Grasse River Superfund Site

Massena, St. Lawrence County, New York

EPA
Region 2 *September 2012*

PURPOSE OF THIS DOCUMENT

This Proposed Plan describes the remedial alternatives considered for the Grasse River Superfund Site (Site), also known as the Alcoa Aggregation Superfund Site, and identifies the preferred remedial alternative with the rationale for this preference.

This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC) and the Saint Regis Mohawk Tribe (SRMT). EPA is issuing the Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination at the Site and the remedial alternatives summarized in this Proposed Plan are described in greater detail in three documents: the *Comprehensive Characterization of the Lower Grasse River (CCLGR), Addendum to CCLGR, and Analysis of Alternatives*. These documents, as well as others, are part of publicly-available administrative record file. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site.

This Proposed Plan is being issued to inform the public of EPA's preferred remedy and to solicit public comments pertaining to all of the remedial alternatives evaluated, including the preferred alternative.

EPA's preferred remedy consists of dredging polychlorinated biphenyl (PCB)-contaminated sediment from the near shore portion of the river containing PCBs at concentrations at or above 1 milligram per kilogram (mg/kg) (estimated to be 109,000 cubic yards) and backfilling of the dredged area to grade. The preferred remedy also includes the placement of an armored cap over 59 acres of PCB-contaminated sediment in the upper two miles of the main channel of the Grasse River, where the sediment column is susceptible to scouring due to severe ice jam events, and placement of one foot of capping material over approximately 225 acres of PCB-contaminated sediments in a five mile stretch of the river immediately downstream of where the armored cap will be placed. Dredged sediment will be dewatered and stabilized prior to disposal in Alcoa Inc.'s (Alcoa's) on-site Toxic Substances Control Act (TSCA) and Resource Conservation and Recovery Act (RCRA)-permitted landfill, and potentially at an off-site permitted landfill. Institutional controls such as fish consumption advisories will remain in place (although perhaps modified as needed) until the concentrations of PCBs in fish tissue are at an acceptable level. Measures to reconstruct impacted habitat would also be implemented, including habitat assessment and surveys during remedial design. The design will address placement of habitat recovery material and aquatic vegetation. The preferred remedy includes long-term monitoring of the capped areas to ensure the stability of the cap and that the caps are functioning as designed. Long-term monitoring of fish, water column, and sediment to determine when Remediation Goals are reached, and also monitoring the reconstruction of habitat will be performed.

The remedy described in this Proposed Plan is the preferred remedy for the Site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in the Proposed Plan and in the detailed analysis section of the *Analysis of Alternatives* report because EPA may select a remedy other than the preferred remedy.

MARK YOUR CALENDAR

The public comment period on the Proposed Plan closes on November 15, 2012*.*

Public Meetings

Monday, October 29, 2012 at 7:00 P.M.:
Office for the Aging – Seniors Dining Hall
29 Business Park Road
Akwesasne, NY 13655

Tuesday, October 30, 2012 at 7:00 P.M.:
Massena Town Hall
Board Room #30
60 Main Street
Massena, NY 13662

Public Information Sessions

Monday, October 29, 2012 at
1:00 - 3:00 P.M.:
St. Regis Mohawk School
385 Church St., Akwesasne, NY.

Tuesday, October 30, 2012 at
1:00 - 3:00 P.M.:
Massena Town Hall
Board Room #30
60 Main Street
Massena, NY 13662

Community Role in the Selection Process

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a public comment period which begins with the issuance of this Proposed Plan and concludes on November 15, 2012.

INFORMATION REPOSITORIES

The administrative record file, which contains copies of the Proposed Plan and supporting documentation is available at the following locations:

Massena Public Library
41 Glenn Street, Massena, NY 13662
315-769-9914
Hours: Mon & Fri, 9:30 am - 5:00 pm;
Tues - Thurs, 9:00 am - 8:30 pm; Sat & Sun, closed

St. Regis Mohawk Tribe –Environment Division
449 Frogtown Road
Akwesasne, NY 13655
By Appointment: 518-358-5937

Akwesasne Library
321 State Route 37
Akwesasne, NY 13655
518-358-2240

USEPA-Region 2
Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
212-637-4308
Hours: Mon - Fri, 9:00 A.M. - 5:00 P.M.

As noted above, public meetings and public information sessions will be held during the comment period to provide information regarding the Site investigations, the alternatives considered and the preferred remedy, as well as to receive public comments. The public meetings will include a formal presentation by EPA of the preferred remedy and other cleanup options for the Site. The information sessions will be less formal, and provide the public a chance to receive printed information and discuss the cleanup options with EPA representatives on a one-on-one basis.

Comments received at the public meetings, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on this Proposed Plan should be addressed to:

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SITE BACKGROUND

Site Description

The Site is located along the northern boundary of New York State in Massena, and includes the Grasse River Study Area. The Grasse River Study Area includes approximately 7.2 miles of the lower Grasse River from the intersection of the Massena Power Canal (Power Canal) and the Grasse River, to the confluence of the Grasse and St. Lawrence Rivers. This 7.2 mile stretch of the Grasse River is referred to as the “Site” for purposes of this Proposed Plan. The Grasse River Study Area also includes the Power Canal, approximately 1.3 miles of the Lower Grasse River upstream of the confluence of the Grasse River and the Power Canal, Robinson Creek (which discharges to the St. Lawrence River) and the Unnamed Tributary (see Figure 1 Grasse River Study Area Location Map). The Site poses an increased risk to human health and the environment due to the presence of PCB contamination in Grasse River sediment. The Power Canal is not proposed for remediation in this Proposed Plan, but will continue to be monitored.

EPA issued an Administrative Order to Alcoa in September 1989, calling for the investigation of the Alcoa Study Area to determine the nature and extent of hazardous substances contamination, develop and screen alternatives for cleanup, and design and implement a remedial action to be selected by EPA. For purposes of the investigation, the river was divided by transects (T) where each transect represented one-tenth of a mile. In most of the Site reports the river is divided into 72 transects (T1 through T72). In addition, the Analysis of Alternatives report separately considered the near shore and main channel areas of the Grasse River in order to evaluate remedial alternatives. “Near shore” is defined for purposes of the Site as the area between the upland and the location where the gentle slope along the shoreline meets the steep slope of the main channel side walls. In general the near shore areas have water depth of five feet or less during normal summer flow and extend approximately 25 feet from shore.

The Alcoa Massena-West Plant (Alcoa West Facility) is located on the north shore of the lower Grasse River, east of the Power Canal, and is bounded to the north by the St Lawrence River. Two other large manufacturing facilities, the Alcoa Massena-East Plant (formerly Reynolds Metals Company (RMC)) and the former General Motors Central Foundry Division (GM) plant are located within two miles east of the confluence of Grasse and St. Lawrence Rivers.[1] The United States maintains that Akwesasne, the

[1] Reynolds Metals Co and General Motors-Central Foundry Division, including sediment in the St. Lawrence River are also Superfund sites, in which EPA oversees the cleanup under CERCLA.

Mohawk territory of the federally-recognized SRMT, as described in the 1796 Treaty with the Seven Nations of Canada, 7 Stat. 55, includes land on both banks of the Grasse River, as well as land located along the St. Lawrence River downstream of the Site, together known as the Indian Meadows.

The Power Canal, constructed between 1898 and 1903, connects the Massena Intake Dam on the St. Lawrence River to the former Power Dam at the Power Canal/Grasse River confluence. The lower Grasse River was significantly deepened in the early 1900s by the Aluminum Company of America (now Alcoa, Inc.) to accommodate discharge from the Power Canal. The discharge had enough energy to prevent significant sediment deposition until the 1950s when the Power Canal was taken out of service; as a result, the river became much more quiescent and sediments began to accumulate. The power generation from the Power Canal stopped operation when the joint U.S. and Canadian development project of the St. Lawrence River completed the construction of the Eisenhower Locks System and of the Moses-Saunders Power Dam (FDR Project), which began supplying hydroelectric power in 1958.

As a result of the early 1900's deepening of the lower Grasse River by the Aluminum Company of America, the physical and ecological characteristics of the lower Grasse River were altered. The Site has relatively steep side slopes, a relatively flat bottom, and minimal floodplains. It is wide (400 to 600 feet) and deep (15 to 25 feet at mid-channel). The majority of the vegetation in the river occurs in the near shore zones.

Due to the early dredging of the lower Grasse River and construction of the FDR Project in the 1950's, the river within the study area acts as a backwater of the St. Lawrence River. The velocity of the lower Grasse River is generally low. Average velocities are estimated to be about 0.1 to 0.2 feet per second and approximately a factor of 10 higher during high-flow events. These low velocities are a consequence of the large cross-sectional area in comparison to the river flow (average flow is about 1,100 cubic feet per second). When flows are low, especially in the late spring and summer, the lower Grasse River has periods of stratification with cooler (more dense) St. Lawrence River water moving upstream, beneath the warmer (less dense) Grasse River water. In addition, the water surface elevations fluctuate (approximately 1 ft) as a result of water releases within the St. Lawrence Seaway. Outfalls and tributaries within the study area add an incremental flow to the river of less than one percent.

The Grasse River is a New York State Class B fresh surface water which means the best usages for the river are "primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival". (6 NYCRR § 701.7) The lower Grasse River is used for various recreational activities such as fishing, boating, and water sports. However, a fish consumption advisory issued initially in 1990 and updated annually by the New York State Department of Health (NYSDOH) currently indicates that no species of fish from the lower Grasse River (i.e., mouth of Grasse River to the Power Canal) should be eaten because of PCBs in the fish. In the Massena Power Canal the recommendation is no more than one meal per month of smallmouth bass for men over 15 years and women over 50 years, but for children under the age of 15 years and women up to age 50 years, the advice is eat none. Grasse River water is also used for domestic purposes (watering lawns and gardens) and agriculture (irrigating crops). The Grasse River is not currently used as a public water supply. There is no commercial transportation use of the river.

What are PCBs?

The contaminants of concern at the Grasse River Site are polychlorinated biphenyls, or "PCBs."

Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were widely used in many industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications. The Alcoa West Facility started using PCBs in hydraulic oils for their fire retardant properties in 1950s after a fatal fire accident at another Alcoa plant.

PCBs are a group of chemicals consisting of 209 individual compounds, known as congeners. PCBs were sold in mixtures containing dozens of congeners. These commercial mixtures were known in the U.S. as Aroclors.

Although manufacturing of PCBs was banned in 1979, they can still be released into the environment from poorly maintained hazardous waste sites that contain PCBs; leaks or releases from electrical transformers containing PCBs; and disposal of PCB-containing consumer products into landfills not designed to handle hazardous waste. PCBs may also be released into the environment by the burning of some wastes in municipal and industrial incinerators. At the Site, the ongoing source of PCBs currently is the PCB-contaminated sediment in the river.

PCBs are classified by EPA as probable human carcinogens and are linked to other adverse health effects such as developmental effects, reduced birth weights and reduced ability to fight infection.

The Grasse River contains a diversity of habitats that supports a variety of species and is a corridor for species to travel between the "upper" river (upstream of Massena) and the St. Lawrence River. The State of New York has designated the Grasse River as a Significant Coastal Fish and Wildlife Habitat based on the significance of the habitats in the river in supporting cool and warm water fish populations including muskellunge, smallmouth bass, northern pike, walleye, bullhead, yellow perch, and lake sturgeon. Observations of both adult and juvenile muskellunge indicate that the Grasse River likely supports a spawning population of resident muskellunge and may serve as a spawning ground for fish residing in the St. Lawrence River. Multiple studies conducted by academic researchers have demonstrated the successful spawning, juvenile rearing, and adult population of lake sturgeon, a New York State (NYS)-listed threatened species, in the Grasse River. Additional state- and federally-listed species have been documented in or around the Grasse River. Documented species include the NYS-listed endangered black tern; NYS-listed threatened bald eagle, Blanding's turtle, common tern, eastern sand darter, mooneye, and upland sandpiper; and, NYS-listed species of special concern osprey and wood turtle. Indiana bats are both federally- and NYS-listed endangered species known to exist in St. Lawrence County. Many regulated (such as sport fish, waterfowl, mink, turtle, birds) species are known to frequent the impacted areas. The ecological risk assessment (discussed below) has shown that PCB contamination poses a risk to the species at the Site, and that remediation is expected to reduce or eliminate those risks.

The United States maintains that land reserved to the SRMT by the 1796 Treaty includes the Indian Meadows described above. EPA notes, however, that the lands reserved by the 1796 Treaty are currently in dispute. *Canadian St. Regis Band of Mohawk Indians v. State of New York, et al*., 5:82-cv-783 (N.D.N.Y.). Fishing, hunting, harvesting and spiritual ceremonies are among the activities that have been historically and are now conducted by the SRMT in the lower Grasse River and the Indian Meadows. The lower Grasse River and the Indian Meadows are of significant cultural significance to the SRMT.

Primary land uses in the vicinity of the lower Grasse River, including the Indian Meadows and the Town of Massena, include residential, agricultural, industrial, recreational and tribal activities. It is expected that future uses of these areas will be similar to the current uses.

<u>Site History</u>

The 2,700-acre Alcoa West Facility is an aluminum production and fabrication plant that has been in operation since 1903. The facility is east of the Power Canal and north of the lower Grasse River. Alcoa's past production processes generated various waste materials, including hydraulic oils that contained PCBs. In the 1950s, coincident with the Power Canal being taken out of service, Alcoa began using and discharging PCBs through outfalls to the Grasse River, the Power Canal, and the Unnamed Tributary. The PCBs accumulated in sediment that became deposited on top of bedrock in the river. PCB discharges to the lower Grasse River decreased significantly after Alcoa stopped using PCBs in the mid-1970's, and as a result the sediment deposited in the lower Grasse River since that time has contained lower PCB concentrations than the sediments that were deposited before Alcoa stopped using PCBs. Storm water and treated wastewater from the Alcoa facility are discharged from permitted outfalls that flow into the lower Grasse River, the Power Canal, the Unnamed Tributary, and Robinson Creek. Historically, PCBs also were released into the river through these outfalls.

As a result of these past disposal practices, NYSDEC determined that select areas throughout the facility posed a significant threat to public health and the environment. Under a 1985 NYSDEC Order, Alcoa conducted a land-based cleanup program from 1991 to 2001, which included the elimination or mitigation of sources of contamination to the Grasse River. Concurrently with the land-based cleanup program, Alcoa has made several site improvements in relation to its State Pollution Discharge Elimination System (SPDES) permit. Some of the upland based efforts included: remediation of 18 separate disposal areas, including 37 acres of landfills and 100 acres of lagoons; construction of Alcoa's on-site Secure Landfill to dispose of excavated material; remediation of the Unnamed Tributary; and, cleaning of underground utilities that are part of the stormwater/wastewater collection system. Through these efforts, Alcoa has significantly reduced its discharges and controlled the upland sources of PCBs to the Site.

The original sources of the PCB contamination in the lower Grasse River were the discharges from the Alcoa plant outfalls. The Alcoa West Facility presently has five permitted outfalls that discharge stormwater and treated wastewater; three discharge to the lower Grasse River, one to the Power Canal, and one to Robinson Creek. Outfall 001 is the main plant outfall. PCB discharges from this outfall have declined from 60 grams per day (grams/day) in 1990 to 1.9 grams/day in 1999 to 0.8 grams/day in 2003; since 2004, PCBs have not been detected in the outfall samples with the exception of a one-time detection of 0.08 micrograms per liter in 2009.

