4.1 DESIGN ANALYSIS REPORT

4.1

Design Analysis Report
Dzus Fastener Site
NYSDEC Site No. 1-52-033
Operable Unit No. 2
Lake Capri/Willetts Creek

Work Assignment No. D003821-2

Prepared for:

DRAFT

SUPERFUND STANDBY PROGRAM
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Prepared by:

Rust Environment & Infrastructure
12 Metro Park Road
Albany, New York 12205

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50 Wolf Road

Albany, New York 12233-7010

Submitted By:

Rust Environment & Infrastructure

12 Metro Park Road

Albany, New York 12205

December 1998

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1.0 INTRODUCTION
1.1 GENERAL

This Design Analysis Report (DAR) has been prepared to support the remedial design for Operable Unit 2 (OU 2) at the Dzus Fastener Site in West Islip, Suffolk County, New York. OU 2 consists of remediating contaminated creek and lake bottom sediments associated with the site (Figure 1-1). This work was performed as part of Task 3, Plans and Specifications, under Work Assignment No. D003821-2, dated August 1997, between the New York State Department of Environmental Conservation (NYSDEC) and Rust Environment and Infrastructure of N. Y., P.C. (Rust).

The purpose of the DAR is to specify design parameters and assumptions, document their technical bases, and support the development of the plans and specifications for the remediation of Lake Capri and Willetts Creek. As stated in the Remedial Design / Construction Management Work Plan prepared by Rust, the DAR specifically addresses:

- Dredging, including the extent of sediment removal, need for subsurface debris and vegetation removal, turbidity and total suspended solids monitoring and action levels, and specific methods for control of suspended sediment;
- Sediment dewatering and water treatment, including the location of treatment facilities and staging areas, and processes to ensure adequate dewatering of the solids, separation into fine and coarse fractions where appropriate, and compliance with State Pollution Discharge Elimination System (SPDES) requirements for the treated water;
- Transportation, including regulatory requirements and transport routes for dewatered sediment; and,
- Federal, state and local permits and substantive permit requirements pertaining to Nationwide permits, SPDES discharges, air emissions, dredging water quality certification and freshwater wetlands.

1.2 PROJECT BACKGROUND

Past releases from the Dzus Fastener Company's manufacturing facility at 425 Union Boulevard in West Islip have resulted in contamination of Willetts Creek and Lake Capri bottom sediments downstream from the Dzus facility. Cadmium is the principal contaminant of concern. Other constituents, primarily chromium, zinc and cyanide are also present, but at frequencies and concentrations of lesser environmental concern.

The cadmium has accumulated in the lake's resident bass and carp population to the extent that NYSDOH has established a Health Advisory restricting consumption of carp to no greater than one meal per month. The NYSDEC has ordered that the cadmium-impacted sediment be removed, and is directing the removal under the State Superfund Standby Program.

PORTION OF MAP 34 OF 39 SUFFOLK COUNTY LAST AMENDMENT DATE 10-12-94
BAY SHORE WEST, NY QUADRANGLE. SCALE 1"=2000'

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FIGURE 1
SITE LOCATION MAP
DZUS FASTENER SITE
LAKE CAPRI/WILLETTS CREEK
SEPTEMBER 1998

202563

The Dzus site is listed as Site Number 1-52-033, Class 2, on NYSDEC's registry of inactive hazardous waste sites. For remediation purposes, it has been divided into two OUs. A Record of Decision (ROD) for OU 1 was issued in March 1995. The ROD for OU 2 was issued in October 1997.

Waste management practices at the Dzus Fastener manufacturing facility have been modified and various remedial activities undertaken to eliminate or reduce the potential for future releases off plant property. An Interim Remedial Measure conducted in 1991 removed a leach field at the eastern side of the site. Solidification of on-site soils containing greater than 10 parts per million (ppm) cadmium (OU 1) was completed in December 1996. This included excavating three small areas in the western side of the site, mixing and solidifying these soils with the contaminated soils in the eastern side of the site, and installing an asphalt cover

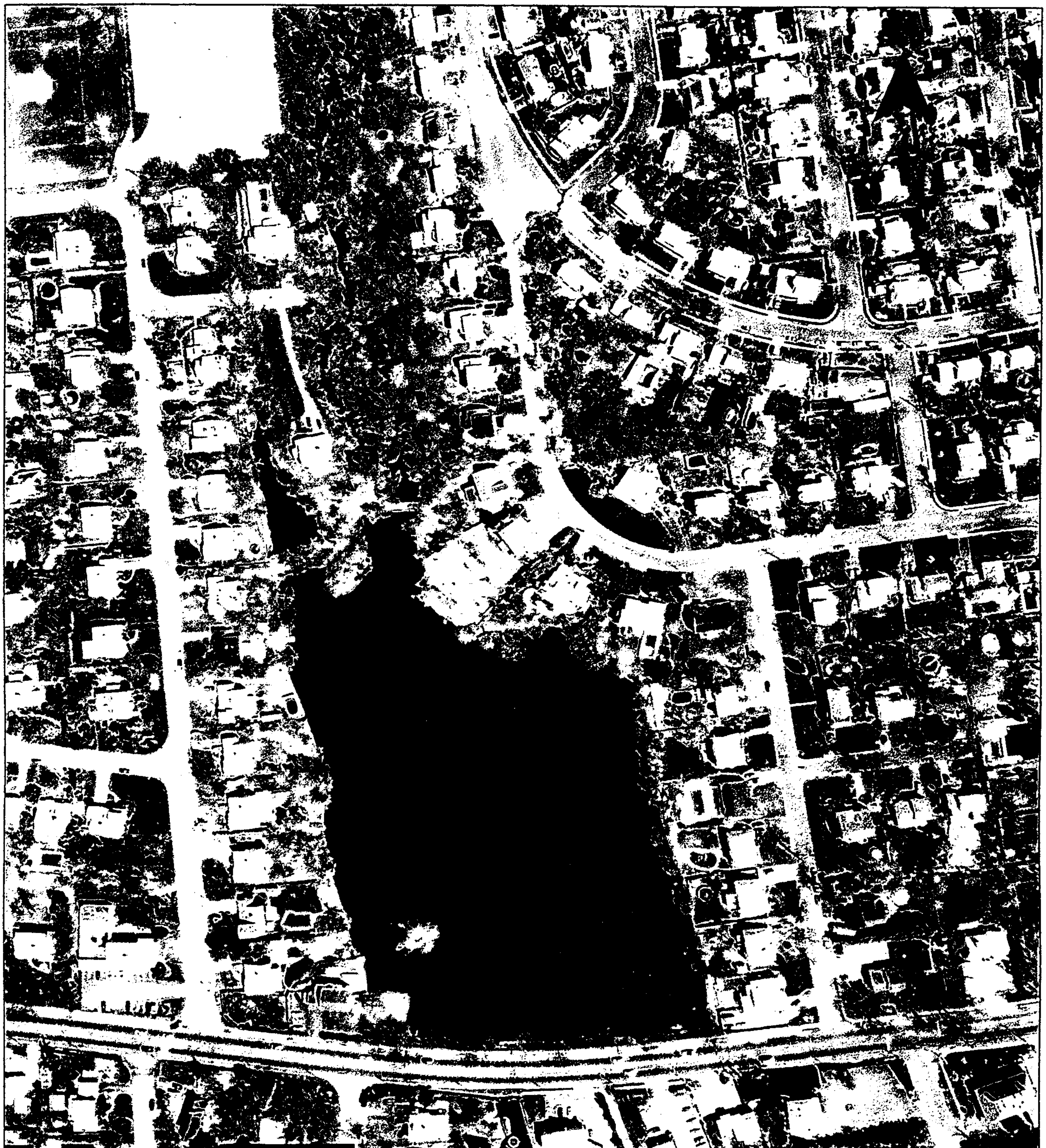
OU 2 consists of remediating the impacted sediments in a portion of Willetts Creek mostly upstream of the Burling Lane foot bridge, and the impacted sediments in Lake Capri. The remedy set forth in the ROD includes hydraulically dredging the contaminated sediments from Lake Capri to a clean up level of 1 ppm cadmium, and mechanically excavating contaminated sediments from Upper Willetts Creek to a clean up level of 9 ppm cadmium. The sediments are to be dewatered as necessary and disposed of by landfilling.

This DAR is the first task in the remedial design for the removal of the contaminated creek and lake bottom sediments. The proposed remedy for the contaminated groundwater in the vicinity of the Dzus facility consists of groundwater monitoring and natural attenuation, and is not addressed further herein.

1.3 SITE DESCRIPTION

Willetts Creek is located immediately to the east of the Dzus facility, and flows in a southerly direction approximately 4,500 feet to Lake Capri, a privately owned, eight-acre man-made lake. The creek flows another 3,000 feet below the lake to Babylon Cove in Great South Bay. The creek is divided into an upper and a lower reach. The "upper" portion is the freshwater reach located upstream of the lake; the "lower" portion is the tidal channelized reach downstream of the lake. In its course, the creek flows past the West Islip Junior High School, and the West Islip Senior High School, both on the Creek's west bank. The Junior High School is adjacent to the Burling Lane foot bridge remediation area; the Senior High School's southeast parking lot is the proposed staging and treatment area for the materials dredged from the lake.

Lake Capri was formed by impoundment of the Willetts Creek estuary upon construction of the embankment for Montauk Highway (Route 27A), or its predecessor, before the turn of the century. The northwest corner of the lake is characterized as a small, approximately one-quarter acre lagoon fed in part by what is now a relatively short intermittent stream, referred to herein as the west branch of Upper Willetts Creek. An aerial photograph of the lake and vicinity taken in April 1998 is presented on Figure 1-2.



Approximate Scale

0 200ft

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FIGURE 1–2
AERIAL PHOTOGRAPH–LAKE CAPRI
DZUS FASTENER SITE

NOVEMBER 1998

202563

Except for the fenced south end of the lake that fronts Montauk Highway, Lake Capri is surrounded by low-lying residential properties that restrict public access. The lake is relatively shallow; with a depth of slightly greater than three feet over broad areas. The lake is fed principally by surface flows from Upper Willetts Creek, by stormwater runoff from two outflow structures that drain local streets to the east and west, and by groundwater.

A concrete outfall structure at the south end of the lake controls overflow into a culvert that extends under Montauk Highway and to Lower Willetts Creek. Given the approximately 3 - 4 foot average head drop between Lake Capri and the tidal Lower Willetts Creek, it is likely that the lake also discharges by groundwater flow.

1.4 PREVIOUS FINDINGS

A Remedial Investigation/Feasibility Study (RI/FS), which included a treatability study for contaminated sediments, was completed by Lawler, Matusky & Skelly Engineers (LMS) in October 1994. A year later, in October 1995, LMS issued an RI/FS Addendum, which included additional sediment testing and a groundwater flow and transport model. Following a new work assignment, Rust completed a Pre-Design Investigation (PDI) Report for OU 2 in November 1998. The PDI included surveying and mapping, additional sampling and analyses, an expanded treatability study, a wetland delineation, and photodocumentation survey.

Lake Capri sediment contains elevated levels of cadmium approaching 400 mg/kg (ppm). This contamination appears limited to the approximately upper 2.5 feet of lake bottom sediment, which consist of a layer of soft silt overlying gravelly sand. Cadmium is also present at elevated levels of cadmium as high as 368 mg/kg in the upper 0.5 - 1.0 feet of sediment in Willetts Creek. Cadmium is also present at low concentrations in the water column immediately overlying the sediments.

The treatability studies provided information for selecting and sizing full-scale sediment and water treatment processes, equipment and materials. The test reports concluded that recessed chamber filtration with lime or polymer addition is the recommended sediment dewatering technology, although gravity dewatering of the coarser materials may also be feasible. The filter cake from this process contained greater than 50 % solids and did not exceed the Toxicity Characteristic Leaching Procedure (TCLP) threshold for cadmium of 1.0 mg/l (ppm). The filtrate from the bench-scale test exceeded effluent standards for certain parameters, including dissolved aluminum, total zinc, total lead, and total suspended solids, indicating that the filtrate will require treatment prior to discharge into Upper Willetts Creek.

1.5 REMEDIAL ACTION PLAN

For sediment removal purposes, OU 2 is divided into two major work areas, Lake Capri and Upper Willetts Creek. As indicated below, each of these areas can be further subdivided based on location, sediment characteristics, extent of sediment removal, water depth and other features.

Lake Capri

- **South Lake area** - remove by hydraulic dredging and other necessary means the continuous layer of silt muck sediments up to 1.5 feet thick and some of the underlying gravelly sand in the designated southern area of the lake to an estimated maximum depth of approximately 24 - 30 inches.

- **North Lake area** - remove by hydraulic dredging and other necessary means the primarily gravelly sand sediments, including a thin overlying layer of silt, in the designated northern area of the lake to an estimated maximum depth of approximately 12 inches.

- **Lake Shoreline areas** - remove by appropriate means the silt and sand sediments in the relatively shallow nearshore areas along the north and south lake shorelines to an estimated maximum depth of approximately 6 - 12 inches. The exact limits of the shoreline areas will be irregular, determined during construction, and depend upon a number of factors including lake level, and dredging and excavation equipment access.

- **North and South Lagoon areas** - remove by dredging and other necessary means the mixed silt and sand sediments in the deeper southern part of the lagoon to an estimated maximum depth of approximately 18 inches, in the shallower northern part of the lagoon to an estimated maximum depth of approximately 12 inches, and feathering out to zero along the shorelines.

Upper Willetts Creek

- **Burling Lane foot bridge area and West Bank area** - as directed by Engineer, remove the upper 6-12 inches of sediments using land-based mechanical excavation equipment in the designated areas in the vicinity of the Burling Lane foot bridge and farther upstream along the west bank.

Remediation Goals

The goal of the design is to remove the targeted contaminated sediment in an environmentally sound manner consistent with access agreements and sufficiently to meet project objectives. To accomplish this, dredging operations will minimize resuspension of the contaminated fine grained sediments by employing experienced personnel using proper equipment effectively and efficiently. Dredging sequencing, controls, containment measures and procedures will be implemented to prevent the dispersal, redistribution and redeposition of resuspended sediments in either relatively uncontaminated areas or in areas that have already been satisfactorily dredged. The dredge(s) will be capable of removing only the relatively thin layer of surficial contaminated sediments without overdredging, or contaminating the underlying material. This will be done in a manner that can be accurately monitored and documented as the dredging operation is underway. Dredging will be matched to the sediment and water processing operations to minimize delays and expedite the completion of the work. The processing and treatment operations will be streamlined to meet the space and schedule constraints. Liquids and solids will comply with discharge and disposal requirements. Waste volumes / weights will be minimized to reduce costs. Work will be conducted in compliance with all permits and authorizations, and in a safe manner that is demonstrably protective of human health and the environment, with only a short-term minimal inconvenience to local residents.

2.0 SEDIMENT REMOVAL

Contaminated sediment will be removed from Lake Capri and Upper Willetts Creek. The design basis, design parameters, sequencing and operations considerations, environmental compliance concerns, environmental health and safety requirements, monitoring requirements and anticipated contractor submittals for each of the areas are addressed below.

2.1 LAKE CAPRI

2.1.1 Design Basis

Sediments will be removed from the 8 acre Lake Capri, including lagoon, as described below. The lake bottom is characterized by a continuous layer of fine silty sediments ranging from a few inches to approximately 1.5 feet thick. The estimated in-place volume of the sediments, not including overdredged material that may be removed during the dredging operation, is estimated to be approximately 17,500 cy. The design basis for the Lake Capri sediment removal is summarized below under five headings: the nature and extent of contamination; sediment characteristics; lake characteristics; shoreline characteristics; and basis for excavation plan. This is based on available information.

2.1.1.1 Nature and Extent of Sediment Contamination

The nature, extent, thickness and volume of the cadmium contamination are addressed below.

Nature of the Cadmium Contamination

The PDI confirmed that the distribution of cadmium contamination in lake bottom sediments varies spatially. Most of the contamination is associated with the recently deposited fine grained sediments (referred to herein as the organic silt or silt muck layer), which have accumulated to a greater degree in the southern part of the lake. Cadmium concentrations in excavated sediments are expected to average approximately 78 mg/kg based on the RI Addendum. The highest cadmium concentration detected approach 400 ppm (dry weight basis) in the south central part of the lake. Fine grained sediments in the northern part of the lake were generally lower in cadmium concentrations.

Evaluation of the available testing data indicates that most of the cadmium is associated with the solid fine particles that may settle out relatively quickly (within a few minutes). However, a minor portion of the cadmium is included in the dissolved or colloidal phase. This will be taken into account during development of the monitoring requirements and action levels for water quality during dredging.

Thickness and Volume of Contaminated Sediments

The total thickness of contamination typically ranges from less than 6 inches in some areas (mostly near the eastern shoreline) to 24 inches over a broad area in the southern part of the lake where contamination possibly as deep as 30 inches or more was detected in a small localized area. This deepest apparent occurrence may be related to carry down of contaminants during the sediment sampling operations or to deposition or infiltration in the vicinity of the former Willetts Creek channel.

The contamination appears to extend from a few inches to possibly as much as a foot below the silt muck layer and into the underlying gravelly sand layer. Contaminant concentrations in the sand are typically substantially lower than in the overlying silts. The depth of cadmium contamination into the underlying sand layer appears to be shallower in the northern part of the lake as compared to the southern part of the lake.

Based on a triangulated volume calculation for a digital terrain model developed from the results of sediment sampling and analysis, approximately 17,030 cy of contaminated (i.e., greater than 1 ppm cadmium) material are present in the main body of Lake Capri, and approximately 400 cy in the lagoon. This is in contrast to a total of approximately 12,000 cy estimated in the RI/FS. The total estimated volume of contaminated sediment is 17,428 cy.

