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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

General Motors Corporation - Central Foundry Division Site
Massena, St. Lawrence County, New York

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the General Motors - Central Foundry Division Superfund Site, in Massena, New York, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the first operable unit remedy for this Site.

The New York State Department of Environmental Conservation (NYSDEC) and the St. Regis Mohawk Tribe concur on the selected remedy. Letters of concurrence from NYSDEC and the St. Regis Mohawk Tribe are appended to this document.

The information supporting this remedial action decision is contained in the Administrative Record for this Site.

ASSESSMENT OF THE SITE

Certain actual or threatened releases of hazardous substances at or from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This action or "operable unit" is the first of two operable units that are planned for the Site. This operable unit addresses several of the principal threats at the Site by treating contaminated river system sediments and sludges, soil, and groundwater at the Site. The second operable unit will address the threats resulting from the East Disposal Area and the Industrial Landfill at the Site.

The major components of the selected remedy include:

- Dredging and excavation of sediments and soils from polychlorinated biphenyl (PCB) contaminated areas in the St. Lawrence and Raquette Rivers, Turtle Creek, and associated riverbanks and wetlands;

- Interim surface runoff control to prevent migration of contamination from the East Disposal Area;

- Excavation of PCB contaminated sludges, soil, and debris in the North Disposal Area, in and around the four Industrial Lagoons, and in other areas on General Motors (G.M.) property (two of the four lagoons, which are currently in use by G.M., will be remediated when they are taken out of service);

- Excavation of PCB contaminated soil on St. Regis Mohawk Reservation land adjacent to the G.M. facility;

- Recovery and treatment of groundwater downgradient from the Site with discharge of treated groundwater to the St. Lawrence River; and

- Treatment of dredged/excavated material by either biological treatment (or another innovative treatment technology which has been demonstrated to achieve site treatment goals) or thermal destruction to be determined by the U. S. Environmental Protection Agency (EPA) following treatability testing. Treatment residuals will be disposed on-site. Other innovative PCB treatment technologies will be tested concurrently with biological treatment so that EPA will have additional information in the event that biological treatment proves to be unsatisfactory for treatment of any Site material. EPA will select the treatment technologies to be employed, in consultation with NYSDEC and the St. Regis Mohawk Tribe.

DECLARATION

The selected remedy is protective of human health and the environment, complies with Federal, State and Tribal requirements that are legally applicable or relevant and appropriate to the remedial action (or provides grounds for invoking a waiver of these requirements), and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels in the active Industrial Lagoons until they are taken out of service, a review will be conducted within at least five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Constantine Sidamon-Eristoff
Regional Administrator
U. S. Environmental Protection Agency

December 17, 1990
Date

ROD FACT SHEET

SITE

Name: General Motors - Central Foundry Division (second operable unit)

Location: Massena, St. Lawrence County, New York

HRS Score: Group 5

NPL Rank: 350

EPA Contact: Lisa Carson, (212) 264-6857

ROD

Date Signed: 3/31/92

Remedy: Excavation and treatment of sludge, visibly oily soil, and highly contaminated soil in the East Disposal Area; in-place containment of less contaminated soils and control of groundwater in the East Disposal Area through the use of a composite cap and a slurry wall, and; recontouring and regrading followed by containment of contaminated material and groundwater control in the Industrial Landfill through the use of a composite cap and slurry wall.

Capital Cost: $ 28,000,000 - $ 42,000,000 (Costs will depend on the type of treatment technology used at the Site. Costs range from $ 28 million for solidification to $ 42 million for incineration.)

O & M/Year: $ 567,000 (years 1 and 2); $200,000 (year 3 - 30)

Present Worth: $ 31,000,000 - 45,000,000

LEAD

Potentially Responsible Party

Main PRP: General Motors Corporation

WASTE

Type: PCBs

Media: Sediments, soil, sludges, and groundwater

Origin: On-site disposal of PCBs used in hydraulic fluids

Est. Quantity: Approximately 598,000 cubic yards of PCB contaminated material addressed in this ROD

DECISION SUMMARY

GENERAL MOTORS - CENTRAL FOUNDRY DIVISION SITE

MASSENA, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

NEW YORK

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SITE NAME, LOCATION, AND DESCRIPTION

The General Motors - Central Foundry Division (G.M.) Site is located on Rooseveltown Road in St. Lawrence County in Massena, New York. The Site consists of several waste areas at an active G.M. manufacturing facility along with contaminated soils on G.M.'s property and on the St. Regis Mohawk Reservation, contaminated sediments in the St. Lawrence and Raquette Rivers and in Turtle Creek, associated riverbanks and wetlands, and contaminated groundwater. Because the Mohawk people have a cultural and spiritual link to the St. Lawrence region, which they call Akwesasne, special consideration must be given to Native American concerns in evaluating and remediating the Site.

The G.M. facility is bordered on the north by the St. Lawrence River, on the east by the St. Regis Mohawk Indian Reservation, on the south by the Raquette River and on the west by the Reynolds Metals Company and property owned by Conrail (see Figure 1). Land use in the area surrounding the Site consists of mixed residential and industrial uses. The Reynolds Metals Company facility and another facility west of the Site owned by the Aluminum Company of America are presently under investigation by the U. S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The nearest residence is located on the St. Regis Mohawk Indian Reservation approximately 300 feet from the G.M. facility boundary. St. Lawrence River flows are partially controlled by the Moses-Saunders Power Dam, located approximately four miles upstream from the Site.

The G.M. facility consists of approximately 270 acres of industrial and undeveloped land. Wetlands lie east of the facility in the area surrounding Turtle Creek. There are no federally listed endangered or threatened species known to inhabit the St. Lawrence River. However, the River does support a number of New York State listed endangered, threatened and special concern fish species. The River and adjacent habitats also provide nesting for a variety of water birds and shorebirds. Federally listed endangered falcons and bald eagles have been reported in the Massena area.

The Site, as defined by EPA, consists of several major areas which are depicted schematically in Figure 2. The North and East Disposal Areas and the Industrial Landfill contain soil, debris, and sludge. The four unlined Industrial Lagoons contain liquids, sludges, and solids and are referred to as the 350,000 gallon, 500,000 gallon, 1.5 million gallon and 10 million gallon lagoons. The Site also includes contaminated sediments, riverbanks, and associated wetlands of the St. Lawrence River, the Raquette River and Turtle Creek (formerly called the unnamed tributary on the St. Regis Mohawk Reservation), contaminated soil on the St. Regis Mohawk Indian Reservation, contaminated soil on G.M. property not associated with the specific disposal areas already mentioned, and contaminated groundwater.

Groundwater flow generally reflects surface topography and flows north toward the St. Lawrence River and northeast to Turtle Creek. Turtle Creek and the adjacent wetlands serve as discharge areas for shallow groundwater flow. There is also some limited shallow groundwater flow south toward the Raquette River. A few residents on Raquette Point rely on groundwater as a drinking water supply. The remainder of the Raquette Point residents obtain water from a public water supply system which has its intake in the St. Lawrence River at the mouth of the Raquette River, approximately 1.5 miles downriver from the G.M. facility.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

G.M. has operated an aluminum casting plant at the Site since 1959. Until 1980, polychlorinated biphenyls (PCBs) were a component of hydraulic fluids used in diecasting machines at the G.M. facility. PCBs provided protection against fire and thermal degradation in the high temperature environment of the diecasting machines. G.M. no longer uses the diecasting process at the facility.

In the early 1960's, wastewater containing PCB-laden oil passed through the 1.5 million gallon lagoon and then to the St. Lawrence River. In 1968-1969, a lined interceptor lagoon was added adjacent to the 1.5 million gallon lagoon. This lined lagoon was subsequently buried and is considered by EPA to be a part of the North Disposal Area. In 1976, a wastewater treatment system was installed at the plant. In that system, wastewater was sent to the 350,000 gallon lagoon for solids settling. Treated water was pumped to the 500,000 gallon and 10 million gallon lagoons for reuse as plant process water. Periodically, water was discharged to the St. Lawrence River from the 1.5 million gallon lagoon. The 1.5 million gallon lagoon was not used for settling after 1976; however, water passed through the 1.5 million gallon lagoon, which contained PCB sludges, prior to discharge to the St. Lawrence River after 1976. After further modifications to G.M.'s wastewater treatment process, the 350,000 gallon lagoon was taken out of service in 1980. All four lagoons are subject to regulation under the Toxic Substances Control Act (TSCA) because they were part of G.M.'s wastewater process after February 17, 1978, the date the TSCA PCB regulations became effective.

During operations, PCB laden sludge from the 1.5 million gallon lagoon and from the wastewater treatment plant was periodically removed to the North and East Disposal areas and to the Industrial Landfill. The Industrial Landfill has also received foundry sand, soil and concrete excavated during plant construction, diecasting machines, and solid industrial waste.

The Landfill was covered with an interim cap in 1988. The North Disposal Area also received construction debris, soil and tree stumps. The East Disposal Area contains soil and sludge along with construction debris. The North and East Disposal Areas and the Industrial Landfill were not lined.

In 1975, a berm surrounding the East Disposal Area was breached. Water and sludge flowed east to the St. Regis Mohawk Reservation and to Turtle Creek. Visible spill material was removed from the Reservation to G.M. property. In 1970, PCB contaminated soil excavated during plant expansion was placed on the north bank of the Raquette River. In addition, G.M. discharged surface water runoff to the Raquette River until 1989 under a State Pollution Discharge Elimination System (SPDES) permit.

The G.M. Site was placed on the Superfund National Priorities List ("NPL") in September 1983 as a result of G.M.'s past waste disposal practices. G.M. indicated a willingness to perform the Remedial Investigation and Feasibility Study (RI/FS) for the Site. On April 16, 1985, EPA and G.M. entered into an Administrative Order on Consent (Index No. II CERCLA-50201) for G.M.'s performance of the RI/FS. Draft and Phase II RI reports were submitted to EPA in May 1986 and May 1988, respectively.

G.M. performed additional river sampling in February 1989, and submitted a report on the additional sampling to EPA in May 1989. On June 9, 1989, EPA approved the RI report, which consists of the draft RI report, the Phase II RI report and the sediment sampling report, for the Site. The RI report delineated those areas in need of remediation throughout the Site. G.M. submitted the draft FS report to EPA in November 1989.

G.M. also entered into a 1985 Consent Order with EPA under the authority of TSCA. In addition to payment of penalties for failure to comply with certain TSCA regulations, G.M. agreed to close an abandoned pump house on-site.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The FS and Proposed Plan for the G.M. Site were released to the public in March 1990. These documents, along with the RI, were made available to the public in information repositories maintained at EPA Region II offices in New York city, at the Massena Public Library, and at the St. Regis Mohawk Tribal Building. The notice of availability of these documents was published in the Massena Daily Courier-Observer on March 21, 1990. A public comment period was held from March 21, 1990 through June 18, 1990. The public comment period was extended once upon the request of the St. Regis Mohawk Tribe.

A public meeting was held on April 25, 1990. At this meeting, representatives from EPA answered questions and received comments on EPA's Proposed Plan and the other remedial alternatives under consideration. In addition, a public availability session was held in Massena on April 26, 1990. The public availability session was an additional informal opportunity for the public to ask questions or comment on EPA's Proposed Plan. On May 9, 1990, EPA met with representatives of the Public Advisory Committee (PAC) in Cornwall, Ontario, Canada to receive the PAC's comments on EPA's Proposed Plan.

A response to comments received during the public comment period is included in the Responsiveness Summary which is part of this Record of Decision (ROD). The Responsiveness Summary and ROD, along with the Administrative Record for the Site are available at the information repositories referenced above.

SCOPE AND ROLE OF RESPONSE ACTION

EPA has organized the work at the Site into two operable units. This ROD for operable unit one presents the selected remedy for the contaminated sediments, contaminated groundwater, soils on the G.M. facility and on the Reservation, and material in the Industrial Lagoons and the North Disposal Area at the Site. Operable unit two, which will be the subject of a separate ROD, will address the East Disposal Area and Industrial Landfill. Initially, a second operable unit was required so that EPA could reevaluate Industrial Landfill data and better factor community concerns into its decision-making process for the Industrial Landfill.

EPA has deferred its remedial decision for the East Disposal Area to the second operable unit in order to evaluate the impact and applicability of new EPA guidance on Superfund sites which are contaminated with PCBs ("Guidance on Remedial Actions for Superfund Sites with PCB Contamination," OSWER Directive 9355.4-01, August 1990). This guidance was issued following the public comment period for the G.M. Site and, while it does not affect the remedy selected in this ROD for other Site areas, it may affect EPA's remedy selection for the East Disposal Area and the Industrial Landfill. Specifically, this guidance recommends that, when considering cleanup of areas which contain large volumes of PCB contaminated material (like the East Disposal Area and the Industrial Landfill), a cleanup alternative which combines treatment of highly contaminated material with containment of less contaminated material be evaluated. EPA will evaluate such an alternative in the coming months and plans to issue a second operable ROD which addresses remediation of the East Disposal Area and the Industrial Landfill in early 1991. In order to expedite site cleanup, the second operable unit remedy for the East Disposal Area and the Industrial Landfill will be consistent with the remedy selected in this document.

The remediation of the entire G.M. Site will be complete only after EPA has selected and implemented remedial actions for both operable units. The final remediation of the Site is intended to address the entire Site with regard to the principal threats to human health and the environment posed by the Site. The findings of the Risk Assessment are summarized in a later section of this document.

SUMMARY OF SITE CHARACTERISTICS

Contaminant Characteristics

Based on sampling and analyses conducted during the RI/FS, there are four major contaminants at the G.M. Site - PCBs, polyaromatic hydrocarbons (PAHs), phenols and volatile organic compounds (VOCs). At the G.M. Site, PAHs, phenols, and VOCs were found at much lower concentrations and in fewer samples than PCBs. Therefore, the primary contaminant of concern at the Site is PCBs. In addition, any method of treatment selected for the Site will also treat PAHs, phenols, and VOCs. For these reasons, PCBs have, in most cases, driven the remedy selection at this Site, although EPA intends to address all contaminants during the cleanup of the Site.

PCBs tend to bioaccumulate in human and animal fatty tissue and are classified by EPA as probable human carcinogens. The major target organs of PCB exposure are the liver and skin. Occupational exposure to relatively high concentrations of PCBs have resulted in changes in blood levels of liver enzymes and skin effects such as chloracne. PCBs have produced liver tumors in laboratory studies of rats. In addition, PCBs cause adverse reproductive effects in laboratory animals at low levels and may cause similar results in humans.

Affected Media

This section summarizes the quantities and types of contamination found in each area of the Site under consideration for this operable unit. Table 1 summarizes the volume of contaminated soil, sludge, and sediments associated with various cleanup levels for the Site. Table 2 summarizes the types of contaminants and their concentrations in several areas of the Site.

Contaminated River and Creek Sediments

Over 62,000 cubic yards of contaminated river sediments and soil with PCB concentrations above 1 part per million (ppm) are located in and along the St. Lawrence River, Raquette River and Turtle Creek ("the river system"). The majority of the contaminated sediments are within the St. Lawrence River (currently estimated at 56,000 cubic yards). The area of the

Raquette River impacted by the Site includes a currently estimated 6,000 cubic yards of soil and sediments located on the northern bank of the River and in the river near the former G.M. outfall. There are additional soils and sediments in and around Turtle Creek which are contaminated with PCBs at levels above 0.1 ppm. These soils are not included in the estimated volume of sediments and soils given above and may significantly increase this estimate.

The highest PCB concentration detected in St. Lawrence River sediments is 5,700 ppm. The highest PCB concentrations detected in the Raquette River area and in Turtle Creek are 390 ppm and 48 ppm, respectively. PAHs were also detected in St. Lawrence River sediments adjacent to the G.M. facility at levels up to 8 ppm. In addition, NYSDEC has detected total PCB concentrations as high as 36 ppm in the Raquette River with at least four additional samples above 5 ppm PCBs.

