F&T DARRIGO

Newburgh (T),Orange County, New York
Site No. 3-36-002

PROPOSED REMEDIAL ACTION PLAN

January 2003

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is proposing a remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the F&T Darrigo Site, a Class 2 inactive hazardous waste disposal site. As more fully described in Sections 3 and 4 of this document, sludge and industrial waste disposal, septage storage, and land spreading activities have resulted in the disposal of a number of hazardous wastes, including heavy metals, at the site. These disposal activities have resulted in the following significant threat to the public health and/or the environment:

C a significant threat to human health associated with direct contact and ingestion of contaminants in onsite soils

In order to eliminate or mitigate the significant threats to the public health and/or the environment that the hazardous wastes disposed at the F&T Darrigo Site have caused, the following remedy is proposed:

- A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.
- Excavation and off-site disposal of soils with concentration of chromium greater than 1000 ppm. Removal of remaining impacted soils from the land spreading area and the placement of this soil onto the lagoons.
- Placement of caution tape followed by two feet of clean soil over the lagoon area. Planting of poplar trees in the lagoon area for phytoremediation. Installation of a chain link fence around the perimeter of the lagoons. Collection and composting of leaves from the trees and sampling of the compost for metals.
- Off-site disposal of soil previously excavated from the soil piles and the access road.
- A soils management plan to address residual contaminated soils that may be excavated from the site during future redevelopment.

- Institutional controls in the form of deed restrictions limiting the use and development of the site.

- Sampling of the on site monitoring wells semi-annually. A tree uptake study to aid in the determination of the effectiveness of this remedy and its applicability to other sites.

- Annual inspection and maintenance of the lagoon area including mowing of the lawn and inspection and maintenance of the soil cover and chain link fence.

- Annual certification by the property owner to the NYSDEC that the site is in compliance with the institutional controls outlined in this PRAP.

The proposed remedy, discussed in detail in Section 7 of this document, is intended to attain the remediation goals selected for this site in Section 6 of this Proposed Remedial Action Plan (PRAP), in conformity with applicable standards, criteria, and guidance (SCGs).

This PRAP identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Focused Remedial Investigation (FRI), Focused Feasibility Study (FFS) and other relevant reports and documents, available at the document repositories.

To better understand the site and the investigations conducted, the public is encouraged to review the project documents at the following repositories:

Newburgh Free Library
124 Grand Street
Newburgh, NY 12550
(845) 561-1985
Mon - Thurs 9 am - 9 pm
Fri, Sat 9 am - 5 pm
Sun 1 pm - 5 pm

Newburgh Town Clerk
1496 Route 300
Newburgh, NY 12550
(845) 564-4554
Mon - Fri 8:30 am - 4:30 pm

NYSDEC Region 3
21 South Putt Corners Road
New Paltz, NY 12561
(845) 256-3000
Mon - Fri 8:30 am - 4:45 pm
Gianna Aiezza, Project Manager

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from January 15, 2003 through February 13, 2003 to provide an opportunity for public participation in the remedy selection process for this site. A public meeting is scheduled for January 28, 2003 at the Newburgh Town Hall beginning at 7:00 pm.

At the meeting, the results of the FRI/FFS will be presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which the public can submit verbal or written comments on the PRAP. Written comments may be sent to Ms. Aiezza at the above address through February 13, 2003.

The NYSDEC may modify the preferred alternative or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision. The Record of Decision is the NYSDEC's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The F&T Darrigo Site, Inactive Hazardous Waste Disposal Site No. 3-36-002, is located on Lakeside Road, immediately north of Interstate I-84, in the Town of Newburgh, Orange County. The site occupies one portion of the Darrigo property. The Darrigo property is currently operated as a lumber and landscaping materials yard, although the site itself is not being utilized.

The site occupies approximately 8 acres of the 59 acres owned by F&T Darrigo. The site was used for septage disposal and consists of two abandoned lagoons, a former soil pile area, and a land spreading area. The site is located in a residential area that is supplied by both municipal and private water. Residential properties are located to the North, East and West of the site and Route 84 is located to the South.

There are no perennial surface waters on the site and the nearest body of water is an unnamed creek located approximately 875 feet to the west of the site. A location map and site map are attached as Figures 1 and 2.

The site (Figure 2) is divided into three areas, described as follows:

Lagoons: The East Lagoon (1.33 acres) and the West Lagoon (0.67 acres) comprise a total area of approximately 2.0 acres. The lagoon areas were previously used for the storage of septic waste to be land spread in the area south of the West Lagoon. The lagoons are densely vegetated with shrub and thistle.

Former Soil Piles: A series of soil piles were previously located adjacent to the dirt access road, northeast of the lagoons. The soil piles were associated with historic sludge disposal activities and consisted of soil with blue-green coloring. The soil piles and a contaminated area of the access road were excavated during the FRI and are staged on site waiting for disposal.