2.1.1.2 Sediment Characteristics

The two principal sediment layers identified in the lake bottom are a recently (geologically) deposited layer of fine grained organic silt overlying gravelly sand glacial outwash. Physical characteristics relevant to dredging are summarized below.

<u>Fine grained, silt deposit</u>

The fine grained sediments, which are invariably contaminated, are comprised primarily of soft, very dark greenish gray organic silts, occasionally with a decaying organics odor. They originated from the deposition of suspended sediments, particulates, colloids and organic detritus derived from the Willetts Creek drainage basin, and may be mixed with indigenous pre-lacustrine estuarine sediments and windblown fines.

A contour map of the estimated thickness of the silt muck layer was presented in the PDI (Plate 3). A copy is included in Appendix A. The silt muck layer ranges in thickness from approximately 6 - 18 inches in the southern part of the lake. Most of the layer is less than one foot thick. The thickest deposits appear to be in the two shallow depressions which likely mark the former channel of the pre-lacustrine Willetts Creek. The silt muck layer is much thinner in the northern part of the lake, typically ranging from less than 1/4 inches to 3-inches thick, although thicker occurrences are present. The estimated volume of the silt muck in the lake is 7,040 cy, which represents approximately 40% of the total in place volume of contaminated sediment in the lake. Physical characteristics of the silt material are summarized in the PDI (Table 3-2). Particle size analyses are also included in the PDI (Appendices E and F) and RI/FS Addendum (Appendix C).

The silt will have a tendency to become resuspended if disturbed. Dredging operations will be controlled to minimize such re-suspension and to contain the re-suspension that does occur. If the average concentration of cadmium in the sediments is 78 mg/l, then 1 mg/l of re-suspended sediment would result in an incremental total cadmium concentration of 0.078 ug/l in the water column. To meet the estimated Ambient Water Quality Standard (AWQS) of 1 ug/l for cadmium, the incremental total suspended sediment concentration must be less than 12.8 mg/l. Given that the re-suspension will be short term dissolved cadmium will likely be present, and that sediments in the shallow lake are stirred up naturally during storm events, a short-term increase to 10 times the AWQS, or 128 mg/l, may be appropriate in the immediate vicinity of the dredge, say 75 feet. Applying a factor of safety of 5.0 yields a re-suspension criterion of 25 mg/l above background within 75 feet of the dredge.

Gravelly sand outwash deposit

The fine grained sediments are underlain by a light gray and tan, native gravelly sand outwash deposit that also underlies much of southern Long Island. Concentrations of cadmium in the sand layer generally decrease with depth. The outwash is comprised primarily of well graded (SW, Unified Soil Classification), fine to coarse sand, with a lower percentage of fine to medium gravel. Percent fines is typically less than 5%. The outwash layer is generally more difficult to penetrate with manual samplers than the overlying silt muck because of its higher percent solids, greater compactness, and the presence of the gravel. Similarly, it may be relatively more difficult to dredge than the soft silts. Local areas of softer sand may be present. Physical characteristics of the gravelly sand material are summarized in the PDI (Table 3-2). Particle size analyses are also included in the PDI (Appendices E and F) and RI/FS Addendum (Appendix C).

2.1.1.3 Lake Characteristics

Relevant lake characteristics including access, water depth, elevation datum, waves and currents, bottom topography (bathymetry), bottom consistency, debris and vegetation, and the lagoon are summarized below.

Access

Access to the lake is highly restricted by the presence of residences around the entire lake. Construction access most likely will be from Montauk Highway and possibly by access agreement with one or more homeowners. Property lines extend into the lake so that the lake is entirely owned by adjacent parcels; therefore access to dredge the lake will need to be obtained. The design will include a temporary dock and work staging area at the south end of the lake. Access to the lagoon will primarily be from the main lake body to the south.

Water Depth

Water depth will vary with lake fluctuations that are expected to be minor. The water depth ranges from 0 feet to approximately 3.3 feet deep. The depth of water in most of the lake was typically 34-38 inches during the PDI, with shallower areas nearshore and in the northern end of the lake. Depths were generally shallower, i.e. 6 - 8 inches, along the eastern shoreline, but not the western shoreline, which is largely bordered by wooden bulkheads. Most of the lake was wadeable, but a few locally deeper areas were encountered during the PDI.

Elevation Datum

A recently compiled bathymetric map of the lake bottom is presented in the PDI (Plate 1), and represents the best information available. The elevation of the lake water surface was photogrammetrically mapped at elevation 3.3 feet, NAVD 88 feet New York, Long Island 3104, in April 1998. All lake bottom elevations and associated surfaces in the PDI report are referenced to this elevation. Given that the RI/FS Addendum indicated an approximate lake elevation of 4.3, it is possible that different datums are available in the area, and caution will be used in interpreting the elevations presented herein, or comparing elevations between reports. The Contractor will be required to confirm the elevation datum used for construction.

Waves and Currents

Waves and currents were very minor during the field activities. Lake waves, current direction and velocity are expected to change with weather conditions and with Willetts Creek flows but are all expected to be minor. Currents are expected to be driven by wind, Willetts Creek, the two stormwater sewer outfalls, and the lake overflow outfall. Circular or eddy currents may also be driven by thermal convection currents and groundwater recharge/discharge.

Bottom Topography

The overall lake bottom is saucer shaped (PDI Plate 1). The central portions are quite flat, with estimated local relief of approximately 4 inches. The PDI report summarized bathymetric and silt thickness evidence for the former Willetts Creek channel in several areas of the lake bottom. Dredging operations will be modified as necessary in these areas.

Bottom Consistency

The silt layer is very soft and overlies a more compact gravelly sand layer. Sampler penetrations on the order of 1 - 3 feet into the gravelly sand were typical, but zones of looser subgrade material were detected in the north parts of the lake, including the sand delta near the mouth of Upper Willetts Creek and in the lagoon. A dense gravelly area was detected in the west central portion of the lake and may be more difficult to dredge than the adjacent materials.

Debris and Vegetation

Most of the central lake bottom appears to be relatively free of large debris and vegetation, but debris may be present on or in the bottom sediments. This may include submerged logs, tree branches, stumps, material discharged from sewer outfalls, and so forth. Small debris, rocks, leaf litter, and overhanging branches and protruding tree roots are commonly present along the shorelines. Bulkheads, small riprap and related structures, and small docks are also present. No large submerged obstacles were observed during PDI sampling activities, except for a few scattered rocks and a small row boat that was found split in half. The largest accumulation of debris in the lake was noted along the south shoreline.

Football-sized clumps of floating soft filamentous algae were occasionally noted in the lake during the PDI sampling activities in spring, but no emergent vegetation was observed at that time. Aquatic vegetation may be locally present in the nearshore areas, but removal of aquatic vegetation is not anticipated to be a major concern.

Lagoon

A wooden foot bridge in the northwestern corner of the lake spans the outlet of the lagoon. Sediments in the lagoon are soft and contain a considerable amount of debris, submerged tree limbs, roots, and vegetative matter. Approximately 38 inches of very soft material was initially penetrated in the core hole in the eastern part of the lagoon. With a little effort, total penetration of the sampler was 74 inches, second only to the depth achieved in the nearby delta at the mouth of the creek. The lagoon sample consisted of interbedded sand and silt muck. The lagoon outlet in the vicinity of the foot bridge is slightly shallower than the lagoon bottom. Lagoon outflows are restricted.

2.1.1.4 Shoreline Characteristics

The shorelines pose special challenges to the dredging Contractor. Water is shallower near the shorelines and more debris appears present than in the deeper areas farther offshore. Available working space on land along the shorelines is extremely restricted. A number of structures along the shoreline will be protected during the sediment removal operations, and restored to pre-dredging conditions as necessary. Selected features along the south, west, north and east shorelines, and the proposed hydraulic dredge pipeline route up Willetts Creek to the staging area in the Senior High School parking lot, are summarized as follows.

South Shore

The south shore, which is a likely access point to the lake during remediation, is characterized by the Montauk Highway embankment and a chain link fence. The entire south shoreline is supported by wooden bulkheads, the depth and condition of which are unknown. This bulkhead was probably installed by NYSDOT as part of the embankment improvements. A brief review of NYSDOT files in Albany failed to recover any relevant drawings or specifications detailing the bulkhead structures. The bulkheads will be protected during sediment removal operations, as necessary, by excavating and promptly backfilling in small work areas, nominally 10 feet wide, so that bulkhead stability is not compromised.

A concrete outfall weir with a fixed outfall elevation is present near the midpoint of the south shoreline. The weir regulates the outflow of lake waters under the Montauk Highway, into the tidal or lower Willetts Creek. Two rows of turbidity barriers will be placed upstream of the outfall during dredging to prevent downstream release of unacceptable concentrations of suspended solids.

West Shore

The western shoreline is extensively supported by privately owned wooden bulkheads (occasionally submerged), some sections of which appear in better condition than others. Because of the bulkheads, the water depth along the western side of the lake is generally deeper and with less root structure and debris than the eastern shore. A storm sewer outfall is present. One offshore area in the vicinity of reference grid lines 4+50N to 5+00N (PDI Plate 2) appears to be covered with dense or coarse gravel that led to sampler penetration and recovery difficulties. This gravelly area was also encountered during the RI/FS. Its approximate location will be marked out as necessary during the dredging operations. A densely vegetated island is present off the southwest corner. It is supported by a wooden bulkhead that will be protected during dredging.

North Shore

Vegetation, including mature tress with protruding roots and branch overhangs, was dense along the north shore, particularly in the 10-15 foot wide channel between the nearby island and the mainland. The island is densely vegetated and the perimeter extensively supported by a wooden bulkhead in fair condition. The vegetation will be trimmed as little as necessary for the sediment removal operations. The foot bridge over the lagoon outlet channel will be protected from damage as necessary.

East Shore

The eastern shoreline is shallow and is characterized in many areas by an erosional bank at the water's edge adjacent to landscaped backyards. Erosion protection, where present, is commonly comprised of small riprap, concrete blocks or similar supports. A couple of small docks jut out into the lake. These structures will be protected during dredging or replaced in kind. Mature trees with protruding shoreline roots and overhanging branches are prevalent and will be trimmed only as necessary. One of these overhangs near the northeast corner of the lake extends out 40 feet. The storm sewer outfall along the east shore is not expected to pose any difficulty during dredging.

Proposed Dredge Pipeline Route

The lake sediments will be removed by hydraulic dredging and conveyed as a slurry through dredge lines approximately 600 feet from the masonry arch foot bridge to the Senior High School parking lot. The foot bridge will be protected as necessary during remedial activities so that it is not damaged or altered. The creek in this sandy area was approximately 6-12 inches deep in May, and provides the corridor for the dredge discharge line. A temporary structure, e.g. riprap, will be placed in the creek as necessary to prevent erosion by the treated water from the treatment area. The creek shorelines are heavily vegetated and include mature trees as well as landscaped lawns. These areas and vegetation will be disturbed as little as possible.

2.1.1.5 Excavation Plan

Contaminated sediment will be removed from Lake Capri to the depths shown on PDI Plate 5, a copy of which is included in Appendix A. These depths were determined based on the analytical results for sediment samples collected during the PDI and RI/FS, and the following observations, considerations and assumptions:

- Excavation depth generally required to achieve subgrade cadmium concentration of nominal 1 ppm, although a few outliers of relatively shallower and deeper contaminated sediment may exist and can be addressed as necessary by post-dredging sampling;

- Where the deepest sample analyzed for a given location did not achieve nominal 1 ppm, assigning a preliminary excavation depth approximately 0.5 feet deeper than the top of that sample, and taking into account the required excavation depths for nearby samples;

- Where the shallowest sample analyzed indicated a cadmium less than nominal 1 ppm, assigning a preliminary excavation depth excavation at the top of that sample;

- Observation that the entire soft silt layer is contaminated greater than nominal 1 ppm and removal of this layer will remove most of the cadmium, e.g. the 2-foot excavation contour completely encompasses the 1-foot silt thickness contour;

- Observations that contamination extends down into the underlying gravelly sand, particularly in the south part of the lake and that concentrations typically decrease with depth;

- Observation that carry down of the upper silts down into the underlying sands occurred to some degree during sampling;

- Observation that the amount of debris and vegetation in the main part of the lake is minimal and should not pose a problem for hydraulic dredging provided that provision is made to remove such materials ahead of time where they are encountered;

- Observation that the shoreline area contains more vegetative matter and debris that will require separate removal;

- Assumption for planning purposes that the practical minimum required draft for the dredging vessel is approximately 24 inches, the minimum practical dredging thickness in open water areas is 12 inches, and the practical incremental dredging depth interval is 6 inches;

- Assumption that an excavation depth of 6 inches is the minimum practical in the shallow nearshore areas;
- Assumption that the core loss during sampling was primarily from compression of the silt layer and sand loss from the bottom of the core;
- Assumption that the dredge can effectively remove sediment in squared off corners;
- Assumption that re-suspension, re-deposition, spillage and residuals will occur to some degree but these can be minimized to acceptable levels;
- Assumption that post-dredging sampling will be conducted to assess if subsequent passes are necessary;
- Assumption that contractor will perform its own bathymetric survey for pay purposes and elevation map will be adjusted accordingly; and
- Assumption that 3-inch maximum overdredge is achievable.

The plan indicates a maximum excavation depth of 24 inches. The deepest area is in the south part of the lake and generally coincides with the estimated location of the former Willetts Creek channel. The shallowest proposed excavation of 6-inches is along the eastern shore. The preliminary excavation plan does not address overdredging. Dredge access to shallow areas where boat draft is limited and may require an alternative sediment removal method or means of access. An excavation plan map based on elevation is presented on Plate 1.

2.1.2 Design Parameters

Lake bottom sediment will be removed by hydraulic dredging equipment and methods, supplemented by ancillary mechanical equipment and methods as necessary to remove debris and vegetation and sediment from shallow areas. Hydraulic dredging equipment and methods will be specified to maximize the percent solids in the dredge slurry while minimizing resuspension and the volume of uncontaminated material being removed. The dredge slurry will be conveyed by means of water-tight pipeline directly to the treatment area for processing.

Sediment will be removed to the estimated grades shown on Plate 1. Deeper or shallower grades may be approved pending the results of samples collected by Engineer during the removal program. It is anticipated that the majority of sediment can be removed in a single dredging pass, and that one cleanup pass may be required in the south part of the lake where the silt layer is thicker. Overdredge will be minimized insofar as practicable, given the high cost of sediment disposal.

To meet the project schedule, dredge slurry solids content are required to average approximately 8%, with short-term peaks expected on the order of 20%, given the estimated 67% average in-place solids content. This includes normal dredging production (target grade limits of ±0 inches) which will likely have a relatively higher solids content, and cleanup passes (target grade limits of ±3 inches) which will likely have a relatively lower solids content. It is envisioned that through selection of appropriate equipment, skilled work crews, and operational planning and procedures, the Contractor will seek to increase these percent solids. Given the requirement to complete the dredging expeditiously in primarily the summer months, this average percent solids rate will be sufficient to keep the required volumetric production (cy/hr) and pumping (gpm) rates to a manageably low level, while reducing the volume of slurry and water that must be treated. Many factors will be balanced to complete the job efficiently within the constraints posed by the site conditions, the available work space, access agreements, daily and project schedules, the residential setting, and controls to minimize sediment re-suspension and overdredging of underlying uncontaminated material.

For hydraulic dredging planning purposes, production periods will be 8 hours per work day and 6 days per week, or 48 hours per week. It is anticipated that the actual work day duration will be greater than 8 hours for the dredge crews (say 12 hours) to provide for an average 33% non-productive time related to set up, moving, discharge line management, re-fueling, and other downtime. It is anticipated that the duration of daily dredging will be limited as a consequence of working in a residential neighborhood.

In order to complete the lake bottom and lagoon dredging during a single season of approximately 90 work days, an average daily production rate of approximately 240 in-place cy (30 cy/hr) will be required for removal of approximately 21,000 cy of sediment. This volume of sediment is based on an in-place volume of 17,030 cy plus approximately 3,104 cy of overdredge (0.25 ft) material. It is anticipated that two hydraulic dredges will be operating in the lake during this period. Higher production rates will minimize the duration of dredging. This assumes that all of the sediment is accessible to a hydraulic dredge.

The dredged material will ultimately consist of two layers with different properties, the overlying silt layer with a an estimated solids content of 20%, and the compact sand layer with a solids content of approximately 85%. For an estimated average 67% in-place solids content (by weight), and an average 8% solids content (by weight) in the dredge slurry, an average slurry pumping rate of approximately 1,500 gpm would be required to complete the lake dredging in approximately 90 working days. Supporting calculations for sediment removal estimates are provided in a spreadsheet included in Appendix B.

Average in-place solids content greater than or less than the average 67% would impact the project significantly. An in-place percent solids content higher than 67% would necessitate a proportionally greater production rate to meet the production rate objective. The Contractor will need to increase the dredge production rate (cy/hr) and pumping (gpm) rate, or an increased duration of dredging would result, all other factors remaining equal. The volumes and weight of sediment and water to treat, transport and dispose of would also increase for the higher in-situ percent solids. A lower in-place percent solids will have the opposite effect.

2.1.3 Sequencing and Operations

2.1.3.1 Sequencing

The remedial design is being prepared to meet a primary objective of completing the sediment removal in one construction season. Sequencing of the work will be left to the Contractor's discretion, with approval by NYSDEC. Initial phases will be conducted with an increased level of monitoring by NYSDEC to ensure the appropriate personnel, equipment, procedures, and controls are in place.

- The lake bottom sediment area will be subdivided into work zones to facilitate dredging and monitoring operations and minimize non-productive time. The size and shape of the work areas will be left to the Contractor's discretion. The sediment processing and water treatment systems will be designed to accommodate the dredge sequencing.

- Before dredging commences, the work zone will be isolated by a high visibility perimeter floating oil boom / silt curtain (pervious or impervious), with an overlapped gap as necessary to enable passage of the dredging equipment and pipeline. The area near the lake outlet will be isolated by two parallel fixed turbidity barriers to prevent significant amounts of suspended sediment from migrating out of the work zone.

