3	6	Black silt, leaves, very "swampy" odor
4	3	Black silt, leaves; closest to concrete abutment
5	9	Black silt; some black-top encountered
6	6	Black silt
7	8	Black silt, oily film, organic material; 10 feet from bank
8	8	Black silt; 20 feet from bank
9	7	Black silt, oily film, odor of tar/oil; 15 feet from bank
10	8	Black silt, oily film, organic matter; 23 feet from bank

TABLE 6-9
COLUMBUS McKINNON CORP.
TONAWANDA FACILITY
SOIL SAMPLE RESULTS (1)(2)

BORING No. / SAMPLING DEPTH (feet)	MDL (3)	SB 90-35 (4-6)	SB 90-35 (6-8)	SB 90-35 (8-10)	SB 90-35 (12-14)	SB 90-35 (20-22)	SB 90-36 (4-6)	SB 90-36 (6-8)	SB 90-36 (10-12)
VOLATILE ORGANICS (mg/kg)		NA			NA	NA			NA
cis-1,2-Dichloroethene	0.002		<0.45	<9			.019J (.024J)	<0.18	
Tetrachloroethylene	0.002						.011J (.014J)		
Trichloroethylene	0.002						.043J (.054J)		
PCB'S (mg/kg)									
PCB-1254	0.16	11 (14)	NA	NA	ND	1.8 (3.0)	ND	NA	ND
METALS (mg/kg)									
Cadmium	0.5	4.1 (5.1)	NA	NA	ND	0.8 (1.3)	20 (25)	NA	ND
Chromium	1.0	75 (94)	NA	NA	10 (17)	21 (35)	190 (238)	NA	11 (18)
Nickel	2.0	220 (275)	NA	NA	16 (27)	36 (60)	740 (925)	NA	15 (25)
Lead	2.5	210 (263)	NA	NA	13 (22)	15 (25)	1400 (1750)	NA	5.3 (8.8)

BORING No. / SAMPLING DEPTH (feet)	MDL (2)	SB 90-37 (0-2)	SB 90-37 (4-6)	SB 90-37 (6-8)	SB 90-37* (6-8)	SB 90-37 (14-16)	SB 90-37* (14-16)
VOLATILE ORGANICS (mg/kg)			NA			NA	NA
1,2-Dichlorobenzene	0.002	<0.47		<0.3	.003J (.005J)		
Dichloropropane	0.002				.017J (.028J)		
Tetrachloroethylene	0.002				.005J (.008J)		
Trichloroethylene	0.002				.004J (.007J)		
PCB'S (mg/kg)							
PCB-1254	0.16	240 (300)	2.3 (2.9)	NA	NA	ND	ND
METALS (mg/kg)							
Cadmium	0.5	3.2 (4.0)	4.6 (5.8)	NA	NA	ND	ND
Chromium	1.0	28 (35)	300 (375)	NA	NA	7.8 (13)	3.8 (6.3)
Nickel	2.0	99 (124)	560 (700)	NA	NA	13 (22)	6.6 (11)
Lead	2.5	390 (488)	1000 (1250)	NA	NA	5.5 (9.2)	4.1 (6.8)

NOTE:

1. Only those parameters are shown for which any value above laboratory detection limits was found.
2. Concentrations shown in parentheses are the adjusted dry weight concentrations that were calculated according to the procedure described in Section 6.3.1.
3. Method Detection Limit

NA - Not Analyzed

ND - Not Detected at a concentration greater than the indicated detection limit.

J - Estimated value due to limitations identified during the quality control review.

* Field duplicate sample.

TABLE 6-9
COLUMBUS McKINNON CORP.
TONAWANDA FACILITY
SOIL SAMPLE RESULTS (1)(2)

BORING No. SAMPLING DEPTH (feet)	MDL (3)	SB 90-38 (0-2)	SB 90-38 (4-6)	SB 90-38 (10-12)	MW2D (0-2)	MW2D (4-6)	MW2D (6-8)
VOLATILE							
<u>ORGANICS (mg/kg)</u>		NA	NA	NA	NA	NA	
1,1,1-Trichloroethene	0.002						0.003 (0.005)
<u>PCB'S (mg/kg)</u>							
PCB-1254	0.16	50 (63)	9.9 (12)	ND	2.1 (2.6)	5.9 (7.4)	ND
<u>METALS (mg/kg)</u>							
Cadmium	0.5	17 (21)	6.5 (8.1)	ND	22 (28)	4 (5.0)	2 (3.3)
Chromium	1.0	190 (238)	130 (163)	7.1 (12)	260 (325)	230 (288)	15 (25)
Nickel	2.0	420 (525)	320 (400)	9.4 (16)	830 (1038)	540 (675)	100 (167)
Lead	2.5	5400 (6750)	420 (525)	4.5 (7.5)	1200 (1500)	310 (388)	170 (283)

BORING No. SAMPLING DEPTH (feet)	MDL (2)	MW-1D (0-2)	MW-1D (4-6)	MW-1D (6-8)	MW-1D * (6-8)	MW-1D (18-20)	MW-3 (4-6)
VOLATILE							
<u>ORGANICS (mg/kg)</u>		NA	NA	NA	NA	NA	NA
<u>PCB'S (mg/kg)</u>							
PCB-1254	0.16	15 (19)	1.6 (2.0)	ND	ND	ND	ND
<u>METALS (mg/kg)</u>							
Cadmium	0.5	16 (20)	6.4 (8.0)	ND	ND	ND	0.6 (1.0)
Chromium	1.0	83 (104)	41 (51)	6.6 (11)	9.4 (16)	3.8 (6.3)	12 (20)
Nickel	2.0	290 (363)	140 (175)	10 (17)	13 (22)	7.4 (12)	14 (23)
Lead	2.5	720 (900)	1800 (2250)	10 (17)	24 (40)	4.4 (7.3)	13 (22)

NOTE:

1. Only those parameters are shown for which any value above laboratory detection limits was found.
2. Concentrations shown in parentheses are the adjusted dry weight concentrations that were calculated according to the procedure described in Section 6.3.1.
3. Method Detection Limit

NA - Not Analyzed
ND - Not Detected at a concentration greater than the indicated detection li
J - Estimated value due to limitations identified during the quality control re
* Field duplicate sample.

TABLE 6-9
COLUMBUS McKINNON CORP.
TONAWANDA FACILITY
SOIL SAMPLE RESULTS (1,2)

BORING No. SAMPLING DEPTH (feet)	MDL(3)	SB 90-39 (4-6)	SB 90-39 (10-12)	SB 90-40 (4-6)	SB 90-40 (12-14)	SB 90-41 (4-6)	SB 90-41 (8-10)	SB 90-41 (12-14)	
VOLATILE **ORGANICS (mg/kg)**	0.002	NA	NA	NA	NA	NA	ND	NA	
PCB'S (mg/kg)									
PCB-1254	0.16	0.360 (0.45)	ND	2.4 (3.0)	ND	3.2 (4.0)	17 (28)	ND	
METALS (mg/kg)									
Cadmium	0.5	8.4 (11)	ND	5 (6.3)	ND	5.2 (6.5)	0.8 (1.3)	ND	
Chromium	1	110 (138)	15 (25)	270 (338)	6.9 (12)	140 (175)	99 (165)	8.5 (14)	
Nickel	2	130 (163)	20 (33)	2200 (2750)	12 (20)	480 (600)	760 (1267)	14 (23)	
Lead	2.5	2400 (3000)	12 (20)	350 (438)	3 (5.0)	1100 (1375)	91 (152)	2.9 (4.8)	

BORING No. SAMPLING DEPTH (feet)	MDL(3)	SB 90-42 (0-2)	SB 90-42 (4-6)	SB 90-42* (4-6)	SB 90-42 (10-12)	SB 90-43 (0-2)	SB 90-43 (4-6)	SB 90-43 (12-14)	SB 90-44 (0-2)
VOLATILE **ORGANICS (mg/kg)**		NA			NA	NA	NA	NA	NA
1,2-Dichloroethane			.004 J (.005J)						
Dichloromethane	0.002		.005 B (.006B)	.005 B (.006B)					
Trichloroethylene	0.002		.003 J (.004J)						
PCB'S (mg/kg)									
PCB-1254	0.16	57 (71)	ND	ND	ND	ND	0.61 (0.76)	ND	0.500 (0.63)
METALS (mg/kg)									
Cadmium	0.5	10 (13)	21 J (26J)	ND	ND	14 (18)	17 (21)	ND	91 (114)
Chromium	1	47 (59)	710 J (888J)	21 J (26J)	8.4 (14)	440 (550)	300 (375)	6.6 (11)	440 (550)
Nickel	2	60 (75)	650 J (813J)	38 J (48J)	12 (20)	600 (750)	510 (638)	9.4 (16)	890 (1113)
Lead	2.5	250 (313)	3800 J (4750J)	0.5 J (0.6J)	1.5 (2.5)	13000 (16250)	1800 (2250)	7 (12)	3000 (3750)

NOTE:

1. Only those parameters are shown for which any value above laboratory detection limits was found.
2. Concentrations shown in parentheses are the adjusted dry dry weight concentrations that were calculated according to the procedure described in Section 6.3.1.
3. Method Detection Limit.

NA - Not analyzed
ND - Not dectected at a concentration greater than the indicated detection limit.
J= Estimated value due to limitations identified during the quality control review.
B= Estimated detection limit due to blank contamination.
* Field duplicate sample.

TABLE 6-9
COLUMBUS McKINNON CORP.
TONAWANDA FACILITY
SOIL SAMPLE RESULTS (1,2)

BORING No. / SAMPLING DEPTH (feet)	MDL(3)	SB 90-44 (4-6)	SB 90-44 (10-12)	SB 90-45 (0-2)	SB 90-45* (0-2)	SB 90-45 (4-6)	SB 90-45 (12-14)	SB 90-46 (0-2)	
VOLATILE ORGANICS (mg/kg)		NA	NA	NA	NA	NA	NA	NA	
PCB'S (mg/kg)									
PCB-1254	0.16	ND	ND	.180 J (0.23J)	0.86 J (1.1J)	ND	ND	4.1 (5.1)	
METALS (mg/kg)									
Cadmium	0.5	36 (45)	ND	80 J (100J)	45 J (56J)	0.6 (0.8)	ND	1.5 (1.9)	
Chromium	1	280 (350)	10 (17)	640 J (800J)	460 J (575J)	47 (59)	10 (17)	300 (375)	
Nickel	2	190 (238)	14 (23)	520 (650)	470 (588)	110 (138)	15 (25)	1000 (1250)	
Lead	2.5	2500 (3125)	5 (8.3)	2600 J (3250J)	14000 J (17500J)	990 (1238)	7 (12)	260 (325)	
BORING No. / SAMPLING DEPTH (feet)	**MDL(3)**	**SB 90-46 (4-6)**	**SB 90-46 (12-14)**	**SB 90-47 (0-2)**	**SB 90-47 (4-6)**	**SB 90-47 (10-12)**	**SB 90-48 (0-2)**	**SB 90-48 (4-6)**	**SB 90-48 (8-10)**
VOLATILE ORGANICS (mg/kg)		NA	NA	NA	NA	NA	NA	NA	NA
PCB'S (mg/kg)									
PCB-1254	0.16	1.3 (1.6)	ND	3.1 (3.9)	3.8 (4.8)	ND	57 (71)	1.4 (1.8)	ND
METALS (mg/kg)									
Cadmium	0.5	15 (19)	ND	43 (54)	5.6 (7.0)	ND	44 (55)	3.1 (3.9)	ND
Chromium	1	270 (338)	14 (23)	140 (175)	150 (188)	9 (15)	270 (338)	21 (26)	10 (13)
Nickel	2	620 (775)	20 (33)	390 (488)	190 (238)	12 (20)	440 (550)	45 (56)	15 (19)
Lead	2.5	3000 (3750)	6 (10)	2000 (2500)	470 (588)	130 (217)	1300 (1625)	100 (125)	2.4 (3.0)

NOTE:
1. Only those parameters are shown for which any value above laboratory detection limits was found.
2. Concentrations shown in parentheses are the adjusted dry dry weight concentrations that were calculated according to the procedure described in Section 6.3.1.
3. Method Detection Limit.

NA - Not analyzed
ND - Not dectected at a concentration greater than the indicated detection limit.
J= Estimated value due to limitations identified during the quality control review.
B= Estimated detection limit due to blank contamination.
* Field duplicate sample.

TABLE 6-10
COLUMBUS MCKINNON CORPORATION
TONAWANDA FACILITY
GROUND WATER SAMPLE RESULTS

PARAMETER (1)	MW-1S			MW-1I			MW-2S			MW-2I			MW-3			MW-4*	MW-2I **	
	MAY 1990	MAY 1991		MAY 1990	MAY 1991		MAY 1990	MAY 1991		MAY 1990	MAY 1991		MAY 1990	MAY 1991		MAY 1990	MAY 1991	
	TOTAL	TOTAL	FF	TOTAL	TOTAL	FF	TOTAL	TOTAL	FF	TOTAL	TOTAL	FF	TOTAL	TOTAL	FF	TOTAL	TOTAL	FF
PCBs (ug/l)																		
PCB-1254	2	<1.1	<1.3	<1.0	<1.1	<1.0	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
PCB-1242	<0.5	<0.54	<0.63	<0.5	<0.55	<0.50	<0.5	<0.50	<0.50	0.7	<0.50	<0.50	<0.5	<0.50	<0.50	<0.5	<0.50	<0.50
VOLATILE ORGANICS (ug/l)																		
Methylene Chloride	<1.0	7.9B	-	<1.0	2.3B	-	<1.0	8.6B	-	<1.0	8.6B	-	<1.0	7.4B	-	<1.0	4.1B	-
Chloroethane	<1.0	<5.2	-	<1.0	<5.2	-	3	<5.2	-	<1.0	<5.2	-	<1.0	<5.2	-	<1.0	<5.2	-
1,1-Dichloroethane	<1.0	<0.70	-	<1.0	<0.70	-	3	2J	-	<1.0	<0.70	-	<1.0	<0.70	-	<1.0	<0.70	-
cis-1,2-Dichloroethylene	<1.0	NA	-	<1.0	NA	-	4	NA	-	<1.0	NA	-	<1.0	NA	-	<1.0	NA	-
Tetrachloroethylene	<1.0	1.6B	-	<1.0	0.58B	-	1	8.9J	-	<1.0	1.5B	-	<1.0	0.85B	-	<1.0	0.59B	-
Trichloroethylene	<1.0	<1.2	-	<1.0	<1.2	-	4	12J	-	<1.0	<1.2	-	<1.0	<1.2	-	<1.0	<1.2	-
METALS (ug/l)																		
Cadmium	9	<5.0	<5.0	<1.0	<5.0	<5.0	8	<5.0	<5.0	<1.0	<5.0	<5.0	1	<5.0	<5.0	<1.0	<5.0	<5.0
Chromium	50	14	<10	<5.0	<10	<10	130	<10	<10	<5.0	<10	<10	8	<10	<10	<5.0	<10	<10
Nickel	90	<40	<40	<4.0	<40	<40	410	88	82	<4.0	<40	<40	<4.0	<40	<40	<4.0	<40	<40
Lead	150	22	<3.0	<5.0	<3.0	<3.0	240	<3.0	<3.0	<5.0	<3.0	<3.0	20	<3.0	<3.0	<5.0	<3.0	<3.0

NOTE:

1. Only those parameters are shown for which any value above laboratory detection limits was found.

< – Not detected at a concentration greater than the indicated method detection limit.

NA – Not analyzed

FF– Field Filtered

B– Estimated detection limit due to blank contamination.

J– Estimated value due to limitations identified during the quality control review.

* Field duplicate of MW-1I for MAY 1990.

** Field duplicate of MW-2I for MAY 1991.

MALCOLM PIRNIE

TABLE 6-11

COLUMBUS McKINNON CORP.

SUMMARY OF FIELD MEASUREMENT DURING GROUND WATER SAMPLING[1]

Parameter	MW-1S		MW-1I		MW-2S		MW-2I		MW-3	
	May '90	May '91	May '90	May '91	May '90	May '91	May '90	May '91	May '90	May '91
pH (units)	7.27	7.41	6.85	7.06	7.06	7.23	6.87	7.54	7.07	7.31
Specific Conductivity (umhos/cm)	565	410	1300	800	1490	700	1275	940	1020	650
Temperature (°C)	11.3	10.2	12.4	11.7	11.6	12.6	12	17.3	9.6	10.1
Turbidity (NTU)	>100	37	50	4.7	>100	33	34	4	>100	15
Visual Appearance	Sheen noted; silty	Color, some floc	Clear	Clear	Silty	Color, some floc	Clear	Clear	Silty	Clear
Water Level (ft below TOR)	6.50	6.75	5.51	6.20	8.41	8.92	8.05	8.62	6.05	6.40
Free Product Level	None	None	None	None	None	None	None	None	None	None

NOTE (1): Sampling conducted May 18, 1990 and May 1-2, 1991.

TABLE 6-12
COLUMBUS MCKINNON CORPORATION
TONAWANDA FACILTY
CREEK SEDIMENT SAMPLE RESULTS

PARAMETER	DL(2)	Creek Sediment #1	Creek Sediment #2	Creek Sediment #3	Creek Sediment #4	Creek Sediment #5	Creek Sediment #6
PCB'S (mg/kg) (1)							
PCB-1254	0.16	0.39	0.48	0.25	ND	41	2.6
METALS (mg/kg)							
Cadmium	0.5	0.7	0.8	0.8	ND	1.4	1
Chromium	1.0	12	9	14	6.4	17	20
Nickel	2.0	11	8.9	11	5.3	26	17
Lead	2.5	47	29	67	23	59	68

PARAMETER	DL(2)	Creek Sediment #7	Creek Sediment #8	Creek Sediment #9	Creek Sediment #10	Creek Sediment #11*
PCB'S (mg/kg) (1)						
PCB-1254	0.16	9	ND	9.3	1.5	0.27J
METALS (mg/kg)						
Cadmium	0.5	0.6	0.6J	2.4	0.7	ND
Chromium	1.0	16	11	23	19	9.8
Nickel	2.0	20	9	23	14	7.2
Lead	2.5	130	38	50	77	34

NOTE:
1. Arochlor 1254 was the only PCB detected.
2. Analytical Detection Limit

ND - Not detected at a concentration greater than the indicated detection limit.

* Field duplicate of Creek Sediment #8

TABLE 6-13

COLUMBUS McKINNON CORPORATION

SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS FOR NORTH AREA

PARAMETER	DEPTH INTERVAL (FEET)	NUMBER OF OCCURRENCES/ NUMBER OF ANALYSES	ADJUSTED DRY WEIGHT BASIS[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2	21/30	0.36 - 125	20
	4-8	9/31	0.32 - 16	1.5
	8-16	2/9	1.8 - 33[3]	4.0 (0.37)
Cadmium	0-2	9/10	0.63 - 7.9	4.0
	4-8	8/31	1.3 - 233[3]	9.5 (2.0)
	8-16	0/10	ND	<0.5
Chromium	0-2	10/10	6.5 - 300[3]	65 (39)
	4-8	31/31	7.7 - 200[3]	32 (20)
	8-16	9/9	7.7 - 35	17
Nickel	0-2	10/10	9.3 - 96	36
	4-8	31/31	6.0 - 417[3]	48 (27)
	8-16	9/9	12 - 38	23
Lead	0-2	10/10	16 - 1200[3]	215 (105)
	4-8	31/31	4.8 - 1100[3]	75 (41)
	8-16	9/9	7.3 - 90[3]	19 (11)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the North Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods as described in Section 6.3.1.

TABLE 6-14

COLUMBUS McKINNON CORPORATION

SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS FOR CENTRAL AREA

PARAMETER	DEPTH INTERVAL (FEET)	NUMBER OF OCCURRENCES/ NUMBER OF ANALYSES	ADJUSTED DRY WEIGHT BASIS[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2	46/46	0.22 - 2220[3]	249 (205)
	2-4	21/21	0.17 - 934	155
	4-8	39/43	0.04 - 153	23
	8-16	3/15	0.30 - 5.0	0.52
Cadmium[1]	0-2	10/12	1.1 - 28	10
	2-4	3/4	5.6 - 31	14
	4-8	14/22	1.4 - 45	7.7
	8-16	3/17	1.0 - 2.3	0.84
Chromium[1]	0-2	12/12	14 - 351	139
	2-4	4/4	29 - 154	101
	4-8	22/22	7.2 - 375	98
	8-16	17/17	4.4 - 18	12
Nickel[1]	0-2	12/12	19 - 1038	310
	2-4	4/4	194 - 614	411
	4-8	22/22	15 - 925	250
	8-16	17/17	11 - 30	20
Lead[1]	0-2	12/12	19 - 6750[3]	1017 (496)
	2-4	4/4	35 - 2638	1357
	4-8	22/22	5.9 - 2250	434
	8-16	16/17	5.2 - 233[3]	24 (11)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the Central Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods described in Section 6.3.1.

TABLE 6-15

COLUMBUS McKINNON CORPORATION

SUMMARY OF SOIL CONTAMINANT CHARACTERIZATION RESULTS FOR SOUTH AREA

PARAMETER	DEPTH INTERVAL (FEET)	NUMBER OF OCCURRENCES/ NUMBER OF ANALYSES	ADJUSTED DRY WEIGHT BASIS[6]	
			Concentration Range (ppm)	Average Conc.[4,5] (ppm)
Total PCBs[1,2]	0-2 4-8 8-16	18/21 7/10 1/11	0.63 - 427[3] 0.45 - 4.8 ND - 28[3]	51 (32) 1.7 2.7 (ND)
Cadmium	0-2 4-8 8-16	7/7 10/10 1/11	1.9 - 114 0.8 - 45 ND - 1.3	48 13 0.60
Chromium	0-2 4-8 8-16	7/7 10/10 11/11	59 - 688 26 - 457 11 - 165[3]	391 244 30 (16)
Nickel	0-2 4-8 8-16	7/7 10/10 11/11	75 - 1250 56 - 2750[3] 20 - 1267[3]	692 602 (364) 136 (23)
Lead	0-2 4-8 8-16	7/7 10/10 11/11	313 - 16,250[3] 0.6 - 3750 3 - 217[3]	5020 (3148) 1826 41 - (8.6)

NOTES:

(1) Includes both historic and present RI data
(2) Only Arochlor 1254 detected.
(3) Outlier value
(4) Average computed without outlier value is in parentheses.
(5) Nondetections were averaged at the applicable detection limit and duplicate analyses were averaged prior to computing the South Area Averages.
(6) Historic data was reported on a dry weight basis; present RI data was reported on a wet weight basis and recalculated to a dry weight basis using the methods as described in Section 6.3.1.

TABLE 6-16

COLUMBUS McKINNON CORP.

CONCENTRATION OF METALS IN NATURAL SOILS[1]
(mg/kg)

METAL	COMMON RANGE[1]	MEAN[1]	MW-3[2]
Cd	1.0 - 4.0	3.3	1.0
Cr	8.0 - 20.0	15	20
Ni	20.0 - 30.0	23	23
Pb	20.0 - 100.0	43	22

NOTE:

(1) Background concentrations in undisturbed soil from four (4) locations not affected by waste disposal sites in the Tonawanda, NY area. Source: USEPA (1985c).

(2) From Table 6-9, adjusted dry weight basis.

TABLE 6-17

COLUMBUS McKINNON CORP.

AVERAGE CONTAMINANT CONCENTRATIONS (mg/Kg) IN CREEK SEDIMENT

Parameter	Downstream[1]		Near Site [2]		Upstream[3]	
	Average	N	Average	N	Average	N
PCBs	.44	2	14.6	5	.25	1
Cadmium	.8	2	1.2	5	.8	1
Chromium	10.5	2	19	5	10.2	2
Nickel	10	2	20	5	8.2	2
Lead	38	2	77	5	45	2

NOTES:

(1) Samples CS-1 and CS-2.
(2) Samples CS-5, CS-6, CS-7 CS-9, CS-10. CS-8 was not averaged.
(3) Samples CS-3 and CS-4.

MALCOLM PIRNIE

APPENDIX A2

Hazard Rating Data

Calculation of Sediment Pore Water conc. of PCBs (Total)

1. Prior Unremediated conditions (1)

[Pore Water] (ug/l)

max[1] – $\dfrac{87,000 \text{ ug/kg (dry wgt)}}{530,000 \frac{\text{ug/kg}}{\text{ug/l}} \times 0.04 \text{ g/g}}$ = 4.10

Avg[1] $\dfrac{14,000}{530,000 \times 0.04}$ = 0.66

2. Actual Conditions (2)

max $\dfrac{830}{530,000 \times 0.04}$ = 0.039

Avg[2] $\dfrac{510}{530,000 \times 0.04}$ = 0.024

3. Background Conditions (3)

max $\dfrac{3,600}{530,000 \times 0.04}$ = 0.17

Avg[3] $\dfrac{1,900}{530,000 \times 0.04}$ = 0.090

Notes

(1) Average of RI sediment samples CS-1 to CS-10 in dry wgt.