Land spreading Area: The land spreading area is located south of the West Lagoon, directly north of Interstate 84. The area occupies approximately one half acre and was historically used for the land spreading of septic waste.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The F&T Darrigo site began operation as a land spreading area for the spreading of sewage sludge in 1948 and continued until 1985. Previous reports and studies indicate that the site received an estimated 800,000 gallons per year of liquid wastes. It is suspected that hazardous wastes, including spent cleaning solution from metal finishing, furniture stripper, and battery waste containing lead was disposed of in the on site lagoons and land spread with the septage waste.

The site is currently operated as a lumber and landscaping materials yard.

3.2: Remedial History

In 1983, the NYSDEC placed the F&T Darrigo site on the NYS Inactive Hazardous Waste Disposal Site Registry (Registry) as a Class 2a site. This is a temporary classification assigned to sites where there is confirmed disposal of hazardous waste but there is inadequate data on hazardous waste impact to the environment and human health to assign them to the five classifications specified by law.

In March 1984, the NYSDEC collected samples of on site soils that revealed elevated concentrations of metals. In 1986, a state-funded Phase I Investigation was conducted that confirmed the presence of elevated concentrations of a variety of metals in on site soils.

In 1989 and 1990, a state-funded Phase II Investigation was conducted. A Phase II Investigation Report was submitted to the NYSDEC in January 1991 that confirmed the presence of metals at hazardous levels. The Phase II results indicated a small area of soil piles highly contaminated with metals and two lagoons, also with elevated concentrations of metals, although to a lesser degree. Groundwater samples collected during the Phase II indicated that the groundwater had not been affected. The Phase II Investigation concluded that further investigation was necessary to determine the extent of the contamination at the site and an appropriate remedial measure. This led to the necessity of a FRI/FFS. A FRI/FFS is conducted when the contamination at the site is known and the investigation can be focused to those areas.

In 1991, as a result of the Phase II Investigation, the NYSDEC reclassified the F&T Darrigo site from a Class 2a to a Class 2 on the Registry. Sites with this classification pose a significant threat to the public health or environment and action is required.

In March 1999, an Order on Consent requiring a FRI/FFS for the site was executed by F&T Darrigo and the NYSDEC.

SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate remedial alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, the owner of the F&T Darrigo Site has recently conducted a FRI/FFS.

4.1: Summary of the Focused Remedial Investigation

The purpose of the FRI was to define the nature and extent of contamination resulting from previous activities at the site.

From 1999 through 2001, remedial investigation activities were performed. Four monitoring wells were installed at the site and groundwater and soil samples were collected to delineate the extent of the contamination.

The RI was conducted in 3 phases. The first phase was conducted between July 1999 and October 1999, the second phase in February 2000, and the third phase between June 2001 and October 2001. A report entitled Focused Remedial Investigation Report, dated June 2002, has been prepared which describes the field activities and findings of the FRI in detail.

The FRI included the following activities:

- Survey of site features, including the lagoons, access road and soil piles;
- Installation of four monitoring wells and the collection of 108 soil samples for chemical analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions;
- Excavation and on-site staging of the soil piles consisting of sewage and industrial waste sludge, and an adjacent portion of the access road that had high concentrations of contaminants.

To determine which media (soil, groundwater, etc.) are contaminated at levels of concern, the FRI analytical data was compared to environmental standards, criteria, and guidance values (SCGs). Groundwater, drinking water and surface water SCGs identified for the F&T Darrigo site are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of New York State Sanitary Code. For soils, NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 provides soil cleanup guidelines for the protection of groundwater, background conditions, and health-based exposure scenarios. In addition, for soils, site specific background concentration levels can be considered for certain classes of contaminants.

Based on the FRI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the FRI Report.

Chemical concentrations are reported in parts per million (ppm) for soils and sediment and parts per billion (ppb) for water. For comparison purposes, where applicable, SCGs are provided for each medium.

4.1.1: Site Geology and Hydrogeology

The surficial material at the site is mainly silt to a depth of 5 to 7 feet, underlain by 3 to 10 feet of brown till with shale fragments. Under the brown till is 5 to 10 feet of gray till with limestone fragments, underlain by bedrock. The depth to bedrock ranges from 17.5 feet in the land spreading area to 24.5 feet in the lagoons.

The groundwater elevation at the site fluctuates by approximately 5 feet depending on the time of year. During the fall and periods of high rain, the groundwater ranges from one to five feet below ground surface (bgs). During the summer months, the groundwater depth ranges from 5 to 9 feet bgs. Groundwater flow is to the south/southwest. Groundwater contours are shown on Figure 3.

4.1.2: Nature of Contamination

As described in the FRI report, many soil and groundwater samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their SCGs are inorganics (metals). The primary metals of concern are chromium, copper, lead, nickel and zinc.