<u>North Disposal Area, Contaminated Soil On the St. Regis Mohawk Reservation, Contaminated Soil On G.M. Property</u>

The North Disposal Area consists of approximately 51,000 cubic yards of soil, debris and sludge with PCB concentrations greater than 10 ppm. This area includes a buried interceptor lagoon located adjacent to the 1.5 million gallon lagoon. The highest PCB concentration detected in the North Disposal Area is 31,000 ppm. Phenols were detected in three North Disposal Area samples with a maximum phenol concentration of 5,000 ppm. Fifteen different VOCs were detected sporadically in North Disposal Area subsurface soil with maximum concentrations of perchloroethylene (PCE) at 800 parts per billion (ppb) and of vinyl chloride at 158 ppb.

There are approximately 15,000 cubic yards of soil on the St. Regis Mohawk Indian Reservation contaminated with PCBs at concentrations above 1 ppm. The highest PCB concentration detected on the Reservation during the RI/FS is 48 ppm. In addition, NYSDEC has detected total PCB concentrations as high as 3,101 ppm in Turtle Creek with at least four additional samples above 100 ppm PCBs. There are also approximately 34,000 cubic yards of soil in various areas on the G.M. property which are contaminated with PCBs at concentrations greater than 10 ppm.

Industrial Lagoons

The status of the lagoons and the volumes of lagoon material with PCB concentrations greater than 10 ppm are as follows:

Lagoon	Volume	Status
350,000 gallon	4,000 yd^3	Inactive
500,000 gallon	2,000 yd^3	Active
1.5 million gallon	16,000 yd^3	Inactive
10 million gallon	69,000 yd^3	Active
TOTAL	91,000 yd^3	

The highest PCB concentration detected in the lagoon sediments was 750 ppm (detected in the 1.5 million gallon lagoon). The highest PCB level detected in the 350,000 gallon lagoon was 700 ppm, while the highest PCB level detected in the 500,000 gallon lagoon was 383 ppm. The highest PCB level detected in the 10 million gallon lagoon was 300 ppm. The highest phenol concentration (detected in the 350,000 gallon lagoon) was 26,200 ppm. VOCs and metals were also detected at levels above background, with the highest levels generally detected in the 350,000 gallon lagoon.

The two inactive lagoons, the 350,000 gallon lagoon and the 1.5 million gallon lagoon, contain precipitation and process water from past plant operations. The two active lagoons, the 500,000 gallon lagoon and the 10 million gallon lagoon, contain treated process water which is reused daily in the G.M. process.

Groundwater

PCBs were detected at concentrations up to 1.3 ppm in groundwater associated with the Site. VOCs were also detected in some groundwater samples with maximum vinyl chloride, dichloroethylene, and trichloroethylene concentrations of 50 ppb, 686 ppb and 50 ppb, respectively. The highest levels of PCB and VOC contamination were detected in samples of groundwater downgradient of the Industrial Landfill.

Potential Routes of Migration and Exposure

Contamination may migrate from surface areas into groundwater, surface water, and off the G.M. facility. The volatilization of PCBs is also a potential route of exposure. PCBs carried in surface water runoff may migrate to the Reservation. In addition, PCBs in the river system may be ingested by aquatic organisms and begin to bioaccumulate within the food chain. Therefore, one potential pathway of human exposure is human consumption of PCBs in the fatty tissue of fish and wildlife.

SUMMARY OF SITE RISKS

The qualitative and quantitative information on risks to human health presented in this section is based on EPA's baseline risk assessment for the G.M. Site which, in turn, was based on the Superfund Public Health Evaluation Manual. Qualitative information on environmental risks is based on a recent study of contaminants in fish performed by NYSDEC and the St. Regis Mohawk Tribe and preliminary natural resource surveys performed by NYSDEC, the St. Regis Mohawk Tribe, the U.S. Department of the Interior, and the National Oceanic and Atmospheric Administration.

Contaminant Identification and Exposure Assessment

Because PCBs are the primary contaminant of concern at the G.M. Site, EPA's baseline risk assessment for the Site reviewed the human health risks resulting from exposure to PCBs in soils, sediments, and groundwater. The potential routes of human exposure to Site contamination are the ingestion of fish and wildlife containing PCBs, ingestion of drinking water (potential future exposure route), ingestion of and dermal contact with PCB contaminated soil, infant ingestion of breast milk, inhalation of dust, and dermal contact while swimming. Two potential exposure routes, inhalation of dust and dermal contact while swimming, were not evaluated quantitatively in EPA's risk assessment because these routes were expected to be relatively minor compared to the other routes of exposure considered for the Site. Exposed populations include the residents of the St. Regis Mohawk Indian Reservation, Canadians who are downriver of the Site, and G.M. workers.

A major assumption of the EPA risk assessment was that the Site would not be developed for residential uses. In addition, because the St. Regis Mohawk Indian Reservation contains the closest residential population to the Site, the St. Regis Mohawk Tribe was considered the exposed population for the purposes of calculating exposure assumptions in EPA's risk assessment. Table 3 presents the exposure assumptions and the exposures used by EPA in its baseline risk assessment.

Toxicity Assessment

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risks unlikely. CPFs are derived from the results of human epidemiological studies or chronic bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. The CPF value for PCBs is 7.7 $(mg/kg\text{-}day)^{-1}$. This value was calculated for the oral route of exposure but was used in EPA's risk assessment for all routes due to a lack of other CPF values.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The current RfD value for PCBs is 0.0001 mg/kg-day. EPA is in the process of reviewing the RfD for PCBs.

Human Health Risk Characterization

Excess lifetime cancer risks for the Site were determined by multiplying the intake levels (given in Table 3) with the CPF for PCBs, 7.7 $(mg/kg\text{-}day)^{-1}$. These risks are probabilities that are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that as a plausible upper bound, an individual has an additional one in one million chance of developing cancer as a result of site-related exposure to PCBs over a 70-year lifetime under the specific exposure conditions presented at the Site.

Table 4 presents a summary of the total carcinogenic risks and the carcinogenic risks posed by each exposure pathway for residents of the St. Regis Mohawk Tribe. It should be noted that the risks from ingestion of fish and wildlife are much greater than the risks associated with the other exposure pathways evaluated.

The potential risk of noncarcinogenic effects of PCBs in a single medium is expressed as the hazard index (HI) (or the ratio of the intake level for a given medium, given in Table 3, to the RfD for PCBs, 0.0001 mg/kg-day). The total HI was generated by adding the HIs across all media. The HI provides a useful reference point for gauging the potential significance of PCB exposures across all media.

Table 5 presents a summary of the total HI and the HIs posed by each exposure pathway for residents of the St.Regis Mohawk Tribe. Again, the noncarcinogenic effects associated with ingestion of fish and wildlife are much greater than the effects associated with the other pathways evaluated.

There were several uncertainties in EPA's risk assessment, which are primarily a result of assumptions made as part of the exposure assessment described above. For instance, data on the eating, hunting, and fishing habits of the Reservation population were based on a case study using an unstructured interview questionnaire of key informants rather than on a large-scale random sample statistical survey of the entire Reservation population. Data on fish and wildlife PCB concentrations were limited and were restricted to fish from waters near the Reservation. Historical data showing surface water contamination in the St. Lawrence River were used despite the fact that more recent data from the Reservation did not indicate PCB contamination. Standard uncertainties exist with respect to adult soil ingestion rates.

The estimation of health risks involves many uncertainties. Given these uncertainties, EPA used conservative assumptions (i.e., assumptions that protect human health) throughout its risk assessment. As a result, EPA's risk assessment provides an estimate of the risks to the Mohawk population from exposures that are reasonably expected to occur under current conditions and during and after remediation of the Site.

Environmental Risks

EPA, NYSDEC, the St. Regis Mohawk Tribe and Natural Resource Trustees are continuing to assess the risks posed to the environment by the Site. Ongoing studies by NYSDEC and the St. Regis Mohawk Tribe will assess the risks to wildlife posed by the Site.

NYSDEC and the St. Regis Mohawk Tribe, in a recent study of PCB concentrations in area fish reached the following conclusions:

- the river area adjacent to the G.M. Site is one principal PCB source area as reflected by concentrations in fish;

- relatively high concentrations of polychlorinated dibenzofurans (PCDFs) were present in fish from the mouth of Turtle Creek; and

- PCB, dioxin, and mercury exceeded the criteria for fish-eating wildlife in the study area.

Based on the currently available information, there are presently unquantified risks to the environment from the Site. This ROD may only partially address these risks. Given the presence of PCBs in the river system, New York State listed endangered, threatened and special concern fish species may be impacted by the Site. PCBs have been detected in area wildlife and in wetlands which provide habitat for water birds and other wildlife.

New York State, the St. Regis Mohawk Tribe, the U.S. Department of Commerce, and the U.S. Department of the Interior are each natural resource trustees pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) with trustee interests in the river system and environs as a result of the impacts noted in this ROD as well as other impacts to natural resources which have been observed. The trustees are currently in the preliminary stages of the natural resource damage assessment process.

Risk Summary

Certain actual or threatened releases of hazardous substances at or from the Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

Remedial alternatives are presented in this section for each area of the Site. Because many of the alternatives include PCB treatment, a discussion of PCB treatment technologies is presented as an introduction. This is followed by a discussion of cleanup levels selected by EPA for this Site.

Treatment Technologies

Six methods of treatment for Site soil, sludges and sediments were examined: biological destruction, chemical destruction, chemical extraction, thermal destruction (incineration), thermal extraction and solidification. Each of these treatment technologies has been tested at other hazardous waste sites. Although some have been found to be effective in treating PCBs, each technology, with the exception of thermal destruction, would require a pilot or field testing program before full-scale use at this Site. Thermal destruction would require trial incinerator burns to establish operating conditions.

Biological Treatment

Biological destruction of PCBs using naturally occurring or scientifically engineered bacteria was determined to be a feasible alternative for the remediation of contaminated soils, sediments, and sludges at the Site. For this Site, biological treatment would involve processing excavated soils and sludges or dredged sediment in slurry form in above-ground batch reactors. Preprocessing would be necessary to remove bulky items. Bacteria and nutrients would be added to the tanks and the tanks would be mechanically aerated and agitated. The bacteria would degrade PCBs to nonhazardous products. Preliminary bench-scale tests of Site soil by G.M. have demonstrated up to 63% reduction of PCBs, from 291 ppm to 108 ppm, after three days of biological treatment.

Because biological treatment would be performed on material in slurry form, a large quantity of water will be produced during treatment and during subsequent dewatering operations. This water would be discharged to the St. Lawrence River in compliance with SPDES requirements which currently require that PCB concentrations in the discharge be non-detectable, down to the method detection level, using EPA Laboratory Method Number 608. Because PCB volatilization is a concern, if necessary, the reactors would be covered or fitted with emissions control equipment. Major applicable or relevant and appropriate requirements for biological treatment are federal Clean Air Act (CAA) and New York State air quality standards along with Resource Conservation and Recovery Act (RCRA) hazardous waste treatment regulations and TSCA disposal requirements.

Biological treatment is an innovative technology. Approximately one year would be required for preliminary testing and technology development. In addition, biological treatment may not sufficiently reduce PCB concentrations in those materials with initially high PCB concentrations.

Chemical Destruction

This technology employs a chemical dechlorination process to treat contaminated soils, sludges, and sediments. In the proprietary KPEG process, PCB-contaminated materials are reacted with a reagent, potassium polyethylene glycol or a similar chemical to remove the chlorine atoms from PCBs. If successful, this process converts PCBs to a glycol-like compound which is less toxic than PCBs. Full-scale process equipment is currently available.

For this Site, chemical dechlorination would be performed in a batch mixed reactor at approximately 300°F with an excess of reagent. The vendor of this process indicates that residual PCB concentrations as low as 2 ppm are achievable. Preprocessing is necessary to remove bulky items. Water, used to wash treated solids, would be discharged to the St. Lawrence River in compliance with SPDES requirements. Because PCB volatilization is a concern, if necessary, the reactors would be covered or fitted with emissions control equipment. Major applicable or relevant and appropriate requirements for chemical destruction are federal CAA and New York State air quality standards along with RCRA hazardous waste treatment regulations and TSCA disposal requirements.

Chemical Extraction

Chemical extraction is based on the proprietary B.E.S.T. (Basic Extractive Sludge Treatment) process. Other similar processes are also available. This technology involves concentrating PCBs found in large volumes of solids and sludges into smaller volumes of an oily extract through the use of triethylamine, a solvent. The PCB rich extract must then be disposed. Preprocessing is necessary to remove bulky items. Full-scale process equipment is currently available.

The vendor reports that solids residual concentrations less than 0.1 ppm PCB are possible. Tests on sludge showed PCB concentrations of 130 ppm in treated sludge with an initial PCB concentration of 5800 ppm.

Process water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for chemical extraction are TSCA disposal requirements and RCRA hazardous waste treatment regulations. The PCB extract would be treated and disposed on-site or transported off-site for disposal, if necessary.

Thermal Destruction

Thermal destruction technology involves the incineration of solid material. After material processing, sorting and, if necessary, dewatering, solids and sludges are fed to the incinerator. A rotary kiln incinerator was used to develop cost estimates, however, the particular type of incinerator to be used would be determined during design. Incinerators are commercially available and have achieved the 99.9999% destruction removal efficiency required by TSCA.

Scrubber water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for thermal destruction are TSCA and RCRA incineration and disposal requirements, and CAA requirements. Incinerator ash would be tested and, if found to be non-hazardous, backfilled on-site.

Thermal Fxtraction

Thermal extraction involves the removal of organics from a solid or sludge waste stream under lower temperature conditions than those of incineration. The organic contaminants are not destroyed during this extraction process; rather another treatment process would be necessary to permanently destroy the liquid PCB extract. Full-scale experimental and pilot-scale thermal extraction units are available. Vendor pilot studies have reduced PCBs from an initial concentration of 18,000 ppm to less than 0.1 ppm.

Scrubber water would be treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Major applicable or relevant and appropriate requirements for thermal extraction are TSCA disposal requirements, RCRA treatment requirements, and CAA requirements. The PCB extract would be treated and disposed on-site or transported off-site for disposal, if necessary.

Solidification

Solidification of the excavated material involves the physical encapsulation, chemical reaction, or both, of the excavated material. A commercially available additive is mixed with the waste to create a slurry which is allowed to harden to a solid material. This solid material can then be disposed. Solidification is used to limit the leachability, or "leaking", of the PCBs into the environment. There is no data on destruction of PCBs during the solidification process.

Because PCB volatilization during solidification is a concern, if necessary, emissions control equipment would be required. Major applicable or relevant and appropriate requirements for solidification are CAA and New York State air quality standards along with TSCA and RCRA disposal requirements. Solidified material would require cover and long-term maintenance since PCBs would not be permanently destroyed.

The treatment options discussed above can be used separately or in combination with each other to treat soils, sludges and sediments at the Site. For example, because biological treatment may not be effective on highly concentrated wastes, EPA has evaluated a mixed treatment alternative which involves incineration of material contaminated with PCBs over 500 ppm and biological treatment of material with PCB concentrations below 500 ppm.

Cleanup Levels for the Site

EPA has chosen cleanup levels and treatment levels for PCBs and other chemicals at this Site. Cleanup levels are those levels which must be met in the river system and in soil and groundwater at the Site once remediation is completed. Treatment levels are those levels which must be met in the residual of any treatment process which is employed to remediate the Site. Site cleanup levels and treatment levels for all contaminants of concern are specified in Table 6.

EPA has selected a soil PCB cleanup level of 1 ppm on the St. Regis Mohawk Indian Reservation. This level is based on applicable St. Regis Mohawk regulations which specify a soil cleanup level of 1 ppm PCBs and on the EPA recommended PCB soil action level of 1 ppm for residential areas as given in the August 1990 PCB guidance referred to earlier. EPA estimates that there are 15,000 cubic yards of soil with PCB concentrations above 1 ppm on the St. Regis Mohawk Reservation. Reservation soil which is excavated, treated, and disposed on G.M. property must have PCB concentrations less than or equal to 10 ppm prior to disposal. This treatment level is based on the cleanup and treatment levels selected by EPA for soil/sludge on the G.M. facility, as described below. This is appropriate because contaminated soil from the Reservation would be deposited on the G.M. facility after treatment. Because the cleanup levels and treatment levels for Reservation soils are not identical, Reservation soil with PCB concentrations above 1 ppm and below 10 ppm would not require treatment prior to disposal on the G.M. facility.