- Site preparation will include trimming of vegetation to the minimum extent necessary and removal of submerged debris as necessary prior to hydraulic dredging. The lake bottom debris and vegetative material may require mechanical removal techniques where encountered, perhaps as a distinct task, but the nature and frequency of this material is not expected to preclude the feasibility of hydraulic dredging as a primary dredging method for most of the lake.

- Water depths, lake bottom topography and sediment thicknesses will be confirmed just prior to dredging. This will ensure that the bottom conditions are consistent with those summarized in the contract documents and prevent misunderstandings. It will also minimize the potential for unintentional over-dredging or the need for additional passes. Locations will be documented by Differential Global Positioning System (DGPS) or other suitable means, all referenced to a site coordinate system.

- Sediment thickness will be measured and documented just after dredging to confirm that the cadmium-contaminated sediment was adequately removed in accordance with the contract documents. Additional cleanup passes of the dredging equipment will be made as necessary as directed by NYSDEC. Dredge equipment used for cleanup may differ from that used for the initial production dredging to more efficiently remove the remaining sediment without overdredging.

- Dredge sequencing and work zone delineation will take into account many factors, including the following considerations:

  - Authorized work hours
  - Equipment capabilities
  - Proximity to residences and shoreline structures
  - Protection of shoreline structures
  - Proximity to the creek
  - Temporal variations in water depth
  - Spatial variations in water depth
  - Sediment removal and processing characteristics and thickness
  - Discharge line length and management
  - Treatment plant and sediment processing capacity
  - Seasonal (weather) limitations
  - Prevention of re-contamination of dredged areas

- Dredging operations will be able to extend closest to the shoreline when lake water levels are high, but Contractor will not be allowed to artificially raise lake levels by obstructing the outfall unless approved in advance in writing by NYSDEC.

- Following excavation, the lake bottom will be left in a deepened state, except as necessary to protect bulkhead structures and mitigate shoreline erosion related to the dredging. Restoration of aquatic vegetation, if any, will be natural re-vegetation.

2.1.3.2 Operations

The dredging equipment, methods and operations in the main body of the lake will be designed to minimize the potential for resuspension and re-deposition of sediment, over-dredging of uncontaminated materials, unnecessary multiple passes, re-contamination of areas already dredged, and damage to shorelines and shoreline structures. The Contractor will be expected to comply with the following requirements during the dredging operations.

- The Contractor will provide highly skilled and experienced personnel to operate the dredging equipment in an environmentally sound manner. The operators will be experienced with the capabilities and limitations of the equipment and know how to efficiently remove the sediment with minimal resuspension and overdredging.

- Dredging operation will be closely monitored and managed by Contractor.

- The Contractor will provide dredging equipment that is suitable for the site characteristics, and for the intended purpose, i.e., precisely remove sediment at the required depths without excessive resuspension or losses. The dredging equipment will include navigational instrumentation to control and identify the location and depth of cut, i.e. horizontal and vertical control. An adequate factor of safety will be applied when selecting equipment to ensure that the proposed dredging equipment is appropriate for the range in water depths, waves and currents, and sediment thicknesses during dredging. Sizing of dredging equipment will be optimized considering the capacity of the processing and treatment operations to minimize downtime.

- Adequate data will be collected during dredging to enable generation of detailed pre- and post dredging bathymetric charts for volume calculations.

- Contractor will secure work platforms and necessary support equipment using the minimum number of spuds and anchors, and will sequence work to minimize the number of times the equipment must be re-positioned.

- The dredging heads will either have no cutting heads which cause resuspension of sediment, or will document that the cutting head is sized and equipped, e.g. shroud, cover, shutter, shield, grates, sensors, for "environmental" or "surgical" dredging at this site and operated to minimize turbidity and resuspension. The rate of operation, vertical position, and depth embedment of cut, and movement (swing or advance) of the dredging head will be optimized to prevent unnecessary resuspension.

- The dredge pumps will have sufficient energy to pump at rates that entrain resuspended particles and minimize excessive settling out in the pipeline that could cause plugging.

- The dredge slurry pipe lines will be properly connected and maintained water-tight. Dredging operations will be shut down if a major leak occurs. The dredge lines will be equipped with real-time flow and slurry density instrumentation to aid in optimizing the dredging operation. The lines will also be equipped with both manual and automatic check valves to prevent back-flow and discharge of dredged slurry into the work zone when dredging operations are interrupted. The line diameter will be sized to minimize the potential for plugging. The lines will be flushed with water before dredging is suspended to minimize the potential for plugging. The lines will include connections to enable injection of air or water to facilitate cleaning or clearing in the event of plugging. The lines will be exposed at the water surface to enable continuous inspection for evidence of leakage. The lines will be pressure tested with clear water before slurry is pumped through them, and on a routine basis as determined necessary following repairs or modifications to the system. On land, the lines will be provided with a means of secondary containment with collection sumps, or equivalent means of spill prevention and control. Line routes through wetlands will be selected with consideration given to minimizing potential environmental impact and decontamination requirements.

- Any booster pump used to move the dredge slurry will be provided a means of secondary containment with sump.

- Debris and vegetation which cannot be safely removed by the hydraulic dredging equipment will be removed mechanically in a slow and careful manner that minimizes the amount of resuspension and potentially contaminated runoff. Debris will properly staged, disposed of, or decontaminated.

- Dredging equipment will be properly decontaminated following the completion of the dredging activities.

- The upward and downward hydraulic gradients in the lake bottom and resulting flow patterns are expected to vary seasonally and in response to fluctuating groundwater and surface water levels around the lake. The significance of this complex groundwater-lake interaction will be taken into account during dredging operations. The fine grained sediments are expected to have a significantly lower permeability than the underlying sand and gravel. If these low permeability sediments are removed from the lake bottom at a time and in a place where downward flow gradients are present, and a hydraulic stagnation point is absent, the downward hydraulic gradient and effective lake bottom permeability may be increased, thereby potentially increasing seepage outflows. Whether this may significantly impact lake water levels would depend upon the relative rates of surface water and groundwater outflow and inflow. A lowered lake level would increase upward flow gradients and rates and the volume of groundwater inflow, thereby damping the significance of the outflow and establishing a balance. Lake levels will be carefully monitored during dredging because of the potential impacts on shoreline exposure and dredge navigability.

Dredging in the lagoon may be implemented with less stringent measures provided that the lagoon is completely isolated. Given the anticipated low flow rate of the west branch of Upper Willetts Creek which feeds the lagoon, Contractor will have the option to isolate the lagoon during dredging by temporarily damming the lagoon outfall and diverting the surface water inflows, if necessary, around the lagoon. With this isolated condition, sediment re-suspension will not be as much of an environmental concern. This will help expedite sediment removal in this limited area. Monitoring will consist of ensuring that discharges of resuspended sediments to the lake do not occur during lagoon dredging.

2.1.4 Environmental Compliance

The remediation will be conducted under authorization of the U.S. Army Corps of Engineers Nationwide Permit program (permit number 38), and will be consistent with requirements for dredge and fill, temporary construction, cleanup of hazardous or toxic waste sites, navigable waterways, wetland protection, fish and wildlife conservation, and historic preservation. No net fill will be placed in the dredge area. Replacement fill may be placed along bulkheads to provide support and structural integrity. All dredged materials will be pre-treated as necessary and disposed of properly. The dredging operation will be designed to minimize turbidity, the resuspension of sediment to the water column, the release of dredge slurry from the discharge lines, and short-term impacts to water quality. The remediation will also be consistent with the policies of the Coastal Management Zone program as administered by the NYS Department of State.

The proposed dredging operation will result in temporary impacts to the local aquatic habitat and wetlands by removal of vegetation and cadmium-contaminated substrate, but these are not considered significant, and will be mitigated by restoration measures implemented in accordance with an agency approved mitigation plan.

Water discharged from the sediment processing area will be treated prior to discharge back to the creek. The treatment method will be sufficient to ensure that the quality of the treated water meets the requirements of the SPDES discharge limitations which are listed in Appendix C (Table B-1 from PDI Report).

2.1.5 Environmental Health and Safety Controls

Sediment removal will be completed in a manner which protects water quality to the maximum extent practicable. All dredging will be conducted within a temporary silt curtain (pervious or impervious) to prevent release of re-suspended solids to uncontaminated areas outside of the active work zones. The silt curtain will extend from near, but not touching, the lake bottom to the water surface, and will be marked and illuminated as necessary. The dual row of turbidity barriers at the outlet area will be affixed to driven temporary soldier piles for stability.

The Contractor will be required to maintain a supply of spill response equipment suitable for response to spills of petroleum products or excavated materials to land and water.

The project will be conducted so as to minimize the potential for cadmium exposure to on-site workers and the community. All work will be conducted in accordance with a worker and community health and safety plans prepared by the Contractor in conformance with 29 CFR 1910. The community health and safety plan will include a program of perimeter air monitoring during dredging. Contractor will be required to stop work as necessary, and implement repairs or additional protective measures whenever its control and mitigation procedures or equipment are not adequately protecting human health and the environment.

Specified work will be conducted only during the approved working hours. Noise will be minimized through site layout, use of enclosures and noise-suppressant equipment, and appropriate work sequencing and work hours. Dust and nuisance odors are not expected to be a problem during the dredging operation. Any traffic directly related to the sediment dredging or excavation operations will be in accordance with a NYSDEC-approved traffic control plan.

2.1.6 Monitoring

Water quality in the vicinity of the active dredging operation will be monitored continuously by visual means for evidence of a turbidity plume, by real-time turbidity sensors, and on a regular basis by sampling and analysis for turbidity, total suspended solids (TSS) and dissolved cadmium. A turbidity sensor will be mounted approximately 50 feet behind the dredge and operated continuously.

Turbidity sensors will also be mounted between and behind the pair of turbidity barriers at the lake outfall structure. Sample collection will be at a depth of 0.5 of the total water depth. Visual monitoring will also be conducted while equipment is being moved.

In the event that a visible increase in turbidity attributable to the dredging operation is observed 50 feet downstream of the dredging operation, or outside the silt curtain, immediate action will be taken to reduce the amount of sediment being re-suspended by the dredging operation.

In the event the concentration of TSS measured at the downstream sample inside the silt curtain pair exceeds the average concentration of an upstream sample at the mouth of Upper Willetts Creek by more than 25 mg/l, immediate action will be taken to reduce the amount of resuspended sediment being generated by the dredging operation. In the event the downstream TSS concentration outside the silt curtain exceeds the average concentration of the upstream samples by more than 5 mg/l, and the situation cannot be corrected within 15 minutes, dredging operations will be temporarily suspended until the cause of the exceedance can be determined and corrective actions taken.

Samples that exceed the action level for TSS outside the silt curtain will be analyzed for cadmium. Both filtered and unfiltered samples will be analyzed. If the analytical results indicate that the dredging operation may have caused or significantly contributed to the exceedance of any New York State Ambient Water Quality Criterion in the lake in excess of that normally anticipated from storm-induced turbidity, the action levels for TSS will be modified appropriately to provide for control of the dredging operations in a manner which will not cause or significantly contribute to the exceedance of a water quality standard downstream of the lake. Additional control measures will be evaluated.

Work zones for which dredging is believed complete will be inspected to verify that the appropriate dredging depth was achieved. This inspection will be done as necessary before the dredge moves to a new dredge work zone and the silt curtain relocated, if necessary. Following dredging, the lake bottom will be visually inspected for evidence of windrows or missed dredging areas by traversing the work zone along inspection transects at an appropriate spacing. Post-excavation samples will be collected at documented locations using a ponar dredge or equivalent sampling device. If the bottom cannot be visually inspected, then one sample will be collected for each 50 ft by 50 ft area. If no sediment is apparent visually or in the samples, the work zone dredging will be deemed complete. If significant sediment is observed, the affected areas of the work zone will be re-dredged, or an alternative remedial measure, if necessary, will be considered. Detailed post-dredging bathymetric surveys will be conducted to determine the dredged volume.

2.1.7 Submittals

After DEC notification of intent to award, the Contractor will submit the following information:

- Exceptions to the proposed work as stated in the contract documents.

- Dredging operations plan that will specify the qualifications and experience of dredging personnel including subcontractor(s), specifications for proposed dredging equipment, proposed pumping rate, anticipated rate of dredge advancement, cutting depth (bank height) relative to sediment thickness, discharge line diameter and length, boom and silt curtain details, and each of the other operational considerations listed above;

- Dredge operations layout, including access;
- Spill prevention and contingency plan; and
- Proposals for alternate construction, if any, which go beyond the normal scope of "or equal" substitutions.

2.2 UPPER WILLETTS CREEK

2.2.1 Design Basis

Sediment will be excavated from areas along the creek where sampling during the PDI indicated average cadmium concentrations greater than 9 ppm. A Preliminary Excavation Plan for Upper Willetts Creek was included in the PDI (Plate 6). A copy of the Plan is included in Appendix A.

The excavation area includes the Burling Lane Foot Bridge Area where individual concentrations approaching 80 ppm were observed, and the west half of the creek bed in the West Bank Area farther upstream where concentrations as high as 368 ppm were observed. The contaminated sediments in both areas are estimated to be 6-12 inches thick. Except for the far northern end, these areas are adjacent to and accessible from the West Islip Junior High School playing fields. Land areas on the east side of the creek will not be disturbed.

The creek is fed by both upstream surface water runoff and groundwater base flow. The potential impacts of these flows during excavation will be minimized by timing the work to coincide with periods of naturally low creek flows, low groundwater levels and high evapotranspiration, i.e. late summer. This will also facilitate diverting surface flows around the active work areas through use of temporary diversion dams and overland piping.

Work areas will be dewatered insofar as practicable, but it is anticipated that some water will remain in the excavations. The anticipated high permeability of the sand and gravel deposit underlying the creek sediments may make complete dewatering difficult. If groundwater levels are high, dewatering may induce relatively high upward hydraulic gradients that could create unstable ground conditions. Sequencing the creek sediment removal to coincide with a period of low groundwater levels will reduce the potential for upward hydraulic gradients.

Following excavation at near in-situ moisture contents, the sediments will be hauled to a temporary staging area on Junior High School property immediately adjacent to the creek. The sediments along this part of the creek are anticipated to be organic-rich silty sands overlying loamy sand. The excavated materials will be gravity dewatered, and solidified as necessary through use of inert additives to meet truck transport and landfilling requirements. The total estimated volume of sediments is approximately 200 cy, not including additives and associated debris.

Wetland vegetation is generally dense, particularly along the western shoreline and will require trimming and clearing in some areas. Portions of this area contained a considerable amount of rocks, debris, submerged tree limbs, roots, and locally dense vegetation matter. Debris was particularly dense at the outfall of a storm water sewer at approximate station 800N (PDI Plate 6).

2.2.2 Design Parameters

Creek bottom sediment will be excavated to a minimum depth of 6-inches across the full width of the creek from station EB 75 South to EB 50 North. This reach is roughly centered on the Burling Lane foot bridge. Sediments will also be excavated in the west half of the creek bed from stations EB 50 to EB 550 North, and EB 775 to EB 925 North. The final extent and depth of removal will be based on the nature of sediment observed during the excavation. The creek bottom will remain in a deepened state after excavation; it will not be backfilled.

2.2.3 Sequencing and Operations

Creek bottom excavation will be conducted independently of the lake dredging and will not require use of the Senior High School staging and treatment area. As described above, the work will be conducted during late summer to take advantage of anticipated favorable hydrologic conditions. Excavation will proceed in a general upstream to downstream direction. It is anticipated that conventional low ground pressure earthmoving equipment will be utilized. Access will be primarily through the Junior High School property, and the shopping center parking lot to the north.

2.2.4 Environmental Compliance

Excavation of the creek bottom sediments will be conducted under authorization of the Army Corps of Engineers nationwide permit 38. The creek bank and bottom will not be disturbed until soil erosion and sediment control structures are installed in accordance with the approved Soil Erosion and Sediment Control Plan. Disturbance of adjacent wetland vegetation will be minimized insofar as practicable. Access to the creek will be via a limited number of short access roads constructed along the west bank. Following the completion of removal activities, access roads will be removed and cleared areas re-vegetated.

Removing the contaminated creek sediments from the west bank area may result in locally enhanced groundwater discharge and increased cadmium concentrations in surface water where the groundwater plume continues to discharge to the creek. The presence of cadmium in the creek water in this area has already been documented. A surface water cadmium concentration of 37.7 ug/l was reported in the Burling Lane foot bridge area during the RI/FS (the highest concentration measured in the creek), and 16 ug/l was detected during the PDI (refer to Figure 2-1 of the PDI Report). Contaminant transport modeling summarized in the RI/FS Addendum indicated that the plume of contaminated groundwater may continue discharging to the creek for more than 200 years.

Accordingly, concentrations of dissolved cadmium in creek water may not be reduced as a result of the sediment removal.

Future deposits of fine grained sediments in the remediated, potentially deepened areas may therefore become contaminated, and the need for future monitoring will be considered. However, given the dense vegetation which helps to stabilize creek sediments, the gentle slope of the creek bed which minimizes net erosion and the presence of Lake Capri which has raised the local erosional base level a few feet, erosion of creek bottom sediments with subsequent deposition in Lake Capri is not expected to be a rapid process.

2.2.5 Environmental Health and Safety Controls

Creek flows will be diverted around active work areas through use of temporary cofferdams and piping. Piping will be sized to accommodate the maximum anticipated flow. Contractor will prepare a Creek Diversion and Contingency Plan to address measures to be taken in the event of storm flooding while the work is underway. Pipe discharge areas will be protected to prevent erosion. A sump area with check dam constructed of hay bales or sand bags will be excavated if necessary at the downstream end of each work zone to act as a settling basin for flows, such as groundwater seepage, that are not diverted from the active work areas, and to minimize the downstream migration of turbid water. Turbidity measurements will be made immediately downstream of work areas. Removal of the cofferdams will be done carefully to prevent erosion and scour.