4.1.3: Extent of Contamination

Tables 1A and 1B summarize the extent of contamination for the contaminants of concern in soil and groundwater respectively and compares the data with the SCGs for the site. The following is a summary of the findings of the investigation of soil and groundwater.

Soil

Soil investigations were conducted to assess the nature and extent of contamination in the lagoons, soil piles and land spreading area.

A total of 108 soil samples were collected during the FRI. A total of 56 samples were collected from the lagoons, with 38 samples collected from 21 locations in the East Lagoon and 18 samples collected from 9 locations in the West Lagoon. A total of 18 samples were collected from the former soil pile locations and 30 samples were collected from the land spreading area at 12 different locations. Four samples were also collected from two locations north of the lagoons in the woods for background information.

Samples in the lagoons were collected mainly from shallow depths, ranging from 4 inches bgs to 18 inches bgs. At 3 boring locations in the East Lagoon and 2 boring locations in the West Lagoon, samples were collected at 5 foot intervals down to bedrock. The boring samples were analyzed for Target Compound List (TCL) VOCs/SVOCs, pesticides/PCBs, Target Analyte List (TAL) metals and cyanide. In addition, 2 shallow samples from each lagoon were analyzed for these parameters. The remaining samples, with the exception of 4 shallow samples in the East Lagoon that were sampled for PCBs, were analyzed for only the five metals of concern. Each of the lagoons exhibited fairly uniform contamination throughout. The elevated concentrations of metals were mainly confined to surface soils to a depth of 2 feet below ground surface (bgs). In isolated areas within the lagoons, the elevated concentrations extended to up to 5 feet bgs. Maximum concentrations of the five metals of concern within the lagoons were 1520 ppm copper, 2250 ppm chromium, 663 ppm lead, 219 ppm nickel, and 1040 ppm zinc. The SCGs for these compounds are 50 ppm for copper, 40 ppm for chromium, 61-500 ppm for lead, 25 ppm for nickel and 50 ppm for zinc. Exceedances of SCGs were also detected in a limited number of samples for other metals, including cadmium, mercury, arsenic and barium. Levels of these metals were detected at maximum levels of 14.1 ppm, 2.2 ppm, 29.1 ppm and 777 ppm, respectively. The SCGs for these metals are

1 ppm for cadmium, 0.2 ppm for mercury (New York State background level), 12 ppm for arsenic and 600 ppm for barium. Low levels of PCBs were detected in some of the samples from the East Lagoon, with all results less than 1 ppm. One sample had elevated SVOCs, but no other samples had SVOCs detected. No pesticides or VOCs were detected in any of the samples.

A total of 13 samples within the lagoons were sampled to determine if the soil was hazardous via the EP Toxicity test and the Toxicity Characteristic Leaching Procedure (TCLP). Of the 13 samples, 12 were tested by the EP Toxicity test and one was tested via TCLP. Sample results are shown in Table 1C. The sample results were below regulatory guidelines and therefore the soil tested was determined not to be a hazardous waste.

Samples from the soil piles were collected at 4 inches and 18 inches from the top of the piles. Two of the shallow samples were analyzed for TCL VOCs/SVOCs, pesticides/PCBs, TAL metals and cyanide, while the remainder of the samples were analyzed for only the five metals of concern. Sampling from the soil piles indicated that the five metals of concern at and above the original ground surface were at concentrations that exceeded 100,000 ppm. Sampling also confirmed that the contamination had not migrated in significant concentration to below ground surface. Due to the elevated levels of metals, the two former soil piles and an area of contamination along the access road located below the West Lagoon were excavated and staged on site.

Approximately 200 tons of contaminated soil was excavated from the three areas. Post-excavation confirmatory samples were collected from the base and side walls of the excavations to determine if the contamination had been removed. The results of the confirmatory samples exhibited elevated levels of metals, which led to additional excavation in all three areas. The second phase of excavation removed 250 tons of contaminated soil. Confirmatory samples were again collected from the base and side walls of the excavations. These confirmatory samples concluded that the contaminated areas had been successfully removed. Figure 5 shows the excavation areas. Table 1D summarizes the concentrations of metals in the confirmatory samples after the excavation.

Samples in the land spreading area were collected from the ground surface to approximately 2 feet bgs in 6 locations and from ground surface to 12 inches bgs in 6 other locations. All samples were analyzed for the five metals of concern. Maximum concentrations of the five metals of concern in the land spreading area were 1410 ppm copper, 2210 ppm chromium, 1560 ppm lead, 253 ppm nickel, and 983 ppm zinc. The results of the sampling in the land spreading area revealed isolated "hot spots" that showed elevated levels of contaminants mainly in the upper 12 inches of soil, with a few areas extending to 2 feet bgs.

The background samples were taken in a wooded area north of the lagoons and were collected from ground surface and 12 inches bgs at two separate locations. The 4 samples were analyzed for the five metals of concern. Only zinc exceeded the SCG of 9-50 ppm with levels at 55.6 ppm and 114 ppm.