EPA has selected a soil/sludge PCB cleanup level of 10 ppm on the G.M. facility. This level is based, in part, on EPA's risk assessment for the alternatives considered for the Site which indicates that 10 ppm is protective of the Mohawk population and, in part, on the August 1990 PCB guidance which recommends soil PCB cleanup levels between 10 ppm and 25 ppm in industrial areas. EPA has selected a cleanup level on the lower end of this range because access to remediated areas will be unlimited to G.M. personnel and because contaminants in on-site soils impact groundwater and surface water quality. EPA has selected a soil/sludge total phenols cleanup level of 50 ppm based on federal RCRA guidance for closure of surface impoundments. EPA estimates that there are 176,000 cubic yards of soils and sludges in the Industrial Lagoons, in the North Disposal Area, and in other areas on the G.M. facility contaminated with PCBs above 10 ppm which are being addressed in this operable unit. In general, the treatment levels for soil/sludge on the G.M. facility (see Table 6) are consistent with the cleanup levels for the G.M. facility. This is appropriate because treated soil would be deposited on the G.M. facility after treatment.

The groundwater PCB cleanup goal selected by EPA is 0.1 ppb, as measured at the boundary of the Industrial Landfill and Industrial Lagoons, based on New York State requirements. This level is lower than the proposed federal maximum contaminant level of 0.5 ppb. Because PCBs sorb to soil, the effectiveness of PCB removal from the groundwater aquifer may be limited. The phenol groundwater cleanup level is 1 ppb based on New York State requirements. The EPA cleanup levels for VOCs shown in Table 6 are based on federal and State requirements which are either applicable or relevant and appropriate for the Site. Groundwater would be treated to comply with SPDES requirements before it would be discharged to the St. Lawrence River. The treatment levels for groundwater are given in Table 6. These levels are based on New York State SPDES requirements which regulate the levels of contaminants which may be discharged to the waters of New York State. This is appropriate since groundwater will be discharged to the St. Lawrence River following treatment.

EPA's selected remedy for river sediments requires the delineation of areas in the river system which are severely contaminated, called PCB hotspots. Hotspot areas as defined in this ROD are then subject to sediment remediation as described below. At this Site, EPA has defined PCB hotspots to be areas with concentrations above 1 ppm in St. Lawrence River and Raquette River sediments and associated soils and above 0.1 ppm in Turtle Creek and Raquette River sediments within the boundaries of the Reservation.

The 1 ppm PCB cleanup in the St. Lawrence and Raquette Rivers was based on interim federal and State sediment quality criteria guidance as well as on EPA's risk assessment. Application of interim federal sediment quality criteria guidance indicates that a PCB cleanup level in sediments should be between 0.08 and 2 ppm. State sediment quality criteria guidance indicates that PCB cleanup levels well below 1 ppm are required to achieve protection of the environment. EPA's risk assessment for the Site demonstrates that a 1 ppm PCB cleanup level in sediment corresponds to a 4×10^{-5} excess cancer risk.

Therefore, in an attempt to minimize residual risks, EPA has selected 1 ppm as a cleanup goal in the St. Lawrence and Raquette Rivers. In selecting the 1 ppm cleanup goal in the St. Lawrence and Raquette Rivers, EPA has also balanced its desire for a very low cleanup level which will minimize residual risk with the constraints posed by the limitations of dredging as a means of removing sediment. EPA believes that a 1 ppm cleanup goal in the St. Lawrence and Raquette Rivers is achievable and provides an acceptable measure of protection to human health.

The 0.1 ppm hotspot definition for Turtle Creek selected by EPA is based on Tribal regulations and applies to the entire area of Turtle Creek, including the adjacent cove (see Figure 3). While EPA acknowledges the applicability of the Tribal regulations in Turtle Creek, technical limitations of dredging, which is the only means of removing sediment, may prevent compliance with this requirement.

EPA estimates that there are 62,000 cubic yards of sediments and soils in the river system with PCB concentrations above 1 ppm in the St. Lawrence and Raquette Rivers and in Turtle Creek. There are additional soils and sediments in and around Turtle Creek which are contaminated with PCBs at levels below 1 ppm. These soils are not included in the estimated volume of sediments and soils given above.

River system sediments which are treated must have PCB concentrations less than or equal to 10 ppm prior to disposal. This treatment level is based on the cleanup and treatment levels selected by EPA for soil/sludge on the G.M. facility, as described above. [redacted] Because the cleanup levels and treatment levels for sediments are not identical, Reservation sediments with PCB concentrations above 0.1 ppm and below 10 ppm and other sediments with PCB concentrations above 1 ppm and below 10 ppm would not require treatment to remove contaminants prior to disposal on the G.M. facility.

Contaminated River and Tributary Sediments

The remedial alternatives evaluated for the river system include: no action, in-place containment of river sediments, and dredging of sediments with on-site treatment (using one of the six PCB treatment technologies outlined above).

<u>No Action for the River Sediments</u>

The Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) requires that the "no action" alternative be considered at Superfund sites. This alternative consists of allowing the contaminated river sediments, riverbanks, and associated wetlands to remain in their present state in the river system.

No actions would be taken to remove or contain contaminated sediments or soil which currently pose a threat to human health and the environment in these areas. There are no costs or implementation times associated with the no action alternative for river sediments.

<u>In-Place Containment of River Sediments</u>

This alternative (also called in-situ containment) consists of the placement of a graded aggregate cover over the contaminated river sediments (see Figure 4). This alternative is designed to limit the transport of river sediments and is based on methods used to reduce shoreline erosion.

In this alternative, a silt curtain would be installed around the hotspots to minimize downstream transport of sediments disturbed during placement of the cover. The hotspots of PCB contamination in the river system would then be backfilled with a graded filter. The thickness of the layers and the type of aggregate to be used in the cover would be determined during design of the cover and would depend on river bottom slope, flow, and current velocity.

Following completion of backfilling activities, the silt curtain would be removed and any accumulated sediment would be moved to the shore for on-site or off-site disposal. The ultimate method of disposal of the accumulated sediment, would be determined following completion of the containment system and would depend on the PCB concentration and water content of the sediments. Annual inspections to determine the cover's effectiveness in containing PCBs and preventing the movement of these hazardous substances into the water column would be performed. Long-term maintenance of the cover, including repair and replacement, would be performed as required.

EPA estimates that the total present worth cost of this alternative is $ 3.6 million. This alternative would require approximately 6 months to construct following completion of design. Because containment of contaminated sediments would be used to mitigate one of the principal threats from this Site, sediment containment would be performed at the earliest opportunity.

Sediment Dredging and On-Site Treatment

This alternative consists of dredging approximately 62,000 cubic yards of PCB contaminated hotspots in the river system and wetlands and on the riverbanks with subsequent on-site treatment with one or a combination of the six treatment methods described earlier. Prior to remediation, a silt curtain or other sediment control device would be installed to control sediment that might be suspended during dredging activities. In addition, a sheet pile wall would be installed on the river side of the dredging area to provide a stilling basin for dredging operations. Prior to remediation of the Raquette River sediments and riverbank soils, the sludges contained in the storm sewer line leading to the existing G.M. outfall to the Raquette River would be removed and the outfall would be monitored and secured to ensure that it could not serve as a source of future contamination to the River.

During design, a decision would be made on the most appropriate type of dredging method to minimize sediment resuspension. During dredging, contaminated sediments within the previously defined PCB hotspots in the river system would be removed. Sediments which are suspended during dredging and which are deposited downstream may be redredged, if necessary. From an engineering perspective, removal of virtually all sediments in fairly shallow areas will be the simplest way to ensure compliance with EPA's cleanup goals and will provide an extra measure of protection in areas where even low levels of PCBs in sediments pose a risk to wildlife.

If necessary for treatment, a temporary sediment dewatering basin and a sediment storage area would be constructed on the shore in the vicinity of sediment remediation. Leachate and decant water from these areas would then be pumped to a wastewater treatment plant and subsequently discharged to the river in compliance with SPDES requirements.

After dredging, the material would be treated on-site using one or a combination of the six treatment methods described above. Treatment residuals would be required to have PCB concentrations below the G.M. facility soil cleanup level of 10 ppm PCBs. Bulk river debris which could not be treated would be disposed in a facility which meets all TSCA requirements, as necessary. The treated sediments would be dewatered and disposed in areas located on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements, provided they were non-hazardous, adequately dewatered, and met EPA's treatment goals for the Site. The silt curtain and sheet pile wall would be removed and decontaminated or disposed after completion of the dredging operation. Dredged areas would be covered and restored to their original grade with clean fill and the riverbed, riverbanks, and wetlands restored as closely as possible to their pre-dredging condition.

Major applicable or relevant and appropriate requirements (ARARs) for this alternative are relevant and appropriate RCRA treatment regulations, applicable TSCA disposal requirements, Tribal PCB requirements (see Table 7) which are applicable on the Reservation, relevant and appropriate RCRA closure requirements, applicable New York State solid waste disposal requirements, relevant and appropriate New York State hazardous waste disposal requirements, and applicable SPDES requirements.

The costs of this alternative depend on the type of treatment used and are presented in Table 8. As shown, present worth costs range from $ 7.7 million to $ 32 million. Implementation times for this alternative range from a few months (for solidification) to two years (for chemical extraction or thermal destruction). These times do not include time required to construct treatment units. Design and construction of treatment units, including performance of required treatability studies, could be performed in approximately two years. Because removal of contaminated sediments would be used to mitigate one of the principal threats from this Site, sediment dredging would be performed at the earliest opportunity. Sediment storage would be used, as necessary, to expedite sediment dredging while treatability tests were conducted and treatment facilities were built.

North Disposal Area, Contaminated Soil on the St. Regis Mohawk Reservation, Contaminated Soil on G.M. Property

The following alternatives were evaluated for the contaminated material in these areas: no action, capping, solids excavation and on-site treatment (using one of the methods outlined above), and excavation of the material with on-site disposal.

No Action for the North Disposal Area, Reservation Soil and Soil on G.M. Property

This alternative consists of allowing the 100,000 cubic yards of contaminated soils, sludges and solids in these areas to remain in their present state. No actions would be taken to remove or contain contaminated materials which currently pose a potential threat to human health and the environment in these areas. There are no costs or implementation times associated with the no action alternative for these areas.

Capping of the North Disposal Area, Reservation Soil, and Soil on G.M. Property

This alternative includes containing wastes in the North Disposal Area on-site to minimize infiltration. As part of this alternative, shallow soil on the St. Regis Mohawk Reservation and soils from areas on G.M. property not associated with past disposal practices would be excavated and consolidated on G.M. property, possibly in the North Disposal Area.

The North Disposal Area (including the buried interceptor lagoon) and other soils would then be graded to enhance surface drainage. Surface water would be rerouted and discharged to the river system, in accordance with SPDES requirements.

Two specific capping methods were considered by EPA: a soil cover and a synthetic composite cover. In the soil cover method, after grading, the North Disposal Area and other soils would be compacted and covered with one layer of a synthetic material known as geotextile, two feet of clay and six inches of topsoil. Revegetation of the cover, regular cover inspection and maintenance, and groundwater monitoring would complete the remediation. Dust suppression measures would be implemented during cover construction.

The composite cover alternative also includes compaction of the North Disposal Area and other soils. The North Disposal Area and other soils would then be capped using the following materials: three feet of clay, one layer of flexible membrane liner, one layer of drainage material, one layer of geotextile, eighteen inches of rooting zone soil and six inches of topsoil. Revegetation of the covers, regular cover inspection and maintenance, and groundwater monitoring would complete the remediation. Dust suppression measures would be implemented during cover construction. Excavated areas on the Reservation would be restored to their original condition with clean fill and revegetated. Excavated areas on G.M. property would be covered to reduce erosion and prevent migration.

Major ARARs for this alternative are applicable TSCA disposal requirements, Tribal PCB requirements which are applicable on the Reservation, applicable New York State solid waste disposal requirements, and relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements. The present worth costs of this alternative are $ 4.2 million for a soil cover and $ 4.8 million for a composite cover. This alternative would require approximately two years to complete.

Excavation and On-Site Treatment of Solids in the North Disposal Area, Reservation Soil, and Soil on G.M. Property

This alternative consists of excavating 51,000 cubic yards of contaminated soil, debris and sludge in the North Disposal Area (including the buried interceptor lagoon) with concentrations above 10 ppm PCBs, 15,000 cubic yards of contaminated soil on the Reservation with concentrations above 1 ppm PCBs, and approximately 34,000 cubic yards of soil on the G.M. property with PCB concentrations above 10 ppm and treating them with one or a combination of the six treatment methods discussed above. Following excavation, material from the Reservation would be temporarily stockpiled near the location of the on-site treatment facility.

Solids would be preprocessed to reduce particle size. Large contaminated objects which could not be treated would be disposed in a facility which meets all TSCA requirements, as necessary. Non-hazardous treated material with concentrations less than EPA's cleanup levels (see Table 6) would be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements. Treatment residuals would be required to have PCB concentrations below the G.M. facility soil cleanup level of 10 ppm PCBs. The excavated areas on the Reservation would be restored with clean fill to their original grade. Excavated areas on G.M. property would be covered to reduce erosion and prevent migration. These areas would be graded to prevent any surface water runoff from G.M. property and restored to support vegetation. A long-term groundwater monitoring program would also be implemented.

Major ARARs associated with this alternative are applicable TSCA disposal requirements, relevant and appropriate RCRA treatment regulations, Tribal PCB requirements which are applicable on the Reservation, applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and CAA and New York State air quality standards. The costs of this alternative are given in Table 9. Present worth costs range from $ 25 million to $ 56 million. Implementation times for this alternative range from a few months (for solidification) to four years (for chemical extraction or thermal destruction). These times do not include time required to design or construct any required treatment units.

Excavation and On-Site Disposal of Solids in the North Disposal Area, Reservation Soil, and Soil on the G.M. Property

This alternative consists of excavation of 100,000 cubic yards of contaminated soils, debris and sludges in the North Disposal Area (including the buried interceptor lagoon), on the Reservation, and on G.M. property followed by placement of these materials in an on-site double-lined landfill located on G.M. property.

A landfill would be constructed on the Site in compliance with federal and state regulations governing landfill construction. The landfill would be bermed and would be designed so that the base of the landfill was above the groundwater table. Contaminated material would then be excavated and transported to the on-site landfill for disposal. Following disposal, the landfill would be covered and closed according to federal and state regulations.

The excavated areas on the Reservation would be restored with clean fill to their original grade and revegetated. Excavated areas on G.M. property would be covered to reduce erosion and prevent migration. Maintenance of the landfill would include upkeep of the landfill cover and an access road, leachate treatment, and semi-annual groundwater monitoring. Treated leachate and groundwater would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Major ARARs for this alternative are RCRA closure requirements which are relevant and appropriate for the wastes at the Site, applicable New York State solid waste disposal requirements, relevant and appropriate New York State hazardous waste disposal and closure requirements, Tribal PCB requirements which are applicable on the Reservation, and TSCA disposal requirements which are applicable at this Site. The present worth cost of this alternative is $ 24 million. Implementation time is approximately three years.

Industrial Lagoons

The following alternatives were evaluated for the sludges contained in the four lagoons (350,000 gallon, 500,000 gallon, 1.5 million gallon and 10 million gallon): no action, solids and sludge excavation and on-site treatment (using one of the treatment alternatives outlined above) and solids and sludge excavation with disposal in an on-site disposal area.

No Action for the Lagoons

Under this alternative, the 91,000 cubic yards of sludge and underlying soil in the four Industrial Lagoons would not be remediated. The 500,000 gallon and 10 million gallon lagoons would continue to function as part of G.M.'s wastewater treatment system. The 1,500,000 gallon and 350,000 gallon lagoons would remain inactive and would not receive additional waste materials.

Lagoon Solids Excavation and On-Site Treatment

This alternative consists of excavating 91,000 cubic yards of contaminated sludges and underlying soils to a level of 10 ppm PCBs in the Industrial Lagoons and treating them with one or a combination of the six treatment methods discussed above. Prior to excavation, water in the lagoons would be removed, treated and discharged to the St. Lawrence River in compliance with SPDES requirements. During excavation, all sludges would be removed. Sludges would be delineated during remedial action either visually or through the use of physical tests, such as the EPA Paint Filter Test. Underlying soil contaminated above 10 ppm PCBs would also be removed. Following excavation, material might be temporarily stockpiled near the location of the on-site treatment facility. Solids would be preprocessed to reduce particle size. Treated material with concentrations less than EPA's cleanup levels (see Table 6) would be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements for a cover. Treatment residuals would be required to have PCB concentrations below the Site soil cleanup level of 10 ppm PCBs. In compliance with TSCA and as explained in subsequent sections of this ROD, sludge with initial concentrations above 500 ppm would be required to have PCB concentrations below 2 ppm after treatment. The excavated sides and bottoms of the lagoons would be covered to reduce erosion and prevent migration. A long-term groundwater monitoring program would also be implemented.