The project will be conducted so as to minimize the potential for cadmium exposure to on-site workers and the community. All work will be conducted in accordance with a worker and community health and safety plans prepared by the Contractor in conformance with 29 CFR 1910. Contractor will be required to stop work as necessary, and implement repairs or additional protective measures whenever its control and mitigation procedures or equipment are not adequately protecting human health and the environment.

Specified work will be conducted only during the approved working hours. Noise will be minimized through site layout, and appropriate work sequencing and work hours. Dust and nuisance odors are not expected to be a problem during the excavation operation, but dust suppressants such as road watering will be implemented as necessary in the staging area and along access roads. Any traffic directly related to the sediment dredging or excavation operations will be in accordance with a NYSDEC-approved traffic control plan.

2.2.6 Submittals

After DEC notification of intent to award, the Contractor will submit the following information:

- Exceptions to the proposed work as stated in the contract documents.
- Excavation Operations Plan

- Soil Erosion and Sediment Control Plan
- Creek Diversion and Contingency Plan

3.0 SOLIDS PROCESSING

Capri Lake and Lagoon:

Solids separation includes all dewatering, conditioning, and materials handling required to prepare sediments and residual materials arising from the remediation for disposal at off-site facilities. The methods and equipment described in this section are based on removal of the contaminated lake sediments during one construction season. Payment for sediment processing and disposal will be based on the weight of solids, and a specified percentage of water weight. Therefore, flexibility exists to consider an alternate processing design after award of the Contract. Approval of the alternate processes will be contingent on a timely and conclusive demonstration by the Contractor of the feasibility of the alternate processes.

Willetts Creek:

The excavation of Willetts Creek will be scheduled later in the summer when it is drier so that material is not anticipated to require filter pressing prior to transport and disposal. Solids processing for Willetts Creek sediments will depend on the quality of gravity dewatering during excavation and may include a conditioning or bulking agent.

3.1 DESIGN BASIS

The required rate of dredging and processing was determined based on the estimated volume of sediment and on the scheduled time for completion. The schedule allows approximately four (4) months for removal of lake sediments. This schedule does not include clean-up dredging which may be needed at the end of the removal operation. The processing rates for the lake are based on the following operations and efficiency:

- 6-days operation per week,
- 12-hour per day dredging with approximately 33% down time
- Total lake sediment volume of about 21,000 cy, and
- Average solids content of about 66.8%.

Based on the above, the daily removal rate for sediments will need to average about 240 in-place cy/day. Therefore, the design basis for the solids separation and water treatment system is the following:

- Average dredge stream flow: 0.72 MGD
- Average dredging rate: 1,500 GPM
- Maximum dredge stream flow: 1 MGD
- Peak dredging rate: 2,000 GPM
- Average solids content: 8%

According to the gradation testing and analysis results, solids can be grouped in three different sizes:

- Debris, cobbles and gravels: About 19%
- Coarse and medium sands: About 40%
- Fine sands and smaller particles: About 41%

It has been reported that debris, cobbles and gravels do not contain cadmium in a concentration exceeding 1 ppm, but other particle sizes contain cadmium above the soil cleanup criteria.

3.2 TREATABILITY STUDY RESULTS

Materials characterization, bench-scale jar tests, and laboratory scale settling and dewatering tests of the sediment were performed by O'Brien & Gere Laboratories, Inc. (OBG). In these tests, a grab sample of shallow sediment was used which was collected from the southern region of the lake. Testing of this sample indicated an initial solids content of about 20% (lb-solids/lb-sediment), a neutral pH, and a specific gravity of solids of 2.23.

In dewatering tests, a sample of the sludge was diluted to about 5% solids. The diluted solids slurry was conditioned with lime at a dosage of about 7% and processed through a plate and frame filter press. The % solids content in the filter cake was about 52%. The Contractor will be responsible for verifying dewatering performance.

3.3 SYSTEM CONSTRUCTION AND OPERATION

The process flow diagram for sediment and water is shown on Figure 3-1. The processing will include, at a minimum, the following steps:

- Screening - Screening (No. 4 sieve) is needed to remove debris and big particles which might damage filter presses. The screening will remove gravels and reduce solids loading to the filter presses.

- Hydrocyclone - Hydrocyclone is used to separate coarse and medium sands (bigger than No. 40 sieve but smaller than No. 4 sieve) in an effort to reduce solids loading to the filter press and the amount of conditioning agent required.

- Filter press dewatering - Filter pressing is needed to dewater the solids separated from the dredged stream. The type of filter press is a plate and frame filter press (recessed chamber) or equivalent. According to the OBG's dewatering study results, the percent solids content in the filter cake is about 52%. The Contractor may consider other alternate dewatering methods. Alternate dewatering methods will be considered by NYSDEC only after Contract award.

The above processing steps and associated components of the process system are described below and are shown on Figure 3-1.

SOLIDS SEPARATION

Provide separate solids handling containers for TSCA and non-TSCA

Primary Screening (S-100)

Type:	Double vibrating screen with water spray
Screen size:	1/8 inch
Minimum number:	2 (parallel)
Capacity:	2,000 gpm each

Hydrocyclone (HC-200)

Type:	Double vibrating screen with water spray
Screen size:	No. 40 sieve
% solids passing:	90 %
Minimum number:	4 (parallel)
Capacity:	Combined flow of 3,000 gpm

Filter Press (F-300)

Type:	Plate and frame filter press or equivalent
Cycle:	Not to exceed 2 hours
Minimum No.	2
Conditioning agent:	Lime or equivalent

WATER TREATMENT

Equalization tank

Type:	Temporary tank
Detention time:	4 hours of the peak flow (minimum)
Minimum number:	1
Mixing:	Suspension of suspended solids

Coagulation tank

Detention time:	1.5 minutes of the peak flow (minimum)
Minimum number:	1
Mixing:	Fast mixing for effective water treatment
Coagulant:	TBD

Polymer mix tank

Detention time:	15 seconds of the peak flow (minimum)
Minimum number:	1
Mixing:	Fast mixing for effective water treatment
Polymer:	TBD

Flocculation tank

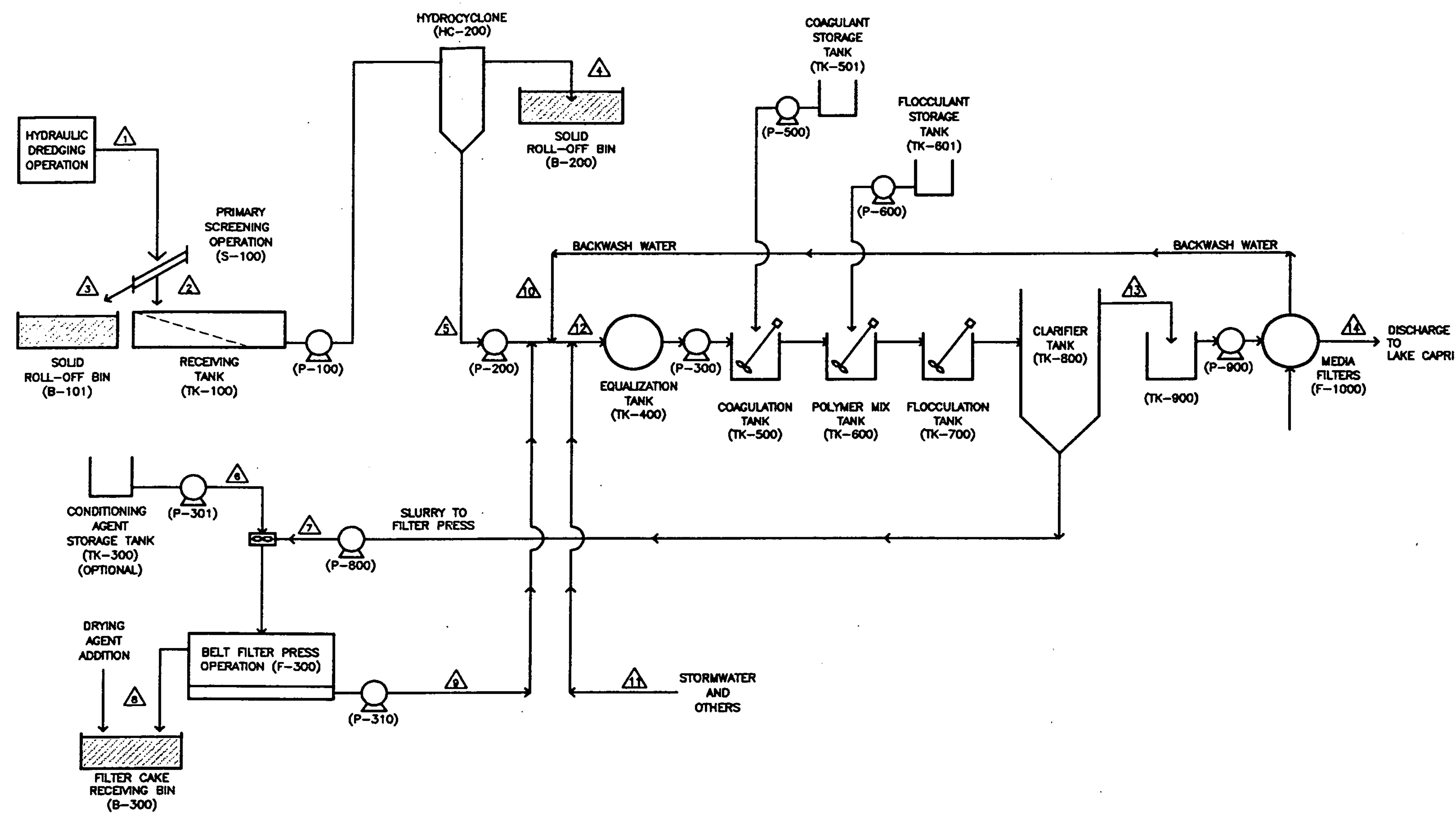
Detention time:	15 minutes of the peak flow (minimum)
Minimum number:	1
Mixing:	Slow mixing for effective water treatment

Clarifiers

Type:	Conical bottom Baffled to prevent short circuiting
Detention time:	4 hours (minimum) of the forward flow and 8 hours of the solids slurry holding time
Surface overflow rate:	TBD
Minimum number:	1

Media filters

Type:	Multi-media Pressure filter Backwash service piping Inlet distributions Flow collectors Man-way
Media:	Multi-media
Loading rate:	5 gpm/sf (maximum)
Minimum No.	3 (parallel)



TAG NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14
DESCRIPTION		HYDRAULIC DREDGE	PRIMARY SCREENING	SOLIDS REMOVED FROM PRIMARY SCREENING	SOLIDS REMOVED FROM HYDROCYCLONE	HYDROCYCLONE EFFLUENT	CONDITIONONG AGENT ADDITION	FEED TO FILTER PRESSES	FILTER CAKE	FILTRATE	FILTER BACKWASH WATER	STORMWATER AND OTHERS	INFLUENT TO EQUALIZATION TANK	CLARIFIER EFFLUENT	SAND FILTER EFFLUENT
FLOW CAPACITY	AVERAGE DAILY - (MGD)	0.720	0.703	0.018	0.042	0.661	0.008	0.369	0.042	0.327	0.023	0.075	1.085	0.717	0.717
	PEAK FLOW- (GPM)	2,000	1,951	49	116	1,835	11	511	58	454	31	78	1,480	969	969
SOLIDS CONTENT	% SOLIDS - (TYPICAL)	8.00%	6.68%	40.00%	40.00%	4.30%	20.00%	7.00%	52.00%	0.01%	0.12%	0.20%	2.62%	0.0040%	0.0002%
	AVERAGE DAILY SOLIDS PROCESSED - (TONS / DAY)	240.31	195.85	44.46	78.34	117.51	8.28	118.27	126.41	0.14	0.11	0.62	118.39	0.12	0.00001
	MAXIMUM DAILY SOLIDS PROCESSED - (TONS / DAY)	320.42	261.14	59.28	104.46	156.68	11.02	157.43	168.27	0.19	0.15	0.62	157.59	0.16	0.00002
DESIGN HOURS OF OPERATION - (HOUR)		12	12	12	12	12	16	16	16	16	16	16	16	16	16

PLOT DATE: 12-01-98

FIG_3-1.DWG

FIGURE 3-1

WASTEWATER TREATMENT SYSTEM

PROCESS FLOW DIAGRAM

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Screening: Slurry received from the dredge will pass through vibrating screens with not less than two decks and a final solids separation at No. 4 sieve screen size. The final screen size may be adjusted by the Contractor based on test data or operational experience gained at this site if approved by the Engineer. Each screen deck will be fitted with wash heads. Coarse materials removed by the screens (the "Screenings") will be collected on a concrete pad and allowed to drain prior to being characterized and loaded into bulk containers or trucks for shipment to disposal. Slurry passing the screens will be pumped or gravity discharged to hydrocyclones. Since the screens will receive material directly from the dredges, the screens will be operated only during dredging. At least two (2) screens must be provided to maintain proper operations.

The Contractor will be required to coordinate sediment processing with on-going dredging operations. For purposes of sizing the sediment processing system, operations are scheduled to run 16-hours per day, six days per week. To facilitate operation of the system and to attain required process rates, the Contractor will need to employ equalization steps within the processing to maintain a reserve of solids for filter press dewatering during times when dredging is not occurring. Equalization measures will be subject to the Engineer's approval. In the event equalization storage results in settling and accumulation of solids, the storage will be provided with a reliable means of regularly removing the settled solids to maintain the function of the equalization storage.

Hydrocyclones: Screened dredge slurry will be transferred into hydrocyclones where particles readily removable (in particular, particle sizes larger than No. 40 sieve but smaller than No. 4 sieve) will be separated from the dredge stream. Hydrocyclones will receive the flow during dredging. A minimum of four (4) hydrocyclones should be used and a combined capacity should not be less than 2,000 gpm. The effectiveness of hydrocyclones increases as flow decreases. The hydrocyclone effluent is further treated and addressed in Section 4.0 (Water Treatment).

Filter Press Dewatering: Solids from the sediment processing operation (in Section 4.0) will be dewatered in a series of filter presses. The presses will be operated principally for the purpose of dewatering the clarifier underflow, but will be suitable for dewatering solids from other sources as well. In the event other alternate dewatering methods are proposed, similar capacity requirements will be met.

The filter presses will be located on a pad capable of containing liquids and solids discharged from the presses and allowing convenient and routine collection of the discharged liquids and solids. Feed to, and solids discharge from, the presses will be conditioned as needed to facilitate processing. Conditioners and their use will be subject to the Engineer's approval.

Sediment Dewatering Building: Temporary sediment dewatering building will be constructed to house portions of the sediment processing operation to reduce noise levels and to facilitate orderly operations. The floor of the process building will be lined to contain spills. The building will be provided with a ventilation system to maintain positive air flow through the building.

System Operation and Maintenance: The Contractor will be required to maintain competent supervision of the processing operation at all times. Dewatering operations will be coordinated with dredging so as to not produce unnecessary down-time for either operation.

Modifications to the dewatering system construction and operation will be subject to the Engineer's approval. Proposed modifications will be submitted in a timely manner and with sufficient supporting documentation to allow review and approval. Odors and fugitive air emissions will be controlled throughout the operation through a combination of construction practices and engineered control systems. The Contractor will maintain operating logs of a form approved by the Engineer to document process rates and volumes, operating problems, and service required or completed.

3.4 ENVIRONMENTAL COMPLIANCE

Liquid storage and transfer operations will be provided with secondary containment structures. Although not strictly applicable, requirements applicable to Petroleum SPCC will be followed.

The Contractor will be required to submit plans for construction, removal, and verification sampling at transfer points, process and storage areas, and any other work areas which have the potential to become contaminated during operations.

Processed solids must meet the paint filter test to allow land disposal. Subsequent processing at the disposal facility will not be allowed as a means of achieving this criteria.

3.5 ENVIRONMENTAL HEALTH AND SAFETY CONTROLS

The project will be completed so as to minimize the potential for contaminant exposure to on-site workers and off-site residents.

Health and safety for workers involved in the remediation will be the responsibility of the Contractor. Prior to mobilization, the Contractor will be required to submit a Health and Safety Plan (HSP) in conformance with 29 CFR 1910. During construction, conformance to the HSP will be monitored and deviations noted in the daily records.

Access to the property will be controlled through the installation of temporary chain link fence and, as necessary, security guards.

3.6 SUBMITTALS

After NYSDEC notification of intent to award, the Contractor will submit the following information:

- Exceptions to the proposed work as stated in the Contract documents.
- Proposed subcontractor or equipment suppliers for the filter presses.

After Contract award, Contractor will submit the following:

- Proposals for alternate construction, if any, which go beyond the normal scope of "or equal" substitutions.

- Proposed equipment lay-out for sediment processing.

- List of subcontractors and their qualifications

- Plan for field testing not less than 1-ton of sediments to verify dewatering characteristics as they relate to design and operation. This Plan is subject to NYSDEC review and approval. On approval, Contractor will implement the test plan and submit results to NYSDEC. Based on the testing, Contractor may propose, or NYSDEC may direct, modifications to the plan for processing of lake sediments.

- Design details for the solids handling system.

4.0 WATER TREATMENT

A significant amount of contaminated water will be generated in the course of dredging and processing of the removed sediments. The Contractor will construct, operate, maintain, and monitor a water treatment system in accordance with limits and conditions set by NYSDEC.

4.1 DESIGN BASIS

The water treatment system will be constructed to treat water generated during remediation. Sources of water include, but are not limited to:

1. Primary solids separation process flow (hydrocyclone effluent);
2. Filter press filtrate;
3. Multi-media filter backwash water;
4. Storm water run-off from limited areas; and
5. Decontamination water and water from other miscellaneous sources.