(2) Average of RI sediment samples CS-1, CS-3, CS-4 in dry wgt.

(3) Average of Ellicott Creek sediment samples reported in NYSDEC (1987)

sample No. 86-33 3.6 mg/kg ~~Tota~~ Total PCB

Core Sample 0.28 mg/kg ~~Ar~~ Aroclor 1248

see NYSDEC (1987) pages 59 and 82

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

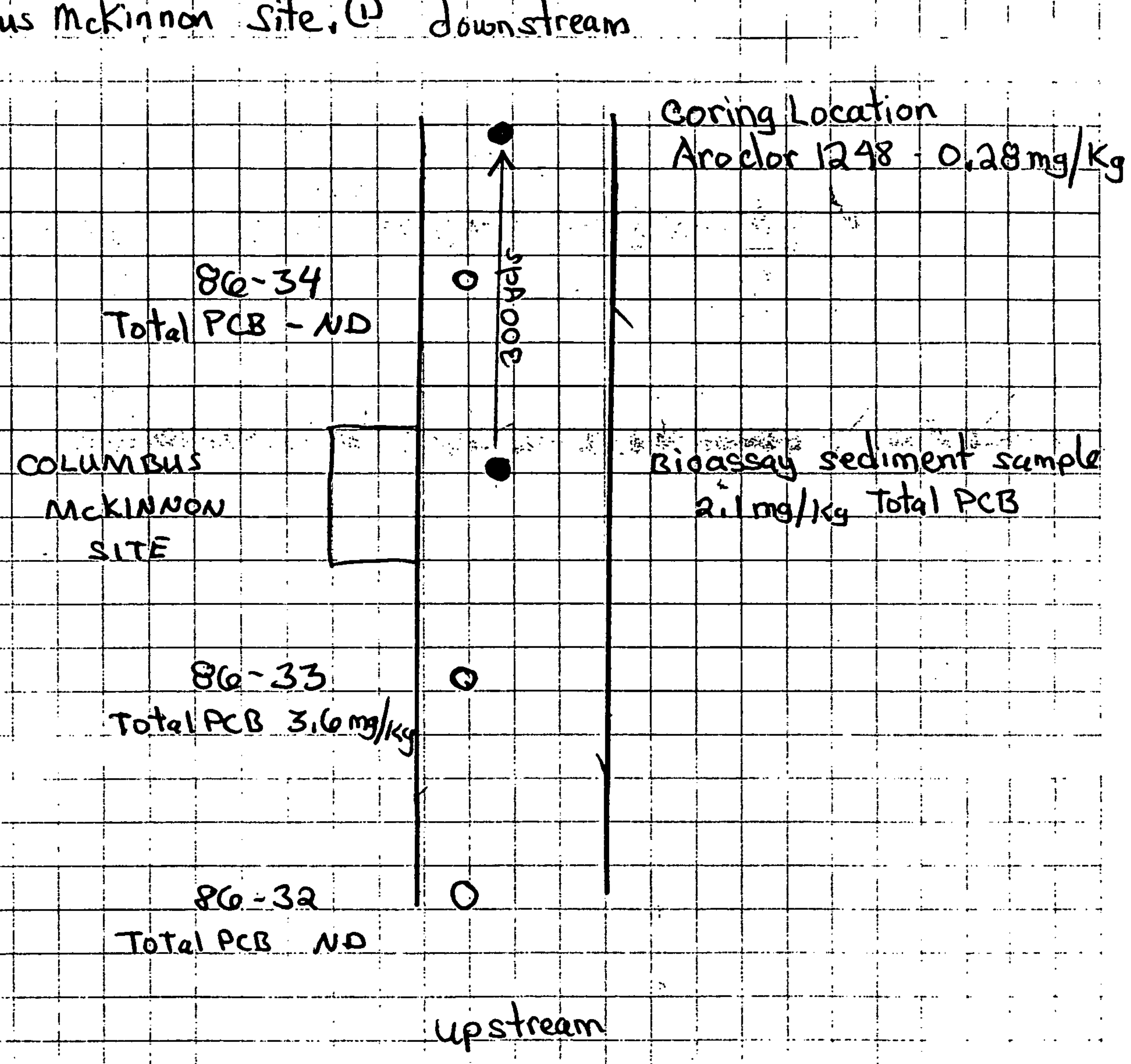
BY RHU DATE 9-17-91 SHEET NO. 2 OF 2

CHKD. BY .... DATE .... JOB NO. 1332-014

SUBJECT ....

FIGURE ____

~~Distribution of~~ Historic Ellicott Creek Sediment Sampling Locations ~~in Ellicott Creek~~ in the Vicinity of the Columbus McKinnon Site.(1)



(1) taken from the Niagara River Area Sediments Study NYSDEC (1987) pages 59, and 82.

NOT TO SCALE

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY .... DATE .... SHEET NO. .... OF ....

CHKD. BY .... DATE .... JOB NO. ....

SUBJECT ....

CM

1) PCB Sediment conc. in Dry Wgt

Average of 10 locations 14 mg/Kg

maximum 87 mg/Kg

2) Pore Water Concentration

$$C_p = C_s / (K_{oc} \times f_{oc})$$

$$\text{Average Value } C_p = \frac{14{,}000\ ug/Kg / 5}{530{,}000\ \frac{ug/kg}{ug/l} \times 0.04\ g/g}$$

$$= 0.66\ ug/l$$

$$\text{Maximum Value } C_p = \frac{87{,}000\ ug/kg}{530000\ \frac{ug/kg}{ug/l} \times 0.04\ g/g}$$

$$= 4.10\ ug/l$$

3. Pore water Concentrations at Limits of sampling Locations

Upstream

$$\text{Upstream } C_p = \frac{530 \text{ ug/kg (dry wgt)}}{530{,}000 \frac{\text{ug/kg}}{\text{ug/l}} \times 0.04 \text{ g/g}}$$

$$= 0.03 \text{ ug/l}$$

$$\text{Downstream } C_p = \frac{830 \text{ ug/kg (dry wgt)}}{530{,}000 \frac{\text{ug/kg}}{\text{ug/l}} \times 0.04 \text{ g/g}}$$

$$= 0.04 \text{ ug/l}$$

4. Hazard Quotients (based on Dry wgt Sediment concentrations)

	Toxicity Criteria			Hazard Quotient	
	Acute	Chronic	Pore Water Conc	Acute	Chronic
Upstream	2	0.014	0.03	.02	2
		0.001	0.03		30
Downstream	2	0.014	0.04	.02	3
		0.001	0.04		40

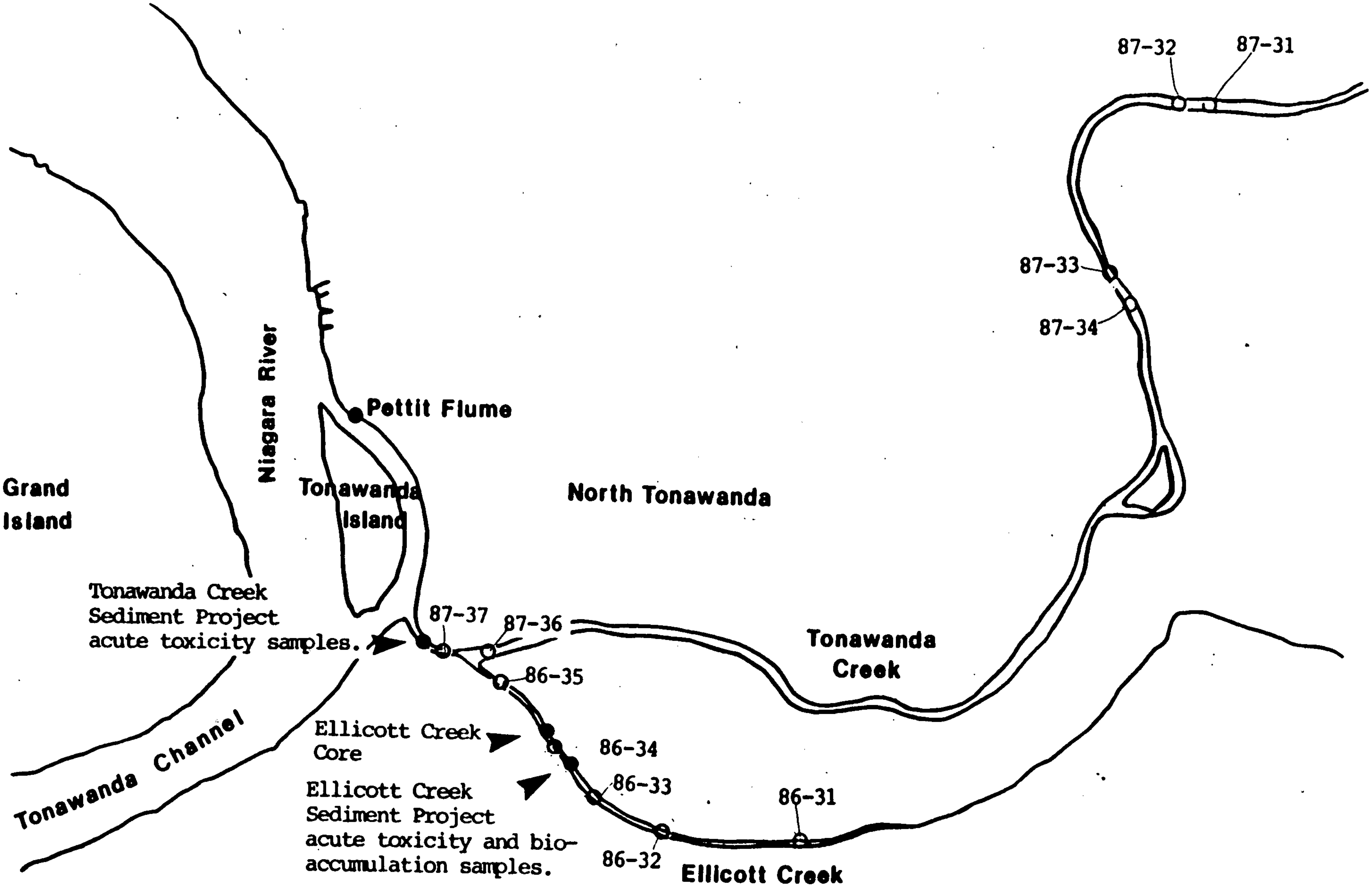


Figure 53. Ellicott Creek and Tonawanda Creek sampling sites.

MALCOLM PIRNIE

APPENDIX B - CALCULATIONS

MALCOLM PIRNIE

APPENDIX B1

PCB Contaminant Distribution

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
A	625	SB90–17			0.16	0.16							1	0	0
		BH44	0.36										5	0	0
		SB90–16			0.16	0.16							10	0	0
		BH45	61										25	0	0
		MAX	61	ERR	0.16	0.16	ERR	ERR	ERR	ERR	ERR	ERR	50	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	500	1	46.3
													N/A	9	416.7
B	525	SB90–18			0.16	0.16							1	0	0
		BH40	0.09										5	0	0
		BH36	0.1										10	0	0
		BH41	20										25	1	38.9
		BH37	20										50	0	0
		SB90–19			0.16		0.16						500	0	0
		SB90–24			0.16			0.16					N/A	9	350.1
		SB90–23			0.16			0.16							
		MAX	20	ERR	0.16	0.16	0.16	0.16	ERR	ERR	ERR	ERR			
		VOL.	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9			
C	625	SB90–25	14		0.16		0.16						1	0	0
		SB90–32			18			0.16					5	0	0
		SB90–31			3.3		0.16						10	0	0
		SB90–26	0.9		48			0.16					25	0	0
		BH22	24										50	3	138.9
		MAX	24	ERR	48	ERR	0.16	0.16	ERR	ERR	ERR	ERR	500	0	0
		VOL	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	N/A	7	324.1
D	625	BH18	1.7	0.25									1	1	46.3
		BH17	58	0.81									5	1	46.3
		SB90–33				60		0.16					10	0	0
		SB90–34			0.62		5	0.3			0		25	0	0
		MAX	58	0.81	0.62	60	5	0.3	ERR	ERR	0	ERR	50	0	0
		VOL	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	500	4	185.2

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
													N/A	4	185.2
E	525	BH8	0.5	0.21	0.26	0.36							1	4	155.6
		CM4-89											5	0	0
		MAX	0.5	0.21	0.26	0.36	ERR	ERR	ERR	ERR	ERR	ERR	10	0	0
		VOL.	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	25	0	0
													50	0	0
													500	0	0
													N/A	6	233.4
F	575	BH54	2.1										1	0	0
		BH56	5										5	1	42.6
		MAX	5	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	10	0	0
		VOL.	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	42.6	25	0	0
													50	0	0
													500	0	0
													N/A	9	383.4
G	413	BH57	4.4												
		MAX	4.4	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	1	0	0
		VOL.	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	30.6	5	1	30.6
													10	0	0
													25	0	0
													50	0	0
													500	0	0
													N/A	9	275.4
H	550	SB90-1	0.46		0.16	0.16									
		MAX	0.46	ERR	0.16	0.16	ERR	ERR	ERR	ERR	ERR	ERR	1	1	40.7
		VOL.	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	40.7	5.0	0	0
													10	0	0
													25	0	0
													50	0	0
													500	0	0
													N/A	9	366.3
I	513	SB90-2	0.36		0.16	0.16									
		MAX	0.36	ERR	0.16	0.16	ERR	ERR	ERR	ERR	ERR	ERR	1	1	38
		VOL.	38.0	38	38	38	38	38	38	38	38	38	5	0	0
													10	0	0
													25	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
													50	0	0
													500	0	0
													N/A	9	342
J	450	BH–62	2										1	0	0
		BH–63	3.4										5	1	33.3
		SB90–3			0.16	0.16							10	0	0
		MAX	3.4	ERR	0.16	0.16	ERR	ERR	ERR	ERR	ERR	ERR	25	0	0
		VOL.	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	50	0	0
													500	0	0
													N/A	9	299.7
K	620	SB90–4	1.5		0.16	0.16							1	1	45.9
		SB90–5	0.33		0.32	0.16							5	2	91.8
		MAX	1.5	ERR	0.32	0.16	ERR	ERR	ERR	ERR	ERR	ERR	10	0	0
		VOL.	45.9	45.9	45.9	45.9	45.9	45.9	45.9	45.9	45.9	45.9	25	0	0
													50	0	0
													500	0	0
													N/A	7	321.3
L	650	SB90–6	0.48		0.16								1	0	0
		SB90–7	0.16			0.16							5	1	48.1
		SB90–8			0.16								10	0	0
		SB90–9			0.16								25	0	0
		BH–60	1										50	0	0
		BH–61	1.7										500	0	0
		MAX	1.7	ERR	0.16	0.16	ERR	ERR	ERR	ERR	ERR	ERR	N/A	9	432.9
		VOL.	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1			
M	675	SB90–10	1.5			0.33			0.16				1	1	50
		SB90–11	34		11								5	0	0
		BH–58	24										10	0	0
		BH–59	86										25	1	50
		MAX	86	ERR	11	0.33	ERR	ERR	0.16	ERR	ERR	ERR	50	0	0
		VOL.	50.0	50	50	50	50	50	50	50	50	50	500	2	100
													N/A	6	300

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
N	700	SB90–12	0.38		16								1	0	0
		SB90–13	29		2.6		1.8						5	1	51.9
		BH48	20										10	0	0
		BH49	1.5										25	2	103.8
		MAX	29	ERR	16	ERR	1.8	ERR	ERR	ERR	ERR	ERR	50	2	103.8
		VOL.	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	51.9	500	0	0
													N/A	5	259.5
[illegible]	625	SB90–15			1				0.16				1	1	46.3
		BH46	67										5	0	0
		MAX	67	ERR	1	ERR	ERR	ERR	0.16	ERR	ERR	ERR	10	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	25	0	0
													50	0	0
													500	2	92.6
													N/A	7	324.1
[illegible]	625	SB90–20				10		0.16							
		SB90–22	20			5.7		0.16					1	0	0
		BH38	46										5	0	0
		BH42	52										10	1	46.3
		MAX	52	ERR	ERR	10	ERR	0.16	ERR	ERR	ERR	ERR	25	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	50	0	0
													500	3	138.9
													N/A	7	324.1
[illegible]	625	SB90–26	0.9		48			0.16					1	1	46.3
		SB90–27	51			0.16							5	0	0
		B4	11	1	0.13	0.69							10	0	0
		BH–26	4.9										25	0	0
		BH–28	2220										50	2	92.6
		MAX	2220	1	48	0.69	ERR	0.16	ERR	ERR	ERR	ERR	500	0	0
													>500	1	46.3
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	N/A	6	277.8
[illegible]	625	SB90–30			0.16			0.16					1	0	0
		BH–10	1210										5	0	0
		BH–19	65	9.6									10	1	46.3
		BH–20	209										25	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
		MAX	1210	9.6	0.16	ERR	ERR	0.16	ERR	ERR	ERR	ERR	50	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	500	0	0
													>500	1	46.3
													N/A	8	370.4
S	625	BH-9	125	8.9	0.3	0.04							1	2	92.6
		BH-15	44	188									5	0	0
		BH-16	1077										10	0	0
		MAX	1077	188	0.3	0.04	ERR	ERR	ERR	ERR	ERR	ERR	25	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	50	0	0
													500	1	46.3
													>500	1	46.3
													N/A	6	277.8
T	685	B1											1	0	0
		B2	51	115		14							5	0	0
		B5	30	14	0.76	0.86							10	0	0
		B7	0.52	0.17									25	0	0
		B8		1.5	2.6								50	0	0
		B10	478	122									500	4	202.8
		B11	225	172	106								N/A	6	304.2
		B12		254	99										
		BH-3	164		0.27	0.23									
		BH-4	269		153	141									
		BH-6	37		6.6	6									
		MAX	478	254	153	141	ERR	ERR	ERR	ERR	ERR	ERR			
		VOL.	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7			
U	500	BH-1	124										1	0	0
		B9		1.7	0.15								5	2	74
		SB90-37	300		2.9					0.16			10	0	0
		MAX	300	1.7	2.9	ERR	ERR	ERR	ERR	0.16	ERR	ERR	25	0	0
		VOL.	37.0	37	37	37	37	37	37	37	37	37	50	0	0
													500	1	37
													N/A	7	259
V	465	BH-55	15										1	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
		SB90-38	63		12			0.16					5	0	0
		MAX	63	ERR	12	ERR	ERR	0.16	ERR	ERR	ERR	ERR	10	0	0
		VOL.	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	25	1	34.4
													50	0	0
													500	2	68.8
													N/A	7	240.8
W	625	SB90-39			0.45			0.16					1	0	0
		SB90-40			3				0.16				5	3	138.9
		SB90-43	0.16		0.76				0.16				10	0	0
		SB90-44	0.63		0.16			0.16					25	0	0
		BH-32	1.9										50	0	0
		MAX	1.9	ERR	3	ERR	ERR	0.16	0.16	ERR	ERR	ERR	500	0	0
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	N/A	7	324.1
X	715	SB90-45	0.23		0.16				0.16				1	0	0
		SB90-46	5.1		1.6				0.16				5	1	53
		BH-34	126										10	0	0
		BH-50	3.4										25	0	0
		MAX	126	ERR	1.6	ERR	ERR	ERR	0.16	ERR	ERR	ERR	50	0	0
		VOL.	53.0	53	53	53	53	53	53	53	53	53	500	2	106
													N/A	7	371
Y	463	SB90-47	3.9		4.8			0.16					1	0	0
		BH-35	2.2										5	1	34.3
		BH-52	6.7										10	2	68.6
		MAX	6.7	ERR	4.8	ERR	ERR	0.16	ERR	ERR	ERR	ERR	25	0	0
		VOL.	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	50	0	0
													500	0	0
													N/A	7	240.1
Z	400	SB90-14			3.2					33			1	0	0
		SB90-21				0.77				0.16			5	0	0
		BH-47	0.33										10	0	0
		MAX	0.33	ERR	3.2	0.77	ERR	ERR	ERR	33	ERR	ERR	25	0	0
		VOL.	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	50	8	236.8
													500	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
													N/A	2	59.2
AA	460	CM–3–89											1	0	0
		BH–39	125										5	0	0
		BH–43	0.74										10	0	0
		MAX	125	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	25	0	0
		VOL.	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	50	0	0
													500	1	34.1
													N/A	9	306.9
BB	425	SB90–28	66		2.9			0.16					1	0	0
		BH–27	0.78										5	1	31.5
		BH–29	94										10	0	0
		MAX	94	ERR	2.9	ERR	ERR	0.16	ERR	ERR	ERR	ERR	25	0	0
		VOL.	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	50	0	0
													500	2	63
													N/A	7	220.5
CC	450	SB90–29			23			0.16					1	0	0
		BH–21	89	506									5	0	0
		MAX	89	506	23	ERR	ERR	0.16	ERR	ERR	ERR	ERR	10	0	0
		VOL.	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	25	1	33.3
													50	0	0
													500	0	0
													>500	2	66.6
													N/A	7	233.1
DD	565	BH–14	440	221									1	0	0
		CM–1–89											5	0	0
		MAX	440	221	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	10	0	0
		VOL.	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9	25	0	0
													50	0	0
													500	2	83.8
													N/A	8	335.2
EE	625	SB90–35			14				0.16			1.8	1	0	0
		SB90–36			0.16			0.16					5	6	277.8
		B3	13			0.8							10	0	0
		BH–5	102		9.9	17							25	2	92.6
		BH–11	1260										50	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
		BH–12	294										500	0	0
		MAX	1260	ERR	14	17	ERR	0.16	0.16	ERR	ERR	1.8	>500	2	92.6
		VOL.	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	46.3	N/A	0	0
FF	650	BH–2	109		62	49									
		BH–13	798										1	0	0
		BH–23	599	147									5	0	0
		BH–24	25										10	0	0
		MAX	798	147	62	49	ERR	ERR	ERR	ERR	ERR	ERR	25	0	0
		VOL.	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1	48.1	50	1	48.1
													500	2	96.2
													>500	1	48.1
													N/A	6	288.6
GG	775	B6	0.22	2.2		0.001									
		BH–30	272										1	1	57.4
		BH–31	427										5	2	114.8
		CM–2–89											10	0	0
		MAX	427	2.2	ERR	0.001	ERR	ERR	ERR	ERR	ERR	ERR	25	0	0
		VOL.	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4	57.4	50	0	0
													500	1	57.4
													N/A	6	344.4
H	755	SB90–41			4		28		0.16						
		SB90–42	71		0.16			0.16					1	0	0
		BH–33	8.4										5	0	0
		MAX	71	ERR	4	ERR	28	0.16	0.16	ERR	ERR	ERR	10	0	0
		VOL.	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	55.9	25	0	0
													50	4	223.6
													500	1	55.9
													N/A	5	279.5
II	675	BH–51	34												
		MAX	34	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	1	0	0
		VOL.	50.0	50	50	50	50	50	50	50	50	50	5	0	0
													10	0	0
													25	0	0
													50	1	50
													500	0	0
													N/A	9	450
	590	BH–53	7.1												
		MAX	7.1	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	1	0	0
													5	0	0

TABLE 1
COLUMBUS McKINNON CORP. FEASIBILITY STUDY
PCB CONTAMINANT DISTRIBUTION

GRID #	AREA (SF)	SAMPLE	PCB CONCENTRATION (PPM) AT DEPTH (FT.) 0–2	2–4	4–6	6–8	8–10	10–12	12–14	14–16	16–18	>18	TREATMENT CATEGORY (PPM)	FREQ.	CY SOIL
		VOL.	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	10	1	43.7
													25	0	0
													50	0	0
													500	0	0
													N/A	9	393.3
KK	663	SB90–48	71		1.8		0.16						1	0	0
		MAX	71	ERR	1.8	ERR	0.16	ERR	ERR	ERR	ERR	ERR	5	2	98.2
		VOL.	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1	10	0	0
													25	0	0
													50	0	0
													500	2	98.2
													N/A	6	294.6

MALCOLM PIRNIE

APPENDIX B2

Calculations for Stabilized Excavation

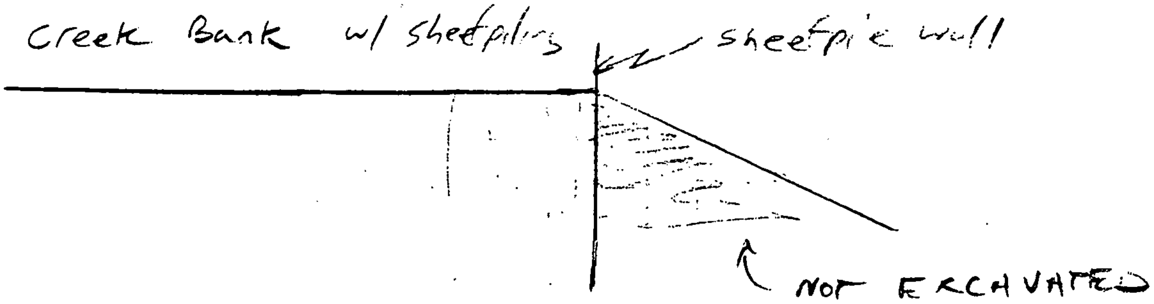
MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY TMF DATE 10/25/91 SHEET NO. ...... OF ......