Although plant facility discharges were important contributors to lower Grasse River PCBs in the past, upland remediation efforts completed in 2001 have significantly reduced PCB discharges to the river. However, small but measurable discharges under Alcoa's SPDES permit continued to occur until 2003 when Alcoa conducted additional work to further reduce the PCB discharges from Outfall 001 under a NYSDEC order. The PCB-containing sediments in Unnamed Tributary were removed in 1998, significantly decreasing continued contaminant inputs from this historical source of PCBs to the lower Grasse River. PCB data collected from several shallow and deep groundwater monitoring wells, coupled with the limited discharge rate, indicate that groundwater is not a significant source of PCBs to the lower Grasse River.

Alcoa's early investigation of the Site under the terms of the 1989 EPA Administrative Order identified significantly elevated PCB concentrations in an area of Grasse River sediment located adjacent to wastewater Outfall 001. As a result, EPA amended the Administrative Order in May 1995 to require Alcoa to conduct a Non-Time-Critical Removal Action (NTCRA) to address the PCB-contaminated sediment within a one-acre area around the outfall (see Figure 2 Locations of Lower Grasse River

Pilot/Demonstration Projects). Alcoa conducted the NTCRA between July and September, 1995. Hydraulic dredging was used to remove most of the sediments, which were dewatered and disposed of in Alcoa's TSCA and RCRA-permitted, double-lined, on-site landfill. Approximately 3,000 cubic yards (cy) of sediment, boulders and debris were removed, which represented about 20 percent (8,000 pounds (lbs)) of the total PCB mass in the river. However, it was not possible to remove all of the PCB-contaminated sediments in this area, due mainly to the presence of cobbles and boulders on the river bottom.

Because in-place capping of contaminated sediments has been one remedial technology under consideration, Alcoa conducted a capping pilot study (CPS) between July and October 2001. The study involved the placement of clean cap material over a seven-acre area in a 750-foot stretch of the river about one mile downstream of Outfall 001 (see Figure 2). Several different cap designs with various cap materials and placement techniques were used. The capping pilot study demonstrated that a cap could be constructed successfully in the lower Grasse River without significant mixing of the cap material with the underlying sediment or causing PCB releases to the water column. However, the targeted cap thickness could not always be achieved on the steep side slopes in the area of the pilot study. Monitoring after the first year showed that the cap thickness remained stable.

During post-placement monitoring of the CPS, it was discovered that an “ice jam” event in 2003 scoured sediment in the river to a depth of up to four feet, including erosion of parts of the cap material and underlying contaminated sediment. The ice jam was an accumulation of ice in the river channel that caused higher flow rates under the ice jam toe, which resulted in some localized scour of the river bottom. Prior to the 2003 ice jam event, the occurrence of scour from ice jams was not known to the project team and therefore the CPS had not been designed to withstand such great forces. As a result, further investigation was initiated in 2003, which revealed that severe ice jam events can cause scouring of the river bottom sediments in the upper 1.8 miles of the lower river (upstream of T19). Through several lines of evidence, the project team discovered that ice jam events severe enough to cause measureable scour have occurred in the lower Grasse River at least four times over the past 40 to 50 years.

Based on an updated conceptual site model, Alcoa performed a Remedial Options Pilot Study (ROPS) in 2005. The ROPS (see Figure 2) included a one-acre armored cap, 24,400 cy (approximate) of main channel dredging, 1,600 cy of near shore dredging/backfilling to grade, and one-half of acre of thin-layer (3 to 6 inches) capping in the southern near shore area. Extensive monitoring of all components was conducted during and following implementation. The study revealed that dredging in the main channel of the Site was difficult due to the presence of cobbles and boulders and irregular river bottom conditions. It also revealed that the typical main channel sediment profile contains the highest PCB concentrations at the lowest depth of the sediment column. This most highly contaminated sediment is present over hard bottom materials such as bedrock, glacial till, and/or marine clay which prevent over-dredging, thereby resulting in PCB residuals with high PCB concentrations that require capping even after an extensive dredging effort. However, these conditions were not present in the northern near shore area, where dredging was much more successful because conditions allowed for more complete removal of contaminated sediments. Placement of a cap by use of thin layered capping over part of the southern near shore was successfully demonstrated. However, post monitoring did discover some areas where the thin layer cap material was absent due to lack of cap installation. A 25-inch armored cap over an acre area consisting of sand/topsoil, gravel, and armor stone was successfully placed in the main channel (and is still intact).

In the fall of 2006, an activated carbon pilot study (ACPS) was conducted in a 0.5-acre area to evaluate the ability to deliver activated carbon to in-river sediments and the effectiveness of activated carbon in reducing the bioavailability of PCBs to biota. The ACPS demonstrated that activated carbon can be successfully applied into the river sediments. No measurable changes in the water column PCBs were observed adjacent to or downstream of the pilot area, with only minor increases in total suspended solids (TSS) measured. Post-construction monitoring revealed that the placed carbon is stable in the fine sediments.

Alcoa, in coordination with EPA, initiated a community involvement program in 2001 in order to communicate with the public about the project status. As part of the program a Community Advisory Panel, composed of community members and local, state, and federal government representatives, was formed to serve as a forum for the exchange of project-related information and to create opportunities for the community to express its interests and concerns regarding the Site. Alcoa and EPA conducted several public meetings and availability sessions prior to the implementation of various pilot and demonstration projects.

RESULTS OF THE REMEDIAL INVESTIGATION

Summary of Sampling Results and Other Investigations

For the investigation of the Site, Alcoa has conducted numerous studies, summarized in the *CCLGR* Report of April 2001 and *Addendum to the CCLGR* of April 2009 (collectively referred to as the “Final CCLGR Report”). The investigations included sediment sampling, river flow and water quality studies, fish and biota sampling, a habitat survey, sediment erosion studies, laboratory PCB studies, source investigations, and studies regarding ice jam and scour. Data were obtained from the following major study programs: (1) an initial *River and Sediment Investigation* (1991–1994); (2) the *NTCRA* in 1995 as mentioned above; (3) a *Supplemental Remedial Studies* program (1995–present); (4) Sediment Probing Programs in 1992, 1998, and 2001; (5) Supplemental Sediment Sampling (2000-2001, and 2006-2007); (6) the CPS of 2001 as mentioned above; (7) the River Ice Evaluation of 2003-2004; (8) Bathymetric Surveys of 2003 to 2005; (9) the ROPS of 2005 as mentioned above; (10) River Ice Monitoring (2004 to present); (11) the *Ice Control Structures Evaluation* (2005-2009); (12) the *Activated Carbon Pilot Study* (2006); (13) the *Ice Breaking Demonstration Project* (2007); and (14) the *Near Shore Sampling Program* (2010). Additional investigations and modeling were conducted to study the fate and transport of the PCBs at the Site. As a result of these investigations, pilots, and demonstration projects, approximately 15 acres of river sediment have been capped and 29,000 cy of PCB-contaminated sediment and 15,200 pounds of PCB mass have been removed from the river. Based on the results of the studies listed above, the 7.2 miles of the lower Grasse River have been determined to be the area of primary concern. Summaries of some of the major findings of these studies are presented in this Plan. More detail can be found in the Final CCLGR Report, the Analysis of Alternatives Report and other documents in the administrative record file.

Sediment

Over 5,000 sediment samples have been collected at the Site to determine the nature and extent of PCB-contaminated sediment.

Deposits of sediment exist on most of the bottom of the Site. In most areas of the Site, soft sediment deposits are underlain by bedrock or glacial till. These sediment deposits typically range from 0 to 5 feet in depth, with isolated pockets up to 10 feet deep. The upstream half mile of the 7.2 mile Site (in T1-T5) has a thin veneer of sand and gravel over bedrock. PCB concentrations in the sediment core data collected from the main channel of the river from 1991 through 2007 indicate that the maximum PCB concentrations tend to be at depth. The sediment data collected from the near shore (2010) indicated that the peak sediment PCB concentrations above 1 mg/kg generally occur within the top 1 to 1.5 feet of sediment. Based on the investigations, it is estimated that approximately 1.7 million cy of sediment are contaminated with measurable PCBs over a 325 acre area.

The main channel in the T1 to T21 transects of the river are prone to potential scouring of sediment from severe ice jam events, which can mobilize PCBs.[2] The estimated volume of contaminated sediment in the main channel is approximately 330,000 cy over a 59-acre area, with PCB concentrations ranging from non-detect (ND) to 3,106 mg/kg, with an average concentration of 82 mg/kg. Sampling data to date have been inconclusive in demonstrating a lack of scouring in the near shore zone and scouring in the upper two miles of the near shore is possible in the future. The near shore from T1 to T21 contains approximately 25,900 cy of contaminated sediment over a 10-acre area with PCB concentrations ranging from ND to 3,070 mg/kg and an average concentration of 68 mg/kg.

For the remainder of the Site (T21 to T72), the investigations concluded that the contaminated sediment in the main channel and near shore is stable even under extreme flow conditions. Mathematical modeling assuming maximum erosion indicated that a 100-year flood event would result in about 0.9 cm (0.35 inch) net erosion, and a 500-year flood event would result in between 1 and 1.5 cm (0.39 to 0.59 inches) of net erosion. It is primarily the surface sediment in this region that has the greatest potential impact on the biota. The surface sediment was defined for the purposes of the Analysis of Alternatives Report as the top 6 inches in the main channel and the top 12 inches in the near shore sediment. The estimated contaminated sediment in the main channel from T21 to T72 is approximately 1.2 million cy over a 225-acre (approximate) area with PCB concentrations ranging from ND to 1,063 mg/kg and an average concentration of 57 mg/kg. The concentration of sediment in the top 6 inches ranges from ND to 558 mg/kg, with an average concentration of 22 mg/kg. The contaminated sediment in the near shore from T21 to T72 is approximately 82,800 cy over a 31-acre area with PCB concentrations ranging from ND to 313 mg/kg and an average of 14 mg/kg. The sediment concentrations in the top 12 inches range from ND to 167 mg/kg with an average concentration of 8 mg/kg.

Water Column

The water column has been monitored for PCBs at several transects (see Figure 3, Water Column Monitoring Locations). Since the mid-1990s, over 2,000 water column samples have been collected. PCB concentrations in the water column exhibit distinct seasonal patterns, with concentrations typically being highest in the summer and lowest in the late fall (note that water column data are not collected in the winter

[2] Ice jam-related scour is primarily of concern from T1 to T19. For purposes of developing remedial alternatives, however, T21 was used to define the downstream extent of the Grasse River that is potentially subject to ice jam-related scour because a contiguous sediment deposit runs from T19 to T21, and any remedy would be expected to address the contiguous deposit as a whole. T21 is included in both the upstream (T1-T21) and downstream (T21-T72) reaches because the contiguous sediment deposit does not cover all of T21, and it therefore may be necessary to apply the upstream and downstream cleanup criteria to separate areas within T21, depending on the specific sediment characteristics in a particular location. Application of the cleanup criteria in T21 will be determined during remedial design.

months when the river is covered with ice).

The data collected upstream of the Site at the Main Street Bridge (WC-MSB) between 2006 and 2011 indicate average PCB concentrations of about 0.2 nanograms per liter (ng/L) (concentrations range from non-detect to 3 ng/L). The Power Canal also releases a small flow of water to the lower Grasse River upstream of the Alcoa West Facility. The water column PCB concentrations in the Power Canal averaged 7.9 ng/L in 1998 and 1.9 ng/L in 2002.

Within the Site, at water column monitoring station WC007 near T16, the average summertime PCB concentrations have declined from approximately 115 ng/L in 1996 to about 20 ng/L in 2007. At water column monitoring station WC131/WC007A between T22 and T23, PCB concentrations declined from approximately 200 ng/L in 1996 to about 8 ng/L in 2011. At WC011 near T38, PCB concentrations declined from 130 ng/L in 1997 to approximately 12 ng/L in 2011.

Though the PCB concentrations in the water column have dramatically decreased over the years due mostly to upland source controls, and outfall and tributary remediation, and partially due to natural sedimentation and in-river pilot work and demonstrations, the data also indicate that PCBs in sediment pore water[3] at the Site are a persistent, widespread, and diffuse source of PCBs to the water column.

Fish

PCB concentrations observed in fish are a result of exposure to PCBs in water and surface sediment, through an aquatic food chain or a benthic food chain, respectively.

Alcoa has collected more than 3,000 fish samples consisting of three species (smallmouth bass, brown bullhead, and spot tail shiner) over a period of 17 years. The fish are collected in the fall of each year in three different stretches (Upper, Middle and Lower) of the Site and in the background stretch of the Grasse River. PCBs have rarely been detected in any of the three fish species collected from the background stretch. Within the Site, PCBs are consistently found in fish tissue although concentrations have decreased since the early 1990s mostly due to various remedial actions that have occurred since that time, although the rate of decline has decreased since 2001. The average concentration of PCB concentrations in smallmouth bass fillets have decreased from 17 mg/kg (ranging from 1.4 to 67 mg/kg) in 1993 to about 0.7 mg/kg (ranging from non-detect to 2 ppm) in 2011. Average PCB concentrations in brown bullhead fillets have also decreased from 8.1 mg/kg (with a range of 0.9 to 35 mg/kg) in 1993 to 0.8 mg/kg (ranging

3 Pore water is the subsurface water in the sediment interstice or in between the pores of the sediment grains.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a “reasonable maximum exposure” (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all chemicals of potential concern (COPCs). Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one-in-ten-thousand excess cancer risk”; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk. For non-cancer health effects, a “hazard index” (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses (RfDs). The key concept for a non-cancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at a site and are referred to as COCs in the ROD.

from non-detect to 2 mg/kg) in 2011. PCB levels in whole-body spottail shiner collected from areas that have undergone the most substantial remediation including from near Outfall 001 and near the Unnamed Tributary decreased from an average of 5.1 mg/kg (with a range of 3 to 5.7 mg/kg) in 1998/1999 to about an average of 1.9 mg/kg (with a range of 1.1 to 3) in 2011. All fish tissue data provided above are on a wet weight basis. In more recent years the amount of lipids in fish tissue samples has decreased, potentially due to analytical changes, providing some uncertainty to the PCB tissue concentrations.

Because PCBs tend to accumulate in fatty tissues, it is also important to examine PCB concentrations in fish on a lipid (fat) basis for trend analysis. Similar decreases to wet weight fish tissue concentrations discussed above have also been observed in the lipid basis data. Overall, lipid-normalized PCB concentrations in both smallmouth bass and brown bullhead have decreased by more than 90 percent since the mid-1990s. By comparison, lipid-normalized PCB concentrations in young-of-year spottail shiner have decreased by 55 to 60 percent since the mid-1990s. Lipid-based concentrations would also be affected by analytical uncertainties. The remediation of the Alcoa West Plant through the NYSDEC Order for land-based cleanup and the reduction of PCBs in the outfall discharges have provided the greatest contribution towards the decrease of PCB concentrations in fish. However, a fish consumption advisory issued by the NYSDOH currently indicates that no species of fish from the lower Grasse River should be eaten.