Groundwater

A total of four monitoring wells were installed during the FRI. Two monitoring wells were installed prior to the FRI, one located upgradient of the soil piles (GWFT-1) installed to a depth of 16 feet and one located in the northeast section of the East Lagoon (GWFT-2) installed to a depth of 18 feet.

Two shallow groundwater monitoring wells were installed in November 1999. The wells were located downgradient of the two lagoons, with one in the land spreading area (M-3) and one west of the land spreading area (M-4). Well M-3 was installed to a depth of 17.5 feet and well M-4 was installed to a depth of 17 feet. Wells GWFT-2, M-3 and M-4 were sampled in November 1999. Two additional wells were installed in August 2001 within the lagoons. Well M-5 was installed to a depth of 24.5 feet and was located within the West Lagoon. Well M-6 was installed to a depth of 24 feet and was located within the East Lagoon. The wells were located in the deepest part of each lagoon. Wells GWFT-2, M-3, M-4, M-5 and M-6 were sampled in August 2001. The groundwater monitoring wells are shown on Figure 4.

No metals of concern were detected above SCGs in the groundwater samples. Iron and manganese levels were detected at levels above SCGs, with a maximum iron concentration of 7430 ppb and a maximum manganese concentration of 518 ppb. The SCG for iron and manganese is 300 ppb for each compound. The SCG for the sum of iron and manganese is 500 ppb. Aluminum was also detected above the SCG value of 100 ppb at a maximum concentration of 5460 ppb. These results were determined to not be site related, but rather a common occurrence in groundwater throughout the local area.

4.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 4.0 of the FRI report.

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Pathways which are known to or may exist at the site include:

- Ingestion of soil,
- Direct contact with soil.

The residential properties surrounding the site utilize both municipal water and private wells. Analysis from three private wells indicates that contamination from the site has not impacted these wells.

The site is not secure and access could be gained to the contaminated areas. Since there is contamination in surface soils, exposure via ingestion or direct contact is a potential exposure pathway.

4.4: Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures and ecological risks which may be presented by the site. The Fish and Wildlife Impact Assessment included in the FRI presents a more detailed discussion of the potential impacts from the site to wildlife resources. The following pathways for environmental exposure and/or ecological risks have been identified:

- Ingestion of soil,
- Direct contact with soil.

The site is not secure and access could be gained to the contaminated areas. Since there is contamination in surface soils, exposure via ingestion or direct contact is a potential exposure pathway. There are no known occurrences of endangered or threatened wildlife or plant species or critical habitat within a two-mile radius of the site, with the exception of the Red Maple Hardwood Swamp Community, located within a one-half mile radius of the site. As a result of delineating the extent of the contamination, on site, there is no reason to suspect that the contamination would reach this ecological community.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The NYSDEC and F&T Darrigo entered into a Consent Order on March 29, 1999. The Order obligates the responsible parties to implement a FRI/FFS remedial program. Upon issuance of the Record of Decision the NYSDEC will approach the PRPs to implement the selected remedy under an Order on Consent.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all SCGs and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate, to the extent practicable, exposures to the contaminated soil.

- Eliminate, to the extent practicable, the migration of contaminants into the groundwater.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the F&T Darrigo site were identified, screened

and evaluated in the report entitled Focused Feasibility Study, F&T Darrigo Site, dated August 2002.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Remedial Alternatives

The potential remedies are intended to address the contaminated soils at the site.

Alternative 1: *No Action*

The No Action alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2: *Institutional Controls*

Present Worth:	*$ 2,000*
Capital Cost:	*$ 0*
Annual O&M:	*$ 500*
Time to Implement	*1 month*

Alternative 2 would leave the site in its current condition but would provide institutional controls, such as a deed restriction on affected soil. Annual site reviews to certify compliance with the institutional controls would be implemented as part of this alternative.

Alternative 3: *Excavation and Off-Site Disposal of Contaminated Soil in the Lagoons and Land Spreading Area*

Present Worth:	*$ 1,930,000*
Capital Cost:	*$ 1,930,000*
Annual O&M:	*$ 0*
Time to Implement	*3 - 6 months*

Alternative 3 would include excavation of the lagoon areas (2.0 acres) and excavation of hot spots identified in the land spreading area (0.09 acres). A total of twelve areas in the land spreading area where sampling indicated elevated levels of metals would be excavated to a 25-foot diameter around the original sampling location. The excavations of the lagoon and land spreading area would generally extend from one foot to two feet bgs, and possibly deeper in up to 10% of the overall area. The total soil to be excavated would be approximately 6,500 cubic yards.

The excavation would be conducted using conventional earthmoving equipment, such as backhoes and front end loaders. Clearing and grubbing would be required to remove thick vegetation that has grown over the lagoons and land spreading area. It is not expected that shoring would be required due to the limited depth of the excavations.