CHKD. BY AWM DATE 12/4/91 JOB NO. ......

SUBJECT ......



NON EXCAVATED VOL = $\frac{1}{2} D (2D) L$

$= \frac{D^2 L}{27}$ CY

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION NOT EXTRACTED

10 PPM PCB CLEANUP LEVEL - SHEETPILING AT RR EMBANKMENT AND BUILDING FOUNDATI

SHEETPILING AT TOP EDGE OF CREEK BANK

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 10 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (CY)	NON BUILDING EFFECTS LENGTH (FT)
A	625	2	46.3	81	307.4	2	46.3	
B	525	2	38.9	20	84.7	2	38.9	
C	625	6	138.9	40	604.7	6	138.9	
D	625	10	231.5	25	629.9	8	185.2	
E	575	8	165.6	0.33	5.6	0	0.0	
F	575	2	42.6	5	23.2	0	0.0	
G	415	2	30.6	4.4	14.7	0	0.0	
H	550	4	81.5	0.46	4.1	0	0.0	
I	513	4	76.0	0.38	3.0	0	0.0	
J	450	4	66.7	3.4	24.7	0	0.0	
K	620	6	137.8	1.11	16.6	0	0.0	
L	650	4	96.3	1.7	17.8	0	0.0	
M	675	8	200.0	45.8	997.0	6	150.0	
N	700	10	259.3	18.36	518.1	8	207.4	
O	625	6	138.9	46	660.3	4	92.6	
P	625	8	185.2	41.5	836.5	6	138.9	
Q	625	8	185.2	587.4	11436.3	6	138.9	
R	625	4	92.6	609.8	6145.4	2	46.3	
S	625	8	185.2	316	6369.2	4	92.6	
T	685	8	203.0	256.5	5666.2	8	203.0	
U	500	6	111.1	101.5	1227.5	2	37.0	
V	465	6	103.3	46	517.4	6	103.3	
W	625	6	138.9	2.6	39.3	0	0.0	
X	715	6	158.9	84.5	1461.3	4	105.9	
Y	463	6	102.9	6.1	68.3	0	0.0	
Z	400	8	118.5	1.9	24.5	0	0.0	
AA	460	2	34.1	126	463.6	2	34.1	
BB	425	6	94.4	63.6	653.8	4	63.0	
CC	450	6	100.0	206	2212.1	6	100.0	
DD	565	4	83.7	331	3015.5	4	83.7	
EE	625	8	185.2	638	12859.2	8	185.2	
FF	650	8	192.6	264	5533.9	8	192.6	
GG	775	8	229.6	107.8	2604.0	2	57.4	
HH	755	10	279.6	40.4	1229.6	10	279.6	
II	675	2	50.0	34	165.0	2	50.0	
JJ	590	2	43.7	7.1	33.8	0	0.0	
KK	663	6	147.3	47.9	705.1	4	98.2	
TOTAL			4765.7		67402.1		2868.0	

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

ONS

-EXTRACTABLE VOLUME OF >10 PPM SOIL						IDEAL MASS	NON-EXTRACTABLE MASSES >10 PPM			
VOL. (CY)	CREEK BANK EFFECTS LENGTH (FT)	VOL. (CY)	RR EMBANKMENT EFFECTS LENGTH (FT)	VOL. (CY)	EXTRACTABL VOLUME (CY)	OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (grams)	BUILDING EFFECTS (grams)	CREEK BANK EFFECTS (grams)	RR EMBANKMENT EFFECTS (grams)	EXTRACTABLE MASS (GRAMS)
0.0	0.0	0.0		0.0	46.30	307.4	0.00	0.00	0.00	307.37
0.0		0.0		0.0	38.89	84.7	0.00	0.00	0.00	84.65
0.0		0.0		0.0	138.89	604.7	0.00	0.00	0.00	604.67
0.0		0.0		0.0	185.19	503.9	0.00	0.00	0.00	503.89
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	33.3		0.0	116.67	747.7	0.00	166.16	0.00	581.57
0.0	25.0	59.3		0.0	148.15	414.5	0.00	118.42	0.00	296.04
0.0		0.0		0.0	92.59	453.5	0.00	0.00	0.00	453.50
0.0		0.0		0.0	138.89	627.3	0.00	0.00	0.00	627.34
0.0		0.0		0.0	138.89	8577.2	0.00	0.00	0.00	8577.20
0.0		0.0		0.0	46.30	3072.7	0.00	0.00	0.00	3072.71
0.0		0.0		0.0	92.59	3184.6	0.00	0.00	0.00	3184.58
0.0		0.0		0.0	202.96	5666.2	0.00	0.00	0.00	5666.21
0.0		0.0		0.0	37.04	409.2	0.00	0.00	0.00	409.16
0.0		0.0		0.0	103.33	517.4	0.00	0.00	0.00	517.35
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	105.93	974.2	0.00	0.00	0.00	974.20
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	3.7		0.0	30.37	463.6	0.00	50.39	0.00	413.19
0.0	25.0	14.8		0.0	48.15	435.8	0.00	102.55	0.00	333.29
0.0	25.0	33.3		0.0	66.67	2242.1	0.00	747.37	0.00	1494.74
0.0	25.0	14.8		0.0	68.89	3015.5	0.00	533.72	0.00	2481.79
0.0	25.0	59.3		0.0	125.93	12859.2	0.00	4114.96	0.00	8744.29
0.0	25.0	59.3		0.0	133.33	5533.9	0.00	1702.74	0.00	3831.17
0.0	25.0	3.7		0.0	53.70	673.6	0.00	43.46	0.00	630.10
0.0	25.0	92.6		0.0	187.04	1229.6	0.00	407.14	0.00	822.43
0.0	25.0	3.7		0.0	46.30	185.0	0.00	13.71	0.00	171.32
0.0	25.0	0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	14.8		0.0	83.41	512.1	0.00	77.24	0.00	434.84
0.0		392.6		0.0	2476.4	53295.4	0.0	8077.8	0.0	45217.6

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION NOT EXTRACTED

25 PPM PCB CLEANUP LEVEL - SHEETPILING AT RR EMBANKMENT AND BUILDING FOUNDATI

SHEETPILING AT TOP EDGE OF CREEK BANK

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 25 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (CY)	NON BUILDING EFFECTS LENGTH (FT)
A	625	2	46.3	81	307.4	2	46.3	
B	525	2	38.9	20	84.7	0	0.0	
C	625	6	138.9	40	604.7	6	138.9	
D	625	10	231.5	25	629.9	8	185.2	
E	625	8	165.6	0.33	5.6	0	0.0	
F	575	2	42.6	5	23.2	0	0.0	
G	413	2	30.6	4.4	14.7	0	0.0	
H	550	4	81.5	0.46	4.1	0	0.0	
I	613	4	79.0	0.36	3.0	0	0.0	
J	450	4	66.7	3.4	24.7	0	0.0	
K	620	6	137.8	1.11	16.6	0	0.0	
L	650	4	96.3	1.7	17.8	0	0.0	
M	675	8	200.0	45.0	897.0	4	100.0	
N	700	10	259.3	18.36	518.1	4	103.7	
O	625	6	138.9	46	666.5	4	92.6	
P	625	8	185.2	41.5	836.5	6	138.9	
Q	625	8	185.2	567.4	11436.3	6	138.9	
R	625	4	92.6	609.8	6145.4	2	46.3	
S	625	8	185.2	316	6369.2	4	92.6	
T	685	8	203.0	256.5	5666.2	8	203.0	
U	600	6	111.1	101.6	1227.6	2	37.0	
V	465	6	103.3	46	517.4	4	68.9	
W	625	6	138.9	2.6	29.0	0	0.0	
X	715	6	158.9	84.5	1461.3	4	105.9	
Y	465	6	102.0	6.1	68.9	0	0.0	
Z	400	8	118.5	1.9	24.5	0	0.0	
AA	460	2	34.1	126	463.6	2	34.1	
BB	425	6	94.4	63.6	653.8	4	63.0	
CC	450	6	100.0	266	2242.1	4	66.7	
DD	565	4	83.7	331	3015.5	4	83.7	
EE	625	8	185.2	638	12659.2	4	92.6	
FF	650	8	192.6	264	5533.9	8	192.6	
GG	775	8	229.6	107.5	2694.2	2	57.4	
HH	755	10	279.6	40.4	1229.6	10	279.6	
II	675	2	50.0	34	165.0	2	50.0	
JJ	590	2	43.7	7.1	33.8	0	0.0	
KK	661	6	147.3	47.0	765.1	4	98.2	
TOTAL			4765.7		67402.1		2515.0	

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

ONS

EXTRACTABLE VOLUME OF >25 PPM SOIL						IDEAL MASS	NON-EXTRACTABLE MASSES >25 PPM			
VOL. (CY)	CREEK BANK EFFECTS LENGTH (FT)	VOL. (CY)	RR EMBANKMENT EFFECTS LENGTH (FT)	VOL. (CY)	EXTRACTABL VOLUME (CY)	OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (grams)	BUILDING EFFECTS (grams)	CREEK BANK EFFECTS (grams)	RR EMBANKMENT EFFECTS (grams)	EXTRACTABLE MASS (GRAMS)
0.0	0.0	0.0		0.0	46.30	307.4	0.00	0.00	0.00	307.37
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	138.89	604.7	0.00	0.00	0.00	604.67
0.0		0.0		0.0	185.19	503.9	0.00	0.00	0.00	503.89
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	14.8		0.0	85.19	498.5	0.00	73.85	0.00	424.64
0.0	25.0	14.8		0.0	88.89	207.2	0.00	29.60	0.00	177.63
0.0		0.0		0.0	92.59	453.5	0.00	0.00	0.00	453.50
0.0		0.0		0.0	138.89	627.3	0.00	0.00	0.00	627.34
0.0		0.0		0.0	138.89	8577.2	0.00	0.00	0.00	8577.20
0.0		0.0		0.0	46.30	3072.7	0.00	0.00	0.00	3072.71
0.0		0.0		0.0	92.59	3184.6	0.00	0.00	0.00	3184.58
0.0		0.0		0.0	202.96	5666.2	0.00	0.00	0.00	5666.21
0.0		0.0		0.0	37.04	409.2	0.00	0.00	0.00	409.16
0.0		0.0		0.0	68.89	344.9	0.00	0.00	0.00	344.90
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	105.93	974.2	0.00	0.00	0.00	974.20
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	3.7		0.0	30.37	463.6	0.00	60.39	0.00	413.19
0.0	25.0	14.8		0.0	48.15	435.8	0.00	102.55	0.00	333.29
0.0	25.0	14.8		0.0	51.85	1494.7	0.00	332.16	0.00	1162.57
0.0	25.0	14.8		0.0	68.89	3015.5	0.00	533.72	0.00	2481.79
0.0	25.0	14.8		0.0	77.78	6429.6	0.00	1028.74	0.00	5400.88
0.0	25.0	59.3		0.0	133.33	5533.9	0.00	1702.74	0.00	3831.17
0.0	25.0	3.7		0.0	63.70	673.6	0.00	43.46	0.00	630.10
0.0	25.0	92.6		0.0	187.04	1229.6	0.00	407.14	0.00	822.43
0.0	25.0	3.7		0.0	46.30	185.0	0.00	13.71	0.00	171.32
0.0	25.0	0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	14.8		0.0	83.41	512.1	0.00	77.24	0.00	434.84
0.0		268.7		0.0	2249.3	45404.9	0.0	4395.3	0.0	41009.6

MALCOLM PIRNIE

APPENDIX B3

Calculations for Unstabilized Excavation

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY THF DATE 10/24/91 SHEET NO. ...... OF ......

CHKD. BY AUM DATE 12/4/91 JOB NO. ......

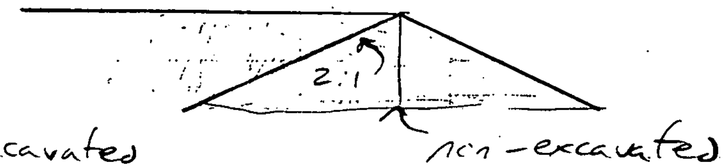
SUBJECT Columbus McKinnon FS

⇒ NO sheetpiling, no underpinning

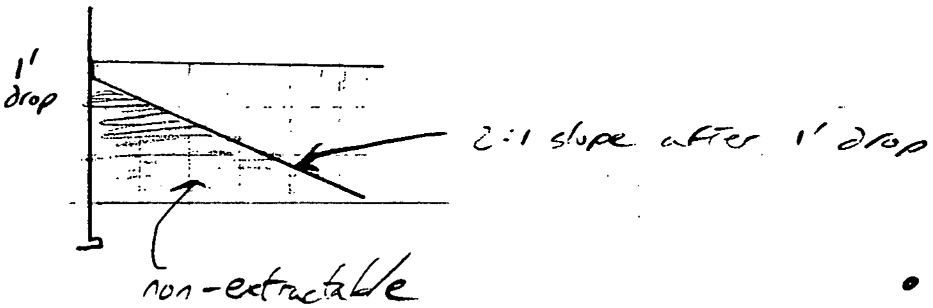
PCB mass non-extractable at 25 + 10 ppm cleanup limits

NOTE: 10 FT = maximum depth due to safety conditions beyond this point

AT Creek Bank

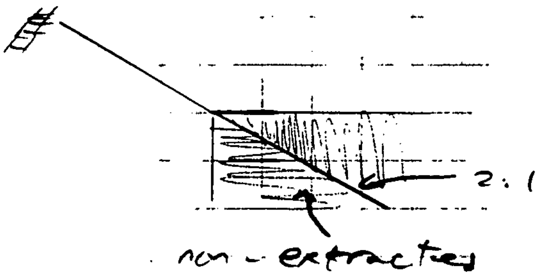


AT Buildings a



- 2:1 slope required for loose silty sand / Fill per OSHA 29 CFR 1926.652

AT CONRAIL TRACKS



Creek Bank - non extractable vol = $\frac{2D^2L}{27}$ cubic yards

where D = depth to excavation (FT)
L = length of sector parallel to bank (FT)

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY THF DATE 10/24/91 SHEET NO. ...... OF ......

CHKD. BY AM DATE 12/4/91 JOB NO. ......

SUBJECT Columbus McKinnon FS

Buildings - non-extractable vol = $\frac{(D-1)^2 L}{27}$

D = Depth to excavation
L = length of sector parallel to building

CONRAIL TRACKS

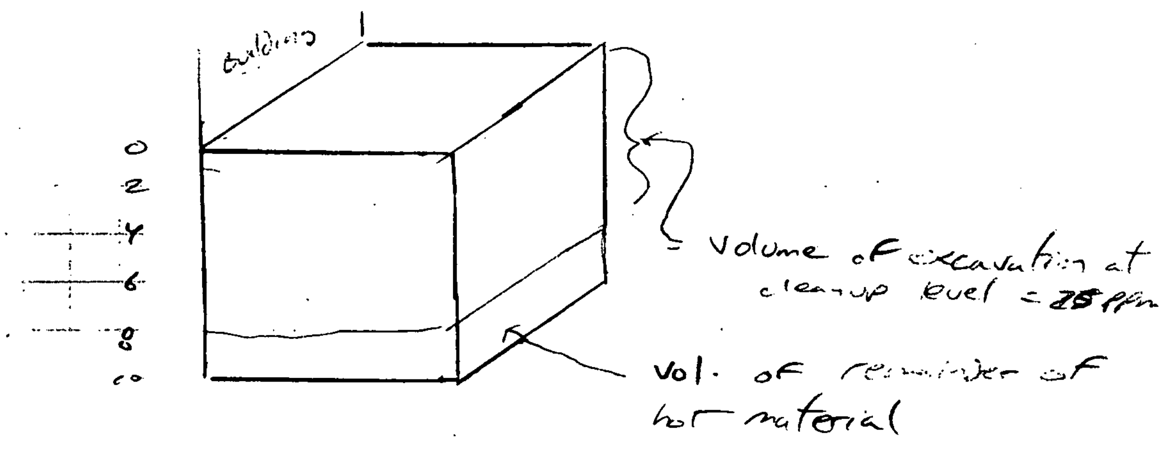
non-extractable VOL = $\frac{D^2 L}{27}$

D = Depth to excavation
L = Length of sector parallel to building

IDEAL EXCAVATIONS:

FOR a given sector and cleanup limit, the ideal excavation is vertical

eg. Sector D



However, due to factors identified above, ideal vols. cannot be excavated

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION NOT EXTRACTED

10 PPM PCB CLEANUP LEVEL - NO SHEETPILING

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 10 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (CY)	NON BUILDING EFFECTS LENGTH (FT)
A	625	2	46.3	61	307.4	2	46.3	50
B	525	2	38.9	20	84.7	2	38.9	45
C	625	6	138.9	40	604.7	6	138.9	50
D	625	10	231.5	25	629.9	8	185.2	25
E	625	8	185.2	0.33	5.6	0	0.0	
F	575	2	42.6	5	23.2	0	0.0	
G	413	2	30.6	4.4	14.7	0	0.0	
H	550	4	81.5	0.46	4.1	0	0.0	
I	513	4	76.0	0.36	3.0	0	0.0	
J	450	4	66.7	3.4	24.7	0	0.0	
K	620	6	137.8	1.11	16.6	0	0.0	
L	650	4	96.3	1.7	17.8	0	0.0	
M	675	8	200.0	45.8	997.0	6	150.0	25
N	700	10	259.3	18.36	518.1	8	207.4	25
O	625	6	138.9	45	680.3	4	92.6	11
P	625	8	185.2	41.5	836.5	6	138.9	5
Q	625	8	185.2	567.4	11436.3	6	138.9	15
R	625	4	92.6	609.8	6145.4	2	46.3	
S	625	8	185.2	316	6369.2	4	92.6	
T	685	8	203.0	256.5	5666.2	8	203.0	13
U	500	6	111.1	101.5	1227.5	2	37.0	35
V	465	6	103.3	46	517.4	6	103.3	28
W	625	6	138.9	2.6	39.3	0	0.0	
X	715	6	158.9	84.5	1461.3	4	105.9	
Y	463	6	102.9	6.1	68.3	0	0.0	
Z	400	8	118.5	1.9	24.5	0	0.0	
AA	460	2	34.1	125	463.6	2	34.1	
BB	425	6	94.4	63.6	653.8	4	63.0	
CC	450	6	100.0	206	2242.1	6	100.0	
DD	565	4	83.7	331	3015.5	4	83.7	
EE	625	8	185.2	638	12869.2	8	185.2	
FF	650	8	192.6	264	5533.9	8	192.6	
GG	775	8	229.6	107.9	2694.2	2	57.4	
HH	755	10	279.6	40.4	1229.6	10	279.6	
[illegible]	675	2	50.0	34	185.0	2	50.0	
JJ	590	2	43.7	7.1	33.8	0	0.0	
KK	663	6	147.3	47.9	768.1	4	98.2	
TOTAL			4765.7		67402.1		2869.0	

. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

-EXTRACTABLE VOLUME OF >10 PPM SOIL							NON-EXTRACTABLE MASSES >10 PPM			
VOL. (CY)	CREEK BANK EFFECTS LENGTH (FT)	VOL. (CY)	RR EMBANKMENT EFFECTS LENGTH (FT)	VOL. (CY)	EXTRACTABL VOLUME (CY)	IDEAL MASS OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (grams)	BUILDING EFFECTS (grams)	CREEK BANK EFFECTS (grams)	RR EMBANKMENT EFFECTS (grams)	EXTRACTABLE MASS (GRAMS)
1.9	0.0	0.0	0.0	0.0	44.44	307.4	12.29	0.00	0.00	295.08
1.7		0.0		0.0	37.22	84.7	3.63	0.00	0.00	81.03
48.3		0.0		0.0	92.59	604.7	201.56	0.00	0.00	403.11
45.4		0.0		0.0	139.81	503.9	123.45	0.00	0.00	380.44
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
23.1	25.0	66.7		0.0	60.19	747.7	115.39	332.32	0.00	300.02
45.4	25.0	118.5		0.0	43.52	414.5	90.66	236.84	0.00	86.96
3.7		0.0		0.0	88.93	453.5	17.96	0.00	0.00	435.54
4.6		0.0		0.0	134.26	627.3	20.91	0.00	0.00	606.43
13.9		0.0		0.0	125.00	8577.2	857.72	0.00	0.00	7719.48
0.0		0.0		0.0	46.30	3072.7	0.00	0.00	0.00	3072.71
0.0		0.0		0.0	92.59	3184.6	0.00	0.00	0.00	3184.58
23.6		0.0		0.0	179.37	5666.2	658.65	0.00	0.00	5007.57
1.3		0.0		0.0	35.74	409.2	14.32	0.00	0.00	394.84
25.9		0.0		0.0	77.41	517.4	129.80	0.00	0.00	387.55
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0	14.0	8.3	97.63	974.2	0.00	0.00	76.30	897.90
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	7.4		0.0	26.67	463.6	0.00	100.78	0.00	362.80
0.0	25.0	29.6		0.0	33.33	435.8	0.00	205.10	0.00	230.74
0.0	25.0	66.7		0.0	33.33	2242.1	0.00	1494.74	0.00	747.37
0.0	25.0	29.6		0.0	54.07	3015.5	0.00	1067.44	0.00	1948.07
0.0	25.0	118.5		0.0	66.67	12859.2	0.00	8229.92	0.00	4629.33
0.0	25.0	118.5		0.0	74.07	5533.9	0.00	3405.48	0.00	2128.43
0.0	25.0	7.4		0.0	60.00	673.6	0.00	86.91	0.00	586.65
0.0	25.0	185.2		0.0	94.44	1229.6	0.00	814.28	0.00	415.29
0.0	25.0	7.4		0.0	42.59	185.0	0.00	27.41	0.00	157.62
0.0	25.0	0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	29.6	30.0	17.8	60.51	512.1	0.00	164.47	92.65	254.98
236.7		785.2		26.1	1821.0	53295.4	2246.3	16155.7	169.0	34724.4

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION NOT EXTRACTED

25 PPM PCB CLEANUP LEVEL - NO SHEETPILING

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 25 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (CY)	NON BUILDING EFFECTS LENGTH (FT)
A	625	2	46.3	61	307.4	2	46.3	50
B	525	2	38.9	20	84.7	0	0.0	
C	625	6	138.9	40	904.7	6	138.9	50
D	625	10	231.5	25	629.9	8	185.2	25
E	525	8	155.6	0.33	5.6	0	0.0	
F	575	2	42.6	5	23.2	0	0.0	
G	411	2	30.6	4.4	14.7	0	0.0	
H	550	4	81.5	0.46	4.1	0	0.0	
I	513	4	76.0	0.36	3.0	0	0.0	
J	450	4	66.7	3.4	24.7	0	0.0	
K	620	6	137.8	1.11	15.6	0	0.0	
L	650	4	96.3	1.7	17.8	0	0.0	
M	675	8	200.0	45.8	997.0	4	100.0	25
N	700	10	259.3	18.36	518.1	4	103.7	25
O	625	6	138.9	45	660.3	4	92.6	11
P	625	8	185.2	41.5	836.5	6	138.9	5
Q	675	8	185.2	567.4	11438.3	6	138.9	15
R	625	4	92.6	609.8	6145.4	2	46.3	
S	625	8	185.2	316	6369.2	4	92.6	
T	685	8	203.0	256.5	5666.2	8	203.0	13
U	500	6	111.1	101.5	1227.5	2	37.0	35
V	465	6	103.3	46	517.4	4	68.9	28
W	625	6	138.9	2.6	38.3	0	0.0	
X	715	6	158.9	84.5	1461.3	4	105.9	
Y	463	6	102.9	6.1	65.3	0	0.0	
Z	400	8	118.5	1.9	24.5	0	0.0	
AA	460	2	34.1	125	463.6	2	34.1	
BB	425	6	94.4	63.6	653.8	4	63.0	
CC	450	6	100.0	206	2242.1	4	66.7	
DD	565	4	83.7	331	3015.5	4	83.7	
EE	625	8	185.2	638	12859.2	4	92.6	
FF	650	8	192.6	264	5533.9	8	192.6	
GG	775	8	229.6	107.8	2684.2	2	57.4	
HH	755	10	279.6	40.4	1229.6	10	279.6	
II	675	2	50.0	34	165.0	2	50.0	
JJ	590	2	43.7	7.1	33.8	0	0.0	
KK	663	6	147.3	47.9	765.1	4	98.2	
TOTAL			4765.7		67402.1		2518.0	

. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

-EXTRACTABLE VOLUME OF >25 PPM SOIL						IDEAL MASS	NON-EXTRACTABLE MASSES >25 PPM			
VOL. (CY)	CREEK BANK EFFECTS LENGTH (FT)	VOL. (CY)	RR EMBANKMENT EFFECTS LENGTH (FT)	VOL. (CY)	EXTRACTABL VOLUME (CY)	OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (grams)	BUILDING EFFECTS (grams)	CREEK BANK EFFECTS (grams)	RR EMBANKMENT EFFECTS (grams)	EXTRACTABLE MASS (GRAMS)
1.6	0.0	0.0	0.0	0.0	44.44	307.4	12.29	0.00	0.00	295.08
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
46.3		0.0		0.0	92.59	604.7	201.58	0.00	0.00	403.11
45.4		0.0		0.0	139.81	503.9	123.45	0.00	0.00	380.44
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
8.3	25.0	29.6		0.0	62.04	498.5	41.54	147.70	0.00	309.25
8.3	25.0	29.6		0.0	65.74	207.2	16.65	59.21	0.00	131.37
3.7		0.0		0.0	88.93	453.5	17.96	0.00	0.00	435.54
4.6		0.0		0.0	134.26	627.3	20.91	0.00	0.00	606.43
13.8		0.0		0.0	125.00	8577.2	857.72	0.00	0.00	7719.48
0.0		0.0		0.0	46.30	3072.7	0.00	0.00	0.00	3072.71
0.0		0.0		0.0	92.59	3184.6	0.00	0.00	0.00	3184.58
23.6		0.0		0.0	179.37	5666.2	658.65	0.00	0.00	5007.57
1.3		0.0		0.0	35.74	409.2	14.32	0.00	0.00	394.84
9.3		0.0		0.0	59.56	344.9	46.73	0.00	0.00	298.17
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0	14.0	8.3	97.63	974.2	0.00	0.00	76.30	897.90
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0		0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	7.4		0.0	28.57	463.6	0.00	100.78	0.00	362.80
0.0	25.0	29.6		0.0	33.33	435.8	0.00	205.10	0.00	230.74
0.0	25.0	29.6		0.0	37.04	1494.7	0.00	664.33	0.00	830.41
0.0	25.0	29.6		0.0	54.07	3015.5	0.00	1067.44	0.00	1948.07
0.0	25.0	29.6		0.0	62.96	6429.6	0.00	2057.48	0.00	4372.14
0.0	25.0	118.5		0.0	74.07	5533.9	0.00	3405.48	0.00	2128.43
0.0	25.0	7.4		0.0	50.00	673.6	0.00	86.91	0.00	586.65
0.0	25.0	185.2		0.0	94.44	1229.6	0.00	814.28	0.00	415.29
0.0	25.0	7.4		0.0	42.59	185.0	0.00	27.41	0.00	157.62
0.0	25.0	0.0		0.0	0.00	0.0	0.00	0.00	0.00	0.00
0.0	25.0	29.6	30.0	17.8	50.81	512.1	0.00	154.47	92.66	264.92
166.6		533.3		26.1	1790.0	45404.8	2011.8	8790.8	169.0	34433.5

MALCOLM PIRNIE

APPENDIX B4

Calculations for Close-pack, Non-overlapping Caisson

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION REMOVED

CLOSE-PACK EXCAVATION WITH NO OVERLAP

10 PPM PCB CLEANUP LEVEL

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 10 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (CY)
A	625	2	46.3	81	307.4	2	46.3
B	525	2	38.9	20	84.7	2	38.9
C	625	6	138.9	40	604.7	6	138.9
D	625	10	231.5	25	629.9	8	185.2
E	625	8	185.2	0.33	5.6	0	0.0
F	575	2	42.6	5	23.2	0	0.0
G	413	2	30.6	4.4	14.7	0	0.0
H	550	4	81.5	0.46	4.1	0	0.0
I	513	4	76.0	0.36	3.0	0	0.0
J	450	4	66.7	3.4	24.7	0	0.0
K	620	6	137.8	1.11	15.6	0	0.0
L	650	4	96.3	1.7	17.8	0	0.0
M	675	8	200.0	45.8	997.0	6	150.0
N	700	10	259.3	18.36	518.1	8	207.4
O	625	6	138.9	45	680.3	4	92.6
P	625	8	185.2	41.5	836.5	6	138.9
Q	625	8	185.2	567.4	11436.3	6	138.9
R	625	4	92.6	609.8	6145.4	2	46.3
S	625	8	185.2	316	6369.2	4	92.6
T	685	8	203.0	256.5	5666.2	8	203.0
U	500	6	111.1	101.5	1227.5	2	37.0
V	465	6	103.3	46	517.4	6	103.3
W	625	6	138.9	2.6	29.3	0	0.0
X	715	6	158.9	84.5	1461.3	4	105.9
Y	463	6	102.9	6.1	68.3	0	0.0
Z	400	8	118.5	1.9	24.5	0	0.0
AA	460	2	34.1	125	463.6	2	34.1
BB	425	6	94.4	63.6	653.8	4	63.0
CC	450	6	100.0	206	2242.1	6	100.0
DD	565	4	83.7	331	3015.5	4	83.7
EE	625	8	185.2	638	12859.2	8	185.2
FF	650	8	192.6	264	5533.9	8	192.6
GG	775	8	229.6	107.8	2694.2	2	57.4
HH	755	10	279.6	40.4	1229.6	10	279.6
II	675	2	50.0	34	185.0	2	50.0
JJ	590	2	43.7	7.1	33.8	0	0.0
KK	663	6	147.3	47.9	768.1	4	98.2
TOTAL			4765.7		67402.1		2869.0

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

BY

MAX No. OF CLOSE-PACK BORINGS (D=48")	TOTAL LINEAR FOOTAGE BORED (FT)	VOLUME OF SOIL REMOVED BY BORING TO 10 PPM DEPTH LIMIT (CY)	PCB MASS REMOVED BY BORING TO 10 PPM DEPTH LIMIT (grams)
28	56	26.1	173.0
22	44	20.5	44.6
30	180	83.7	364.5
30	240	111.6	303.8
25	0	0.0	0.0
31	0	0.0	0.0
23	0	0.0	0.0
23	0	0.0	0.0
24	0	0.0	0.0
21	0	0.0	0.0
30	0	0.0	0.0
30	0	0.0	0.0
30	180	83.7	417.4
34	272	126.5	252.8
30	120	55.8	273.4
30	180	83.7	378.2
30	180	83.7	5171.0
30	60	27.9	1852.5
30	120	55.8	1919.9
32	256	119.1	3324.6
23	46	21.4	236.4
19	114	53.0	265.5
25	0	0.0	0.0
32	128	59.5	547.6
23	0	0.0	0.0
17	0	0.0	0.0
20	40	18.6	253.2
21	84	39.1	270.5
23	138	64.2	1439.3
26	104	48.4	1742.9
29	232	107.9	7494.2
33	264	122.8	3528.8
37	74	34.4	403.9
36	360	167.5	736.4
33	66	30.7	113.6
26	0	0.0	0.0
35	140	65.1	339.5
1021.0	3678.0	1711.0	31847.5

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION REMOVED

CLOSE-PACK EXCAVATION WITH NO OVERLAP

25 PPM PCB CLEANUP LEVEL

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 25 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (CY)
A	625	2	46.3	81	307.4	2	46.3
B	525	2	38.9	20	84.7	0	0.0
C	625	6	138.9	40	604.7	6	138.9
D	625	10	231.5	25	629.9	8	185.2
E	525	8	155.6	0.33	5.6	0	0.0
F	575	2	42.6	5	23.2	0	0.0
G	413	2	30.6	4.4	14.7	0	0.0
H	550	4	81.5	0.46	4.1	0	0.0
I	513	4	76.0	0.38	3.0	0	0.0
J	450	4	66.7	3.4	24.7	0	0.0
K	620	6	137.8	1.11	18.6	0	0.0
L	650	4	96.3	1.7	17.8	0	0.0
M	675	8	200.0	45.8	997.0	4	100.0
N	700	10	259.3	18.36	518.1	4	103.7
O	625	6	138.9	45	660.3	4	92.6
P	625	8	185.2	41.5	836.5	6	138.9
Q	625	8	185.2	567.4	11436.3	6	138.9
R	625	4	92.6	609.8	6145.4	2	46.3
S	625	8	185.2	316	6369.2	4	92.6
T	685	8	203.0	256.5	5666.2	8	203.0
U	500	6	111.1	101.5	1227.5	2	37.0
V	465	6	103.3	46	517.4	4	68.9
W	625	6	138.9	2.6	39.3	0	0.0
X	715	6	158.9	84.5	1461.3	4	105.9
Y	463	6	102.9	6.1	65.3	0	0.0
Z	400	8	118.5	1.9	24.5	0	0.0
AA	460	2	34.1	125	463.6	2	34.1
BB	425	6	94.4	63.6	653.8	4	63.0
CC	450	6	100.0	206	2242.1	4	66.7
DD	565	4	83.7	331	3015.5	4	83.7
EE	625	8	185.2	636	12859.2	4	92.6
FF	650	8	192.6	264	5533.9	8	192.6
GG	775	8	229.6	107.8	2694.2	2	57.4
HH	755	10	279.6	40.4	1229.6	10	279.6
II	675	2	50.0	34	185.0	2	50.0
JJ	590	2	43.7	7.1	33.8	0	0.0
KK	663	6	147.3	47.9	765.1	4	98.2
TOTAL			4765.7		67402.1		2518.0

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

BY

MAX No. OF CLOSE-PACK BORINGS (D=48")	TOTAL LINEAR FOOTAGE BORED (FT)	VOLUME OF SOIL REMOVED BY BORING TO 25 PPM DEPTH LIMIT (CY)	PCB MASS REMOVED BY BORING TO 25 PPM DEPTH LIMIT (grams)
28	56	26.1	173.0
22	0	0.0	0.0
30	180	83.7	364.5
30	240	111.6	303.8
25	0	0.0	0.0
31	0	0.0	0.0
23	0	0.0	0.0
23	0	0.0	0.0
24	0	0.0	0.0
21	0	0.0	0.0
30	0	0.0	0.0
30	0	0.0	0.0
30	120	55.8	278.3
34	136	63.3	126.4
30	120	55.8	273.4
30	180	83.7	378.2
30	180	83.7	5171.0
30	60	27.9	1852.5
30	120	55.8	1919.9
32	256	119.1	3324.6
23	46	21.4	236.4
19	76	35.4	177.0
25	0	0.0	0.0
32	128	59.5	547.6
23	0	0.0	0.0
17	0	0.0	0.0
20	40	18.6	253.2
21	84	39.1	270.5
23	92	42.8	969.6
26	104	48.4	1742.9
29	116	54.0	3747.1
33	264	122.8	3528.8
37	74	34.4	403.9
36	360	167.5	736.4
33	66	30.7	113.6
26	0	0.0	0.0
35	140	65.1	339.5
1021.0	3236.0	1506.3	27222.0

MALCOLM PIRNIE

APPENDIX B5

Calculations for Close-pack, Overlapping Caisson

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY THF DATE 10/28/91 SHEET NO. 1 OF 2

CHKD. BY JAM DATE 12/4/91 JOB NO.

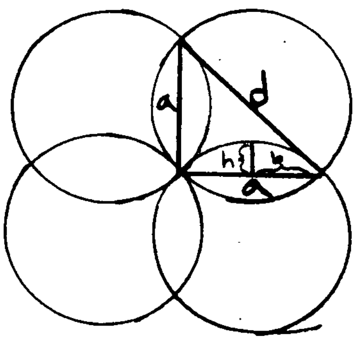
SUBJECT Columbus McKinnon FS
Excavation Alts.

Close-Pack, Case-On approach:

Buffalo Drilling, Inc. (Jim Baron) is familiar w/ CM site and has contacted regarding caisson close pack boring. Jim suggested that 48 inch diameter borings be used given the site access limitations and nature of soil/Fill (loose). Cost for such drilling would be approx. \$75/FT depth.

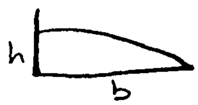
- Volume removed for non-overlap $= n\pi r^2 D$, where n = max # of borings per block
  $r = 2$ FT
  $\pi = 3.14$
  D = depth of excavation

- Volume removed in overlap case:



$a^2 + a^2 = d^2$, $d = 4'$
$2a^2 = 16$
$a = 2.83$

Area of a Parabola



$= \frac{2bh}{3}$

where $b = \frac{1}{2}a = 1.42$

$h \simeq \frac{1}{2}b = 0.71$

Thus, $\frac{2bh}{3} = 0.67$

each "leaf" has 4 parabolas $= 2.68$ FT^2.

Typically, each caisson boring will extract

$(\pi r^2 - 2.68) D$ FT^3

where D = Depth of excavation
r = 2'

Thus, volume of soil extracted in overlapping caisson alternative =

$9.88\ nD$

where n = # of overlapping borings within a given sector

D = Depth of excavation within a given sector

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION REMOVED

CLOSE-PACK EXCAVATION WITH OVERLAP

25 PPM PCB CLEANUP LEVEL

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 25 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 25 PPM TO BE EXTRACTED (CY)
A	625	2	46.3	61	307.4	2	46.3
B	525	2	38.9	20	84.7	0	0.0
C	625	6	138.9	40	604.7	6	138.9
D	625	10	231.5	25	629.9	8	185.2
E	525	8	155.6	0.33	5.6	0	0.0
F	575	2	42.6	5	23.2	0	0.0
G	413	2	30.6	4.4	14.7	0	0.0
H	550	4	81.5	0.46	4.1	0	0.0
I	513	4	76.0	0.38	3.0	0	0.0
J	450	4	66.7	3.4	24.7	0	0.0
K	620	6	137.8	1.11	16.6	0	0.0
L	650	4	96.3	1.7	17.8	0	0.0
M	675	8	200.0	45.8	997.0	4	100.0
N	700	10	259.3	18.36	518.1	4	103.7
O	625	6	138.9	45	660.3	4	92.6
P	625	8	185.2	41.5	836.5	6	138.9
Q	625	8	185.2	567.4	11436.3	6	138.9
R	625	4	92.6	609.8	6145.4	2	46.3
S	625	8	185.2	316	6369.2	4	92.6
T	685	8	203.0	256.5	5666.2	8	203.0
U	600	6	111.1	101.5	1227.5	2	37.0
V	465	6	103.3	46	517.4	4	68.9
W	625	6	138.9	2.6	39.3	0	0.0
X	715	6	158.9	84.5	1461.3	4	105.9
Y	463	6	102.9	6.1	65.3	0	0.0
Z	400	8	118.5	1.9	24.5	0	0.0
AA	460	2	34.1	125	463.6	2	34.1
BB	425	6	94.4	63.6	653.8	4	63.0
CC	450	6	100.0	206	2242.1	4	66.7
DD	565	4	83.7	331	3015.5	4	83.7
EE	625	8	185.2	638	12859.2	4	92.6
FF	650	8	192.6	264	5533.9	8	192.6
GG	775	8	229.6	107.8	2694.2	2	57.4
HH	755	10	279.6	40.4	1229.6	10	279.6
II	675	2	50.0	34	185.0	2	50.0
JJ	590	2	43.7	7.1	33.8	0	0.0
KK	663	6	147.3	47.9	766.1	4	98.2
TOTAL			4765.7		67402.1		2518.0

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

BY

MAX No. OF CLOSE-PACK BORINGS (D=48")	TOTAL LINEAR FOOTAGE BORED (FT)	VOLUME OF SOIL REMOVED BY BORING TO 25 PPM DEPTH LIMIT (CY)	PCB MASS REMOVED BY BORING TO 25 PPM DEPTH LIMIT (grams)
42	84	30.7	204.1
33	0	0.0	0.0
45	270	98.8	430.1
45	360	131.7	358.4
38	0	0.0	0.0
47	0	0.0	0.0
35	0	0.0	0.0
35	0	0.0	0.0
38	0	0.0	0.0
32	0	0.0	0.0
45	0	0.0	0.0
45	0	0.0	0.0
45	180	65.9	325.3
51	204	74.6	149.2
45	180	65.9	322.6
45	270	98.8	446.3
45	270	98.8	6101.5
45	90	32.9	2185.8
45	180	65.9	2265.4
48	384	140.5	3922.8
35	70	25.6	283.0
29	116	42.4	212.5
38	0	0.0	0.0
48	192	70.3	646.2
35	0	0.0	0.0
26	0	0.0	0.0
30	60	22.0	296.7
32	128	46.8	324.2
35	140	51.2	1145.6
39	156	57.1	2056.5
44	176	64.4	4472.1
50	400	146.4	4205.8
56	112	41.0	460.9
54	540	197.6	868.9
50	100	36.6	135.4
39	0	0.0	0.0
50	200	73.2	381.5
1637.0	4862.0	1779.1	32225.9

TABLE 1

COLUMBUS McKINNON SITE

SUMMARY OF DETECTABLE PCB CONTAMINATION REMOVED

CLOSE-PACK EXCAVATION WITH ~~NO~~ OVERLAP

10 PPM PCB CLEANUP LEVEL

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOT. PCB MASS (GRAMS)	DEPTH OF PCB CONTAM. ABOVE 10 PPM (FT)	IDEAL VOLUME OF PCB CONTAM. ABOVE 10 PPM TO BE EXTRACTED (CY)
A	625	2	46.3	81	307.4	2	46.3
B	525	2	38.9	20	84.7	2	38.9
C	625	6	138.9	40	604.7	6	138.9
D	625	10	231.5	25	629.9	8	185.2
E	525	8	155.6	0.33	5.6	0	0.0
F	575	2	42.6	5	23.2	0	0.0
G	413	2	30.6	4.4	14.7	0	0.0
H	550	4	81.5	0.46	4.1	0	0.0
I	513	4	76.0	0.38	3.0	0	0.0
J	450	4	66.7	3.4	24.7	0	0.0
K	620	6	137.8	1.11	15.6	0	0.0
L	650	4	96.3	1.7	17.8	0	0.0
M	675	8	200.0	45.8	997.0	6	150.0
N	700	10	259.3	18.36	518.1	8	207.4
O	625	6	138.9	45	680.3	4	92.6
P	625	8	185.2	41.5	836.5	6	138.9
Q	625	8	185.2	567.4	11436.3	6	138.9
R	625	4	92.6	609.8	6145.4	2	46.3
S	625	8	185.2	316	6369.2	4	92.6
T	685	8	203.0	256.5	5666.2	8	203.0
U	500	6	111.1	101.5	1227.5	2	37.0
V	465	6	103.3	46	517.4	6	103.3
W	625	6	138.9	2.6	39.3	0	0.0
X	715	6	158.9	84.5	1461.3	4	105.9
Y	463	6	102.9	6.1	66.3	0	0.0
Z	400	8	118.5	1.9	24.5	0	0.0
AA	460	2	34.1	125	463.6	2	34.1
BB	425	6	94.4	63.6	653.8	4	63.0
CC	450	6	100.0	206	2242.1	6	100.0
DD	565	4	83.7	331	3015.5	4	83.7
EE	625	8	185.2	638	12859.2	8	185.2
FF	650	8	192.6	264	5533.9	8	192.6
GG	775	8	229.6	107.8	2694.2	2	57.4
HH	755	10	279.6	40.4	1229.6	10	279.6
II	675	2	50.0	34	185.0	2	50.0
JJ	590	2	43.7	7.1	33.8	0	0.0
KK	663	6	147.3	47.8	765.1	4	98.2
TOTAL			4765.7		67402.1		2869.0

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

BY

MAX No. OF CLOSE-PACK BORINGS (D=48")	TOTAL LINEAR FOOTAGE BORED (FT)	VOLUME OF SOIL REMOVED BY BORING TO 10 PPM DEPTH LIMIT (CY)	PCB MASS REMOVED BY BORING TO 10 PPM DEPTH LIMIT (grams)
42	84	30.7	204.1
33	66	24.2	52.6
45	270	98.8	430.1
45	360	131.7	358.4
38	0	0.0	0.0
47	0	0.0	0.0
35	0	0.0	0.0
35	0	0.0	0.0
38	0	0.0	0.0
32	0	0.0	0.0
45	0	0.0	0.0
45	0	0.0	0.0
45	270	98.8	492.5
51	408	149.3	298.3
45	180	65.9	322.6
45	270	98.8	446.3
45	270	98.8	6101.5
45	90	32.9	2185.8
45	180	65.9	2265.4
48	384	140.5	3922.8
35	70	25.6	283.0
29	174	63.7	318.8
38	0	0.0	0.0
48	192	70.3	646.2
35	0	0.0	0.0
26	0	0.0	0.0
30	60	22.0	295.7
32	128	46.8	324.2
35	210	76.8	1722.9
39	156	57.1	2056.5
44	352	128.8	8944.3
50	400	146.4	4205.8
56	112	41.0	460.9
54	540	197.6	868.9
50	100	36.6	135.4
39	0	0.0	0.0
50	200	73.2	381.5
1637.0	5526.0	2022.1	37747.5

MALCOLM PIRNIE

APPENDIX B6

Calculations for Principal-threat Soil Excavation

COLUMBUS McKINNON CORP.
SUMMARY OF EFFECT OF EXCAVATION OF PRINCIPAL THREAT SOILS

SECTOR	C.S. AREA (SF)	MAX. DEPTH OF DETECT. PCB CONTAM. (FT)	VOLUME OF DETECT. PCB CONTAM. (CY)	AVG. PCB CONC. ACROSS DEPTH (MG/KG)	TOTAL PCB MASS (GRAMS)	VOL. OF SOIL EXHIBITING PCB CONCENTRATIONS >500 MG/KG (CY)	NON-EXTRACTABLE VOLUME OF SOIL AT CREEK BANK (CY)	EXTRACTABLE VOLUME (CY)	MAX. PCB CONC. OF SOIL EXHIBITING PCB CONCENTRATIONS >500 MG/KG	EXTRACTABLE PCB MASS (GRAMS)
A	625	2	46.3	81	3073.7	0.0	0.0	0.00		0.00
B	525	2	38.9	20	846.5	0.0	0.0	0.00		0.00
C	625	6	138.9	40	6046.7	0.0	0.0	0.00		0.00
D	625	10	231.5	25	6298.6	0.0	0.0	0.00		0.00
E	625	8	165.6	0.33	65.9	0.0	0.0	0.00		0.00
F	575	2	42.6	5	231.8	0.0	0.0	0.00		0.00
G	413	2	30.6	4.4	146.6	0.0	0.0	0.00		0.00
H	550	4	81.5	0.46	40.8	0.0	0.0	0.00		0.00
I	513	4	76.0	0.36	29.8	0.0	0.0	0.00		0.00
J	450	4	66.7	3.4	246.7	0.0	0.0	0.00		0.00
K	620	6	137.8	1.11	166.8	0.0	0.0	0.00		0.00
L	650	4	96.3	1.7	178.2	0.0	0.0	0.00		0.00
M	675	8	200.0	45.8	9969.7	0.0	0.0	0.00		0.00
N	700	10	259.3	18.36	5180.8	0.0	0.0	0.00		0.00
O	625	6	138.9	46	6802.5	0.0	0.0	0.00		0.00
P	625	8	185.2	41.5	8364.6	0.0	0.0	0.00		0.00
Q	625	8	185.2	667.4	114362.6	46.3	0.0	46.30	2220	111872.28
R	625	4	92.6	609.8	61454.3	46.3	0.0	46.30	1210	60975.43
S	625	8	185.2	310	63691.6	46.3	0.0	46.30	1077	64273.17
T	685	8	203.0	256.5	56662.1	0.0	0.0	0.00		0.00
U	600	[illegible]	111.1	101.6	12224.7	0.0	0.0	0.00		0.00
V	465	6	103.3	46	5173.5	0.0	0.0	0.00		0.00
W	625	6	138.9	2.8	303.0	0.0	0.0	0.00		0.00
X	715	6	158.9	84.5	14613.0	0.0	0.0	0.00		0.00
Y	463	6	102.9	8.1	683.1	0.0	0.0	0.00		0.00
Z	400	8	118.5	1.9	245.1	0.0	0.0	0.00		0.00
AA	460	2	34.1	126	4635.8	0.0	0.0	0.00		0.00
BB	425	6	94.4	63.6	6537.7	0.0	0.0	0.00		0.00
CC	450	6	100.0	208	22421.0	33.3	3.7	29.60	89	2867.28
						33.3	11.1	22.20	506	12226.21
DD	565	4	83.7	331	30155.1	0.0	0.0	0.00		0.00
EE	625	8	185.2	638	128692.4	92.6	14.8	77.80	1260	106693.68
FF	650	8	192.6	264	55339.1	48.1	3.7	44.40	798	38563.32
GG	775	8	229.6	107.8	26942.3	0.0	0.0	0.00		0.00
HH	755	10	279.6	40.4	12295.7	0.0	0.0	0.00		0.00
II	675	2	50.0	34	1850.3	0.0	0.0	0.00		0.00
JJ	590	2	43.7	7.1	337.7	0.0	0.0	0.00		0.00
KK	663	6	147.3	47.9	7681.1	0.0	0.0	0.00		0.00
TOTAL			4765.7		674020.5	346.2	33.3	312.90		387471.4

1. Maximun depth of PCB contamination limited to 10 feet due to saturated conditions below this depth.

2. Area CC contains principal threat soil at the 2–4 foot layer. It will be necessary to excavate and dispose the 0–2 foot layer prior to excavating this soil.