Water from the above sources is expected to contain a number of contaminants which must be removed prior to discharge to Willetts Creek. Final NYSDEC effluent limits for the project have been set. The design basis for water treatment is summarized as follows:

Parameters	Influent* (Approximate Concentrations)	Discharge Limits
Dredge stream flow	Average: 810,000 gpd Peak: 2,000 gpm	1 mgd
pH (s.u)	6.5	6 - 9
TSS	8%	20 mg/l
TDS	Not tested	Monitor
Settleable solids	Not tested	0.1 mg/l
Aluminum	720 mg/l	0.36 mg/l
Cadmium	25 mg/l	0.017 mg/l
Chromium	2.6 mg/l	0.132 mg/l
Cyanide	<0.01 mg/l	0.060 mg/l
Iron	1,760 mg/l	10 mg/l
Lead	52 mg/l	0.014 mg/l
Zinc	84 mg/l	0.72 mg/l

* Based on the available information. Concentrations are expected to vary.

As shown in the table above, the maximum flow that can be discharged into the lake is 1 MGD. Therefore, the water treatment system capacity would be about 1 MGD.

The parameters of concern include suspended solids, cadmium, chromium, aluminum, iron, lead and zinc. The metals of concern are mainly in particulate form, which means that if the solids are removed, then the metals will also be removed. The limited analytical information indicates that dissolved aluminum and lead concentrations may exceed the discharge limits. Additionally, treatment may be required to correct water quality due to additives the Contractor applies in processing (e.g. pH or others).

Of the contaminants potentially of concern, the metals of concern will dictate the design of the water treatment system. Due to the tendency of the metals of concern to be carried on particulate matter in the water, the treatment system is designed for a high efficiency of solids removal.

4.2 WATER TREATMENT SCHEME

The hydrocyclone effluent will be pumped into the equalization tank where filter press filtrate, sand filter backwash water, storm water and others are also collected. The equalization tank will feed the equalized water into the coagulation and flocculation tanks followed by the settling tank. Flocculated materials will settle in the settling tank. The settling tank effluent will be pumped into media filters and will be discharged to the creek, while the settling tank underflow will be pumped into plate and frame filter presses for dewatering.

Minimum unit sizing specifications contained herein are based on the minimum sediment processing rates specified in Section 3.0. In the event the Contractor generates water at higher rates than those on which the design is based, the sizing of water treatment components will be increased accordingly. For modifications to the system described here, Ten-State Standards for potable water pretreatment and filtration will be considered applicable, unless specifically waived by the Engineer.

The water treatment system is designed to process the maximum anticipated daily flows from the lake sediment processing, and will be able to process the average daily dredge stream flow of about 0.81 MGD on a 16-hour basis and the maximum daily flow of about 1 MGD. Storm water retention capacity will be provided sufficient to contain 100% of the water from a 2-inch rainfall over all contaminated or potentially contaminated work areas.

The system design includes process arrangement and minimum unit sizes that will, if properly operated and maintained, routinely meet effluent limits. Since operations and maintenance are as critical as proper design to meeting the effluent limits, the Contractor will be required to maintain the system in good working order. The above specifications present minimum design requirements, and the Contractor will retain all responsibility for construction, operation, and maintenance of the system to meet effluent limits.

4.3 SYSTEM CONSTRUCTION

The processing system will consist of equalization, coagulation/flocculation, separation, and filtration. The treatment system process flow diagram is shown on Plate 2. In the event unit loading rates exceed those shown on the process flow diagram, the Contractor will increase the unit capacity or provide additional treatment steps unless these design requirements are waived by the Engineer.

4.3.1 Equalization

Equalization is provided to dampen solids loading and flow variations to enhance performance of the downstream units by feeding the flow at a constant rate. A minimum retention of the equalization tank should be 4 hours for the peak dredge stream flow, equivalent to about 500,000 gallons. The equalization tank will receive filtrate from filter presses (as discussed in Section 3.0), collected storm water, multi-media filter backwash water and other miscellaneous water and will have a mixing mechanism that will prevent suspended solids from settling.

4.3.2 Coagulation and Flocculation

The Contractor will select and use suitable coagulant/flocculent chemicals to facilitate effective settling effectively in the separation step. The specified effluent limits may be supplemented in the event the chemical proposed for use poses potential water quality concerns. The Contractor will be required to install, operate, and maintain feed and process systems as needed to properly apply the chemicals. Chemical application may require flash mixing in the fast mix tank to apply chemicals and flocculation tank with low shear mixing units to produce particles settleable in the settling tanks.

4.3.3 Solids Separation/Settling

The settling tanks will receive the flocculated materials. During daily dredging operations, solids will accumulate in sufficient quantity to feed the filter presses after dredging is completed for the day. Based on jar tests of about 2% solids content slurry prepared for bench tests, the settling tanks are designed to provide an effective overflow rate not greater than 0.35 gpm/SF and a minimum effective hydraulic retention time of about 3 hours. The effective retention time is the total tank volume, less the freeboard and settled solids volume, and multiplied by a suitable settling efficiency factor such as 75 % for well baffled tanks. If alternate configurations are used for the tanks, suitable efficiency factors will be used to calculate effective overflow rates and retention times.

Basins of a suitable design and meeting the design intent of the requirements below may be considered as an alternate to conventional tanks. The materials, design, and construction of the tanks and piping systems will be such as to function without failure for the duration of the project, and will be subject to the Engineers approval. At least two settling tanks will be provided. The settling tanks will be provided with:

- influent and overflow baffles to control short-circuiting of flow,

- conical floor, mechanical collection devices, or other reliable means of collecting settled solids for further dewatering,

- coagulant and polymer feed systems as proposed by the Contractor and approved by the Engineer,

- sediment discharge pumps and control and isolation valving on all lines,

- odor control covers as necessary, which provide means of access to service the tank internal components.

- stable footings within a bermed area to provide secondary containment for 110% of the largest tank volume.

Overflow from the settling tanks will have a solids content not greater than 0.0004% (40 ppm by weight) and will be pumped into the multi-media filters. The underflow will be pumped into the filter presses for dewatering after being mixed with a conditioning agent.

4.3.4 Multi-media filters

Pressure type multi-media filters will be utilized for filtration of water from the settling tanks. The filters will be fed by pumps. The filters will contain graded media suitable for removal of fine particulate matter. Filter media will have an effective size no greater than 0.6 mm, a uniformity coefficient not greater than 1.65, and be supported by Torpedo sand and underdrain gravel of grading designed for proper filtration. The beds will be provided as no less than three (3) parallel units. The filter surface loading rate will not exceed 5 gpm/SF. Housings will have a minimum service pressure rating of 75 psi and will be provided with inlet distributors, flow collectors, and man way. Backwash service piping will be provided as routine connections.

Multi-media filters will be back washed on a daily basis regardless of pressure loss in order to limit the migration of fine sediments carrying the contaminants of concern through the bed. Raw lake water or finished effluent will be used for backwash, and the backwash flow will be returned to the equalization tank. Filter media will be replaced as frequently as necessary to maintain the design hydraulic and removal efficiency requirements.

4.4 EFFLUENT DISCHARGE

Effluent discharge will be continuously monitored for flow rate. In the event discharge exceeds the design flow rate of the system, the system will be immediately shut down and problems corrected.

The system effluent will be sampled according to the SPDES discharge permit requirements.

4.5 SUBMITTALS

After NYSDEC notification of intent to award, the Contractor will submit the following information:

- Exceptions to the proposed work as stated in the Contract documents.
- Proposed subcontractor, if any, who would operate the systems.

After Contract award, Contractor will submit the following:

- Proposals for alternate construction, if any, which go beyond the normal scope of "or equal" substitutions.
- Proposed equipment lay-out for water processing.
- List of subcontractors and their qualifications
- Design details and shop drawings for major system components, including equalization tank, coagulation/flocculation systems, solids separation/settling tanks, and media filters.

5.0 TRANSPORT AND OFF-SITE DISPOSAL

5.1 TRANSPORTATION

The Contractor will transport all solid and any hazardous wastes resulting from remediation to off-site disposal facilities as described in Section 5.2.

5.1.1 Design Basis

During the course of the project it will be necessary to transport and dispose of waste materials arising from removal of the Lake Capri/Willetts Creek sediments and associated work. It is estimated that approximately 200 cy to 400 cubic yards (cy) of material will be generated per day as a result of the lake dredging and processing. Waste material will be disposed of at a permitted solid waste landfill and RCRA permitted hazardous waste landfill as outlined in Section 5.2 of this report. The calculation supporting daily waste generation rates are included in Appendix A.

Waste materials will be processed, placed in stockpiles, covered, and secured. Each stockpile will be sampled by the Contractor for moisture content (for measurement and payment basis) and disposal parameters. Based on the TCLP testing for cadmium concentration, the material will be disposed as solid or hazardous waste. All preliminary treatability testing indicate that the processed sediments are non-hazardous. Any excess processing performed by the Contractor to meet disposal facility requirements will be done by the Contractor at his expense. Stockpiles will be removed from the site within five calendar days of the time a stockpile is secured.

5.1.2 Design Parameters

Each transportation vehicle will have a transporter's permit pursuant to the provisions set forth in 6 NYCRR Part 364 and all other applicable out of state regulations as necessary.

Manifesting and transportation of all hazardous waste, if any, will be in accordance with 6 NYCRR Part 372 and 40 CFR Part 263. The Contractor will be responsible for providing complete and accurate documentation for the signature of NYSDEC or their authorized representative. The completed documents will accompany all shipments of hazardous waste while in transit at all time.

Transportation of non-hazardous regulated waste will be in accordance with Federal Department of Transportation (DOT) regulations 49 CFR 172 and will be transported under a standard bill of lading.

5.1.3 Facilities and Operations

Loading facilities will be prepared and maintained to accommodate transporter traffic. The facilities and their operation will be as described below.

On-site Traffic: Trucks will enter and leave loading areas along designated routes. Routes will be established in the Facility Operations Plan (Section 6.0) and may be modified in the field with the Engineer's approval. The routes will be selected which are most convenient for routine operations.

Testing Prior to Shipping: Although preliminary treatability study TCLP analysis for cadmium of filter cake samples reported passing results, filter cake from the filter presses will be sampled hourly for collection of composites to be tested for TCLP cadmium on a daily basis. These results will be used to verify if waste stream is non-hazardous for the purpose of segregating material in the soil stock piles. The testing may be reduced with permission of the Engineer as dredging/processing progresses and the analyses are reviewed. Waste will be tested at a frequency not less than one sample per 500 cy for Paint Filter, moisture content and other disposal parameters as required by the disposal facility. Sampling and analysis will be the responsibility of the Contractor. All samples will be collected according to the QA Plan and under the Engineer's observation. Results will be made available to the Engineer at least one day prior to the shipment of the material off site.

Shipping Containers: Shipping containers will be DOT approved for the class material being transported. In addition, depending on the liquids content of the material being transported and the potential for leakage during transport, the Contractor may be required to provide temporary polyethylene lining in the trucks or place absorbent materials in the trucks prior to and/or after loading. All trucks will be covered with tarps prior to leaving the site. All trucks will be required to display appropriate placards and possess NYSDEC hauler permits prior to loading. Containers will be inspected prior to loading and prior to leaving the site.

Truck Decontamination: The site will have a decontamination zone. Trucks, after being loaded, will will require decontamination of their tires and outer body prior to leaving the site. The loading area will be maintained in as dry a condition as practicable to limit the accumulation of debris on trucks. A truck wash station will be provided, used, and maintained. Following the truck wash, vehicles will be subject to inspection prior to departing from the site. Manifests will not be released to drivers prior to verification of decontamination and mandatory documentation as described above. Debris and water resulting from truck decontamination will be considered to be contaminated and will be treated prior to discharge.

Traffic Control: Local and construction traffic will be controlled during the project. The Contractor will be responsible for all signage and personnel needed for directing traffic and posting detours into and around the West Islip High School and its back south lot which is designated as the treatment and staging area. Depending upon the disposal facility chosen, waste transporters will be required to follow a route either to the Long Island Expressway or Sunrise Highway which is the most direct route and which causes the least disturbance to the surrounding areas. The proposed truck transportation routes are shown on Figure 5-1.

Dust Control: Water will be applied to any disturbed areas as necessary to minimize fugitive dust emissions on site. Calcium chloride may be used as an alternate dust control agent. The Contractor will supply a suitable water truck with spray bar to control dust. Procedures will be implemented to control the tracking of soil from the site to public roads and to regularly clean up soil which is tracked off site.

FIG-5-1.DWG PLOT DATE: 12-1-98

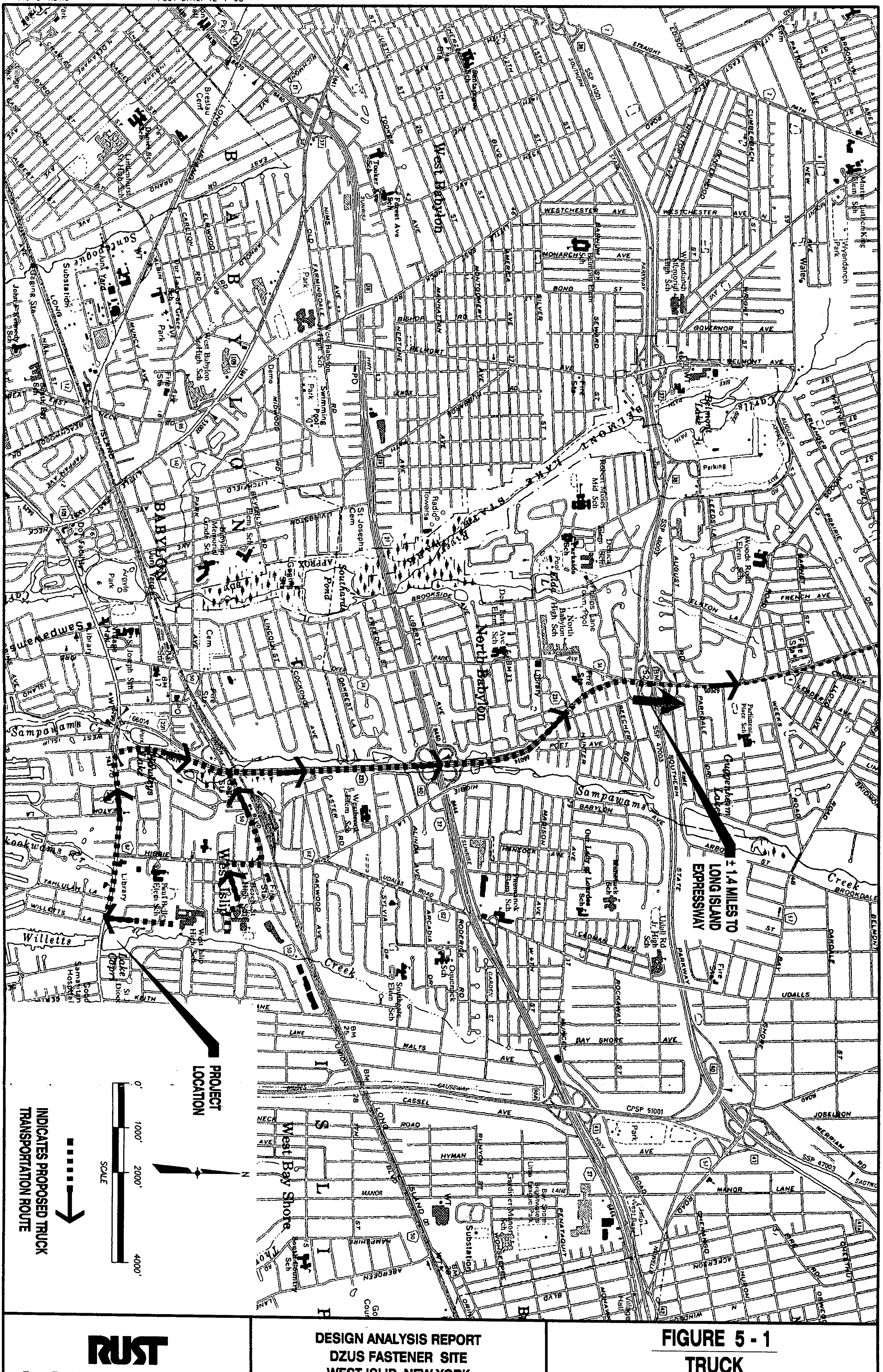

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FIGURE 5 - 1
TRUCK
TRANSPORTATION ROUTES

Weigh Scale: The Contractor will supply a scale for weighing of trucks. All trucks entering and leaving the site will be weighed. All loads of waste admixture will also be weighed on delivery to the site. The scale will be provided and maintained with a current NYSDOT certification. The Contractor will coordinate with the Engineer to verify accuracy of the scale on a weekly basis using a local commercial NYSDOT certified scale.

5.1.4 Environmental Health and Safety Controls

In the event of a spill or discharge of hazardous waste during transportation, the transporter will take immediate action to protect human health and the environment. The appropriate action will include but not be limited to the following: notify local and state authorities, dike the spill area if necessary, barricade spill area to prevent human contact, followed by spill clean-up.

Run-off water from decontamination and traffic areas will be directed to the water treatment facility for processing prior to discharge.

Truck loading operations will be conducted in a manner so as to minimize fugitive dust and odors. This will include enclosure of the loading operation or other equivalent measures as approved by the Engineer.

5.2 DISPOSAL FACILITY

All solid and hazardous wastes resulting from remediation will be transported off site and disposed at permitted facilities.

The Contractor will be required to provide documentation on the proposed disposal facility including: facility permit, record of environmental and H&S compliance and violations for the past two years, approved waste profiles, and other documentation as may be needed to verify the suitability of the disposal facility. Facilities must conform to all applicable Federal, State, and local permits and laws.