Major ARARs for this alternative are RCRA treatment requirements which are relevant and appropriate for the wastes at the Site, applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and TSCA disposal requirements which are applicable at this Site. The present worth costs of this alternative range from $ 24 million to $ 48 million and are shown in Table 10. Implementation times for this alternative range from a few months (for solidification) to four years (for chemical extraction or thermal destruction). These times do not include time required to design and construct any required treatment units.

Lagoon Solids Excavation with On-Site Disposal

This alternative consists of excavation of contaminated sludges and underlying soils in the Industrial Lagoons followed by placement of these materials in an on-site double-lined landfill located on G.M. property.

A landfill would be constructed on the Site as described previously for the on-site disposal of North Disposal Area soils. Water in the lagoons would be removed, treated and discharged to the St. Lawrence River in compliance with SPDES requirements. Contaminated sludge and soil would then be excavated and transported to the on-site landfill for disposal. Following disposal, the landfill would be covered and closed according to federal and state regulations. The sides and bottoms of the lagoon areas would be covered to reduce erosion and prevent migration.

Maintenance of the landfill would include upkeep of the landfill cover and an access road, leachate treatment, and semi-annual groundwater monitoring. Treated leachate and groundwater would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Major ARARs for this alternative are applicable New York State solid waste disposal requirements, relevant and appropriate RCRA and New York State hazardous waste disposal and closure requirements, and TSCA disposal requirements which are applicable at this Site. The present worth cost of this alternative is $ 23 million. Implementation time is approximately four years.

Groundwater

Groundwater may be remediated by one of the following remedial alternatives: no action, containment of the groundwater and extraction and treatment of contaminated groundwater.

No Action for Groundwater

Under the no action alternative for groundwater, no groundwater remediation would occur. However, groundwater monitoring would be performed for a 30-year period.

The present worth of the groundwater monitoring costs associated with the no action alternative is $ 1.2 million. This alternative could be implemented immediately.

Groundwater Containment

This alternative provides for installation of a slurry wall downgradient of the Site to a depth sufficient to achieve a hydraulic barrier. The slurry wall would be keyed into the lowermost till deposit at the Site. In this way, the hydraulic pathway provided by the higher permeability sand layer would be eliminated. Pumping wells would also be installed on the G.M. side of the slurry wall as a hydraulic control measure. The water from the pumping wells would be treated in a wastewater treatment system which could include a combination of aeration, clarification, filtration, air stripping and carbon adsorption to remove VOCs and PCBs from the groundwater. After treatment, the water would be discharged to the St. Lawrence River in compliance with SPDES requirements.

Monitoring wells and piezometers would be placed inside and outside of the slurry wall's perimeter to detect possible infiltration and assure the integrity of the slurry wall.

The major ARARs associated with this alternative are RCRA and New York State groundwater monitoring requirements. The present worth cost associated with this alternative is $ 7.6 million. Implementation time for this alternative is two years.

Groundwater Recovery and Treatment

This alternative consists of the installation of recovery wells or trenches hydraulically downgradient of the Site for the removal and treatment of groundwater. Pumping wells or trenches could be located along the downgradient sides of the Industrial Landfill, the Industrial Lagoons, and the East Disposal Area. Extracted groundwater would be pumped to a wastewater treatment plant for treatment which could include a combination of aeration, clarification, filtration, air stripping and carbon adsorption to remove VOCs and PCBs from the groundwater. After treatment, the water would be discharged to the St. Lawrence River in compliance with SPDES requirements. Treated groundwater would be required to have PCB concentrations consistent with the SPDES requirements. Groundwater treatment residuals (e.g., spent carbon) would be tested and disposed as hazardous waste, if necessary.

The major ARARs associated with this alternative are relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels (MCLs), New York State groundwater quality standards, Tribal PCB requirements, RCRA treatment and land disposal requirements which are applicable if the groundwater treatment residuals are RCRA hazardous wastes, and federal and State groundwater monitoring regulations. The present worth cost associated with this alternative is $ 4 million. Implementation time for this alternative is two years.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the National Contingency Plan (NCP), a detailed analysis of each alternative was performed. The purpose of the detailed analysis was to objectively assess the alternatives with respect to nine evaluation criteria that encompass statutory requirements and include other gauges of the overall feasibility and acceptability of remedial alternatives. The analysis was comprised of an individual assessment of the alternatives against each criterion and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs, that is, relative advantages and disadvantages, among them.

The nine evaluation criteria against which the alternatives were evaluated are as follows:

Threshold Criteria - The first two criteria must be satisfied in order for an alternative to be eligible for selection.

1. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable, or Relevant and Appropriate Requirements (ARARs)** is used to determine whether each alternative will meet all of its federal and state ARARs. When an ARAR is not met, the detailed analysis should discuss whether one of the six statutory waivers is appropriate.

Primary Balancing Criteria - The next five "primary balancing criteria" are to be used to weigh major trade-offs among the different hazardous waste management strategies.

3. **Long-term Effectiveness and Permanence** focuses on any residual risk remaining at the Site after the completion of the remedial action. This analysis includes consideration of the degree of threat posed by the hazardous substances remaining at the Site and the adequacy of any controls (for example, engineering and institutional) used to manage the hazardous substances remaining at the Site.

4. **Reduction of Toxicity, Mobility, or Volume Through Treatment** is the anticipated performance of the treatment technologies a particular remedy may employ.

5. **Short-term Effectiveness** addresses the effects of the alternative during the construction and implementation phase until the remedial response objectives are met.

6. **Implementability** addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation.

7. **Cost** includes estimated capital, and operation and maintenance costs, both translated to a present-worth basis. The detailed analysis evaluates and compares the cost of the respective alternatives, but draws no conclusions as to the cost-effectiveness of the alternatives. Cost-effectiveness is determined in the remedy selection phase, when cost is considered along with the other balancing criteria.

Modifying Criteria - The final two criteria are regarded as "modifying criteria," and are to be taken into account after the above criteria have been evaluated. They are generally to be focused upon after public comment is received.

8. **State and Tribe** Acceptance reflects the statutory requirement to provide for substantial and meaningful State and Tribal involvement.

9. **Community Acceptance** refers to the community's comments on the remedial alternatives under consideration, along with the Proposed Plan. Comments received during the public comment period, and the EPA's responses to those comments, are summarized in the Responsiveness Summary which is attached to this ROD.

The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria.

Overall Protection of Human Health and the Environment

With the exception of the no action alternatives, each of the alternatives for the various contaminated areas, if properly implemented, operated, and maintained, protects human health and the environment. Although the alternatives differ in the degree of protection they afford, all provide human health risks within the acceptable EPA range of 10^{-4} to 10^{-6}.

The current risks to the adult Mohawk population associated with the no action alternatives for river sediments and Reservation soil are not within the EPA risk range. EPA estimates that the current risks to the adult Mohawk population associated with the no action alternatives for the North Disposal Area and for the

Industrial Lagoons are within the EPA risk range. However, based on information supplied by G.M. and on its experience at other sites, EPA believes that the current risks to G.M. workers from these areas is unacceptable. Since the no action alternatives are not protective, they will not be considered in the remainder of this analysis.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

All alternatives comply with ARARs or provide the grounds for invoking an ARAR waiver as noted below.

Sediment Dredging and On-Site Treatment

During dredging, EPA's goal is removal of all contaminated sediments within PCB hotspots. Within Turtle Creek, this goal is in compliance with the Tribal PCB ARAR of 0.1 ppm PCBs. Based on limited previous experience at other Superfund sites and federal projects, it is possible that dredging to 0.1 ppm PCBs will be technically impracticable. Therefore, this alternative requires that EPA waive the Tribal sediment standard due to technical impracticability, as discussed in CERCLA, section 121(d)(4)(C). EPA would consult with the St. Regis Mohawk Tribe and NYSDEC before making a final determination as to the technical impracticability of meeting the Tribal sediment PCB ARAR.

Excavation and On-Site Treatment of Solids in the North Disposal Area, Reservation Soil, and Soil on G.M. Property and Lagoons Solids Excavation and On-Site Treatment

According to TSCA disposal regulations and policy, all treatment residuals with PCB concentrations above 2 ppm must be disposed in a TSCA chemical waste landfill. However, these alternatives specify that treatment residuals with PCB concentrations less than 10 ppm will be disposed on G.M. property in a disposal facility which will include, at a minimum, a vegetated soil cap. Therefore, depending on the type of disposal facility ultimately selected during design, these alternatives require that, in accordance with TSCA regulations (40 CFR 761.75(c)(4)), EPA waive certain TSCA chemical waste landfill requirements for treatment residuals with PCB concentrations above 2 ppm. These TSCA chemical landfill requirements would be waived because treatment residuals which meet Site cleanup standards do not present an unreasonable risk of injury to health or the environment from PCBs. EPA bases this finding on its risk assessment and the EPA August 1990 PCB guidance which indicate that 10 ppm is protective of human health at the Site.

In addition, TSCA regulations require that sludges with PCB concentrations above 500 ppm be incinerated in a TSCA compliant incinerator or be treated by a method equivalent to incineration.

In compliance with TSCA, any sludges with initial PCB concentrations above 500 ppm which cannot be treated by an innovative technology to achieve PCB residuals below 2 ppm must be incinerated.

Groundwater Recovery and Treatment

During recovery and treatment, EPA's cleanup goal is the New York State PCB ARAR of 0.1 ppb PCBs. Based on EPA studies of other sites, EPA has found that the final groundwater cleanup level will depend on technical considerations such as the propensity of PCBs to sorb to soil.

Long-Term Effectiveness and Permanence

In general, remedies which include excavation and treatment perform best with respect to long-term effectiveness and permanence. Containment and capping remedies provide a lower degree of permanence in remediating contamination at the Site. Although sediment containment with a graded cover would reduce the erosive force of the flowing river water and would limit movement of contaminants into the environment, its long-term effectiveness is dependent upon the adequacy and reliability of the sediment cover. Long-term monitoring and maintenance of contained sediments which would be required would be difficult to achieve because the cover is located underwater. Little information is available on the frequency of maintenance or on the probability of cover failure. If the sediment cover fails, risks on the order of 10^{-2} would be present immediately. Sediment dredging permanently removes the risks from contaminated sediments.

Similarly, capping of solids in the North Disposal Area and other areas is less permanent than solids excavation. Long-term monitoring and maintenance of covered areas would be required and these areas would not be usable once capped. On-site disposal without treatment would not implement any permanent treatment technologies and is less effective in the long-term than treatment and disposal.

With respect to the treatment alternatives, thermal destruction is a permanent and effective technology since it results in destruction of PCBs. Of all the technologies considered, it is likely that incineration will meet required treatment levels.

Chemical extraction, biological treatment, chemical destruction and thermal extraction technologies have the potential to permanently remediate the Site; however, uncertainties exist because these technologies have not been proven in the past. Treatability studies would be necessary during the design phase to ensure long-term effectiveness of these alternatives. Solidification is less permanent than other treatment technologies considered and solidified material would require long-term management.

The long-term effectiveness of groundwater containment depends on the stability of the slurry wall. The long-term effectiveness of groundwater recovery and treatment depends on the reliability of the recovery system. Both groundwater containment or recovery and treatment would reduce the risk from direct exposure to contaminated groundwater.

Reduction of Toxicity, Mobility or Volume

Biological treatment, chemical destruction, and thermal destruction perform best with respect to this measure. Containment alternatives do not employ treatment although they do reduce contaminant mobility. Treatment alternatives address principal threats through treatment of contaminated materials. Biological treatment, chemical destruction, and thermal destruction reduce the toxicity, mobility and volume of toxic contaminants. Chemical and thermal extraction reduce the volume of toxic contaminants. Solidification reduces the mobility of toxic contaminants.

Groundwater alternatives would reduce the mobility of the contaminated groundwater; groundwater treatment would also reduce the toxicity and volume of the contaminants in the treated groundwater.

Short-Term Effectiveness

Containment alternatives which can be implemented quickly with moderate amounts of dust generation perform best with respect to short-term effectiveness. Any alternatives which incorporate Site excavation would be accompanied by an increase in dust generation during excavation. Although mitigative measures would be used, the emission of contaminated dust during excavation is much greater than during containment activities where the contaminated soils would remain relatively undisturbed.

Implementation of sediment dredging would result in resuspension of sediments. Minimization of sediment resuspension would be accomplished through the use of engineering controls such as sheet piles, silt curtains, and coffer dams and through selection of appropriate dredging equipment and production rates. These controls have been proven to control sediment resuspension.

Biological treatment, thermal destruction, chemical destruction, thermal extraction, and solidification result in air emissions which will have a short-term effect on the community and Site workers. The short-term excess cancer risks to the adult Mohawk population and remediation workers during implementation of the remedial alternatives are presented in Table 11. Risks to remediation workers can be mitigated through the use of protective equipment. Risks to G.M. workers would be lower than those for remediation workers.

The area on the St. Regis Reservation will be impacted by excavation of the North Disposal Area and emissions from treatment equipment; precautions to minimize potential impacts will be included in the design phase for the remediation of the Site. If necessary, these precautions may include temporary relocation of Raquette Point residents. Any impacted wetlands or habitats will be restored after excavation, if necessary. Residual impacts to the wetlands may remain after excavation. Groundwater alternatives do not pose significant short-term risks to the community or workers.

Sediment dredging would require approximately one year to complete. Completion of pilot treatability studies (if necessary), remedial design and construction for all alternatives will take up to two years. The time to complete a biological treatment process for all areas addressed in this operable unit is estimated to be three years from completion of construction of the treatment units. Chemical destruction of all of the contaminated material addressed in this ROD would take approximately four years from construction completion, assuming a treatment rate of 175 cubic yards per day.

Utilizing three treatment units after construction completion, the chemical extraction alternative would require five years for treatment of all areas addressed in this ROD assuming each unit processed 49 cubic yards per day. Using the thermal destruction alternative for all of the contaminated material addressed in this ROD, the remedial action would take seven years to complete following construction, assuming a processing rate of 4.2 cubic yards per hour. The thermal extraction alternative would require approximately four years for completion of the remedial action following construction, assuming a processing rate of seven cubic yards per hour. The solidification alternative, at a process rate of 200 tons per hour, would require approximately one-half year to complete following construction.

Implementability

All of the alternatives are implementable from an engineering standpoint. However, there are some inherent difficulties which may be encountered during implementation of some alternatives. Engineering controls will be employed to minimize sediment resuspension during the dredging process. Although adequate sediment dredging services are currently available, dredging will require coordination with the governments of the St. Regis Mohawk Tribe, New York State, and Canada.

The construction of a sediment cover system will involve some sediment resuspension. In the event that the sediment cover fails and dredging is required, the multi-layer sediment cover material would be an impediment. Monitoring of the sediment cover system will be severely hampered by ice cover during the winter months.

Solids excavation in the North Disposal Area, on the Reservation and on G.M. property is easily implementable. Treatment alternatives will require treatability studies to optimize the design and operating parameters for the treatment system. These treatability studies will determine the implementability of innovative technologies including biological treatment, chemical destruction, and chemical and thermal extraction. If innovative technologies are not found to be implementable, other more proven technologies, such as incineration, would be used to treat soils, sludges and sediments. Full-scale equipment and vendors are available for chemical destruction, chemical extraction, thermal destruction, and solidification.

Cost

The costs associated with the alternatives for each disposal area are presented in Tables 8 - 10. These costs are estimates and may change as a result of design and construction modifications.

Capital costs include fixed costs (costs associated with equipment mobilization and site preparation) and non-fixed costs (costs associated with treatment of a specific disposal area). Capital costs are only incurred once for each treatment technology. Thus, significant savings (in fixed costs) from those costs displayed in the Tables 8 -10 will result whenever the same treatment technology is used for two different disposal areas.