SUMMARY OF SITE RISKS

Based upon the results of the Final CCLGR, a baseline risk assessment was conducted for the Site to estimate the risks associated with current and future site conditions. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous substance releases from a site assuming no further actions to control or mitigate exposure to these hazardous substances are taken.

Human Health Risk Assessment

As part of the investigation, a Baseline Human Health Risk Assessment (BHHRA) was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health. The BHHRA includes the 1993 *Revised Risk Assessment ALCOA Study Area (*TRC); the 2002 Update to the 1993 Revised Risk Assessment (Alcoa); and the 2012 Addendum[4] to assess non-PCB chemical contaminants. The BHHRA evaluated exposure to sediment, surface water and fish at the Site. The reaches that represent background conditions (i.e. Reaches 1 and 2) located upstream of the Alcoa West Facility were also evaluated. The primary COPCs for the Site are PCBs, with exposure to PCBs via consumption of fish from the lower Grasse River posing the greatest risk.

A four-step human health risk assessment process was used for assessing site-related cancer risks and non-cancer health hazards. The four-step process comprises: Hazard Identification of COPCs, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see "What Is Risk and How Is It Calculated" box on the previous page).

The BHHRA evaluated potential risks to receptors under current and future land use scenarios. The current NYSDOH Grasse River fish consumption advisory was not considered in the assessment since the BHHRA does not consider such an institutional control in the definition of potential exposure scenarios.

Consistent with EPA policy and guidance, cancer risks and non-cancer health hazards were evaluated for the reasonably maximally exposed (RME) individual and the central tendency exposed (CTE) individual. The RME is considered the maximum exposure that is reasonably estimated to occur at a site and is not a worst-case scenario. The CTE, which is the average exposure to an individual, is also provided for further characterization.

Potential current and future receptors that may be exposed to the Grasse River include: adults from the local population and the Mohawk Nation who may fish and consume their catch; recreational users of the River including adults, adolescents, and young children who may camp near or swim in the River; and Mohawk adult anglers who may contact sediments when pulling gillnets from the water. Routes of exposure under current/future conditions include: consumption of fish and incidental ingestion and dermal contact with sediments and surface water.

In furtherance of EPA's current Environmental Justice policy, known as EJ 2014, Region 2 has identified Akwesasne, the territory of the SRMT, as a Potential Environmental Justice Community. Members of the SRMT have been burdened by the environmental and health impacts of pollution in the local river systems, including the Grasse River, due primarily to the consumption of local fish contaminated with PCBs. Members of the SRMT consume such fish at higher rates than the general population. The potential for adverse health impacts from consumption of fish contaminated with PCBs is well documented.

The BHHRA evaluated the following specific reaches of the River (see Figure 4):

- Reaches 1 and 2, located upstream of the Alcoa

[4] The Addendum was conducted to take into consideration changes in toxicity factors (reference doses and cancer slope factors) that were identified by USEPA in 2009 and additional updates in 2010. The Addendum can be found in the Appendix G of the 2012 Analysis of Alternatives Report.

West Facility, for exposures to sediment and surface water by swimmers and consumption of fish by local anglers;

- Reaches 4 through 8, located adjacent to and/or downstream of the Alcoa West Facility, for exposures to sediment and surface water by swimmers and consumption of fish by local anglers; and,

- Reaches 7 and 8, located further downstream, for consumption of fish by Mohawk anglers.

Reach 3 is located in the Power Canal (Reach 3) and was analyzed in the 1993 *Revised Risk Assessment ALCOA Study Area.* However, as mentioned above, the Power Canal is not within the scope of this Proposed Plan but will continue to be monitored.

Exposure point concentrations in fish, sediment and surface water were estimated using either the maximum detected concentration of a contaminant or the 95%, 97.5% or 99% upper-confidence limit (UCL) of the average concentration. Chronic daily intakes were calculated based on exposures to the RME individual. The RME is intended to represent a conservative exposure scenario that is still within the range of possible exposures. A CTE or average exposure is also provided. A complete evaluation of all exposure scenarios can be found in the BHHRA.

A summary of PCB risks and hazards to anglers consuming fish, organized by reach, is as follows:

- Reaches 1 and 2. The risk for the RME individual was 3×10^{-5} (3 in 100,000) and is within the acceptable risk range. The risks to the local adult angler (person fishing) in Reaches 1 and 2 were 3×10^{-7}(3 in 10,000,000) for the CTE individual and are less than the risk range.

  The non-cancer Hazard Index (HI) for the RME individual is 1.6 and the CTE individual is 0.1. The non-cancer HI for the RME individual is above the goal of protection. The non-cancer HI of 1 for the CTE individual is within the goal of protection.

- Reaches 4 through 8. The risks to the local adult angler fishing in Reaches 4 through 8 were 3×10^{-3} (3 in 1,000) for the RME adult individual and 3×10^{-5} for the CTE individual. The risks to the RME individual exceeded the risk range and for the CTE individual were within the acceptable risk range.

  The non-cancer HI for the RME individual is 160 and for the CTE individual is 9.9. The non-cancer HI for the RME and CTE individual was above the goal of protection.

- Reaches 7 and 8. The risks to the local adult Mohawk angler fishing in Reaches 7 and 8 were 2×10^{-2} (2 in 100) for the RME adult individual and 7×10^{-4} (7 in 10,000) for the CTE individual. The risks to the CTE and RME individual are above the acceptable risk range.

  The non-cancer HI for the RME individual is 615 and for the CTE individual is 67. The non-cancer HI for the RME and CTE individual is above the goal of protection.

The non-cancer health hazards for a young child (1 to 6 years of age) would be approximately 1.6 times higher than that of an adult assuming an ingestion rate of 1/3 of that of the adults for all stretches of the River. The non-cancer hazards for the adolescent (7 to 18 years) would be approximately 1.1 to 1.2 times higher than the adult Hazard Index assuming an ingestion rate of 2/3 that of the adult for all stretches of the River. The non-cancer hazards in all reaches for the adolescent and young child are above the goal of protection.

The cancer risks to the young child and adolescent are lower than those of the adult based on differences in ingestion rate, bodyweight, and exposure duration. The calculated risks for the young child and adolescent in Reaches 4 through 8, including a separate analysis for Reaches 7 and 8, remain above the risk range of 10^{-4} to 10^{-6}.

A summary of risks and hazards to recreational users of the lower Grasse River exposed to sediment and surface water are organized by reach as follows:

- Reaches 4-8. The risks to the local recreational user of the River in Reaches 4 through 8 were 3×10^{-7} for the adult, 1×10^{-6} for the adolescent; and 3×10^{-7} for the child. The risks to the RME individual were 2×10^{-6} for the adult, 1×10^{-5} for the adolescent, and 4×10^{-6} for the child. The total risks to the RME and CTE individuals were within the risk range.

  The non-cancer HI for the recreational user of the River in Reaches 4 to 8 were 0.2 for the adult, 0.6 for the adolescent, and 0.4 for the child. The non-cancer HI for the RME individual was 0.43 for the adult, 1.6 for the adolescent, and 1.1 for the child. The non-cancer HI for the CTE individuals was within the goal of protection. The hazards to the RME individual were above the goal of protection for the adolescent and child. The HI for the adult was within the goal of protection.

- Reaches 7 and 8. The risks to the Mohawk angler exposed to sediment through the use of gill nets in Reaches 7 and 8 were 3×10^{-5} for

RME individual and within the risk range. The risks for the CTE adult were 4 x 10^{-6} and within the risk range.

The non-cancer HI for the recreational user of the River in Reaches 7 and 8 was 0.4 for the adult CTE individual and was within the goal of protection. The non-cancer HI for the RME individual was 0.8 for the adult and was within the goal of protection.

The re-evaluation of the cancer risks and non-cancer HI associated with other contaminants in fish, sediments, and surface water is provided in the 2010 Addendum to the BHHRA. This Addendum provides updated calculations of risks and hazards for non-PCB COPCs at the Site that were identified in the 1993 Risk Assessment. The revised estimates are based on changes in the toxicity factors since the original risk assessment of 1993. Risks from dioxin toxic equivalents (TEQ) are within the upper bounds of the risk range and these exposures occurred in Reaches 4 through 8. The cancer risks associated with non-PCB COPCs from ingestion of fish within Reaches 4 through 8 were 1.4 x 10^{-4}. The non-cancer HI for the adult angler within Reach 4 to 8 was 3, which exceeds the goal of protection. Both risks and hazards related to dioxin TEQ are significantly less than those posed by PCBs.

Ecological Risk Assessment

This section summarizes the results of the Ecological Risk Assessment (ERA) process and is based on the July 2010 Ecological Risk Analysis Update (ERAU) report (Lockheed-Martin/SRC). The July 2010 report combines into a single report the ERA that was conducted for the Lower Grasse River Study Area in 1993 (TRC Environmental Corporation) and the additional ecological risk analysis incorporating data for sediment, surface water, river bank sediment, whole body fish tissue, and invertebrate tissue data collected through 2008, immediately prior to the commencement of the ERA in 2009.

The process used for assessing site-related ecological risks includes:

Problem Formulation - a qualitative evaluation of contaminant release, migration, and fate; identification of COCs, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study;

Exposure Assessment - a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations;

Ecological Effects Assessment - literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors; and

Risk Characterization - measurement or estimation of both current and future adverse effects.

This process is described in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997).

The lower Grasse River is home to a wide variety of aquatic and riparian habitats and is located within the St. Lawrence Plain ecological zone of New York State. This zone can be characterized as a gently rolling agricultural landscape interspersed with small woodland areas. A habitat assessment to determine the site-specific habitats and species that may be affected by the alternatives has not yet been completed however will be performed during the design. The Grasse River lies within the Upper Saint Lawrence River watershed. It is a large, medium-gradient river characterized by riffles and pools flowing over bedrock, cobble, and gravel substrate. In 1994, the New York Department of State's Division of Coastal Resources designated the Grasse River from its confluence with the St. Lawrence River to the Madrid Dam a significant coastal fish and wildlife habitat (NYDOS 1994). The assessment endpoints that were selected for the Grasse River ERA are survival, growth, and reproduction of aquatic organisms, piscivorous (fish-eating) bird and mammal populations, and insectivorous (insect-eating) mammal populations.

PCBs, including dioxin-like PCBs, are the contaminants of concern for the ERA based on the results of earlier investigations. Ecological exposure to PCBs is primarily an issue of bioaccumulation through the food chain. Risk to fish was evaluated by comparing measured concentrations of PCBs and dioxin-like PCB congeners in fish tissue with concentrations reported in published studies that identified adverse effects. Food chain models were used to calculate risk to upper trophic level piscivorous birds (belted kingfisher), mammals (mink), and insectivorous mammals (little brown bat) from consumption of fish and aquatic invertebrates.

For the food chain estimates of risks, the complete exposure pathways and exposure parameters (e.g., body weight, prey ingestion rate, home range) used to calculate the concentrations or dietary doses to which the receptors of concern may be exposed were obtained from EPA sources and the scientific literature. Site-specific PCB concentrations in fish, invertebrates, and sediment were used to model the food-chain risks. Measures of toxicological effects were selected based on Lowest Observed Adverse Effects Levels (LOAELs) and/or No Observed Adverse Effects Levels (NOAELs) from laboratory and/or field-based studies as reported in the scientific literature. Reproductive effects were generally the most sensitive endpoints for animals exposed to PCBs.

Conclusions from the 2010 ERAU are provided below. For purposes of the updated risk analysis, current data were defined as data collected from 2003 to 2008 in the T1 to T19 transects and data collected from 2000 to 2008 in the T20 to T72 transects. In the T1 to T19 transects, data collected prior to the ice jam scour of 2003 were not included in the analysis. Additional details are provided in the final ERAU (EPA, July 2010).

The Ecological Risk Assessment indicates that aquatic organisms and piscivorous and insectivorous receptors are at risk from adverse reproductive, growth, or survival effects from exposure to PCBs in sediments and/or prey. The major findings of the ERAU include:

- Sediment: Available information indicates unacceptable risks to aquatic organisms from exposure to the mean concentrations of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260, total PCBs, and dioxin-like PCB congeners.

- Surface water: Available information indicates unacceptable risk to aquatic organisms from exposure to the mean measured concentrations of total PCBs and dioxin-like PCB congeners.

- Fish: Available information indicates unacceptable risks for adverse ecological effects (i.e., reduced survival, growth and/or reproduction) from exposure of fish to total PCBs and dioxin-like PCB congeners.

- Food chain: Unacceptable risks were estimated for piscivorous birds and mammals from dietary exposure to Aroclors 1232, 1248, 1254, and 1260, and total PCBs; and to insectivorous mammals from dietary exposure to Aroclors 1248 and 1260 and total PCBs.

Based upon the results of the investigations reported in the CCLGR and the Addendum CCLGR and the risk assessments, EPA has determined that the preferred alternative identified in this Proposed Plan or one of the other active measures considered and identified in this Proposed Plan is necessary to protect public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment.

SCOPE AND ROLE OF ACTION

The primary objective of this action is to address the PCB-contaminated sediments in the lower Grasse River. Removal, capping, and natural recovery[5] of these sediments will reduce PCB concentrations in biota including fish tissue, thereby reducing potential human health and ecological risks. In addition, remediation of the sediment will control this source of PCBs to the water column which contributes to fish tissue concentrations, and transports PCBs downstream. An important early step in sediment cleanup is source control. Upland source control for the Site has been completed, as mentioned above in the Site History section. The Power Canal is not within the scope of this Proposed Plan but will continue to be monitored.

Alcoa investigated potential PCB sources to the river, including sources upstream of the Site that enter the Upper Grasse River, plant outfalls, the Unnamed Tributary, groundwater discharges to the river, and river sediments. Two potential upstream sources exist: the Grasse River upstream of the Massena Dam and the Power Canal. Studies indicate that the PCB flux from these upstream sources currently contributes a very small fraction of the total PCBs in the lower Grasse River. However, after cleanup of the lower Grasse River, these upstream sources combined with the influence of residual concentrations will influence the ability of all remedial alternatives to meet two water standards.

Although plant facility discharges were important contributors to lower Grasse River PCBs in the past, upland remediation efforts completed in 2001 have significantly reduced PCB discharges to the river. However, small but measurable discharges under Alcoa's SPDES permit continued to occur until 2003 when Alcoa conducted additional work to further reduce the PCB discharges from Outfall 001 under a NYSDEC order. The PCB-containing sediments in Unnamed Tributary were removed in 1998, significantly decreasing continued contaminant inputs from this historical source of PCBs to the lower Grasse River. PCB data collected from several shallow and deep groundwater monitoring wells, coupled with the limited discharge rate, indicate that groundwater is not a significant source of PCBs to the lower Grasse River.

Buried sediments with high PCB concentrations in the upper two miles of the main channel can be scoured during severe ice jam events. The 2003 ice jam event, which appears to have been the most severe jam in the past 50 years, had caused scour in approximately 15 percent of this region. PCB concentrations in surface sediments of the Site are broadly and variably distributed. This distribution pattern of surface sediment PCBs and monitoring data suggest that the surface sediment source is diffuse and that the widespread diffusive flux from the surface sediments is currently the primary source of PCBs to the water column and biota. Therefore, a large area of the river bottom must be addressed for any remedy to be effective.