Cadmium impacted sediments may be segregated and handled as separate disposal types; solid waste filter cake material passing TCLP cadmium criteria which will be disposed at a permitted landfill; segregated gravity drained sands retained on coarse screening which may be returned to the lake if cadmium concentrations are below 1 ppm.; and segregated gravity drained sands retained on coarse screening with cadmium concentrations greater than 1 ppm which will be disposed of at a permitted landfill. The possibility exists that some filter cake material may not pass TCLP for cadmium. Any material so designated will require disposal as hazardous waste.

The disposal facilities will be subject to periodic audits by the Engineer. The disposal facility will be required to provide a weekly certification that the materials received meet facility permit requirements such as free liquids content or TCLP cadmium concentration. The disposal facilities will supply a weekly accounting of the loads of waste received, including manifest numbers, bill of lading numbers, load weights as received, truck identification information, and receipt date. The Contractor will be responsible for resolving any discrepancies between loads shipped and received.

5.3 SUBMITTALS

Bidders will be required to submit the following items for review and approval:

- List of proposed disposal facilities.

Upon Award, Contractors will be required to submit the following items for review and approval:

- Facility Operation Plan Sheet (as required by Section 6).
- Shop Drawings for the equipment decontamination facility.
- Compliance and other qualifications information for proposed disposal facilities.
- List of proposed trucking subcontractors
- QA Plan for the laboratory performing disposal acceptance analysis
- Traffic control plan.

6.0 SITE ACCESS, SERVICES AND LAYOUT

6.1 SITE ACCESS

General access to Lake Capri and the lagoon and Willetts Creek is restricted due to the residential nature of the site. All lake adjoining properties are joint owners of the lake and lagoon. Prior to commencing work, all property easement agreements with the town, school board and residents will need to be in place to allow the Contractor to mobilize equipment and personnel. Operation areas and potential access locations have been designated based upon the operations to be conducted, several ground reconnaissances, and an aerial photo review of the site which would allow for practical access.

6.2 SITE SERVICES AND LAYOUT

Lake Capri and Lagoon

Prior to mobilization, the Contractor will submit, and revise as directed, a proposed Facility Operation Plan which shows the location of all temporary facilities anticipated to be necessary for the work. Plate 2 shows the limits of the areas available for construction of the treatment systems, facilities and operation areas specifically for the Lake Capri and lagoon sediment removal. This figure shows the existing locations of important site features including:

- West Islip High School building and south parking lot;
- Property lines;
- Bulkhead shoreline protection areas and bulkhead supported islands;
- Existing roadways;

Plate 2 also shows the proposed location of:

- Lake Capri and lagoon sediment removal work areas including discharge pipeline location running up Willetts Creek from the lake to the West Islip High School south parking lot area (treatment area);
- The solids processing and water treatment systems (access agreements with the West Islip High School have not been finalized but it is assumed that the south parking lot will be available for Contractor use);
- The proposed area for comfort station and construction trailers;
- Access to the lagoon excavation area (access agreements with property owners have not been finalized but it is assumed that access to the lagoon for dredge and/or mechanical removal is most easily accessed from the designated location;

- Dredge launch location from Montauk Highway;
- Lake access/egress areas for equipment handing and deployment (access agreements with property owners have not been finalized but it is assumed that these locations offer the most practical and functional access to the site for operational activities).

The proposed locations for the features listed above have been selected based on practicality and assumed access agreements. As NYSDEC receives more information about property access agreements, more specific requirements for site layout will be placed in the Plans and Specifications. Presently, it is assumed that the Lake Capri dredging operation will be conducted mainly from the water and limited shoreline/property access will be required. A portable docking platform constructed along the southern shoreline will provide lake access and room for equipment handling and service to the dredge. Based upon location and room, several property lots were chosen as possible lake accessible routes, whereby controlled transfer of personnel and equipment will take place to facilitate operations. In the lagoon, it is assumed that possible access to and removal of sediments will be conducted from the shoreline running adjacent to the eastern side of the lagoon.

The Contractor's site layout will delineate the operational work zones, decontamination zones and will illustrate methods for separating hazardous work areas from non-hazardous areas. During the course of operations, the Contractor will modify the site services and layout as needed to facilitate the work.

Willetts Creek

Included in the Facility Operation Plan, the Contractor will prepare a section which shows the location of all temporary facilities anticipated to be necessary for the work in the stretch of Willetts Creek north of the Burling Lane footbridge. Plate 3 shows the limits of the areas available for construction of the operation areas specifically for the upper Willetts Creek sediment removal. Proposed access to the creek are indicated, as well as a proposed work area where trucks will be able to access to collect excavated materials for bulking, material testing and subsequent removal.

6.3 IMPLEMENTATION

Prior to commencing work, the Contractor will arrange for temporary utility services (including electric, water and sewer), mobilize equipment and materials, and establish appropriate environmental and health and safety controls. Upon the Engineer's determination that mobilization activities have been completed, the Contractor will commence removal of sediment.

Traffic Areas: Traffic areas will be prepared where necessary, with a suitable surface which will consist of geotextile and 3 to 6 inches of 2-inch run of crusher (ROC) depending on traffic loading. Traffic and work areas will be maintained during construction to allow access for emergency vehicles, prevent the spread of potentially contaminated materials, and keep the area in a condition conducive to completion of the work. Personnel and traffic control will be maintained on site through posting of signs and installation of physical barriers. Personnel barriers will consist of high-visibility fence or more substantial barriers as needed. Traffic barriers will consist of concrete barriers, or more substantial barriers as needed.

Utilities: The Contractor will arrange for, connect, pay for, and remove at the end of work all temporary electric utilities, potable and service water, sanitation, temporary lighting, and other utilities as may be needed for completion of the work. Electricity is available on poles adjacent to the site. Potable water is available at the street from the City distribution mains. Service water may be obtained directly from the effluent discharge as approved by the engineer. The Contractor will be required to provide sanitary facilities and trash receptacles for employees and NYSDEC personnel at a frequency as required by State Health Code and OSHA. One office trailer and one box (storage) trailer will be provided for the combined use of the NYSDEC and the Engineer. All services will be temporary and will be removed upon completion of work. All facilities will be returned to their original condition.

Decontamination Facilities: The Contractor will arrange for, connect, pay for, and remove at the end of work as directed all personnel and equipment decontamination facilities as may be needed for completion of the work. The specifications provide detailed requirements for personnel decontamination facilities. Equipment decontamination facilities will be provided and maintained by the Contractor to prevent contamination from being spread off-site. All equipment which the Contractor demobilizes from the site will be cleaned by pressure washing or other approved means so as to remove all soils and debris. The Contractor will be required to provide the NYSDEC with a certificate of decontamination prior to taking each piece of equipment off site. Trucks hauling waste off-site will be cleaned as described in Section 5.0.

6.4 STAGING AREA

The site layout will provide for staging of materials storage and office trailers. The office trailers will be located at the treatment area. The Contractor may arrange for off-site staging of materials and equipment upon Engineer's approval.

6.5 OPERATIONS AREAS

Sediment removal for Lake Capri will be conducted by hydraulic dredge/s placed into Lake Capri. The Contractor will construct discharge pipelines from the dredge/s along Willetts Creek, north to the West Islip High School parking lot (staging/treatment/process area). Sediment removal from the lagoon will encompass dry land excavation and or small or hand operated hydraulic vacuums, with transfer of sediments hydraulically or by container to the West Islip High School parking lot. Sediment removal from Willetts Creek will take place with dry land mechanical excavators, with staging adjacent to the creek prior to testing and removal. These operations areas will be protected to prevent spills or contaminated run-off from entering surface waters. If routine handling of dredge materials has the potential to contaminate the operations area, the operations area will be underlain by membrane and will be decontaminated and sampled at the conclusion of work.

Since operations areas will be in the vicinity of public schools, protective fencing with secure gates will be placed around the operations area at the proposed West Islip High School parking lot. The operation work area in Willetts Creek will not be enclosed by any fencing.

Sediment processing operations may need to be carried out in temporary enclosures such as Sprung Buildings or approved equivalents to meet noise requirements. The floor of the enclosures will be constructed with a base geomembrane sloped to a floor collector sump, and overlain by crushed stone. Sediment processing buildings will be equipped with lighting and ventilation. Construction of the enclosure will be such that the ventilation system can be connected to optional air filters for odor control. At the conclusion of work, the buildings and floors will be cleaned and removed and the underlying soils sampled, removed and properly disposed.

Gravity dewatering areas for coarse segregated materials will be constructed in a location in the process area to minimize potential drainage to surface water or the surrounding operations area. Excavated coarse screened materials will be placed in covered roll-offs prior to disposal off-site. The dewatering areas will be equipped with a double lining system meeting the requirements of 6 NYCRR 373.1. At the conclusion of work, these areas will be cleaned and removed.

Operations will be conducted in a manner so as to minimize air emissions, odors, excess noise, and vibrations in off-site residences. Noise levels will be maintained at less than 50 decibels at 10 feet from the property line. Truck traffic will be limited to set hours. In the event complaints are received from off-site residents, the Contractor will take all reasonable steps as directed by NYSDEC to curb the conditions causing complaints.

6.6 SUBMITTALS

Following Contract Award, the Contractor will be required to submit the following items for review and approval:

- Facility Operation Plan (site layout, utilities connection, parking areas, gravity dewatering area, stockpile locations, etc.);
- Shop drawing for decontamination facilities (soil and water);
- Stormwater Management Plan;
- Erosion Control Plan
- Health & Safety Plan
- Quality Control (QC) Plan

7.0 SITE RESTORATION

Site restoration activities will include the disturbed dredge areas, and access and support areas. Wetland mitigation will be implemented in the jurisdictional wetlands.

Dredge Areas

With one exception, the three areas of sediment removal, i.e., the lake, lagoon and Upper Willetts Creek, will not be backfilled following sediment removal. They will remain in a deepened state and may eventually become filled in as natural sediment depositional processes occur. The one exception is along the lake shoreline adjacent to existing bulkheads. Any sediment removed from adjacent to the bulkheads will be promptly replaced with clean granular fill in the remote event that the contaminated sediment was providing lateral structural support.

Access and Support Areas

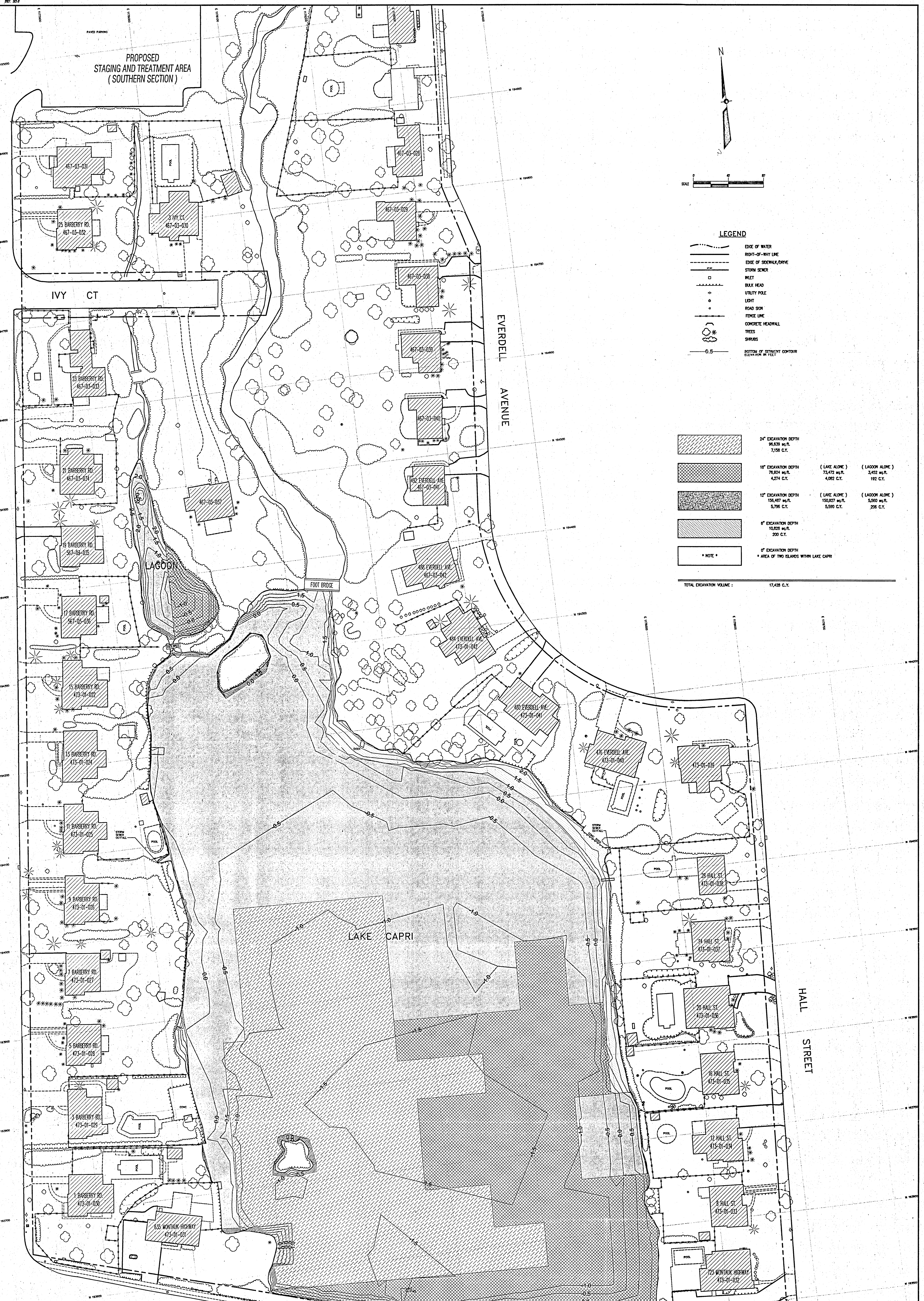
Subgrade and vegetation disturbances adjacent to the sediment removal and staging areas will be kept to a minimum insofar as practicable. Areas that are disturbed will be restored to their pre-remediation condition. This will include, as necessary, but is not limited to, the removal of temporary structures and fills, replacement of topsoil or asphalt paving, regrading of topographic contours, re-planting of vegetation, and restoration or replacement of structures.

Wetland Mitigation

It is inevitable that some clearing of wetland vegetation will be necessary in order to accomplish the work. Areas where this occurs on private property will be restored to pre-remediation conditions by re-plantings. It is anticipated that wetland mitigation efforts on public property, i.e. the Senior High School, Junior high School and Town property, will be limited due to the relatively low permanent impact to the wetlands along Willetts Creek.

Anticipated impacts to the wetlands will be the removal of vegetation in a few designated areas along the upper part of the Upper Willetts Creek stream bank to provide construction equipment access to the creek , and the removal of vegetation within the stream bed. An additional minor impact will be the removal of not more than the top 12 inches of contaminated sediments encountered within creek and the associated deepening of the creek. Vegetation removed to provide access will be re-planted with similar stock.

The vegetation along the creek banks consists primarily of willows, jewel weed and phragmites. The areas along the stream bank that will be disturbed due to construction activities will be allowed to re-vegetate naturally. The vegetation within Willetts Creek will also be allowed to re-vegetate naturally. The adjacent stream bank vegetation will provide the seed source for the regeneration of the new vegetation within the stream bed. The substrate that remains after the excavation should be generally similar to the sediment that will be removed and will be suitable for the establishment of the new vegetation. Erosion along the stream banks should not be of concern because the stream bank vegetation will not be removed entirely, therefore it will maintain a stable stream bank, not conducive to erosion.



NOTES

1. MAP COMPILED FROM: "LAKE CAPRI – WEST ISLIP, N.Y. TOPOGRAPHIC SURVEY OF LAKE CAPRI", AS PREPARED BY JOY CONTRACTORS, INC. STATEN ISLAND, N.Y., DATED 5/7/98, LATEST REVISED 7/17/98; GPS GROUND CONTROL AND MAPPING PERFORMED BY GEOD CORP.; FIELD OBSERVATIONS BY RUST ENVIRONMENT & INFRASTRUCTURE.
2. STREET LINES SHOWN ON THIS MAP WERE TAKEN FROM RECORD ROAD MAPS PREPARED BY SUFFOLK COUNTY DEPARTMENT OF PUBLIC WORKS, DATED 11-30-72
3. COORDINATES ARE NAD 83-92/NAVD 88 FEET NEW YORK, LONG ISLAND 3104.