State and Tribe Acceptance

New York State has expressed a preference for permanent remedies which include excavation and treatment of most contaminated soils, sediments, and sludges from the Site. The St. Regis Mohawk Tribe has indicated that its primary concern is protection of the Mohawk people's health and environment through expeditious cleanup of the Site. To this end, they support the removal of contamination from the Reservation and comprehensive controls which ensure that there will be no further migration of contamination from the G.M. Site onto the Reservation, or into waters utilized by the Mohawk people. Consequently, the Tribe advocated inclusion of the East Disposal Area in this ROD. NYSDEC and the Tribe have concurred on this ROD (see Appendix 3).

Community Acceptance

Comments from the community submitted during the public comment period indicate that the community has varying opinions regarding remediation of the Site. Many citizens expressed a desire for complete removal and treatment of all contamination at the Site. Other citizens, many of them residents of Massena, supported a G.M. plan for Site remediation which included sediment containment, excavation of Reservation soil and soil in the North Disposal Area, excavation and treatment of the inactive lagoons, and groundwater recovery and treatment. Community comments are responded to in detail in the Responsiveness Summary which is an appendix to this document.

DESCRIPTION OF THE SELECTED REMEDY

The major components of the selected remedy for the first operable unit include:

- Dredging/excavation and on-site treatment of sediments and soils in PCB hotspots in the St. Lawrence and Raquette Rivers and in Turtle Creek, in associated wetlands, and on St. Lawrence and Raquette River banks

  Hotspots in the St. Lawrence and Raquette Rivers and Turtle Creek will be dredged and excavated to remove PCBs. All PCB contaminated sediments in the hotspots will be removed given the technological limitations associated with dredging. EPA anticipates that residual PCB levels in dredged hotspot areas will be no greater than 1 ppm in the St. Lawrence and Raquette Rivers. In selecting the 1 ppm cleanup goal in the St. Lawrence and Raquette Rivers, EPA has balanced its desire for a very low cleanup level which will minimize residual risk with the constraints posed by the limitations of dredging as a means of removing sediment. EPA believes that a 1 ppm cleanup goal in the St. Lawrence and Raquette Rivers is achievable and provides an acceptable measure of protection to human health.
  EPA intends to comply with the Tribal PCB ARAR by removing sediments with PCB concentrations greater than 0.1 ppm PCBs in Turtle Creek. However, technical limitations may preclude removal of sediments to 0.1 ppm PCBs. If this is the case, EPA will remove all contaminated sediments to the extent practicable due to the limitations of dredging technology. Sediment resuspension will be minimized through the use of engineering controls. However, if, as a result of dredging, resuspended sediments settle on Tribal land, they will be subject to the Tribal sediment ARAR.

  Based on a 1 ppm PCB cleanup level, the PCB hotspot in the St. Lawrence River extends from approximately 1200 feet above the G.M. outfall to 700 feet below the mouth of Turtle

Creek and approximately 300 feet from the shore. The PCB hotspot in the Raquette River, based on a 1 ppm PCB cleanup level, extends to the soils on the riverbank and to the sediments in the river which are along the shore approximately 250 feet upriver and 250 feet downriver from the G.M. outfall. The approximate limits of the PCB hotspot in Turtle Creek extend from the cove at the mouth of Turtle Creek to a point 2500 feet upstream from the mouth of Turtle Creek.

Prior to remediation, a wetlands assessment, floodplains assessment, cultural resources survey, and a statement of consistency with the New York Coastal Management Program will be required. Excavated sediments will be dewatered, as necessary. Decanted water would be treated, as necessary by methods which could include a combination of aeration, clarification, filtration, air stripping and carbon adsorption to remove VOCs and PCBs and discharged to the St. Lawrence River. Bulk items which are not amenable to treatment will be separated from the sediments and disposed in a facility which meets all TSCA requirements, as necessary.

During remediation, additional sediment analyses may be required to better delineate PCB hotspots. In addition, silt curtains or other sediment control devices will be installed to control sediment that might be disturbed during dredging activities. Sheet pile walls will be installed on the river side of the dredging areas to provide a stilling basin for dredging operations. Prior to remediation of the Raquette River sediments, the sludges from the existing G.M. outfall to the Raquette River will be removed and the outfall will be plugged and secured to ensure that it will not serve as a source of future contamination to the River.

Sediments will be treated to levels below 10 ppm PCBs. The type of treatment to be used will be determined on the basis of treatability tests during design. If any sediments cannot be treated to levels below 10 ppm PCBs using biological treatment alone, incineration or one of the other innovative technologies tested during design which has been demonstrated to achieve site treatment goals will be used to treat them.

Treated sediments and sediments with initial PCB concentrations below 10 ppm will be disposed on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements for a cover. The disposal area will be maintained. Dredged areas, riverbanks, and wetlands in the river system and on the St. Regis Mohawk Reservation will be restored, as closely as possible, to their original grade and pre-dredging conditions. Post-remediation monitoring of the St. Lawrence River, Raquette River, and Turtle Creek and associated wetlands and riverbanks will be conducted to ensure that PCBs and other contaminants at unacceptable levels are no longer found in or migrating to these areas. Monitoring program plans will be finalized by EPA, in consultation with NYSDEC and the St. Regis Mohawk Tribe.

Because sediments present a principal threat at this Site, sediment excavation will proceed as soon as possible. If necessary to expedite sediment dredging, sediment will be stored in an upland protected area while treatability testing is conducted.

- Interim surface runoff control in the East Disposal Area

The East Disposal Area will be contoured and revegetated as necessary to prevent surface runoff to the St. Regis Mohawk Reservation and to minimize movement of contaminated surface soil from the G.M. facility. Where possible, recontouring will be accomplished through the addition of fill so as not to disturb PCBs buried in the East Disposal Area. In addition, any contaminated surface water which is diverted from the East Disposal Area during and after recontouring will be treated to comply with SPDES requirements and discharged to the St. Lawrence River. A remedy for the East Disposal Area and Industrial Landfill will be the subject of a second operable unit ROD. Because contaminated surface soil in the East Disposal Area is a principal threat at this Site, runoff prevention will proceed as soon as possible.

- Excavation and on-site treatment of PCB contaminated sludges and soils in the North Disposal Area, in the four Industrial Lagoons, and in other areas on G.M. property (active lagoons, while being addressed in this operable unit ROD, will be remediated when they are taken out of service)

Soil and sludge in the North Disposal Area (including the buried interceptor lagoon) and in miscellaneous areas on G.M. property with concentrations above the cleanup levels given in Table 6 will be excavated and treated to levels below 10 ppm PCBs. The type of treatment to be used will be determined on the basis of treatability tests during design. If any material cannot be treated to levels below 10 ppm PCBs using biological treatment alone, incineration or one of the other innovative technologies tested during design which has been demonstrated to achieve site treatment goals will be used to treat it. Bulk items which are not amenable to treatment will be separated and disposed in a facility which meets all TSCA requirements, as necessary. Treated soils will be backfilled in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements for a cover. The disposal area will be maintained. The excavated areas in the North Disposal Area will be covered to reduce erosion and prevent migration.

Standing water in the inactive lagoons will be drained, treated as necessary to remove PCBs and discharged to the St. Lawrence River. All sludge in the lagoons will be excavated. Underlying soil with contaminant concentrations above the levels given in Table 6 will also be excavated and treated to levels below 10 ppm PCBs. The type of treatment to be used will be determined on the basis of treatability tests during design. If any lagoon material cannot be treated to levels below 10 ppm PCBs using biological treatment alone, incineration or one of the other innovative technologies tested during design which has been demonstrated to achieve site treatment goals will be used to treat it. Treated materials will be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New York State and TSCA chemical waste landfill requirements for a cover. The excavated areas in and around the lagoons will be covered to reduce erosion and prevent migration. The active lagoons will be remediated in exactly the same manner when they are taken out of service by G.M. In the interim, any contamination from the active lagoons which migrates to groundwater will be recovered as described below. For purposes of cost estimation, EPA has assumed that the active lagoons will be taken out of service in ten years.

- <u>Excavation and on-site treatment of PCB contaminated soil on St. Regis Mohawk Reservation land adjacent to the G.M. facility</u>

Soil on the Reservation with PCB concentrations above 1 ppm PCBs will be excavated. Soil with PCB concentrations above 10 ppm will be treated to levels below 10 ppm. Bulk items which are not amenable to treatment will be separated and disposed in a facility which meets all TSCA requirements, as necessary. The type of treatment to be used will be determined on the basis of treatability tests during design. If any soil cannot be treated to levels below 10 ppm PCBs using biological treatment alone, incineration or one of the other innovative technologies tested during design which has been demonstrated to achieve site treatment goals will be used to treat it.

Treated soils and soils with initial PCB concentrations below 10 ppm will be disposed in areas on G.M. property and covered with a vegetated soil cap which complies with New

York State and TSCA chemical waste landfill requirements for a cover. The disposal area will be maintained. Excavated areas on the St. Regis Mohawk Reservation will be restored, as closely as possible, to their original grade and condition. Post-remediation monitoring on the Reservation will be conducted to ensure that PCBs are no longer migrating to areas from the G.M. facility. During remediation, necessary measures will be taken to protect Mohawk cultural resources. To protect the Tribe's spiritual values, a Mohawk cultural representative may need to be present during much of the remediation work on Mohawk lands.

- Downgradient groundwater recovery and treatment with discharge of treated groundwater to the St. Lawrence River

Groundwater will be recovered downgradient of the Industrial Landfill, the Industrial Lagoons, and the East Disposal Area. Extracted groundwater will be pumped to a wastewater treatment plant for treatment which could include a combination of aeration, clarification, filtration, air stripping and carbon adsorption to remove VOCs and PCBs from the groundwater. After treatment, the water will be discharged to the St. Lawrence River. Groundwater will be treated to comply with SPDES requirements. Groundwater will be extracted and treated until groundwater PCB concentrations, as measured at the boundary of the Industrial Landfill, the Industrial Lagoons, and the East Disposal Area are below 0.1 ppb. During and after remediation, groundwater and surface water will be monitored. If necessary, additional groundwater and/or surface water recovery and treatment will be used to ensure that no contamination is migrating from the Site.

- Testing of other PCB treatment technologies

Other innovative PCB treatment technologies will be tested concurrently with biological destruction so that EPA will have additional information in the event that biological destruction proves to be unsatisfactory for treatment of any Site material. Biological treatment will be used wherever EPA determines it to be viable. In the event that biological treatment is ineffective for a certain area of the Site or for certain Site materials, other innovative PCB treatment technologies (which have been demonstrated to achieve site treatment goals) or incineration may be employed. The criteria used to judge the treatment technologies during treatability testing include effectiveness and cost. EPA will select the treatment technologies to be employed, in consultation with NYSDEC and the St. Regis Mohawk Tribe.

The total present worth cost of the first operable unit selected remedy is $ 78 million. A breakdown of estimated costs associated with the selected remedy is presented in Table 12.

STATUTORY DETERMINATIONS

Protection of Human Health and the Environment

The selected remedy protects human health and the environment through the permanent treatment of contaminated sediments, soils, and sludges and through groundwater treatment. Treatment residuals will be covered. Bulk items which are not amenable to treatment will be separated and disposed in a facility which meets all TSCA requirements, as necessary. Following implementation of the selected remedy, the excess cancer risk to the adult Mohawk population will be on the order of 10^{-5} to 10^{-6}, depending on the residual sediment level attained after dredging.

Compliance with ARARs

A list of ARARs for the selected remedy is presented in Table 13. The selected remedy complies with these ARARs or provides the grounds for invoking a waiver as described below.

During dredging, EPA will attempt to meet the Tribal PCB ARAR of 0.1 ppm PCBs in Turtle Creek. However, based on limited previous experience at other Superfund sites and federal projects, dredging to 0.1 ppm PCBs may be technically impracticable. Therefore, EPA is waiving the Tribal sediment standard where it proves to be technically impracticable to achieve during dredging, as discussed in CERCLA, section 121(d)(4)(C). EPA will consult with the St. Regis Mohawk Tribe and NYSDEC before making a final determination as to the technical impracticability of meeting the tribal sediment PCB ARAR. EPA will base its determination on the results of dredging conducted in Turtle Creek.

According to TSCA disposal regulations and policy, soil treatment residuals with PCB concentrations above 2 ppm must be disposed in a TSCA chemical waste landfill. However, in accordance with TSCA regulations, EPA is waiving certain TSCA chemical waste landfill requirements for soil treatment residuals with PCB concentrations above 2 ppm and below 10 ppm. Specifically, provided the residuals are soils with a low water content and PCB concentrations below 10 ppm, EPA is waiving the TSCA requirements on landfill location and the TSCA requirement for a leachate collection system. These TSCA chemical landfill requirements are being waived under TSCA (40 CFR 761.75(c)(4)) because soil treatment residuals which meet Site cleanup standards do not present an unreasonable risk of injury to health or the environment from PCBs.

According to New York State hazardous waste disposal regulations at 6 NYCRR Part 370, all treatment residuals which satisfy the New York State definition of hazardous waste must be disposed in a landfill which meets New York State requirements. EPA does not anticipate that treatment residuals will be hazardous (e.g., have PCB concentrations above 10 ppm). However, all treatment residuals will be considered solid waste under New York State regulations at 6 NYCRR Part 360. New York State solid waste regulations, while mandating several requirements, including the use of a liner and leachate collection system, allow for less stringent requirements based on the potential pollution of the waste (6 NYCRR Part 360-2.14(a)).

During design, EPA, NYSDEC and the Tribe will finalize plans for the disposal of residuals. These plans will include certain provisions to ensure proper residuals disposal. For instance, the location of the residuals placement area will be selected such that the groundwater beneath the area flows towards the groundwater recovery and treatment system. Further, the residuals will be placed in a manner to ensure that they are not in contact with the shallow groundwater aquifer. The design of the cap will specify that soil with a very low permeability will be used. The cap will be constructed and maintained to prevent erosion and graded to direct runoff from the capped area. Should certain treatment residuals be hazardous or require greater protection than discussed above, EPA in consultation with New York State and the St. Regis Mohawk Tribe, will impose appropriate requirements in the finalized residuals treatment and disposal design plans.

In addition, TSCA regulations require that sludges with PCB concentrations above 500 ppm be incinerated in a TSCA compliant incinerator or be treated by a method equivalent to incineration. In compliance with TSCA, any sludges with initial PCB concentrations above 500 ppm which cannot be treated by an innovative technology to achieve PCB residuals below 2 ppm must be incinerated.

During groundwater recovery and treatment, EPA's cleanup goal is the New York State PCB ARAR of 0.1 ppb PCBs. Based on EPA studies of other sites, EPA has found that the final groundwater cleanup level will depend on technical considerations such as the propensity of PCBs to sorb to soil.

Cost-Effectiveness

The selected remedy is cost-effective because it has been demonstrated to provide overall effectiveness proportional to its costs. The present worth of the selected alternative is $ 78 million. EPA has selected an alternative which includes the use of biological treatment and incineration. This is a cost-effective remedy since biological treatment was the least expensive of the treatment remedies evaluated for the Site.

Sediment dredging and treatment, although approximately seven times more expensive than containment, is cost-effective because it is a highly permanent and effective remedy for the principal threat at the Site and because it reduces contaminant toxicity. Similarly, the additional costs associated with lagoon sludge excavation and treatment and excavation and treatment of solids in the North Disposal Area, on the Reservation, and on G.M. property are proportional to the long-term effectiveness and reductions in toxicity afforded by these alternatives. The higher degree of effectiveness and the reduction in contaminant mobility associated with groundwater recovery and treatment justifies the additional costs associated with this alternative.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner for the first operable unit at the G.M. Site. Of those alternatives that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, and cost while also considering the statutory preference for treatment as a principal element and considering State, Tribe and community acceptance.

The selected remedy offers a higher degree of permanence than containment alternatives. Because PCBs are highly persistent in the environment, removal and treatment provide the most effective way of assuring long-term protection. In addition, the use of biological treatment (or another innovative treatment technology), incineration, and groundwater treatment results in the reduction of toxicity and mobility of PCBs. Extraction technologies only reduce the volume of PCB contaminated materials. Although there are short-term impacts associated with the selected remedy, these can be mitigated and will not pose an unacceptable risk to the surrounding community, G.M. workers, or remediation workers.