The PCBs in the surface and subsurface sediment in the near shore areas are expected to present a greater direct and indirect exposure potential to affected fish and wildlife than the sediments in the main channel. The near shore sediments are expected to include a greater density of rooted vegetation, use by semi-aquatic species

[5] The current average rate of sedimentation in the main channel is from 0.2 to 0.7 centimeters per year.

such as mink and wading birds, and a greater variety of habitat types. These uses are likely to result in greater penetration of the sediments by biological activity, a greater variety of species sensitivity, and an exposure potential to a greater number of species. Additionally, there is expected to be a greater impact from above grade placement of capping materials resulting in significant or complete filling of the water column, preventing recovery of the affected habitats.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels established using the risk assessments. There are no federal or New York State cleanup standards for PCB-contamination in sediment. The following remedial action objectives have been established for the Site:

1. Reduce the cancer risks and non-cancer health hazards for people eating fish from the Grasse River by reducing the concentration of PCBs in fish. The risk-based preliminary remediation goal (PRG) for the protection of human health is 0.05 mg/kg (wet weight) PCBs in fish fillet based on non-cancer hazard indices for the RME adult fish consumption rate of one half-pound meal per week (equivalent to 32 grams per day, this level is protective of cancer risks as well). The risk-based PRG for the protection of Mohawk human health is 0.01 mg/kg PCBs in fish fillet based on non-cancer hazard indices for the adult tribal subsistence population with a consumption rate of 142 grams per day. Other interim target concentrations are 0.26 mg/kg PCBs in fish fillet, which is protective for cancer risks for the adult avid angler at a fish consumption rate of one half-pound meal per month and 0.36 mg/kg PCBs in fish fillet, which is protective of the CT or average angler, who consumes one half-pound meal every two months.

2. Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish. The risk-based PRG for the ecological exposure pathway is a range in whole-body fish (brown bullhead and spottail shiner) PCB concentrations of 0.22 to 0.44 mg/kg (wet weight) based on the NOAEL and the LOAEL for consumption of fish by the mink. The ecological PRG is considered protective of all the ecological receptors evaluated because it was developed for the mink, the piscivorous mammal calculated to be at greatest risk from PCBs at the Site. In addition, a range from 0.1 to 0.2 mg/kg (wet weight) PCBs in brown bullhead fillet was developed based on the NOAEL and LOAEL for consumption of fish by the mink.

3. Minimize the current and potential future bioavailability of the PCBs in sediments. PCBs in sediments may become bioavailable by various mechanisms (e.g., pore water diffusion, bioturbation, biological activity, benthic food chains, ice jam event scour, etc). Minimizing the degree to which such mechanisms may make PCBs bioavailable (e.g., through removal or containment) will reduce PCB levels in biota and the associated risks to human health and the environment.

4. Protect the ecosystem of the lower Grasse River. The remedy will protect the ecosystem and replace and/or reconstruct habitat impacted by remedial activities in order to re-establish appropriate conditions for supporting the fish and wildlife of the river. The remedy will be monitored for ecosystem recovery through the measurement and analysis of appropriate physical, chemical, and biological parameters.

5. Minimize the long-term transport of PCBs from the lower Grasse River to the St. Lawrence River. PCBs that are transported downstream in the water column are available to biota, contributing to the risks from the Site. Downstream transport also may move PCBs from contaminated areas to clean areas and from the lower Grasse River to the St. Lawrence River.

As noted above, the Power Canal (Reach 3) is not within the scope of this Proposed Plan but will continue to be monitored.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4).

Detailed Analysis

Detailed descriptions of the ten remedial alternatives for addressing the contamination associated with the Site can be found in the Analysis of Alternatives report. With the exception of the No Further Action Alternative, all of these alternatives involve dredging, capping, or monitored natural recovery, or combinations thereof.

All of the alternatives, except Alternative 1 (No Further Action) and Alternative 2 (Monitored Natural Recovery), include the development of a habitat reconstruction plan. The objective of the habitat reconstruction plan would be to identify impacts to habitat and species from the remedy, identify habitat re-establishments goals, provide design specifications for habitat recovery, and provide the scope for monitoring of habitat recovery. The plan would be developed and implemented during design and remedy implementation, and would include the following components:

- A) Habitat assessment study for affected species to assess the river for habitats that are present and use of the habitats by aquatic and semi-aquatic species. The study would include a survey for the presence of federal and state listed aquatic species and the habitats used by these species in the remedial area. Additionally, the study would document the habitat characteristics (including but not limited to temperature regime, substrate type, structure, plant species and density) of all areas affected by the remedy and identify any fish and wildlife concentration areas. Collected data would be used to determine the habitats affected by the remedy, any actions necessary to eliminate or minimize impacts to listed species, measures needed to protect existing habitats, and develop design specifications for the replacement and recovery of the all affected habitats following the remedy.
- B) Identification of habitat recovery material over capped areas and/or return to grade. Placement of clean substrate on top of the cap to allow for habitat re-establishment and species use, except where the material placed for the cap would be of sufficient quality and thickness to allow for omitting an additional habitat layer. The design of the thickness of the habitat layer of the cap should consider, in addition to other things, the potential for burrowing animals to compromise the integrity of the cap. The habitat recovery material would be free of contaminants and would not require significant maintenance once habitat has been re-established. After placement of the habitat recovery material, the initial grade should be returned in near shore areas and main channel areas should be returned to a stable condition. The most appropriate substrate type would be determined based on the information collected during the habitat assessment and may vary depending on habitat re-establishment and species requirements or habitat reconstruction goals.
- C) Design for restoration of vegetation. In areas disturbed by the remedy or implementation of the remedy, vegetation would be re-established through a mixture of appropriate active planting and seeding and passive measures to allow for healthy and diverse habitat. Vegetation placement would be determined during the design.
- D) Monitoring habitat and biota recovery: A monitoring plan would assess the success of habitat re-construction materials, plantings, and recovery of biota. The monitoring plan would include baseline sampling and corrective actions pertaining to habitat reconstruction, should they be necessary. Additionally, monitoring of PCBs in biota would be conducted to track the success of the remedy in reducing PCBs in the areas affected by the remedy. Monitoring would be specifically designed to track changes in PCB concentrations in aquatic and semi-aquatic species relevant to the Site.

Listed below are additional elements that are common to all alternatives:

- All of the alternatives, except Alternatives 1 and 2, would include provisions for habitat assessment, re-establishment and monitoring. The following elements would be developed during the remedial design phase and incorporated in a habitat re-construction plan for the Site: habitat assessment and survey for listed or sensitive species; habitat assessment and use study for general species; habitat recovery material over capped areas and/or return to grade; restoration of vegetation; monitoring of re-establishment success; and monitoring of PCBs in biota.

- A Phase 1A Cultural Resource Assessment will be conducted during the pre-remedial design prior to any disturbance and/or in-river work.

- The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy or procure contracts for design and construction.

- All of the alternatives assume contaminants remaining on-site above levels that would allow for unrestricted use and unlimited exposure and, therefore, CERCLA requires that the Site be reviewed at least once every five years. Costs associated with five-year reviews are included in all of the alternative present-worth cost estimates except for No Further Action Alternative 1.

- All alternatives define the near shore surface sediment depth as the top 12 inches and the main channel surface sediment depth as the top 6 inches.

- All alternatives with the exception of Alternatives 1 and 2 would include air monitoring to ensure that remedy implementation is protective.

- For cost estimating purposes, all alternatives with a dredging component assume use of a hydraulic dredge for the main channel and use of a mechanical dredge for the near shore. For the dewatering process, the cost estimate assumes the use of plate and frame filter press, belt filter press, solid-bowl evaporator, hydrocyclone, and gravity thickener or settling basin. For water treatment, granular activated carbon is assumed. However, once a remedy has been selected, the most appropriate and effective equipment will be determined during the design phase and utilized during construction.

- For cost estimating purposes, all alternatives assumed the armored cap to be 25 inches and the main channel cap to be 12 inches of sand/topsoil cap as designed in the ROPS. However, during design, the composition and thickness of the capping material will be optimized to promote reliability and efficacy of the cap;

- For all alternatives where dredging is proposed, the cost estimate assumes up to 100,000 cy of in-situ dredged sediment will be disposed of in an existing on-site permitted TSCA/RCRA landfill. The cost estimates for alternatives with greater quantities of dredged material assume the volume exceeding 100,000 cy will be transported off-site for disposal at a permitted TSCA/RCRA landfill.

The remedial alternatives are:

Alternative 1: No Further Action

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action alternative does not include any physical remedial measures beyond those response actions already implemented to address the problem of sediment contamination at the Site.

Present-Worth Cost:	$0
Construction Time:	0 years

Alternative 2: Monitored Natural Recovery

The Monitored Natural Recovery (MNR) alternative relies on naturally occurring processes to reduce the toxicity, mobility, and volume of the contaminants in the lower Grasse River sediments. Natural recovery processes may include biodegradation, biotransformation, bioturbation, diffusion, dilution, adsorption, volatilization, chemical reaction or destruction, resuspension, downstream transport, and burial by cleaner material. Long-term monitoring of sediment, water column, and fish would be included in this alternative to confirm that contaminant reduction is occurring and that the reduction is achieving the Remedial Action Objectives.

Institutional controls, in the form of continuation of fish consumption advisories would be implemented as long-term control measures as part of the MNR alternative. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$3,400,000
Construction Time:	0 years

Alternative 3: Capping

This alternative includes: the placement of a 25-inch armored cap over the T1-T21 main channel sediments (59 acres) where either the segment length weighted average (SLWA) or the maximum surface sediment PCB concentration is greater than or equal to 1 mg/kg[6]; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 (approximately 225 acres) with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; placement of a 6-inch near shore cap over sediments in the near shore areas between T1 and T21 (10 acres) with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; and placement of a near shore cap (6-inch) over sediments in the near shore areas between T21 and T72 (31 acres) with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg. The SLWA is used to identify PCBs at depth, and is one of the criteria for triggering remediation in T1-T21 because of the potential for scour in those transects. (Refer to the Analysis of Alternatives Report for more details on the armored cap, and near shore and main channel cap materials.)

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portion of the caps has been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

6 "Maximum surface sediment PCB concentration greater than or equal to 1 mg/kg" means a PCB concentration of 1 mg/kg or greater in any core segment collected from surface sediments.

Present-Worth Cost:	$114,400,000
Construction Time:	3 years

Alternative 4: T1-T21 Near Shore (NS) Dredging and Backfill to Grade, T21-T72 NS Capping, T1-T21 Main Channel (MC) Armored Capping and T21-T72 MC Capping

Alternative 4 includes: the placement of a 25-inch armored cap over the T1-T21 main channel sediments where either the SLWA or the maximum surface sediment PCB concentrations is greater than or equal to 1 mg/kg; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade; and placement of a near shore cap (6-inch) over sediments in the near shore areas between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg. This alternative includes 59 acres of armored cap, approximately 225 acres of main channel cap, 31 acres of near shore cap, 26,000 in-situ cy of sediment dredged in the near shore followed by backfilling to pre-dredging grade in the dredged area. (Refer to Table 2 below in the Reduction in Toxicity, Mobility, or Volume Through Treatment section for estimated volumes dredged and areas capped.)

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portion of the caps has been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$147,000,000
Construction Time:	3 years

Alternative 5: T1-T72 NS Surface Sediment PCBs ≥ 10 mg/kg Dredging and Capping between 1 mg/kg and 10 mg/kg, T1-T21 MC Armored Capping and T21-T72 MC Capping

Alternative 5 includes: the placement of a 25-inch armored cap over the T1-T21 main channel sediments where either the SLWA or the maximum surface sediment PCB concentration is greater than or equal to 1 mg/kg; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 10 mg/kg, followed by 6-inch capping of near shore sediment between T1 and T21 with PCB concentrations greater than or equal to 1 mg/kg and less than 10 mg/kg; and dredging of near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 10 mg/kg, followed by 6-inch capping of near shore sediment between T21 and T72 with PCB concentrations greater than or equal to 1 mg/kg and less than 10 mg/kg. This alternative includes 59 acres of armored cap, approximately 225 acres of main channel cap, 31 acres of near shore cap, 46,000 in-situ cy of sediment dredged in the near shore and 13 acres backfilled to grade. The 28 acres of the remaining near shore area between T1 and T72 that is not addressed by dredging/backfilling would be capped.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portion of the caps has been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$175,000,000
Construction Time:	4 years

Alternative 6: T1-T72 NS Dredging and Backfill to Grade, T1-T21 MC Armored Capping and T21-T72 MC Capping

Alternative 6 includes: the placement of a 25-inch armored cap over the T1-T21 main channel sediments where either the SLWA or the maximum surface sediment PCB concentrations is greater than or equal to 1 mg/kg; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade; and, dredging near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade. This alternative includes 59 acres of armored cap, approximately 225 acres of main channel cap, 109,000 in-situ cy of sediment dredged in the near shore and 41 acres backfilled to grade.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portion of the caps has been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$243,000,000
Construction Time:	4 years

Alternative 7: T1-T72 NS Dredging and Backfill to Grade, T1-T19.5 Select MC Dredging, T1-T21 MC Armored Capping, and T21-T72 MC Capping

Alternative 7 includes: dredging of main channel sediments from Work Zones 2 and 3 (approximately T7.5 to T9.5) defined in the ROPS and T16.5 to T19.5; placement of a 25-inch armored cap over the dredged portion of the main channel sediments where residuals sediment PCB concentrations greater than or equal to 1 mg/kg; placement of an armored cap over remaining sediments in the main channel between T1 and T21 with SLWA or maximum sediment PCB concentrations greater than or equal to 1 mg/kg; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade; and dredging of near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade. This alternative includes 150,000 in-situ cy of sediment dredged from main channel, 59 acres of armored cap, approximately 225 acres of main channel cap, 109,000 in-situ cy of sediment dredged in the near shore and 41 acres backfilled to grade.

Though a great amount of sediment in the main channel is dredged in this alternative, due to the site conditions and based on information from site-specific pilot studies and other dredging sites, it is anticipated that residual sediments with PCB concentrations greater than or equal to 1 mg/kg will remain after dredging, requiring an armored cap.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portion of the caps has been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$352,000,000
Construction Time:	5 years

Alternative 8: T1-T21 NS Dredging and Backfill to Grade, T1-T21 MC Dredging and Armored Capping Residuals, and T21-T72 NS and MC Capping

Alternative 8 includes: dredging of main channel and near shore between T1 to T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; placement of a 25-inch armored cap over the dredged portion of the main channel sediments where residuals sediment PCB concentrations greater than or equal to 1 mg/kg; placement of backfill to grade in the dredged near shore; the placement of a 12-inch main channel cap over main channel sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; and placement of a near shore cap (6-inch) over sediments in the near shore areas between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg. This alternative includes 329,000 in-situ cy of sediment dredged from the main channel, 59 acres of armored cap, approximately 225 acres of main channel cap, 26,000 in-situ cy of sediment dredged in the near shore and 10 acres backfilled to grade, and an additional 31 acres of near shore would be capped.