NO	REVISIONS	DRN	CHK	DATE

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DES	-
CHK	-
APP	-

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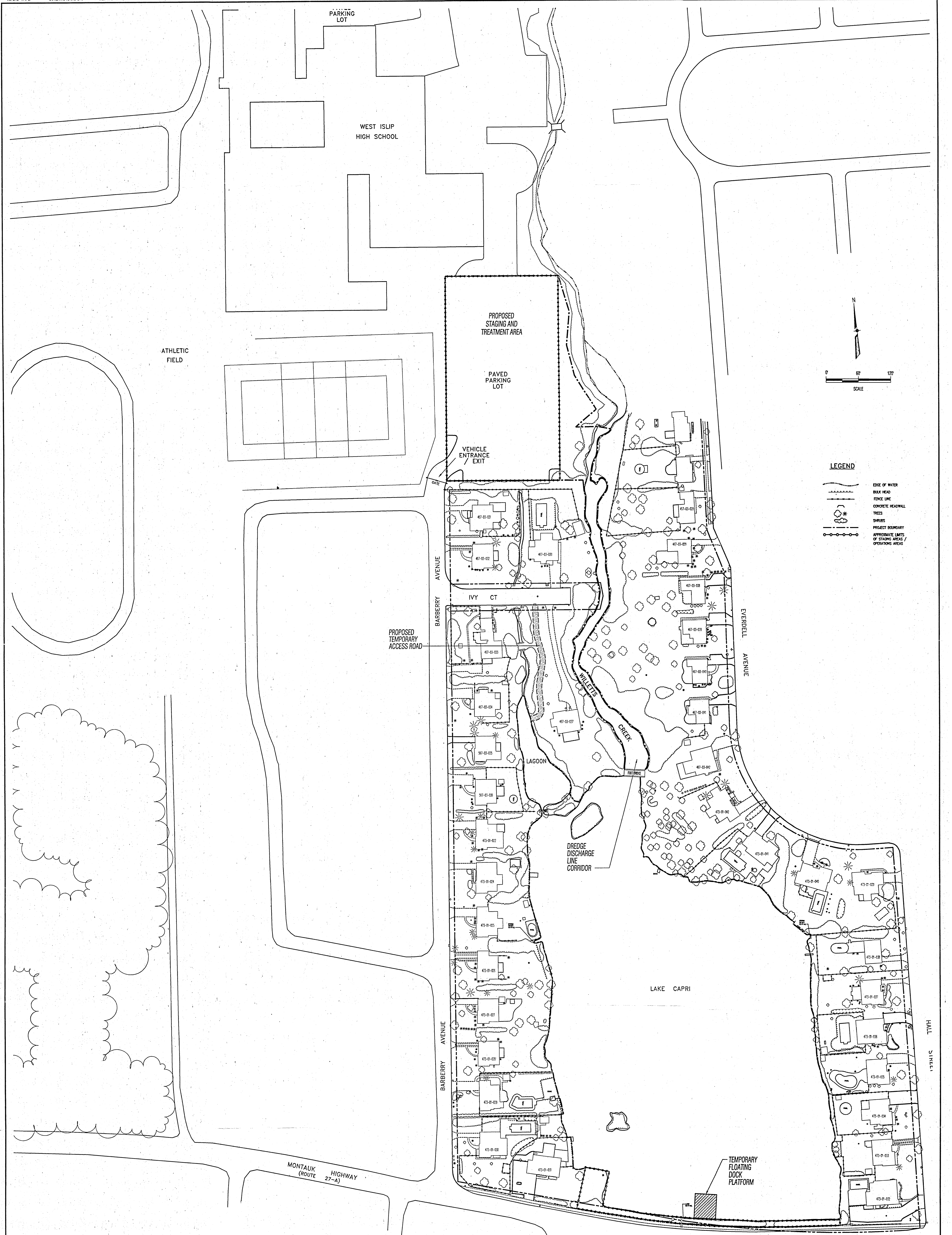
BOTTOM OF SEDIMENT PLAN
LAKE CAPRI

RUST
Rust Environment & Infrastructure Inc.

DESIGN ANALYSIS REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	DEC. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 01
PLATE NO:	01
DRAWING NO:	PLATE - 01



NO	REVISIONS	DRN	CHK	DATE

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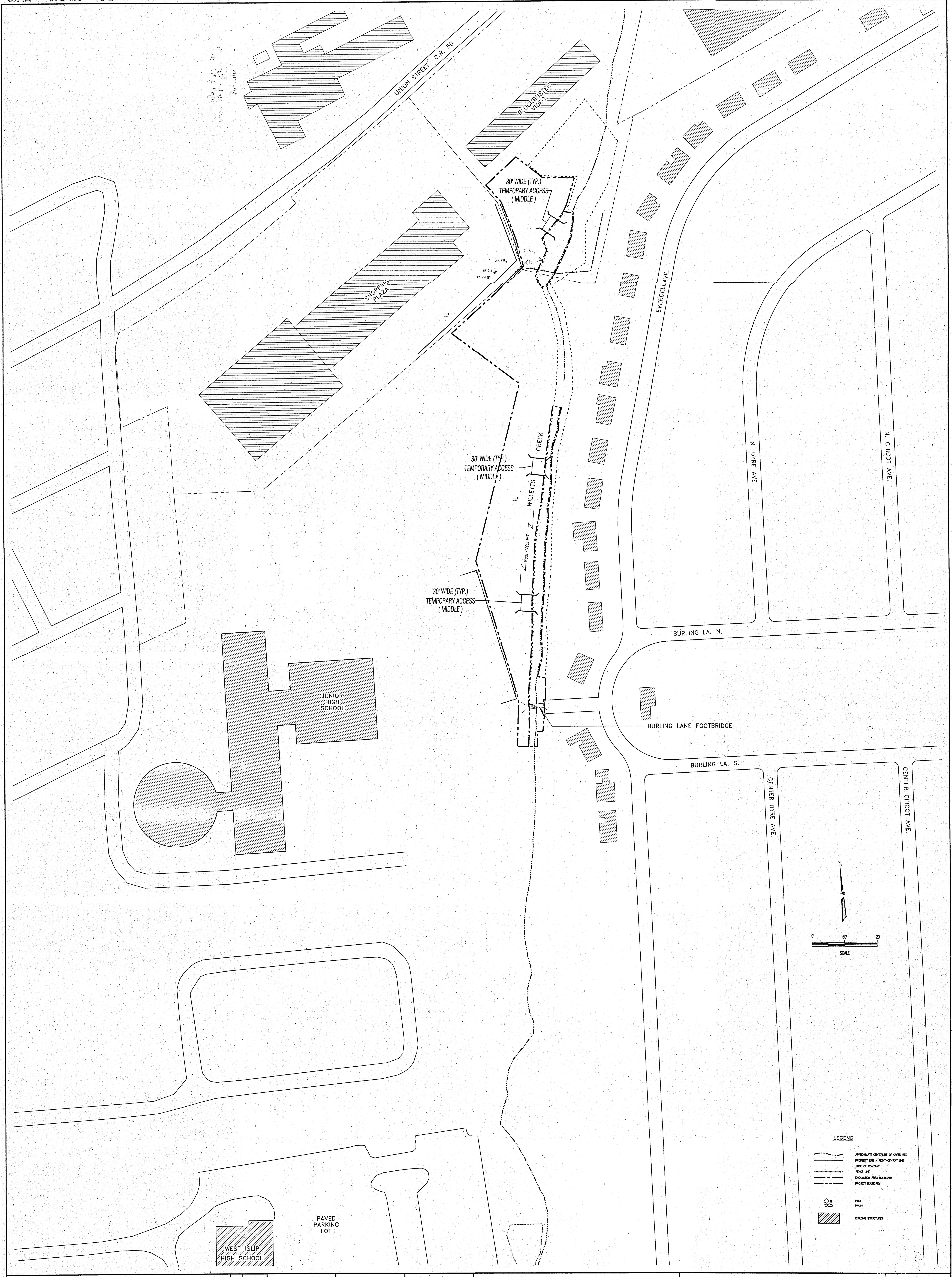
DES	-	-
CHK	-	-
APP	-	-

OPERATION LAYOUT PLAN
LAKE CAPRI

RUST
Rust Environment & Infrastructure Inc.

DESIGN ANALYSIS REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	DEC. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 02
PLATE NO:	2
DRAWING NO:	PLATE - 02



NO	REVISIONS	DRN	CHK	DATE

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OPERATION LAYOUT PLAN
WILLETTS CREEK

RUST
Rust Environment & Infrastructure Inc.

DESIGN ANALYSIS REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

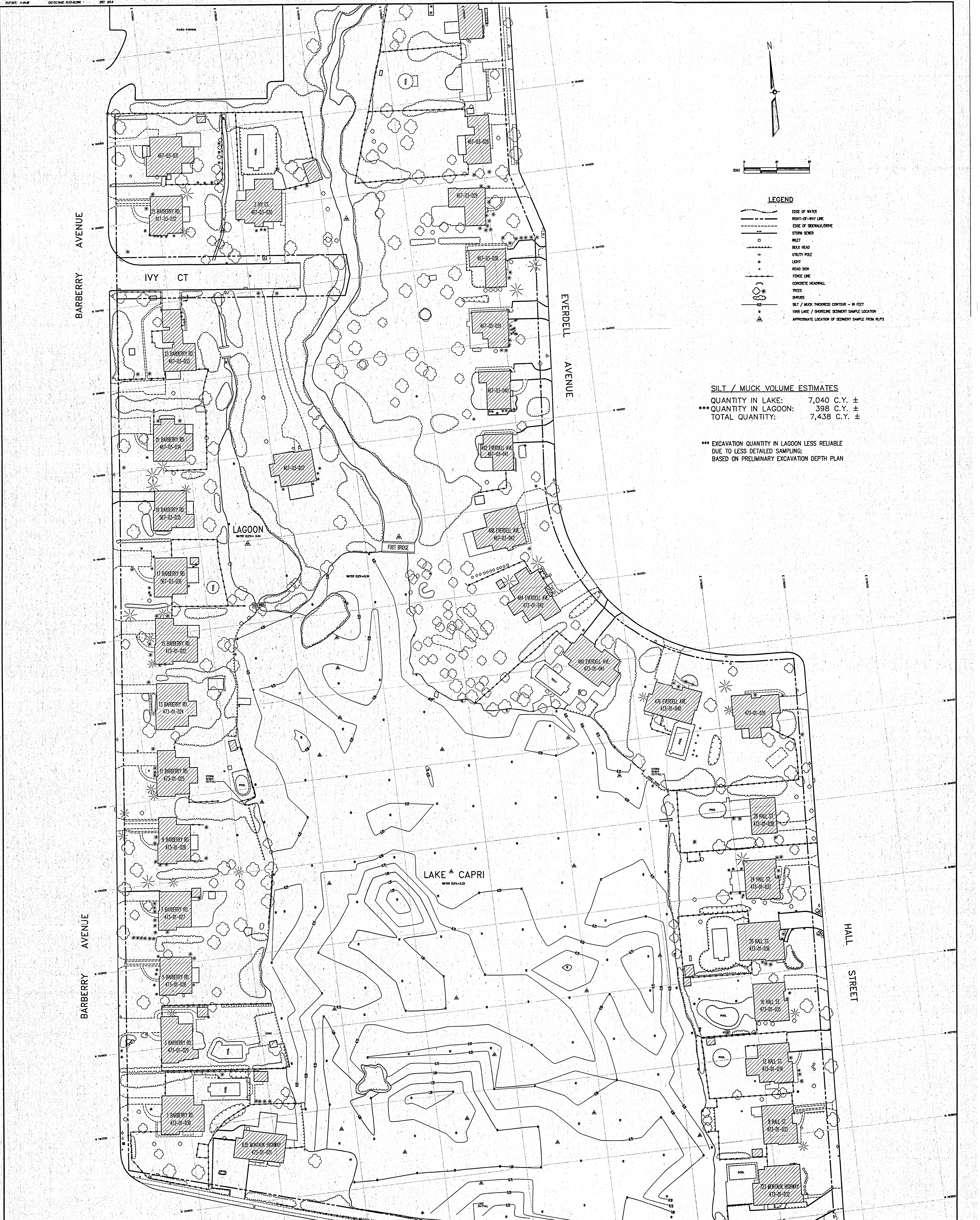
DATE:	DEC. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 03
PLATE NO:	3
DRAWING NO:	PLATE - 03

Appendix A

Pre-Design Investigation Report
Plates 1, 2, 3, 5 and 6

ALBANY, N.Y.	UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.	CADMIUM CONCENTRATION PLAN - LAKE CAPRI	PRE - DESIGN INVESTIGATION REPORT DZUS FASTENER SITE WEST ISLIP, NEW YORK NYSDEC SITE No. 1-52-033	DATE: OCT. 1998
DRN / DES / CHK / APP		Rust Environment & Infrastructure Inc.		PROJECT NO: 202563
				FILENAME: PLATE - 02
				PLATE NO: 2
				DRAWING NO: PLATE - 02

NO | REVISIONS | DRN | CHK | DATE



NOTES

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NO	REVISIONS	DRN	CHK	DATE

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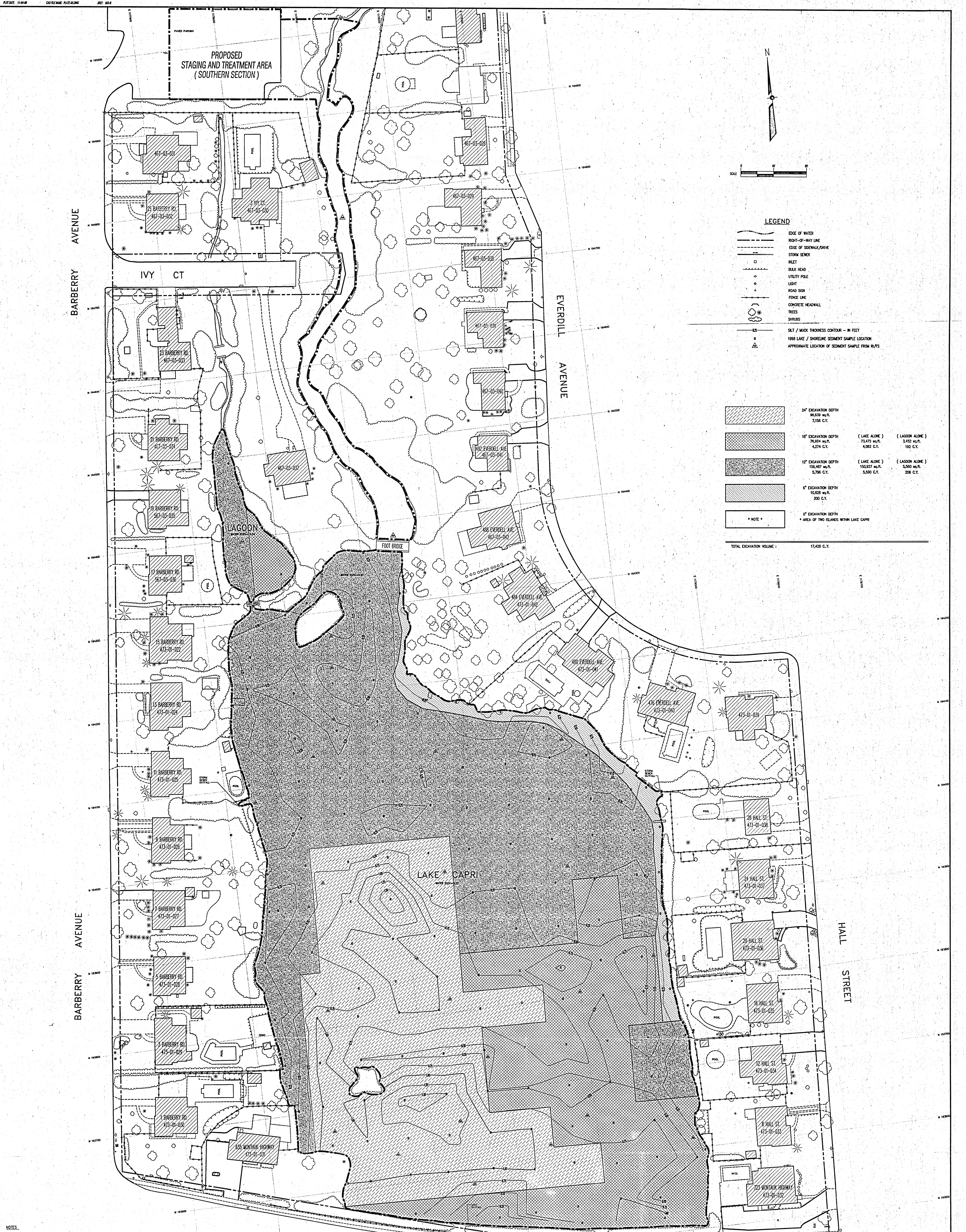
DES	-	-	
CHK	-	-	
APP	-	-	

SILT / MUCK THICKNESS PLAN - LAKE CAPRI

RUST
Rust Environment & Infrastructure Inc.

PRE - DESIGN INVESTIGATION REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	OCT. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 03
PLATE NO:	3
DRAWING NO:	PLATE - 03



NOTES

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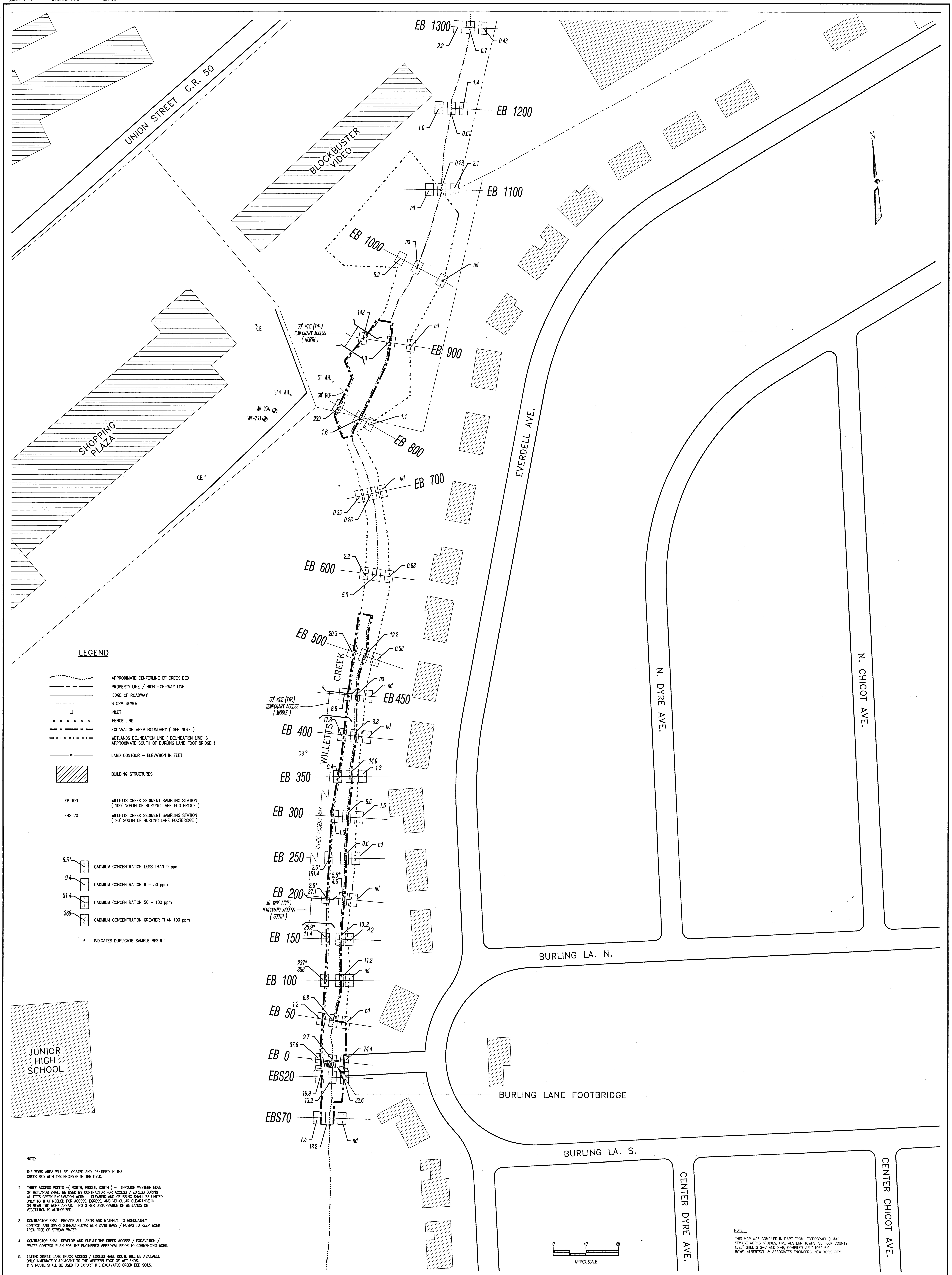
PRELIMINARY EXCAVATION DEPTH PLAN - LAKE CAPRI

RUST
Rust Environment & Infrastructure Inc.