Biological treatment presents some difficulties in implementation since it must be tested during design. However, incineration is a proven technology for the destruction of PCBs which can be used if necessary to ensure destruction of contaminated materials. Biological treatment is the least costly of all treatment alternatives evaluated. Therefore, use of biological treatment minimizes the cost of the selected alternative provided treatability tests show that it performs in a manner comparable to the other technologies considered. In addition, EPA favors the development of biological treatment since it is an innovative technology.

The selection of treatment is consistent with Superfund program expectations that indicate that highly toxic, persistent wastes are a priority for treatment which ensures long-term effectiveness. Among the treatment alternatives considered for the various areas of the Site, the major tradeoffs that provided the basis for EPA's remedy selection were proven effectiveness of incineration and the cost of biological treatment.

Preference for Treatment as a Principal Element

By treating the contaminated sediments and solids in the river system, in the North Disposal Area, on the Reservation and on G.M. property and by treating contaminated groundwater, the selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element for several of the principal threats posed by the Site.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the G.M. Site was released on March 21, 1990. The Proposed Plan identified the following preferred alternative:

- sediment dredging;
- excavation of lagoon sludges in all four Industrial Lagoons;
- excavation of solids and sludges in the North and East Disposal Areas, on the Reservation, and on G.M. property;
- groundwater recovery and treatment
- incineration of all excavated/dredged material with PCB concentrations greater than 500 ppm and biological treatment of all excavated/dredged material with PCB concentrations less than 500 ppm.

After reviewing all written and verbal comments received during the public comment period, EPA has made five significant changes from this proposed alternative. These changes were made based on new information received during the public comment period from EPA, the public, G.M., the St. Regis Mohawk Tribe and NYSDEC.

EPA has determined that its remedial decision for the East Disposal Area should be deferred. This determination was based on the fact that new EPA policy on Superfund sites with PCB contamination which may affect EPA's decision for the East

Disposal Area was released during the public comment period. EPA will select a remedy for the East Disposal Area and the Industrial Landfill in a second operable unit ROD.

EPA has determined that G.M. plant operations could be impacted during remediation of the active wastewater lagoons. This determination is based on comments received from G.M. which stated that the lagoons are an integral part of current plant operations. In addition, any groundwater releases from the active lagoons which would be a source of contamination to the environment will be dealt with through the groundwater recovery and treatment remedy specified in this ROD. As a result, EPA has delayed remediation of active lagoons. The method of remediation for the lagoons is exactly the same as for inactive lagoons, however, EPA will delay remediation of the active lagoons as long as they remain in service.

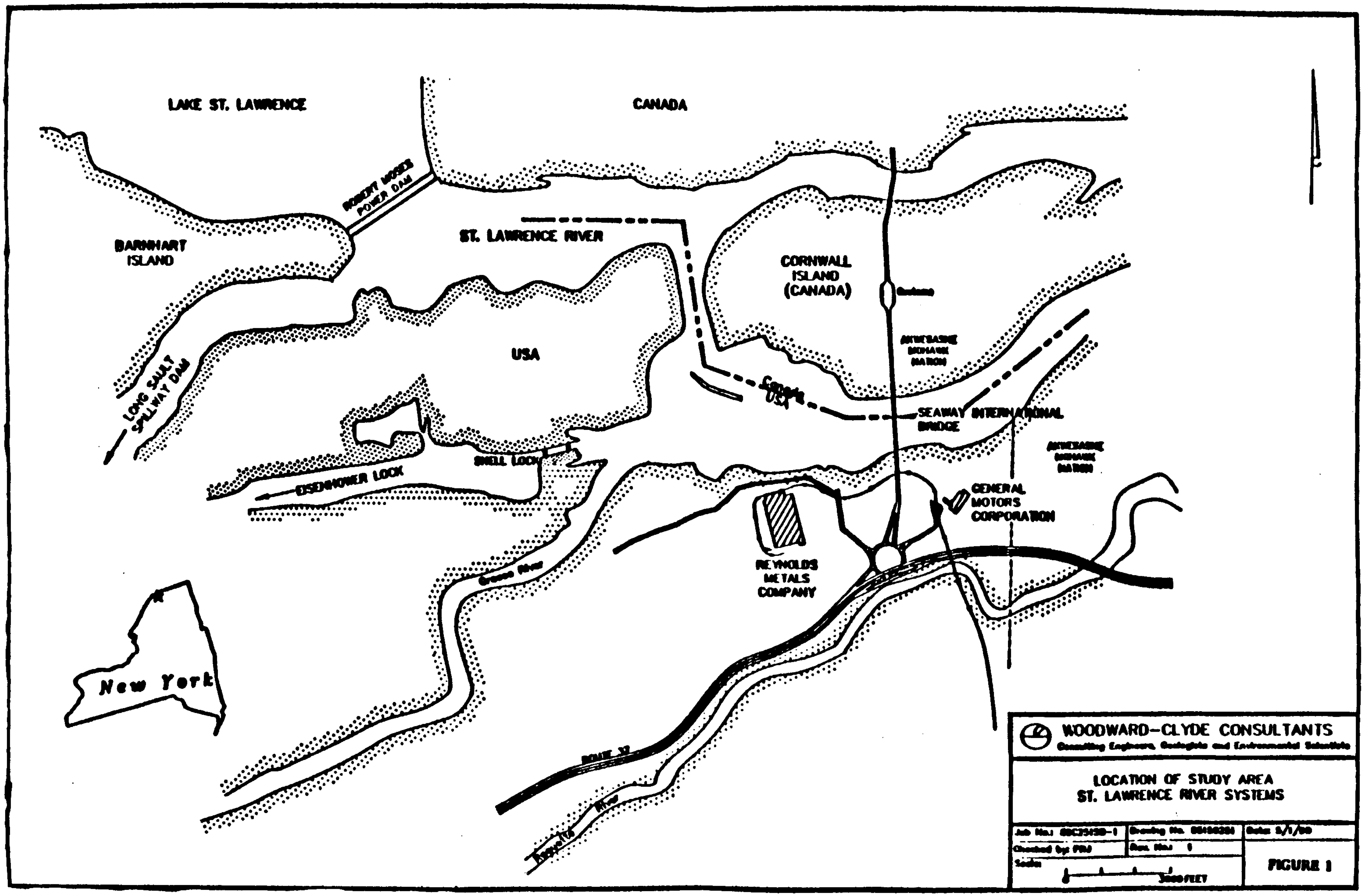
EPA has determined that the use of on-site incineration should be minimized in the selected remedy. This determination was based on comments from the public and the Tribe which stated that incineration was the least preferred treatment method for the Site. As a result, EPA will rely on the results of treatability tests to determine whether biological treatment will be used to treat the various areas at the Site. In the event that biological treatment is ineffective for a certain area of the Site, other treatment technologies which will be tested concurrently with biological treatment may be employed. In the event that these other technologies are ineffective, incineration will be used at the Site.

EPA has determined that a lower PCB cleanup goal is warranted in St. Lawrence River sediments and soils. This determination was based on comments from the public, NYSDEC, the Tribe, and the Natural Resource Trustees which called for lower cleanup levels in the river system. Based on these comments and on a review of the data used to determine the initial sediment cleanup level, EPA has revised the PCB cleanup level in the St. Lawrence River to 1 ppm. The 1 ppm level roughly corresponds to a 10^{-5} excess cancer risk to adult Mohawks.

Finally, EPA has determined that a higher PCB cleanup goal is warranted in Raquette River sediments. This determination was based on a review of PCB data which shows that all contamination detected in the Raquette River is located on the riverbank and in the sediment near the former G.M. outfall. Since this area is not located on the Reservation, EPA has revised the PCB cleanup level in the Raquette River to 1 ppm.

APPENDIX 1

FIGURES


LAKE ST. LAWRENCE
CANADA
BARNHART ISLAND
ROBERT MOSES POWER DAM
ST. LAWRENCE RIVER
CORNWALL ISLAND (CANADA)
AKWESASNE MOHAWK NATION
USA
LONG SAULT SPILLWAY DAM
Canada
USA
SEAWAY INTERNATIONAL BRIDGE
SNELL LOCK
EISENHOWER LOCK
GENERAL MOTORS CORPORATION
REYNOLDS METALS COMPANY
Grasse River
New York
ROUTE 37
WOODWARD-CLYDE CONSULTANTS
LOCATION OF STUDY AREA
ST. LAWRENCE RIVER SYSTEMS
FIGURE 1