Though a great amount of sediment in the main channel is dredged in this alternative, due to the site conditions and based on site-specific pilot studies and experiences at other dredging sites, it is anticipated that residual sediments with PCB concentrations greater than or equal to 1 mg/kg will remain after dredging that require an armored cap after dredging.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portions of the caps have been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$388,000,000
Construction Time:	8 years

Alternative 9: T1-T72 NS Dredging and Backfill to Grade, T1-T46 Select MC Dredging, T1-T21 MC Armored Capping, and T21-T72 MC Capping

Alternative 9 includes: dredging of main channel sediments from Work Zones 2 and 3 (approximately T7.5 to T9.5) as defined in the ROPS and T16.5 to T19.5, T27 to T37, and T43 to T46; placement of a 25-inch armored cap over the dredged portion of the main channel sediments where the residual sediment PCB concentration is greater than or equal to 1 mg/kg; placement of an armored cap over remaining undredged sediments in the main channel between T1 and T21 with SLWA or maximum sediment PCB concentrations greater than or equal to 1 mg/kg; the placement of a 12-inch main channel cap over main channel sediments (undredged and residuals) between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade; and, dredging near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade. This alternative includes 525,000 in-situ cy of sediment dredged from the main channel, 59 acres of armored cap, approximately 225 acres of main channel cap, 109,000 in-situ cy of sediment dredged in the near shore and 41 acres backfilled to grade.

Though a great amount of sediment in the main channel is dredged in this alternative, due to the site conditions and based on information from site-specific pilot studies and other dredging sites, it is anticipated that residual sediments with PCB concentrations greater than or equal to 1 mg/kg will remain, requiring an armored cap or main channel cap, as appropriate, after dredging.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portions of the caps have been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$589,000,000
Construction Time:	7 years

Alternative 10: T1-T72 NS Dredging and Backfill to Grade, T1-T72 MC Dredging, T1-T21 MC Armored Capping, and T21-T72 MC Capping

Alternative 10 includes: dredging areas of the main channel and near shore between T1 to T21 which have SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; placement of a 25-inch armored cap over the dredged portion of the main channel sediments between T1 and T21 with PCB residuals of greater than or equal to 1 mg/kg; backfilling the dredged near shore area between T1 to T21 to grade; dredging sediments in the main channel between T21 to T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg; placement of a main channel cap over dredged portions of the main channel between T21 and T72 with residuals greater than or equal to 1 mg/kg; and dredging of near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade. This alternative includes 1,555,000 in-situ cy of sediment dredged from the main channel, 59 acres of armored cap, approximately 225 acres of main channel cap, 109,000 in-situ cy of sediment dredged in the near shore and 41 acres backfilled to grade.

Though a great amount of sediment in the main channel is dredged in this alternative due to the site conditions and based on information from site-specific pilot studies and other dredging sites, it is anticipated that residual sediments with PCB concentrations greater than or equal to 1 mg/kg will remain, requiring an armored cap or main channel cap, as appropriate, after dredging.

After construction is completed, the remedy would be monitored over the long term. This alternative also relies on institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and sedimentation in achieving the Remedial Action Objectives. If monitoring reveals any portions of the caps have been eroded, damaged areas would require maintenance/replacement. A review of site conditions would be conducted at five-year intervals, as required by CERCLA.

Present-Worth Cost:	$1,274,000,000
Construction Time:	18 years

NINE EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to the site, or provide grounds for invoking a waiver.
Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies an alternative may employ.
Short-term effectiveness considers the period of time needed to implement an alternative and the risks the alternative may pose to workers, residents, and the environment during implementation.
Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
Cost includes estimated capital and annual operation and maintenance costs, as well as present-worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Comments received on the Proposed Plan are an important indicator of community acceptance.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA § 121, 42 U.S.C. § 9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP at 40 CFR § 300.430(e)(9), EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies*, OSWER Directive 9355.3-01, and EPA's *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, OSWER 9200.1-23.P. The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria (see box above) and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

A comparative analysis of these alternatives based upon the evaluation criteria noted below follows.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment at the Site would be achieved by reducing the PCB concentrations in fish and other biota. To accomplish this reduction, remedial alternatives need to address the diffusive flux of PCBs from surface sediments, and control sediment stability through dredging, capping, and natural recovery. Each of the alternatives presented, except Alternative 1 (No Further Action) and Alternative 2 (Monitored Natural Recovery), would provide some level of protection of human health and the environment through a combination of active remediation and monitored natural recovery. Alternative 1 (No Further Action) would not be protective of human health and the environment since it would not address the PCBs in the sediments, which present human health and ecological risks.

Alternative 2 (Monitored Natural Recovery) relies on natural processes such as sedimentation to cover the surface sediment with cleaner sediment from upstream, in order to reduce the PCB concentration at the sediment surface and reduce risk. However, periodic ice jam-related scour events could result in remobilization of PCBs and would therefore present a continued risk to human health and the environment even after cleaner sediments are deposited over the PCBs.

Alternative 3 (Capping) relies on effective cap placement and maintenance to isolate PCB-containing sediments, while Alternatives 4 through 10 rely on a combination of dredging and capping, followed by monitoring and maintenance of the caps, for the protection of human health and the environment. Dredging generally relies upon effective removal of contaminated sediment and low PCB residual concentrations. For the main channel, none of the alternatives presented rely solely on dredging because the residuals would most likely exceed the PCB sediment action level of 1 mg/kg, thus requiring the main channel to be capped even after dredging.

The projected times that it would take under each of the alternatives to reach the fish Preliminary Remediation Goal (PRG) and the interim target concentrations in the Remedial Action Objectives have been modeled and are provided on Table 1.

The fish PRG is 0.05 mg/kg PCBs (wet weight) in fillet. The fish PRG to protect Mohawk human health is 0.01 mg/kg. The difference is attributable to the greater fish consumption rate used in the calculation for the Mohawk population than the average fish consumption rate of the non-Mohawk adult population. EPA has identified an interim target concentration of 0.26 mg/kg PCBs in fillet based on the average consumption rate of one half pound meal per month, and another interim target concentration of 0.36 mg/kg based on the average consumption rate of one half pound meal every two months. Currently, the fish consumption advisory is established as, “eat none” for the lower Grasse River. For all alternatives, after remedy implementation, NYSDOH would review post-remediation fish PCB data and will consider relaxing the current fish advisory based on their review. NYSDOH and NYSDEC Fish and Wildlife staff also would be involved in post-remediation fish sampling and analysis program design.

Although the time frames vary for alternatives 2 through 10, these alternatives are projected to provide reduced PCB concentrations in fish over variable time frames, and therefore offer varying degrees of protection of human health and the environment. Alternatives 3 through 10, which include measures to prevent remobilization of PCBs in the main channel sediment vulnerable to ice jam-related scour would provide greater protection than Alternatives 1 and 2.

As can be seen in Table 1, none of the alternatives meet the human health PRG of 0.05 mg/kg PCBs within the 30-year modeling time frame. Because capping can be performed more quickly than dredging, the alternatives with the greatest amounts of dredging take longer to achieve the other target concentrations, because fish continue to be exposed to PCBs in the sediment over the longer construction time frame. Though it was not modeled, none of the alternatives are anticipated to meet the Mohawk human health PRG of 0.01 mg/kg within the 30-year modeling time frame, because it is lower than the fish tissue level of 0.05 mg/kg.

Again, all of the active remedies presented in Alternatives 3 through 10 are expected to provide substantial risk reduction compared to Alternatives 1 and 2, which provide no active cleanup of the river. Alternatives 4, 5, and 6 show the best predicted combined short and long-term risk reduction.

Compliance with ARARs

The federal chemical-specific ARARs for PCBs in the water column are the 0.001 ug/L federal Clean Water Act (CWA) ambient water quality criterion for navigable water, and the 0.014 ug/L federal CWA criterion continuous concentration (CCC) [chronic] for freshwater aquatic life. The NYS surface water quality standards for PCBs are 0.12 ng/L for protection of wildlife and 0.001 ng/L for protection of human consumers of fish.

Alternatives 3 through 10 would meet the CWA ambient water criterion of 0.001 ug/L and the CWA CCC of 0.014 ug/L. However, the NYS surface water quality standard of 0.12 ng/L and the 0.001 ng/L standard for protection of human consumers of fish are not expected to be met by any of the alternatives. This is due to Site background PCB loading conditions and contributions from the Power Canal, which have been accounted for in the model projections. As such, a technical impracticability waiver would be required for these ARARs under any of the alternatives.

Because there is no active remediation associated with the sediment for Alternatives 1 and 2, action-specific and location-specific ARARs do not apply. Alternatives 3 through 10 would comply with action-specific ARARs (e.g. CWA Section 401 and 404; TSCA Section 6(e) and 40 CFR Part 761; RCRA Section 3004; Section 10 of the Rivers and Harbors Act; New York State ECL Article 3, Title 3 and Article 27, Titles 7 and 9) and location-specific ARARs (e.g., Endangered Species Act; Fish and Wildlife Coordination Act; National Historic Preservation Act; Coastal Zone Management Act; and New York State Freshwater Wetlands Law). With regard to the location-specific ARARs of New York State ECL Article 15, Title 5, Article 17, Title 3 and 6 NYCRR Part 608 (regarding placement of fill in navigable waters), Alternatives 6, 7, 9 and 10 are expected to be more likely to meet this ARAR because they do not alter the bathymetry of the Grasse River to the same extent as Alternatives 3, 4, 5 and 8 because Alternatives 6, 7, 9 and 10 do not include capping that alter the near-shore bathymetry. Additional assessment of remedial impacts will be necessary to

Table 1: Time (years) to Reach Target Concentration (mg/kg) in Fish

Alternatives	0.05	0.26	0.36
1. No Further Action	> 30	> 30	> 30
2. MNR	> 30	> 30	> 30
3. Capping	> 30	7	6
4. T1-T21 NS Dredge and Backfill, T21-T72 NS Capping, and T1-T72 MC Capping	> 30	7	6
5. T1-T72 NS Surface Sediment PCBs > 10 mg/kg Dredge and Cap between 1 mg/kg and 10 mg/kg, and T1-T72 MC Cap	> 30	8	7
6. T1-T72 NS Dredge and Backfill, T1-T72 MC Capping	> 30	8	7
7. T1-T72 NS Dredge and Backfill, T1-T19.5 Select MC Dredge and Cap Residuals, and Rest of MC Capping	> 30	14	10
8. T1-T21 NS Dredge and Backfill, T1-T21 MC Dredge and Cap Residuals, and T21-T72 NS and MC Capping	> 30	19	13
9. T1-T72 NS Dredge and Backfill, T1-T46 Select MC Dredge and Cap Residuals, and Rest of MC Capping	> 30	17	13
10. Dredging/Capping	> 30	23	20

Note: “>” = greater than

determine the precise actions necessary for Alternatives 3 through 10 to meet the substantive requirements of the location-specific ARAR of New York State ECL Article 11 Title 5 (New York State Endangered Species Act) and 6 NYCRR Part 182. A more detailed Analysis of potential effects on wetlands and floodplains associated with the preferred remedial alternative would be performed during the remedial design, as necessary to ensure compliance with Executive Orders 11990 (Protection of Wetlands) and 11988 (Floodplain Management). More details and the full list of ARARs and TBCs are available in the Analysis of Alternatives report.

The SRMT has promulgated a 0.1 mg/kg cleanup standard for PCBs in sediments. Tribal Council Resolution No. 89-19 and Tribal Council Resolution No. 2007-72. EPA and the SRMT are currently discussing, on a government-to-government basis, whether the SRMT's sediment cleanup standard will be applied as a "relevant and appropriate" requirement for the cleanup. The SRMT cleanup standard is significantly lower than EPA's proposed action levels for sediment cleanup (i.e., $\geq$1 mg/kg PCB surface or SLWA concentration) in this Proposed Plan and may not be technically practicable to achieve. Because it is doubtful that the SRMT sediment standard can be achieved, and may therefore need to be waived due to technical impracticability if it is identified as an ARAR, EPA does not believe that the SRMT sediment standard would necessarily lead to a remedy that is different from the preferred remedy in this Proposed Plan.

EPA calculated the PRG of 0.01 mg/kg PCBs in fish tissue for protection of Mohawk health using a fish consumption rate for Mohawk subsistence anglers, which is higher than the average fish consumption rate of the non-Mohawk population.

Long-Term Effectiveness and Permanence

Reduction of Residual Risk

The No Further Action and MNR alternatives (Alternatives 1 and 2, respectively) remove no PCBs from the Grasse River and include no active measures to reduce residual risk at the Site. Under both alternatives, the degraded condition of surficial sediment and surface water quality will continue for decades, with no improvements other than from sedimentation. Neither option would prevent mobilization of PCBs in the main channel sediments that are vulnerable to ice jam-related scour. Each of these alternatives therefore would allow for the continued exposure to PCB contamination over the long-term.

Alternative 3 actively reduces residual risk by isolating PCBs in surface sediment under a cap. Alternatives 4 through 10 all reduce residual risk through various combinations of dredging and capping. Alternatives 3 through 10 provide similar long-term risk reduction. Removal of PCB-contaminated sediment if done completely such that no sediments with PCB concentrations above 1 mg/kg remain is considered more permanent than capping, which requires long-term maintenance of the cap. Complete removal of PCB-contaminated sediment is possible in the near-shore, but cannot be achieved in the main channel due to site-specific conditions. The alternatives with greater amounts of dredging are also projected to take longer to achieve the RAOs interim target for PCBs in fish (0.26 mg/kg PCBs in fillet based on the average consumption rate of one half pound meal per month, and 0.36 mg/kg based on the average consumption rate of one half pound meal every two months) because capping can be more quickly implemented than dredging.

Adequacy and Reliability of Controls

Sediment capping, sediment removal (dredging and excavation), habitat replacement/backfilling, and off-site disposal/treatment of removed sediments are all reliable and proven technologies. Proper design, placement, and maintenance of the caps are required for their effectiveness, continued performance, and reliability. Cap monitoring and maintenance programs would provide for reasonable reliability, and any TSCA-permitted landfills into which dredged PCBs are placed also would be monitored and maintained over the long-term. The fish consumption advisories would continue to provide some measure of protection of human health until PCB concentrations in fish are reduced to the point where the fish consumption advisories can be relaxed or lifted.

Neither the No Further Action nor the MNR Alternative includes any engineering controls to address PCB contamination at the Site. Alternatives 3 through 10 all reduce exposure to PCBs in surface sediments and improve water quality through active measures. The alternatives that have a dredging component in the main channel (Alternatives 7 through 10) will permanently remove various volumes of sediment and the associated mass of PCBs from the river. Active Alternatives 3 through 10 also rely on capping for long-term effectiveness. Alternatives 3 through 10 include placement of an armored cap to provide a long-term effective means of sequestering the PCB-contaminated sediments buried beneath the main channel in areas prone to scour from severe ice jam events in the river, and also rely on the main channel cap in the lower T21 to T72 transects to address availability of PCBs in main channel sediments.

Evaluations of propeller wash and scour from recreational boats and placement of anchors on the cap show that these activities are not expected to significantly impact the overall stability of a main channel cap or an armored cap; however, institutional controls, such as restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap), and long-term monitoring would be necessary to ensure long-term integrity of the cap.