PRE - DESIGN INVESTIGATION REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	OCT. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 05
PLATE NO:	5
DRAWING NO:	PLATE - 05



LEGEND

	APPROXIMATE CENTERLINE OF CREEK BED
	PROPERTY LINE / RIGHT-OF-WAY LINE
	EDGE OF ROADWAY
	STORM SEWER
	INLET
	FENCE LINE
	EXCAVATION AREA BOUNDARY (SEE NOTE)
	WETLANDS DELINEATION LINE (DELINEATION LINE IS APPROXIMATE SOUTH OF BURLING LANE FOOT BRIDGE)
15	LAND CONTOUR – ELEVATION IN FEET
	BUILDING STRUCTURES
EB 100	WILLETTS CREEK SEDIMENT SAMPLING STATION (100' NORTH OF BURLING LANE FOOTBRIDGE)
EBS 20	WILLETTS CREEK SEDIMENT SAMPLING STATION (20' SOUTH OF BURLING LANE FOOTBRIDGE)
5.5*	CADMIUM CONCENTRATION LESS THAN 9 ppm
9.4	CADMIUM CONCENTRATION 9 – 50 ppm
51.4	CADMIUM CONCENTRATION 50 – 100 ppm
368	CADMIUM CONCENTRATION GREATER THAN 100 ppm
*	INDICATES DUPLICATE SAMPLE RESULT

NOTE:

1. THE WORK AREA WILL BE LOCATED AND IDENTIFIED IN THE CREEK BED WITH THE ENGINEER IN THE FIELD.
2. THREE ACCESS POINTS –(NORTH, MIDDLE, SOUTH) – THROUGH WESTERN EDGE OF WETLANDS SHALL BE USED BY CONTRACTOR FOR ACCESS / EGRESS DURING WILLETTS CREEK EXCAVATION WORK. CLEARING AND GRUBBING SHALL BE LIMITED ONLY TO THAT NEEDED FOR ACCESS, EGRESS, AND VEHICULAR CLEARANCE IN OR NEAR THE WORK AREAS. NO OTHER DISTURBANCE OF WETLANDS OR VEGETATION IS AUTHORIZED.
3. CONTRACTOR SHALL PROVIDE ALL LABOR AND MATERIAL TO ADEQUATELY CONTROL AND DIVERT STREAM FLOWS WITH SAND BAGS / PUMPS TO KEEP WORK AREA FREE OF STREAM WATER.
4. CONTRACTOR SHALL DEVELOP AND SUBMIT THE CREEK ACCESS / EXCAVATION / WATER CONTROL PLAN FOR THE ENGINEER'S APPROVAL PRIOR TO COMMENCING WORK.
5. LIMITED SINGLE LANE TRUCK ACCESS / EGRESS HAUL ROUTE WILL BE AVAILABLE ONLY IMMEDIATELY ADJACENT TO THE WESTERN EDGE OF WETLANDS. THIS ROUTE SHALL BE USED TO EXPORT THE EXCAVATED CREEK BED SOILS.

NOTE:

THIS MAP WAS COMPILED IN PART FROM, "TOPOGRAPHIC MAP SEWAGE WORKS STUDIES, FIVE WESTERN TOWNS, SUFFOLK COUNTY, N.Y.," SHEETS S-7 AND S-8, COMPILED JULY 1964 BY BOWE, ALBERTSON & ASSOCIATES ENGINEERS, NEW YORK CITY.

NO	REVISIONS	DRN	CHK	DATE

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PRELIMINARY EXCAVATION PLAN
WILLETTS CREEK

RUST
Rust Environment & Infrastructure Inc.

PRE - DESIGN INVESTIGATION REPORT
DZUS FASTENER SITE
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	OCT. 1998
PROJECT NO:	202563
FILENAME:	PLATE - 06
PLATE NO:	6
DRAWING NO:	PLATE - 06

Appendix B

Design Basis Spreadsheet

Table B-1
Ambient Surface Water Concentrations/SPDES Limitations
Dzus Fastener Site
West Islip, New York

Analyte	Ambient Ranges (East & West Branch and Lake)	Ambient Range (West Branch Only)	Average Ambient (Concentrations East Branch Only)	SPDES Limitations* (July 15, 1998)
calcium	16.1 - 24.3	18.3 - 19.5	18.9	None
magnesium	3.1 - 3.5	3.1 - 3.2	3.15	None
manganese	1.7 - 2.4	1.8 - 2.0	1.9	None
aluminum, dissolved	0.057 - 0.260	0.057 - 0.059	0.058	0.360
cadmium, total	<0.005 - 0.016	0.005 - 0.016	0.011	0.017
chromium, total	all <0.010	all <0.010	<0.010	0.132
lead, total	<0.003 - 0.010	all <0.005	<0.005	0.014
iron, total	0.060 - 10.0	0.060 - 0.680	0.370	0.010
zinc, total	<0.020 - 0.061	0.024 - 0.061	0.043	0.072
cyanide	all <0.010	all <0.010	<0.010	0.060
total dissolved solids	110 - 140	120 - 140	130	Monitor
total suspended solids	<4 - 97	all <4	<4	0.020
alkalinity	30 - 56	30 - 32	31	None
setteable solids	all <0.2 (ml/l/hr)	all <0.2 (ml/l/hr)	<0.2 (ml/l/hr)	0.0001

* Analyses must be performed using Graphite Furnace Atomic Absorption, or alternate method approved by NYSDEC.

Appendix C

SPDES Limits

DESIGN ANALYSIS REPORT - TOTAL PROJECT
Lake Capri Dredge & Process Volumes - Filter Press Option

Est'd % Solids In-Place (Ws/Wt):	**67%**	
Est'd % Solids in Slurry (Ws/Wt):	**8%**	
Estimated % <#40 (Wf/Wt):	**41%**	

(Note - Data Inputs are in bold in boxes)

Sed. Vol. on Plan	**17,428**	cy
Overdredge	**3,188**	cy
Total Volume	20,616	cy

		AVG. IN PLACE PROPERTIES			DREDGE SLURRY			FILTER CAKE			SEPARATED COARSE MATL. (+#40)		
SEDIMENT PROPERTIES													
In-Place VOLUME (cy)	Vt		**21,000**	cy	Vt (CF) / 27	284,531	cy	Vt (CF) / 27	14,788	cy	Vt (CF) / 27	10,309	cy
VOLUME (Mgal)	Vt		4.2417	Mgal		57.4715	Mgal		2.9869	Mgal		2.0823	Mgal
WATER CONTENT		Ww / Ws	0.4925		Ww / Ws	11.5000		Ww / Ws	1.0000		Est'd Ww / Ws	0.0526	
MOISTURE CONTENT	m	Ww / Wt	33%	water	Ww / Wt	92%		Ww / Wt	**50%**	water	Ww/Wt	**5%**	water
SPECIFIC GRAVITY SOLIDS	SG	see Sheet 2	**2.60**		CONSTANT	2.60		SG Cake Solids	**2.30**	estimated	SG Coarse Matl.	**2.65**	
WEIGHTS													
UNIT WEIGHT (lb / cf)		Wt / Vt	106.2	lb / cf	Wt / Vt	65.6	lb / cf	Wt / (Vs + Vw)	87.0	lb/cf (Va=0)	Est'd Wt / (Vt)	**90.0**	lb / cf
SPECIFIC GRAVITY SEDIMENT			1.70			1.05			1.39			1.44	
TOTAL WEIGHT (tons)	Wt	Ws+Ww	30,101	tons	Ws+Ww	252,100	tons	Ws+Ww	17,365	tons	Ws+Ww	12,525	tons
WATER WEIGHT (tons)	Ww	m x Ws / (1-m)	9,933	tons	m x Ws / (1-m)	231,932	tons	m x Ws / (1-m)	8,682	tons	m x Ws / (1-m)	626	tons
SOLIDS WEIGHT (tons)	Ws	*1	20,168	tons	CONSTANT	20,168	tons	*2	8,682	tons	*2	11,899	tons
					Weight Bulking	8.4		Wt. Rate	192.9	tons / day	Wt. Rate	139.2	tons / day
								% Solids	50%		% Solids	95%	
VOLUMES													
VOL WATER (cf)	Vw	Ww / 62.4	318,381	cf	Ww / 62.4	7,433,711	cf	Ww / 62.4	278,279	cf	Ww / 62.4	20,073	cf
VOL SOLIDS (cf)	Vs	Ws / (SG x 62.4)	248,619	cf	CONSTANT	248,619	cf	Ws / (SG x 62.4)	120,991	cf	Ws / (SG x 62.4)	143,918	cf
VOL TOTAL (cf)	Vt	Vol (Cy) x 27	567,000	cf	Vs+Vw	7,682,330	cf	Vs+Vw	399,270	cf (Va=0)	Wt / Unit Wt	278,342	cf
					Volume Bulking	13.55		Vol. Rate	164.3	cy / day	Vol. Rate	114.5	cy / day
FILTER AID (% Dry Solids Weight)								Filter aid rate:	**5.0%**	by dry weight			
								Filter aid wt.:	413	tons			

DREDGING PRODUCTION						
DREDGE WEEKS	**15**	weeks				
DREDGE DAYS PER WEEK	**6**	days / week				
DREDGE WORKING DAYS	90	days	60	days	66	days
DREDGE HOURS PER DAY	**8**	hrs / day				
DREDGE MINUTES PER HOUR	**60**	mins / hr				
AVG. DREDGE RATE	1,330	gpm	**2,000**	gpm	1,824	gpm
AVG. DREDGE RATE	79,822	gph	120,000	gph	109,470	gph
AVG. DREDGE RATE	638,572	gpd	960,000	gpd	875,756	gpd
AVG. DREDGE RATE	29.2	cy / hr	43.8	cy / hr	**40**	cy / hr
AVG. DREDGE RATE	233	cy / day	351	cy / day	320	cy / day
DREDGE WIDTH	**8.0**	ft				
AVG. DREDGE CUT	1.6	ft				
AVG. DREDGE ADVANCE	1.00	ft / min				
ADDL. OVERDREDGE	**3**	inches				
ADDL. OVERDREDGE VOLUME	3,188	cy				

PASS LENGTH:	**450**	ft
PASS DURATION:	7.5	hrs / pass

DREDGE AREA:	**344,288**	sq ft
	7.90	acres
AVG. CUT DEPTH:	1.6	ft

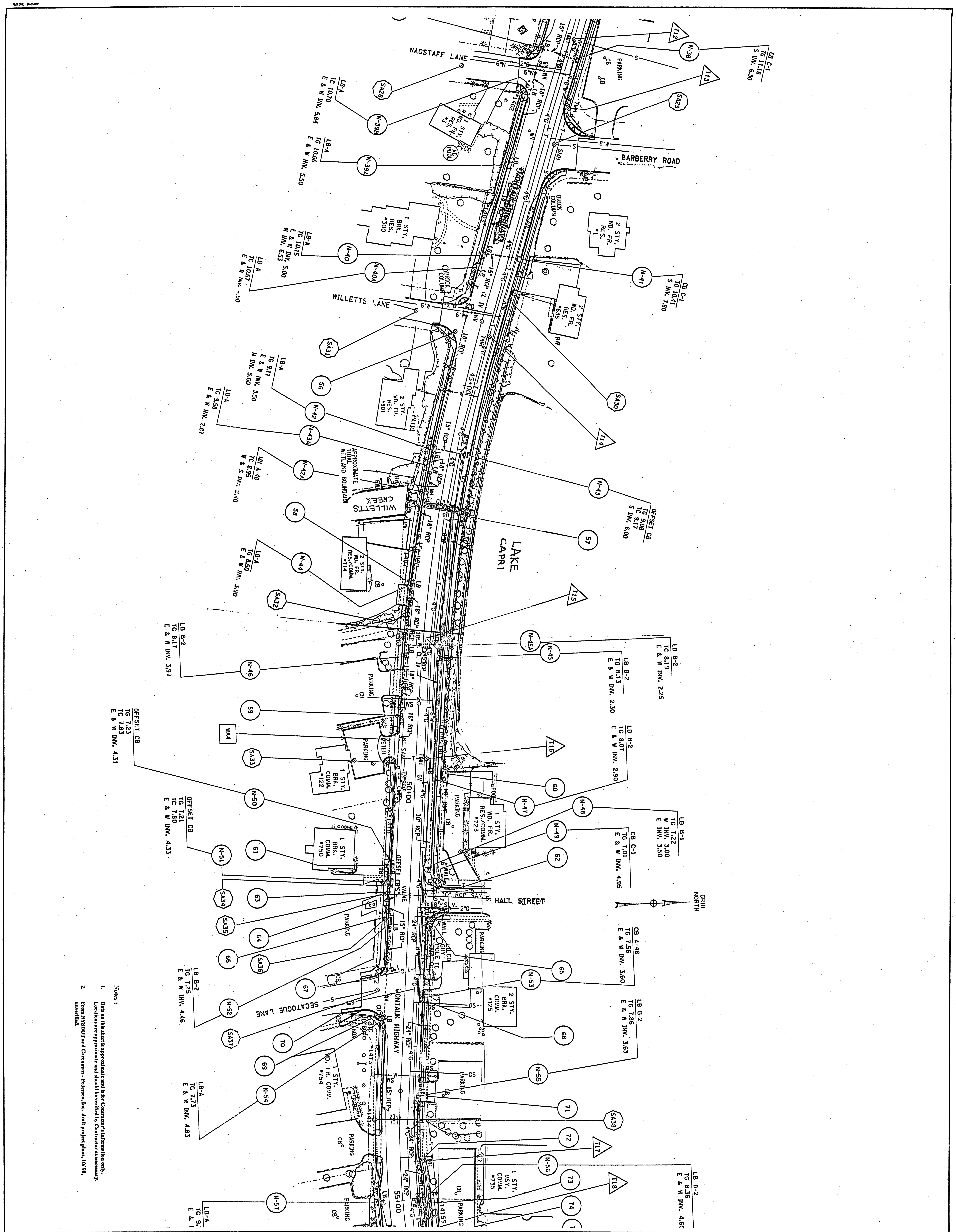
DREDGE WATER TREATMENT		
Excess H20:	53,372,488	gals
Dredge H20 treat:	593,028	gpd
Dredge H20 treat:	824	gpm
SPDES Q Limit:	**1,000,000**	gpd
Plant operation:	**12**	hrs / day
Effective Q Limit:	1389	gpm
Exceeding Limit?:	NO	

LAND DISPOSAL		
Truck capacity:	**11**	tons / truck
Truck trips:	2717	total trips
Daily trips:	30.2	trips / day
Landfill disp. rate:	**$70.00**	per ton
Landfill base cost:	$2,092,301	total
Overdredge cost:	$151,513	net addl.
Revised cost:	$2,243,813	

SOLIDS OUTPUT		
TOTAL WEIGHT	29,890	tons
PROD. RATE	332	tons / day
Wt. BULK. FACTOR	0.99	
TOTAL VOL.	25,097	cy
PROD. RATE	279	cy / day
VOL. BULK. FACTOR	1.20	
FINAL UNIT WT	1.19	tons / cy
FINAL UNIT WT	88.2	lbs / cf
FINAL % SOLIDS	0.69	

*1. $Ws = \frac{Vt}{((m/(1-m)*62.4) + (1/(62.4*SG)))}$

*2. Ws = %F x CONSTANT Ws x (1+ Filter aid rate)



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1-28-99

MONTAUK HIGHWAY
EXISTING UTILITIES

RUST
Rust Environment & Infrastructure Inc.

DZUS FASTENER SITE (OU2)
REMOVAL AND DISPOSAL CONTRACT
WEST ISLIP, NEW YORK
NYSDEC SITE No. 1-52-033

DATE:	JAN. 1998
PROJECT NO:	202563
FILENAME:	563-13
SHEET NO:	13
DRAWING NO:	563-13

File on eDOCs ___X___ Yes ________ No
Site Name ___Dzus___
Site No. ___152033___
County ___Suffolk___
Town ___West Islip___
Foilable ___∞___ Yes ________ No
File Name ___1998-12-01. Design Analysis Report.___
Scanned & eDOC ________