MALCOLM PIRNIE

APPENDIX C

HYDRAULIC ANALYSIS CALCULATIONS

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY EWM DATE 11/4/91 SHEET NO. 1 OF 4

CHKD. BY ACM DATE 12/2/91 JOB NO. 133-01-1

SUBJECT Columbus McKinnon - Ellicott Creek Hydraulic Analysis

- HYDRAULIC ANALYSIS OF ELLICOTT CREEK

  - Determine effect on flood stage elevation due to channel constriction by sheeting

- METHODS

  - Analysis will be conducted by using Manning Eq; information derived from a flood insurance study report for Ellicott Creek in the Town of Tonawanda and local site conditions

- BACKGROUND INFORMATION FROM FLOOD INSURANCE STUDY
  - $n = 0.035$
  - $Q_{10} = 3,300$ cfs } @ mouth of Ellicott Creek
  - $Q_{100} = 4,900$ cfs
  - $S = 0.00021$ ft/ft (from 100 yr stage water surface profile)
  - $V_{100} = 5.3$ fps
    Channel $\text{Width}_{100} = 95'$ } near study area
    Channel $\text{Area}_{100} = 919'$

- ANALYSIS

MANNING EQ $Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

where Q = flow (cfs)
A = channel area (sf)
R = hydraulic radius (Area/Wetted Perimeter)
S = slope (ft/ft)
n = channel roughness coeff.

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.

BY E.W.M. DATE 11/4/91 SHEET NO. 2 OF 4

CHKD. BY [illegible] DATE 12/2/91 JOB NO. 1332-01-1

SUBJECT COLUMBUS McKINNON - ELLICOTT CRK HYD. EVAL

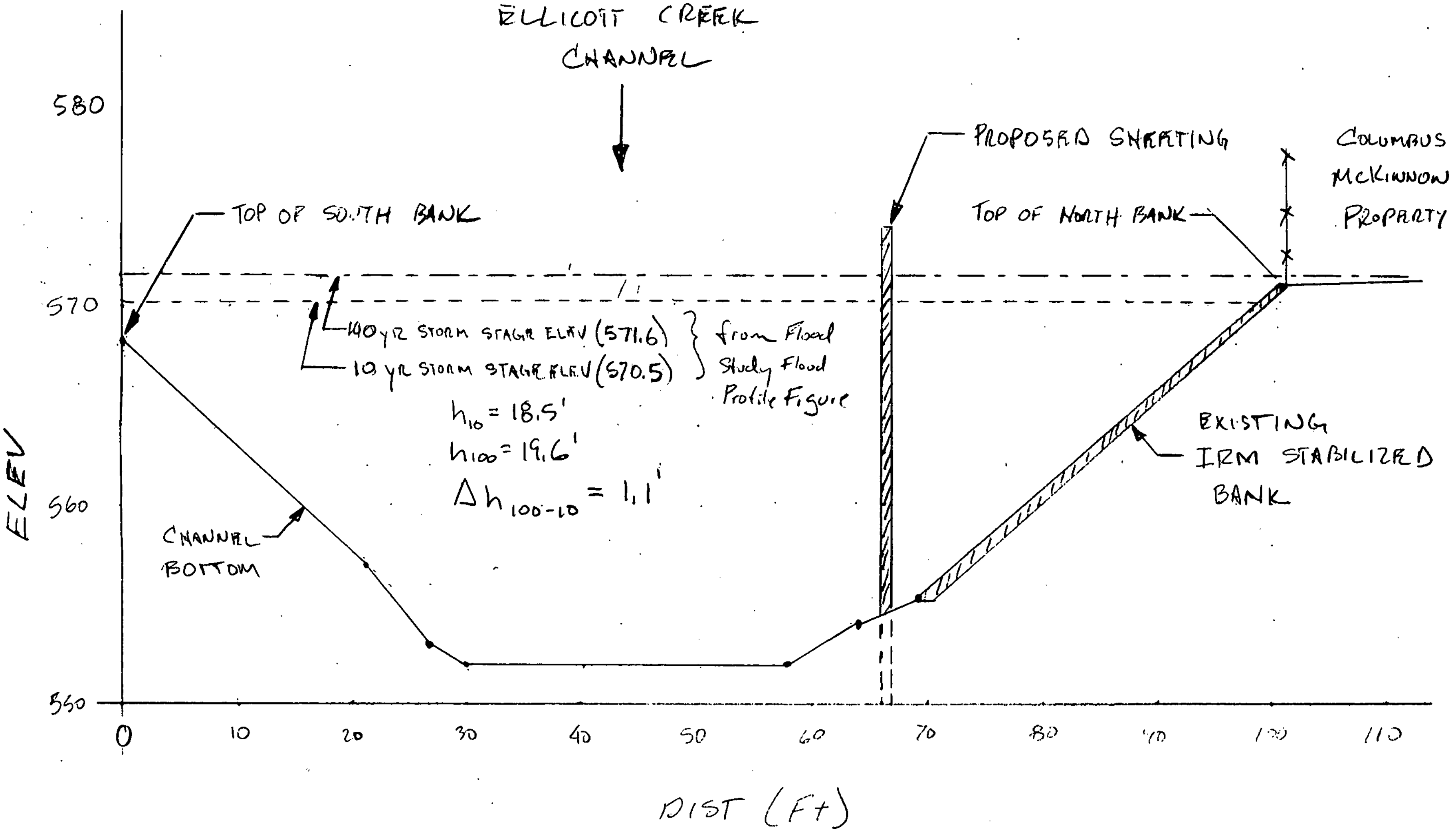
FROM: FLOOD INSURANCE STUDY FOR CITY OF TONAWANDA, ERIE COUNTY, NY; HUD & FIA (2/79)

$n = 0.035$

$Q_{10} = 3{,}300$ cfs } @ mouth of Ellicott Creek

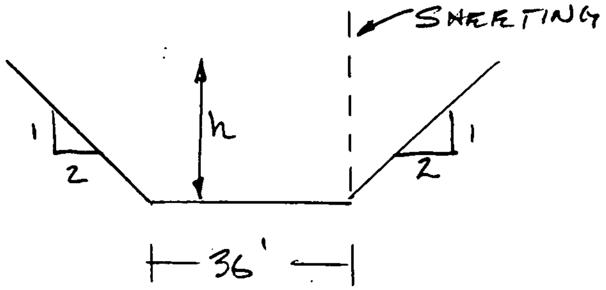
$Q_{100} = 4{,}900$ cfs }

$S = 0.00021$ ft/ft



- ASSUMPTIONS
  - FLOOD STUDY DATA IS VALID FOR ANALYSIS
  - FLOOD STAGE FLOWS WILL BE ENTIRELY CONTAINED BY THE CREEK BANKS. OVERBANK FLOWS ARE NOT CONSIDERED.
  - FLOW THRU THE CONSTRICTED CHANNEL WILL BE ACCOMODATED BY INCREASED STAGE HEIGHTS

FROM THE STUDY AREA, A SIMPLIFIED CHANNEL CROSS-SECTION IS DEPICTED BELOW



$A = h \times (36 + 2h) = 36h + 2h^2$
$P = 2\sqrt{5}\,h + 36 \cdot 4.47h + 36$

Constricted channel
$A' = h \times (36 \times \tfrac{1}{2}(2h)) - 36h + h^2$
$P' - \sqrt{5}\,h + 36 + h = 3.24 + 36$

1ST DETERMINE UNRESTRICTED CHANNEL STAGE HEIGHT

$Q_{100} = 4900\ \text{cfs}$
$Q_{10} = 3300\ \text{cfs}$
$= \frac{1.49}{0.035}\left[36h + 2h^2\right]\left[\frac{36h + 2h^2}{36 + 4.47h}\right]^{2/3}(0.00021)^{1/2}$

$\frac{Qn}{1.49\sqrt{S}} = \begin{matrix} 7942.7_{(100)} \\ 5349.2_{(10)} \end{matrix} = \left[36h + 2h^2\right]\left[\frac{36h + 2h^2}{36 + 4.47h}\right]^{2/3}$

- By Trial & Error $h_{100} = 19.9'$
  $h_{10} = 16.4'$

2ND DETERMINE CONSTRICTED CHANNEL STAGE HEIGHT

$$Q_{100} = 4900 cfs = \frac{1.49}{0.035}\left[36h+h^2\right]\left[\frac{36h+h^2}{36+3.24h}\right]^{2/3}(0.00021)^{1/2}$$
$$Q_{10} = 3300 cfs$$

$$\frac{Qn}{1.49\sqrt{S}} = \begin{matrix} 7942.7_{(100)} \\ 5349.2_{(10)} \end{matrix} = \left[36h+h^2\right]\left[\frac{36h+h^2}{36+3.24h}\right]^{2/3}$$

By Trial & Error $h'_{100} = 24.2'$
$h'_{10} = 19.55'$

$\Delta h'_{10} = 19.55' - 16.4' = 3.15'$ $\Delta h'_{100} = 24.2' - 19.9 = 4.30'$

$\Delta h_{100-10} = 1.1'$

- CONCLUSIONS

BASED ON FLOOD STUDY INFORMATION, IF A 100 YR STORM OCCURRED DURING IN AN UNCONSTRICTED CHANNEL, SEVERE LOCALIZED FLOOD WILL OCCUR. DURING A 10 YR STORM, SOME MINOR OVERBANK FLOWS WILL LIKELY OCCUR. IF THE CHANNEL IS CONSTRICTED FOR SITE REMEDIATION, IT APPEARS THAT A 10 YR STORM COULD RESULT IN EXTENSIVE OVERTOPPING OF THE CREEK BANK IN EXCESS OF THE 100 YR STAGE FLOWS, THUS RESULTING IN EXTENSIVE LOCALIZED AND UPSTREAM FLOODING. IN ORDER TO DETERMINE EXTENT OF FLOODING, DETAILED HYDRAULIC ANALYSIS IS REQUIRED

MALCOLM PIRNIE

APPENDIX D – COST CALCULATIONS

MALCOLM PIRNIE

APPENDIX D1

Soils Remediation Cost Calculations

PREP. BY ·//·
CHKD. BY ACM

COLUMBUS McKINNON
COST ESTIMATE FOR INSTALLING INSTITUTIONAL CONTROLS

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
FENCE				
Install Additional Fence	LF	300	$18.00	$5,400
SIGNS				
Warning/Tresspassing Signs	EA	6	$300.00	$1,800
Installation	EA	6	$150.00	$900
SUBTOTAL				$8,100
ENGINEERING	LS	1	$5,000.00	$5,000
TOTAL				$13,100

PREP. BY ___

CHKD. BY ACM

COLUMBUS McKINNON

REMEDIAL ALTERNATIVES PRELIMINARY SCREENING

COST ESTIMATE FOR PLACEMENT OF TOPSOIL COVER ACROSS SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREP (GRADING)				
Clear & Grub	SY	1733	$0.49	$849
Furnish & deliver soil	CY	854	$10.00	$8,540
Onsite Hauling	CY	854	$5.00	$4,270
Place & Compact	CY	854	$6.10	$5,209
6" TOPSOIL LAYER				
Furnish and Deliver	CY	290	$20.00	$5,800
On-Site Hauling	CY	290	$5.00	$1,450
Place and Grade	CY	290	$6.10	$1,769
Seed and Mulch	ACRES	0.36	$2,500.00	$900
MONITORING WELLS				
Extend Wells	EA.	6	$500.00	$3,000
ACCESS ROAD				
Gravel-Based Haul Road	LF	450	$15.50	$6,975
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
EQUIPMENT				
Mobilization/Demob.	LS	1	$10,000.00	$10,000
HEALTH AND SAFETY				
Preparation/Implementation	LS	1	$50,000.00	$50,000
SUBTOTAL				$113,613
ENGINEERING & CONTINGENCY @ 35%				$39,764
TOTAL				$153,377

PREP. BY _ll_

CHKD. BY _KM_

COLUMBUS McKINNON

COST ESTIMATE FOR PLACEMENT OF A GRAVEL COVER ACROSS SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREP (GRADING)				
Clear & Grub	SY	1733	$0.49	$849
Furnish & deliver soil	CY	854	$10.00	$8,540
Onsite Hauling	CY	854	$5.00	$4,270
Place & Compact	CY	854	$6.10	$5,209
6" GRAVEL LAYER				
Furnish and Deliver	CY	290	$20.00	$5,800
On-Site Hauling/Grading	CY	290	$6.10	$1,769
MONITORING WELLS				
Extend Wells	EA.	6	$500.00	$3,000
ACCESS ROAD				
Gravel-Based Haul Road	LF	450	$15.50	$6,975
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
EQUIPMENT				
Mobilization/Demob.	LS	1	$10,000.00	$10,000
HEALTH AND SAFETY				
Preparation/Implementation	LS	1	$50,000.00	$50,000
SUBTOTAL				$111,263
ENGINEERING & CONTINGENCY @ 35%				$38,942
TOTAL				$150,204

PREP. BY ___
CHKD. BY ___

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR PLACEMENT OF ASPHALT COVER ACROSS SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREP (GRADING)				
Clear & Grub	SY	1733	$0.49	$849
Furnish & deliver soil	CY	854	$10.00	$8,540
Onsite Hauling	CY	854	$5.00	$4,270
Place & Compact	CY	854	$6.10	$5,209
RETENTION FABRIC				
Furnish, Deliver & Install	SY	1733	$1.25	$2,166
6" STONE BASE				
Furnish, Deliver & Install	CY	288	$22.50	$6,480
4" BINDER COURSE				
Furnish, Deliver & Install	SY	1733	$12.00	$20,796
2" SURFACE COURSE				
Furnish, Deliver & Install	SY	1733	$10.00	$17,330
EQUIPMENT				
Mobilization/Demob.	LS	1	$20,000.00	$20,000
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
HEALTH & SAFETY				
Preparation & Implementation	LS	1	$50,000.00	$50,000
SUBTOTAL				$150,491
ENGINEERING & CONTINGENCY @ 35%				$52,672
TOTAL				$203,163

PREP. BY ___
CHKD. BY ___

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR PLACEMENT OF SYNTHETIC COVER ACROSS SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREP (GRADING)				
Clear & Grub	SY	1733	$0.49	$849
Furnish & deliver soil	CY	854	$10.00	$8,540
Onsite Hauling	CY	854	$5.00	$4,270
Place & Compact	CY	854	$6.10	$5,209
SYNTHETIC LAYERS				
Filter Fabric (lower)	SF	15600	$0.25	$3,900
Filter Fabric (upper)	SF	15600	$0.25	$3,900
40 Mil HDPE	SF	15600	$1.50	$23,400
6" CLEAN FILL				
Furnish and Deliver	CY	289	$10.00	$2,890
On-Site Hauling	CY	289	$5.00	$1,445
Place and Grade	CY	289	$6.10	$1,763
6" TOPSOIL LAYER				
Furnish and Deliver	CY	289	$20.00	$5,780
On-Site Hauling	CY	289	$5.00	$1,445
Place and Grade	CY	289	$6.10	$1,763
Seed and Mulch	ACRES	0.36	$2,500.00	$900
GAS VENTILATION SYSTEM				
Gas Vents	EA.	4	$500.00	$2,000
MONITORING WELLS				
Extend Wells	EA	6	$500.00	$3,000
ACCESS ROAD				
Gravel-Based Haul Road	LF	450	$15.50	$6,975
EQUIPMENT				
Mobilization/Demob.	LS	1	$20,000.00	$20,000
HEALTH AND SAFETY				
Preparation/Implementation	LS	1	$50,000.00	$50,000
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
SUBTOTAL				$162,879
ENGINEERING & CONTINGENCY @ 35%				$57,008
TOTAL				$219,887

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND INCINERATION OF PRINCIPAL THREAT SOILS

PREP. BY ſſſ

CHKD. BY KM

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	313	$27.00	$8,451
Haul/Incinerate Off-Site	CY	313	$3,000.00	$939,000
RESTORATION				
FILL				
Furnish/Deliver Soil	CY	313	$10.00	$3,130
On-Site Hauling	CY	313	$5.00	$1,565
Place & Compact	CY	313	$6.10	$1,909
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROADWAY				
Improvements	LS	1	$100,000.00	$100,000
HEALTH AND SAFETY				
Prep/implementation	LS	1	$100,000.00	$100,000
Decon Pad	LS	1	$16,000.00	$16,000
SUBTOTAL				$1,184,905
ENGINEERING & CONTINGENCY				$150,000
TOTAL				$1,334,905

COLUMBUS McKINNON

PREP. BY AC

COST ESTIMATE FOR EXCAVATION AND INCINERATION OF CONTAMINATED SOILS

CHKD. BY KM

NO SHEETPILING STABILIZATION

PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	1790	$15.00	$26,850
Haul/Incinerate Off-Site	CY	1790	$3,000.00	$5,370,000
RESTORATION				
Furnish/Deliver Grading Soil	CY	1790	$10.00	$17,900
On-Site Hauling	CY	1790	$5.00	$8,950
Place & Compact	CY	1790	$6.10	$10,919
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
SUBTOTAL				$5,911,410
ENGINEERING & CONTINGENCY @ 35% (not incl. incineration)				$189,493
TOTAL				$6,100,903

Note:

1. Cost for excavation, hauling & disposal has been provided by Sevenson, Inc. and reflects mobilization, demobilization, health and safety concerns and decontamination.
2. Prices above do not include any de-watering of soil.
3. Prices for sheetpiling and Timber Access Road provided by Hartman Engineering.

PREP. BY [illegible]

CHKD. BY [illegible]

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND INCINERATION OF CONTAMINATED SOILS

INCLUDING SHEETPILING STABILIZATION

PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	2249	$15.00	$33,735
Haul & Incinerate in Secured Landfill	CY	2249	$3,000.00	$6,747,000
RESTORATION				
Furnish/Deliver Grading Soil	CY	2249	$10.00	$22,490
On-Site Hauling	CY	2249	$5.00	$11,245
Place & Compact	CY	2249	$6.10	$13,719
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
STABILIZATION				
Sheetpiling at tracks (installed)	LF	160	$850.00	$136,000
Sheetpiling at edge of bank (installed)	LF	355	$590.00	$209,450
Sheetpiling at bldgs. (installed)	LF	300	$475.00	$142,500
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$7,792,929
ENGINEERING & CONTINGENCY @ 35% (not incl. incineration)				$366,075
TOTAL				$8,159,005

Note:

1. Cost for excavation, hauling & disposal has been provided by Sevenson, Inc. and reflects mobilization, demobilization, health and safety concerns and decontamination.
2. Prices above do not include any de-watering of soil.
3. Prices for sheetpiling and Timber Access Road provided by Hartman Engineering.

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND INCINERATION OF CONTAMINATED SOILS

NON-OVERLAPPING, CLOSE-PACK BORINGS

PCB CLEANUP LIM. (PPM) = 25

PREP. BY *[illegible]*

CHKD. BY *[illegible]*

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
BORINGS				
Volume of Soils Removed	CY	1711	$70.00	$119,770
Haul & Incinerate Off-Site	CY	1711	$3,000.00	$5,133,000
RESTORATION				
Furnish/Deliver Grading Soil	CY	355	$10.00	$3,550
On-Site Hauling	CY	355	$5.00	$1,775
Place & Compact	CY	355	$6.10	$2,166
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$5,737,051
ENGINEERING & CONTINGENCY @ 35% (not incl. incineration)				$211,418
TOTAL				$5,948,469

Note:
1. Cost for 4' caisson borings provided by Buffalo Drilling, Inc. and includes backfilling with clean, off-site fill.
2. Cost for hauling & disposal has been provided by Sevenson, Inc.
3. Prices above do not include any de-watering of soil.

PREP. BY ~~
CHKD. BY ~~

COLUMBUS McKINNON
COST ESTIMATE FOR EXCAVATION AND INCINERATION OF CONTAMINATED SOILS
OVERLAPPING, CLOSE-PACK BORINGS
PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
BORINGS				
Volume of Soils Removed	CY	1779	$70.00	$124,530
Haul & Incinerate Off-Site	CY	1779	$3,000.00	$5,337,000
RESTORATION				
Furnish/Deliver Grading Soil	CY	355	$10.00	$3,550
On-Site Hauling	CY	355	$5.00	$1,775
Place & Compact	CY	355	$6.10	$2,166
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$5,945,811
ENGINEERING & CONTINGENCY @ 35% (not incl. incineration)				$213,084
TOTAL				$6,158,895

Note:
1. Cost for 4' caisson borings provided by Buffalo Drilling, Inc. and includes backfilling with clean, off-site fill.
2. Cost for hauling & disposal has been provided by Sevenson, Inc.
3. Prices above do not include any de-watering of soil.

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND DISPOSAL OF PRINCIPAL THREAT SOILS

PREP. BY ii

CHKD. BY ACM

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	313	$27.00	$8,451
Haul/Dispose Off-Site	CY	313	$360.00	$112,680
RESTORATION				
FILL				
Furnish/Deliver Soil	CY	313	$10.00	$3,130
On-Site Hauling	CY	313	$5.00	$1,565
Place & Compact	CY	313	$6.10	$1,909
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROADWAY				
Improvements	LS	1	$100,000.00	$100,000
HEALTH AND SAFETY				
Prep/implementation	LS	1	$100,000.00	$100,000
Decon Pad	LS	1	$16,000.00	$16,000
SUBTOTAL				$358,585
ENGINEERING & CONTINGENCY				$150,000
TOTAL				$508,585

COLUMBUS McKINNON

PREP. BY *[illegible]*

CHKD. BY *[illegible]*

COST ESTIMATE FOR EXCAVATION AND DISPOSAL OF CONTAMINATED SOILS
NO SHEETPILING STABILIZATION
PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	1790	$15.00	$26,850
Haul/Dispose Off-Site	CY	1790	$360.00	$644,400
RESTORATION				
Furnish/Deliver Grading Soil	CY	1790	$10.00	$17,900
On-Site Hauling	CY	1790	$5.00	$8,950
Place & Compact	CY	1790	$6.10	$10,919
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
SUBTOTAL				$1,185,810
ENGINEERING & CONTINGENCY @ 35%				$415,033
TOTAL				$1,600,843

Note:

1. Cost for excavation, hauling & disposal has been provided by Sevenson, Inc. and reflects mobilization, demobilization, health and safety concerns and decontamination.
2. Prices above do not include any de-watering of soil.
3. Prices for sheetpiling and Timber Access Road provided by Hartman Engineering.

PREP. BY ___
CHKD. BY ___

COLUMBUS McKINNON
COST ESTIMATE FOR EXCAVATION AND DISPOSAL OF CONTAMINATED SOILS
INCLUDING SHEETPILING STABILIZATION
PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Excavate Soils	CY	2249	$15.00	$33,735
Haul & Dispose in Secured Landfill	CY	2249	$360.00	$809,640
RESTORATION				
Furnish/Deliver Grading Soil	CY	2249	$10.00	$22,490
On-Site Hauling	CY	2249	$5.00	$11,245
Place & Compact	CY	2249	$6.10	$13,719
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
STABILIZATION				
Sheetpiling at tracks (installed)	LF	160	$850.00	$136,000
Sheetpiling at edge of bank (installed)	LF	355	$590.00	$209,450
Sheetpiling at bldgs. (installed)	LF	300	$475.00	$142,500
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$1,855,569
ENGINEERING & CONTINGENCY @ 35% (not incl. disposal)				$366,075
TOTAL				$2,221,645

Note:
1. Cost for excavation, hauling & disposal has been provided by Sevenson, Inc. and reflects mobilization, demobilization, health and safety concerns and decontamination.
2. Prices above do not include any de-watering of soil.
3. Prices for sheetpiling and Timber Access Road provided by Hartman Engineering.

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND DISPOSAL OF CONTAMINATED SOILS

NON-OVERLAPPING, CLOSE-PACK BORINGS

PCB CLEANUP LIM. (PPM) = 25

PREP. BY ...

CHKD. BY ACM

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
BORINGS				
Volume of Soils Removed	CY	1711	$70.00	$119,770
Haul & Dispose Off-Site	CY	1711	$360.00	$615,960
RESTORATION				
Furnish/Deliver Grading Soil	CY	355	$10.00	$3,550
On-Site Hauling	CY	355	$5.00	$1,775
Place & Compact	CY	355	$6.10	$2,166
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$1,220,011
ENGINEERING & CONTINGENCY @ 35% (not incl. disposal)				$211,418
TOTAL				$1,431,429

Note:

1. Cost for 4' caisson borings provided by Buffalo Drilling, Inc. and includes backfilling with clean, off-site fill.
2. Cost for hauling & disposal has been provided by Sevenson, Inc.
3. Prices above do not include any de-watering of soil.