The excavated soil targeted for disposal would be loaded into trucks and transported to a licensed Treatment, Storage and Disposal Facility (TSDF) for disposal. Sampling of the soils, either before or after excavation, would need to be performed to characterize the soils for disposal purposes before off site disposal. For cost estimating purposes, it is assumed that one sample per 250 cubic yards would be collected for

characterization purposes. The samples would be analyzed via TCLP to determine if the soil is a hazardous waste. The soil would be characterized to determine the type of disposal facility.

The soils previously excavated from the soil piles and the access road would be disposed of off-site as part of this alternative. The soils are currently staged on site and have been sampled for characterization purposes and found to be non-hazardous.

Post excavation samples would be collected approximately every 1,000 square feet and analyzed for the five metals of concern. If sample results do not meet the SCGs for the site, additional excavation would be performed and new confirmatory samples collected. This process would be performed until the confirmatory sampling results meet site specific SCGs.

After excavation and confirmatory sampling of each area, clean backfill from elsewhere on the site or off site would be placed into the excavation area of the lagoons and land spreading area to bring the excavation to grade. On-site soil to be used would be sampled prior to backfilling. The areas would be re-graded and seeded to prevent erosion.

Alternative 4: *Caution Tape and Deed Restriction*

Present Worth:	*$ 235,000*
Capital Cost:	*$ 215,000*
Annual O&M:	*$ 5,000*
Time to Implement	*2 - 4 months*

Alternative 4 would consist of removal of impacted soils from the land spreading area and the placement of this soil onto the lagoons. Caution tape would then be installed over the lagoons, with a deed restriction placed on this portion of the site.

Excavation of hot spots identified in the land spreading area would be excavated for placement in the lagoons. A total of twelve areas in the land spreading area where sampling indicated elevated levels of metals would be excavated to a 25-foot diameter around the original sampling location and to a depth ranging from one foot to two feet bgs. The excavation in this area would total approximately 400 cubic yards of material. The locations to be relocated are illustrated on Figure 6. Confirmatory sampling would be performed to ensure removal of soil in the land spreading area with metals concentrations over SCGs.

The caution tape to be placed over the lagoons after the consolidation of the soil from the land spreading area would be overlain by clean soil and topsoil. The soil cover would prevent direct contact of the contaminated soils. The caution tape would be installed in a grid pattern over the barrier to warn persons who are inadvertently digging in this area that contaminated soil is below. The caution tape would be overlain by at least one and a half feet of clean fill and six inches of topsoil for vegetation, for a total soil cover of two feet. The area would then be seeded for vegetation.

The soils previously excavated from the soil piles and the access road would be disposed of off-site as part of this alternative. The soils are currently staged on site and have been sampled for characterization purposes and found to be non-hazardous.

Two monitoring wells would be installed at the completion of the work for future groundwater monitoring. Monitoring would include annual sampling of the monitoring wells, mowing and inspection of the integrity of the barrier and soil cover. Maintenance of the barrier and soil cover would be performed as necessary.

A deed restriction would be placed on the area of the lagoons to limit access and utilization of this portion of the site. Annual certifications would be performed to ensure compliance with the deed restriction.

Alternative 5: *Phytoremediation*

Present Worth:	*$ 290,000*
Capital Cost:	*$ 235,000*
Annual O&M:	*$ 15,000*
Time to Implement	*2 - 6 years*

Alternative 5 would consist of excavation and off site disposal of areas with high levels of chromium within the lagoons and land spreading area, and the removal of remaining impacted soils from the land spreading area and the placement of this soil onto the lagoons, followed by the implementation of phytoremediation in the lagoons. The area to be excavated in the lagoon area for off-site disposal are shown on Figure 7A. The areas in the land spreading area to be excavated for off-site disposal and to be relocated to the lagoons are illustrated in Figure 7B.

Excavation of areas in the lagoons and land spreading area with levels of chromium greater than 1000 ppm would be excavated and disposed of off-site at a licensed facility. Excavation of areas with elevated concentrations of chromium would be removed to expedite remediation.

Approximately 320 cubic yards of material would be disposed of off site. The remaining contaminated areas identified in the land spreading area would be excavated for placement in the lagoons. A total of twelve areas in the land spreading area where sampling indicated elevated levels of metals would be excavated to a 25-foot diameter around the original sampling location and to a depth ranging from one foot to two feet bgs. The excavation in this area would total approximately 300 cubic yards of material after the removal of the soil with chromium concentrations greater than 1000 ppm. Confirmatory sampling would be performed to ensure removal of soil in the land spreading area with metals concentrations over SCGs.

Excavated soil for off site disposal and soil from the land spreading area would be loaded directly into trucks for transporting or would be staged on site until transport. Staged soils would be placed on plastic sheeting and covered with plastic. A berm would be constructed around the staging area to prevent run off.