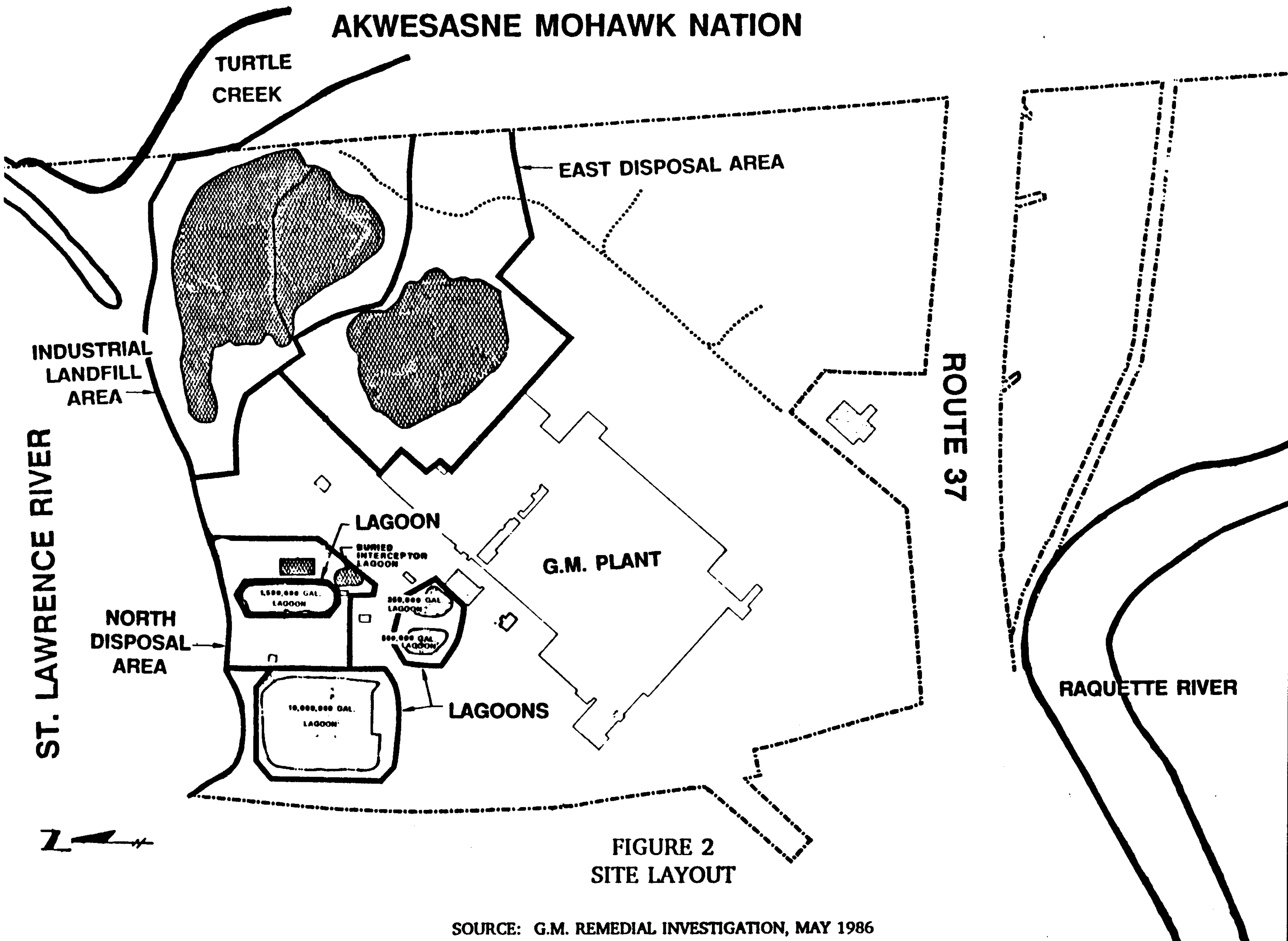


FIGURE 2
SITE LAYOUT

SOURCE: G.M. REMEDIAL INVESTIGATION, MAY 1986

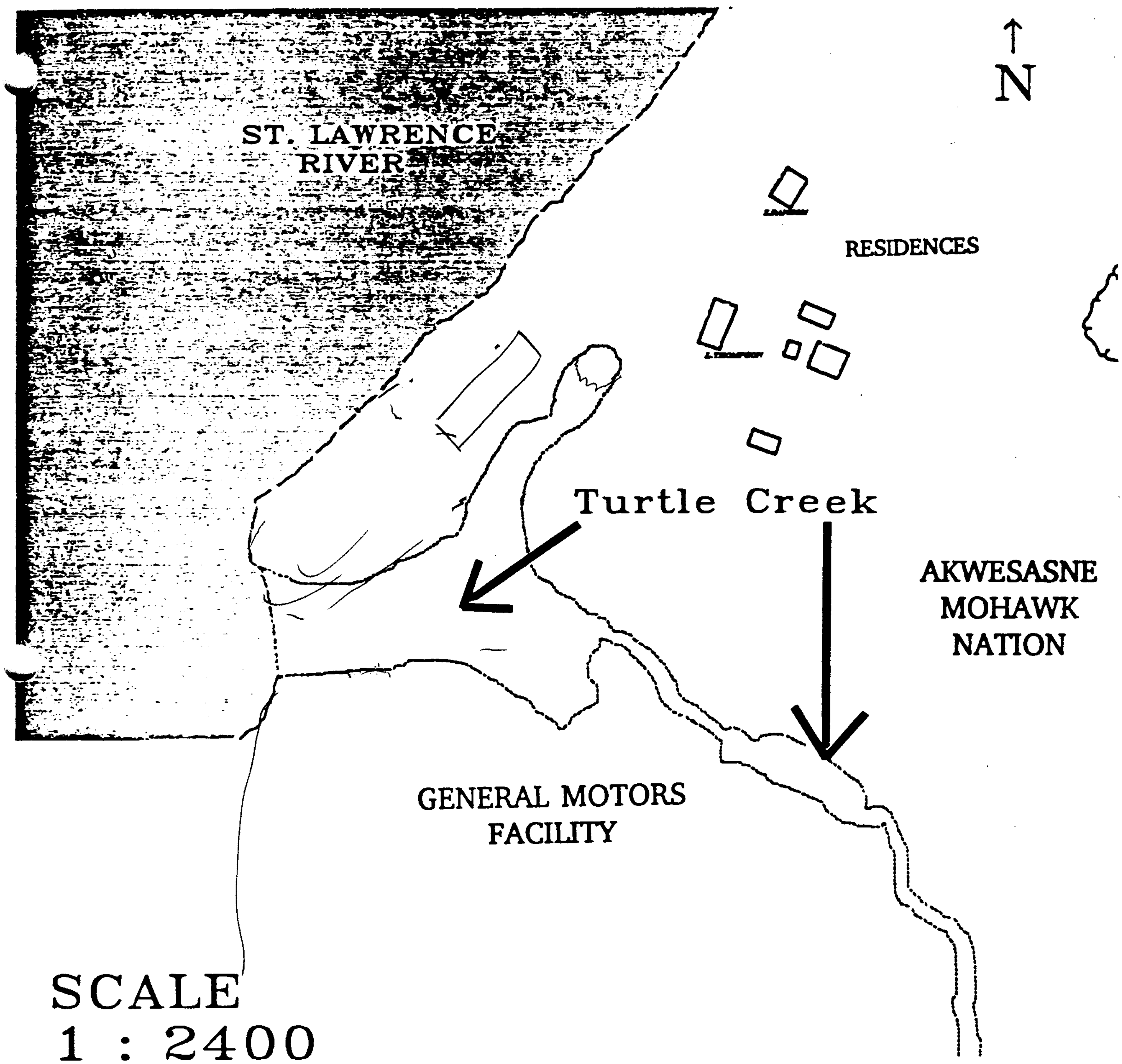


FIGURE 3
DELINEATION OF TURTLE CREEK

APPENDIX 2

TABLES

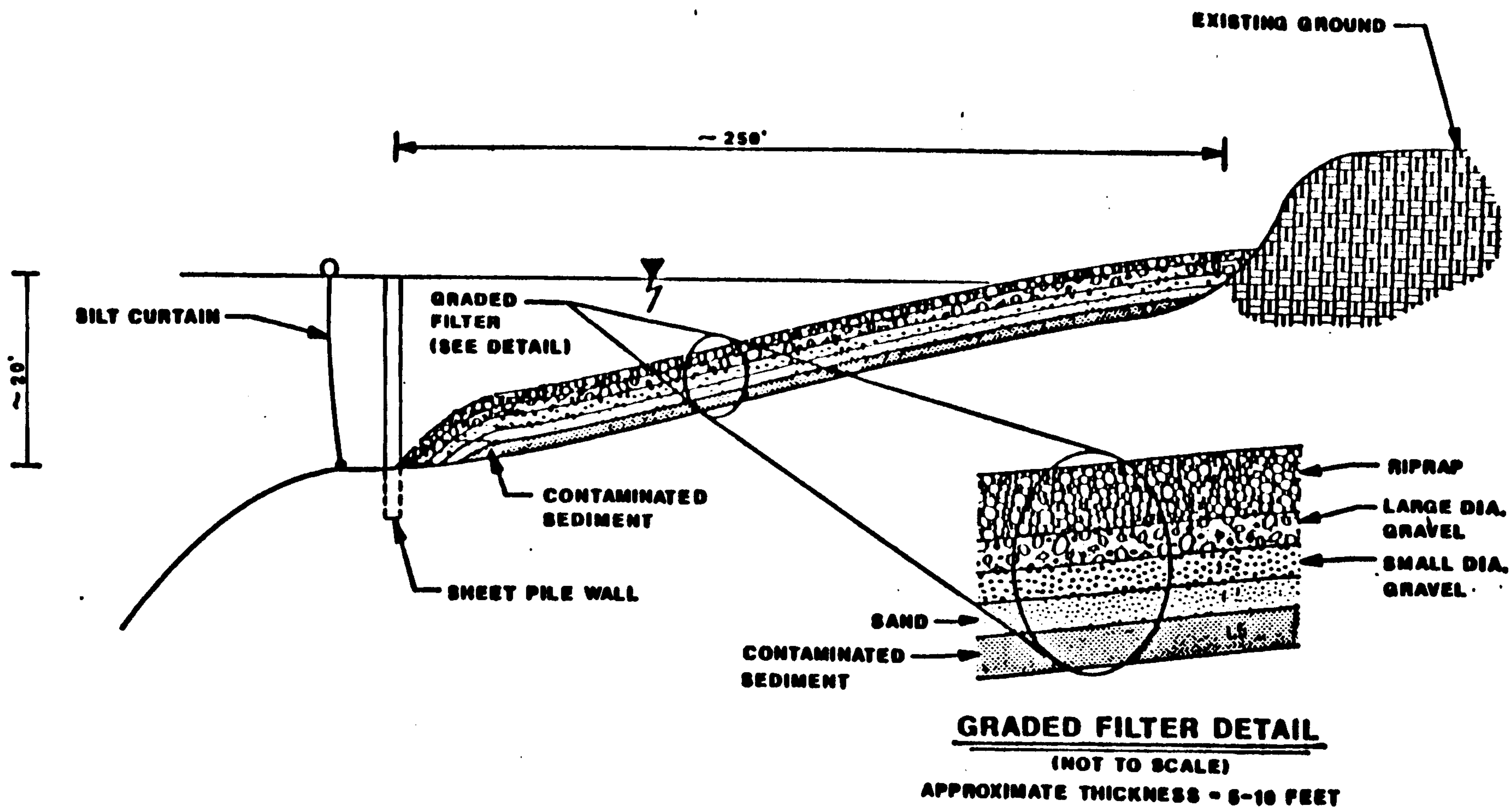


FIGURE 4
DESIGN CONCEPTS: IN-PLACE CONTAINMENT OF SEDIMENTS

SOURCE: G.M. DRAFT FEASIBILITY STUDY, NOVEMBER 1989

TABLE 1

VOLUMES OF PCB CONTAMINATED MATERIAL
AT THE G.M. SITE

Site Area	Volume of Material with PCBs ≥ 1 ppm (yd^3)	Volume of Material with PCBs ≥ 10 ppm (yd^3)	Volume of Material with PCBs ≥ 25 ppm (yd^3)	Volume of Material with PCBs ≥ 50 ppm (yd^3)	Volume of Material with PCBs ≥ 500 ppm (yd^3)
River Sediments	62,000	34,000	29,000	24,000	16,000
Lagoons	103,000	91,000	84,000	83,000	42,000
North and East Disposal Areas	311,000	225,000	195,000	126,000	76,000
Industrial Landfill	442,000	424,000	420,000	316,000	305,000
Reservation Soils*	15,000	15,000	15,000	15,000	15,000
Other Areas	60,000	34,000	4,000	1,000	0
TOTAL	993,000	823,000	747,000	565,000	454,000

where: ppm = parts per million
yd^3 = cubic yards

* Calculation of Reservation soil volumes is based on a 1 ppm action level.

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 2
SUMMARY OF RI RESULTS
GMC CFD MASSENA
(ABBREVIATIONS DEFINED AT END OF TABLE)

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
1. NORTH DISPOSAL AREA			
a. Soils/Sludge	PCBs (Total)	S: 0.27 - 12,000 ppm (28/28) Median = 6.1 ppm S/S: 0.13 - 31,000 ppm (56/61) Median = 30 ppm	Two patterns of PCB concentrations with depth are evident. One indicates decreasing concentration with depth. PCB is at less than 10 ppm by a depth of 11 feet. The second indicates concentration of > 25 ppm at a 20-foot depth.
	VOCs	S: No detects S/S: VC 0.158 ppm (1/9) PCE 0.8 ppm (2/9) Benzene 0.01 ppm (1/9) MEK 0.1 ppm (1/9) DCE 0.3 ppm (1/9)	Fifteen different VOCs detected in soil samples. All VOC concentration values in soil borings were less than 0.3 ppm, with the exception of PCE and DCE in two samples.
	Phenol/Substituted Phenol	S: No detect S/S: Up to 5000 ppm (3/9)	Two borings accounted for the only quantifiable observations of substituted phenols (2,4-dimethyl-phenol, 2-methylphenol, and 4-methylphenol). The highest concentrations of phenols were associated with areas of past waste disposal or treatment.
	PNAs	S: BMDL S/S: 2 Methylnaphthalene 2.0 ppm (1/9)	Eleven PNAs were detected in surficial soils and boring samples. All PNAs, with the exception of 2-methyl-naphthalene, were detected below the MDL.

S = Surface
S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Phthalates	S: Up to 2.0 ppm (2/4) S/S: Up to 17 ppm (5/9)	Four phthalate compounds were detected in surficial soil and boring samples. Quantifiable concentrations of phthalate compounds ranged from 0.891 to 17.8 ppm in five of thirteen samples.
	Metals	S: See comment	Only manganese and magnesium were observed at concentrations above those in background samples. Neither constituent warrants consideration for remedial action.
b. Ground Water	PCBs (1248) (MW 24B, MW14A, MW14B)	Not Detected to 0.0041 ppm	Results indicate lower concentrations in Phase II RI in comparison to Phase I RI.
2. EAST DISPOSAL AREA			
a. Soils	PCBs (Total)	S: Up to 41,000 ppm (60/68) Median = 12 ppm S/S: Up to 30,000 ppm (87/89) Median = 2.5 ppm	Most of the PCBs were found within the boundaries of previous sludge disposal areas. Three additional areas adjacent to the sludge disposal areas were also defined.
	VOCs	S: MEK up to 0.01 ppm (1/8) S/S: Xylene up to 0.008 ppm (4/18) Toluene up to 0.01 ppm (4/18)	Phase I and Phase II RI results indicated the presence of eleven VOCs. These concentrations are low and do not warrant further assessment.

S = Surface
S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
PCB's = Polychlorinated Biphenyls
PNA's = Polynuclear Aromatic Hydrocarbons

TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Phenols/Substituted Phenols	S: Up to 11,000 ppm (16/22) S/S: Up to 8,000 ppm (3/18)	Phenol and three substituted phenols (see IA) were detected in soil and boring samples. Phase I and II results indicate they were present within and below waste materials but not in surrounding soils.
	PNAs	S: BMDL to 0.6 ppm (2/8) S/S: BMDL to 0.6 ppm (3/18)	Sixteen PNAs were detected in soil and boring samples. The highest PNA concentration reported was 0.6 ppm.
	Phthalates	S: Up to 2 ppm (3/8) S/S: Up to 8 ppm (18/18)	Five different phthalate compounds were detected in soil and sludge samples. All of these compounds correspond to areas of past waste disposal.
	Metals	See Comments	Means and ranges typically comparable to background.
b. Ground Water	PCBs (1248) (MW-27A)	Up to 0.0017 ppm	Detected in first round of sampling but could not be confirmed by three subsequent rounds.
	Phenol (MW-27A&B)	Up to 0.06 ppm	Two rounds of Phase I RI results indicated presence of phenols. The two rounds of Phase II RI indicated no detectable phenols.

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S/S = Subsurface
BMDL = Below Method Detection Limit
(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
VC = Vinyl Chloride
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
3. INDUSTRIAL LANDFILL a. Soils/Waste	PCBs (Total)	S: Up to 45 ppm (27/27) Median = 1.7 ppm S/S: Up to 4300 ppm (80/90) Median = 1.7 ppm	
	VOCs	S: BMDL S/S: TCE up to 1.1 ppm (2/12)	Ten different VOCs were detected in boring samples. Of fourteen detectable values in soil boring samples, 9 were found in two samples. Contamination is generally isolated and at low levels.
	Phenols/Substituted Phenols	S: Up to 8 ppm (1/6) S/S: Up to 51 ppm (2/12)	2,4-dimethylphenol, 4-methylphenol and phenol were detected in two soil boring samples.
	PNAs	S: BMDL S/S: Up to 3 ppm (2/12)	Fifteen different PNAs were detected in soil boring and surface soil samples. Twenty-three of 32 observations of PNAs were BMDL. One sample accounted for 13 of 32 PNA occurrences.
Phthalates		S: Up to 4 ppm (2/6) S/S: Up to 5 ppm (12/12)	Four phthalates were detected in soil boring and surface soil samples from this area. In five of the 18 samples, the concentrations are below MDL.

S = Surface
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(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
PCE = Tetrachloroethylene
TCE = Trichloroethylene
MEK = Methyl Ethyl Ketone
VOCs = Volatile Organic Compounds
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Metals	See Comments	Five samples out of 20 showed levels above background (Al, As, Co, Cu, Cr, Fe, Ni, Zn). The occurrence of trace metals is probably due to the presence of foundry sands and not to the disposal of PCB waste oils.
b. Ground Water	PCBs (1248) (MW-16A&B)	Up to 1.3 ppm	Only samples from well 16A and 16B showed a consistent occurrence (PCBs). The Phase II data indicate the extent of hazardous substance migration in ground water in the vicinity of the landfill is more limited than shown by the Phase I RI data.
	VOCs (MW-16B)	1,2 DCE up to 0.686 ppm (6/6) TCE up to 0.050 ppm (4/6) VC 0.050 ppm (4/6)	Only samples from well MW-16B showed a consistent pattern of VOC occurrence. Phase II RI data showed lower concentrations.
	Phenols/Substituted Phenols	Up to 0.024 ppm	Concentrations decreased from Phase I RI results to Phase II RI results.
	PNAs (MW-26B)	Up to 0.188 ppm	Four PNAs detected in MW-26B in Phase I and not Phase II.
	Phthalates (several wells)	Up to 0.082 ppm (2/16)	Phthalates were seen in the Phase I RI but not in Phase II RI sampling of wells.
	Metals	See Comments	All were within background concentrations.

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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
4. LAGOONS			
a. Sludges	PCBs (1248)	Up to 750 ppm (19/19)	All lagoons were found to have PCBs in and/or beneath sludge within the lagoons and soil immediately adjacent to lagoons.
	VOCs	PCE up to 6 ppm (5/14) Toluene up to 28 ppm (14/14) TCE up to 3 ppm (5/14) VC up to 2 ppm (7/19) Xylenes up to 1.5 ppm (4/14)	Thirteen VOCs were detected in soil and/or sludges from the lagoon area. VOCs showed up most often and were generally at the highest concentrations in sludges from the 350,000-gallon lagoon. Eight different VOCs were detected from sludges from the 500,000-gallon lagoon. Five different VOCs were detected in the 1.5 m-gallon lagoon.
	Phenols/Substituted Phenols	Up to 26,000 ppm (14/14)	Constituents included phenol, 2,4-methylphenol, and 4 methyl-phenol.
	PNAs	Up to 30 ppm (3/14)	Nine PNAs were detected in sludges from one or more of the lagoons. Sixteen of 37 reported occurrences of PNAs were of concentrations below the MDL.
	Phthalates	Up to 37 ppm (3/14)	Only one phthalate was detected in the 350,000-gallon lagoon. Three phthalates were detected in the 1.5 M-gal lagoon. Two phthalates were detected in the 500,000-gallon lagoon.

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TCE = Trichloroethylene
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
	Nitrosodiphenylamine	Up to 268 ppm (4/14)	Detected in the 350,000-gallon lagoon.
	Metals	See Comments	Eleven of 23 metals exceeded background, notably C, Pb, Hg.
b. Soils	PCBs (Total)	S: Up to 280 ppm (11/11) Median = 7.6 ppm S/S: Up to 41 ppm (38/43) Median = 11 ppm	PCB concentrations ranged from BMDL to 280 ppm.
	VOCs	S: No detects S/S: MEK up to 0.1 ppm (4/6)	Five VOCs were detected in soil samples. With the exception of MEK, all values of VOCs were less than 0.01 ppm.
	Phenols/Substituted Phenols	S: No detects S/S: Up to 4 ppm (2/6)	All concentrations of compounds in this group were observed below the MDL, with the exception of phenol in one sample.
	PNAs	S: BMDLs S/S: BMDLs	Six PNAs were detected (below the MDL) in the surface soil samples.
	Phthalates	S: BMDL (1/6) S/S: Up to 17 ppm (6/6)	The surface soil sample contained only di-n-butylphthalate at below MDL. Bis(2-ethyl hexyl) phthalate and di-n-butylphthalate were detected below the MDL in all boring samples.
	Metals	See Comments	Ni, Ca, Mg were found above background.

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(1/9) = Number of Samples Detected/Number of Samples Analyzed
DCE = 1,2-Trans-dichloroethylene
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
c. Ground Water	PCBs (1248) (22B)	Up to 0.087 ppm (at 22B)	The RI I data from MW23B suggested migration of PCBs from the 10 M-gallon lagoon. Both Phase II samples from MW-23B were free of detectable PCBs. This makes it uncertain if PCBs are migrating by a ground water pathway. Three of four rounds from MW-14B and MW-24B produced reportable PCB levels indicating the probable existence of PCBs in ground water.
	VOCs	See comments	A few constituents were noted at low concentrations.
	Phenols/Substituted Phenols (22B)	Up to 2.7 ppm (at 22B)	Phenols were detected in all rounds from MW-22B.
	PNAs	No detects	
	Phthalates (22B)	Up to 0.029 ppm (at 22B)	Detected above BMDL in MW-22B and MW24B in one of four rounds.
	Metals	See comments	All were within background concentrations. Mercury was reported at 2.6 ug/L (over the MCL) from MW-22B. This was not confirmed by other RI sampling rounds or NYDEC split samples.

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PCE = Tetrachloroethylene
TCE = Trichloroethylene
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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC-CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
5. ST. LAWRENCE RIVER SEDIMENT	PCBs	S: ND - 5,700 (38/39) Median = 24 ppm	Samples generally contained from 2 to 4 times as much Aroclor 1232 as 1248. This is the only location where other than Aroclor 1248 was detected. No measurable concentrations of the 2, 3, 7, 8-isomers of dioxin or furan were observed in any samples.
	VOCs	MEK Up to 0.0321 ppm (7/8)	Significant concentrations of VOCs were not observed.
	Phenols/Substituted Phenols	BMDL	Significant concentrations of acid extractables were not observed.
	Phthalates	Up to 3.22 ppm (8.8)	
	PNAs	Benzo(a)anthracene BMDL to 8 ppm.	Sixteen of PNAs were detected in the eight sediment samples collected adjacent to the site. No measurable concentrations of the 2, 3, 7, 8,-isomers of dioxin or furan were observed in any samples.
	Metals	See Comments	Mercury and selenium were above local background concentrations but within those reported for soils in New York.