PREP. BY _ii_

CHKD. BY _ACM_

COLUMBUS McKINNON

COST ESTIMATE FOR EXCAVATION AND DISPOSAL OF CONTAMINATED SOILS

OVERLAPPING, CLOSE-PACK BORINGS

PCB CLEANUP LIM. (PPM) = 25

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
BORINGS				
Volume of Soils Removed	CY	1779	$70.00	$124,530
Haul & Dispose Off-Site	CY	1779	$360.00	$640,440
RESTORATION				
Furnish/Deliver Grading Soil	CY	355	$10.00	$3,550
On-Site Hauling	CY	355	$5.00	$1,775
Place & Compact	CY	355	$6.10	$2,166
Furnish/Deliver Topsoil	CY	355	$20.00	$7,100
On-Site Hauling	CY	355	$5.00	$1,775
Place & Grade	CY	355	$6.10	$2,166
Seed & Mulch	ACRES	0.36	$2,500.00	$900
FENCE				
Remove/Replace Existing	LF	270	$35.00	$9,450
Install New Fence	LF	300	$18.00	$5,400
ACCESS ROAD				
Timber Access Road	LS	1	$450,000.00	$450,000
SUBTOTAL				$1,249,251
ENGINEERING & CONTINGENCY @ 35% (not incl. disposal)				$213,084
TOTAL				$1,462,335

Note:

1. Cost for 4' caisson borings provided by Buffalo Drilling, Inc. and includes backfilling with clean, off-site fill.
2. Cost for hauling & disposal has been provided by Sevenson, Inc.
3. Prices above do not include any de-watering of soil.

PREP. BY ___

CHKD. BY ___

COLUMBUS McKINNON

REMEDIAL ALTERNATIVES PRELIMINARY SCREENING

COST ESTIMATE FOR SOILS O&M AND PRESENT WORTH

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	EST. COST
ASPHALT COVER				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Maintenance	total	1	$500	$500
Repair Work	total	1	$500	$500
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$7,560
30 YR PW for above				$85,109
Capital Cost				$203,000
TOTAL PRESENT WORTH				$288,109
TOPSOIL COVER				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Maintenance	total	1	$500	$500
Repair Work	total	1	$500	$500
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$7,560
30 YR PW for above				$85,109
Capital Cost				$153,000
TOTAL PRESENT WORTH				$238,109
GRAVEL COVER				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Repair Work	total	1	$350	$350
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$6,910
30 YR PW for above				$77,791
Capital Cost				$150,000
TOTAL PRESENT WORTH				$227,791
INSTITUTIONAL CONTROLS				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Repair Work	total	1	$300	$300
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$6,860
30 YR PW for above				$77,229
Capital Cost				$13,000
TOTAL PRESENT WORTH				$90,229

PREP. BY ·ΠΓ

CHKD. BY KM

SYNTHETIC COVER				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Maintenance	total	1	$500	$500
Repair Work	total	1	$500	$500
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$7,560
30 YR PW for above				$85,109
Capital Cost				$220,000
TOTAL PRESENT WORTH				$305,109

NO ACTION				
Inspection/Sampling Labor	hours	16	$55	$880
Analytical Cost	sample	7	$250	$1,750
QA/QC Samples	sample	4	$250	$1,000
Report Labor	hours	30	$55	$1,650
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$6,560
30 YR PW for above				$73,851
Capital Cost				$0
TOTAL PRESENT WORTH				$73,851

EXCAVATION ALTERNATIVES:
ALL INCLUDE COVER SYSTEM, NONE COMPLETELY REMOVE ALL CONTAMINATION
THUS, 30 YR PW FOR ALL EXCAVATION ALTS. IS SAME AS TOPSOIL CAP = $85,109
TOTAL PW = CAPITAL COST + $85,109

Note: PW assumes PW factor of 11.2578 @ 8% interest rate over 30 years.

MALCOLM PIRNIE

APPENDIX D2

Creek Sediment Remediation Cost Calculations

PREP. BY ___

CHKD. BY ___

COLUMBUS McKINNON

COST ESTIMATE FOR INSITU STABILIZATION OF CONTAMINATED SEDIMENTS THROUGH PLACEMENT OF RIP-RAP AND EROSION CONTROL FABRIC

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
PREPARATION				
Clear Large Debris/Vegetation	SF	6800	$10.00	$68,000
STABILIZATION				
Erosion Control Fabric Placement & Riprap Placement	LS	1	$117,000.00	$117,000
SUBTOTAL				$185,000
ENGINEERING & CONTINGENCY @ 35%				$64,750
TOTAL				$249,750

Note:

1. All work to be performed from a barge.
2. Pricing based on contractor estimate

PREP. BY *[illegible]*

CHKD. BY *[illegible]*

COLUMBUS McKINNON

COST ESTIMATE FOR INSITU STABILIZATION OF CONTAMINATED SEDIMENTS

THROUGH PLACEMENT OF REVETMENT FABRIC

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
PREPARATION				
Clear Large Debris/Vegetation	SF	6800	$10.00	$68,000
STABILIZATION				
Revetment Fabric Placement	SF	6800	$5.00	$34,000
SUBTOTAL				$102,000
ENGINEERING & CONTINGENCY @ 35%				$35,700
TOTAL				$137,700

Note:

1. All work to be performed from a barge.
2. Pricing based on contractor estimate, and includes mob/demob.

PREP. BY ·/i (
CHKD. BY ACM

COLUMBUS McKINNON
COST ESTIMATE FOR HYDRAULIC DREDGING
NO REMOVAL OF IRM, SEDIMENTS DISPOSED OFF-SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Hydraulic Dredge Sediments	LS	1	$195,000.00	$195,000
Haul/Dispose Dried Sediments	CY	280	$360.00	$100,800
Silt Curtain	LS	1	$5,000.00	$5,000
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	226240	$0.21	$47,510
BERM SETTLING POND				
Construction of Berm	LS	1	$136,000	$136,000
SUBTOTAL				$484,310
ENGINEERING & CONTINGENCY @ 35%				$169,509
TOTAL				$653,819

Note:

1. Water treatment assumes 4:1 (typical) ratio water removed/sediment excavated.

2. Water treatment assumes return of clean water to Ellicott Creek.

PREP. BY ~~ff~~

CHKD. BY ACM

COLUMBUS McKINNON
COST ESTIMATE FOR HYDRAULIC DREDGING
NO REMOVAL OF IRM, SEDIMENTS INCINERATED OFF-SITE

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXCAVATION				
Hydraulic Dredge Sediments	LS	1	$195,000.00	$195,000
Haul/Incinerate Dried Sediments	CY	280	$3,000.00	$840,000
Silt Curtain	LS	1	$5,000.00	$5,000
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	226240	$0.21	$47,510
BERM SETTLING POND				
Construction of Berm	LS	1	$136,000	$136,000
SUBTOTAL				$1,223,510
ENGINEERING & CONTINGENCY @ 35% (not incl. incineration)				$134,229
TOTAL				$1,357,739

Note:

1. Water treatment assumes 4:1 (typical) ratio water removed/sediment excavated.

2. Water treatment assumes return of clean water to Ellicott Creek.

PREP. BY _ _
CHKD. BY _ _

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR EXCAVATION AND OFF-SITE INCINERATION OF CONTAMINATED SEDIMENTS
INCLUDING COST FOR REMOVAL OF IRM

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED
IRM EXCAVATION				
Install Sheetpiling	LF	355	$1,515.00	$537,825
Barge-mounted Clamshell	LS	1	$7,500.00	$7,500
Dispose Riprap	lb	650000	$0.15	$97,500
Silt Curtain	SF	1500	$3.00	$4,500
DREDGING				
Hydraulic Dredge Sediments	LS	1	$195,000.00	$195,000
Haul/Incinerate Dried Sediments	CY	436	$3,000.00	$1,308,000
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	187420	$0.21	$39,358
BERM SETTLING POND				
Construction of Berm	LS	1	$136,000	$136,000
SUBTOTAL				$2,325,683
ENGINEERING & CONTINGENCY				$500,000
TOTAL				$2,825,683

Note:

1. Cost for barge-mounted clamshell includes clamshell cost only. Barge cost included in hydraulic dredge estimate

2. Water treatment assumes 4:1 (typical) ratio water removed/sediment excavated.

3. Water treatment assumes return of clean water to Ellicott Creek.

PREP. BY *RC*

CHKD. BY *ACM*

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR EXCAVATION AND OFF-SITE DISPOSAL OF CONTAMINATED SEDIMENTS
INCLUDING COST FOR REMOVAL OF IRM

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED
IRM EXCAVATION				
Install Sheetpiling	LF	355	$1,515.00	$537,825
Barge-mounted Clamshell	LS	1	$7,500.00	$7,500
Dispose Riprap	lb	650000	$0.15	$97,500
Silt Curtain	SF	1500	$3.00	$4,500
DREDGING				
Hydraulic Dredge Sediments	LS	1	$195,000.00	$195,000
Haul/Dispose Dried Sediments	CY	436	$360.00	$156,960
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	187420	$0.21	$39,358
BERM SETTLING POND				
Construction of Berm	LS	1	$136,000	$136,000
SUBTOTAL				$1,174,643
ENGINEERING & CONTINGENCY				$500,000
TOTAL				$1,674,643

Note:

1. Cost for barge-mounted clamshell includes clamshell cost only. Barge cost included in hydraulic dredge estimate

2. Water treatment assumes 4:1 (typical) ratio water removed/sediment excavated.

3. Water treatment assumes return of clean water to Ellicott Creek.

PREP. BY ___ CHKD. BY ___

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR CREEK SEDIMENTS O&M AND PRESENT WORTH

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	EST. COST
DREDGING ALTERNATIVES				
ANNUAL COST				$0
30 YR PW for above				$0
Capital Cost				
TOTAL PRESENT WORTH = CAPITAL COST				
RIP-RAP/EROSION FABRIC				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	day	2	$35	$70
Repair Work	total	1	$5,000	$5,000
Report Labor	hours	20	$55	$1,100
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$9,210
30 YR PW for above				$103,684
Capital Cost				$250,000
TOTAL PRESENT WORTH				$353,684
REVETMENT FABRIC				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	day	2	$35	$70
Repair Work	total	1	$5,000	$5,000
Report Labor	hours	20	$55	$1,100
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$9,210
30 YR PW for above				$103,684
Capital Cost				$138,000
TOTAL PRESENT WORTH				$241,684
NO ACTION				
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$1,280
30 YR PW for above				$14,410
Capital Cost				$0
TOTAL PRESENT WORTH				$14,410

Note: PW assumes PW factor of 11.2578 at 8% interest over 30 years

APPENDIX D3

Creek Bank Remediation Cost Calculations

PREP. BY *[illegible]*

CHKD. BY *KM*

COLUMBUS McKINNON
COST ESTIMATE FOR CREEK BANK STABILIZATION
VIA RIP-RAP EXTENSION

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREPARATION				
Clear & Grub Creek Bank	LF	190	$375.00	$71,250
STABILIZATION				
Erosion Control Fabric	SY	1200	$15.00	$18,000
Riprap Placement	CY	400	$100.00	$40,000
Subgrade Prep.	LF	190	$485.00	$92,150
Remove/Replace Fence	LF	70	$35.00	$2,450
SUBTOTAL				$223,850
ENGINEERING & CONTINGENCY @ 35%				$67,155
TOTAL				$291,005

Note:

1. Cost for clearing and grubing remaining portion of creek bank assumes no stump removal. Debris above ground cut and disposed of in sanitary landfill.

2. All work to be performed from a barge as previously done.

PREP. BY ___
CHKD. BY ACM

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR CREEK BANK (AND SEDIMENT) STABILIZATION VIA PLACEMENT OF 8" FABRIFORM MAT

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
SITE PREPARATION				
Clear & Grub Creek Bank	LF	190	$375.00	$71,250
STABILIZATION				
Subgrade Prep.	LF	190	$485.00	$92,150
FABRIFORM purchase/install	SF	19215	$5.00	$96,075
Remove/Replace Fence	LF	70	$35.00	$2,450
SUBTOTAL				$261,925
ENGINEERING & CONTINGENCY @ 35%				$91,674
TOTAL				$353,599

Note:
1. Cost for clearing and grubing remaining portion of creek bank assumes no stump removal. Debris above ground cut and disposed of in sanitary landfill.

PREP BY ·ЛС

CHKD. BY ACM

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR EXCAVATION AND OFF-SITE INCINERATION OF CREEK BANK
WITHOUT DEWATERING BEHIND SHEETPILING

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED TOTAL
EXCAVATION				
Install Sheetpiling	LF	355	$1,515.00	$537,825
Remove/Replace fence	LF	70	$35.00	$2,450
Dispose Rip-Rap	lb	650000	$0.15	$97,500
Silt Curtain	SF	5400	$3.00	$16,200
Wipe Sample Rip-Rap	LS	1	$5,000.00	$5,000
Barge-Mounted Clamshell				
Mob/Demob.	LS	1	$45,000.00	$45,000
Excavation	CY	650	$30.00	$19,500
Soil Excavation	CY	1315	$27.00	$35,505
Haul/Incinerate Dried Soil/Sediment	CY	1965	$3,000.00	$5,895,000
Replace Excavated Soil	CY	1315	$13.00	$17,095
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	550000	$0.21	$115,500
SETTLING TANKS				
Construction of Tanks	LS	1	$136,000	$136,000
TEMP. HAUL ACCESS ROAD				
Construction of Road	LS	1	$450,000	$450,000
SUBTOTAL				$7,372,575
ENGINEERING & CONTINGENCY				$500,000
TOTAL				$7,872,575

Note:

1. Sheetpiling and haul road costs provided by Hartman Engineering.

2. Water treatment assumes return of clean water to Ellicott Creek.

PREP. BY ____
CHKD. BY ____

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR EXCAVATION AND OFF-SITE DISPOSAL OF CREEK BANK
WITHOUT DEWATERING BEHIND SHEETPILING

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED TOTAL
EXCAVATION				
Install Sheetpiling	LF	355	$1,515.00	$537,825
Remove/Replace fence	LF	70	$35.00	$2,450
Dispose Rip-Rap	lb	650000	$0.15	$97,500
Silt Curtain	SF	5400	$3.00	$16,200
Wipe Sample Rip-Rap	LS	1	$5,000.00	$5,000
Barge-Mounted Clamshell				
Mob/Demob.	LS	1	$45,000.00	$45,000
Excavation	CY	650	$30.00	$19,500
Soil Excavation	CY	1315	$27.00	$35,505
Haul/Dispose Dried Soil/Sediment	CY	1965	$360.00	$707,400
Replace Excavated Soil	CY	1315	$13.00	$17,095
WATER TREATMENT				
Filtration, Activated Carbon Treat.	GAL	550000	$0.21	$115,500
SETTLING TANKS				
Construction of Tanks	LS	1	$136,000	$136,000
TEMP. HAUL ACCESS ROAD				
Construction of Road	LS	1	$450,000	$450,000
SUBTOTAL				$2,184,975
ENGINEERING & CONTINGENCY				$500,000
TOTAL				$2,684,975

Note:

1. Sheetpiling and haul road costs provided by Hartman Engineering.

2. Water treatment assumes return of clean water to Ellicott Creek.

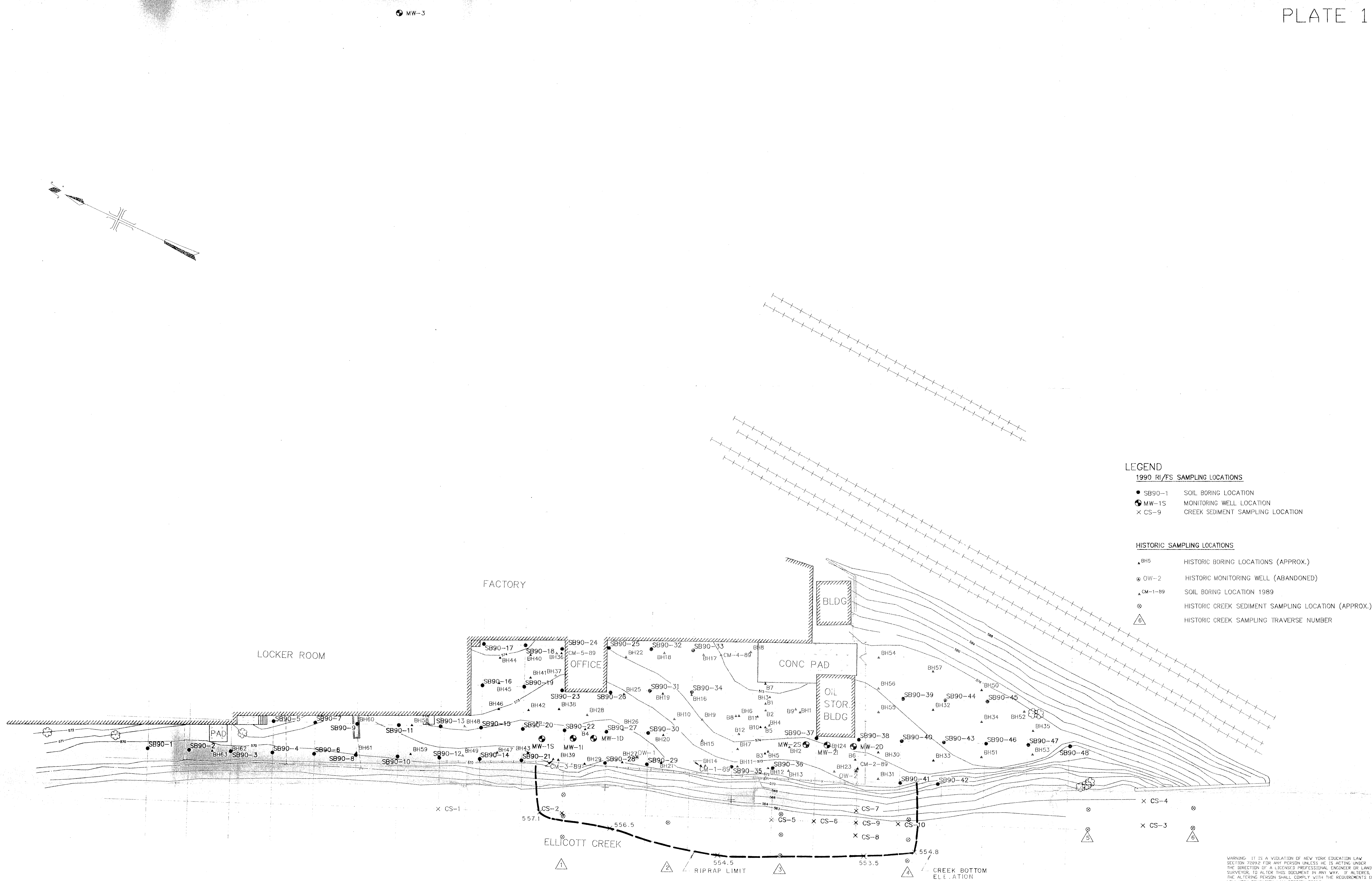
PREP. BY ___
CHKD. BY ___

COLUMBUS McKINNON
REMEDIAL ALTERNATIVES PRELIMINARY SCREENING
COST ESTIMATE FOR CREEK BANK O&M AND PRESENT WORTH

ITEM/MATERIAL	UNITS	QUANTITY	UNIT COST	ESTIMATED COST
EXTEND IRM				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	days	2	$35	$70
Repair Work	CY	2	$250	$500
Report Labor	hours	16	$55	$880
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$4,490
30 YR PW for above				$50,548
Capital Cost				$292,000
TOTAL PRESENT WORTH				$342,548
NO ACTION				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	days	2	$35	$70
Repair Work	CY	2	$250	$500
Report Labor	hours	16	$55	$880
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$4,490
30 YR PW for above				$50,548
Capital Cost				$0
TOTAL PRESENT WORTH				$50,548
REVETMENT FABRIC				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	days	2	$35	$70
Repair Work	SF	3	$500	$1,500
Report Labor	hours	16	$55	$880
ANNUAL COST				$4,210
30 YR PW for above				$47,395
Capital Cost				$354,000
TOTAL PRESENT WORTH				$401,395
EXCAVATE/DISPOSE				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	days	2	$35	$70
Repair Work	SF	3	$500	$1,500
Report Labor	hours	16	$55	$880
ANNUAL COST				$4,210
30 YR PW for above				$47,395
Capital Cost				$2,685,000
TOTAL PRESENT WORTH				$2,732,395
EXCAVATE/INCINERATE				
Inspection Labor	hours	16	$110	$1,760
Boat Rental	days	2	$35	$70
Repair Work	SF	3	$500	$1,500
Report Labor	hours	16	$55	$880
1/5 CERCLA 5 year report	hours	16	$80	$1,280
ANNUAL COST				$5,490
30 YR PW for above				$61,805
Capital Cost				$7,873,000
TOTAL PRESENT WORTH				$7,934,805

Note: PW assumes PW factor of 11.2578 at 8% interest over 30 years

PLATE 1



MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

DES J.C.S.
DWN A.R.A.
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK
REMEDIAL
INVESTIGATION/FEASIBILITY STUDY

COLUMBUS McKINNON CORPORATION
PARTIAL SITE PLAN AND
SAMPLING LOCATIONS
SCALE 1"=20.0'

MALCOLM PIRNIE, INC.
DATE SEPTEMBER 1991
SHEET ___ OF ___
DWG. NO. 1332X-91.001-0

AIGNER : MARKETING\COLOPL1 SCALE: 1:240 01/24, 1991 at 13:32

PLATE 2

NOTES

1 THE SITE PLAN WAS DEVELOPED FOR REFERENCE PURPOSES ONLY AND DOES NOT REPRESENT A LEGAL SURVEY.

2 THE IRM AREA OF THE COLUMBUS McKINNON SITE PLAN WAS PREPARED FROM INSTRUMENT SURVEY DATA OBTAINED BY MALCOLM PIRNIE, INC.

3 THE REMAINING SITE PLAN WAS DEVELOPED FROM SITE PLAN INFORMATION PROVIDED BY COLUMBUS McKINNON DATED 5/79. THE COLUMBUS McKINNON SUPPLIED SITE PLAN WAS DEVELOPED FROM INFORMATION TRANSFERRED FROM THE FOLLOWING:
- UNDATED CITY OF TONAWANDA MAPS NOS. 19 & 39;
- FACTORY INSURANCE ASSOCIATION MAP NO. E-2341 DATED 10/11/73; AND
- A SITE SURVEY BY STRALEY CIVIL ENGINEERS, BUFFALO, NEW YORK DATED 11/27/17.

4 ELLICOTT CREEK CHANNEL AND BANK CONTOURS WERE DEVELOPED FROM INSTRUMENT SURVEY DATA OBTAINED BY MALCOLM PIRNIE, INC. ON 9/18/91 AND 9/19/91.

5 THE COLUMBUS McKINNON SITE PLAN WAS AUGMENTED BY ADDITIONAL INFORMATION OBTAINED 10/23/91 TO INDICATE CURRENT SITE FEATURES AND NEIGHBORING PROPERTIES.

6 THE WATER SURFACE ELEVATION INDICATED ALONG ELLICOTT CREEK IS BASED ON THE AVERAGE OF THREE WATER SURFACE ELEVATIONS OBTAINED BY MALCOLM PIRNIE, INC.

7 THE 10 YEAR AMD 100 YEAR FLOOD STAGE ELEVATIONS IN THE VINCINITY OF THE SITE ARE EL. 570.5 AND EL. 571.6, RESPECTIVELY.

MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

DES EWM
DWN GJS
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK

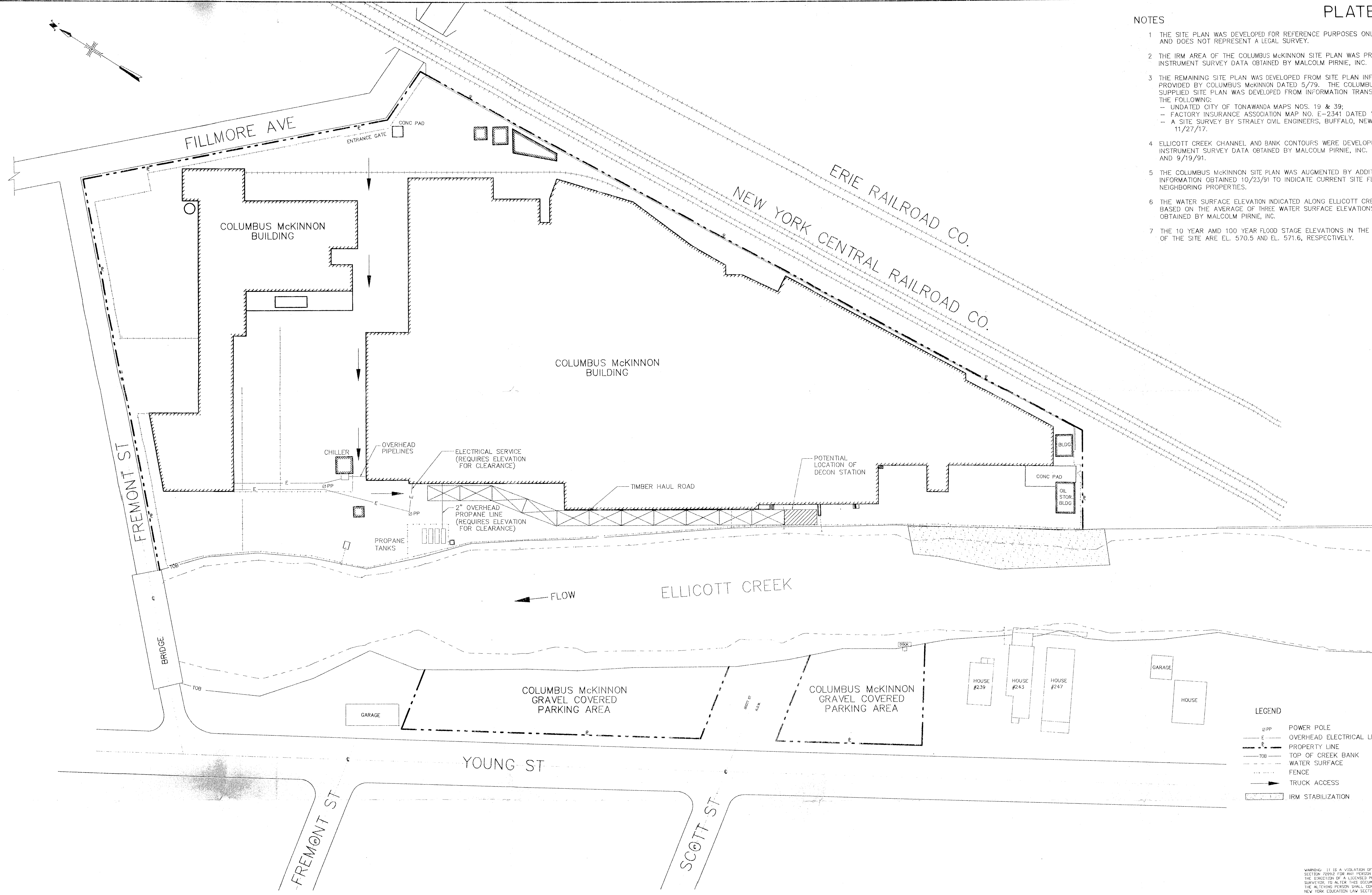
ENGINEERING FEASIBILITY STUDY

TONAWANDA FACILITY
SITE PLAN

SCALE: 1" = 40'-0"

MALCOLM PIRNIE, INC.
DATE NOVEMBER 1991
SHEET ____ OF ____
DWG. NO. 1332X-91.001-0

PLATE 3



NOTES

1. THE SITE PLAN WAS DEVELOPED FOR REFERENCE PURPOSES ONLY AND DOES NOT REPRESENT A LEGAL SURVEY.
2. THE IRM AREA OF THE COLUMBUS McKINNON SITE PLAN WAS PREPARED FROM INSTRUMENT SURVEY DATA OBTAINED BY MALCOLM PIRNIE, INC.
3. THE REMAINING SITE PLAN WAS DEVELOPED FROM SITE PLAN INFORMATION PROVIDED BY COLUMBUS McKINNON DATED 5/79. THE COLUMBUS McKINNON SUPPLIED SITE PLAN WAS DEVELOPED FROM INFORMATION TRANSFERRED FROM THE FOLLOWING:
   - UNDATED CITY OF TONAWANDA MAPS NOS. 19 & 39;
   - FACTORY INSURANCE ASSOCIATION MAP NO. E-2341 DATED 10/11/73; AND
   - A SITE SURVEY BY STRALEY CIVIL ENGINEERS, BUFFALO, NEW YORK DATED 11/27/17.
4. ELLICOTT CREEK CHANNEL AND BANK CONTOURS WERE DEVELOPED FROM INSTRUMENT SURVEY DATA OBTAINED BY MALCOLM PIRNIE, INC. ON 9/18/91 AND 9/19/91.
5. THE COLUMBUS McKINNON SITE PLAN WAS AUGMENTED BY ADDITIONAL INFORMATION OBTAINED 10/23/91 TO INDICATE CURRENT SITE FEATURES AND NEIGHBORING PROPERTIES.
6. THE WATER SURFACE ELEVATION INDICATED ALONG ELLICOTT CREEK IS BASED ON THE AVERAGE OF THREE WATER SURFACE ELEVATIONS OBTAINED BY MALCOLM PIRNIE, INC.
7. THE 10 YEAR AMD 100 YEAR FLOOD STAGE ELEVATIONS IN THE VINCINITY OF THE SITE ARE EL. 570.5 AND EL. 571.6, RESPECTIVELY.

LEGEND

- ØPP POWER POLE
- E OVERHEAD ELECTRICAL LINES
- P PROPERTY LINE
- TOB TOP OF CREEK BANK
- WATER SURFACE
- FENCE
- TRUCK ACCESS
- IRM STABILIZATION

MALCOLM PIRNIE

REVISIONS

NO.	BY	DATE	REMARKS

DES EWM
DWN GJS
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK

ENGINEERING FEASIBILITY STUDY

TONAWANDA FACILITY

LAYOUT OF TEMPORARY HAUL ACESS ROAD

SCALE: 1" = 40'-0"

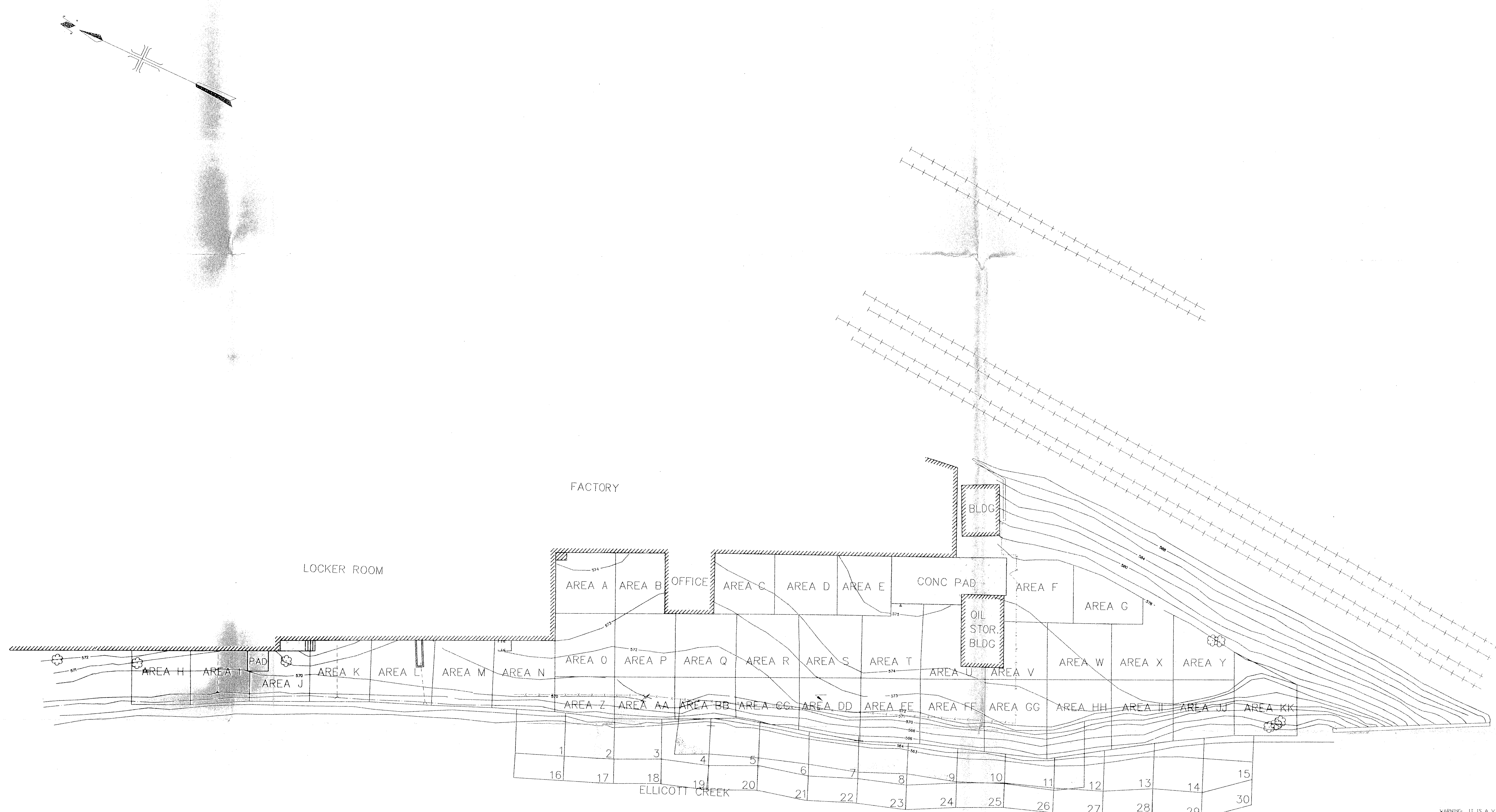
MALCOLM PIRNIE, INC.

DATE NOVEMBER 1991

SHEET ____ OF ____

DWG. NO. 1332X-91.001-0

PLATE 4



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MALCOLM PIRNIE

REVISIONS

NO.	BY	DATE	REMARKS

DES J.C.S.
DWN A.R.A.
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK
REMEDIAL
INVESTIGATION/FEASIBILITY STUDY

COLUMBUS McKINNON CORPORATION

EXCAVATION GRID

SCALE 1"=20.0'

MALCOLM PIRNIE, INC.

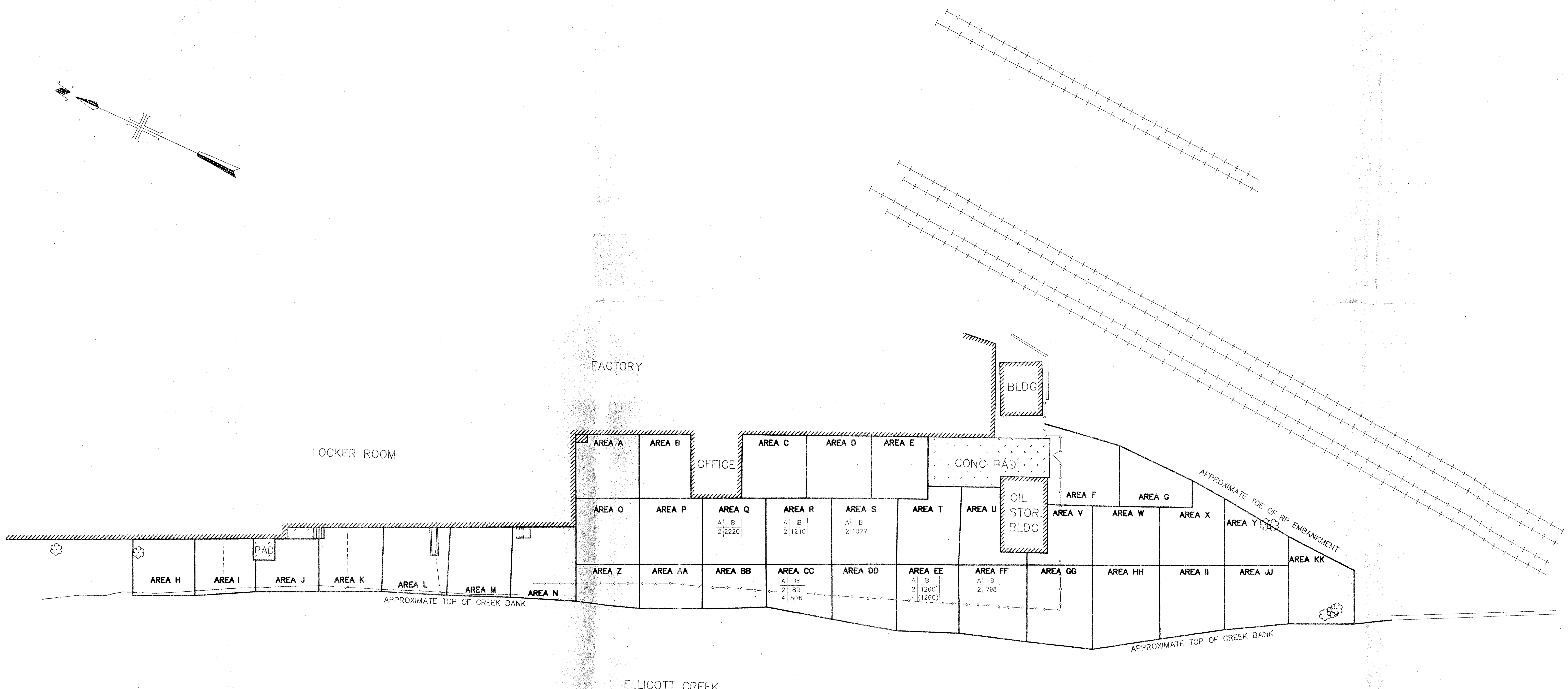
DATE JANUARY 1991

SHEET ___ OF ______

DWG. NO. 1332X-91.001-0

AIGNER : MARKETING\COL01PL1 SCALE: 1:240: 01/24, 1991 at 13:32

PLATE 5



LEGEND

A DEPTH (BELOW GROUND SURFACE) OF PCB CONTAMINATION ABOVE 500 mg/kg (FT)
B PCB CONCENTRATION (mg/kg)
(1260) INFERRED CONCENTRATION BASED ON LACK OF SAMPLE DATA

MALCOLM PIRNIE

REVISIONS

NO.	BY	DATE	REMARKS

DES ___TF___
DWN ___GJS___
CKD ________

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK
REMEDIAL
INVESTIGATION/FEASIBILITY STUDY

SUMMARY OF LOCATION AND CONCENTRATION OF PRINCIPAL THREAT PCB CONTAMINATION
SCALE 1"=20.0'

MALCOLM PIRNIE, INC.
DATE __DECEMBER 1991___
SHEET ___ OF ______
DWG. NO. 1332X-91.001-0

1332011159 : \COLO\PL5 SCALE: 1:240 12/04/1991 at 13:41

PLATE 6

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MALCOLM PIRNIE

REVISIONS

NO.	BY	DATE	REMARKS

DES TF
DWN GJS
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK
REMEDIAL
INVESTIGATION/FEASIBILITY STUDY

SUMMARY OF PCB CONCENTRATION AND DEGREE OF EXCAVATION:
UNSTABILIZED EXCAVATION (NO SHEET PILING)
PCB CLEANUP LEVEL = 10 mg/kg
SCALE 1"=20.0'

MALCOLM PIRNIE, INC.
DATE NOVEMBER 1991
SHEET ___ OF ___
DWG. NO. 1332X-91.001-0

1332011159 : \COLOPL3 SCALE: 1:240 11/13/1991 at 13:24

LEGEND

- A DEPTH OF DETECTABLE PCB CONTAMINATION (FT)
- B PCB CONCENTRATION (mg/kg)
- C DEGREE OF EXCAVATION
- ■ TOTAL
- ◪ PARTIAL
- □ NONE

MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

DES TF
DWN GJS
CKD

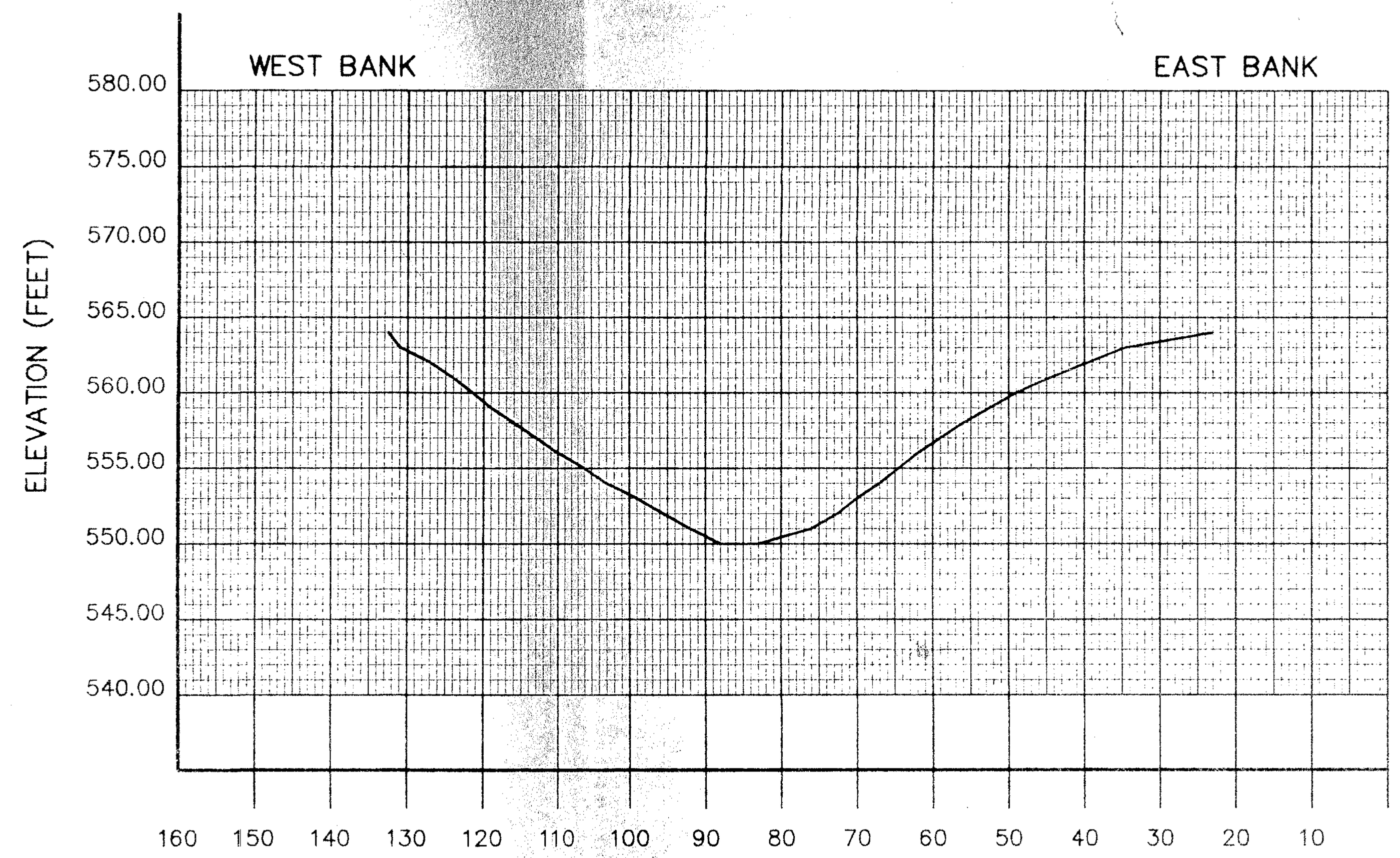
COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK
REMEDIAL
INVESTIGATION/FEASIBILITY STUDY

SUMMARY OF PCB CONCENTRATION AND DEGREE OF EXCAVATION:
UNSTABILIZED EXCAVATION (NO SHEET PILING)
PCB CLEANUP LEVEL = 25 mg/kg
SCALE 1"=20.0'

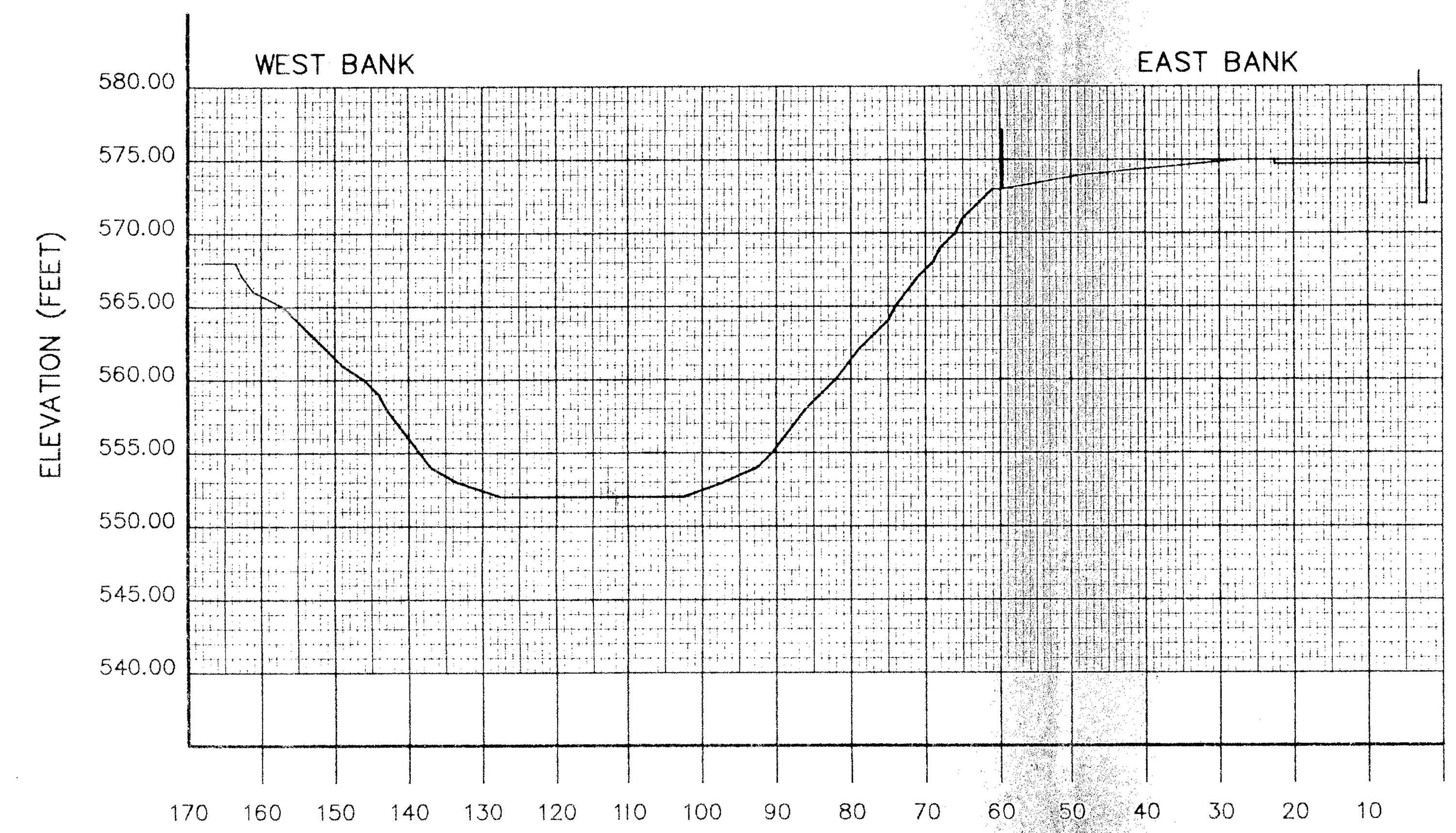
MALCOLM PIRNIE, INC.
DATE NOVEMBER 1991
SHEET ___ OF ___
DWG. NO. 1332X-91.001-0