Caution tape followed by two feet of clean fill would be placed over the lagoons. Caution tape would serve as a indicator of the location of the contaminated soil for future sampling and inspection of the soil cover. Poplar trees would then be planted throughout the lagoons for phytoremediation. These trees would bioaccumulate the metals, thereby remediating the soil.

Poplar trees would be chosen since they have been shown to be effective for the site specific metals of concern. The poplar root system extends down to approximately 15 feet bgs. The contamination at the site is confined mostly to the

top two feet and would be between two and four feet bgs after the placement of a clean fill cover. Current data on the phytoremediation process indicates that the majority of the metals bioaccumulate in the trunks and stems of the trees rather than in the leaves. Leaves would be raked as needed and collected for composting on site. Composted leaves would be sampled for metals. If concentrations of metals in the compost are below TAGM 4046 guidance values, the compost would be spread at the site. Otherwise, the compost would be disposed of off-site at a licensed disposal facility.

The remedial process is expected to take at least six years. Every two years, the soil in the lagoon area, located below the caution tape, would be analyzed for the five metals of concern to determine the effectiveness of the phytoremediation. The fate of the trees after remediation would be determined during the remedial design and on the analytical data collected in the monitoring period.

A chain link fence would be placed around the perimeter of the lagoons to limit access by people and wildlife.

The soils previously excavated from the soil piles and the access road would be disposed of off-site as part of this alternative. The soils are currently staged on site and have been sampled for characterization purposes and found to be non-hazardous.

The on site monitoring wells would be sampled semi-annually. The frequency of sampling and the need for continued sampling would be evaluated periodically by the NYSDEC.

Institutional controls would be implemented in the form of existing use and development restrictions limiting the use of site. Annual certifications would be performed to ensure compliance with the institutional controls.

Alternative 6: *Impermeable Barrier and Deed Restriction*

Present Worth:	*$ 430,000*
Capital Cost:	*$ 330,000*
Annual O&M:	*$ 14,000*
Time to Implement	*2 - 4 months*

Alternative 6 would consist of removal of impacted soils from the land spreading area and the placement of this soil onto the lagoons. An impermeable flexible bituminous pavement would then be installed over the lagoons, with a deed restriction placed on this portion of the site.

Excavation of hot spots identified in the land spreading area would be excavated for placement in the lagoons. A total of twelve areas in the land spreading area where sampling indicated elevated levels of metals would be excavated to a 25-foot diameter around the original sampling location and to a depth ranging from one foot to two feet bgs. The excavation in this area would total approximately 400 cubic yards of material. The areas to be relocated are the same as discussed in Alternative 3, as shown on Figure 6.

A six-inch gravel sub-base would first be placed over the lagoons for support of the pavement cap. Two inches of a base course of bituminous pavement would be placed over the sub-base. The impermeable layer would prevent direct contact of the contaminated soils and would limit infiltration of precipitation. One inch of a wearing

course would be placed over the pavement to provide a seal and to further limit infiltration of precipitation.

The soils previously excavated from the soil piles and the access road would be disposed of off-site as part of this alternative. The soils are currently staged on site and have been sampled for characterization purposes and found to be non-hazardous.

Monitoring would include annual inspection and periodic re-sealing of the pavement. The pavement cap would need to be replaced after approximately 20 years.

A deed restriction would be placed on the area of the lagoons to limit access and utilization of this portion of the site.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the FFS.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. The most significant SCGs for the Darrigo site include those for metals which are site background levels, or standard background levels for the northeastern United States.

Alternatives 1, 2, 4 and 6 would not meet site specific SCGs, which are eastern soil background levels for metals. Alternative 4 would monitor groundwater to ensure there is no exceedance of groundwater SCGs. Alternative 3 would achieve compliance with SCGs. Alternative 5 would achieve SCGs, however it would be over an extended period of time. In addition, there is the potential for the SCGs for chromium to not be reached.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

In comparing the remedial alternatives, Alternatives 1 and 2 would provide the least protection of human health and the environment as the contaminated soils may be directly contacted by persons in the lagoon area. The remaining alternatives would each provide protection of human health either by removing the contamination for the site, as in Alternative 3, or by creating a barrier to prevent contact, as in Alternatives 4 and 6. Alternative 5 would accomplish both, with the contamination being remediated over an extended period of time, in addition to a soil cover to prevent direct contact. Alternative 3 would provide the highest protection of the environment by removal of the source followed by Alternative 5. Alternatives 4 and 6 would also provide protection, although to a lesser extent, by isolating and monitoring the source.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

No short-term impacts would result from the implementation of Alternative 1 or 2 as this alternative does not include any active remediation of contaminated soil. Alternatives 1 and 2 would not meet remedial objectives.