PCBs isolated under the cap would migrate into the cap very slowly via molecular diffusion, and the fastest migration rate would still be slower than the rate at which sediments will naturally accumulate on top of the cap. Molecular diffusion is therefore not expected to compromise the effectiveness of the cap.

Dredging in the near shore under Alternatives 4 through 6 would be more effective than dredging in the main channel because contaminated near shore sediment can be fully captured by dredging, as demonstrated by ROPS. Alternatives 4 and 5 will each leave behind greater near shore contamination (albeit under a cap) than the Alternative 6. Therefore, Alternatives 6, 7, 9 and 10, which include the most near shore dredging, would be more effective and permanent in re-establishing valuable habitat for varied species in the near shore than Alternatives 3, 4, 5, and 8, which include capping in the near shore. Near shore areas that are dredged will be backfilled with clean material to grade to provide appropriate depth of sediment to allow for habitat re-establishment and species use.

Reduction in Toxicity, Mobility, or Volume Through Treatment

The No Further Action and MNR alternatives do not involve any containment or removal of contaminants from the Site. Both rely on natural attenuation processes such as burial (sedimentation) by cleaner sediments to reduce the concentration of PCBs in the sediment and surface water. Mobility is not reduced by Alternative 1 or 2 because neither alternative sequesters and protects sediment in the main channel that is susceptible to scouring from severe ice jam events, and neither actively retards the flux of PCBs from the sediment to the water column.

Alternatives 4 through 10 will permanently remove various volumes of sediment from the river (see Table 2) through dredging, although not through treatment. Dredged sediment would be transported to and disposed of at an existing on-site TSCA/RCRA landfill and/or off-site to a permitted TSCA/RCRA landfill. Alternatives 4 through 10 will include treatment of water generated by the dredging and sediment handling processes to meet NYSDEC discharge limits prior to discharge.

Placement of caps, which is a component of Alternatives 3 through 10, would provide reduction of mobility of the contaminated sediment in the river through isolation of PCBs contained beneath the cap, not through treatment.

Also in active Alternatives 3 through 10, after construction of the remedy is completed, sedimentation will provide further (but slower) reductions in the toxicity of PCBs in the remaining sediment and surface water.

Table 2: Volume of Dredging and Area Capped[7]

Alternatives	Dredging Volume in Main Channel (cy)	Area Capped in Main Channel (acre)	Dredging Volume in Near Shore (cy)
1. No Further Action	0	0	0
2. MNR	0	0	0
3. Capping	0	284	0
4. T1-T21 NS Dredge and Backfill, T21-T72 NS Capping, and T1-T72 MC Capping	0	284	25,900
5. T1-T72 NS Surface Sediment PCBs > 10 mg/kg Dredge and Cap between 1 mg/kg and 10 mg/kg, and T1-T72 MC Cap	0	284	46,100
6. T1-T72 NS Dredge and Backfill, T1-T72 MC Capping	0	284	108,700
7. T1-T72 NS Dredge and Backfill, T1-T19.5 Select MC Dredge and Cap Residuals, and Rest of MC Capping	149,600	284	108,700
8. T1-T21 NS Dredge and Backfill, T1-T21 MC Dredge and Cap Residuals, and T21-T72 NS and MC Capping	329,000	284	25,900
9. T1-T72 NS Dredge and Backfill, T1-T46 Select MC Dredge and Cap Residuals, and Rest of MC Capping	524,500	284	108,700
10. Dredging/Capping	1.554 million	284	108,700

Short-Term Effectiveness

The No Further Action and MNR alternatives (Alternatives 1 and 2) do not involve any capping, dredging, or other construction activities that could present a risk to workers or the public. In addition, neither alternative increases the potential for direct contact with or ingestion and inhalation of PCBs from the surface water and sediment.

For the remaining alternatives, Alternative 3, which relies on capping and MNR, would have the lowest short-term impact to the workers, the environment, and the community based on the construction duration (three years) and minimal exposure to contaminated sediment at

7 The area to be capped in the near shore for Alternative 3 is 41 acres, for Alternative 4 is 31 acres, and for Alternatives 1, 2, 6-10 is none. The area to be backfilled in the near shore after dredging for Alternative 4 is 10 acres, for Alternatives 6-10 is 41 acres. Alternative 5 has some dredging in the near shore, however since the dredging is to 10 ppm and not to a 1ppm cleanup level, the activity after dredging is capping and not backfill. Alternative 5 has 41 acres to be capped after dredging.

depth. Some of the impacts associated with Alternative 3 would include disruption to the recreational boating, road congestion from vehicles needed to bring equipment, materials and workers to the Site, and short-term ecosystem impacts from cap placement. A typical construction season includes six months for the actual in-river construction season (May – October) plus a month before and a month after for mobilization/demobilization.

Alternatives 4 through 6 are expected to have greater short-term impacts than Alternatives 1 through 3, but fewer short-term impacts than Alternatives 7 through 10, which include significant amounts of main channel dredging. The construction durations are from three to four years and the short-term impacts would include the impacts outlined above for Alternative 3 (Capping). Additionally, since Alternatives 4, 5, and 6 include dredging, resuspension and release of PCBs in the river will likely increase PCB concentrations in the water column and fish tissue during the in-river remedial operations and for a short period of time after dredging; however, experience at other sites has shown that while fish tissue concentrations often increase during dredging projects, the fish tissue concentrations return to, pre-dredging concentrations and then generally decline within a few years after dredging ends. Also with dredging, additional transportation congestion would occur on the river from transporting up to 100,000 cy of dredged material to the on-site landfill

Alternatives 7 through 9 have greater short-term impacts than all alternatives except Alternative 10. Impacts would be similar to those outlined for Alternatives 4 through 6, except impacts would occur for longer construction duration, 5 to 8 years. Also, the larger volume of sediment requiring disposal at an off-site landfill would mean increased truck traffic on the road beyond the disposal facility and the Site.

Alternative 10 has the highest short-term impacts from dredging and capping because it has the longest time frame for construction (18 years). The magnitude of potential short-term impacts associated with dredging would increase greatly for this alternative in all respects (environmental impacts, community impacts, and worker safety) because of the dredge volume (approximately 1,663,000 in-situ cy) and duration.

The risks to remediation workers and nearby populations under all of the active alternatives would, however, be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment. Work areas in the river would be isolated (access restricted), with an adequate buffer zone so the recreational water craft can safely avoid such areas.

There may be some short-term temporary impacts to aquatic and wildlife habitat, particularly in the near shore for Alternatives 4 through 10, as a result of temporary habitat removal through dredging. Habitat replacement/backfilling measures would be implemented to mitigate these impacts. A monitoring program would be established to verify the attainment of the habitat construction objectives set during the remedial design. A habitat assessment and survey for listed or sensitive species and a use study for general species would be conducted during remedial design.

Implementability

In general, all alternatives are considered to be technically feasible within the lower Grasse River. Design and implementation of both capping and dredging are administratively feasible, as no permits are required for in-river activities (although such activities would comply with substantive requirements of otherwise required permits), and construction would be performed in accordance with ARARs. Permits would be obtained as needed for off-site work.

There are no implementability issues for the No Further Action and MNR alternatives, which do not involve any active remediation.

Based on site-specific experience during the CPS and ROPS, the design and placement of armored, main channel, and near shore caps/backfill (components of all active remedial alternatives) are expected to be technically implementable. Some of the larger dredging alternatives (Alternatives 7 through 10) would require significant off-site landfill capacity for the dredged sediments. Since all of the active alternatives require significant quantities of capping material, coordination with multiple cap material sources may be required to support the project. Alternative 10, which requires the greatest amount of dredging, has a greater uncertainty regarding the local availability of necessary materials, equipment, supplies, and services including landfill capacity and capping materials over the extended project period.

Dredging of various sediment volumes is a component of the Alternatives 4 through 10. Operational problems with the hydraulic horizontal auger dredge were encountered during the NTCRA and ROPS in the main channel area. The presence of complex site bottom conditions and debris is expected to reduce the practicability and/or efficiency of removing sediment from targeted main channel areas in Alternatives 7 through 10. These limitations would be present for all main channel dredging alternatives; Alternative 6 does not have any main channel dredging.

Unlike dredging in the main channel, dredging in the near shore under Alternatives 4 through 10 would be more effective because the contaminated sediment can be fully captured by dredging as demonstrated by ROPS. Near shore areas that are dredged will be backfilled with clean material to grade to provide appropriate depth of sediment to allow for habitat re-establishment and species use.

Cost

The present-worth costs were calculated using a discount rate of seven percent and a thirty-year time interval for the post-construction monitoring and maintenance period.

The estimated capital, long term monitoring, operation and maintenance (O&M), and present-worth costs for each of the alternatives are presented in the table below. As can be seen from the Table 3, costs progressively increase from Alternative 1 through Alternative 10. Within the active Alternatives 3 through 10, the progressive cost increases are primarily driven by increasing amounts of dredging specified under the alternatives.

State Acceptance

NYSDEC acceptance of the preferred alternative will be addressed in the ROD following review of comments received on the Proposed Plan.

Tribal Acceptance

Tribal acceptance of the preferred alternative by the St. Regis Mohawk Tribe will be addressed in the ROD following review of comments received on the Proposed Plan, and continuing government-to-government consultation.

Community Acceptance

Community acceptance of the preferred alternative will be addressed in the ROD following review of the public comments received on the Proposed Plan.

Table 3: Cost Comparison

Alternatives	Capital (million)	Long term Monitoring/ O&M (present worth, million)	Total Present Worth (million)
1. No Further Action	$0	$0	$ 0
2. MNR	$0	$3.4	$ 3.4
3. Capping	$74.2	$10.2	$ 114.1
4. T1-T21 NS Dredge and Backfill, T21-T72 NS Capping, and T1-T72 MC Capping	$97.6	$10.6	$ 147.2
5. T1-T72 NS Surface Sediment PCBs > 10 mg/kg Dredge and Cap between 1 mg/kg and 10 mg/kg, and T1-T72 MC Cap	$117.3	$11.0	$ 175.2
6. T1-T72 NS Dredge and Backfill, T1-T72 MC Capping	$165.2	$11.8	$ 243.1
7. T1-T72 NS Dredge and Backfill, T1-T19.5 Select MC Dredge and Cap Residuals, and Rest of MC Capping	$242.7	$11.8	$ 351.6
8. T1-T21 NS Dredge and Backfill, T1-T21 MC Dredge and Cap Residuals, and T21-T72 NS and MC Capping	$269.6	$10.6	$ 388.0
9. T1-T72 NS Dredge and Backfill, T1-T46 Select MC Dredge and Cap Residuals, and Rest of MC Capping	$411.9	$11.9	$ 588.5
10. Dredging/Capping	$901.2	$11.9	$ 1,273.5

PREFERRED REMEDY

EPA's preferred remedy is Alternative 6: T1-T72 Near Shore Dredge and Backfill to Grade and T1-T72 MC Capping (see Figure 5). This alternative includes the following components:

- Dredging of near shore sediment between T1 and T21 with SLWA or maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade;
- Dredging of near shore sediment between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg, followed by backfill to grade;
- Placement of an armored cap over the T1-T21 main channel sediments where either the SLWA or the maximum surface sediment PCB concentrations is greater than or equal to 1 mg/kg. During design, the composition and thickness of the capping material will be optimized to promote reliability and efficacy of the cap;
- Placement of a main channel cap over sediments between T21 and T72 with maximum surface sediment PCB concentrations greater than or equal to 1 mg/kg. During design, the composition and thickness of the capping material will be optimized to promote reliability and efficacy of the cap;
- Within the near shore area targeted for dredging, the goal is to remove all of the PCB-contaminated sediments within these area, leaving a residual of less than 1 mg/kg;
- Treatment of water generated by the dredging and sediment handling processes to meet NYSDEC discharge limits;
- Frequent monitoring at least one or two times per year of fish, water, and sediment to determine when Preliminary Remediation Goals are reached

and implementation (or modification) of appropriate institutional controls, until goals are met;

- A Phase 1A Cultural Resource Assessment will be conducted during the pre-remedial design prior to any disturbance and/or in-river work;

- Development of a habitat reconstruction plan. The objective of the habitat reconstruction plan would be to identify impacts to habitat and species from the remedy, identify habitat re-establishments goals, provide design specifications for habitat recovery, and provide the scope for monitoring of habitat recovery. The plan would be developed and implemented during design and remedy implementation, and would include the following components:
  - A) Habitat assessment study for affected species would be conducted to assess the river for habitats that are present and use of the habitats by aquatic and semi-aquatic species. The study would include a survey for the presence of federal and state listed aquatic species and the habitats used by these species in the remedial area. Additionally, the study will document the habitat characteristics (including but not limited to temperature regime, substrate type, structure, plant species and density) of all areas affected by the remedy and identify any fish and wildlife concentration areas. Collected data would be used to determine the habitats affected by the remedy, any actions necessary to eliminate or minimize impacts to listed species, measures needed to protect existing habitats, and develop design specifications for the replacement and recovery of the all affected habitats following the remedy.
  - B) Identification of habitat recovery material over capped areas and/or return to grade. Placement of clean substrate on top of the cap to allow for habitat re-establishment and species use, except where the material placed for the cap would be of sufficient quality and thickness to allow for omitting an additional habitat layer. The design of the thickness of the habitat layer of the cap should consider, in addition to other things, the potential for burrowing animals to compromise the integrity of the cap. The habitat recovery material would be free of contaminants and would not require significant maintenance once habitat has been re-established. After placement of the habitat recovery material, the initial grade should be returned in near shore areas and main channel areas should be returned to a stable condition. The most appropriate substrate type will be determined based on the information collected during the habitat assessment and may vary depending on habitat re-establishment and species requirements or habitat reconstruction goals.
  - C) Design for restoration of vegetation. In areas disturbed by the remedy or implementation of the remedy, vegetation would be re-established through a mixture of appropriate active planting and seeding and passive measures to allow for healthy and diverse habitat. Vegetation placement would be determined during the design; and
  - D) Monitoring habitat and biota recovery. A monitoring plan would assess the success of habitat re-construction materials, plantings, and recovery of biota. The monitoring plan would include baseline sampling and corrective actions pertaining to habitat reconstruction, should they be necessary. Additionally, monitoring of PCBs in biota would be conducted to track the success of the remedy in reducing PCBs in the areas affected by the remedy. Monitoring would be specifically designed to track changes in PCB concentrations in aquatic and semi-aquatic species relevant to the Site;

- Air monitoring to ensure that remedy implementation is protective; and

- Institutional controls, such as the fish consumption advisories and restrictions on activities that could compromise the integrity of the cap (such as anchoring which can disturb the cap).

This alternative includes 59 acres of armored cap, approximately 225 acres of main channel cap, approximately 109,000 in-situ cy of sediment dredging in the near shore, and 41 acres backfilled to grade. Most of the dredged material (up to about 100,000 cy) would be disposed in the on-site permitted Secured Landfill. During the design, the design team will evaluate the feasibility of expanding the on-site Secured Landfill to accommodate approximately 9,000 additional cy of dredged material. The design team also will consult with the appropriate state and federal permitting authorities regarding substantive requirements for such expansion. In the event that it is not feasible to expand the existing on-site landfill, the additional 9,000 cy of dredged material will be disposed at an off-site permitted TSCA/RCRA landfill.