1332011159 : \COL01PL4 SCALE: 1:240 11/13, 1991 at 13:33

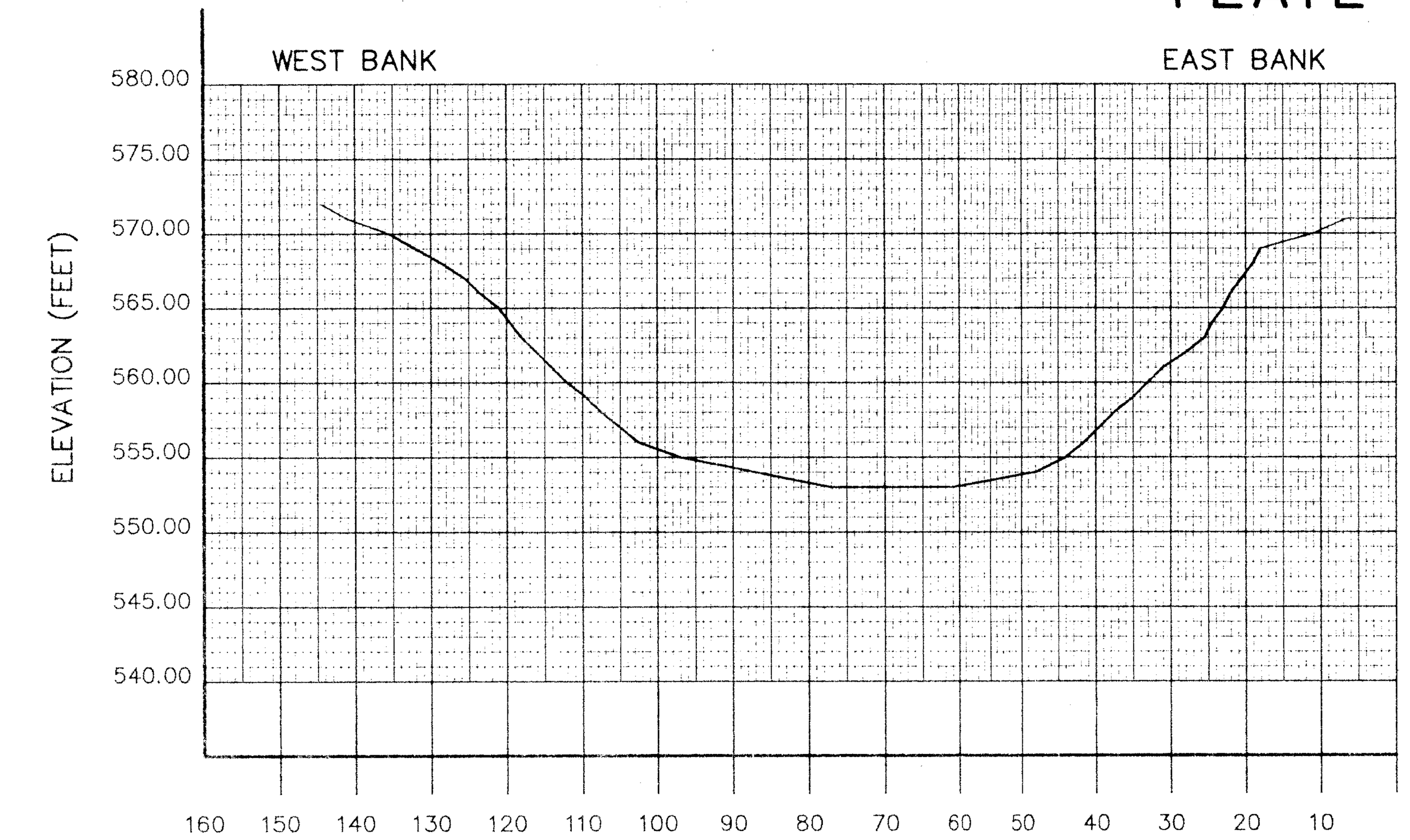
PLATE 8



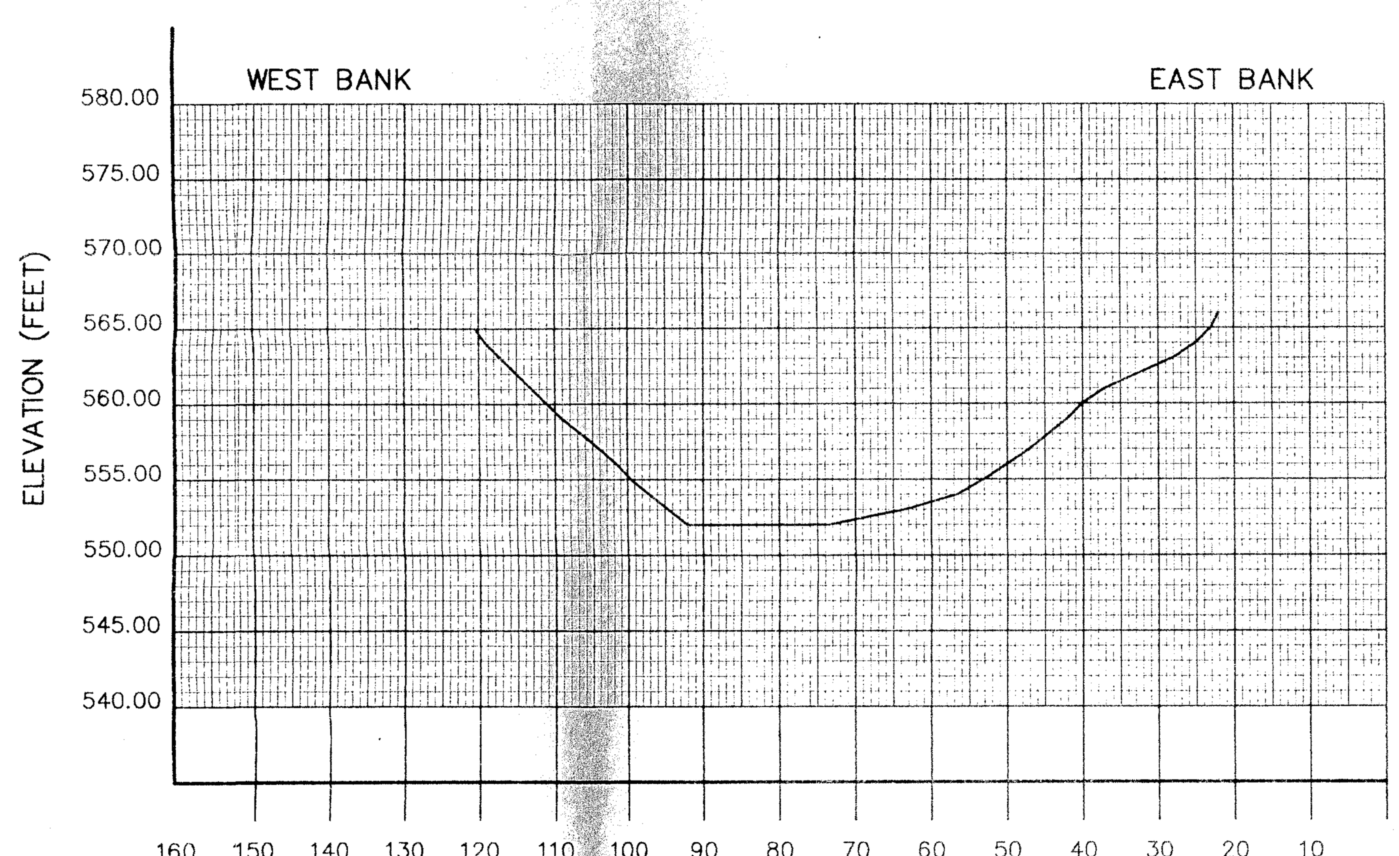
STA. 01



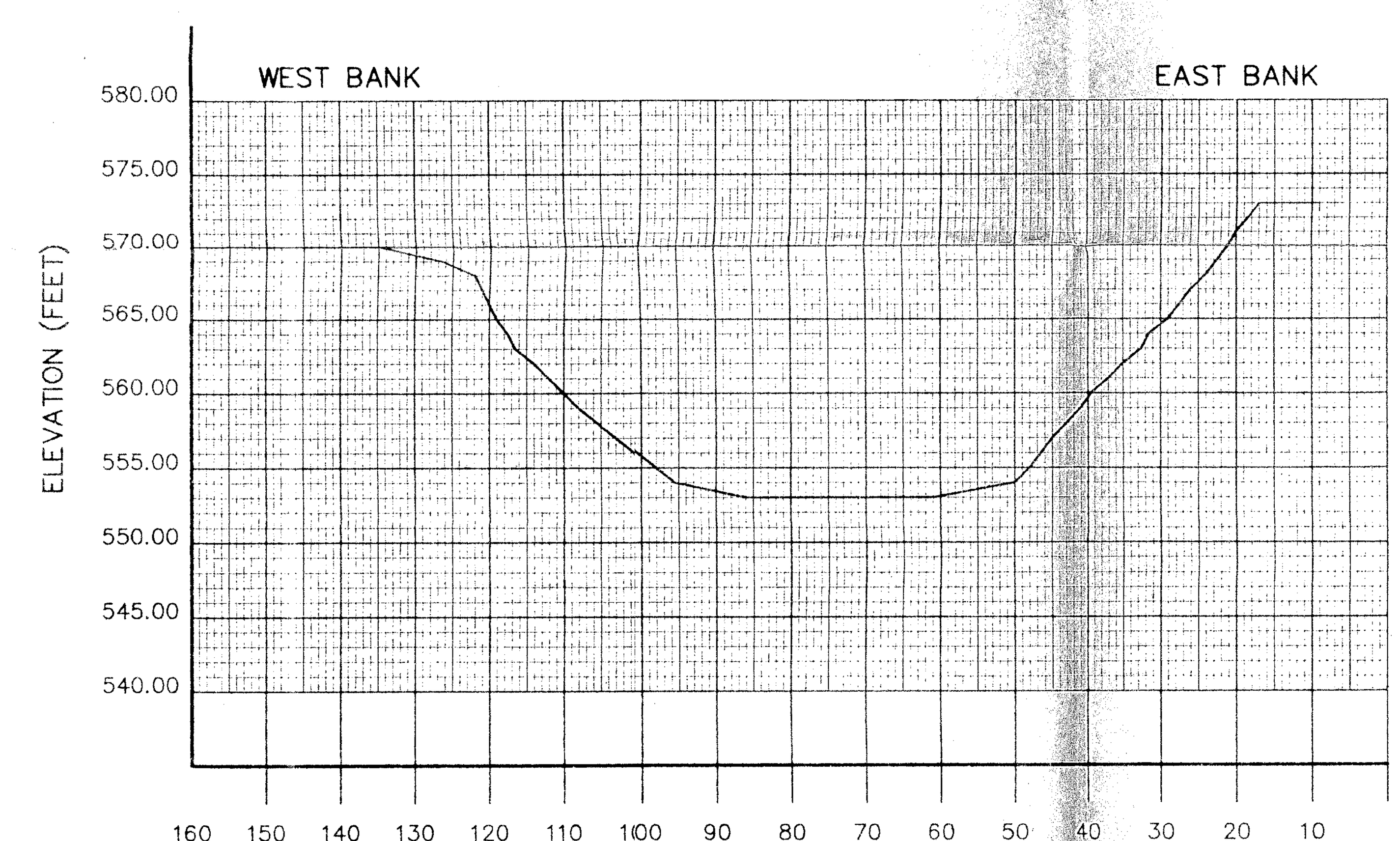
STA. 04



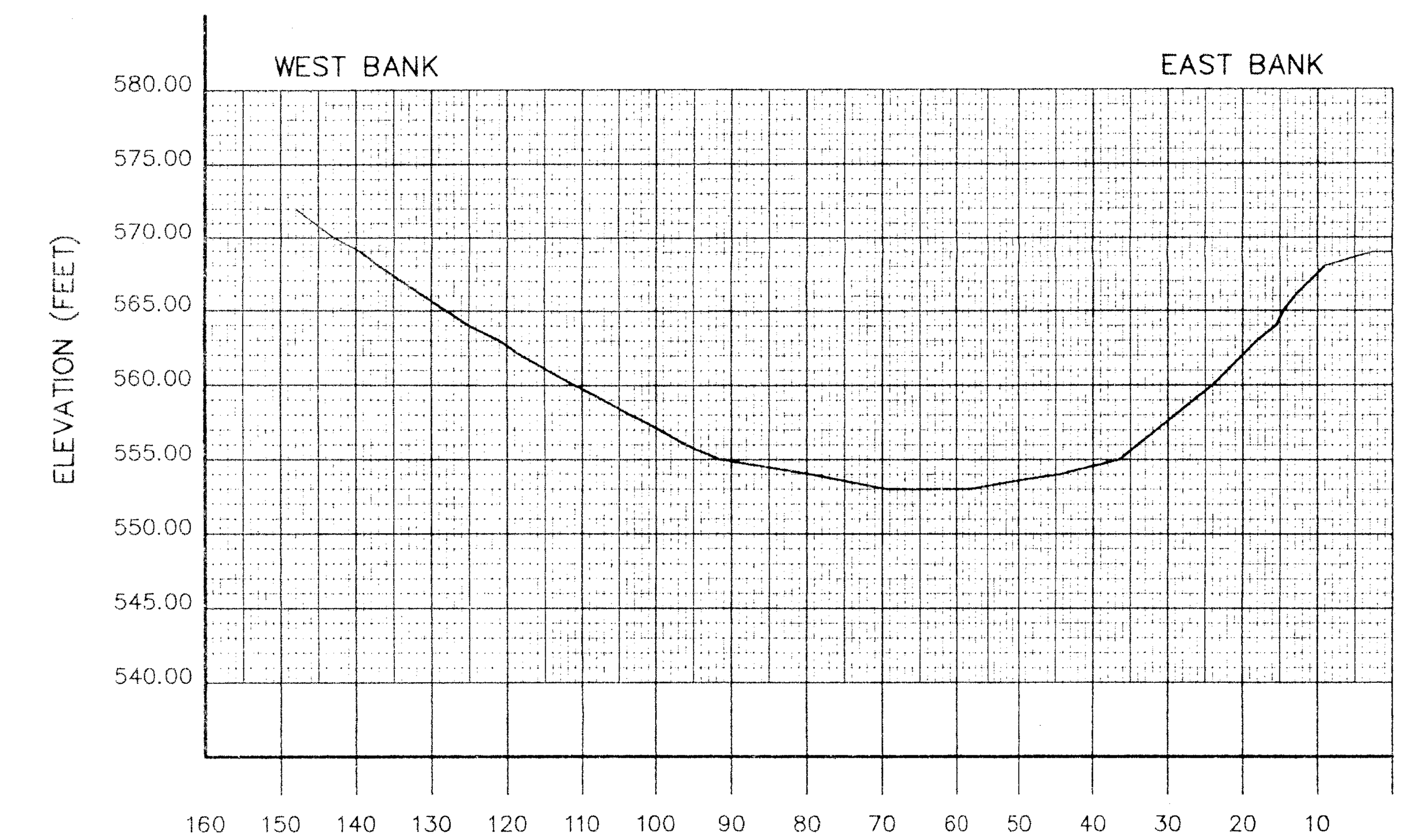
STA. 07



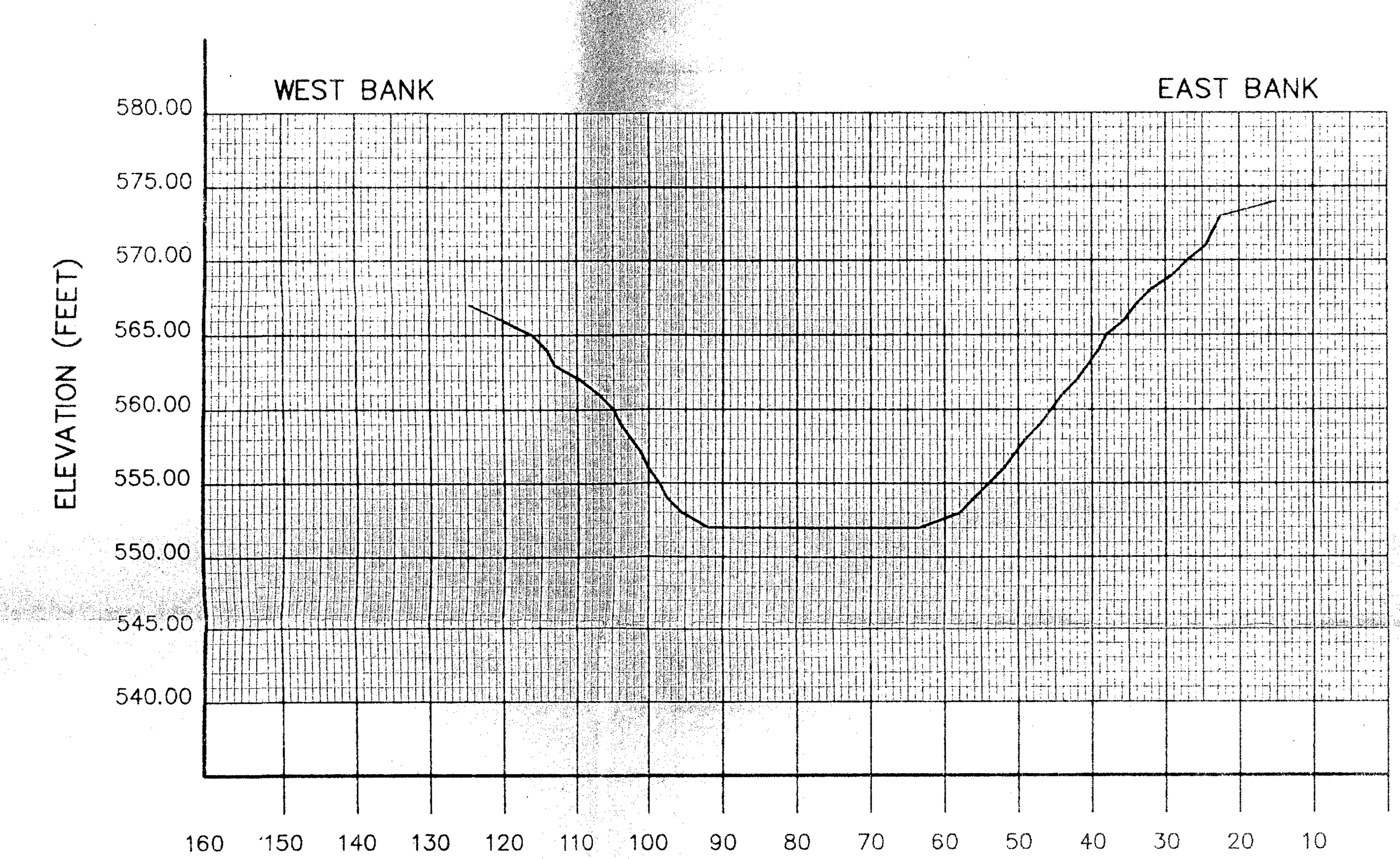
STA. 02



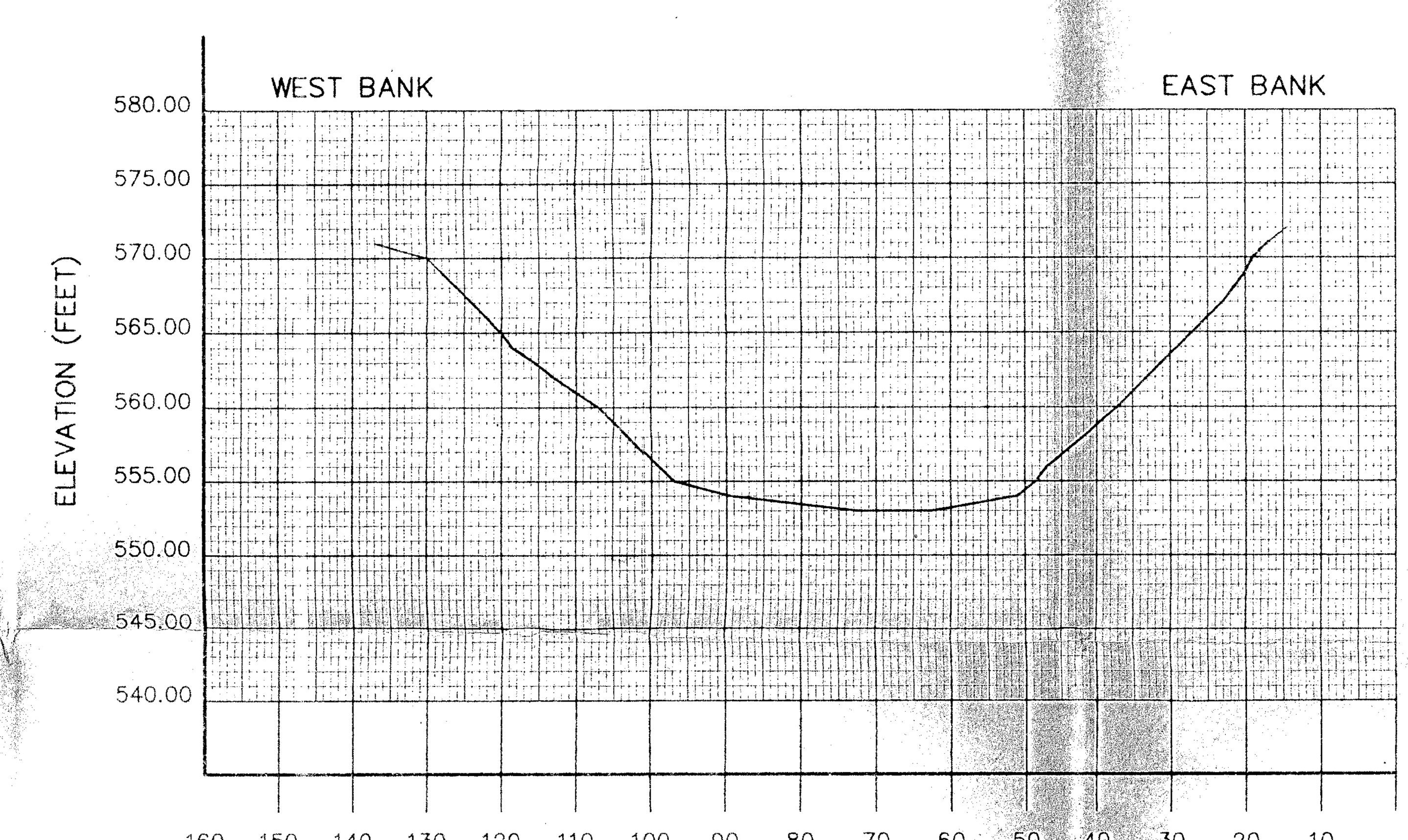
STA. 05



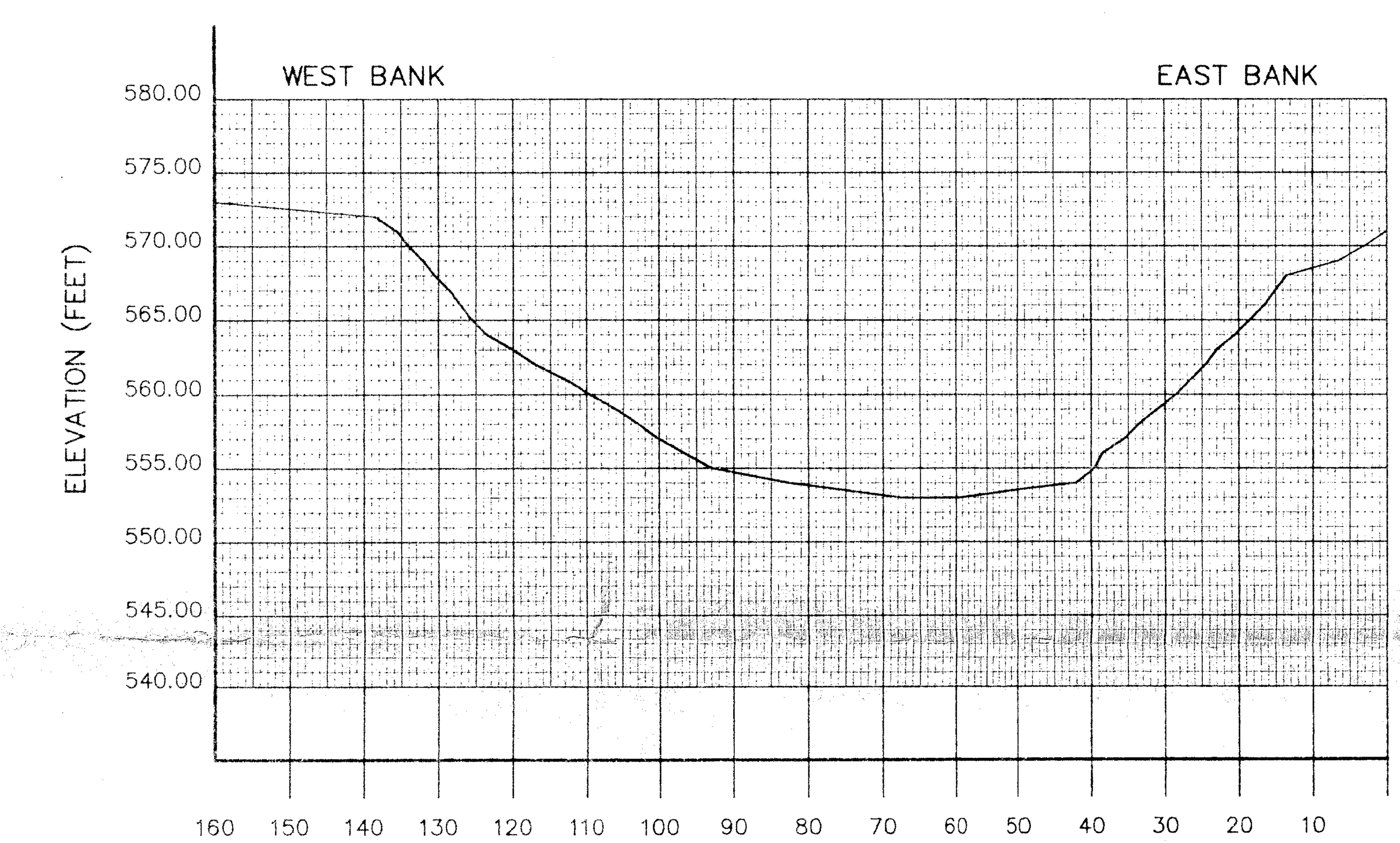
STA. 08



STA. 03



STA. 06



STA. 09

MALCOLM PIRNIE

REVISIONS			
NO.	BY	DATE	REMARKS

DES EWM
DWN GJS
CKD

COLUMBUS McKINNON CORPORATION
TONAWANDA, NEW YORK

ENGINEERING FEASIBILITY STUDY

TONAWANDA FACILITY
CROSS SECTIONS
STATIONS 01 – 09
SCALE: H 1"=20' ; V 1"=10'

MALCOLM PIRNIE, INC.
DATE NOVEMBER 1991
SHEET __ OF __
DWG. NO.

\COL01CSA SCALE: 1:1 11/08, 1991 at 15:56