Alternative 3 would have greater short term impacts than Alternatives 4, 5 and 6 since a larger amount of excavation would be required. Dust would be generated from excavation and trucking of the soil off site. Other short term impacts associated with trucking of soil would include increased traffic, noise and exhaust vapor. Alternatives 4, 5 and 6 would have similar short term impacts associated with the excavation of the soils in the land spreading area and placement of the soil on the lagoons. Alternative 6 would have greater short term impacts than Alternative 4 since three layers of material would be used to cover the lagoon area as opposed to one layer for Alternative 4. Alternative 5 would have similar short term impacts to Alternative 4, and would also involve the planting of trees and installation of a fence.

Neither Alternative 4 nor 6 would achieve remedial objectives. Alternative 3 would achieve remedial objectives in the most timely manner, within 6 months. Alternative 5 would achieve remedial objectives, although with an extended time frame of up to 6 years. A Community Air Monitoring Plan (CAMP) would be prepared for all Alternatives except Alternatives 1 and 2. The CAMP would provide measures to mitigate impacts and prevent potential exposures.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternatives 1 and 2 would provide the least long-term effectiveness and permanence as contaminated soil would remain on site and untreated.

Alternatives 4 and 6 would both prevent direct contact with contaminated soils. Alternative 6 would have to be replaced after approximately 20 years.

Alternative 5 would be an effective long term remedy since the contamination would be removed from the soil by phytoremediation. Alternative 3 would also be effective long term since the contamination would be permanently removed from the site.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternatives 1 and 2 would not achieve reduction in the toxicity, mobility or volume of contamination present, as contaminants would remain on site in their current condition.

Alternatives 4 and 6 would not achieve a reduction in the toxicity or volume of contamination present since contaminated soils would remain on site. Alternative 6 would decrease the mobility by providing an impermeable barrier that would prevent infiltration of precipitation.

Alternative 3 would not decrease the toxicity of the contamination, although it would be removed from the site so it would no longer be mobile. Alternative 5 would reduce the toxicity and mobility by removing contaminants from the soil via treatment.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternatives 1 and 2 would be the easiest alternative to implement as it would maintain the current conditions at the site and Alternative 2 would add institutional measures.

Alternatives 3, 4, 5 and 6 are equally easy to implement since the materials, equipment and skilled personnel required are readily available. In addition, since there is no activity on the site, there would be no disruption of operations.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

Alternative 1, No Action, would have the lowest estimated present worth cost since no action would be taken. Alternative 2 would have the next lowest cost ($2,000) associated with annual reviews of the institutional controls.

Alternative 4 has a lower estimated present worth cost ($235,000) than Alternatives 3, 5 and 6. Alternative 5 has a lower estimated present worth cost ($290,000) than Alternatives 3 and 6. Alternative 6 has a lower estimated present worth cost ($430,000) than Alternative 3 ($1,930,000). Alternative 3 is the most costly of the alternatives due to the extensive capital cost.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and the manner in which the Department will address the

concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing Alternative 5 as the remedy for this site. Alternative 5 involves removal of impacted soils with levels of chromium greater than 1000 ppm to be excavated and disposed of off-site, removal of remaining impacted soils from the land spreading area and the placement of this soil onto the lagoons followed by the implementation of phytoremediation in the lagoons.

This selection is based on the evaluation of five alternatives developed for this site. With the exception of Alternatives 1 and 2, each of the alternatives would comply with the threshold criteria of overall protection of human health and the environment. Alternative 1, Alternative 2, Alternative 4 and Alternative 6 do not meet the threshold criteria of compliance with SCGs. In addition, with the exception of the No Action alternative and Institutional Controls alternative, all alternatives are similar with respect to the majority of the balancing criteria. The major differences between these alternatives are with the reduction of toxicity, mobility and volume, and cost. Alternatives 4 and 6 leave contamination on site and do not reduce toxicity or volume. However, sampling has shown that the soil contamination is not mobile and is not impacting groundwater. Alternative 3 would not reduce the toxicity, but would remove the contamination from the site. Alternative 5 would reduce the toxicity and mobility in the soil by removing the contamination. Alternatives 4, 5 and 6 had similar costs, with Alternative 3 being considerable higher.

Alternative 5 would remove the metals of concern from the soil. Alternative 5 is less costly than the other alternatives and is easier to implement than Alternatives 3 and 6. Alternative 5 would eliminate the threat direct contact of contaminated soil by the placement of a two foot soil cover over the contaminated soils and the installation of a fence around the perimeter of the lagoons.

The estimated present worth cost to implement the remedy is $290,000. The cost to construct the remedy is estimated to be $235,000 and the estimated average annual operation and maintenance cost for 6 years is $15,000.

The elements of the proposed remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

2. Excavation and off-site disposal of soils with concentration of chromium greater than 1000 ppm. Removal of remaining impacted soils from the land spreading area and the placement of this soil onto the lagoons.