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TABLE 2 (CONTINUED)
SUMMARY OF RI RESULTS
GMC CFD MASSENA

AFFECTED AREA	CONSTITUENTS	CONCENTRATION RANGE (FREQUENCY)	COMMENTS
6. RAQUETTE RIVER	PCBs (Total)		
a. Sediments		S: 0.34 - 2.3 (2/4) Median = 1.3 ppm	In addition, a "Highly localized" IT detect of 240 ppm at outfall was found.
b. Soils on River Bank		S: 0.22 - 32 (10/11) Median = 1.7 ppm	
7. OFF-SITE SOILS (UNNAMED TRIBUTARY)	PCBs (Total)	S: ND - 48 (49/82) Median = 0.59	The spatial distribution of PCBs indicates that runoff over a limited area in the southeast corner of the GMC-CFD facility was the primary route by which PCBs migrated from the facility.
	VOCs	S: MEK upto 0.9 ppm (3/15)	
	Phenols	S: BMDL (1/15)	
	PNAs	S: BMDL (15/15)	
	Phthalates	S: BMDL - 7.99 ppm (1/15)	
	Metals	See Comments	No metals were identified above background levels.

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TABLE 3

Summary of Exposure Assumptions and Exposures via All Pathways for the G.M. Site

Pathway	Most Probable	Worst Case
Fish Ingestion		
Consumption	130 g/day	130 g/day
Fish Concentration	1.7 mg/kg	6.9 mg/kg
Exposure	0.003 mg/kg-day	0.013 mg/kg-day
Wildlife Consumption		
Consumption	6.6 g/day	6.6 g/day
Wildlife Concentration	23 mg/kg	33 mg/kg
Exposure	0.002 mg/kg-day	0.003 mg/kg-day
Soil Ingestion		
Soil Ingestion	39 mg/day (child)	200 mg/day (child)
	10 mg/day (adult)	100 mg/day (adult)
Soil Concentration	0.065 mg/kg	3.3 mg/kg
Exposure	1.1×10^{-7} mg/kg-day	3.5×10^{-6} mg/kg-day
Water Ingestion		
Ingestion	1.4 l/day	2.0 l/day
Water Concentration	1.0 μg/l	7.5 μg/l
Exposure	2×10^{-5} mg/kg-day	2.1×10^{-4} mg/kg-day

TABLE 3 (cont.)

Summary of Exposure Assumptions and Exposures via All Pathways for the G.M. Site

Pathway	Most Probable	Worst Case
Breast Milk		
Ingestion	800 ml/day	800 ml/day
Milk Concentration	0.07 mg/l	0.22 mg/l
Exposure	8.9×10^{-5} mg/kg-day	2.8×10^{-4} mg/kg-day

where:
- g = grams
- mg = milligrams
- kg = kilograms
- l = liters
- μg = micrograms
- ml = milliliter

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 4

Summary of Carcinogenic Risks to Mohawks

Pathway	Most Probable	Worst Case
Fish Ingestion	2.4×10^{-2}	1.0×10^{-1}
Wildlife Consumption	1.7×10^{-2}	2.4×10^{-2}
Soil Ingestion	8.5×10^{-7}	2.7×10^{-5}
Water Ingestion	1.5×10^{-4}	1.7×10^{-3}
Breast Milk	6.8×10^{-4}	2.2×10^{-3}
TOTAL	4.2×10^{-2}	1.3×10^{-1}

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 5

Summary of Noncarcinogenic Effects on Mohawks

Pathway	Most Probable	Worst Case
Fish Ingestion	31.6	128
Wildlife Consumption	21.7	31.1
Soil Ingestion	1.1×10^{-3}	3.5×10^{-2}
Water Ingestion	0.2	2.1
Breast Milk	8.9×10^{-1}	2.8
TOTAL	54.4	164.0

Source: "Baseline Risk Assessment for GM/Massena Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, September 15, 1989.

TABLE 6

G.M. SITE CLEANUP LEVELS

Medium	Contaminant	Cleanup Level	Treatment Level
Sediment in the St. Lawrence and Raquette Rivers*	PCBs	1 ppm	≤10 ppm
Sediment in Turtle Creek*	PCBs	0.1 ppm	≤10 ppm
Soil/Sludge on G.M. Property	PCBs	10 ppm	≤10 ppm **
	Total Phenols	50 ppm	50 ppm
Soil on the Reservation	PCBs	1 ppm	≤10 ppm
Groundwater	PCBs	0.1 ppb	≈65 ppt ***
	Total Phenols	1 ppb	1 ppb
	1,2 DCE	100 ppb	50 ppb
	TCE	5 ppb	3 ppb
	Vinyl Chloride	2 ppb	300 ppt

where:

ppm	= parts per million
ppt	= parts per trillion
1,2 DCE	= 1,2-(trans)-dichloroethylene
TCE	= trichloroethylene
VC	= vinyl chloride

* Cleanup levels given for sediments were used to define PCB hotspots.

** In compliance with TSCA regulations, sludge with initial PCB concentrations above 500 ppm is subject to a 2 ppm treatment level.

*** Water would be treated to comply with SPDES which currently requires that PCB concentrations in the discharge be non-detectable, down to the method detection level, using EPA Laboratory Method Number 608.

TABLE 7

ST. REGIS MOHAWK PCB CLEANUP REQUIREMENTS

Medium	Cleanup Standard
Sediments	0.1 ppm
Soil	1 ppm
Groundwater	10 ppt
Air	5 ng/m^3
Surface Water	1 ppt

where:
- ppm = parts per million
- ng = nanograms
- m^3 = cubic meter
- ppt = parts per trillion

TABLE 8

COSTS ASSOCIATED WITH SEDIMENT DREDGING AND ON-SITE TREATMENT

Alternative	Construction Cost ($M)	Annual O&M Cost ($K/year)	Present Worth Costs ($M)
Dredging and Biological Treatment	7.7	30	7.7
Dredging and Chemical Destruction	29	12	29
Dredging and Chemical Extraction	22	12	22
Dredging and Thermal Destruction	32	12	32
Dredging and Thermal Extraction	29	12	29
Dredging and Solidification	17	12	17
Dredging and a Combination of Biological Treatment and Thermal Destruction*	21.5	24	21.5

where: O&M = operation and maintenance
$M = millions of dollars
$K = thousands of dollars

* Costs are based on an assumption of biological treatment of sediments with PCB concentrations between 1 ppm and 500 ppm and thermal destruction of sediments with PCB concentrations greater than 500 ppm.

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 9

COSTS ASSOCIATED WITH EXCAVATION AND ON-SITE TREATMENT OF SOLIDS IN THE NORTH DISPOSAL AREAS, RESERVATION SOILS. SOILS ON G.M. PROPERTY

Alternative	Construction Cost ($M)	Annual O&M Cost ($K/year)	Present Worth Costs ($M)
Excavation and Biological Treatment	25	102	25
Excavation and Chemical Destruction	49	165	49
Excavation and Chemical Extraction	36	165	36
Excavation and Thermal Destruction	56	165	56
Excavation and Thermal Extraction	49	165	49
Excavation and Solidification	27	165	27
Excavation and a Combination of Biological Treatment and Thermal Destruction*	38	267	38

where: O&M = operation and maintenance
$M = millions of dollars
$K = thousands of dollars

* Costs are based on an assumption of biological treatment of sediments with PCB concentrations between 1 ppm and 500 ppm and thermal destruction of sediments with PCB concentrations greater than 500 ppm.

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 10

COSTS ASSOCIATED WITH LAGOON SOLIDS EXCAVATION AND ON-SITE TREATMENT

Alternative	Construction Cost ($M)	Annual O&M Cost ($K/year)	Present Worth Costs ($M)
Excavation and Biological Treatment	24	102	24
Excavation and Chemical Destruction	42	165	42
Excavation and Chemical Extraction	31	165	31
Excavation and Thermal Destruction	47	165	47
Excavation and Thermal Extraction	42	165	42
Excavation and Solidification	22	165	22
Excavation and a Combination of Biological Treatment and Thermal Destruction*	47	267	48

where: O&M = operation and maintenance
$M = millions of dollars
$K = thousands of dollars

* Costs are based on an assumption of biological treatment of sediments with PCB concentrations between 1 ppm and 500 ppm and thermal destruction of sediments with PCB concentrations greater than 500 ppm.

Source: Draft Feasibility Study for G.M. Site, November 1989

TABLE 11

ESTIMATED WORST CASE TRANSIENT CANCER RISKS AND NONCARCINOGENIC EFFECTS FOR ADULT INDIANS AND REMEDIATION WORKERS DURING IMPLEMENTATION OF REMEDIAL ACTIONS

Alternative	Transient Cancer Risks to Adult Indians	Transient Noncarcinogenic Effects on Adult Indians (Hazard Index)	Transient Cancer Risks to Remediation Workers	Transient Noncarcinogenic Effects on Remediation Workers (Hazard Index)
Capping of the North Disposal Area	4.0×10^{-7}	5.2×10^{-4}	1.6×10^{-5}*	2.1×10^{-2}*
Sediment Dredging with Treatment by a Combination of Biological Treatment and Thermal Destruction	2.1×10^{-5}	2.7×10^{-2}	1.6×10^{-4}	2.0×10^{-1}
Excavation of the North Disposal Area with Treatment by a Combination of Biological Treatment and Thermal Destruction	3.3×10^{-6}	2.1×10^{-3}	3.7×10^{-3}**	4.7**

* Risks or hazard indices estimated for North and East Disposal collectively.

** Risks or hazard indices estimated for North and East Disposal Areas and Industrial Lagoons collectively.

Source: "Risk Assessment for Five Remedial Alternatives at the G.M. Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, April 2, 1990.

TABLE 11 (cont.)

ESTIMATED WORST CASE TRANSIENT CANCER RISKS AND NONCARCINOGENIC EFFECTS FOR ADULT INDIANS AND REMEDIATION WORKERS DURING IMPLEMENTATION OF REMEDIAL ACTIONS

Alternative	Transient Cancer Risks to Adult Indians	Transient Noncarcinogenic Effects on Adult Indians (Hazard Index)	Transient Cancer Risks to Remediation Workers	Transient Noncarcinogenic Effects on Remediation Workers (Hazard Index)
Excavation of the Industrial Lagoons with Treatment by a Combination of Biological Treatment and Thermal Destruction	7.0×10^{-7}	7.7×10^{-4}	3.7×10^{-3}**	4.7**

** Risks or hazard indices estimated for North and East Disposal Areas and Industrial Lagoons collectively.

Source: "Risk Assessment for Five Remedial Alternatives at the G.M. Site," prepared by Gradient Corporation for the U. S. Environmental Protection Agency, April 2, 1990.

TABLE 12

SUMMARY OF COSTS OF SELECTED REMEDY

Component of Selected Remedy	Construction Cost ($M)	O&M Costs ($K/year*)	Present Worth Cost ($M)**
Sediment Dredging with a Combination of Biological Treatment and Thermal Destruction***	21.5	24 (3 years)	21.5
North Disposal Area, Reservation Soil, and G.M. Property Soil Excavation with a Combination of Biological Treatment and Thermal Destruction***	38	267 (5 years)	38
Active Industrial Lagoon Excavation with a Combination of Biological Treatment and Thermal Destruction***	39.6	267 (3 years)	24.6****
Inactive Industrial Lagoon Excavation with a Combination of Biological Treatment and Thermal Destruction***	25.8	267 (3 years)	26
Groundwater Recovery and Treatment	2	197 (30 years)	4
TOTAL*****	84.8	464 (years 1 - 8) 197 (years 9 - 10) 464 (years 11 - 13) 197 (years 14 - 30)	78****

* O&M begins after completion of construction.

** Based on an assumed discount rate of five percent

TABLE 12 (cont.)

SUMMARY OF COSTS OF SELECTED REMEDY

*** Costs are based on an assumption of biological treatment of sediments with PCB concentrations between 1 ppm and 500 ppm and thermal destruction of sediments with PCB concentrations greater than 500 ppm.

**** Present worth costs reflect the assumption that active lagoons will be remediated in ten years.

***** Reflects the savings (in fixed incineration and biological treatment costs) realized by utilizing the same treatment technologies for all areas of the Site.

TABLE 13

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SELECTED REMEDY

Chemical-Specific ARARs

- Safe Drinking Water Act
  - Maximum Contaminant Level (MCL) for trichloroethylene and vinyl chloride
- St. Regis Mohawk Tribe Requirements
  - PCB cleanup levels in soil, sediment, air, water, and groundwater
- Clean Air Act
  - National Ambient Air Quality Standards at 40 CFR Part 50
- New York State Requirements
  - Groundwater regulations at 6 NYCRR Part 703
  - Surface water regulations at 6 NYCRR Part 701, including Appendix 31
  - Air quality standards at 6 NYCRR Part 257

Action-Specific ARARs

- Toxic Substances Control Act
  - 40 CFR 761.60-79 PCB disposal requirements
- Resource Conservation and Recovery Act
  - Closure requirements at 40 CFR 264 Subparts G, K, L, and N
  - Groundwater monitoring requirements at 40 CFR 264 Subpart F
  - Incineration requirements in 40 CFR 264 Subpart O
  - Design and operating requirements for a new unit at 40 CFR Subpart N
  - Design and operating requirements for tank at 40 CFR Subpart J
  - Generator requirements at 40 CFR 262
  - Transporter requirements at 40 CFR 263
  - Land Dipsosal Restrictions (for hazardous treatment residuals only) at 40 CFR 268

TABLE 13 (cont.)

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SELECTED REMEDY

- Clean Water Act
  - Best Available technology and monitoring requirements at 40 CFR 122.44(a, e, i)
  - Best Management Practices program requirements at 40 CFR 125.100
- Rivers and Harbors Act
  - Dredging requirements at 33 CFR 320-330
- New York State Requirements
  - Solid Waste Management Facility regulations at 6 NYCRR Part 360
  - Final status standards for hazardous waste facilities at 6 NYCRR Part 373-2
  - Implementation of National Permit Discharge Elimination System at 6 NYCRR 750-757

Location-Specific ARARs

- Executive Orders 11988 and 11990
  - Floodplains management and protection of wetlands at 40 CFR 6.302 and 40 CFR 6, Appendix A
- Fish and Wildlife Coordination Act
  - Protection of endangered species and wildlife at 33 CFR Parts 320-330 and 40 CFR 6.302
- National Wildlife Historical Preservation Act
  - Preservation of historic properties at 36 CFR 65 and 36 CFR 800
- Endangered Species Act
  - Protection of endangered species at 50 CFR 200, 50 CFR 402
- Clean Water Act
  - Section 404 requirements for dredge spoil discharge at 40 CFR 230 and 33 CFR Parts 320-330
- Wild and Scenic Act
  - Protection of recreational river at 40 CFR 6.302(e)

TABLE 13 (cont.)

MAJOR APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, AMONG OTHERS, ASSOCIATED WITH THE SELECTED REMEDY

- Coastal Zone Management Act
  - Conduct activities in manner consistent with State program
- New York State Requirements
  - Wetlands land use regulations at 6 NYCRR Part 661
  - Freshwater wetlands requirements at 6 NYCRR 662-665
  - Endangered species requirements at 6 NYCRR 182
  - Coastal zone management policies at 1 NYCRR Part 600

"To Be Considered" Requirements

- Toxic Substances Control Act
  - 40 CFR 761.120-135 PCB Spill Policy
- Safe Drinking Water Act
  - 40 CFR 141.61 and 54 FR, May 22, 1989, 22062: Proposed MCLs for PCB and 1,2 - trans-dichloroethylene
- Clean Water Act interim sediment criteria for PCBs, EPA, April 1988
- New York State sediment criteria for PCBs
- Resource Conservation and Recovery Act clean closure level for phenol, EPA, October, 1987