Based on current information, the 59-acre main channel area estimated for armored capping is from T1 to T21. However, during the design further investigation may be necessary in the vicinity of T35, T37, T46, and any other areas where evidence of periodic high energy has been observed in the cores such that these areas may require more than a 12-inch sand/topsoil main channel cap. As with all areas of remediation, EPA will optimize the dredging and capping components during remedial design to maximize the immediate risk reduction and long-term effectiveness.

Based on anticipated dredge material production rates, the current estimated construction period will extend over four construction seasons and include dredging, backfilling, and capping. It is anticipated that it will take two years for remedial design and mobilization, so that dredging may begin in 2015. Prior to construction, a remedial design would be developed that specifies details regarding the construction and implementation of the remedy. Design plans would include Site health and safety measures for the workers and a Community Health and Safety Plan for the surrounding community. In addition, habitat assessment would be conducted during the design. Habitat would be reconstructed during implementation of the remedy in accordance with the site-specific habitat reconstruction plan.

After construction is completed, this alternative relies on institutional controls (such as restrictions on activities that could compromise the integrity of the cap such as anchoring which can disturb the cap), long-term monitoring,, and sedimentation to achieve the Remedial Action Objectives. The fish consumption advisories will continue to provide some measure of protection of human health until PCB concentrations in fish are reduced to the point where they can be relaxed or lifted. If monitoring reveals any portion of the various caps has been eroded, damaged areas would require maintenance/replacement. If any portion of a capped area has been eroded, monitoring and sampling will determine whether other areas have been contaminated with PCBs released from the damaged areas. Additional enhanced capping may be undertaken to cover any areas that sampling shows surface sediment PCB concentrations greater than or equal to 1 mg/kg. Monitoring will also be conducted to measure the success of habitat re-establishment. A review of site conditions would be conducted at least once every five-years, as required by CERCLA.

The present-worth cost for Alternative 6 was estimated in the *Analysis of Alternatives* Report to be approximately $243.1 million.

RATIONALE FOR SELECTION OF PREFERRED ALTERNATIVE

The selection of the preferred alternative is accomplished through the evaluation of the nine criteria as specified in the NCP. EPA has evaluated the alternatives against the first seven criteria. New York State is still evaluating EPA's preferred remedy as presented in this Proposed Plan. Consultation with SRMT regarding the Proposed Plan was initiated prior to the release of the Proposed Plan; however, the SRMT's acceptance of the preferred remedy will be assessed during the comment period. Community Acceptance will be evaluated after the Proposed Plan is issued.

The preferred Alternative 6 is protective of human health and the environment. Risk is reduced through removal of PCB-contaminated sediment from the near shore area, and by isolating PCBs in the main channel under caps. PCB-contaminated sediments in the scour-prone areas of the main channel will be isolated and stabilized by the armored cap, which will protect those sediments from future ice jam events. The modeling projects that the target concentration of 0.36 mg/kg in fish, which is protective of the average adult who consumes one fish meal every two months, would be attained in seven years from the start of the active remediation. The target concentration of 0.26 mg/kg in fish, which is protective of the average adult who consumes one fish meal per month, would be attained eight years after the start of active remediation. These time periods are significantly shorter compared to Alternatives 1 (No Further Action) and 2 (MNR), under which attainment of the targets are greater than the 30-year modeling time frame. The time frames also are significantly shorter than the projected times to reach the target concentrations under Alternatives 7-10, which include main channel dredging. The protectiveness of the preferred alternative is further enhanced through the implementation of institutional controls, such as the fish consumption advisories.

According to the model projections, none of the alternatives will meet the human health PRG of 0.05 mg/kg PCBs within the 30-year modeling time frame. Also, although it was not modeled, none of the alternatives, including Alternative 6, are anticipated to meet the lower Mohawk human health PRG of 0.01 mg/kg within the 30-year modeling time frame.

The preferred alternative is also protective of the environment, because it would reduce the PCB concentrations in fish to concentrations that are within the range of 0.22 to 0.44 mg/kg (wet weight) in whole-body fish and a range from 0.1 to 0.2 mg/kg (wet weight) PCBs in brown bullhead fillet within the 30-year modeled time frame, which are the PRGs for ecological exposure. Thus, the preferred alternative is protective of the birds, fish, and mammals that live in and near the lower Grasse River.

The preferred Alternative 6 is the most cost-effective of the remedial alternatives for the risk reduction achieved. Alternatives 1 and 2 are not sufficiently protective of human health and the environment. While Alternatives 3, 4, and 5 are less expensive than Alternative 6, they raise concerns regarding the change in the near shore bathymetry. The preferred alternative is more cost-effective than Alternatives 7 through 10, which include more dredging at a higher cost but which are projected to take longer to reach the interim target levels for PCBs in fish.

The preferred Alternative 6 maximizes the benefit gained from successful dredging in the near shore where minimal or no residual PCBs are anticipated, such that near shore capping after dredging will not be needed. The preferred alternative would permanently and reliably remove approximately 109,000 cy of contaminated sediments from the near shore. The area where the near shore is dredged will be backfilled to grade and habitat reconstruction will re-establish valuable and diverse habitat for biota.

The preferred alternative will comply with the location-specific and action-specific ARARs identified, as well as the two out of four chemical-specific ARARs. However, two chemical-specific ARARs are not expected to be met due to site background PCB loading conditions. Therefore, it is expected that technical impracticability waivers will be required for the NYS water quality PCB standards for the protection of human consumers of fish (0.001 ng/L) and for the protection of wildlife (0.12 ng/L). EPA is considering whether to treat the SRMT's sediment cleanup standard 0.1 mg/kg for PCBs in sediments as a "relevant and appropriate" requirement for the cleanup. It is doubtful that the SRMT sediment standard can be achieved, and it is expected that a technical impracticability waiver would be required if the SRMT standard is identified as an ARAR. Even the most aggressive dredging alternatives would require these same waivers.

The preferred alternative is technically and administratively feasible and implementable. All of the necessary personnel, equipment, and services required are expected be readily available.

The preferred alternative will be protective of human health and the environment, will achieve target concentrations for PCBs in fish faster than alternatives that include dredging of the main channel, is protective in the long-term, complies with ARARs (with two justified waivers), and is cost-effective. The preferred alternative includes dredging of near shore areas where dredging can effectively remove contaminated sediments from the environment, and effectively isolates PCBs in the main channel, where highly contaminated sediment is present over hard bottom material such as bedrock, glacial till, and/or marine clay that interferes with effective dredging. EPA believes that, the preferred remedy will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria.

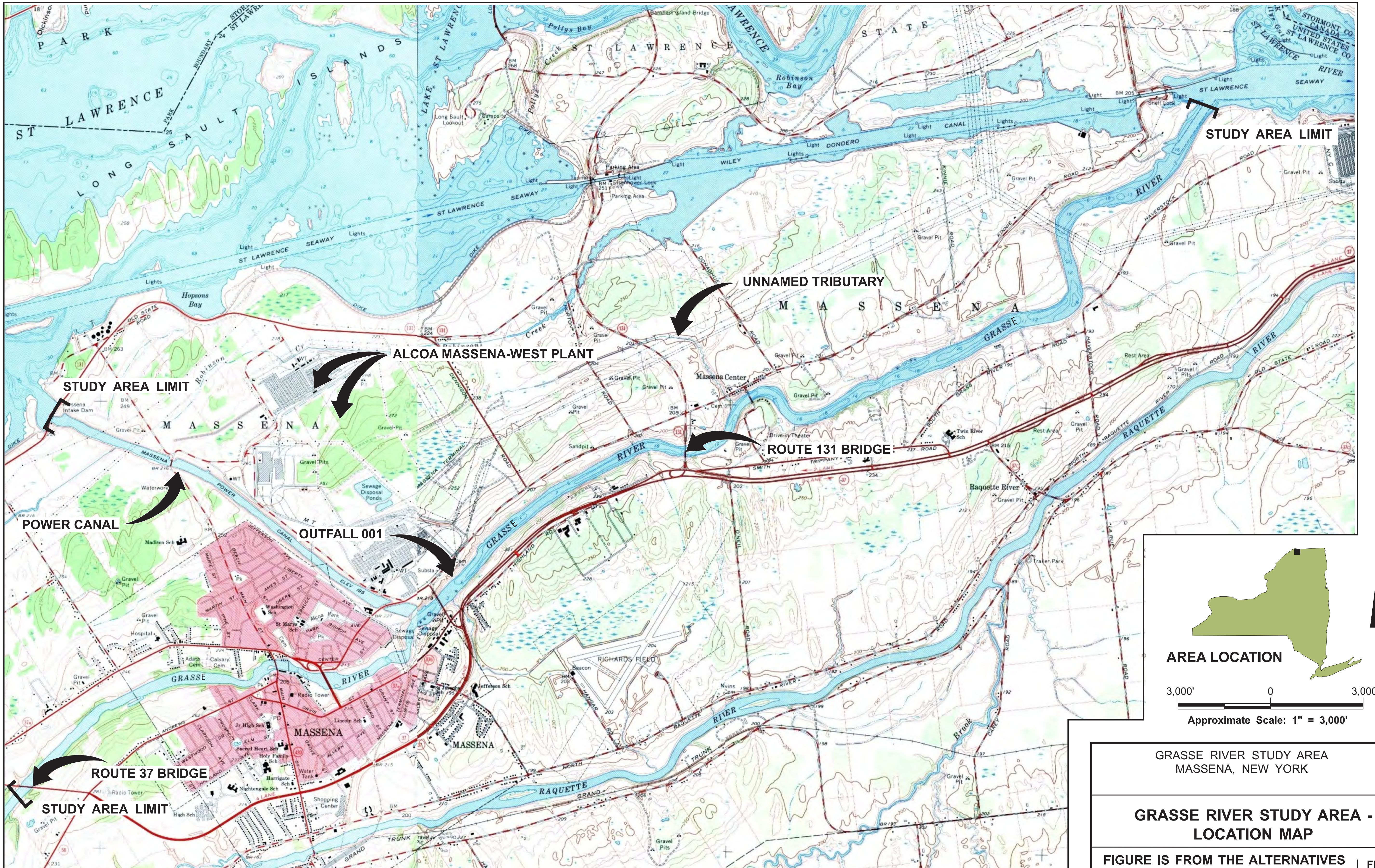
The environmental benefits of the preferred remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy and NYSDEC's Green Remediation Policy[8]. This will include consideration of green remediation technologies and practices.

In furtherance of EPA's current Environmental Justice policy, known as EJ 2014, Region 2 has identified Akwesasne, the territory of the SRMT, as a Potential Environmental Justice Community. Members of the SRMT have been burdened by the environmental and health impacts of pollution in the local river systems, including the Grasse River, due primarily to the consumption of local fish contaminated with PCBs. Members of the SRMT consume such fish at higher rates than the general population. The potential for adverse health impacts from consumption of fish contaminated with PCBs is well documented.

In order to decrease these environmental and health burdens, and mitigate harm, EPA is proposing an enhanced post-remedial monitoring and action plan regarding the levels of pollutants in fish, wildlife habitat, and the permanence and effectiveness of the remedy for the Grasse River including in particular the cap. If such monitoring indicates that an element of the remedy has failed, or is not achieving the interim targets set out in the Proposed Plan, and/or that the remedy is not protective of human health and the environment, then EPA will take appropriate further action to achieve an effective and protective outcome.

Based on information currently available, EPA believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs (or justify a waiver); 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element (or justify not meeting the preference). EPA's statutory preference for treatment was considered as part of this preferred remedy. EPA does not believe that treatment of the sediments is practicable or cost effective given the widespread nature of the sediment contamination in the Grasse River and the high volume of sediment that is being addressed.

[8] See http://epa.gov/region2/superfund/green_remediation and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.



REFERENCE: MASSENA, NEW YORK-ONTARIO USGS QUAD. 1964 RAQUETTE RIVER, NEW YORK-ONTARIO USGS QUAD. 1964

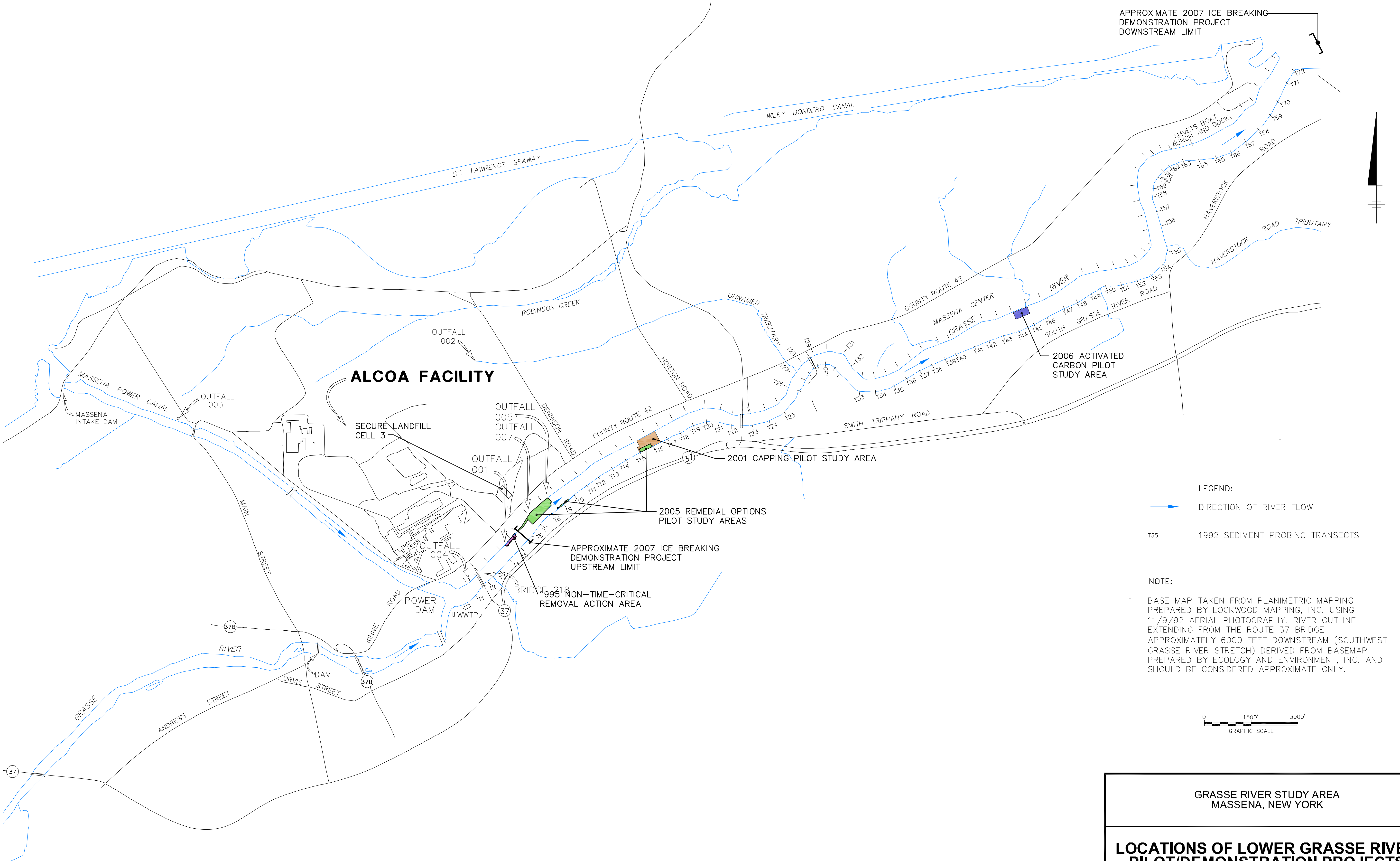
GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