3. Placement of caution tape followed by two feet of clean soil over the lagoon area. Planting of poplar trees in the

lagoon area for phytoremediation. The spacing of the trees will be determined during the Remedial Design. Installation of a chain link fence around the perimeter of the lagoons. Collection and composting of leaves from the trees and sampling of the compost for metals. The compost will be spread on site or disposed of off-site depending on sample results.

4. Off-site disposal of soil previously excavated from the soil piles and the access road.

5. A soils management plan would be developed to address residual contaminated soils that may be excavated from the site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations.

6. Institutional controls in the form of deed restrictions limiting the use and development of the site.

7. Since the remedy results in untreated contamination at the site, long-term monitoring will be implemented at the site. Sampling of the on site monitoring wells semi-annually. If the results indicate migration of the contaminants, steps would be taken to alter the remedy at the site to mitigate the problem. This program, along with the soil sampling, would allow the effectiveness of the phytoremediation to be monitored and would be a component of the operation and maintenance for the site. A tree uptake study would also be completed to aid in the determination of the effectiveness of this remedy and its applicability to other sites. Based on the evaluation of the results, the frequency of groundwater and soil sampling may be modified by the NYSDEC.

8. Annual inspection and maintenance of the lagoon area including mowing of the lawn and inspection and maintenance of the soil cover and chain link fence. The soil cover would be inspected for any exposure of the caution tape and would be repaired and maintained as necessary.

9. Annual certification by the property owner to the NYSDEC that the site is in compliance with the institutional controls outlined in this PRAP.

Table 1A
Nature and Extent of Contamination
Lagoon and Landspreading Area Soils
1999 - 2001

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppm)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppm)
Soil (Lagoons)	Metals	Chromium	14.4 to 2250	27 of 56	40/12*
		Copper	23.5 to 1520	35 of 56	50/13*
		Nickel	14.4 to 219	33 of 56	25/13*
		Lead	1.5 to 663	34 of 56 25 of 56	25/17* 60
		Zinc	57.9 to 1040	56 of 56	50/48*
		Mercury	ND to 2.2	4 of 20	0.1/0.2**
		Cadmium	ND to 14.1	3 of 20	1/1**
		Barium	41.4 to 777	1 of 20	300/600**
		Arsenic	ND to 29.1	13 of 20	7.5/12***
Soils (Land-spreading Area)	Metals	Chromium	10.4 to 2210	21 of 30	40
		Copper	9.8 to 1410	20 of 30	50
		Nickel	10.5 to 349	26 of 30	25
		Lead	9.1 to 1560	23 of 30 10 of 30	25 60
		Zinc	42.4 to 983	29 of 30	50

* Site-specific Background
** Eastern USA Background
*** New York State Background

Table 1B
Nature and Extent of Contamination
Groundwater
1999-2001

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs/Background	SCG (ppb)
Groundwater	Metals	Aluminum	14.3 to 5,460	6 of 8	100
		Iron	33.3 to 7,430	6 of 8	300
		Manganese	ND to 518	6 of 8	300

Table 1C
Nature and Extent of Contamination
EP Toxicity (1990) and TCLP (1999)

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING REGULATORY GUIDELINES	REGULATORY GUIDELINES (ppb)
Soil (Lagoon)	EP Toxicity	Chromium	ND to 8.0	0 of 12	5,000
		Lead	ND to 22.9	0 of 12	5,000
		Barium	56.0 to 357.0	0 of 12	100,000
		Cadmium	ND to 4.7	0 of 12	1,000
Soils (Lagoon)	TCLP	Chromium	23.9	0 of 1	5,000
		Copper	618	0 of 1	NA
		Nickel	306	0 of 1	NA
		Lead	100	0 of 1	5,000
		Zinc	3600	0 of 1	NA

NA - Not Applicable

EP Toxicity and TCLP testing are performed to determine if the waste meets the regulatory definition of a hazardous waste. A waste is considered hazardous by definition if the sample extract contains levels of contaminants above regulatory guidelines.

Table 1D
Nature and Extent of Contamination
Former Soil Piles
2001

MEDIUM	CATEGORY	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppm)	FREQUENCY of EXCEEDING SCGs/Background	SCG/ Bkgd. (ppm)
Soils (Post Excavation Samples)	Metals	Chromium	14.1 to 132	3 of 18	40
		Copper	13.7 to 161	3 of 18	50
		Nickel	17.3 to 82.5	8 of 18	25
		Lead	6.1 to 38.9	0 of 18	60
		Zinc	44.6 to 139	14 of 18	50

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
Alternative 1 - No Action	$0	$0	$0
Alternative 2 - Institutional Controls	$0	$500	$2,000
Alternative 3 - Excavation and off-site disposal	$1,930,000	$0	$1,930,000
Alternative 4 - Caution tape and deed restriction	$215,000	$5,000	$235,000
Alternative 5 - Phytoremediation	$235,000	$15,000	$290,000
Alternative 6 - Impermeable barrier	$330,000	$14,000	$430,000