GRASSE RIVER STUDY AREA - LOCATION MAP

FIGURE IS FROM THE ALTERNATIVES OF ANALYSIS REPORT, COURTESY OF ALCOA

FIGURE 1

09/05/2012 SYRACUSE, NY-ENV/141-DJHOWES
B0010875/0000/00001/CDR/10875N01.CDR

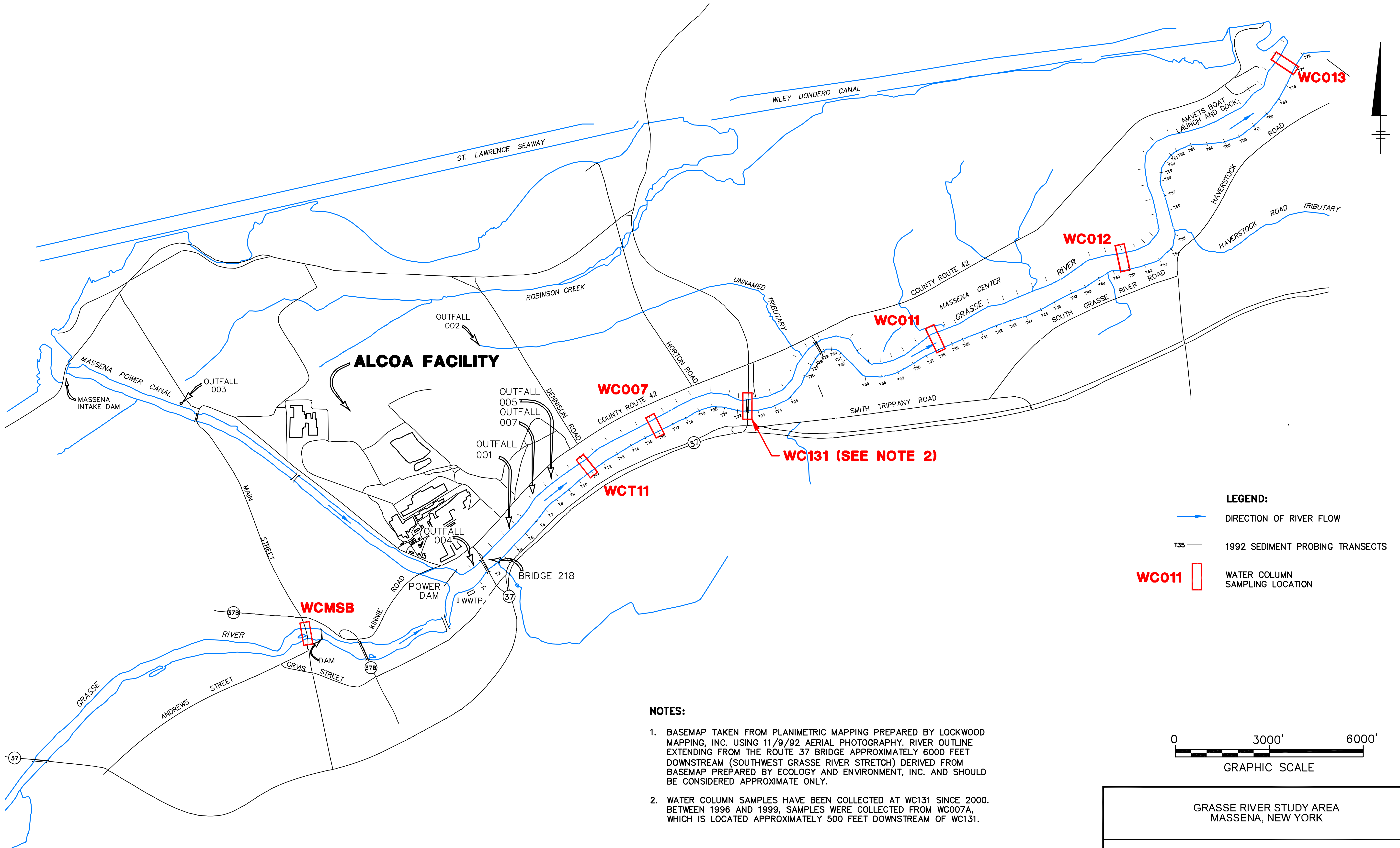


GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

LOCATIONS OF LOWER GRASSE RIVER PILOT/DEMONSTRATION PROJECTS

FIGURE IS FROM THE ANALYSIS OF ALTERNATIVES REPORT, COURTESY OF ALCOA

FIGURE **2**



NOTES:

1. BASEMAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. RIVER OUTLINE EXTENDING FROM THE ROUTE 37 BRIDGE APPROXIMATELY 6000 FEET DOWNSTREAM (SOUTHWEST GRASSE RIVER STRETCH) DERIVED FROM BASEMAP PREPARED BY ECOLOGY AND ENVIRONMENT, INC. AND SHOULD BE CONSIDERED APPROXIMATE ONLY.

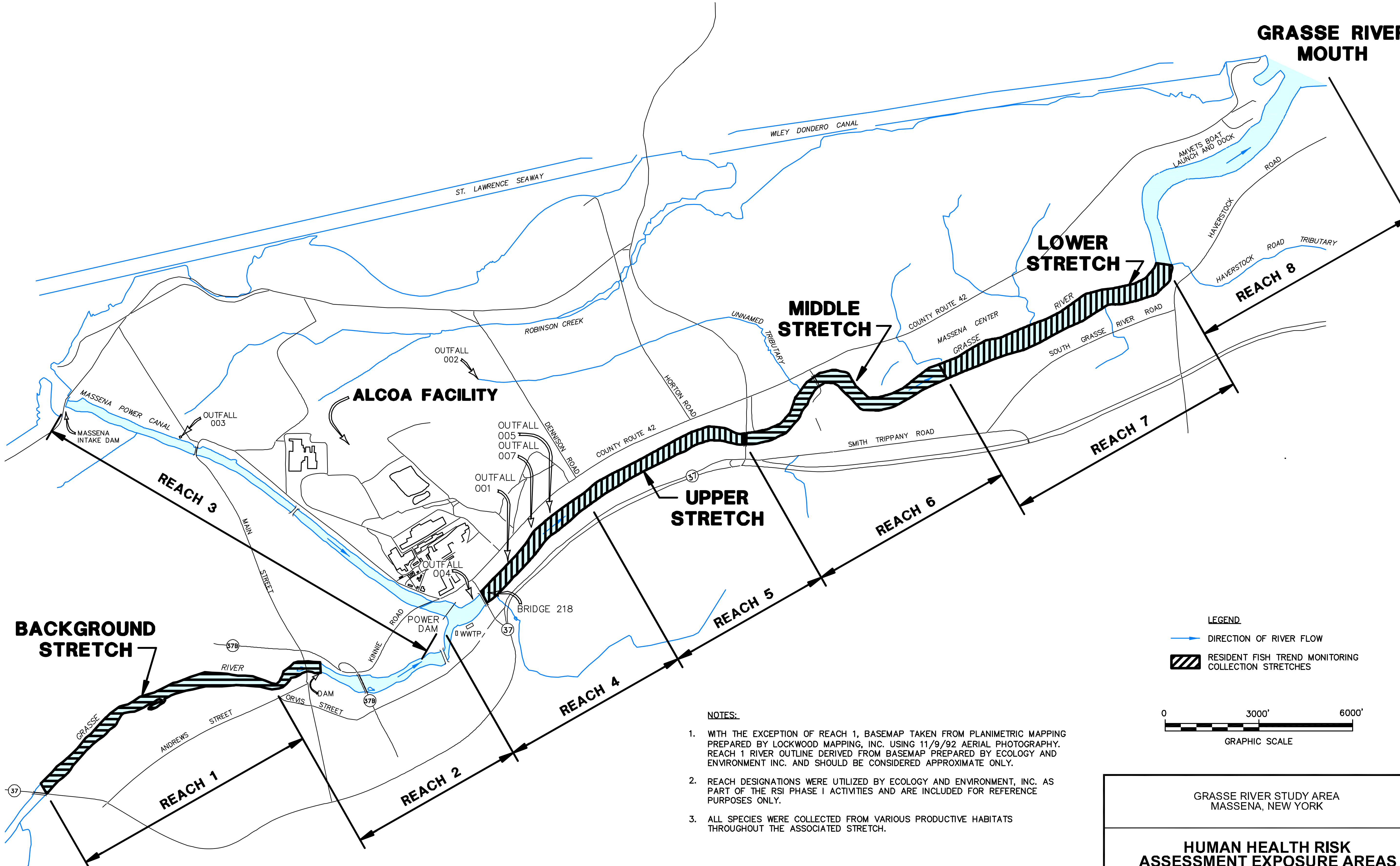
2. WATER COLUMN SAMPLES HAVE BEEN COLLECTED AT WC131 SINCE 2000. BETWEEN 1996 AND 1999, SAMPLES WERE COLLECTED FROM WC007A, WHICH IS LOCATED APPROXIMATELY 500 FEET DOWNSTREAM OF WC131.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

WATER COLUMN MONITORING LOCATIONS

FIGURE IS FROM THE ANALYSIS OF ALTERNATIVES REPORT, COURTESY OF ALCOA

FIGURE 3



NOTES:

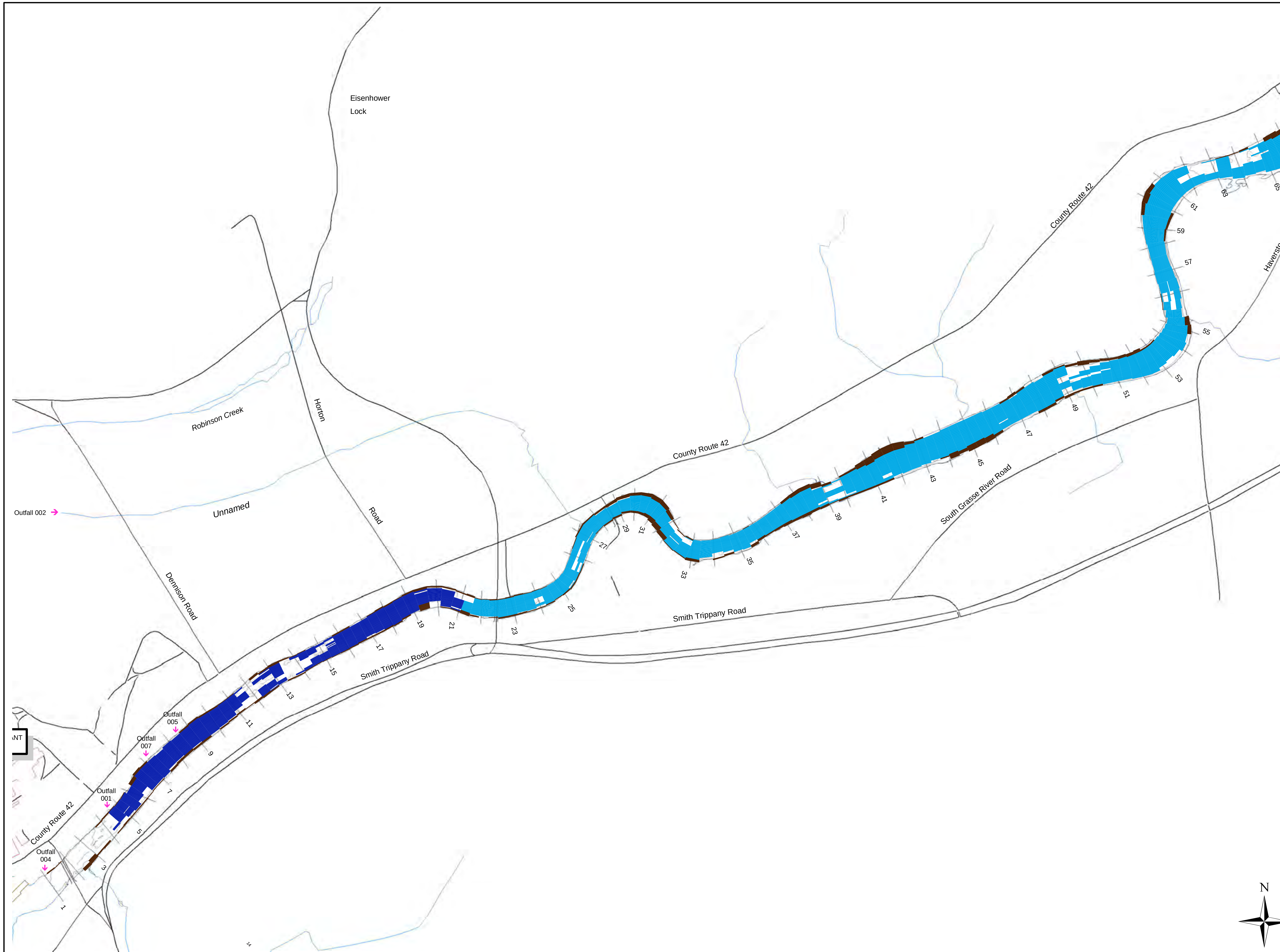
1. WITH THE EXCEPTION OF REACH 1, BASEMAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. REACH 1 RIVER OUTLINE DERIVED FROM BASEMAP PREPARED BY ECOLOGY AND ENVIRONMENT INC. AND SHOULD BE CONSIDERED APPROXIMATE ONLY.
2. REACH DESIGNATIONS WERE UTILIZED BY ECOLOGY AND ENVIRONMENT, INC. AS PART OF THE RSI PHASE I ACTIVITIES AND ARE INCLUDED FOR REFERENCE PURPOSES ONLY.
3. ALL SPECIES WERE COLLECTED FROM VARIOUS PRODUCTIVE HABITATS THROUGHOUT THE ASSOCIATED STRETCH.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

HUMAN HEALTH RISK ASSESSMENT EXPOSURE AREAS

FIGURE IS FROM THE ANALYSIS OF ALTERNATIVES REPORT, COURTESY OF ALCOA

FIGURE 4



GRAPHIC SCALE

0 850 1,700 3,400 Feet

LEGEND

- Near Shore Capping
- Capping
- Armored Capping
- Dredging / Capping
- Dredging / Armored Capping
- Dredging / Backfilling to Grade
- Sediment Type
- Grasse River + Tributaries Shoreline
- Roads
- Dams
- Alcoa Buildings
- Bridges
- Sediment Probing Transects

N

Figure 5
Alternative 6:
T1-T72 Near Shore Dredging/Backfilling and Main Channel Capping

Figure is from the Analysis of Alternative Report, courtesy of Alcoa.

Sept. 2012

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